Docket:	:	A.15-09-010
Exhibit Number	:	
Reference Number	:	ORA-06
Commissioner	:	L. Randolph
ALJ	:	J. McKinney
Witness	:	N. Stannik

OFFICE OF RATEPAYER ADVOCATES
CALIFORNIA PUBLIC UTILITIES COMMISSION

Application of San Diego Gas & Electric Company for Authorization to Recover Costs Related to the 2007 Southern California Wildfires Recorded in the Wildfire Expense Memorandum Account (WEMA)

ORA Supporting Attachments (Volume 3)
All Other Supporting Attachments

San Francisco, California
October 3, 2016

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1	116, 125, 175	01	January 28, 2008
4	133, 176	02	May 14, 2008
6	157, 177	03	January 7, 2009

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37	126, 155	ORA-04
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169	155	Tree FF1090 Trim Photos and Photo Index	ORA DR-02, Q01
185	88	Nolte Survey (Rice)	ORA DR-02, Q01
248	35	TL637 October 21, 2007 Outage Report	ORA DR-02, Q01
250	57, 169-170, 230, 238	TMC1320 (December 2006)	ORA DR-02, Q01
261	239-242	TMC1320 (September 2008)	ORA DR-02, Q01
309	100-101	Visual Inspection of Poles and Equipment Procedures	ORA DR-03, Q06
329	229, 243	TMC1320 (April 2015)	ORA DR-05, Q02
345	219	WEMA_WSYcalcs	ORA DR-05, Q07
354	134	Pre-inspection Scheduled Visits	ORA DR-05, Q16
355	62, 64-66, 134	TL637 Outage Record	ORA DR-05, Q16
357	134	VMA Pre-inspection Audit Results	ORA DR-05, Q16
360	142	Bubble Sheet FF1090	ORA DR-07, Q05
361	143	Exception FF1090 11-13-07	ORA DR-07, Q05
362	42	TMC1010 (September 2007)	ORA DR-15, Q02
375	191	Sunrise PowerLink Wind Study	MGRA DR-02, Q21
452	190	Southwest PowerLink Wind Study	MGRA DR-02, Q21

Index of SDG&E Control Center Audio Recordings

Page	Footnote(s)	Shortcode[1]	Full Filename
481	(multiple)	Index for October 21, 2007 Station M Audio Recordings	
493	***29***	19F	SDGE0208938_STM_jcampbel_datarequest_10-21-2007_19F
493	58-59, ***34-35***	1B6	SDGE0208961_STM_jcampbel_datarequest_10-21-2007_1B6
493	46, **36**	1B7	SDGE0208962_STM_jcampbel_datarequest_10-21-2007_1B7
493	47-48, ***41***	1C0	SDGE0208971_STM_jcampbel_datarequest_10-21-2007_1C0
493	56, ***43***	1D7	SDGE0208994_STM_jcampbel_datarequest_10-21-2007_1D7
493	55	1DA	SDGE0208997_STM_jcampbel_datarequest_10-21-2007_1DA
493	53, 60	1F9	SDGE0209028_STM_jcampbel_datarequest_10-21-2007_1F9
493	61	1FA	SDGE0209029_STM_jcampbel_datarequest_10-21-2007_1FA
493	43, 49, ***48, 50***	204	SDGE0209039_STM_jcampbel_datarequest_10-21-2007_204
493	50	210	SDGE0209051_STM_jcampbel_datarequest_10-21-2007_210
493	51	212	SDGE0209053_STM_jcampbel_datarequest_10-21-2007_212
493	173	259	SDGE0209124_STM_jcampbel_datarequest_10-21-2007_259
493	44	175	SDGE0209283_STM_jcampbel_datarequest_10-21-2009_175

[1] Here, "shortcode" is used to indicate the last 3 digits of each recording's filename, which appears to be unique and can be used as an identifier.

Index of Appendices to SDG&E's Testimony[2]

Page	Footnote(s)	Document
494	115, 127, 130	Appendix 3 to the Testimony of Don Akau: Tree Pre-inspection Procedures Manual
560	132	Appendix 7 to the Testimony of Don Akau: Davey Data Request Response I. 08-11-006
564	189	Appendix 4 to the Testimony of Steve Vanderburg: Wildfire Threat Index Poster

Index of All Other Supporting Attachments

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565	2, 4, 15, 28, 30, 32, 34, 36-37, 67-69, 73-74, 83, ***33, 39, 42, 45***	CalFire Report (Witch Fire)
723	3, 11, 16, 41, 76-77, 79-82, 84-85, 94-95, ***52-55***	CalFire Report (Guejito Fire)
869	12, 17, 106-108, 110-111, ***18, 56-60, 62, 65, 73***	CalFire Report (Rice Fire)
968	14, ***14, 16, 26, 70-71***	"California Fire Siege 2007 – An Overview"
1078	228	CalFire – Red Flag Warnings
1081	213-215	"Downslope Windstorms of San Diego County" (Fovell)
1095	183	"Lessons from the October 2003 Wildfires in Southern California" (Keeley, Fotheringham, Moritz)

[2] For reference, ORA is including documents provided by SDG&E in support of SDG&E's testimony and referenced in ORA's testimony.

1101	180	“A Brief History of the Santa Ana Winds” (Masters)
1113	178, 227	NOAA Red Flag Warnings and Watches
1114	179, 182, 187	NOAA Technical Memorandum WR-270
1223	87, 93	Nolte Survey (Guejito Fire)
1250	181	“Red Wind” (Chandler)
1286	***47***	“2007 San Diego County Firestorms After Action Report”
1385	224	Interagency Wildland Fire Weather Station Standards & Guidelines (June 2012)
1441	27	Calfire: “Guide to Wildland Fire Origin and Cause Determination”
1778	192	Southwest Powerlink Map
1779	192	Sunrise Powerlink Map
1780	117	Davey Tree FF1090 Photos

Footnotes in ***bold and italics*** refer to footnotes in ORA Exhibit ORA-02 (Supporting Timeline). All other footnotes refer to ORA Exhibit ORA-01 (ORA Prepared Testimony).

Attachment C

Tree Trimming Records

Information for Tree FF1090

Tree ID: FF1090
VMA: 379 - Rainbow 1
Status: XT - Exception
Species: Sycamore
Growth Rate: Fast
Height: 60.1 to 80 ft.
DBH: 36 to 41.9 in.

Clearance: 4.1 to 5.9 ft.
Trunks: 1
Pole 1: P213072
Pole 2: P112340
Thomas Bros: 998J7
Reliability Flag:
System Add Date: 5/7/1999 9:13:48 AM

Property Information
Owner:
Address: 1548 RICE CANYON RD, FALLBROOK CA, 92028

Pre-Inspection History

Clearance	Pre-Inspector	Update Time
4 to 8 ft.	Kuchera, Michael	5/7/1999 9:25:03 AM
4 to 8 ft.	Flagherty, Patrick	1/25/2001 9:47:19 AM
1.5 to 4 ft.	Moi, Fune	1/2/2002 7:56:48 AM
8 to 12 ft.	Moi, Fune	1/13/2003 7:48:26 AM
4 to 8 ft.	Mikulanis, Vince	11/11/2003 8:01:46 AM
4 to 8 ft.	Wloch, Michael	11/17/2004 6:56:34 AM
8 to 12 ft.	Space, Ben	7/12/2005 8:17:14 AM
8 to 9.9 ft.	Klein, Kevin	7/19/2006 3:40:35 PM
6 to 7.9 ft.	Clemens, Mark	7/18/2007 1:00:03 PM

Visit History

Pre-Inspector	Update Time
Flagherty, Patrick	1/25/2001 9:47:19 AM

Moi, Fune	1/2/2002 7:56:48 AM
Moi, Fune	1/13/2003 7:48:26 AM
Mikulanis, Vince	11/11/2003 8:01:46 AM
Wloch, Michael	11/17/2004 6:56:34 AM
Wloch, Michael	11/17/2004 7:19:43 AM
Space, Ben	7/12/2005 8:17:14 AM
Klein, Kevin	7/19/2006 3:40:35 PM
Clemens, Mark	7/18/2007 1:00:03 PM

Pruning History

Contractor	Crew Name	Pruning Performed	Clearance	Pruning Date
Davey	Jorge Orellana	Exception	4.1 to 5.9 ft.	11/13/2007
Davey	Gustavo Sanchez	Trimmed	10 to 11.9	2/11/2005
Asplundh	Josue Aparicio	Trimmed	10 to 11.9	2/17/2004
Davey	Antonio Prieto	Partial	8 to 9.9 ft.	5/7/2003
Davey	William Holder	Trimmed	10 to 11.9	4/29/2002
Asplundh	LOWRY, J.	Trimmed	8 to 12 ft.	5/1/2000

Tree Notes History

Tree Note Description	Note Active	Crew Name	Update Time
Remove direct overhang		Clemens, Mark	7/18/2007 1:00:03 PM
Poison oak		Klein, Kevin	7/19/2006 3:40:35 PM
Start at 1551 Rice Cyn Rd mailbox-tree in 1st span sw		Space, Ben	7/12/2005 8:17:14 AM
located along Rice Cnyn Rd		Wloch, Michael	11/17/2004 7:19:43 AM

Property Notes History

Tree Note Description	Note Active	Crew Name	Update Time
Beware of Dog(s)		Clemens, Mark	7/17/2007 2:30:00 PM
[redacted]		Klein, Kevin	7/19/2006 3:44:26 PM
[redacted]		Klein, Kevin	7/14/2006 11:39:15 AM
[redacted]		Myers, Bob	10/26/2005 2:13:42 PM
[redacted]		Space, Ben	7/12/2005 8:20:31 AM
[redacted]		Wloch, Michael	11/17/2004 7:45:02 AM
[redacted]		Wloch, Michael	11/17/2004 7:45:02 AM

Removal History

Refusal History

SDGE

A Sempra Energy utility™

Information for Tree FF1090

Tree ID: FF1090
VMA: 379 - Rainbow 1
Status: LC - Listed & Clear
Species: Sycamore
Growth Rate: Fast
Height: 60.1 to 80 ft.
DBH: 36 to 41.9 in.

Clearance: 10 to 11.9 ft.
Trunks: 1
Pole 1: P213072
Pole 2: P112340
Thomas Bros: 998J7
Reliability Flag: ☐
System Add Date: 5/7/1999 9:13:48 AM

Property Information
Owner:
Address: 1548 RICE CANYON RD, FALLBROOK CA, 92028

Pre-Inspection History

Clearance	Pre-Inspector	Update Time
10 to 11.9 ft.	Jebrail, Jon	1/22/2008 11:33:00 AM
6 to 7.9 ft.	Clemens, Mark	7/18/2007 1:00:03 PM
8 to 9.9 ft.	Klein, Kevin	7/19/2006 3:40:35 PM
8 to 12 ft.	Space, Ben	7/12/2005 8:17:14 AM
4 to 8 ft.	Wloch, Michael	11/17/2004 6:56:34 AM
4 to 8 ft.	Mikulanis, Vince	11/11/2003 8:01:46 AM
8 to 12 ft.	Moi, Fune	1/13/2003 7:48:26 AM
1.5 to 4 ft.	Moi, Fune	1/2/2002 7:56:48 AM
4 to 8 ft.	Flagherty, Patrick	1/25/2001 9:47:19 AM
4 to 8 ft.	Kuchera, Michael	5/7/1999 9:25:03 AM

Visit History

Pruning History

Contractor	Crew Name	Pruning Performed	Clearance	Pruning Date
Davey	Jorge Orellana	Exception.	4.1 to 5.9 ft.	11/13/2007
Davey	James Crowley	Trimmed	10 to 11.9 ft	10/22/2007
Davey	Gustavo Sanchez	Trimmed	10 to 11.9 ft	2/11/2005
Asplundh	Josue Aparicio	Trimmed	10 to 11.9 ft	2/17/2004
Davey	Antonio Prieto	Partial	8 to 9.9 ft.	5/7/2003
Davey	William Holder	Trimmed	10 to 11.9 ft	4/29/2002
Asplundh	LOWRY, J.	Trimmed	8 to 12 ft.	5/1/2000

PRIVATE INFORMATION - DO NOT SHARE WITH OTHER PARTIES

Tree Notes History

Tree Note Description	Note Active	Crew Name	Update Time
Remove direct overhang	☑	Jebrail, Jon	1/22/2008 11:38:57 AM
Poison oak	☑	Klein, Kevin	7/19/2006 3:40:35 PM
Start at 1551 Rice Cyn Rd mailbox-tree in 1st span sw	☐	Space, Ben	7/12/2005 8:17:14 AM
located along Rice Cnyn Rd	☐	Wloch, Michael	11/17/2004 7:19:43 AM

Property Notes Histor

Tree Note Description	Note Active	Crew Name	Update Time
Beware of Dog(s)	☑	Clemens, Mark	7/17/2007 2:30:00 PM
[redacted]	☐	Klein, Kevin	7/19/2006 3:44:26 PM
	☑	Klein, Kevin	7/14/2006 11:39:15 AM
	☐	Myers, Bob	10/26/2005 2:13:42 PM
	☐	Space, Ben	7/12/2005 8:20:31 AM
	☐	Wloch, Michael	11/17/2004 7:45:02 AM
	☐	Wloch, Michael	11/17/2004 7:45:02 AM

Removal History

Refusal History

SDGE

A Sempra Energy utility

Information for Tree FF1090

Tree ID: FF1090
VMA: 379 - Rainbow 1
Status: CT - Compltd/Trimmed
Species: Sycamore
Growth Rate: Fast
Height: 40.1 to 50 ft.
DBH: 36 to 41.9 in.

Clearance: 12 to 14.9 ft.
Trunks: 1
Pole 1: P213072
Pole 2: P112340
Thomas Bros: 998J7
Reliability Flag: ☑
System Add Date: 05/07/1999 9:13:48 AM

Property Information
Owner:
Address: 1548 RICE CANYON RD, FALLBROOK CA, 92028

Pre-Inspection History

Clearance	Pre-Inspector	Update Time
4 to 8 ft.	Kuchera, Michael	05/07/1999 9:25:03 AM
4 to 8 ft.	Flagherty, Patrick	01/25/2001 9:47:19 AM
1.5 to 4 ft.	Moi, Fune	01/02/2002 7:56:48 AM
8 to 12 ft.	Moi, Fune	01/13/2003 7:48:26 AM
4 to 8 ft.	Mikulanis, Vince	11/11/2003 8:01:46 AM
4 to 8 ft.	Wloch, Michael	11/17/2004 6:56:34 AM
8 to 12 ft.	Space, Ben	07/12/2005 8:17:14 AM
8 to 9.9 ft.	Klein, Kevin	07/19/2006 3:40:35 PM
6 to 7.9 ft.	Clemens, Mark	07/18/2007 1:00:03 PM
10 to 11.9 ft.	Jebrail, Jon	01/22/2008 11:33:00 AM
6 to 7.9 ft.	Greene, Les	08/04/2008 11:31:12 AM

Visit History

Pre-Inspector	Update Time
Flagherty, Patrick	01/25/2001 9:47:19 AM
Moi, Fune	01/02/2002 7:56:48 AM
Moi, Fune	01/13/2003 7:48:26 AM
Mikulanis, Vince	11/11/2003 8:01:46 AM
Wloch, Michael	11/17/2004 6:56:34 AM
Wloch, Michael	11/17/2004 7:19:43 AM
Space, Ben	07/12/2005 8:17:14 AM
Klein, Kevin	07/19/2006 3:40:35 PM
Clemens, Mark	07/18/2007 1:00:03 PM

PRIVATE INFORMATION - DO NOT SHARE WITH OTHER PARTIES

Jebrail, Jon	01/22/2008 11:33:00 AM
Jebrail, Jon	01/22/2008 11:33:57 AM
Greene, Les	08/04/2008 11:31:12 AM
Greene, Les	08/06/2008 7:00:15 PM
Reynolds, Angela	08/29/2008 10:16:22 AM

Pruning History

Contractor	Crew Name	Pruning Performed	Clearance	Pruning Date
Davey	Raul Martinez	Trimmed	12 to 14.9 ft	11/06/2008
Davey	Jorge Orellana	Exception	4.1 to 5.9 ft.	11/13/2007
Davey	James Crowley	Trimmed	10 to 11.9 ft	10/22/2007
Davey	Gustavo Sanchez	Trimmed	10 to 11.9 ft	02/11/2005
Asplundh	Acosta, Honorio	Trimmed	10 to 11.9 ft	02/17/2004
Davey	Antonio Prieto	Partial	8 to 9.9 ft.	05/07/2003
Davey	William Holder	Trimmed	10 to 11.9 ft	04/29/2002
Asplundh	LOWRY, J.	Trimmed	8 to 12 ft.	05/01/2000

Tree Notes History

Tree Note Description	Note Active	Crew Name	Update Time
Reliability - To be Worked in 2009	☑	Reynolds, Angela	08/29/2008 10:16:22 AM
Remove direct overhang	☐	Greene, Les	08/06/2008 7:00:15 PM
FSZ Cycle 11	☑	Greene, Les	08/06/2008 7:00:15 PM
Traffic control required-flagman needed	☑	Greene, Les	08/04/2008 11:31:12 AM
Reliability - Green Tree	☑	Greene, Les	08/04/2008 11:31:12 AM
trim tree below bell cables	☑	Greene, Les	08/04/2008 11:31:12 AM
Poison oak	☑	Klein, Kevin	07/19/2006 3:40:35 PM
Start at 1551 Rice Cyn Rd mailbox-tree in 1st span sw	☐	Space, Ben	07/12/2005 8:17:14 AM
located along Rice Cnyn Rd	☐	Wloch, Michael	11/17/2004 7:19:43 AM

Property Notes Histor

Tree Note Description	Note Active	Crew Name	Update Time
Beware of Dog(s)	☑	Clemens, Mark	07/17/2007 2:30:00 PM
[redacted]	☐	Klein, Kevin	07/19/2006 3:44:26 PM
	☑	Klein, Kevin	07/14/2006 11:39:15 AM
	☐	Myers, Bob	10/26/2005 2:13:42 PM
	☐	Space, Ben	07/12/2005 8:20:31 AM
	☐	Wloch, Michael	11/17/2004 7:45:02 AM
	☐	Wloch, Michael	11/17/2004 7:45:02 AM

PRIVATE INFORMATION - DO NOT SHARE WITH OTHER PARTIES

Removal History

Refusal History

ORA DATA REQUEST
ORA-SDG&E DR-02, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E OBJECTIONS
DATE RECEIVED: APRIL 1, 2016
DATE OF RESPONSES: APRIL 29, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (*see* Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

ORA DATA REQUEST
ORA-SDG&E DR-02, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E OBJECTIONS
DATE RECEIVED: APRIL 1, 2016
DATE OF RESPONSES: APRIL 29, 2016

III. OBJECTIONS TO REQUESTS

Request 1: [Please provide] [a]ll discovery containing relevant information regarding causation and/or SDG&E's operational prudence, which SDG&E produced and/or received in the civil litigation associated with the Witch, Rice and Guejito Fires of 2007.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 3, 4, 5, 8 and 10. Subject to this objection, SDG&E will attempt to provide a response by April 29, 2016.

Response: Subject to the foregoing objection, SDG&E responds as follows. As you requested, SDG&E is transmitting to ORA two removable hard drives containing its document production and relevant discovery responses from the civil litigation associated with the Witch, Rice and Guejito Fires of 2007.

As discussed during our April 27, 2016 meet and confer, a portion of the materials on these hard drives were marked as confidential in the course of the civil litigation. As we also discussed, in the interests of providing these materials to you as promptly as possible, SDG&E is not separately marking those materials as "**Confidential Pursuant to P.U. Code § 583 and General Order 66-C,**" but it is producing these materials on the understanding that they will be treated as confidential pursuant to those legal provisions. SDG&E is willing to further examine and discuss the appropriateness of any confidentiality designation with ORA.

ORA DATA REQUEST
ORA-SDG&E DR-02, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E OBJECTIONS
DATE RECEIVED: APRIL 1, 2016
DATE OF RESPONSES: APRIL 29, 2016

Request 2: [Please provide] [a]ll deposition transcripts taken in the civil litigation of the Witch, Rice and Guejito Fires of 2007.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 3, 5, 6 and 10. SDG&E notes that California law generally prohibits a party to litigation in the Superior Courts who has purchased a transcript from distributing that transcript to other parties or persons. SDG&E takes the position that producing deposition transcripts in this regulatory proceeding (A.15-09-010) is appropriate because they are documents in its possession, custody or control that may be responsive to this discovery request. However, SDG&E is providing these requests subject to the limitation that they cannot be provided to any other persons without SDG&E's prior written consent or by court or CPUC order. Subject to this objection, SDG&E will attempt to provide a response by April 29, 2016.

Response: Subject to the foregoing objection, SDG&E responds as follows. On the two removable hard drives, referenced above, SDG&E has also provided relevant deposition transcripts from the civil litigation regarding the Witch, Rice and Guejito Fires of 2007.

As discussed during our April 27, 2016 meet and confer, a portion of the materials on these hard drives were marked as confidential in the course of the civil litigation. As we also discussed, in the interests of providing these materials to you as promptly as possible, SDG&E is not separately marking those materials as "**Confidential Pursuant to P.U. Code § 583 and General Order 66-C,**" but it is producing these materials on the understanding that they will be treated as confidential pursuant to those legal provisions. SDG&E is willing to further examine and discuss the appropriateness of any confidentiality designation with ORA.

ORA DATA REQUEST
ORA-SDG&E DR-02, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E OBJECTIONS
DATE RECEIVED: APRIL 1, 2016
DATE OF RESPONSES: APRIL 29, 2016

Request 3: [Please provide] [a] written narrative of all facts in SDG&E's possession regarding causation and/or SDG&E's operational prudence, in relation to the Witch, Rice and Guejito Fires of 2007.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1, 2, 3, 4, 5, 7, 9 and 10. Subject to this objection, SDG&E will attempt to provide a response by April 29, 2016.

Response: Subject to the foregoing objection, SDG&E responds as follows. SDG&E's prepared direct testimony submitted in this proceeding on September 25, 2015 contains narratives responsive to this request. Appendices to that testimony (particularly Mr. Schavrien's direct testimony) contain further such narratives. Cal Fire and CPSD (in connection with the Wildfire OIIs) have also produced narratives, although SDG&E reserves its rights to disagree with or dispute all or a portion of those narratives. Further facts on these issues are contained in the materials produced in response to Requests 1 and 2 above.

ORA DATA REQUEST
ORA-SDG&E DR-02, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E OBJECTIONS
DATE RECEIVED: APRIL 1, 2016
DATE OF RESPONSES: APRIL 29, 2016

Request 4: [Please provide] [e]ach and every document containing any factual or legal admission by SDG&E in relation to the Witch, Rice and Guejito Fires of 2007.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1, 2, 3, 4, 5, 7, 9 and 10. In connection with this objection, SDG&E notes that it has been involved in more than 2,000 civil cases relating to these fires, as described in the prepared direct testimony of Ms. Karen Sedgwick. Even if this request were construed to relate solely to that litigation, searching documents relating to those lawsuits and trying to determine whether they contain what ORA might deem an "admission . . . in relation to the Witch, Rice and Guejito Fires" is, on its face, overly broad, unintelligible, and unduly burdensome. Subject to this objection, SDG&E will attempt to provide a response by April 29, 2016.

Response: Subject to the foregoing objection, SDG&E responds as follows. See Response to Requests 1-3 above.

ORA DATA REQUEST
ORA-SDG&E DR-02, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E OBJECTIONS
DATE RECEIVED: APRIL 1, 2016
DATE OF RESPONSES: APRIL 29, 2016

Request 5: [Please provide] [e]ach and every document containing any factual or legal admission by any person or entity in relation to the Witch, Rice and Guejito Fires of 2007.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10. In connection with this objection, SDG&E notes that it has been involved in more than 2,000 civil cases relating to these fires, as described in the prepared direct testimony of Ms. Karen Sedgwick. Even if this request were construed to relate solely to that litigation, searching documents relating to those lawsuits and trying to determine whether they contain what ORA might deem an "admission . . . in relation to the Witch, Rice and Guejito Fires" is, on its face, overly broad, unintelligible, and unduly burdensome. Further, this request seeks information not in the possession, custody or control of SDG&E. Subject to this objection, SDG&E will attempt to provide a response by April 29, 2016.

Response: Subject to the foregoing objection, SDG&E responds as follows. See Response to Requests 1-3 above.

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ORA-SDG&E DR-02, Q1-6
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SDG&E OBJECTIONS
DATE RECEIVED: APRIL 1, 2016
DATE OF RESPONSES: APRIL 29, 2016

Request 6: [Please provide] [e]xculpatory information.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1, 2, 3, 4, 5, 7, 9 and 10. In particular, SDG&E does not know what ORA means by the term "exculpatory" in this context. Subject to this objection, SDG&E will attempt to provide a response by April 29, 2016.

Response: Subject to the foregoing objection, SDG&E responds as follows. See Response to Requests 1-3 above.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

April 28, 2016

Sent Via Sempra EDT and FedEx

A.15-09-010

Mr. Nathaniel Skinner
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Response to ORA Data Request 03 - Wildfire Expense Memorandum Account Application

Dear Mr. Skinner:

Attached please find SDG&E's response to ORA Data Request 03 (ORA-SDG&E-A.15-09-010-03), dated April 13, 2016. SDG&E's response includes general objections, narrative responses where applicable, and associated attachments.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E
Nils Stannik - ORA
Edward Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-03, Q1-10
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: APRIL 13, 2016
DATE RESPONDED: APRIL 28, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

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III. OBJECTIONS AND RESPONSES TO REQUESTS

Request 1:

On page 6, lines 11-14 of Mr. Geier's testimony, SDG&E states:

> *"We have seen these conditions worsen in recent years as a result of the effects of the drought and climate change. Approximately two-thirds of SDG&E's service territory now falls within what SDG&E has determined to be a fire threat zone in connection with mapping activities we have undertaken."*

a. Has SDG&E quantified or otherwise studied to what extent the drought and/or climate change has worsened fire risk? If so, please provide the quantification, study, or similar document.

b. Please provide the historical proportion (on at least an annual basis) of SDG&E's service territory SDG&E determined to be a fire threat zone since the year 1990. If data is not available back to 1990, please provide all available historical data.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 9. Subject to this objection, SDG&E provides the following response.

Response:

a. SDG&E has confirmed an increase in the frequency of high fire risk days through research conducted as part of the Santa Ana Wildfire Threat Index (see "Attachment for Question 1a_SAWTI"), which is further discussed in the Prepared Direct Testimony of Mr. Steve Vanderburg. Additionally, these findings were included in the Wildfire section of the attached Vulnerability Assessment report submitted to the Department of Energy as a deliverable for its Partnership for Energy Sector Climate Resilience (see "Attachment for Question 1a_SDGE Potential Climate Change Impacts").

b. The most recent boundary of the SDG&E Fire Threat Zone (FTZ) constitutes 62.6 % of SDG&E's service territory. In the only previous version of the FTZ, it constituted 62.4% of SDG&E's service territory. This small increase came about after a review of the FTZ boundary that SDG&E undertook following the May 2014 wildfires in San Diego County to determine if there were logical additions that could be made to the FTZ. The SDG&E FTZ was established in 2010 in response to the Fire Safety OIR (R.08-11-005). Prior to establishment of the FTZ, SDG&E used a boundary called the "Wildland Fire Area," which was comprised of lands that were State and Federal Responsibility areas (under CALFIRE and US Forest Service jurisdiction, respectively), for its fire preparedness procedures.

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SDG&E does not have the GIS data necessary to calculate the exact percentage of its service territory that fell within the boundary of the Wildland Fire Area.

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DATE RECEIVED: APRIL 13, 2016
DATE RESPONDED: APRIL 28, 2016

Request 2:

Page 28 of SDG&E's Fire Prevention Plan (included as Appendix 2 to Mr. Geier's testimony) shows an "FPI Weather Component" table with various wind speeds. It is ORA's understanding that the values for the 36 dewpoint/wind combinations are a contributing component to SDG&E's Fire Potential Index (FPI).

a. Does any component of the FPI take into account non-sustained wind speeds (i.e. gusting or similar)?

b. Has SDG&E analyzed how often each of the wind speed ranges shown in the FPI Weather Component table occur in its service territory annually? If so, please provide frequency data, studies, or similar documents.

Response:

a. The FPI does not take into account wind gusts.

b. SDG&E has analyzed the daily FPI back to 2002, which incorporates wind speed as one of its components. On average, there are 243 Normal FPI days, 113 Elevated FPI days, and 9 Extreme FPI days per year in the SDG&E service territory (see "Attachment for Question 2a_Copy of Historic_FPI_2002-2016"). Regarding the wind speed portion of the weather component of the FPI, see the following table for the frequency of occurrence in the SDG&E service territory.

FPI Wind Speed Ranges	Average number of days per year
0 to 4	0
5 to 9	2
10 to 14	67
15 to 19	193
20 to 24	69
25 or greater	34

Please note: this only examines daily maximum sustained wind speeds at Federally-owned ASOS weather stations and does not take into account wind measurements from Federally-owned RAWS or SDG&E weather stations. It was not the intent of the FPI to create a wind climatology (*i.e.*, the known wind patterns) of the SDG&E service territory.

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DATE RECEIVED: APRIL 13, 2016
DATE RESPONDED: APRIL 28, 2016

Request 3:

On lines 4-16 of page 7 of Mr. Akau's testimony, SDG&E describes the use of the Master Schedule in its management of trees and poles under the Vegetation Management Program, stating:

> *"Within an annual cycle, the pre-inspection is completed within 30 days; the quality assurance audit of the pre-inspection is completed within the first month following the pre-inspection; tree trimming and removal begins two months after the start of pre-inspection, and the contractor has 60 days to complete all assigned work and 5 additional days to certify completion; and the quality assurance audit of the tree trimming and removal is completed within 30 days from that completion and certification – a continuous cycle."*

a. What event or timeline triggers the pre-inspection (for example, 365 days since a Vegetation Management Area was last assessed)?

b. Does SDG&E's description of the Quality Assurance (QA) audit mean that between 30 days (pre-inspection completed on the 31st of a month, so QA audit must be completed within the subsequent calendar month) and 61 days (pre-inspection completed on the 1st of the month, so QA audit must be completed by the end of the <u>following</u> calendar month) can elapse between pre-inspection completion and audit completion, depending on what date the pre-inspection is completed? If not, please describe.

c. Does the timing of the tree trimming work remain the same if the QA audit finds issues in the pre-inspection? If not, please describe how the timeline changes.

d. Must the contractor certify completion of work within 65 days of <u>starting</u> work or within 5 days of <u>completing</u> work? For example, if work is completed in 15 days, must work be certified within 20 total days or within 65 total days?

Response:

a. The Master Schedule was designed to manage SDG&E's 133 Vegetation Management Areas (VMA) that comprise the entire service territory. Each of the 133 VMA's are assigned a specific month within the calendar year for the pre-inspection activity (repeated the same month each year, 365 days or fewer). Approximately 10-12 individual VMA's are pre-inspected within each month of the calendar year.

b. Yes.

c. If QA finds issues in the VMA during the Pre-inspection audit, the auditor will make the necessary corrections and provide the final results to SDG&E. Pre-inspection audits do not hold up the release of the tree trimming work.

d. SDG&E's contractors are required to certify the completion of work within 65 days of starting work but are free to certify the completion of work earlier than that.

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DATE RESPONDED: APRIL 28, 2016

Request 4:

"Table 1 – Historical Tree-Caused Outages" on page 14 of Mr. Akau's testimony shows appears to show numerous significant year-over-year changes in tree-caused outages, including, for example a reduction from 446 outages in 1997 to 280 (-37%) in 1998 to 58 (-79%) in 2009.

Please provide dates and descriptions of any years between 1995 and 2015 in which:

- Extreme or unusual weather caused significant numbers of tree-caused outages
- Specific components of SDG&E's Vegetation Management Program (VMP) were put into place or began to be accounted for
- Specific components of SDG&E's VMP changed or were ended, discontinued, or paused
- Significant resources were added to the VMP (or a component thereof)
- Significant resources were moved from one VMP program/section to another
- SDG&E changed its definition or categorization of "tree-caused outage" (or related, similar terms)
- SDG&E changed its method of counting "tree-caused outages" or similar statistics

Objection: SDG&E objects to this request on the grounds set forth in General Objections 3 and 9. Subject to this objection, SDG&E provides the following response.

Response:

- Extreme or unusual weather caused significant numbers of tree-caused outages

Weather contributed to an increase in the total number of tree-related outages in 2004 and 2010. During the winter season of those years a number of storm events (with associated strong winds and saturated soils) caused an increase in tree branch breakouts and whole tree failures which impacted the overhead electric facilities.

- Specific components of SDG&E's Vegetation Management Program (VMP) were put into place or began to be accounted for

In 1997, General Order 95, Rule 35 established minimum clearance requirements between power lines and vegetation, and SDG&E initiated an annual Vegetation Management cycle of pre-inspection and tree trimming activities to identify and abate tree encroachments into electrical facilities and to comply with the new regulatory requirements. At this time, SDG&E increased post-trim clearances and hazard tree inspection scope to mitigate impacts to overhead facilities. As a result there was a significant reduction in the number of tree-related outages in 1998 and 1999

compared to 1997. SDG&E reported its compliance with the increased clearance requirements to the CPUC in 1999. As more information was gathered regarding tree growth and tree failures, SDG&E made additional adjustments to post pruning clearances for fast and very fast growing tree species, as well as inspection of palms further away from the overhead lines; 25 feet to as much as 65 feet away depending on the height of the palm. Additionally, SDG&E began an aggressive removal of palms and removal of overhanging branches since 2001 and continues to do so today.

In April 2003, SDG&E supported the Governor's State of Emergency Proclamation (CPUC Resolution E-3824) to remove dead, dying and diseased trees, as part of the "Bark Beetle project," which was completed in early 2005.

In 2009, SDG&E began its participation in the OII workshops and worked closely with contractors to develop an annual hazard tree training program with its workforce.

In 2010, SDG&E implemented a Highest Risk Fire Area map and the vegetation management team began an off-cycle hazard tree patrol to mitigate dead or declining tree concerns arising since a tree's last inspection, before September 1.

In 2012, SDG&E implemented a "Century Plant Patrol" to remove the flowering bloom during its Spring and Summer growing period. Lastly, SDG&E began an effort to apply tree growth regulator to trees that are very fast growing and where customers will not permit heavier pruning.

Today, SDG&E has a strong tree removal program that has resulted in minimizing the number of tree related outages annually.

- Specific components of SDG&E's VMP changed or were ended, discontinued, or paused

Following the implementation of General Order 95, Rule 35 and the subsequent increase in SDG&E VMP scope of work and activities, there have been no singular components that have significantly impacted the number of tree-related outages.

- Significant resources were added to the VMP (or a component thereof)

Following the implementation of General Order 95, Rule 35, SDG&E increased its contractor workforce of pre-inspectors, auditors, and tree trimmers to meet the demand of the annual schedule activities and scope of work.

- Significant resources were moved from one VMP program/section to another

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The change in the number of tree-related outages over time has not been caused by SDG&E moving or allocating significant resources (budgetary or labor) from the VMP program to or from another.

- SDG&E changed its definition or categorization of "tree-caused outage" (or related, similar terms)

SDG&E has not changed its definition of "tree-caused outages" over time.

- SDG&E changed its method of counting "tree-caused outages" or similar statistics.

SDG&E has not changed its methodology of counting "tree-caused outages" over time.

ORA DATA REQUEST
ORA-SDG&E DR-03, Q1-10
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: APRIL 13, 2016
DATE RESPONDED: APRIL 28, 2016

Request 5:

How are tree identifying numbers assigned? In the case of tree FF1090, what do the components "FF" and "1090" stand for, mean, or otherwise indicate?

Response:

Each inventory tree is assigned unique alpha-numeric identification. In the example of tree record FF1090, the alpha characters, "FF" identify the Mobil Data Terminal (MDT), which is the portable computer used in recording the tree information. The numeric "1090" is the sequential numbering assigned by the system software to create the unique tree record. This number increases by one digit as new inventory trees are created in the system and prevents duplication of records.

The record remains in service and updated as long as the tree meets the inventory criteria. If the tree no longer meets the criteria for inventory or is removed (cut down entirely), the record is de-activated and the history retained.

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DATE RECEIVED: APRIL 13, 2016
DATE RESPONDED: APRIL 28, 2016

Request 6:

On page 11, lines 22-27 of Mr. Walters's testimony, SDG&E states (regarding Communications Infrastructure Provider-related General Order 165 infractions):

Q. Did SDG&E take any action when it found such infractions?

A. Yes. SDG&E routinely provided a detailed notice to CIPs of their infractions, even though not required to do so by GO 165 prior to the 2007 wildfires. The notices detailed the affected pole numbers and addresses or location identifiers and the problem requiring remediation. These notices typically also included photographs of the problem. The preparation of these notices was quite labor intensive.

a. Did SDG&E send a notice to Cox Communications regarding Cox's lashing wire infraction between poles P196387 and P196394 prior to the Guejito Fire? If so, please provide the notice, notice date, and any supplemental documents.

b. Please provide the procedures, protocols, or standards by which SDG&E provided "a detailed notice to CIPs of their infractions" prior to the 2007 wildfires.

Response:

a. As discussed in the direct testimony of Mr. Walters (pages 14-15) and Mr. Weim, (pages 10-11), SDG&E had inspected these facilities but had no notice of the issues that are alleged to have caused the Guejito Fire. Thus, no notice was sent to Cox Communications regarding this lashing wire.

b. See attachments titled "Attachment for Question 6b_Deffering CMP Facility and Equipment Repairs_Mar2003"; "Attachment for Question 6b_Example of a GO95 Infraction Notification"; and "Attachment for Question 6b_Visual Inspection of Poles_Feb2006". See also Appendix 3 to Mr. Walters' direct testimony.

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SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: APRIL 13, 2016
DATE RESPONDED: APRIL 28, 2016

Request 7:

On page 7, lines 4-5 of Mr. Weim's testimony, SDG&E states,

> *"Second, the accuracy of our [Corrective Maintenance] program is constantly verified and maintained through regular internal audits."*

Are there now or have there ever been any equivalent external audits performed on SDG&E's Corrective Maintenance Program? If so, please describe.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 3 and 10. Subject to the foregoing objection, SDG&E responds as follows.

Response:

The only external party that has audited the CMP is the Safety and Enforcement Division (SED) of the CPUC. It has historically performed several audits per year at SDG&E.

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SDG&E RESPONSE
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DATE RESPONDED: APRIL 28, 2016

Request 8:

On page 6, lines 15-16 of Mr. Weim's testimony, SDG&E states *"For problems posing immediate safety concerns, the repairs are normally completed that same day."*

a. Under what conditions would immediate safety concerns not be completed the same day?

b. Please provide a historical annual count (since 1990) of immediate safety concern repairs that were not addressed the same day there were discovered. If data is not available back to 1990, please provide all available historical data.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 3 and 9. Subject to the foregoing objection, SDG&E responds as follows.

a. Immediate safety concerns are almost always completed the same day, and in the rare instances where repairs are not made the same day, SDG&E takes steps to make conditions safe until the permanent repairs can be made. There are a few reasons that immediate safety concerns might not be completed on the same day found. The first reason is timing. If a condition is found at the end of a day, repairs could carry over to the following day. In addition, weather could factor into the repair time. Typically, when these types of hazards are identified, the party or parties that identify the hazard stand-by until a make-safe crew or repair crew arrives on scene to begin repairs. Another scenario where repairs might not be completed the same day is if, as noted previously, the conditions can be made safe temporarily until permanent repairs can be made, or if the facilities can be de-energized for a short period of time. Many SDG&E circuits have ties with other circuits. Depending on the nature of the hazard, the load on a circuit with a problem can be transferred to another circuit, and the circuit with the hazard can be deenergized, making same day follow-up unnecessary.

b. SDG&E does not compile data in the manner suggested by this request. There can be a variety of scenarios in which emergency repairs become necessary.

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SDG&E RESPONSE
DATE RECEIVED: APRIL 13, 2016
DATE RESPONDED: APRIL 28, 2016

Request 9:

On page 9, lines 14 through 20 of Mr. Weim's testimony, SDG&E states [internal citation removed]:

> *"SDG&E has also received the 'Top Ten Best North American Utilities' award for smart grid development from Greentech Media, SDG&E was named "Most Intelligent Utility" for three years in a row by Intelligent Utility magazine, and received POWER Magazine's prestigious '2012 Smart Grid Award' for the nation's most advanced smart grid. From SDG&E's perspective, these awards are the result of a comprehensive approach to improving the quality of the electric system through a myriad of activities, including inspection and maintenance."*

a. Do any of the above-mentioned awards specifically relate to safety-related programs and activities? If so, please provide appropriate citations, grading criteria, etc.

b. Do any of the above-mentioned awards specifically relate to inspection and maintenance programs and activities? If so, please provide appropriate citations, grading criteria, etc.

c. Do any of the above-mentioned awards specifically relate to wildfire preparedness or response? If so, please provide appropriate citations, grading criteria, etc.

Response:

a. The Smart Grid Awards do relate to safety-related activities. Under the Smart Grid portfolio of projects related to the 2012 awards, advanced sectionalizing devices were installed (*e.g.*, Intellirupters), Supervisor Control and Data Acquisition (SCADA) capacitors were installed, wireless fault indicators were installed, advanced relays were installed, weather stations were installed, and sensitive ground fault settings were applied to relays. In addition, an arc detection system was pursued under the Smart Grid portfolio of projects to increase the capability of identifying arcs on the overhead electric system. Unlike the reliability awards SDG&E has received, where the metrics and grading system are known, the details of the Smart Grid award grading system are not known.

b. The '2012 Smart Grid Award' was awarded to SDG&E for work done in the Smart Grid area. This does include the work SDG&E has done with Condition Based Maintenance (CBM), which is related to substation inspection and maintenance activities. It also includes the deployment of SCADA capacitors. SCADA capacitors allow SDG&E to get real-time performance and diagnostic information. In the past, capacitors were inspected as part of the normal detailed inspection cycle (done as part of the CMP), as well as annual capacitor

surveys. These "smart" capacitors are an example of how SDG&E has deployed equipment, and continues to deploy equipment, capable of providing real-time operational status. Unlike the reliability awards SDG&E has received, where the metrics and grading system are known, the details of the Smart Grid award grading system are not known.

c. Under the Smart Grid portfolio of projects related to the 2012 award, advanced sectionalizing devices were installed (e.g. Intellirupters), SCADA Capacitors were installed, wireless fault indicators were installed, advanced relays were installed, weather stations were installed and sensitive ground fault settings were applied to relays. In addition, an arc detection system was pursued under the Smart Grid portfolio of projects to increase the capability of identifying arcs on the overhead electric system. Unlike the reliability awards SDG&E has received, where the metrics and grading system are known, the details of the Smart Grid award grading system are not known.

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SDG&E RESPONSE
DATE RECEIVED: APRIL 13, 2016
DATE RESPONDED: APRIL 28, 2016

Request 10:

On page 13, line 14 of Mr. Weim's testimony, SDG&E mentions wood-to-steel construction standards as *"further reduc[ing] fire risk on the transmission system."*

Do wood-to-steel pole conversion programs primarily reduce risk by preventing or reducing the spread of wildfires, preventing or reducing wildfires' ignition, preventing or reducing wildfire effects on the electrical system, or some other factor? Please explain.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 5. Subject to this objection, SDG&E provides the following response.

Response:

The wood-to-steel conversion projects are designed to reduce the risk of ignitions as well as reduce the impact of wildfires on the overhead electric system. The design standards that were developed for the steel pole construction in fire prone areas include the use of steel poles designed for wind speeds that exceed GO 95 wind loading criteria, the use of high-strength conductors, increased phase separation, and the use of longer insulators. For distribution wood-to-steel construction, steel poles are also designed for higher wind speeds, and high-strength conductors are used, but additional measures are also within the project scope, including, the use of advanced sectionalizing devices and relays for improved monitoring and detection, use of engineered fiberglass crossarms and in some cases the use of insulated spacer cable. The transmission wood-to-steel projects, and now, the distribution Fire Risk Mitigation (FiRM) capital projects, are designed using the advanced PLS-CADD 3-D modeling software, using Light Detection and Ranging (LiDAR) and/or survey quality data.

ORA DATA REQUEST
ORA-SDG&E DR-04 Q1-16
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: MAY 13, 2016
DATE RESPONDED: MAY 26, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

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SDG&E RESPONSE
DATE RECEIVED: MAY 13, 2016
DATE RESPONDED: MAY 26, 2016

Request 1:

Please provide the following documents identified in Appendix 4 of the testimony of Mr. Gentes:

- Settlement agreement between SDG&E and Cox Communications
- Settlement agreement between SDG&E and Herman Weissker, Inc.
- Settlement agreement between SDG&E and Davey Tree
- Settlement agreement between SDG&E and PAR Electric

Objection:

SDG&E objects to producing these documents at this time on the grounds that they are not relevant to the issues to be considered in Phase 1 of this proceeding. The Commission phased this proceeding, finding that such an approach "will be fair and make the most efficient use of party and Commission resources … and make it easier to distinguish Phase 1 issues related to prudent management of facilities from Phase 2 issues related to settling of legal claims." Scoping Memo at p. 4. The Commission further found that "For Phase 2, the scope of the matter properly before the Commission is whether SDG&E's actions and decisionmaking in connection with settling of legal claims and costs in relation to the wildfires were reasonable." *Id*. at p. 5.

Since these settlement agreements relate to the settling of legal claims and costs in relation to the wildfires, SDG&E will respond to this request in Phase 2.

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Request 2:

In its report on the Guejito Fire, the CPUC's Consumer Protection and Safety Division (CPSD) stated:

> *"The exact vertical midspan clearance between SDG&E's 12kV conductors and Cox's cable prior to the incident is unknown. Neither SDG&E nor Cox measured the vertical clearance before making repairs and modifications to their facilities following the incident"*[1]

a. Under what circumstances would SDG&E measure vertical clearance before making repairs or modifications to its facilities?

b. Under what circumstances would SDG&E not measure vertical clearance before making repairs or modifications to its facilities?

c. Is measuring vertical clearance between conductors and/or other cables prior to routine or regular facilities work currently a required or recommended part of any SDG&E protocol, work procedure, best practice, or training? If so, please provide the relevant supporting documents.

d. Was measuring vertical clearance between conductors and/or other cables prior to routine or regular facilities work a required or recommended part of any SDG&E protocol, work procedure, best practice, or training in the year preceding October 2007? If so, please provide the relevant supporting documents.

e. Is measuring vertical clearance between conductors and/or other cables as part of an investigation into wildfires, circuit tripping, equipment malfunction, weather damage, or similar events currently a part of any SDG&E protocol, work procedure, best practice, or training? If so, please provide the relevant supporting documents.

f. Was measuring vertical clearance between conductors and/or other cables as part of an investigation into wildfires, circuit tripping, equipment malfunction, weather damage, or similar events currently a part of any SDG&E protocol, work procedure, best practice, or training in the year preceding 2007? If so, please provide the relevant supporting documents.

[1] California Public Utilities Commission, Consumer Protection and Safety Division, Utilities Safety and Reliability Branch. Investigation of the Guejito Fire; San Pasqual, California; October 2007. Dated September 2, 2008. Pp. 4-5.

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Objection:

SDG&E objects to this request on the grounds set forth in General Objections 3 and 7. Subject to the foregoing objections, SDG&E responds as follows.

Response:

Please see SDG&E's Corrected Response, dated February 25, 2009, to CPUC Data Request of November 6, 2008. This response was included as Exhibit No. 4-G in the documents listed in Appendix A to the OII Settlement and was made available by SDG&E to the parties in this proceeding on March 21, 2016.

As noted in SDG&E's corrected response to Question 1:

> SDG&E agrees that "[t]he exact vertical mid-span clearance between SDG&E's 12 kV conductors and Cox's cable prior to the incident is unknown." SDG&E did, however, cause survey measurements to be undertaken on November 2, 2007, prior to removal and repair of the SDG&E and Cox lines that, among other things, included a vertical clearance measurement of 3.3 feet between Cox's cable and SDG&E's conductor at approximately mid-span.

Thus, the premise of the cited portion of the CPSD report is not correct.

Prior to 2007, SDG&E measured clearances if a Line Checker/Inspector perceived that a clearance issue might exist. The Line Checker/Inspectors were trained to use a vertical clearance stick to measure the clearance.

Since 2007, SDG&E has used LiDAR for spans over 1,000 feet and modeled them in 3-D, and in some cases, where necessary, repairs were made as a result of this work. In connection with SDG&E's FiRM project, SDG&E is performing LiDAR and creating 3-D models, and clearances are being analyzed. On the transmission side, SDG&E performs LiDAR surveys on a portion of the 69 kV lines in the HRFA every year.

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Request 3:

In its report on the Guejito Fire, the CPUC's Consumer Protection and Safety Division (CPSD) stated:

> *"The Vegetation Management Program Manager further stated that he visited the site [of the Rice Fire] on October 23, 2007 and found that the sycamore tree was reduced to two-thirds of its height."*[2]
>
> and:
>
> *"The Utility Forester indicated that, upon his arrival at the scene, he requested that the tree trimming crew trim the tree to a level below the assumed height of the wire."*[3]

a. What specific safety, reliability, or other concerns was SDG&E attempting to address in the post-ignition trimming of the tree described above?

b. For each objective or goal listed in response to part (a) above, please describe why less-substantial trimming or management would not have sufficed.

Objection:

SDG&E objects to this request on the grounds set forth in General Objection 7. Subject to the foregoing objection, SDG&E responds as follows.

Response:

As discussed in the Direct Testimony of Chris Thompson submitted by SDG&E in I.08-11-006, Mr. Thompson, an Area Forester, was instructed to go to the Rice Fire Site by Don Akau, SDG&E's Vegetation Program Manager and supervise the Davey Tree Surgery crew that worked on tree FF1090. Mr. Thompson explained the objectives of the tree trimming, and why less substantial trimming or management would not have sufficed in light of those objectives, at pages 3-6 of his testimony. Mr. Akau also provided his perspective on these issues on pages 13-16 of his Direct Testimony in I.08-11-006.

[2] California Public Utilities Commission, Consumer Protection and Safety Division, Utilities Safety and Reliability Branch. Investigation of the Rice Fire; Fallbrook, California; October 2007. Dated September 2, 2008. P.5.
[3] California Public Utilities Commission, Consumer Protection and Safety Division, Utilities Safety and Reliability Branch. Investigation of the Rice Fire; Fallbrook, California; October 2007. Dated September 2, 2008. P.5.

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Request 4:

a. Currently, when performing routine or scheduled tree trimming, what metrics do SDG&E (and its vegetation management contractors) use to determine the appropriate amount of trimming?

b. In the year proceeding October 2007, when performing routine or scheduled tree trimming, what metrics did SDG&E (and its vegetation management contractors) use to determine the appropriate amount of trimming?

c. Currently, if, as part of routine or scheduled vegetation management, a tree is determined to require trimming, who is responsible for determining the appropriate level of tree trimming?

d. In the year proceeding October 2007, if, as part of routine or scheduled vegetation management, a tree was determined to require trimming, who was responsible for determining the appropriate level of tree trimming?

e. Currently, if, as part of routine or scheduled vegetation management, a tree is determined to require trimming and the responsible party listed in Question 3 determines that significant trimming is necessary (for example, a dramatic height reduction, removal of an entire significantly-sized limb, or removal of the entire tree), is this decision verified, audited, or otherwise checked by another party, department, or individual? If so, please describe such a process.

f. In the year proceeding October 2007, if, as part of routine or scheduled vegetation management, a tree was determined to require trimming and the responsible party listed in Question 3 determined that significant trimming was necessary (for example, a dramatic height reduction, removal of an entire significantly-sized limb, or removal of the entire tree), was this decision verified, audited, or otherwise checked by another party, department, or individual? If so, please describe such a process.

g. If the answer to part (e) above is yes, are there any situations in which significant trimming would not be verified, audited, or otherwise checked? If so, please list and describe.

h. If the answer to part (f) above is yes, were there in the year proceeding October 2007 any situations in which significant trimming would not have been verified, audited, or otherwise checked? If so, please list and describe.

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Response:

a. SDG&E Vegetation Management (VM) and its contractors apply various metrics to determine the appropriate amount of trimming to perform. These include: trim cycle, species, tree growth rate, voltage, proper trimming standards, applicable regulation, wind sway, line sag. For trees identified as a hazard (*i.e.*, diseased, dead, dying, heavy lean, structural defect) the extent of trimming is based on the amount needed to abate the hazardous condition, that is, the portion(s) of the tree are trimmed to avoid striking the line if the tree and/or branches failed.

b. See the response to subpart 4a of this request.

c. The tree trimming company determines the appropriate level of tree trimming, per SDG&E standards, to maintain compliance for at least one annual trim cycle, applying the metrics set forth in subpart 4a.

d. See the response to subpart 4c to this request.

e. The responsible party listed in Request 3 is the Area Forester, an employee within SDG&E Vegetation Management. This individual is usually the final arbitrator in determining if significant trimming is necessary. There is typically no additional party, department, or individual that who reviews or verifies the decision subsequent to the Area Forester. Tree trimming contractors also make determinations in the field – e.g. to remove a large limb if that is deemed necessary.

f. See the response to subpart 4e of this request.

g. The answer to 4e is no.

h. The answer to 4f is no.

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Request 5:

In the direct testimony of Gerry Akin in I. 08-11-007 (Guejito Fire Investigation), SDG&E states:

> *"Q: Was there a history of phase-to-ground faults in the span between poles 196394 and 196387 prior to October 22, 2007?*
>
> *A: No. SDG&E records going back to 2001 show that no phase-to-ground faults had occurred in that span before October 22, 2007."*[4]

Since installation, has any <u>other</u> type of fault occurred in the span between poles 196394 and 196387? If so, please provide the date, time, and type of fault for each occurrence.

Response: SDG&E is not aware of any other type of fault occurring in the referenced span prior to October 22, 2007.

[4] Direct Testimony of Gerry Akin, San Diego Gas & Electric Company, I. 08-11-007, page 3, lines 17 - 20.

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Request 6:

In the direct testimony of Paul Alvarado in I. 08-11-007 (Guejito Fire Investigation), SDG&E states:

> *"Q: Does SDG&E have any other spans over 850 feet in length in its electric system?*
>
> *A: Yes. According to SDG&E's records, there are approximately 250 overhead distribution spans in the system that exceed 850 feet."*[5]

a. At the time of the Guejito fire ignition, approximately how many overhead spans did SDG&E's system contain?

b. As of the response date of this data request, approximately how many overhead spans does SDG&E's system contain?

c. As of the response date of this data request, approximately how many overhead spans exceeding 850 feet in length does SDG&E's system contain?

d. Has SDG&E conducted any risk analysis regarding overhead distribution span length? If so, please provide.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 3 and 5. Subject to the foregoing objections, SDG&E responds as follows.

Response:

a. In April 2009, SDG&E ran a query and determined there were approximately 176,000 overhead distribution spans at that time. The GIS system is constantly updated, and is a real-time source of data for our distribution system. SDG&E cannot search back to 2007 to determine exactly how many such spans existed at that time. Most likely, there were more than 176,000 spans in 2007 since more and more of SDG&E's electric system is converted to underground every year.

b. There are currently 172,573 overhead distribution spans.

c. There are currently 240 overhead distribution spans that are greater than or equal to 850 feet in length.

d. SDG&E has not conducted a risk analysis based on span length.

[5] Direct Testimony of Paul Alvarado, San Diego Gas & Electric Company, I. 08-11-007, page 5, lines 1 - 3.

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Request 7:

Are joint-pole-use applications free for applicants or does SDG&E collect a processing fee (or similar)?

If SDG&E does not charge a fee, please describe how costs of processing these applications are recovered (if at all). If SDG&E does charge a fee, please provide the fee structure or similar documentation.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 5. Subject to the foregoing objection, SDG&E responds as follows.

Response:

At this time, SDG&E does not collect a processing fee for pole attachment applications that are submitted. Costs are not recovered. SDG&E is, however, considering capturing processing fees in the foreseeable future.

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Request 8:

Aside from any potential fees described in Question 7 above, does SDG&E receive any payment or compensation from joint pole uses by telecommunication companies? If so, please describe the structure of such payments (i.e. one-time payment vs. monthly payment, payment amount, variations in payment amount by location, pole loading, etc.).

Objection: SDG&E objects to this request on the grounds set forth in General Objection 5. Subject to the foregoing objection, SDG&E responds as follows.

Response:

SDG&E only receives Pole Attachment fee payments as prescribed in CPUC D.98-10-058. Below is a description of the payment structure for telecommunication pole attachments.

- SDG&E collects pole attachment fees from telecommunication companies on an annual basis based on their total number of attachments.

- In addition, when new attachment applications are approved, the telecommunication companies are prorated for those new attachments for the remainder of the year.

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Request 9:

a. How does SDG&E (or its contractors) determine default tree growth rates for a new tree entered into its Vegetation Management System?

b. Please describe how SDG&E's default VMS tree growth rates and the methods of determining them compare to industry standards and best practices.

c. Under what circumstances could a tree's default growth rate in SDG&E's Vegetation Management System be changed?

d. What level and type of approval would be necessary to change a tree's default growth rate in SDG&E's Vegetation Management System?

Response:

a. Default growth rates are based on the species and the anticipated growth rate for the species. Additionally, growth rates are determined by observable, site-specific conditions such as previous year's growth, and other potential factors such as soil conditions, proximity to water, cultural practices. SDG&E categorizes growth rates as: slow, medium, fast, or very fast.

b. SDG&E's determination of growth rates are considered the same as industry standards and best practices; that is, species is usually the most significant factor followed by site specific conditions.

c. A tree's growth rate is recorded in the inventory record. The growth rate category can be changed during the tree inspection activity. An inspector may change the growth rate category if it appears the rate has changed. The growth rate can also be changed during the post-inspection quality assurance activity by the third-party contract auditor.

d. There is no approval required to change a tree growth rate.

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DATE RECEIVED: MAY 13, 2016
DATE RESPONDED: MAY 26, 2016

Request 10:

In the direct testimony of Gerry Akin in I. 08-11-006 (Witch-Rice Fire Investigation), SDG&E states:

> *"Q: Is there anything else that leads you to believe the reduction in tension with the C phase did not occur prior to the wind events of October 2007?*
>
> *A: Yes. Records dating back to June 6, 2000 confirm that there were no phase-to-phase faults involving the C phase conductor prior to October 21, 2007, except for one fault on February 10, 2002 with unknown phase records."* [6]

a. As used in this context, what does the phrase "with unknown phase records" mean?

b. Please provide all information, records, documentation, or other knowledge that SDG&E has regarding the February 10, 2002 fault.

Response:

a. In this context, "with unknown phase records" indicates that the fault targets for the TL637 event on February 10, 2002 were not recorded.

b. The following table is an extract from SDG&E's database for the event in question:

Type	TL
Id	637
Terminal1	Creelman
Terminal2	Santa Ysabel
Terminal(s)	CRE-ST
kV	69
Outage Date/Time	2/10/02 10:10
Restoration Date/Time	2/10/02 10:11
Load Restoration Date/Time	
Load Drop	FALSE
Sub Load Dropped	None
Field Notes	Outage added per CAISO
Targets	N/A
Description	Wind

[6] Direct Testimony of Gerry Akin, San Diego Gas & Electric Company, I. 08-11-006, page 6, lines 17 - 21.

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Request 11:

Were any SDG&E substation facilities damaged by the Witch, Rice, or Guejito fires? If so, please provide the location and description for each occurrence.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 5. Subject to the foregoing objection, SDG&E responds as follows.

Response: No, there were no SDG&E substation facilities damaged by the Witch, Rice, or Guejito fires.

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Request 12:

In the direct testimony of Ronald Matranga in I. 08-11-006 (Witch-Rice Fire Investigation), SDG&E states:

> *"Q: Had [tree FF1090] been trimmed at that time? Did you take pictures?*
>
> *A: It had been reduced in height, with all the upper foliage removed. I took approximately 16 photos while on site."*[7]

Please provide the referenced photographs.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 5. Subject to the foregoing objection, SDG&E responds as follows.

Response:

The referenced photographs taken by Ronald Matranga are in the SDG&E document production from the civil litigation associated with the Witch, Rice and Guejito Fires of 2007 which was previously provided to ORA in response to ORA DR-02. These photographs have the Bates range SDGE0013437 – SDGE0013444, and SDG&E is providing to ORA courtesy copies of the photographs.

[7] Direct Testimony of Ronald Matranga, San Diego Gas & Electric Company, I. 08-11-006, page 2, lines 11 - 13.

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DATE RECEIVED: MAY 13, 2016
DATE RESPONDED: MAY 26, 2016

Request 13:

In the direct testimony of Jon A. Peterka in I. 08-11-006 (Witch-Rice Fire Investigation), Mr. Peterka cites an "acceptable match for this process" of "gust estimates … within 10 and 3 percent … of the wind tunnel measured gusts."[8]

What percentages constitute an "acceptable match for this process"? What percentages would <u>not</u> constitute an "acceptable match for this process"?

Response:

There is no specific "threshold" value for an "acceptable match." The basis for "acceptable match" is based on engineering experience and judgement. Ten and three percent are small numbers which Dr. Peterka judged to be acceptable.

[8] Direct Testimony of Jon A. Peterka, San Diego Gas & Electric Company, I. 08-11-006, page 3, lines 1 - 2.

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DATE RECEIVED: MAY 13, 2016
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Request 14:

In the direct testimony of Jon A. Peterka in I. 08-11-006 (Witch-Rice Fire Investigation), Mr. Peterka states[9] that weather data from Julian (page 4, line 15), Pine Hills (page 5, line 7), Goose Valley (page 6, line 6), Valley Center (page 6, line 17), and the Ramona Airport (page 7, line 2) weather stations had data quality and other issues and were therefore not used in his analysis.

a. Did Mr. Peterka use any Remote Automated Weather Station (RAWS) or Automated Surface Observing System (ASOS) data in his analysis?
b. Did Mr. Peterka use any Remote Automated Weather Station (RAWS) or Automated Surface Observing System (ASOS) data to confirm his analysis?
c. Did Mr. Peterka determine or analyze whether any RAWS or ASOS stations in San Diego would have met his data quality criteria? If so, please provide the determination or analysis, including its results.

Response:

a. No.

b. Dr. Peterka did not use this data in the referenced testimony, but he did use Ramona data for confirmation purposes in my testimony in September 2015.

c. Yes, Dr. Peterka did determine whether any regional anemometers met data quality criteria as explained in the referenced testimony.

[9] Direct Testimony of Jon A. Peterka, San Diego Gas & Electric Company, I. 08-11-006, page and line number citations follow in text above.

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DATE RESPONDED: MAY 26, 2016

Request 15:

Please provide all documents generated related to the survey(s) performed by Nolte Associates, Inc. on and around November 2, 2007 related to the Guejito fire (previously referred to as "The Nolte Survey"[10]). Please also provide all supporting or related documents and attachments.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1 and 3. Subject to the foregoing objection, SDG&E responds as follows.

Response:

The Nolte survey documents related to the Guejito fire are in the SDG&E document production from the civil litigation associated with the Witch, Rice and Guejito Fires of 2007 which was previously provided to ORA in response to ORA DR-02. These documents have the Bates range SDGE0123654 – SDGE0123719, and SDG&E is providing to ORA courtesy copies of the survey documents.

[10] For example, see Rebuttal Testimony of the Consumer Protection and Safety Division to the Direct Testimony of Cox Communications and the Direct Testimony of San Diego Gas & Electric Company Regarding the Formal Guejito Fire Investigation, I. 08-11-007.

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DATE RECEIVED: MAY 13, 2016
DATE RESPONDED: MAY 26, 2016

Request 16:

Please provide all documents generated related to the survey(s) performed by Nolte Associates, Inc. in October and November 2007 related to the Witch and Rice fires (previously referred to as "Nolte Survey II"[11]). Please also provide all supporting or related documents and attachments.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1 and 3. Subject to the foregoing objection, SDG&E responds as follows.

Response:

The Nolte survey documents related to the Rice fire are in the SDG&E document production from the civil litigation associated with the Witch, Rice and Guejito Fires of 2007 which was previously provided to ORA in response to ORA DR-02. These documents have the Bates range SDGE0253829 – SDGE0253891, and SDG&E is providing to ORA courtesy copies of these survey documents.

[11] For example, see Rebuttal Testimony of the Consumer Protection and Safety Division to the Direct Testimony of San Diego Gas & Electric Company Regarding the Formal Witch and Rice Fire Investigations, I. 08-11-006.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

June 24, 2016

Sent Via CPUC FTP and FedEx

A.15-09-010
Wildfire Expense Memorandum Account

Ms. Nika Rogers
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Response to ORA Data Request 05 - Wildfire Expense Memorandum Account

Dear Ms. Rogers:

Attached please find SDG&E's response to ORA Data Request 5 dated June 10, 2016. SDG&E's response includes general objections, narrative responses where applicable, associated attachments and native files.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Nils Stannik – ORA
Ed Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-05, Q1-16
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: June 10, 2016
DATE RESPONDED: June 24, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

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III. RESPONSES

Request 1:
Please provide records of all red flag warnings/watches issued since 2005 with specific times, dates, durations, and locations.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 8 and 9.

Response:
Subject to the foregoing objections, SDG&E responds as follows. The National Weather Service (NWS) is responsible for issuing and archiving all Red Flag Warnings (RFW) and Fire Weather Watches (FWW). SDG&E recommends that ORA contact the NWS office in San Diego to obtain the RFW and FWW records for San Diego and Orange Counties.

National Weather Service
San Diego Weather Forecast Office
11440 W. Bernardo Court, Suite 230
San Diego, California 92127

Tel: (858) 675-8700

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Request 2:
Please describe or provide:

a. All operational measures that SDG&E currently takes in response to red flag warnings and

b. All operational measures that SDG&E took in response to red flag warnings prior to the 2007 fires.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 2.

Response:
Subject to the foregoing objection, SDG&E responds as follows.

a. All response activities are outlined in TMC1320.

b. As of October 21, 2007, TMC 1320 and ESP 109 addressed Red Flag Warning periods for transmission and distribution, respectively. See also, the SDG&E Wildland Fire Prevention and Fire Safety Guide. (All three documents are attached and titled: TMC1320; ESP109; and Wildland Fire Prevention and Fire Safety Guide)

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Request 3:
Provide the GPS coordinates of all weather stations listed on SDG&E's public weather website[1] to the nearest second.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 4, 5 and 9.

Response:

Subject to the foregoing objections, SDG&E responds as follows. See attached spreadsheet titled: SDGE_170WeatherStations_06152016.

[1] http://weather.sdgeweather.com/

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Request 4:
Please provide a list of the month and year in which each weather station listed on SDG&E's public weather website was built. In the context of this question, please interpret "built" to mean the month the weather station first entered service.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 4, 5 and 9.

Response:

Subject to the foregoing objections, SDG&E responds as follows. See attached spreadsheet titled: SDGE_170WeatherStations_06152016.

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Request 5:
Please provide any data collected from all of the weather stations that correlate with Santa Ana conditions since the 2007 fires or since the construction of the weather stations (whichever is later).

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 5 and 9.

Response:

Subject to the foregoing objections, SDG&E responds as follows. The attached spreadsheet titled: Peak Wind Gusts, which contains a list of all Santa Ana wind events in the SDG&E service territory since October 2012 (44 wind events in total) and the corresponding peak wind gusts for 40 of our windiest weather stations. Those 40 weather stations were chosen because they each have a history of recording Santa Ana wind gusts greater than or equal to 55 mph at least once since installation. We chose to focus only on those events since October 2012 as that is when the SDG&E mesonet reached a point of relative maturity. Prior to that date, the mesonet was in a state of rapid expansion, growing from 0 stations at the beginning of 2009 to 128 stations by the fall of 2012.

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Request 6:
In relation to the direct testimony of Mr. Jon A. Peterka filed September 25, 2015 on behalf of SDG&E:

a. When calculating the gust factors for each location,[2] was any data taken from the site(s) used for the calculations or was data derived entirely from the wind tunnel models? Please describe.

b. Was the Z-value determined purely from Mr. Peterka's model or from the actual terrain of the site? For example, when accounting for terrain and surface roughness,[3] were actual, physical trees or buildings surrounding the sites of ignition for the Witch, Rice, and Guejito Fires factored into the model?

c. Were any measurements of wind speed taken at the location of the site of ignition for the Witch, Rice, and Guejito fires used in the model? If so, please provide these measurements (including the date and precise location at which they were taken) and describe how they were used in the model.

d. When calculating the change of wind speed due to height,[4] was the line height used the top of the electricity pole, the lowest point in the wire, or the average height of the wire?

Response:
a. Data to calculate gust factors at each fire site were obtained entirely from wind tunnel tests; no full scale data from the field were used. The shape of the vertical profile of mean velocity was used to assess the value of effective roughness Zo. This value was then used in a computer program that models atmospheric boundary layer winds to determine the gust factor. The theory underlying the computer program is given in two ESDU publication listed in the testimony (references 6 and 7 in Appendix 2).

b. The Zo value for each site was determined in the wind tunnel tests by including in the model both the shape of the terrain (terrain features) and by setting the local surface roughness on the model to match that of the trees and rock outcrops near the sites. The local roughness of the wind tunnel model surface was calibrated to reasonably match a suburban or open treed landscape such as the local tree and rock outcrop roughness of each site. Individual trees and houses were not modeled explicitly.

[2] Direct Testimony of Jon A. Peterka on Behalf of SDG&E, p. 3, line 8.
[3] Direct Testimony of Jon A. Peterka on Behalf of SDG&E, p. 8, line 10.
[4] Direct Testimony of Jon A. Peterka on Behalf of SDG&E, p. 7, line 18.

c. There were no anemometers at the sites of the fires, and no wind speed measurements were obtained at the sites.

d. The rationale for heights for evaluation of the wind speeds at the three sites are explained in detail in the table on page 3, in the text on pages 7 and 8, and in footnotes 5, 6, and 7 on pages 7 and 8 of Mr. Peterka's testimony. For Witch and Guejito, the height of the lowest line at the approximate point of ignition was used, while at the Rice site a point was used near the top of the tree canopy near the height of the broken branch.

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Request 7:
In the direct testimony of Mr. Steve Vanderburg, SDG&E references a wind speed of 92 miles per hour (MPH).[5]

How was the 92 MPH wind speed for West Santa Ysabel calculated? Please describe and provide all data used in order to calculate this wind speed.

Response:

Mr. Vanderburg divided the peak wind gust at West Santa Ysabel (WSY) by the peak wind gust at Julian RAWS (JULC1) for every Santa Ana wind event from the Fall of 2012 through the beginning of 2015. Mr. Vanderburg then calculated the median of those results to get the median gust multiplier for the two stations (including +/- 1 standard deviation). See attachment titled: WEMA_WSYcalcs.

[5] Direct Testimony of Steve Vanderburg on Behalf of SDG&E, p. 13 line 14

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Request 8:
In the direct testimony of Mr. Steve Vanderburg, SDG&E states that there are 170 weather stations currently in use.[6] However, ORA is only able to locate 162 stations on SDG&E's website. [7]

a. Please explain why there are fewer than 170 weather stations listed on SDG&E's website.

b. Are there any operating weather stations that are not publicly accessible? If so, please provide a list (including GPS coordinates) and describe why these stations are not listed on the website.

Response:

a. Weather stations are temporarily removed from the website if they are down for maintenance or are out of commission. Further, the number of stations in the SDG&E mesonet is not static and can change based on a variety of factors including observational needs, vandalism, access issues, etc. Currently, there are 170 weather stations in the SDG&E mesonet.

b. Yes, there are 8 portable weather stations which are periodically put into service to support various projects. They are not always in service and GPS coordinates are not always available because of the portable nature of these stations. The data from these portable weather stations are not made publicly available. The 170 weather stations mentioned in Mr. Vanderburg's testimony do not include these portable weather stations.

[6] Direct Testimony of Steve Vanderburg on Behalf of SDG&E, p. 5 line 19
[7] http://weather.sdgeweather.com/

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Request 9:
Please provide a clearer, high-resolution version of the chart (Operating Chart for Normal through Red Flag Conditions) on page 25 of SDG&E's Fire Prevention Plan (included as Appendix 2 to Mr. Geier's testimony).

Was this chart (or an earlier iteration) in use before the 2007 wildfires?

Response:
See the chart on the following page. This chart was not in use before the 2007 wildfires.

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CONDITION	**Normal Condition** **Fire Potential Index 1-11** Fuel and weather conditions are no longer conducive to significant fire growth. Based on fire indices and Fire Coordinator / Meteorologist Recommendation		**Elevated Condition** **Fire Potential Index 12-14** The burn environment of a specific area or district has become conducive for a large wildfire within the SDG&E service territory.		**Extreme Condition** **Fire Potential Index 15 and above** An extreme operating condition will be declared when the burn environment of a specific area or district has become conducive for a catastrophic wildfire within the SDG&E service territory. .		**Red Flag Condition (NWS)** RFW: Relative Humidity ≤ 15%, with sustained winds ≥ 25 mph and/or frequent gusts ≥ 35 mph (duration ≥ 6 hours) Declared by NWS	
	Distribution	**Transmission**	**Distribution**	**Transmission**	**Distribution**	**Transmission**	**Distribution**	**Transmission**
Highest Risk Fire Area	No change to reclosing policy. Line will be tested by recloser action.	No change to reclosing policy. Line will be tested by recloser action.	All reclosers will be turned off.		All reclosers will be turned off. Enable Sensitive Relay Setting at direction of EDO.		All reclosers will be turned off. Enable Sensitive Relay Setting at direction of EDO.	
			TESTING		**TESTING**		**TESTING**	
			Distribution	**Transmission**	**Distribution**	**Transmission**	**Distribution**	**Transmission**
			SGF Targets: Patrol entire line or line segment before energizing. Non-SGF Targets: Patrol line segment to load-side sectionalizing device before energizing.	Patrol entire line or line segment before energizing.	SGF Targets: Patrol entire line or line segment before energizing. Non-SGF Targets: Patrol line segment to load-side sectionalizing device before energizing.	Patrol entire line or line segment before energizing.	SGF Targets: Patrol entire line or line segment before energizing. Non-SGF Targets: Patrol line segment to load-side sectionalizing device before energizing.	Patrol entire line or line segment before energizing.
			If Control Center Management, SDG&E FC and/or Meteorologist determine that weather conditions do not warrant special considerations (such as wind, relative humidity, etc.), the line may be tested once, before it is patrolled. If a Distribution outage is caused by a Transmission/Substation outage, Distribution may re-energize without a patrol, as directed by Control Center Management, SDG&E FC and/or Meteorologist.		If a Distribution outage is caused by a Transmission/Substation outage, Distribution will consult with Fire Coordinator / Meteorologist and evaluate re-energization without a patrol. Crew Deployment Plan Activated by District		Crew Deployment Plan Activated Staging Sites Include: All C&O Centers Viejas, Santa Ysabel, Jamul, Del Mar, Fallbrook At a > 56 mph wind gust forecast, EDO will stage field observers, close to affected areas.	
FIRE THREAT ZONE	No change to reclosing policy. Line will be tested by recloser action.		All reclosers will be turned off.		All reclosers will be turned off.		All reclosers will be turned off.	
			TESTING		**TESTING**		**TESTING**	
			Distribution	**Transmission**	**Distribution**	**Transmission**	**Distribution**	**Transmission**
			SGF Targets: Patrol entire line or line segment before energizing. Non-SGF Targets: Patrol line segment to load-side sectionalizing device before energizing.	Patrol entire line or line segment before energizing.	SGF Targets: Patrol entire line or line segment before energizing. Non-SGF Targets: Patrol line segment to load-side sectionalizing device before energizing.	Patrol entire line or line segment before energizing.	SGF Targets: Patrol entire line or line segment before energizing. Non-SGF Targets: Patrol line segment to load-side sectionalizing device before energizing.	Patrol entire line or line segment before energizing.
			If Control Center Management, SDG&E FC and/or Meteorologist determine that weather conditions do not warrant special considerations (such as wind, relative humidity, etc.), the line may be tested once, before it is patrolled. If a Distribution outage is caused by a Transmission/Substation outage, Distribution may re-energize without a patrol as directed by Control Center Management, SDG&E FC and/or Meteorologist.		If Control Center Management, SDG&E FC and/or Meteorologist determine that weather conditions do not warrant special considerations (such as wind, relative humidity, etc.), the line may be tested once, before it is patrolled. If a Distribution outage is caused by a Transmission/Substation outage, Distribution may re-energize without a patrol as directed by Control Center Management, SDG&E FC and/or Meteorologist.		*For Coastal Zone 243 ONLY (wildland):* If Control Center Management, SDG&E FC and/or Meteorologist determine that weather conditions do not warrant special considerations (such as wind, relative humidity, etc.), the line may be tested once, before it is patrolled.	

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Request 10:

Please provide a map of what SDG&E identifies as “Fire Threat Zones” and the “Highest Risk Fire Areas” for San Diego County.

Response:
See attachment titled: FTZ_HRFA Map.

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Request 11:
In the direct testimony of Mr. David L. Geier, SDG&E states:

> *"SDG&E also revised transmission and distribution operating practices to incorporate procedures for coordination of operations during fire conditions with other entities, such as the U.S. Forest Service, Cal Fire, the City and County of San Diego and the law enforcement offices."*[8]

Please provide these revisions.

Response:
See response to Request 2.b. above.

[8] Direct Testimony of David L. Geier on Behalf of SDG&E, p. 17

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DATE RESPONDED: June 24, 2016

Request 12:
The fourth page of Appendix 2 of Mr. Don Akau's testimony is a spreadsheet pertaining to Vegetation Management Areas (VMAs).[9] Please provide:

a. A version of this spreadsheet in native format.

b. A key or legend for the colors used.

Response:

a. See separately attached excel files: C10 VMP Schedule.xls and Cycle 9 pole brush activity.xls. Both documents make up the contents of Don Akau's Appendix 2.

b. The legend for C10 VMP Schedule.xls begins within the attachment on line 136, columns C – P. The legend for Cycle 9 pole brush activity.xls begins within the attachment on line 136, column C.

[9] This page is unnumbered, but is a spreadsheet that contains multiple colored cells and immediately follows a page labeled "3 of 3." In the electronic version of Mr. Akau's testimony, this page is 28 of 141.

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DATE RESPONDED: June 24, 2016

Request 13:
If a tree were to have internal growth and/or rotting, where in the inspection record or report would this be indicated?

Does SDG&E maintain a database of this information? If so, please provide all entries in this database corresponding to trees that have internal growth and/or rotting.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 3.

Response:
Subject to the foregoing objection, SDG&E responds as follows. The term, "internal growth" is an ambiguous term. If a tree were to display signs of disease or decay ("rotting") the condition may be noted in the tree record as a comment. SDG&E maintains a database of inventory trees. The current inventory contains over 460,000 trees. The archived database includes many thousands of additional inventory tree records. Vegetation Management does not maintain a report of any and all inventory trees whose record may have at one time or another included any comment of disease or decay.

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DATE RECEIVED: June 10, 2016
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Request 14:
In the direct testimony of Mr. Gerry Akin, SDG&E states:

> *"The conductors have not yet been subjected to forensic investigation because they are in Cal Fire's possession and unavailable to SDG&E."*[10]

Have the conductor(s) undergone forensic analysis (including tension of the conductor, the state of the steel core, and any other relevant information) by either CalFire or SDG&E? If so, please provide the results of the analysis and supporting documents/data.

Objection:
SDG&E objects to this request on the grounds set forth in General Objection 1.

Response:
Subject to the foregoing objection, SDG&E responds as follows. The conductors were the subject of extensive examination and testing in 2008 and 2009 in connection with evidence protocols undertaken in conjunction with Cal Fire and other parties to the 2007 Wildfire Litigation. SDG&E will make available to ORA data collected in connection with those protocols, which was shared among the parties via a repository, by July 1, 2016.

[10] Direct Testimony of Gerry Akin SDG&E (Witch Fire), p. 8

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DATE RECEIVED: June 10, 2016
DATE RESPONDED: June 24, 2016

Request 15:
In the direct testimony of Mr. Gerry Akin, SDG&E states:

"After TL 637 was re-energized to reestablish service to the Santa Ysabel substation, another phase-to-phase fault involving phase C occurred on November 12, 2007"[11]

a. At what time on October 21, 2007 was TL 637 first re-energized?

b. Had TL 637 been inspected to check for tension before November 12, 2007?

c. Was the re-energization of TL 637 automatic (using automatic re-closers or similar devices) or manual?

d. If the answer to part (c) is 'manual,' who had determined that the line should be reenergized?

Objection:
SDG&E objects to this request on the grounds set forth in General Objection 3.

Response:
Subject to the foregoing objection, SDG&E responds as follows.

a. TL637 was re-energized at 3:02 p.m. on October 25, 2007 to re-establish service to the Santa Ysabel substation so that power could be restored to customers.
b. The conductors had been inspected following ignition of the Witch fire. SDG&E is not aware of tension measurements being taken prior to November 12, 2007.
c. TL637 was manually re-energized on October 25, 2007.
d. Grid Operations, and Transmission Construction & Maintenance Manager J. Bret Ball.

[11] Direct Testimony of Gerry Akin SDG&E (Witch Fire), p. 6

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SDG&E RESPONSE
DATE RECEIVED: June 10, 2016
DATE RESPONDED: June 24, 2016

Request 16:
In relation to the hard drive provided in response to ORA data request ORA-SDG&E-A.15-09-010-02 (ORA's second data request):

a. Within the SDGE PRODS/IMAGES/001 folder, SDGE0005079.TIF shows a chart displaying visits by Jorge Orellana for routine checks on 10/18/07. Is there a document showing a similar visit to FF1090 on 10/15/07? If so, please provide.

b. Within the SDGE PRODS/IMAGES/001 folder, SDGE0000789.TIF shows information for load drops through 2006. Is there a similar, more recent file displaying information in the year 2007? If so, please provide.

c. Within the SDGE PRODS/IMAGES/002 folder, SDGE0005778.TIF shows pre-inspection audit results for VMA 380. Please provide a similar data file for any audits done for VMA 379.

Objection:
SDG&E objects to this request on the grounds set forth in General Objection 2.

Response:
Subject to the foregoing objection, SDG&E responds as follows.

a. SDG&E has not located a document like SDGE0005079 for 10/15/07, but has confirmed in data responses served by Davey Tree Surgery on May 27, 2009, the "Tree History Report" for tree FF1090 reflects a visit by Jorge Orellana to the site of FF1090 on October 15, 2007. These documents were attached as Appendix 6 and Appendix 7 to the Prepared Direct Testimony of Don Akau.
b. SDGE0000789 appears to be data from SDG&E's forced outage database, which was produced in full (including data for 2007) in the 2007 Wildfire Litigation, e.g., at SDGE0314132-SDGE0314143.
c. SDGE0005775 and SDGE0005759 are similar data files related to VMA 379 audits that were produced by SDG&E in the 2007 Wildfire Litigation.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

August 2, 2016

Sent Via Electronic Mail and FedEx

A.15-09-010
Wildfire Expense Memorandum Account

Nils Stannik
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Second Supplemetal Response to ORA Data Request 06 – Wildfire Expense Memorandum Account

Dear Mr. Stannik,

Attached please find SDG&E's second supplemental response to ORA Data Request 06 (ORA-SDG&E-A.15-09-010-06), dated July 7, 2016. SDG&E's second supplemental response includes a narrative response to request #9 and referenced attachments. This is the only change to SDG&E's first supplemental response dated July 26, 2016.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E
Ed Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

III. RESPONSES

Request 1:

a. At the time of the 2007 wildfires, did SDG&E's vegetation management program have any scheduling or procedural mechanisms designed to deal with trees that had included bark? If so, please describe and provide appropriate documentation.

b. At the time of the 2007 wildfires, did SDG&E's vegetation management program have any scheduling or procedural mechanisms designed to deal with trees that had codominant structures? If so, please describe and provide appropriate documentation.

c. Does SDG&E's current vegetation management program have any scheduling or procedural mechanisms designed to deal with trees that have included bark? If so, please describe and provide appropriate documentation.

d. Does SDG&E's current vegetation management program have any scheduling or procedural mechanisms designed to deal with trees that have co-dominant structures? If so, please describe and provide appropriate documentation.

Response:

a. Yes, SDG&E had in place and utilized its "Vegetation Management Tree Pre-Inspection Procedures" to help direct contract inspection personnel on how to identify hazard trees duringroutine inspections. In section 5 (pages 30 and 31) of the "Vegetation Management Tree Pre-Inspection Procedures", one item on the "Tree Hazard Checklist" asks "A*re there narrow angled branch crotches that may indicate included bark*?". Additionally, the Procedure includes a photo of included bark on page 33, figure 10. The "Vegetation Management Tree Pre-Inspection Procedure" is Appendix 3 to Mr. Akau's prepared direct testimony.

b. Yes, the checklist referenced in the response to subpart (a) above asks "*Are there multiple vertical branches originating from one point that may indicate weak attachments*?"

c. Yes, SDG&E continues to utilize the same "Vegetation Management Tree Pre-Inspection Procedure." The practices described above have not changed since 2007. Additionally, SDG&E has made it a requirement for its Pre-inspection and tree trim contractors to provide and document its annual refresher training in hazard tree assessment.

d. Yes, SDG&E continues to utilize the same "Vegetation Management Tree Pre-Inspection Procedure." The practices described above have not changed since 2007. Additionally, SDG&E has made it a requirement for its Pre-inspection and tree trim contractors to provide and document its annual refresher training in hazard tree assessment.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 2:

Prior to the 2007 wildfires, had SDG&E documented complaints, concerns, or doubts concerning the data quality of Remote-Operated Weather Stations (RAWS) as described in Mr. Peterka's testimony? If so, please provide documentation of such concerns.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 2. Subject to the foregoing objection, SDG&E responds as follows.

Response:

SDG&E is unaware of any documented complaints, concerns, or doubts concerning the data quality of RAWS prior to 2007.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 3:

Please describe:

a. The data sources SDG&E relied on in its weather monitoring and recording practices prior to the 2007 wildfires;

b. To what extent the weather monitoring and recording practices in part (a) used data provided by the RAWS described in Mr. Peterka's testimony;

c. How long SDG&E had been relying on data from the RAWS described in Mr. Peterka's testimony; and

d. What data source(s) SDG&E relied on prior to using RAWS data, if any.

Response:

a. Any operational measures by SDG&E prior to the 2007 wildfires were based primarily on the National Weather Service (NWS) Red Flag Warning system or other information provided by NWS. CALFIRE disseminated the proclamations, but the source data was from NWS. Within SDG&E, Grid Control had the lead for sharing the information and initiating any proactive measures taken by the company.

b. Any operational measures by SDG&E were based on NWS data or information which may have included RAWS data within its content, but SDG&E used RAWS specific data only in a cursory or informational way to broaden scope of understanding of a given weather scenario. No proactive measures were based on a pre-determined criteria measured at a RAWS.

c. SDG&E did not rely on RAWS data.

d. See responses to subparts (a)-(c).

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 4:

Regarding attachment "Peak Wind Gusts," provided in response to ORA data request DR-02 (dated April 29, 2016):

a. Please provide similar wind data for the Julian RAWS station.

b. Please provide similar wind data for the following dates and weather stations:
   - Dates: February 10, 2002; January 8, 2003; June 3 – 12, 2008; and March 29,2003
   - Weather stations: Julian, Ramona Airport, Pine Hills, Goose Valley, and Valley Center.

c. Why is the BOC station listed twice? What do the differing data values for the two BOC entries represent?

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 5, 7, 8 and 9. Subject to the foregoing objection, SDG&E responds as follows.

Response:

a. See attachment "JULC1 Peak Wind Gust"

b. The data ORA requests is not archived at SDG&E but is publicly available through http://mesowest.utah.edu/

c. There was a typo in the original attachment. The station listed as BOC in column D should actually be BMS. The weather data under the column is correct. See corrected attachment provided herewith, entitled "Corrected_Peak Wind Gusts_072116."

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 5:

Regarding attachment "SDGE_170WeatherStations_06152016," provided in response to ORA data request DR-05 (dated June 24, 2016):

a. Please explain why the installation dates for the five stations analyzed by Mr. Peterka (Julian, Ramona Airport, Pine Hills, Goose Valley, and Valley Center) are after 2007.

b. Have the five stations listed in part (a) above been moved, relocated, or replaced at any time since 2007? If so, please explain and provide dates corresponding to any changes made to the stations.

c. Did any of the other provided wind stations in the attachment exist before the 2007 wildfires? If so, please provide the original installation dates and dates of all subsequent and substantive changes to the wind stations.

d. Does the listed station "Ramona" (code "RAM") describe the Ramona Airport, as analyzed within Mr. Peterka's testimony?

Objection: SDG&E objects to this request on the grounds set forth in General Objections 5 and 8. Subject to the foregoing objection, SDG&E responds as follows.

Response:

a. The stations listed in the attachment "SDGE_170WeatherStations_06152016" represent SDG&E-owned weather stations that were installed after the 2007 wildfires. In his prepared direct testimony, Mr. Peterka analyzed the pre-existing, federally-owned RAWS stations. NOTE: Ramona Airport is not a RAWS but is actually an ASOS with different instrumentation and installation specifications.

b. The Federally-owned Goose Valley RAWS was relocated by the USFS sometime in late 2012 or early 2013. ORA should contact the U.S. Forest Service for exact dates. SDG&E is unaware of any other changes to these five federally-owned weather stations. Again, these stations are not owned or operated by SDG&E and are not included in the list of 170 SDG&E weather stations.

c. None of the weather stations in the attachment existed before the 2007 wildfires.

d. No.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 6:

Has SDG&E performed any internal investigation into the cause of the Witch, Rice, or Guejito fires? If so, please provide these investigations, including any related documentation.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1, 2, 3, and 9. Subject to the foregoing objection, SDG&E responds as follows.

Response:

SDG&E's internal investiation into the cause of the Witch, Rice, or Guejito fires is privileged. All non-privileged data collected during the parties various joint inspections of the Witch, Rice or Guejito facilities is contained on a hard-drive previously provided to the ORA in response to ORA-SDG&E DR-02. In addition, information related to the cause of the fires may be found in SDG&E's responses to various CPUC data requests, its OII testimony, litigation discovery, and testimony in this proceeding, which are in the possession of the Commission's Safety Enforcement and Division (formerly Consumer Protection and Safety Division), or ORA.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 7:

In the folder SDGE PRODS\NATIVES\001 on the hard drive provided in response to ORA data request ORA-02, file **SDGE0214266_TRWITCH.mdb** appears to have many blank tables, including those regarding clearance violations and conductors.

Please explain why these tables were left blank. If these tables were left blank in error, please provide the indicated information.

Response:

SDG&E0214266 is a native copy of a database also produced in .pdf at SDGE0214267. The blank tables in SDG&E0214266 are not an error and are representative of the original database.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 8:

In the folder SDGE PRODS\IMAGES\004, the SDG&E Fire Conditions document dated 09/03/08 (starting with file SDGE0024129.tif) includes procedures regarding transmission and distribution lines related to tripping that occurs during a Red Flag Warning.

a. Were these procedures in effect prior to the effective date of September 3, 2008?

b. Were these procedures in effect during the 2007 wildfires?

c. If these procedures were not in effect during October 2007, were there any otherprocedures for dealing with tripping wires during a Red Flag Warning? If so, do theseprocedures differ from the procedures on a day in which no Red Flag Warning is ineffect?

Response:

As set forth in SDG&E's response to Request 2 in ORA-SDG&E DR-05, TMC 1320 and ESP 109 set forth procedures relating to Red Flag Warning periods for transmission and distribution, respectively. The versions of TMC 1320 and ESP 109 in effect at the time of the fires were previously provided in response to Request 2.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 9:

Regarding attachment "TMC1320" (Hazardous Fire Conditions - Red Flag Fire Warning) provided in response to ORA data request DR-05:

a. Which personnel are currently included on the "'Fire Warning' distribution list" (p. 4)? Please provide a list of all persons and their corresponding titles.

b. Who was included on the "'Fire Warning' distribution list" during October 2007? Please provide a list of all persons and their corresponding titles.

c. Please provide all notifications sent via the SDG&E web-based Pager System related to Red Flag Fire Warnings, including around the time of the 2003 wildfire, the 2007 wildfires, and all dates corresponding to the Santa Ana conditions provided in response to ORA data request DR-05, Question 5.

d. Who is included in the "Fleet Wide Call" (p. 6)? Who was included during October 2007? Please provide a list of all persons and their corresponding titles.

e. Please provide any documentation related to any Fleet Wide Calls made regarding the Red Flag Fire Warnings, including around the time of the 2003 wildfire, the 2007 wildfires, and any dates correlating to the Santa Ana conditions provided in response to ORA data request DR-05, Question 5.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 5 and 9. Subject to the foregoing objections, SDG&E responds as follows.

Response:

a. SDG&E no longer uses a "Fire Warning" distribution list. The existing procedures for notifications during a Red Flag Warning are listed in the current version of TMC1320, attached here as "TMC1320_041515_CONFIDENTIAL.pdf".[1]

b. SDG&E has searched its records, and it does not have the Fire Warning distribution list from October 2007. The list of personnel notified of emergency situations, including fires, has evolved over the last nine years, and is now comprised of those in the Storm Desk distribution list; attached

[1] TMC1320 is confidential under North American Electric Reliability Corporation's Rules of Procedure, Section 1500 et seq. and all other applicable federal and state laws and regulations. Accordingly, SDG&E is treating this document as Protected Materials.

here as "Storm Desk distribution list_072916.pdf". While personnel have changed since 2007, the types of positions/personnel listed on the Storm Desk distribution list are similar to what would have been in place in 2007. SDG&E does not include titles on this list. However, if there are specific individuals on the list whose titles ORA needs to have identified, SDG&E is willing to discuss that with ORA.

c. SDG&E does not record the notifications that are sent via SDG&E's web-based pager system. However, SDG&E believes notifications sent during Red Flag Warnings were similar to what was recorded on Grid Control's daily log from October 19, 2007, which states: "1620 - CDF has issued a Red Flag warning Starting 10/21/07 Sunday at 0800 through 10/23/07 at 1500; pager notification sent."

d. Fleet Wide Calls are currently sent out to all SDG&E employees in SDG&E vehicles with 800 MHz radios capable of receiving such calls. In October 2007 the same process applied.

e. SDG&E does not document Fleet Wide Calls.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 10:

Within various subfolders of SDGE PRODS\IMAGES on the hard drive provided in response to ORA data request ORA-02, the following files appear to be blank:

- In folders 004, 005, and 006, images **SDGE0098983.tif** through **SDGE0109113.tif**
- In folder 007, images **SDGE0109114.tif** to **SDGE0110159.tif**

Please provide non-blank versions of these files. If non-blank versions are not available, please explain why.

Response:

SDGE0098983.tif through SDGE0109113.tif and SDGE0109114.tif to SDGE0110159.tif were placeholders for documents not ultimately produced in the underlying litigation and are not responsive to data requests in this proceeding.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 11:

In the folder **SDGE PRODS\IMAGES** on the hard drive provided in response to ORA data request ORA-02, there are many files that appear to be either corrupt or broken, including, for example, **SDGE0026546** and **SDGE0098834** (subfolder 004) and **SDGE0111922** and **SDGE0112071** (subfolder 007). Please provide uncorrupt versions of these and any additional corrupted files.

Response:

Having investigated this issue, it is SDG&E's understanding that the files identified may appear corrupt when opened outside a specific database. SDG&E has corrected the compression ratio to enable viewing with Windows and is providing them via thumb drive enclosed with this supplemental response.

ORA DATA REQUEST
ORA-SDG&E DR-06, Q1-12
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SECOND SUPPLEMENTAL RESPONSE
DATE RECEIVED: July 7, 2016
DATE RESPONDED: August 02, 2016

Request 12:

Regarding photos **SDGE0247128_DL_IMG_0104_edited-1.jpg** through **SDGE0247139_DL_IMG_0115_edited-1.jpg** in folder SDGE PRODS\NATIVES\001 on the hard drive provided in response to ORA data request ORA-02:

a. Please describe which part of ORA's second data request these files are in response to (question number, sub-question).

b. Please provide the location and additional background information regarding these pictures. If none is available, please state as such.

c. Please describe why ten of the twelve listed files contain "edited-1" in their filename. If unedited versions of these files exist, please provide.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 5. Subject to the foregoing objection, SDG&E responds as follows.

Response:

SDGE0247128_DL_IMG_0104_edited-1.jpg through SDGE0247139_DL_IMG_0115_edited-1.jpg were files produced in the underlying civil litigation related to the Witch, Rice and Guejito Fires. Background information regarding the photographs can be found in the metadata. SDG&E understands the photographs were taken at the alleged area of origin of the Witch fire. SDG&E understands the photos identified were edited by the photographer, Dean LeBrecht. Mr. LeBrecht discussed his practice regarding editing photographs in his deposition dated March 25, 2010 starting at 175:7.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

August 3, 2016

Sent Via Electronic Mail and FedEx

A.15-09-010
Wildfire Expense Memorandum Account

Nils Stannik
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Response to ORA Data Request 07 – Wildfire Expense Memorandum Account

Dear Mr. Stannik,

Attached please find SDG&E's response to ORA Data Request 07 (ORA-SDG&E-A.15-09-010-07), dated July 20, 2016. SDG&E's response includes general objections, narrative responses and attachments.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E
Ed Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-07, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 20, 1016
DATE RESPONDED: August 3, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

ORA DATA REQUEST
ORA-SDG&E DR-07, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 20, 1016
DATE RESPONDED: August 3, 2016

III. RESPONSES

Request 1:

How much money did SDG&E seek from Cox Communications regarding the 2007 wildfires? Please provide all supporting documentation.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 1. SDG&E further objects to this request on the grounds that it seeks discovery of information related to issues that have been deferred until Phase 2 of this proceeding.

ORA DATA REQUEST
ORA-SDG&E DR-07, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 20, 1016
DATE RESPONDED: August 3, 2016

Request 2:

Please provide a diagram of transmission line poles 416674; 416675; and 416676 showing all conductors and other wires (communications, lashing wires, etc.) at the time of the 2007 wildfires. On the diagram, please indicate exact locations where contact between wires occurred.

Please provide the above diagram in CAD (native) format and in image/screenshot format showing, at a minimum, elevation (side) and birds-eye (above) views.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1 and 9. Subject to the foregoing objections, SDG&E responds as follows.

Response:

Diagrams were previously produced by SDG&E in connection with the CPUC's Witch and Rice Fire Investigations in I.08-11-006, which SDG&E made available to the parties in this case in April 2016. For example, the June 5, 2009 "Direct Testimony of Gerry Akin, San Diego Gas & Electric Company (Witch Fire)" contains such a diagram as Exhibit 2. Additional diagrams were produced by SDG&E in discovery in I.08-11-006 and were incorporated in Exhibit 2-B to the June 22, 2009 "Rebuttal Testimony of the Consumer Protection and Safety Division to the Direct Testimony of San Diego Gas & Electric Company Regarding the Formal Witch and Rice Fire Investigations." Further information regarding these facilities and contact points would be contained within the examination and testing materials prepared in connection with the evidence protocols undertaken in conjunction with Cal Fire and other parties to the 2007 Wildfire Litigation, which SDG&E made available to ORA in response to ORA-SDG&E DR-05, Request 14 via a hard drive that was sent to ORA on June 30, 2016.

ORA DATA REQUEST
ORA-SDG&E DR-07, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 20, 1016
DATE RESPONDED: August 3, 2016

Request 3:

Please provide all reports from any SDG&E contractors or sub-contractors regarding the causes of or conditions related to the Witch, Rice, and/or Guejito fires.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1, 2, 3 and 8. Subject to the foregoing objections, SDG&E responds as follows.

Response:

SDG&E is not aware of any specific non-priviledged reports responsive to this request, but if any such responsive materials exist, they would be among the collection of materials produced on the hard drive in response to ORA-SDG&E DR-02.

ORA DATA REQUEST
ORA-SDG&E DR-07, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 20, 1016
DATE RESPONDED: August 3, 2016

Request 4:

a. Please provide all tension analyses performed on the conductors between transmission line poles #416675 and #416676.

b. Please provide any documentation related to the survey performed to calculate tension[1] as described in the Direct Testimony of Gerry Akin regarding the Witch Fire.

c. Please describe how the Manual Tensions Measurements provided in response to ORA Data Request 06 (as observed by Felling Engineering, Inc.[2]) relate to the tension measurements provided in Mr. Akin's testimony.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 1, 4, 5, 7 and 9. Subject to the foregoing objections, SDG&E responds as follows.

Response:

a./b. The tension analyses and surveys performed by Mr. Akin were previously produced by SDG&E in connection with the CPUC's Witch and Rice Fire Investigations in I.08-11-006, which SDG&E made available to the parties in this case in April 2016. These materials were incorporated in Exhibit 2-B to the June 22, 2009 "Rebuttal Testimony of the Consumer Protection and Safety Division to the Direct Testimony of San Diego Gas & Electric Company Regarding the Formal Witch and Rice Fire Investigations." See pp. 69-76 of the .pdf version of this exhibit. Any further non-priviledged information regarding surveys and tensions would be contained within the examination and testing materials prepared in connection with the evidence protocols undertaken in conjunction with Cal Fire and other parties to the 2007 Wildfire Litigation, which SDG&E made available to ORA in response to ORA-SDG&E DR-05, Request 14 via a hard drive that was sent to ORA on June 30, 2016.

c. See objections.

[1] *See:* Direct Testimony of Gerry Akin SDG&E (Witch Fire), p. 2-3
[2] This file is located within the Witch Inspection 2008 folder given in response to ORA-DR-06, Q14, within the Grotefeld & Hoffman folder, second deposit.

ORA DATA REQUEST
ORA-SDG&E DR-07, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 20, 1016
DATE RESPONDED: August 3, 2016

Request 5:

Please provide all documentation (including the work order as mentioned in Mr. Akau's testimony[3]) showing FF1090 was scheduled to be trimmed as part of the next routine trimming.

Unless clearly noted on the document, please provide an index listing the date on which each trim was first scheduled and the date on which any revisions/changes to that schedule occurred.

Response:

Attached is the original work order showing FF1090 had been flagged for routine trim (see attachment "Bubble Sheet FF1090.pdf"). Trimming FF1090 was on schedule to be completed by the end of the routine trim cycle (November 1, 2007), when the fire started on October 22, 2007. During an emergency event such as a fire, a memo order is issued to replace the routine work order to allow for emergency work and to restore services. See attached "Memo Order", which replaces the original work order "Bubble Sheet FF1090.pdf". After emergency work was performed on FF1090 an exception form was approved by the area forester, which shows that the work has been completed and the original work order closed out as an exception due to the memo trim during a fire event (see attached "Exception FF1090 11-13-07.pdf").

[3] Direct Testimony of Don Akau on Behalf of SDG&E, p. 10.

ORA DATA REQUEST
ORA-SDG&E DR-07, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 20, 1016
DATE RESPONDED: August 3, 2016

Request 6:

Please indicate the number of faults that occurred on October 21, 2007 on the conductors associated with the ignition of the Witch Fire of 2007. For each fault, indicate its time and duration. Provide all documentation related to these faults.

a. Did SDG&E employees or agents receive information regarding these faults on the day of the incident? How many of these faults were SDG&E employees or agents aware of on the day of the incident?
b. List each action that SDG&E employees or agents took in response to these faults on the day of the incident.
c. What was SDG&E's policy for responding to faults on October 21, 2007. What it its policy today?

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2 and 7. Subject to the foregoing objections, SDG&E responds as follows.

Response:

The faults at issue in this request are described in the June 5, 2009 "Direct Testimony of David L. Geier, San Diego Gas & Electric Company (Witch and Rice Fires)" which SDG&E made available to the parties in this case in April 2016. More specifically, in the section of Mr. Geier's testimony entitled "The October 21, 2007 Faults on Tie Line 637 (Witch Fire)," Mr. Geier explained SDG&E's procedures in place at the time for transmission line faults (as set forth in TMC 1100); the number, time and duration of each fault; and the responses SDG&E took in response to each of these faults. TMC 1100, as it has been revised, contains SDG&E's current procedures for responding to faults. See TMC 1100 provided herewith. Please note that this document is CONFIDENTIAL. See also TMC 1320. The current version is provided herewith and is also CONFIDENTIAL.[4] The version of TMC 1320 in effect at the time of the 2007 Wildfires was previously produced in response to ORA-SDG&E DR-05, Request 2. Additional information regarding the duration of the faults is set forth on p. 28 of SDG&E's January 8, 2009 responses to CPUC discovery requests in I.08-11-006, which SDG&E made available to the parties in this case in April 26 (see Exh. 1-WR). Additional information regarding SDG&E's actions in responding to faults is set forth in the 2007 Wildfire Litigation depositions of Messrs. Sean Long, Ray Necochea,

[4] TMC1320 and TMC1100 are confidential under North American Electric Reliability Corporation's Rules of Procedure, Section 1500 et seq. and all other applicable federal and state laws and regulations. Accordingly, SDG&E is treating these document as Protected Materials.

James Minton, Mike Higbee, Bret Ball and John Hotta, which SDG&E produced on a harddrive in response to ORA-SDG&E DR-02.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

August 18, 2016

Sent Via Electronic Mail and FedEx

A.15-09-010
Wildfire Expense Memorandum Account

Nils Stannik
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Response to ORA Data Request 08 – Wildfire Expense Memorandum Account

Dear Mr. Stannik,

Attached please find SDG&E's response to ORA Data Request 08 (ORA-SDG&E-A.15-09-010-08), dated August 4, 2016. SDG&E's response includes general objections and narrative responses.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E
Ed Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-08, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 4, 1016
DATE RESPONDED: August 18, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

ORA DATA REQUEST
ORA-SDG&E DR-08, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 4, 1016
DATE RESPONDED: August 18, 2016

III. RESPONSES

Request 1:

Question 3 of ORA data request ORA-SDG&E-A.15-09-010-03 (DR-03) contained 4 components asking about SDG&E's vegetation management practices.

a. It is ORA's understanding that the quoted section of Mr. Akau's testimony and SDG&E's responses describe SDG&E's current practices. Is this understanding correct?

b. Are there any differences between SDG&E's description (in Mr. Akau's testimony, Section III, pages 3-16) of current practices and the practices in place in October 2007? If so, please describe.

c. Are there any differences between SDG&E's description (in response to DR-03, Question 3) of current practices and the practices in place in October 2007? If so, please describe.

Response:

a. Yes.

b. No.

c. The practices described in the referenced response remain in place. Additionally, SDG&E performs off-cycle inspections in the company's defined highest risk fire areas (HFRA), as well as off-cycle patrols of certain vegetation species (bamboo, century plants). To the extent unsafe clearances may exist, as determined in the off-cycle inspection, an order to clear vegetation is issued and trimming is completed prior to September 1 of each year. See also SDG&E's response to ORA-SDG&E DR-09, Request 4.

ORA DATA REQUEST
ORA-SDG&E DR-08, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 4, 1016
DATE RESPONDED: August 18, 2016

Request 2:

In response to ORA DR-03, Question 3, part (c), SDG&E stated:

> *"If QA finds issues in the VMA during the Pre-inspection audit, the auditor will make the necessary corrections and provide the final results to SDG&E. Pre-inspection audits do not hold up the release of the tree trimming work."*

a. It is ORA's understanding that "hold up the release of tree trimming work" is given to mean causing a delaying beyond normal practices/schedules if discrepancies are found during the course of the audit. Is this understanding correct?

b. Under SDG&E's current practices, do tree trims happen concurrently with or following the quality assurance audit of the pre-trim inspection?

c. Prior to the 2007 wildfires, did tree trims happen concurrently with or following the quality assurance audit of the pre-trim inspection?

d. Under SDG&E's current practices, under what conditions could a tree recommended for trimming be trimmed prior to or concurrent with the pre-trim quality assurance audit?

e. Prior to the 2007 wildfires, under what conditions could a tree recommended for trimming be trimmed prior to or concurrent with the pre-trim quality assurance audit?

Response:

a. Yes. The audit does not hold up the release of the tree trimming work. If an auditor finds compliance issues, contractors are dispatched to perform the work, and the VMA is then completed and released.

b. Following.

c. Following.

d. If an auditor finds compliance issues, or a hazard condition is observed, a memo is issued to the contractor to immediately correct the condition.

e. The response to this subpart is the same as the response to subpart (d) above.

ORA DATA REQUEST
ORA-SDG&E DR-08, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 4, 1016
DATE RESPONDED: August 18, 2016

Request 3:

Please provide the precise time that of the trim of tree FF1090 occurred on October 22, 2007.

Objection: SDG&E objects to this request on the grounds set forth in General Objection 5. Subject to the foregoing objection, SDG&E responds as follows.

Response:

SDG&E does not know the precise time that the trim occurred on October 22, 2007, but it believes that the tree trim contractor arrived at the site to begin timming work at approximately 11:30 am and undertook the work thereafter.

ORA DATA REQUEST
ORA-SDG&E DR-08, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 4, 1016
DATE RESPONDED: August 18, 2016

Request 4:

At the time of the trim of tree FF1090 on October 22, 2007:

a. Was a Red Flag Warning in effect?

b. Was the area considered at risk for further ignition or re-ignition?

c. Were any firefighting actions taking place in the immediate vicinity?

d. Were any CPUC representatives present?

e. Were any CalFire representatives present?

Response:

a. Yes.

b. Yes. The downed power lines were de-energized, but there was existing vegetation in the area that had not burned, and a shift in winds thus could have brought additional fire to that area. In addition, as described on pp. 15-16 of the June 5, 2009 "Direct Testimony of Don Akau, San Diego Gas & Electric Company (Rice Fire)" in I.08-11-006, tree FF1090 was trimmed to make the area safe for fire crews , residents in the area, and for electrical crews that would begin restoration of service.

c. Yes.

d. SDG&E does not believe that there were CPUC representatives present.

e. SDG&E does not know whether any CalFire representatives were present at this time.

ORA DATA REQUEST
ORA-SDG&E DR-08, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 4, 1016
DATE RESPONDED: August 18, 2016

Request 5:

When were the 12kV conductors between pole #112340 and pole #213072:

a. First de-energized on October 22, 2007?

b. Last de-energized on October 22, 2007 (if more than one occurrence)?

c. Re-energized after reinstallation?

Response:

a. 4:17 am.

b. See response to subpart (a) above.

c. 1:43 pm on November 5, 2007.

ORA DATA REQUEST
ORA-SDG&E DR-08, Q1-6
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 4, 1016
DATE RESPONDED: August 18, 2016

Request 6:

When were the conductors between pole #112340 and pole #213072 re-installed after the Rice Fire? When were the conductors between pole #112340 and pole #213072 put back into service after the Rice Fire?

Objection: SDG&E objects to this request on the grounds set forth in General Objection 5. Subject to the foregoing objection, SDG&E responds as follows.

Response: Records indicate that repairs were made on October 24 and October 31, 2007. The line was re-energized on November 5, 2007.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

August 26, 2016

Sent Via Electronic Mail and FedEx

A.15-09-010
Wildfire Expense Memorandum Account

Nils Stannik
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Supplemental Response to ORA Data Request 09 – Wildfire Expense Memorandum Account

Dear Mr. Stannik,

Attached please find SDG&E's supplemental response to ORA Data Request 09 (ORA-SDG&E-A.15-09-010-09), dated August 5, 2016. SDG&E's supplemental response includes general objections, narrative responses and attachments.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E
Ed Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-09, Q1-7
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 5, 1016
DATE RESPONDED: August 26, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

ORA DATA REQUEST
ORA-SDG&E DR-09, Q1-7
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 5, 1016
DATE RESPONDED: August 26, 2016

III. RESPONSES

Request 1:

Please provide monthly recorded expense amounts for Vegetation Management Account from January 2003 to December 2016 in Excel format. Please include:

a. data broken down with all sub accounts under Vegetation Management, followed by their recorded expense;

b. a description of the expense followed by the recorded amounts; and

c. for any subcontract cost, please provide the name of the subcontractor company, contract length, and contract amount.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 5 and 9. Subject to the foregoing objections, SDG&E responds as follows.

Response:

a. See the the attachment "TTBA 2003-2016.xls," which contains responsive information from SDG&E's Tree Trimming Balancing Account.

b. See response to 1a.

c. See response to 1a.

ORA DATA REQUEST
ORA-SDG&E DR-09, Q1-7
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 5, 1016
DATE RESPONDED: August 26, 2016

Request 2:

Please provide the number of employees and their position titles under the Vegetation Management Account from January 2003 to December 2016 in Excel format, as well as an organizational chart of the employees.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 5 and 9. Subject to the foregoing objections, SDG&E responds as follows.

Response:

See the spreadsheet "VM_Employee_2003-2016" provided herewith showing employees from 2003 to 2016. See also the document "VM Organizational Chart" provided herewith that shows a current organizational chart.

ORA DATA REQUEST
ORA-SDG&E DR-09, Q1-7
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 5, 1016
DATE RESPONDED: August 26, 2016

Request 3:

Please provide:

a. total Vegetation Management funding for SDG&E's past four GRC cycles;

b. CPUC Decision numbers for each GRC of the GRC and dollar amount granted for Tree Vegetation Management; and

c. A breakdown of dollar amounts spent on all sub-accounts under Vegetation Management for the past four GRC cycles.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 5 and 9. Subject to the foregoing objections, SDG&E responds as follows.

Response:

a. The following numbers are for the Tree Triming balancing account, and are annual figures authorized for the test year in each related GRC cycle (in test year dollars):

- Test Year 2004: $23.215mm (A.02-12-028/D.04-12-015)
- Test Year 2008: $19.652mm (A.06-12-009/D.08-07-046)
- Test Year 2012: $25.500mm (A.10-12-005/D.13-05-010)
- Test Year 2016: $24.559mm (A.14-11-003/D.16-06-064)

b. See response to 3a.

c. See response to 1a.

ORA DATA REQUEST
ORA-SDG&E DR-09, Q1-7
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 5, 1016
DATE RESPONDED: August 26, 2016

Request 4:

Please provide a detailed explanation of all the improvements or changes in SDG&E's Vegetation Management practices for the last 10 years. For each of the practices, please provide the cost of that improvement/change and explain in detail.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 5 and 9. Subject to the foregoing objections, SDG&E responds as follows.

Response:

Improvements and changes in SDG&E Vegetation Management practices have included the following:

1. **Increased frequency in tree inspections in the Highest Risk Fire Areas (HRFA)**
   In 2010, SDG&E implemented an annual, off-cycle tree inspection patrol in areas of the service territory identified as having the greatest fire risk. This patrol is performed in addition to the routine-scheduled inspection of the same area. The intent and scope of the off-cycle patrol is to identify any non-compliant tree condition and/or hazard tree condition to ensure the safety and reliability of the electrical system and avoid fire. There are approximately 100,000 inventory trees in the HRFA. The off-cycle HRFA patrol has been performed each year since 2010. The average, annual cost of this additional inspection and work over the years has been $185k.

2. **Off-cycle Century Plant patrol**
   In 2011, SDG&E Vegetation Management implemented an off-cycle inspection of Century plants (Agave spp) in its service territory. Century plants produce a tall flower-bearing flower stalk at the end of their life cycle. The flower stalk can grow 30-40 feet and, therefore, can reach the height to contact electrical conductors and start a fire. The timing of the plant's reproductive cycle is not predictable. Therefore, an off-cycle inspection allows for an additional opportunity to ensure a plant has not sprouted a flower stalk. There are an estimated 16,000 Century plants in SDG&E's service territory. The off-cycle Century plant patrol was performed in 2011, 2013, and 2016. The average, annual cost of this additional inspection and work over the years has been $151k.

3. **Increased palm trimming scope**
   In 2010, SDG&E Vegetation Management expanded its scope of palm trimming to include trees located a greater distance from the power lines. Prior to 2010, palms located approximately fifteen (15) from the power lines were identified to be trimmed. This distance was initially thought to be sufficient to avoid detached palm fronds falling onto

power lines. Experience and outage investigations indicated that, under conditions such as strong winds and line construction, palms located much greater than fifteen feet from the lines could still cause a conflict due to falling fronds. SDG&E now trims palms located fifty (50) feet and greater from the power lines. The average, annual cost of this additional inspection and work over the years has been $1.4M.

4. **Use of Tree Growth Regulators**
In 2014, SDG&E Vegetation Management began the use of tree growth regulators (TGR) in conjunction with its tree trimming activities. TGRs are chemicals applied to trees that reduce annual shoot growth of and leaves. The use of this product has proved to be very effective on fast-growing species such as eucalyptus. TGRs are regulated and approved products. SDG&E's application is performed with written consent of the customer. The intent in the use of TGR is to suppress tree growth, reduce frequency of tree trimming, improve regulatory compliance, and limit the impact to customers. The annual cost of the use of TGRs since implementation has been $60k; we have seen an increase in customer approval for the application and expect to reach more customers in the future.

ORA DATA REQUEST
ORA-SDG&E DR-09, Q1-7
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 5, 1016
DATE RESPONDED: August 26, 2016

Request 5:

Has SDG&E examined other electric utilities' approaches to vegetation management in order to determine best practices and improve its own vegetation management program? If so, please describe, including the nature of this examination, dates (or date ranges), and any changes or effects resulting from the examination.

Response:

SDG&E Vegetation Management (VM) personnel attend utility conferences on an annual basis as part of its educational development for its staff. SDG&E is a member of the International Society of Arboriculture (ISA) and the Utility Arborist Association (UAA). SDG&E's VM staff receive continuing credits for attendance and participation in local and regional events. SDG&E has presented at the International Society of Arborist Conferences and participated in industry panel discussions regarding its program. SDG&E participates in the Utility Safety Summit that bring many utilities and contractors together to network and learn how to further develop work safety practices. Additionally, SDG&E has been a member of the Arborday Foundation "Tree Line USA" for 15 consecutive years. The membership requires SDG&E to support five core values – Quality Tree Care work, Annual Worker Training, Tree Planting and Public Education, Tree based Energy Conservation Program, and conduct an Arbor Day Celebration. SDG&E is a member of the San Diego Regional Urban Forests Council (SDRUFC) which is a member-driven coalition of agencies, businesses and educators working to improve our urban forest assets. As a member we help to promote the electrical safety awareness and benefits of right tree in the right place for a cleaner, healthier and more prosperous San Diego region. We are also a member of the North American Transmission Forum (NAFT), a national forum that facilitates monthly meetings to discuss vegetation management best practices and worker safety. Lastly SDG&E is a member of the Greater San Diego Fire Safe Council, and other smaller local organizations to provide outreach and education information, sponsorship and in some partnership for fuel reduction projects in the Greater San Diego County.

ORA DATA REQUEST
ORA-SDG&E DR-09, Q1-7
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 5, 1016
DATE RESPONDED: August 26, 2016

Request 6:

Please provide all subcontractors used for vegetation management since January 2003, including scope of work, contract period, and cost per year.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2 and 5. Subject to the foregoing objections, SDG&E responds as follows.

Response:

This information will be included in the scope of the response to Request 1a. above.

ORA DATA REQUEST
ORA-SDG&E DR-09, Q1-7
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 5, 1016
DATE RESPONDED: August 26, 2016

Request 7:

Please describe SDG&E's process for selecting a vegetation management contractor. Please include:

a. Bid solicitation process;

b. Requirements or guidelines that bidders/contractors must meet;

c. Requirements for minimum number of bids (if any); and

d. Cost requirements (i.e. maximum/minimum bid, if any).

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2 and 5. Subject to the foregoing objections, SDG&E responds as follows.

Response:

a. A summary of the bid solicitation process is below. Additionally, see attached "Vegetation Management Sourcing Overview".

- SDG&E researches companies that can provide vegetation management services
- SDG&E sends a Request for Information (RFI) via email or online bidding tool to qualified companies
- The contractors were screened based on the experience within the industry, the size of their company, their safety plan and overall years of doing business.
- SDG&E evaluates RFI responses and shortlists contractors to send a Request for Proposal (RFP)
- RFP is sent out and responses are evaluated by the team
  - Additionally, SDGE requested full disclosure of the cost drivers for each type of labor rate specified in the RFP. These cost drivers included: labor, capital equipment, overhead, insurance, benefits and profit.
- Contracts are awarded/negotiated
- Competitive awards were based on a number of criteria as depicted in the table below including experience, service, costs and bidder's overall technical proposal. Critical factors in the team's award determination were experience with California regulations and SDG&E and costs (including price, switching costs, and the cost to maintain competition).

b. Requests For Information (RFI) and Requests For Proposals (RFP) are evaluated with weighted evaluation criteria listed within the "Vegetation Management Sourcing Overview" document referenced in the response to subpart 1(a).

c. There is no minimum bid requirement.

d. There are no maximum or minimum cost requirements.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

September 2, 2016

Sent Via Electronic Mail and FedEx

A.15-09-010
Wildfire Expense Memorandum Account

Nils Stannik
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Supplemental Response to ORA Data Request 12 – Wildfire Expense Memorandum Account

Dear Mr. Stannik,

Attached please find SDG&E's supplemental response to ORA Data Request 12 (ORA-SDG&E-A.15-09-010-10), dated August 17, 2016. The attached contains SDG&E's response to Request #8, which was the only response SDG&E was not able to complete in the responses SDG&E transmitted to you on August 31, 2016. With this response, SDG&E has now fully responded to ORA-SDG&E DR-12.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E
Ed Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

III. RESPONSES

Request 1:

Can tie-lines between substations be disconnected or de-energized from either substation? If not or if only in some cases, please explain.

Response:

Typically, tie-lines are connected between substations that have more than one tie-line connected to each substation. In those cases, a tie-line between substations cannot be disconnected or de-energized from either substation alone, unless the other tie-lines connected to the other substation are also de-energized. With all lines in service, a tie-line must open at both terminals to de-energize the line.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 2:

As of October 2007, could TL637 be de-energized from either the Santa Ysabel or Creelman substations? If not, please explain.

Response:

As of October 2007, TL637 could not be de-energized from either Santa Ysabel or Creelman Substations alone, so long as the other tie-lines connected at Santa Ysabel and Creelman Substations were energized (the normal case). With multiple energized tie-line sources, both Santa Ysabel and Creelman terminals must open to de-energize TL637.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 3:

Currently, can the tie line between Santa Ysabel and Creelman substations be de-energized from either the Santa Ysabel or Creelman substations? If not, please explain.

Response:

Currently, TL637 cannot be de-energized from either Santa Ysabel or Creelman Substations alone, so long as the other tie-lines connected at Santa Ysabel and Creelman are energized (the normal case). With multiple energized tie-line sources, both Santa Ysabel and Creelman terminals must open to de-energize TL637.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 4:

When responding to reports of a line trip/fault, why did SDG&E elect to send a troubleman to the Santa Ysabel substation after the 8:53am trip but not to the Creelman substation?

Response:

As mentioned on page 3 of the "Direct Testimony of David L. Geier, San Diego Gas & Electric Company (Witch and Rice Fires)" in I.08-11-006, troubleshooters were dispatched to both the Santa Ysabel and Creelman substations after the 8:53 am fault to investigate the fault and report back regarding the fault indicators. See also the 2007 Wildfire Litigation deposition transcripts of Ray Necochea and Michael Higbee, which SDG&E provided to ORA in its response to Request 2 of ORA-SDG&E DR-02 on April 29, 2016.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 5:

When responding to reports of a line trip/fault, why did SDG&E elect to send troublemen to both the Santa Ysabel substation and the Creelman substation after the 11:22am trip?

Response:

As mentioned on page 4 of the "Direct Testimony of David L. Geier, San Diego Gas & Electric Company (Witch and Rice Fires)" in I.08-11-006, troubleshooters were dispatched to both the Santa Ysabel and Creelman substations after the 11:22 am fault because it was SDG&E's standard practice to gather information from the substation equipment following a fault.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 6:

In an audio recording provided in response to ORA data request ORA-02, a station manager discusses being "super busy with the 500." Please describe any non-standard events, occurrences, or issues that occurred on October 20-22, 2007 regarding the facilities that "the 500" refers to.

The audio recording name and location are provided below: \SDGE PRODS\AUDIO_NATIVE FILES\SDGE230\2007_1021\SDGE0208962_STM_jcampbel_datarequest_10-21-2007_1B7.wav

Objection: SDG&E objects to this request on the grounds set forth in General Objection 3. Subject to the foregoing objection, SDG&E responds as follows.

Response:

On October 21, 2007, the Harris Fire broke out and threatened SDG&E's Southwest Power Link, a 500 kV line. This situation is further discussed in the 2007 Wildfire Litigation deposition transcripts of Sean Long, Jim Minton and Bret Ball, which SDG&E provided to ORA in its response to Request 2 of ORA-SDG&E DR-02 on April 29, 2016.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 7:

What type of anchor points were used at the facilities allegedly involved in the ignition of the Witch and Guejito fires?

Response:

On August 29, 2016, counsel for ORA provided clarification on Request 7, as follows: "SDG&E can interpret the question to refer to where the wires attach to the poles/insulators. Thus, for the Witch fire, the span between poles Z416675 and Z416676, and the spans to either end of that span, including all four poles, would be captured by the data request. Likewise, for the Guejito fire, the span between poles P196387 and P196394, and the spans to either end of that span, including all four poles, would be captured by the data request."

Accordingly, SDG&E provides the following response.

"Span between poles Z416675 and Z416676, and the spans to either end of that span"

Z416674 – At the time of the fire, this pole was what is referred to as a deadend structure. The "anchor points," or points where the wire was mechanically affixed to the structure, consisted of bolted strain clamps, which were attached with hardware to the insulators, which were affixed to the crossarms mounted on the pole.

Z416675 – At the time of the fire, this pole was what is referred to as a tangent structure. The "anchor points," or points where the wire was mechanically affixed to the structure, consisted of bolted trunnion clamps at the end of post insulators, which were mounted directly onto the pole.

Z416676 – At the time of the fire, this pole was what is referred to as a tangent structure. The "anchor points," or points where the wire was mechanically affixed to the structure, consisted of bolted trunnion clamps at the end of post insulators, which were mounted directly onto the pole.

Z416677 – At the time of the fire, this pole was what is referred to as a tangent structure. The "anchor points," or points where the wire was mechanically affixed to the structure, consisted of bolted trunnion clamps at the end of post insulators, which were mounted directly onto the pole.

"Span between poles P196387 and P196394, and the spans to either end of that span"

P196387 – At the time of the fire, this pole was what is referred to as a tangent structure. The "anchor points," or points where the wire was mechanically affixed to the structure, consisted of a

double stop-tie connection, where the conductors were tied to cap and pin insulators with top-ties, or tie wires.

P196394 – At the time of the fire, the pole configuration was what is referred to as a deadend configuration for the span heading from this pole to P196387, and tangent construction for the spans heading to P196403 and P410064. For the span heading to P196387, the "anchor points," or points where the wire was mechanically affixed to the structure, consisted of bolted strain clamps, which were attached with hardware to the insulators, which were affixed to the crossarms mounted on the pole. For the spans heading to P196403 and P410064, the conductors were tied to cap and pin insulators with top-ties, or tie wires.

P196386 – At the time of the fire, this pole was what is referred to as a deadend structure. The "anchor points," or points where the wire was mechanically affixed to the structure, consisted of bolted strain clamps, which were attached with hardware to the insulators, which were affixed to the crossarms mounted on the pole.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 8:

Please provide the following specifications for the electric conductors allegedly involved in the ignition of the Witch and Guejito fires:

a. Weight per unit length;
b. Yield strength;
c. Ultimate strength;
d. Young's modulus of elasticity (in psi or MPa);
e. Equivalent cross-sectional area; and
f. Drag coefficient

Response:

a. Weight per unit length - .2308 LBS./FT
b. Yield strength – The information is not available.
c. Ultimate strength – 6620 LBS.
d. Young's modulus of elasticity (in psi or MPa) – Core 40,300 psi/100 – Outer 73,200 psi/100
e. Equivalent cross-sectional area - .1537 [in^2]
f. Drag coefficient - 1

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 9:

Please provide the elevations of poles Z416675, Z416676, P196394, and P196387 as of October 2007.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 6 and 7. Subject to the foregoing objections, SDG&E responds as follows.

Response:

Survey information regarding poles Z416675 and Z416676 is incorporated in Exhibit 2-B to the June 22, 2009 "Rebuttal Testimony of the Consumer Protection and Safety Division to the Direct Testimony of San Diego Gas & Electric Company Regarding the Formal Witch and Rice Fire Investigations." Ground clearance and other information regarding these facilities is included in Exhibit 2-E to that CPSD testimony. SDG&E made this information available to the parties in this proceeding in April 2016.

Survey information regarding poles P196394 and P196387 was previously produced to ORA in response to ORA-SDG&E DR-02. Additionally, in response to Request 15 of ORA-SDG&E DR-04, SDG&E identified the bates range of these survey materials (SDGE123654-123719). Ground clearance and other information regarding these facilities is included in Exhibit 2-D to the June 8, 2009 "Rebuttal Testimony of the Consumer Protection and Safety Division to the Direct Testimony of Cox Communications and San Diego Gas & Electric Company Regarding the Formal Guejito Fire Investigation." SDG&E made this information available to the parties in this proceeding in April 2016.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 10:

Please provide (as of October 2007):

a. The horizontal distance between poles Z416675 and Z416676;
b. The horizontal distance between poles P196394 and P196387;
c. The horizontal distance of the spans on either side of the span described in part (a); and
d. The horizontal distance of the spans on either side of the span described in part (b).

Objection: SDG&E objects to this request on the grounds set forth in General Objections 6 and 7. SDG&E objects to subparts (c) and (d) of this request on the grounds set forth in General Objection 5. Subject to the foregoing objections, SDG&E responds as follows.

Response:

See the surveys referenced in response to Request 9, above. Further, as noted in the "Direct Testimony of Gerry Akin, San Diego Gas & Electric Company (Witch Fire)" in I.08-11-006, the distance between poles Z416675 and Z416676 was approximately 613 feet. As noted in the "Direct Testimony of Paul Alvarado, San Diego Gas & Electric Company (Guejito Fire)" In I.08-11-007, the distance between poles P196394 and P196387 was 872.5 feet.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 11:

What is the maximum recorded sag of the conductors allegedly involved in the ignition of the Witch and Guejito fires?

Objection: SDG&E objects to this request on the grounds set forth in General Objection 3. Subject to the foregoing objection, SDG&E responds as follows.

Response:

See the surveys referenced in response to Request 9, above. SDG&E is willing to further discuss this request if those surveys do not provide the information ORA seeks.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 12:

Given equipment and software installed as of October 2007, would SDG&E have been able to detect faults/trips that occurred between the time a circuit breaker automatically opened and when it automatically reclosed?

Response:

From the time a circuit breaker opens to the time it recloses, the protected circuit is de-energized. Faults cannot occur on a de-energized circuit, so there is no fault event to detect in the de-energized condition, regardless of the monitoring capability.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 13:

Given equipment and software installed as of October 2007, would SDG&E have been able to detect faults/trips that occurred while a circuit breaker was automatically opening or reclosing?

Objection: SDG&E objects to this request on the grounds set forth in General Objection 3. Subject to the foregoing objection, SDG&E responds as follows.

Response:

SDG&E would have been able to detect faults/trips while a circuit breaker was automatically opening or reclosing. See also the response ot Request 12, above.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 14:

Is SDG&E aware of any documentation or indication that any trips/faults occurred on TL637 while circuit breakers were opening or closing, or between the automatic opening and reclosing of circuit breakers? If so, please provide.

Response:

No.

ORA DATA REQUEST
ORA-SDG&E DR-12, Q1-15
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: August 17, 1016
DATE RESPONDED: September 2, 2016

Request 15:

On page 5, lines 19-22 of Mr. Vanderburg's testimony, SDG&E states that it has "installed five Remote Automated Weather Stations (or RAWS)." Please provide the names of the five RAWS stations.

Response:

SDG&E now has six Remote Automated Weather Stations: Aliso Laguna, Barrett, Mission Valley, Mountain Springs Grade, Pala, and San Pasqual. Please note: the Mountain Springs Grade RAWS was originally in Santa Ysabel from 2009-2014 and the Mission Valley RAWS was originally in Boulevard from 2009-2013. Both were relocated due to encroachment from utility-related construction projects.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

September 8, 2016

Sent Via Electronic Mail and FedEx

A.15-09-010
Wildfire Expense Memorandum Account

Nils Stannik
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Response to ORA Data Request 13 – Wildfire Expense Memorandum Account

Dear Mr. Stannik,

Attached please find SDG&E's response to ORA Data Request 13 (ORA-SDG&E-A.15-09-010-13), dated August 24, 2016. SDG&E's response includes general objections, narrative responses and attachments.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E
Ed Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-13, Q1-3
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 24, 1016
DATE RESPONDED: September 8, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

ORA DATA REQUEST
ORA-SDG&E DR-13, Q1-3
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 24, 1016
DATE RESPONDED: September 8, 2016

III. RESPONSES

Request 1:

a. At the time of the 2007 wildfires, what person(s) or department was/were responsible for scheduling the reinstallation of the facilities associated with the ignition of the Rice Fire after repair work was completed?

b. When was the repair work that was completed on October 24, 2007 and October 31, 2007 on the facilities described in part (a) above scheduled?

c. When was the re-energization (of the facilities described in part (a) above) scheduled?

Objection: SDG&E objects to this request on the grounds set forth in General Objection 5.

ORA DATA REQUEST
ORA-SDG&E DR-13, Q1-3
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 24, 1016
DATE RESPONDED: September 8, 2016

Request 2:

a. Please provide the results (and any associated documents or workpapers) of the preinspection audit of the tree-trimming work that would have included tree FF1090 in October – November 2007.

b. If not apparent in the documents provided in response to part (a) above, please provide the audit due date according to SDG&E's vegetation management schedule, including the actual begin date of the audit and the actual end date of the audit.

Response:

a. See attached "Auditor Summary Report and Certification of Audit Performed.pdf." Also attached is a listing of the 471 record IDs for the VMA 379 audit work release (see attached "Audit Work Release Tree IDs (VMA 379)". FF1090 (which is within VMA 379) is not included in this spreadsheet because it was not randomly selected for the audit.

b. As stated within the Auditor Summary Report and Certificaiton of Audit Performed document, the audit start date was August 14, 2007, and the audit end date was August 22, 2007.

ORA DATA REQUEST
ORA-SDG&E DR-13, Q1-3
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: August 24, 1016
DATE RESPONDED: September 8, 2016

Request 3:

Please provide the most recent version of TMC1320 (AKA: DOP3013, ESP109), or a confirmation of the most recent version number/date if these documents are already in ORA's possession. If TMC1320 has been superseded by another document or set of procedures, please provide:

a. The date that TMC1320 was replaced by the new document/procedures;
b. The most recent version of TMC1320 before it was superseded; and
c. The name and most recent version of the replacing document.

Response:

The most recent version of TMC1320 is in ORA's possession. This document was included on the removable hard drive SDG&E produced in response to ORA-SDG&E DR-02 and within SDG&E's Second Supplemental Response to ORA-SDG&E DR-06. The effective date is 04/15/15 and the document number is TMC1320 (AKA: DOP3013, ESP109).

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

September 29, 2016

Sent Via Electronic Mail and FedEx

A.15-09-010
Wildfire Expense Memorandum Account

Nils Stannik
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Response to ORA Data Request 15 – Wildfire Expense Memorandum Account

Dear Mr. Stannik,

Attached please find SDG&E's supplemental response to ORA Data Request 15 (ORA-SDG&E-A.15-09-010-15), dated September 13, 2016. SDG&E's response includes an update to Request 1 accompanied by confidential document, TMC1010. CPUC Decision (D.) 16-08-024 requires an officer confidentiality declaration which is provided herewith.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E
Ed Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-15, Q1-3
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: September 13, 2016
DATE RESPONDED: September 29, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

5. SDG&E objects generally to each request to the extent it seeks information or documents that are not reasonably calculated to lead to the discovery of admissible evidence.

6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

ORA DATA REQUEST
ORA-SDG&E DR-15, Q1-3
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: September 13, 2016
DATE RESPONDED: September 29, 2016

III. RESPONSES

Request 1:

Please provide SDG&E's policy and guidelines for the use of automatic reclosers as of the time of the 2007 wildfires (October 2007).

Response:

See the version of TMC1320 that was in effect in October 2007, which SDG&E previously produced to ORA.

In addition, please see attached TMC1010 which is confidential. Per CPUC Decision (D.) 16-08-024 an officer declaration of confidentiality is provided herewith signed by David Geier, Vice President of Electric Transmission and System Engineering.

ORA DATA REQUEST
ORA-SDG&E DR-15, Q1-3
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: September 13, 2016
DATE RESPONDED: September 29, 2016

Request 2:

At the time of the 2007 wildfires (October 2007):

a. Did SDG&E's policy require or recommend the disabling of automatic reclosing of lines based on the number of phase-to-phase trips within a certain time period? If so, please provide the number of trips and time period.

b. Did SDG&E's policy require or recommend the disabling of automatic reclosing of lines based on any other factors? If so, please list and describe all potential factors.

c. Please describe any limitations (technical or otherwise), policies, requirements, or CPUC rules or regulations that precluded SDG&E from disabling automatic reclosing of lines at its discretion.

d. Please describe any limitations (technical or otherwise), policies, requirements, or CPUC rules or regulations that precluded SDG&E from disabling automatic reclosing of lines given the circumstances and conditions that occurred on October 21, 2007 on Tie Line 637.

Response:

a. There was no formal policy requiring the disabling of automatic reclosing, but in certain instances, reclosers would be turned off. See also response to subparts (c) and (d) below.

b. There were no specific factors.

c./d. In the event of a transmission line fault, the protective relays open the circuit breakers, de-energizing the line, and the circuit breakers remain open for ten seconds before the reclosers attempt to reclose them. Automatic reclosers are important from a safety and reliability perspective because they allow a line to be automatically re-energized following a fault, thereby meeting the need for continuous electric service, which is critical for water pumping services, special needs customers, emergency services, traffic and street lights, communication networks, and many other societal needs. In some areas of SDG&E's service territory, particularly rural areas, there may not be other means for routing power to customers if a line is de-energized.

It is also important to recognize that there were limitations on automatic reclosing in October 2007. As explained in the "Direct Testimony of David L. Geier, San Diego Gas & Electric Company (Witch and Rice Fires)" in I.08-11-006:

> If the circuit breakers do not reclose successfully, which would indicate that the fault has not cleared after 10 seconds, the recloser "locks out" and prevents further automatic reclose attempts. If the circuit breakers reclose successfully, the circuit is restored. As an additional protection, even if the circuit breakers reclose successfully after 10 seconds, the recloser will lockout if the line faults again within 120 seconds of the initial fault. If no additional faults occur in that 120-second period, the recloser resets.

Mr. Geier further explained that "when a line tripped and reclosed successfully and the cause for the trip was unknown, the lines would be patrolled at the discretion of the field supervisor." Mr. Geier noted that troubleshooters were dispatched to examine the faults on TL 637 on October 21, 2007. SDG&E has the discretion to disable automatic reclosers and did so on TL 637 on October 21, 2007 due to the fire.

ORA DATA REQUEST
ORA-SDG&E DR-15, Q1-3
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E SUPPLEMENTAL RESPONSE
DATE RECEIVED: September 13, 2016
DATE RESPONDED: September 29, 2016

Request 3:

Please describe the technical process required to disable automatic reclosing of lines (for example, button or script in control software, manual switch at a substation, etc.)

Response:

A recloser cutout switch is always provided at the substation protection panel to provide local control; in some stations, SCADA control is also provided. Disabling automatic reclosing of TL637 would have required the device to be locally turned off at the Creelman substation. If SCADA were available at the Santa Ysabel substation, the SCADA system could be used; if not, SDG&E would dispatch a troubleshooter to locally turn off at the Santa Ysabel substation.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

September 26, 2016

Sent Via Electronic Mail and FedEx

A.15-09-010
Wildfire Expense Memorandum Account

Nils Stannik
Office of Ratepayer Advocates
505 Van Ness Avenue, Room 4108
San Francisco, CA 94102

Re: SDG&E Response to ORA Data Request 16 – Wildfire Expense Memorandum Account

Dear Mr. Stannik,

Attached please find SDG&E's response to ORA Data Request 16 (ORA-SDG&E-A.15-09-010-16), dated September 19, 2016. SDG&E's response includes narrative responses.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: **SSidhar@semprautilities.com**.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E
Ed Moldavsky - ORA

ORA DATA REQUEST
ORA-SDG&E DR-16, Q1
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: September 19, 2016
DATE RESPONDED: September 26, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

2. SDG&E objects generally to each request that is overly broad and unduly burdensome. As part of this objection, SDG&E objects to discovery requests that seek "all documents" or "each and every document" and similarly worded requests on the grounds that such requests are unreasonably cumulative and duplicative, fail to identify with specificity the information or material sought, and create an unreasonable burden compared to the likelihood of such requests leading to the discovery of admissible evidence. Notwithstanding this objection, SDG&E will produce all relevant, non-privileged information not otherwise objected to that it is able to locate after reasonable inquiry.

3. SDG&E objects generally to each request to the extent that the request is vague, unintelligible, or fails to identify with sufficient particularity the information or documents requested and, thus, is not susceptible to response at this time.

4. SDG&E objects generally to each request that: (1) asks for a legal conclusion to be drawn or legal research to be conducted on the grounds that such requests are not designed to elicit facts and, thus, violate the principles underlying discovery; (2) requires SDG&E to do legal research or perform additional analyses to respond to the request; or (3) seeks access to counsel's legal research, analyses or theories.

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7. SDG&E objects generally to each request to the extent that it would require SDG&E to search its files for matters of public record such as filings, testimony, transcripts, decisions, orders, reports or other information, whether available in the public domain or through FERC or CPUC sources.

8. SDG&E objects generally to each request to the extent that it seeks information or documents that are not in the possession, custody or control of SDG&E.

9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

ORA DATA REQUEST
ORA-SDG&E DR-16, Q1
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: September 19, 2016
DATE RESPONDED: September 26, 2016

Request 1:

As used or defined in October 2007, please provide a brief description or summary for each of the following SDG&E positions or titles:

a. Forester
b. Troubleman
c. Lineman
d. Transmission Construction & Maintenance Manager
e. Construction Supervisor
f. Fire Coordinator
g. Back-up Fire Coordinator

Response:

a. **Forester:** A Forester is a person that has the proper training and experience, and in some cases the certifications or credentials for identifying and managing a variety of tree species and ground vegetation in proximity to utilities.

b. **Troubleman:** Electric Troubleshooters are first responders to emergency calls. They determine the cause of electrical distribution malfunctions and power outages. In addition they also independently perform skilled electrical repair work on overhead and underground electric distribution facilities.

c. **Lineman:** A Lineman is a trained electrical line worker that constructs and maintains SDG&E's electrical transmission and distribution systems.

d. **Transmission Construction & Maintenance Manager:** This position directs and manages, through subordinate supervision, the activities of the construction operations department involving the construction, maintenance and repair of 69kV – 500kV electric transmission facilities.

e. **Construction Supervisor:** A Construction Supervisor manages the line crews, ensures safe working practices, writes repair orders and helps with manning of crews and material ordering.

f. **Fire Coordinator:** A Fire Coordinator is responsible for providing situational awareness on fires burning in the service territory, electric safety training to first responders and fire safety training to utility personnel.

g. **Back-up Fire Coordinator:** A Back-Up Fire Coordinator serves as a second Fire Coordinator during busy times when the Fire Coordinator is committed or otherwise unavailable for fire response.

Shivani Sidhar
Regulatory Case Manager
San Diego Gas and Electric Company
8330 Century Park Court
San Diego, CA 92123-1530

August 15, 2016

Sent Via Electronic Mail

A.15-09-010
Wildfire Expense Memorandum Account

Ms. Diane Conklin
Mussey Grade Road Alliance
PO Box 683 Ramona, CA 92065

Re: SDG&E Response to MGRA Data Request 03 -WEMA

Dear Ms. Conklin:

Attached please find SDG&E's response to MGRA Data Request 03 (MGRA-SDG&E-A.15-09-010-03), dated July 29, 2016. SDG&E's response includes general objections, narrative responses and attachments.

If you have any questions or require additional information, please feel free to contact me by phone at (858) 637-7914 or e-mail: SSidhar@semprautilities.com.

Sincerely,

Signed

Shivani Sidhar
Regulatory Case Manager

Enclosures

cc: Chris Lyons – SDG&E
Stacie Atkinson – SDG&E

MGRA DATA REQUEST
MGRA-SDG&E DR-03, Q21-24
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 29, 2016
DATE RESPONDED: August 15, 2016

I. GENERAL OBJECTIONS

1. SDG&E objects generally to each request to the extent that it seeks information protected by the attorney-client privilege, the attorney work product doctrine, statutory mediation confidentiality (see Cal. Evid. Code §§ 1115-28) or any other applicable privilege or evidentiary doctrine. No information protected by such privileges will be knowingly disclosed.

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6. SDG&E objects generally to each request to the extent that it is unreasonably duplicative or cumulative of other requests.

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9. SDG&E objects generally to each request to the extent that the request would impose an undue burden on SDG&E by requiring it to perform studies, analyses or calculations or to create documents that do not currently exist.

10. SDG&E objects generally to each request that calls for information that contains trade secrets, is privileged or otherwise entitled to confidential protection by reference to statutory protection. SDG&E objects to providing such information absent an appropriate protective order. With respect to the Office of Ratepayer Advocates, however, SDG&E will produce such information subject to the requirements of Public Utilities Code Section 583 and General Order 66-C.

II. EXPRESS RESERVATIONS

1. No response, objection, limitation or lack thereof, set forth in these responses and objections shall be deemed an admission or representation by SDG&E as to the existence or nonexistence of the requested information or that any such information is relevant or admissible.

2. SDG&E reserves the right to modify or supplement its responses and objections to each request, and the provision of any information pursuant to any request is not a waiver of that right.

3. SDG&E reserves the right to rely, at any time, upon subsequently discovered information.

4. These responses are made solely for the purpose of this proceeding (A.15-09-010) and for no other purpose.

MGRA DATA REQUEST
MGRA-SDG&E DR-03, Q21-24
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 29, 2016
DATE RESPONDED: August 15, 2016

III. RESPONSES

Request 21:

Please provide all meteorological and wind studies performed internally or by third party contractors prior to 2009 for SDG&E engineering projects taking place in eastern San Diego County. Please provide both final and draft copies of said studies.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 3, 5 and 10. Subject to the foregoing objections, SDG&E responds as follows.

Response: Please see the "Meteorlogical and Structure Wind Load Studies" report prepared in connection with the Sunrise PowerLink Project ("Sunrise Study.pdf") and the "Meteorological Study for the APS/SDGE Interconnection Project" report prepared in connection with the Southwest PowerLink Project ("SWPL Study.pdf").

MGRA DATA REQUEST
MGRA-SDG&E DR-03, Q21-24
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 29, 2016
DATE RESPONDED: August 15, 2016

Request 22:

For any meteorological or wind study performed by third party contractors as per MGRA-21, please provide the name of the contracting company or individuals, the date that the work was initiated, and the date the work was completed. Please provide a copy of the applicable contract stating the terms of work.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 3, 5 and 10. Subject to the foregoing objections, SDG&E responds as follows.

Response: See response to Request 21 above.

MGRA DATA REQUEST
MGRA-SDG&E DR-03, Q21-24
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 29, 2016
DATE RESPONDED: August 15, 2016

Request 23:

In regard to SDG&E's RIRAT program for fire reduction, described in its GRC filings, what specific system design specifications have been modified to enhance system integrity and reduce the potential for fires?

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 5 and 9. SDG&E further objects to this request on the grounds that it calls for information that is outside of the scope of this proceeding. Subject to the foregoing objection, SDG&E responds as follows.

Response:

See the "San Diego Gas & Electric Company Fire Prevention Plan" (dated October 31, 2014) attached as Appendix 2 to the September 25, 2015 Prepared Direct Testimony of David L. Geier in this proceeding. The Fire Prevention Plan provides a discussion of design and construction standard modifications undertaken in connection with fire prevention efforts on page 12. More detailed information regarding modified design standards is set forth in Sections 5122 and 6232 of SDG&E's Distribution Design Manual, which was developed to reduce fire potential. See Distribution System Design Manual 5122_6232.pdf. Additionally, several of SDG&E's overhead construction standards contain specific standards for equipment that take into account work in the Fire Threat Zone ("FTZ") or High Risk Fire Area ("HFRA"). The relevant standards are provided herewith. See Overhead Construction Standards.pdf.

Please note that the Reliability Improvements in Rural Areas Team ("RIRAT") referenced in the question has now been incorporated into the Fire Risk Mitigation ("FiRM") program, as discussed in the SDG&E Direct Testimony of John D. Jenkins in SDG&E's 2016 GRC (A.14-11-003). The FiRM program addresses aging infrastructure within the Fire Threat Zone, while taking into account data on local meteorological and fire conditions that were not considered or known when the facilities were originally constructed.

MGRA DATA REQUEST
MGRA-SDG&E DR-03, Q21-24
SDG&E WEMA PROCEEDING - A.15-09-010
SDG&E RESPONSE
DATE RECEIVED: July 29, 2016
DATE RESPONDED: August 15, 2016

Request 24:

For infrastructure upgrades and replacements under RIRAT, and for new construction in high fire hazard areas, what wind loading is being applied to distribution and transmission equipment, and what safety factors are being applied? If the wind loading used for engineering standards is site or situation specific, provide the specific criteria used for adopting the chosen wind speed, and list specific wind speed used for engineering calculations by circuit number and nearest SDG&E weather station.

Objection: SDG&E objects to this request on the grounds set forth in General Objections 2, 5 and 9. SDG&E further objects to this request on the grounds that it calls for information that is outside of the scope of this proceeding. Subject to the foregoing objection, SDG&E responds as follows.

Response:

See "ET&DE Standard 12100.pdf" provided herewith. This document contains SDG&E's Electric Transmission and Distribution Engineering standard for pole loading, including wind loading criteria.

Photo No.	Title of Photograph/ Video	Photographer	Date/Time of Photograph/ Video	Description / Location of Photograph
1.	DSCF 1244.jpg	Consultant D[1]	11/19/07	Witch fire area
2.	DSCF 1245.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
3.	DSCF 1246.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
4.	DSCF 1247.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
5.	DSCF 1248.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
6.	DSCF 1249.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
7.	DSCF 1250.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
8.	DSCF 1251.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
9.	DSCF 1252.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
10.	DSCF 1253.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
11.	DSCF 1254.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
12.	DSCF 1255.jpg	Consultant D	11/19/07	Rice – section of Sycamore tree
13.	DSCF 1256.jpg	Consultant D	11/21/07	Rice – Sycamore tree
14.	DSCF 1257.jpg	Consultant D	11/21/07	Rice – Sycamore tree
15.	DSCF 1258.jpg	Consultant D	11/21/07	Rice – fire area
16.	DSCF 1259.jpg	Consultant D	11/21/07	Rice – Sycamore tree
17.	DSCF 1260.jpg	Consultant D	11/21/07	Rice – Sycamore tree
18.	DSCF 1261.jpg	Consultant D	11/21/07	Rice – Sycamore tree
19.	DSCF 1262.jpg	Consultant D	11/21/07	Rice – fire area
20.	DSCF 1263.jpg	Consultant D	11/21/07	Rice – fire area
21.	DSCF 1264.jpg	Consultant D	11/21/07	Rice – fire area
22.	DSCF 1265.jpg	Consultant D	11/21/07	Rice – fire area
23.	DSCF 1266.jpg	Consultant D	11/21/07	Rice – fire area
24.	DSCF 1267.jpg	Consultant D	11/21/07	Rice – Sycamore tree
25.	DSCF 1268.jpg	Consultant D	11/21/07	Rice – Sycamore tree
26.	DSCF 1269.jpg	Consultant D	11/21/07	Rice – Sycamore tree
27.	DSCF 1270.jpg	Consultant D	11/21/07	Rice – Sycamore tree
28.	DSCF 1271.jpg	Consultant D	11/21/07	Rice – fire area

[1] **Outside consultant retained by counsel in connection with the wildfire litigation**

SDGE0013429

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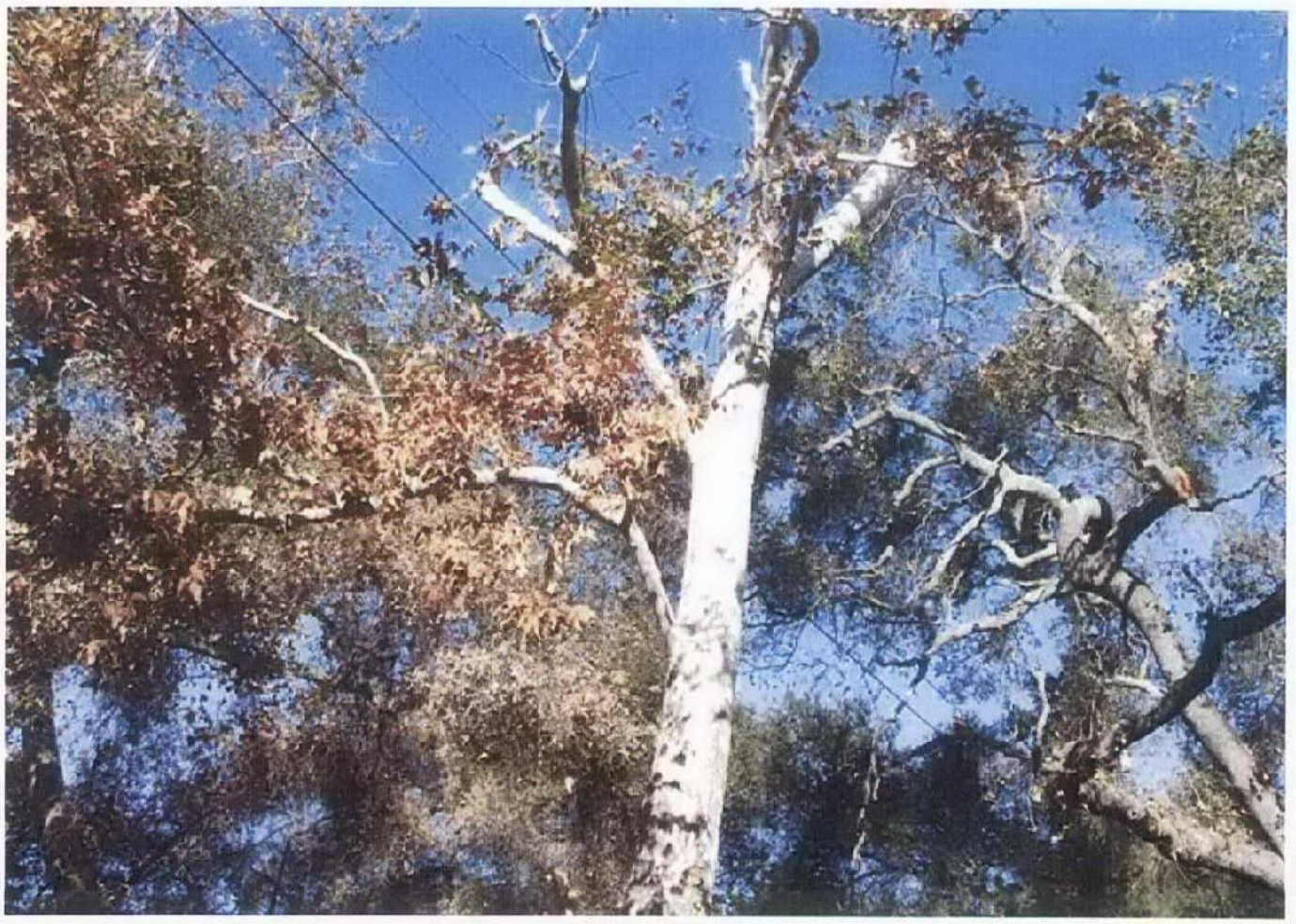

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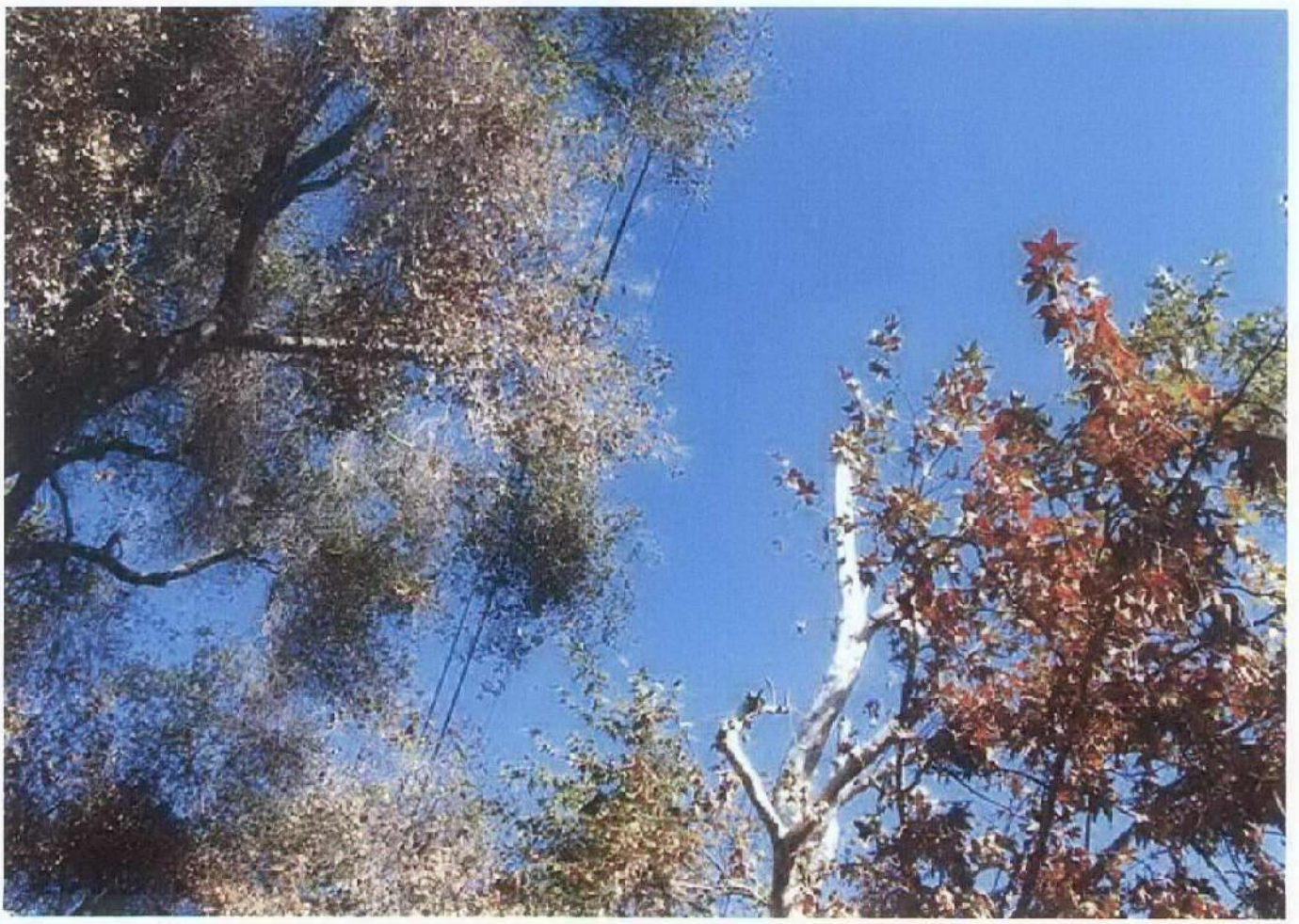

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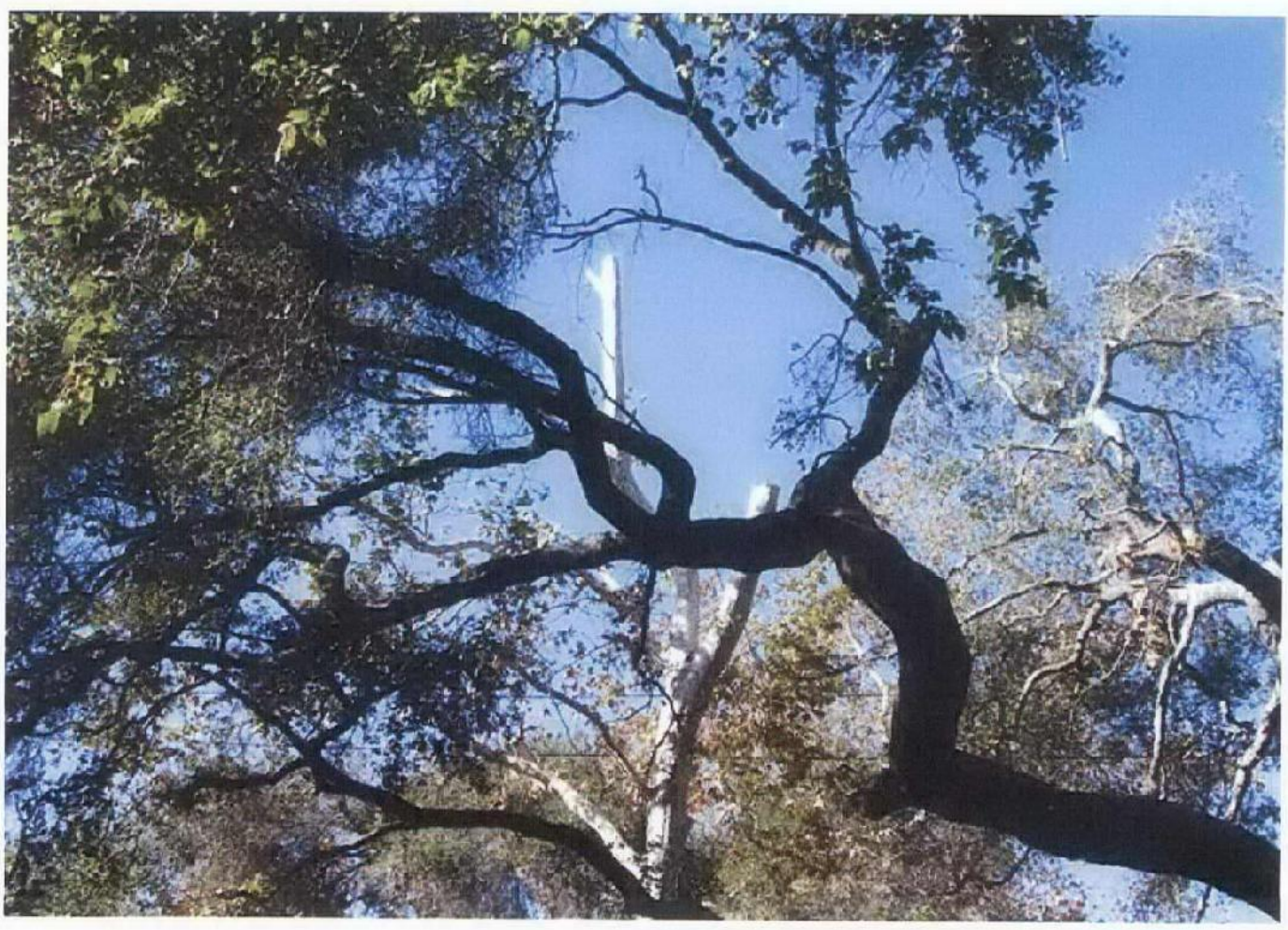

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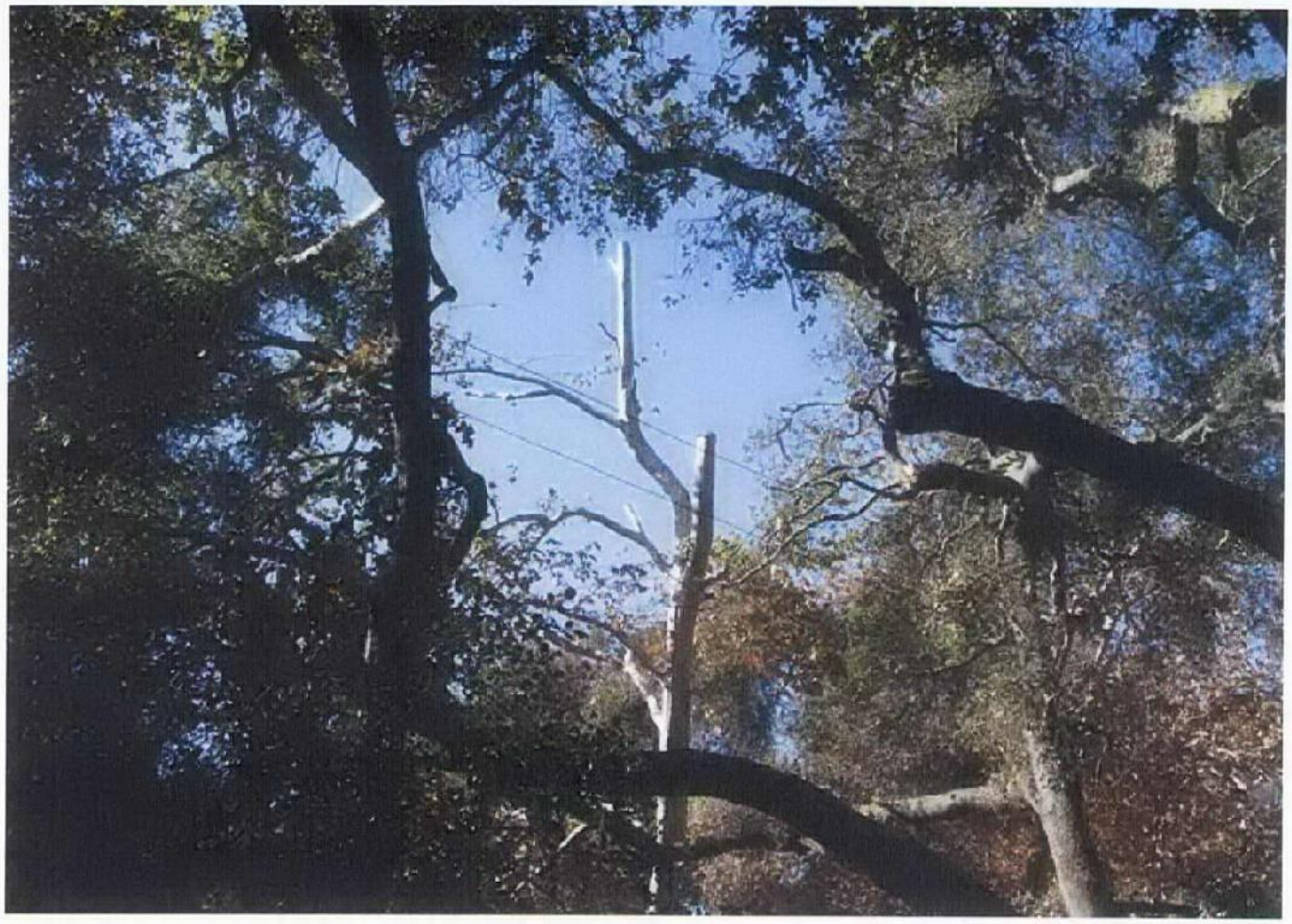

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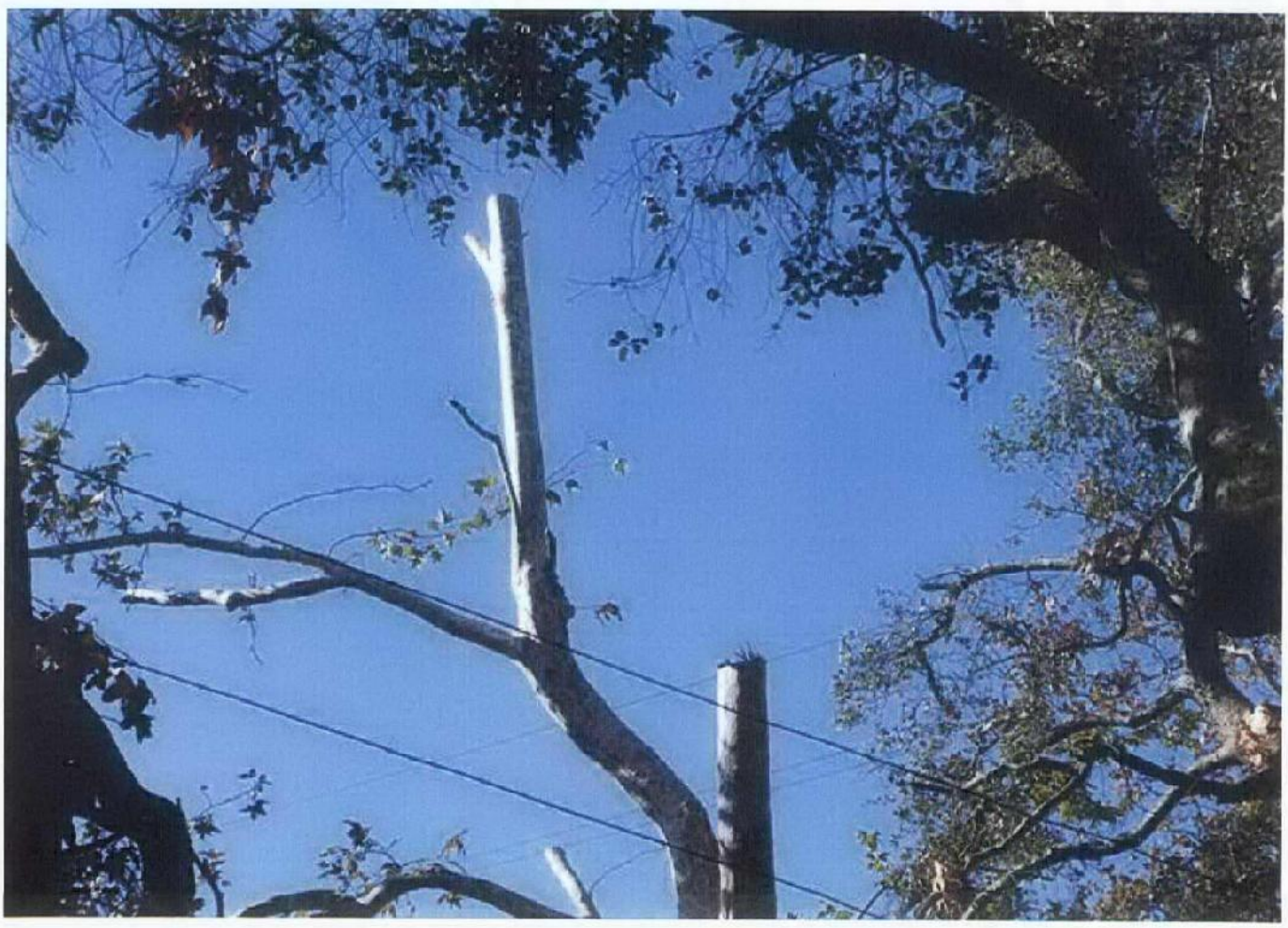

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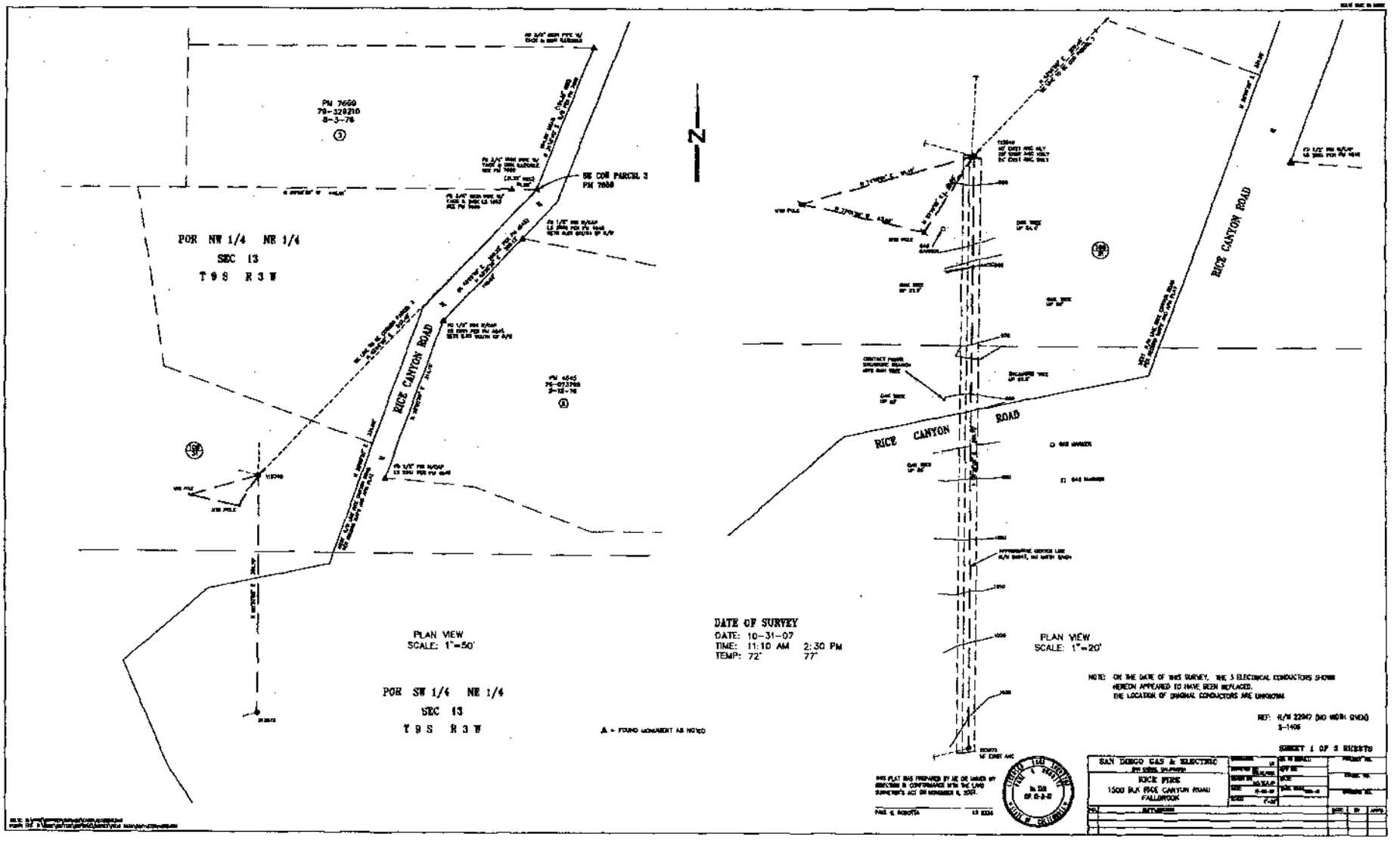
27.

28



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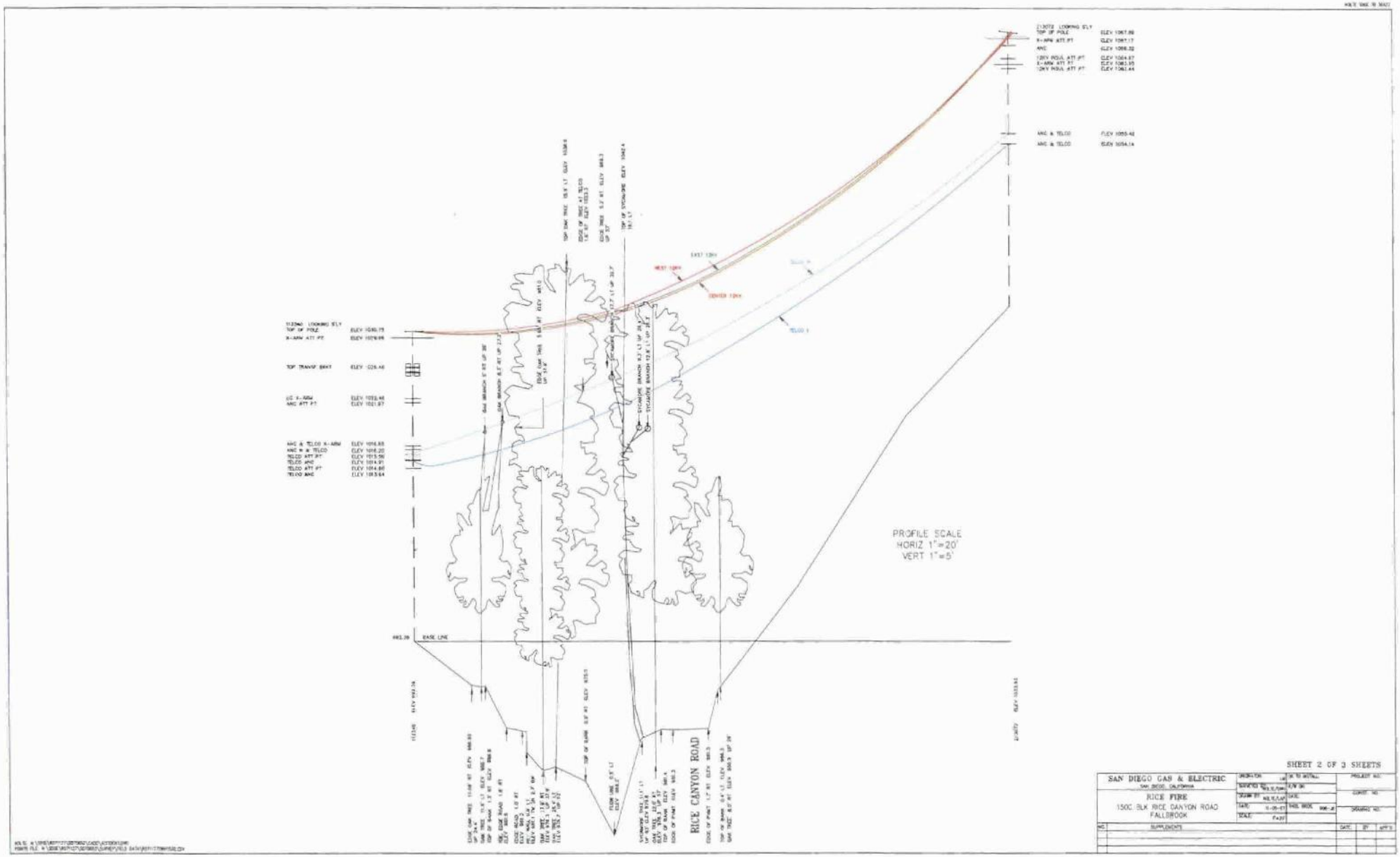
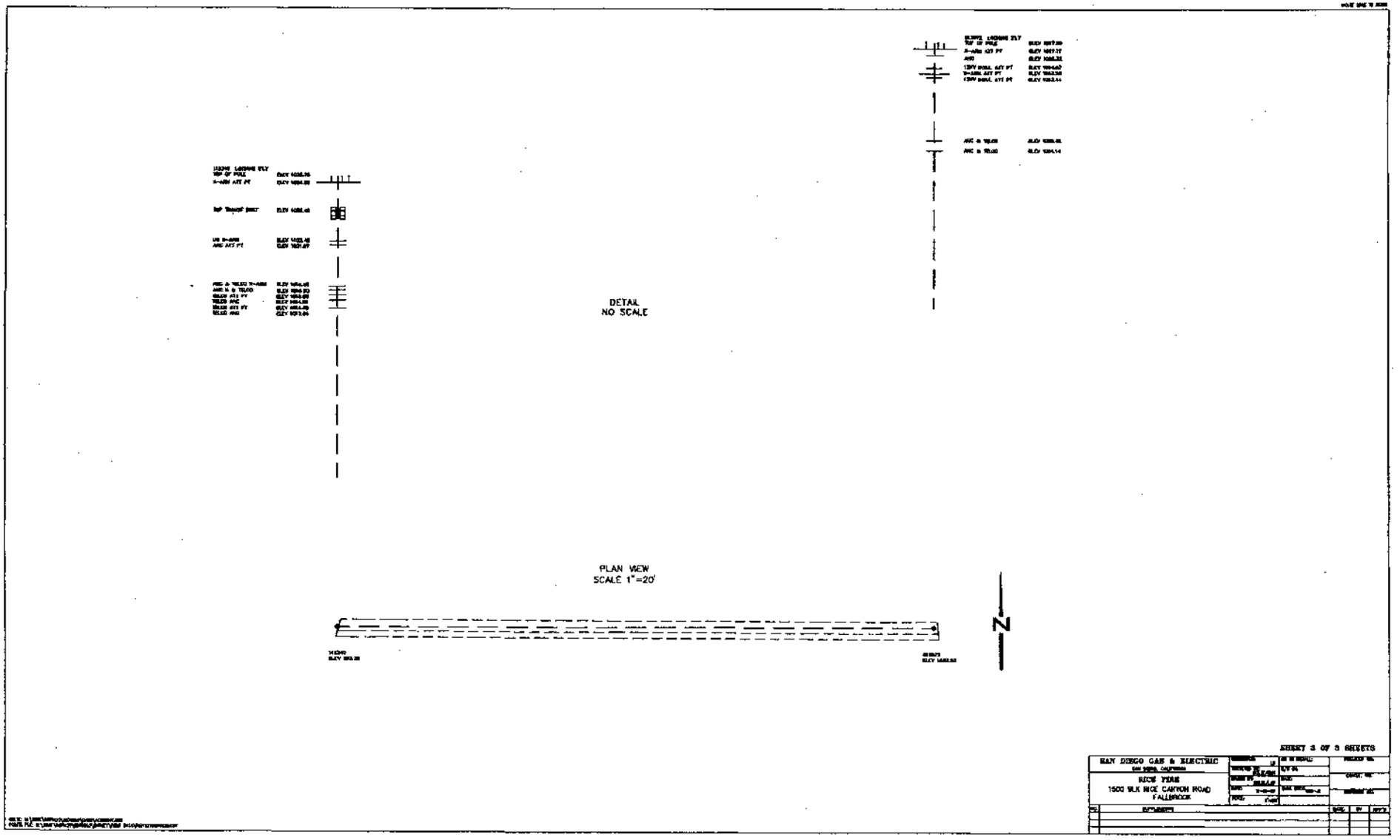


SHEET 2 OF 3 SHEETS

SAN DIEGO GAS & ELECTRIC	DESIGN BY	JP	W.O. TO INSTALL	PROJECT NO.
SAN DIEGO, CALIFORNIA	SURVEY BY	R.S.S./MM	R/W DWG.	
RICE FIRE	DRAWN BY	M.S./L.A.P.	DATE	CONST. NO.
150C BLK RICE CANYON ROAD	DATE	11-05-07	MAP, BOOK, PAGE	DRAWING NO.
FALLBROOK	SCALE	As Noted		

NO.	SUPPLEMENTS	DATE	BY	APP'D



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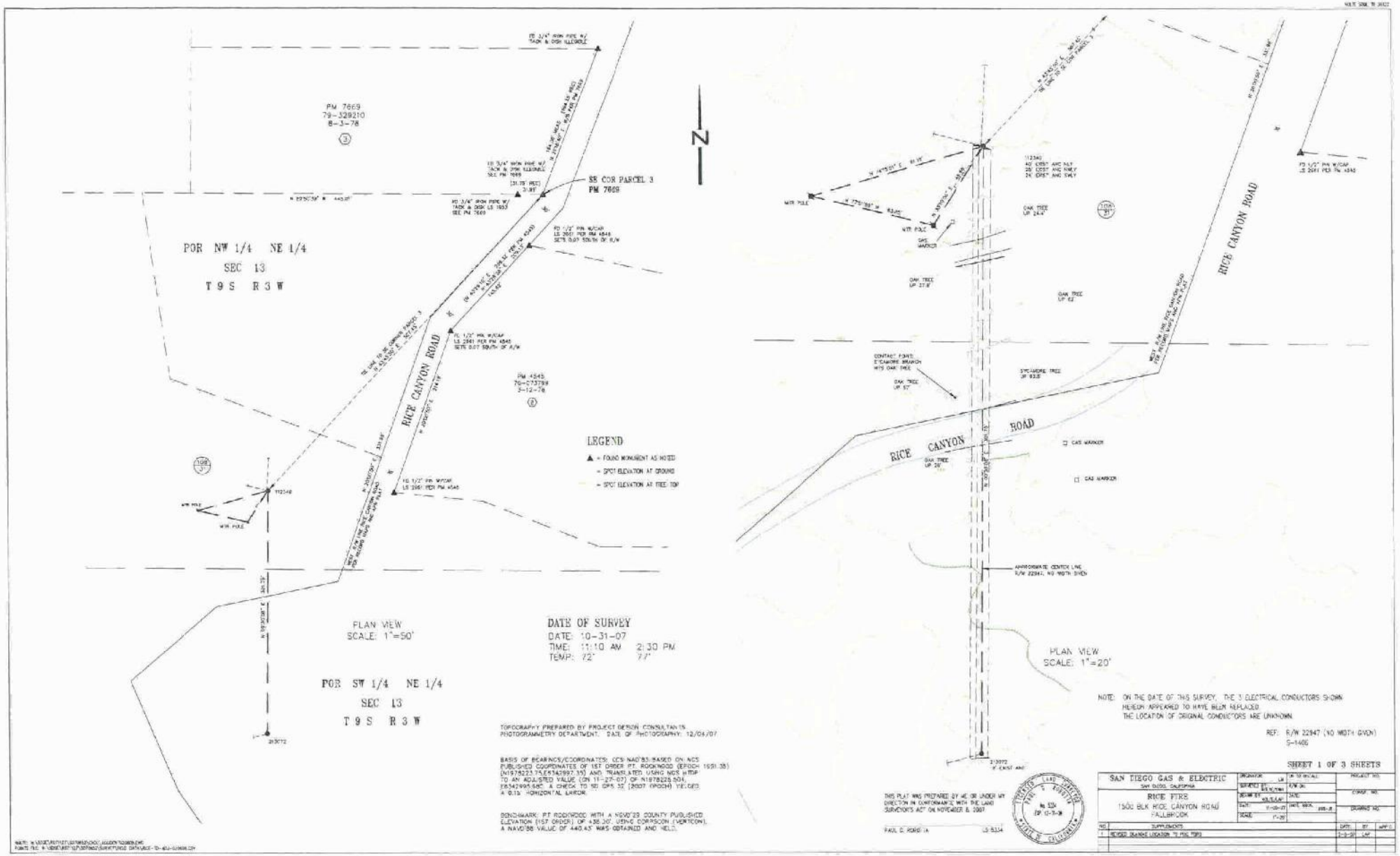

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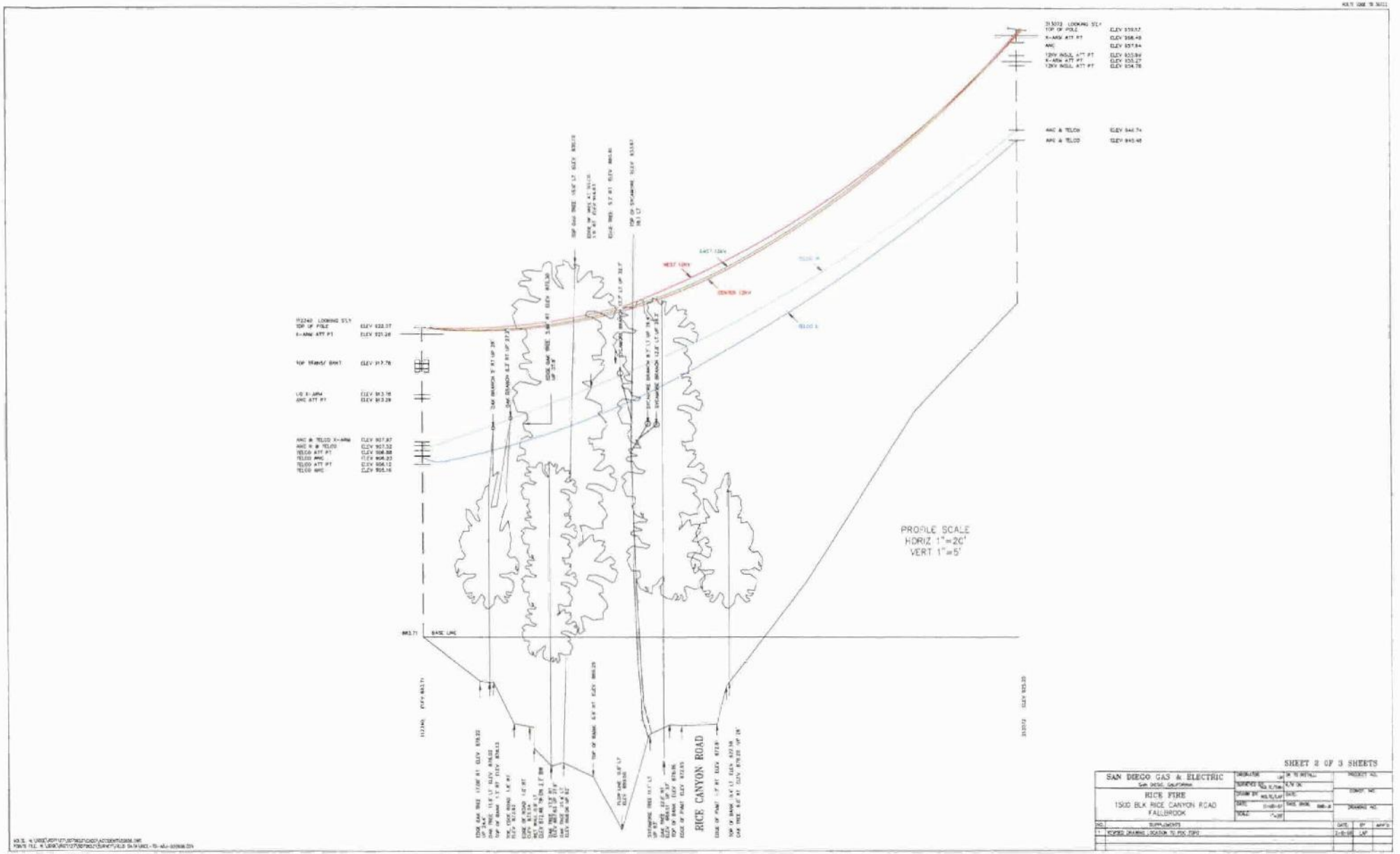

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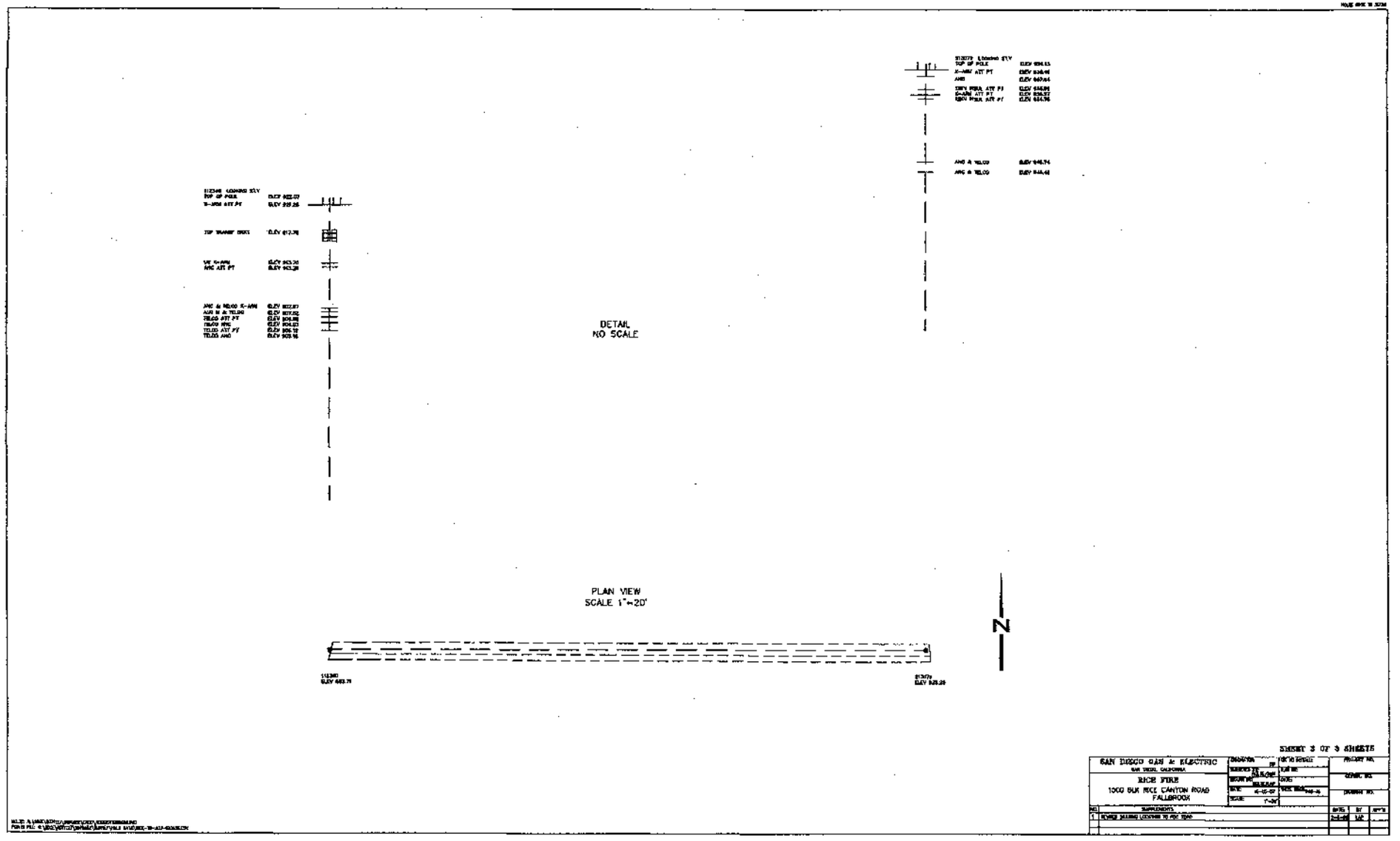


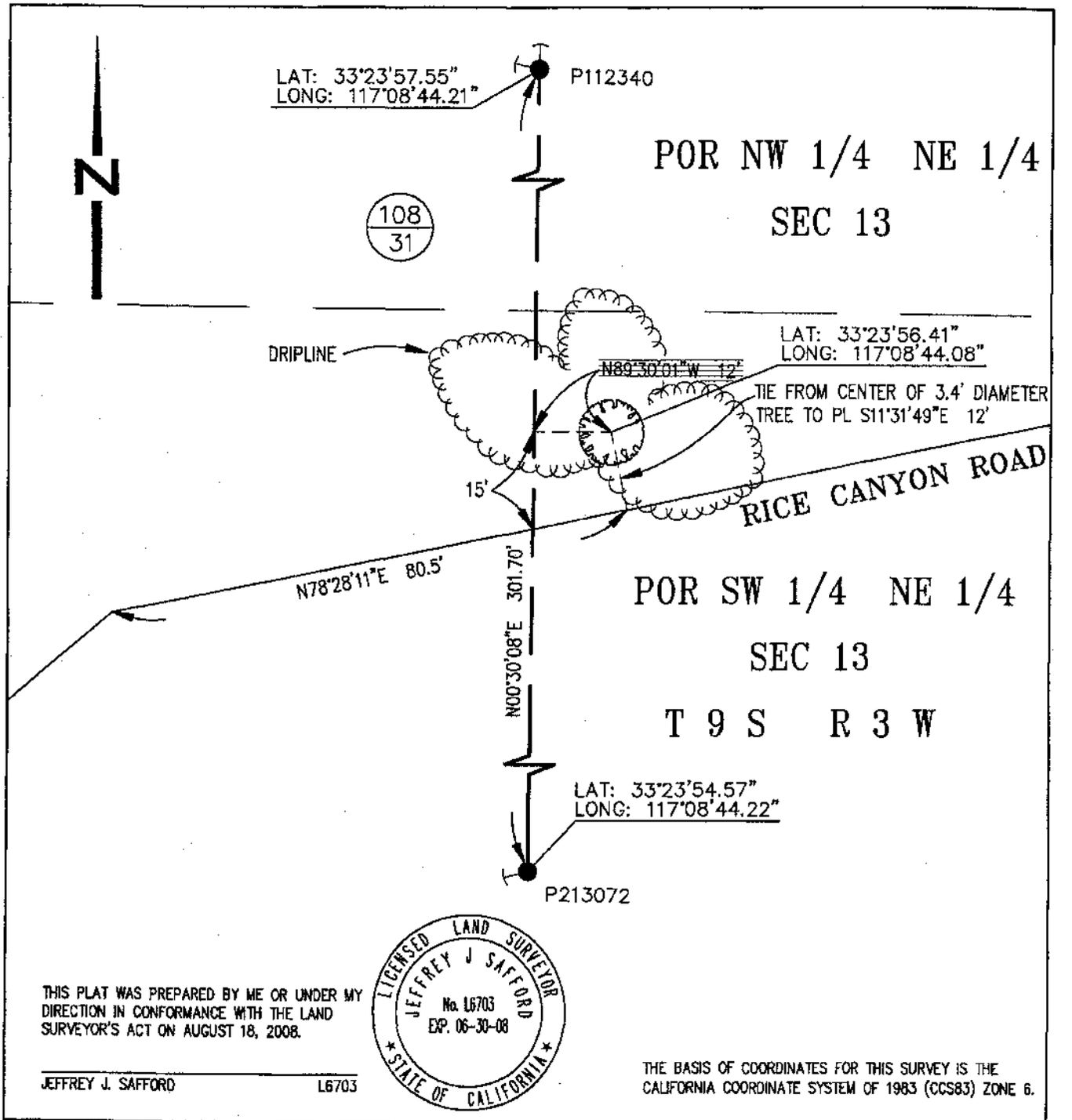
SHEET 3 OF 3 SHEETS

SAN DIEGO GAS & ELECTRIC
SAN DIEGO, CALIFORNIA

RICE FIRE
1000 BLK RICE CANYON ROAD
FALLBROOK

NO.	SUPPLEMENTS	DATE	BY	APP'D
1	REVISED BUILDING LOCATIONS TO ADD ROAD	2-1-08	SAE	

SDGE0253834



THIS PLAT WAS PREPARED BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE LAND SURVEYOR'S ACT ON AUGUST 18, 2008.

JEFFREY J. SAFFORD L6703

LICENSED LAND SURVEYOR
JEFFREY J SAFFORD
No. L6703
EXP. 06-30-08
STATE OF CALIFORNIA

THE BASIS OF COORDINATES FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS83) ZONE 6.

SAN DIEGO GAS & ELECTRIC SAN DIEGO, CALIFORNIA	ORIGINATOR: LM	OK TO INSTALL:	PROJECT NO.
	SURVEYED BY: NOLTE/RAH	R/W OK:	
RICE FIRE RICE CANYON ROAD FALLBROOK	DRAWN BY: NOLTE/ARW	DATE:	CONST. NO.
	DATE: 04-15-08	THOS. BROS. 998-J6	DRAWING NO.
	SCALE: 1"=20'		

NO.	SUPPLEMENTS	DATE:	BY	APP'D
1	ADDED COORDIANTES PER E-MAIL FROM S. COOK.	08-18-08	ARW	

NOLTE: N:\SDGE\R071127\R071127-S070652.DWG

N:\SDGE\R071127\S070852\MASTER\R071127.CSV

NOLTE
BEYOND ENGINEERING
15070 Avenue of Science, Suite 100
San Diego, CA 92128
Ph: 858-385-0500 Fax: 858-385-0400
www.nolte.com

SURVEY NOTES COVER SHEET

SDG&E JOB NO: R071127, S070652 **NOLTE JOB NO:** SDB555200
SURVEY NO: _____ **JOB TYPE:** _____ **SHT 1 OF:** 7
DPSS NO: — _____ **DATE:** 11-01-07
W.O. NO: — _____ **SURVEY CREW:** HAHN
ACCT NO: _____ JOHNSON
T.B. NO: 998 J-6
JOB NAME: RICE FIRE
JOB ADDRESS: 1500BLK RICE CANYON RD.
FLBK
BENCH MARK: ASSUMED AT PT. 1
BASIS OF BEARINGS: E LINE PAR. 3, PM 7669
BASIS OF COORDINATES: ASSUMED AT PT. 1

		REFERENCE DATA MAIN:	BACKGROUND:
DATA DUMP:	N:\SDGE\R071127\S070652\SURVEY\FIELD DATA\R071127SWH1030.CSV		
PHOTOS ~~PODES~~ **FILE:**	N:\SDGE\R071127\S070652\SURVEY\FIELD DATA\PHOTOS\RICE FIRE 10-30-07		RICE FIRE 11-01-07
CAD TECH:			
DWG PATH:		PM 4575	
DWG SIZE:		PM 7669	
DATE:			

NOTES: EDM CALIBRATED 7-06-07
JT MT ON SITE W/ SDGE PERSONNEL 10-30-07

08/23/078:26 AM

SDGE0253836

RICE FIRE
SUBJECT

SDB555200, R01127 — SWH
JOB NO. — DESIGNED BY

10-30-07
DATE — CHECKED BY

NOLTE

JT. MT. - SDGE - L. MARTINEZ, G. TRAVERS
NOLTE - S. HAHN, N. JOHNSON, L. PERSON, P. ROBOTTA, R. PARKER

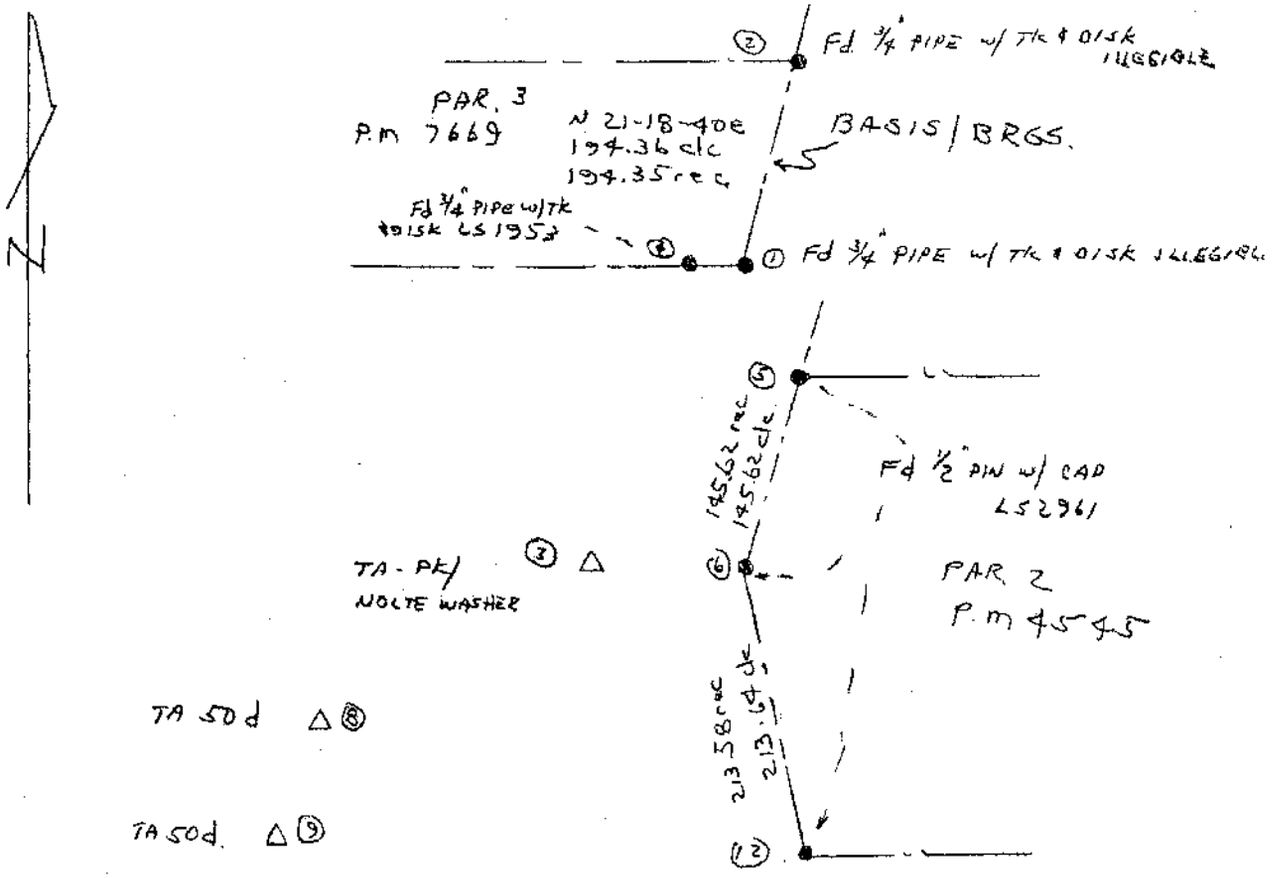
TO LOCATE
SYCAMORE
BRANCHES ON W, OAK
WIRES
PROP TIE
PROFILE -
- GAS MRKRS
- TELCO

RICE FIRE
SUBJECT

SDB 555200, R07 1127 SWH NRJ
JOB NO. DESIGNED BY

10-31-07
DATE CHECKED BY

NOLTE



RICE FIRE
SUBJECT

SDB 555200 JOB NO.

10-31-07 DATE

SWH NRJ DESIGNED BY

CHECKED BY

NOLTE

NOTE: AS OF 10-30-07
3-12 KV CONDUCTORS SHOWN ON THIS SKETCH HAD BEEN REPLACED. POSITION OF NEW CONDUCTORS COMPARED TO ORIGINAL UNKNOWN

S. HAHN
10-31-07

XTRA SHOTS
116- W. COND.
117- CTR COND
118- E. COND
119. W. COND
120 CTR COND
121 E. COND.
122 W. COND
123 CTR COND
124 E. COND.

11:10A 72°F
2:30P 77°F

112380
54

75 76 77
78 79 80
81 82 83
150 151 152 SYC
162 163 164 165 & 166 TELCO
167 168 169 170 & 171 TELCO
172 173 174
40 & 41 Telco
161
2/3072

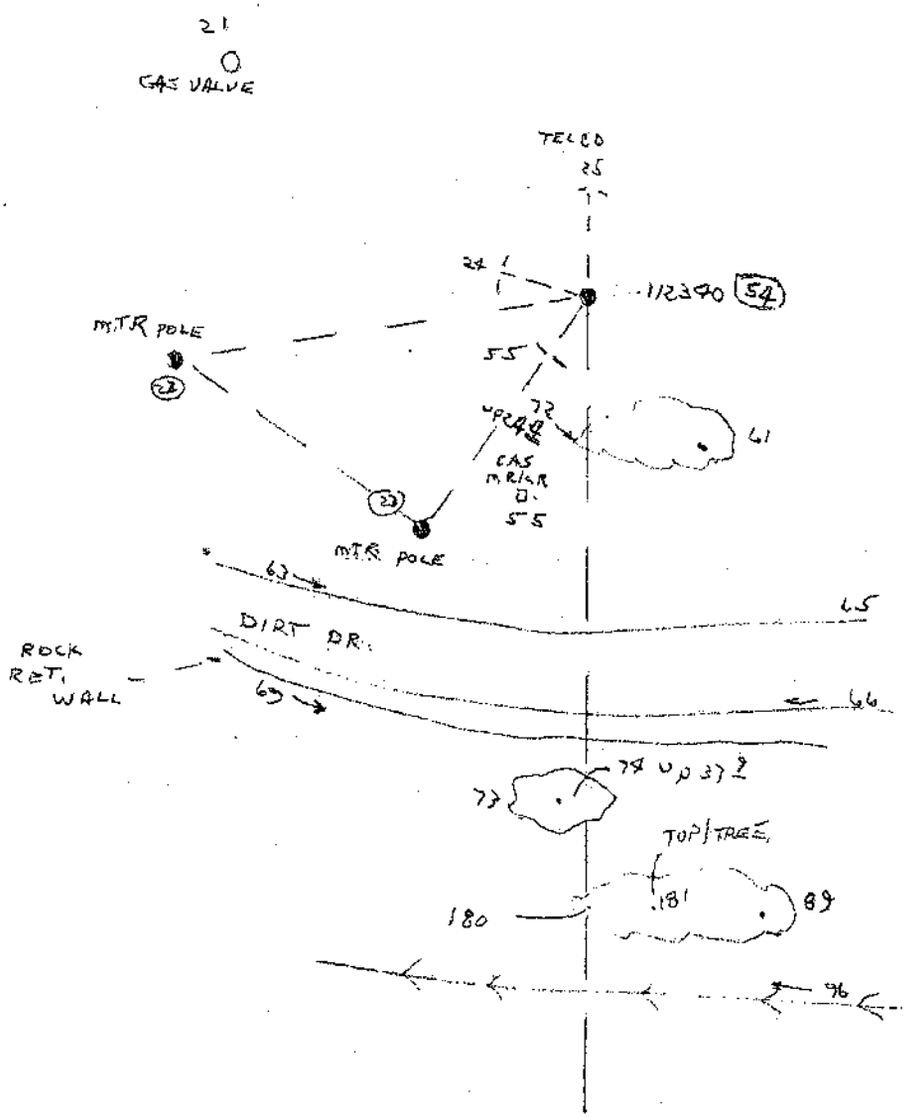
TELCO CABLE PTS.
130-133
148-149

RISE FIRE
SUBJECT

SDD 555200, R 07127 — SVH, NPJ
JOB NO. — DESIGNED BY

10-31-07
DATE — CHECKED BY

NOLTE



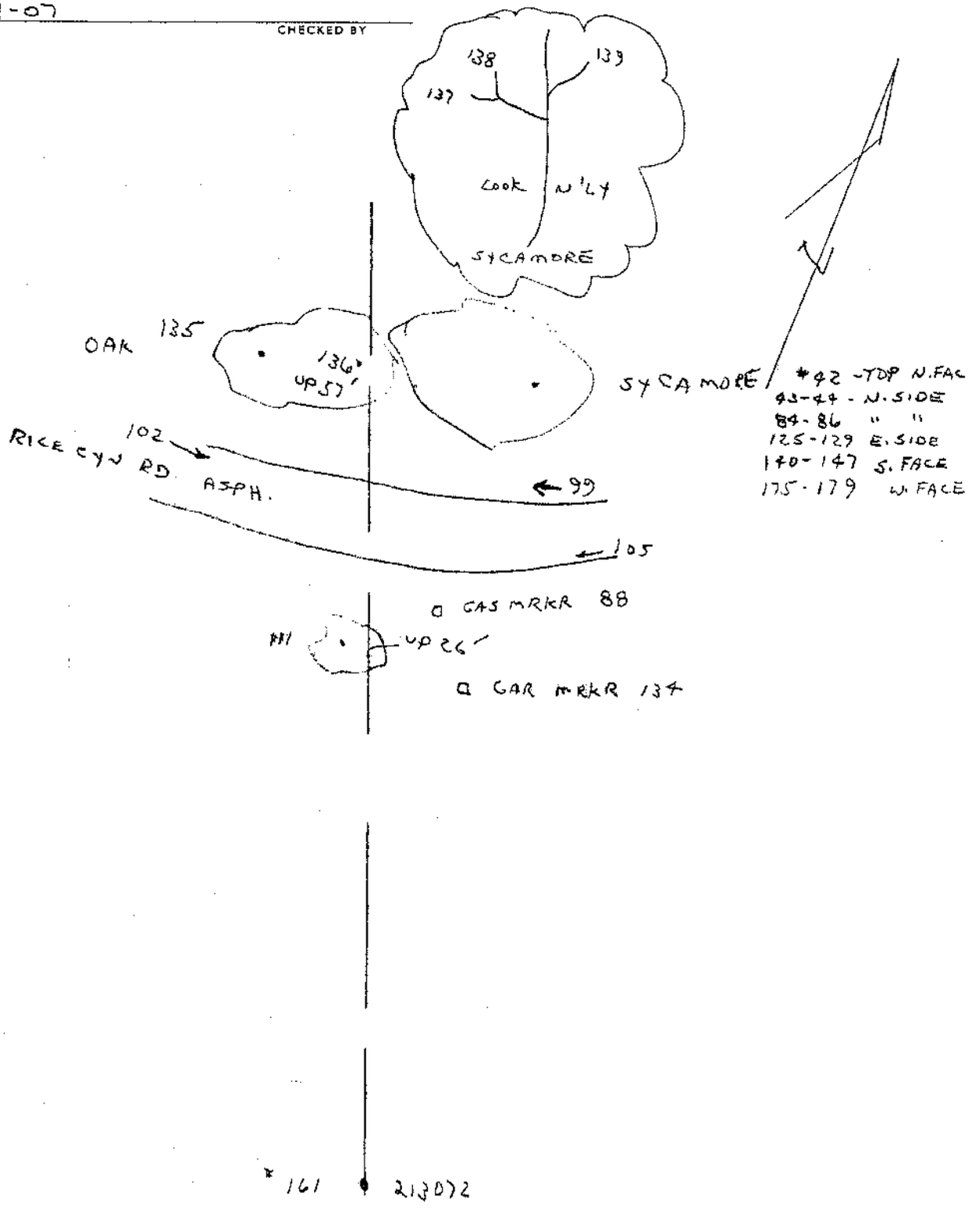
SDGE0253840

RICE FIRE
SUBJECT

SD3555200, R071127 — SWH, NRJ
JOB NO — DESIGNED BY

10-31-07
DATE — CHECKED BY

NOLTE



SDGE

PAGE 7 OF 7

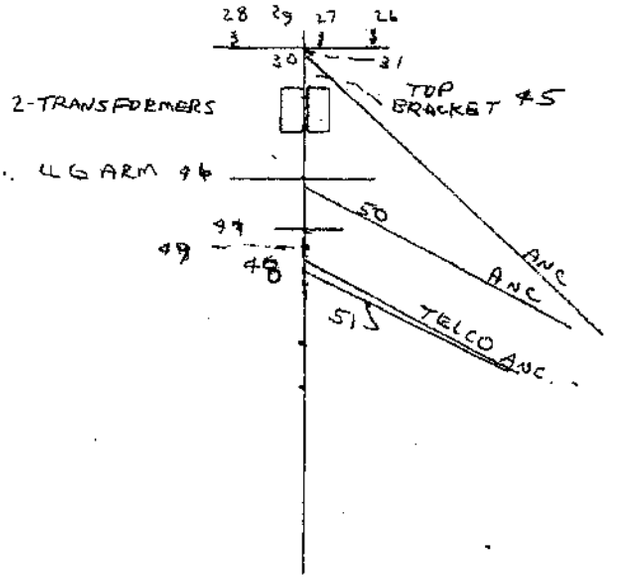
JOB NAME RISE FIRE JOB NO SDB555200, R071127

NOTES: NOTE TAKER S. HAHN DATE 10/31/07

CHECKED BY DATE / /

STRUCTURE # 112340 * 54

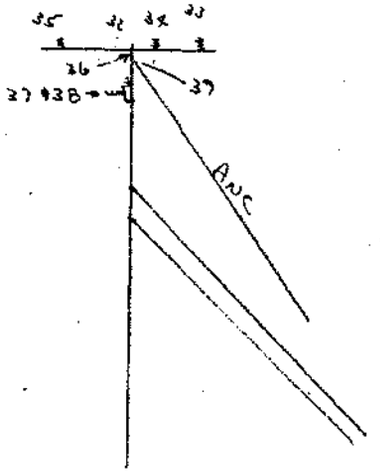
CABLE POLE



DESC.	PT
TOP OF POLE	29 (112)
12 KV INSUL.	26 (113)
" " "	27 (114)
" " "	28 (115)
ANC.	30
X-ARM ATT PT.	31
TOP TRANSF BRKT	45
4 G X ARM	46
ANC	50
TELCO X ARM	99
" "	
TELCO & ANC. N	49
ANC TELCO	48 W'LY
ANC TELCO	51 SW'LY
TELCO	52
ANC	53

LOOKING S'LY

STRUCTURE # 213072 * 141



DESC.	UP
TOP OF POLE	32
12 KV INSUL	33
" " "	34
" " "	35
X-ARM ATT. PT	36
12 KV INSUL ATT. PT	37
" " "	38
ANC	39
ANC & TELCO	40
ANC & TELCO	41

LOOKING S'LY

ANC'S 25-30 - NLY
TELCO 24-48 - WLY
TELCO - 55-51 - SWLY
50 - ? 2 INK

FILE 92227

Device: Survey Controller (TSCe) on ActiveSync

Receive operation Completed.
4 File(s) Successfully Transferred.
Details are as follows:

12:07:47 PM 11/1/2007 Received File N:\SDGE\R070840\S070634\SURVEY\FIELD DATA\R070840ASWH1107.dc from Default. No Error
12:07:47 PM 11/1/2007 Received File N:\SDGE\R070840\S070634\SURVEY\FIELD DATA\R070840ASWH1107.csv from Export. No Error
12:07:47 PM 11/1/2007 Received File N:\SDGE\R071127\S070652\Survey\Field Data\R071127SWH1030.dc from Default. No Error
12:07:48 PM 11/1/2007 Received File N:\SDGE\R071127\S070652\Survey\Field Data\R071127SWH1030.csv from Export. No Error

1	10000.00000	10000.00000	1000.00000	MO 3/4IP T&D
2	10181.06900	10070.63600	1009.70500	MO 3/4IP T&D
3	9818.07400	9832.41300	991.70700	TA PK/WASH
4	10000.08700	9968.01500	999.12400	MO 3/4IP T&D
5	9937.33900	9982.07000	1005.03200	MO PIN/CAP LS2961
6	9831.61500	9881.93800	994.74000	MO PIN/CAP LS2961
7	9541.85600	9755.56200	981.24400	TA 50D
8	9745.03500	9620.28800	1009.62400	TA 50D
9	9687.04300	9583.70000	999.88600	TA 50D
10	9487.39900	9677.12500	982.16600	TA PIN/CAP
11	9471.70700	9549.34100	982.89400	TA PIN/CAP
12	9630.88000	9808.82100	986.42700	MO PIN/CAP LS2961
21	9747.05800	9542.13100	1003.39900	GSVA
22	9608.77000	9561.24100	986.49200	ECSP
23	9594.44300	9623.46200	984.78900	ECSP
24	9639.59000	9623.59700	994.36300	ECGY
25	9673.96300	9649.90400	1001.67200	ECGY TELCO
26	9634.42100	9643.76700	1030.75200	12@INS
27	9633.64400	9646.72600	1030.72800	12@INS
28	9632.05400	9652.61900	1030.73500	12@INS
29	9633.75400	9648.33600	1030.75400	ECPP TOP
30	9633.84600	9647.86200	1029.31000	ANC ATT
31	9634.40400	9648.64800	1029.96300	CRSARM ATT
32	9329.12200	9644.92500	1067.89300	ECPP TOP
33	9329.38800	9640.34600	1067.81300	12@INS
34	9329.58100	9643.33000	1067.91500	12@INS
35	9330.10900	9649.34300	1068.06600	12@INS
36	9329.78300	9644.86800	1067.17400	CRSARM ATT
37	9332.40400	9645.05200	1064.67200	12@ARM
38	9325.01600	9646.68100	1063.44200	12@ARM
39	9329.20000	9644.47500	1066.32300	ANC ATT
40	9330.32500	9644.73100	1055.42000	TELCO ANC ATT
41	9330.34000	9644.84100	1054.14300	TELCO ANC ATT
42	9525.83100	9664.12600	1042.35300	LSTR TOP N/FACE SYC
43	9526.06200	9664.08100	1039.54700	LSTR N/FACE SYC
44	9526.14800	9664.06400	1038.14400	LSTR N/FACE SYC
45	9633.26000	9648.17700	1026.46000	TRNSFRMR BRCKT
46	9634.30600	9648.72600	1022.46100	UG CRSS ARM ATT
47	9634.26300	9649.01800	1016.64800	TELCO ARM ATT
48	9633.75600	9648.03500	1015.55600	TELCO ANC ATT
49	9633.17800	9648.20300	1016.20200	TELCO ATT
50	9633.10400	9648.36000	1021.96900	ANC ATT
51	9633.15000	9648.34900	1014.91300	TELCO ANC ATT
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53	9634.12900	9648.74300	1013.84300	TELCO ANC ATT
54	9633.52100	9649.00300	992.38700	ECPP 112340
55	9613.45900	9633.94700	988.82700	ECGY
56	9596.22400	9633.16600	985.49100	GSMC MARKER
57	9635.78500	9638.02800	993.45900	SV
58	9630.74400	9662.62500	991.66800	SV
59	9597.92600	9647.36500	986.81200	TB
60	9598.56700	9658.84400	986.70200	TB

61	9599.80400	9660.28500	986.70400	LSTR 1.3 OAK
62	9590.00300	9635.09500	984.77600	TB
63	9584.35700	9631.47600	980.80500	TE ER
64	9587.58000	9646.82400	981.59700	TE ER
65	9592.00600	9660.53500	982.56600	TE ER
66	9583.27900	9663.13300	982.32600	ER
67	9579.50100	9647.48900	981.22000	ER
68	9576.05400	9634.06600	980.63400	ER
69	9574.11500	9634.50400	980.49500	RW TOP -3.2BOT
70	9577.06500	9649.38500	981.13800	RW TOP -2.7BOT
71	9579.29500	9659.27500	981.53100	RW TOP -2.4BOT
72	9604.97000	9631.66800	986.90300	EDGE LSTR PT61
73	9569.05200	9630.50000	976.30500	LSTR 1.3 OAK
74	9581.63600	9642.69200	980.97500	EDGE LSTR PT73
75	9627.86400	9643.66400	1030.61200	12KV
76	9624.94500	9646.62200	1030.44900	12KV
77	9619.19600	9652.44700	1030.43000	12KV
78	9614.13900	9643.51900	1030.47000	12KV
79	9610.57600	9646.44300	1030.19500	12KV
80	9603.44400	9652.29600	1030.27500	12KV
81	9563.25100	9642.94900	1031.48900	12KV
82	9557.19800	9645.84700	1031.04700	12KV
83	9545.02900	9651.67100	1031.90900	12KV
84	9526.10700	9663.86600	1037.40300	LSTR N/FACE SYC
85	9526.27600	9663.78200	1031.72800	LSTR N/FACE SYC
86	9526.48000	9663.45200	1029.43200	LSTR N/FACE SYC
87	9630.88600	9808.96900	994.74000	CALC
88	9486.40300	9689.38800	982.59000	GSMC MARKER
89	9582.33700	9673.80700	976.74000	LSTR 3.0 OAK
90	9570.19900	9660.02700	976.64800	SV
91	9569.21100	9646.59700	976.46600	SV
92	9565.28500	9632.51300	975.09500	SV
93	9542.47300	9632.98300	973.33000	TB
94	9547.66400	9647.30400	974.96700	TB
95	9552.02900	9661.46300	975.48100	TB
96	9538.97500	9662.43000	968.97600	RIFL
97	9533.09400	9648.76500	968.17500	RIFL
98	9530.17700	9633.75000	971.33300	RIFL
99	9514.00100	9666.25600	977.50300	TB
100	9509.11900	9647.71600	981.44400	TB
101	9506.34300	9634.47700	981.67300	TB
102	9501.11900	9636.12800	981.65300	EP
103	9503.14600	9648.12400	981.32600	EP
104	9507.68400	9664.97600	981.04900	EP
105	9487.77400	9662.69200	981.45900	EP
106	9485.22000	9645.98800	981.49400	EP
107	9481.95600	9628.65800	981.50800	EP
108	9476.84800	9631.95300	986.97800	TB
109	9480.38800	9648.01800	986.25500	TB
110	9481.66200	9665.12000	986.08300	TB
111	9478.94100	9641.62900	986.87500	LSTR 2.0 OAK
112	9633.63000	9648.45900	1030.73100	ECPP TOP

113	9634.21300	9643.81800	1030.73200	12@INS
114	9633.41300	9646.85500	1030.68200	12@INS
115	9631.85400	9652.72900	1030.69700	12@INS
116	9629.96900	9643.72400	1030.66100	12KV
117	9627.63700	9646.68300	1030.53400	12KV
118	9622.98400	9652.58800	1030.50300	12KV
119	9612.87300	9643.55300	1030.48900	12KV
120	9610.99700	9646.51100	1030.20100	12KV
121	9607.33400	9652.44100	1030.28200	12KV
122	9480.48000	9642.10200	1038.37400	12KV
123	9482.09200	9645.08200	1037.16300	12KV
124	9485.33100	9651.07000	1037.14800	12KV
125	9524.61700	9661.04900	988.91000	LSTR E/FACE SYC
126	9525.51200	9660.94500	994.34500	LSTR E/FACE SYC
127	9526.07200	9660.95800	997.82900	LSTR E/FACE SYC
128	9526.66600	9661.12200	1001.37700	LSTR E/FACE SYC
129	9526.80000	9661.18400	1002.80600	LSTR E/FACE SYC
130	9619.23100	9648.18300	1016.99200	TELCO
131	9618.95300	9648.56800	1014.26900	TELCO
132	9484.99600	9647.07300	1029.48300	TELCO
133	9485.06500	9647.20500	1026.55700	TELCO
134	9468.13500	9695.10600	992.76000	GSMC MARKER
135	9512.13400	9625.91000	977.18800	LSTR 2.2 OAK
136	9535.38200	9642.96900	969.29300	EDGE LSTR PT135
137	9519.06900	9656.28500	1018.73500	LSTR BRANCH SYC
138	9514.66100	9660.73800	1018.83600	LSTR BRANCH SYC
139	9532.82200	9665.87100	1025.11600	LSTR BRANCH SYC
140	9518.06100	9660.97400	980.36500	LSTR S/FACE SYC
141	9522.02100	9660.58900	984.05600	LSTR S/FACE SYC
142	9523.35200	9660.13700	989.32900	LSTR S/FACE SYC
143	9524.13100	9660.12300	993.26100	LSTR S/FACE SYC
144	9525.07600	9660.31000	997.87500	LSTR S/FACE SYC
145	9525.87900	9660.52800	1002.39700	LSTR S/FACE SYC
146	9526.45400	9660.64300	1007.12300	LSTR S/FACE SYC
147	9527.44900	9661.45000	1015.47200	LSTR S/FACE SYC
148	9523.64200	9647.54300	1021.47800	TELCO
149	9545.21100	9629.93900	1047.10300	TELCO
150	9529.63300	9642.65400	1033.53600	12KV
151	9526.02000	9645.60500	1032.90100	12KV
152	9518.85600	9651.45600	1033.81600	12KV
153	9445.57300	9628.41200	997.46500	SV
154	9439.72700	9646.81400	999.25800	SV
155	9436.20800	9659.64100	1000.81200	SV
156	9384.81500	9633.17700	1019.09700	SV
157	9384.14200	9646.37400	1020.43600	SV
158	9384.11100	9659.48400	1021.85700	SV
159	9330.95300	9636.78400	1030.30000	SV
160	9335.20100	9664.87500	1037.95200	SV
161	9331.83500	9646.35800	1033.92700	ECPP 213072
162	9491.37900	9642.18300	1037.67700	12KV
163	9492.01200	9645.16900	1036.59600	12KV
164	9492.95600	9651.12200	1036.93700	12KV

165	9487.57800	9647.04700	1029.85900	TELCO
166	9486.83700	9647.16200	1026.78100	TELCO
167	9396.22200	9641.08000	1052.48100	12KV
168	9393.79000	9644.03700	1052.38200	12KV
169	9388.81000	9650.09000	1053.88200	12KV
170	9391.89600	9646.34100	1044.05700	TELCO
171	9391.87400	9646.37000	1042.12200	TELCO
172	9364.34900	9640.65900	1059.22100	12KV
173	9360.82400	9643.65700	1059.79400	12KV
174	9353.91400	9649.53600	1061.79600	12KV
175	9519.74000	9658.63600	979.86600	LSTR W/FACE SYC
176	9522.69200	9658.83200	982.22200	LSTR W/FACE SYC
177	9523.07200	9659.06600	984.44500	LSTR W/FACE SYC
178	9523.45700	9659.02600	988.18400	LSTR W/FACE SYC
179	9524.17900	9658.61100	991.42900	LSTR W/FACE SYC
180	9547.64200	9646.64800	1023.30900	LSTR OAK PT89 @ TELCO
181	9555.38700	9664.21800	1038.77800	LSTR OAK PT89 TOP

Baseline Name	San Diego Miramar
Survey Party	SWH/NRD
Date	7-6-07
Instrument Model	Topcon GPT 3003LW
Instrument Serial	160069
Reflector Model	
Reflector Serial	
Reflector Constant	

Notes:
Heat waves @ 20 + used signal meter to verify target

Occupied Sta	Pressure	Insturment Height	Target Sta	Target Height	Temp	Direct Face Measurements (ft)				
						1	2	3	4	5
0			1		78	30.481	30.481	30.480		
			3			91.437	91.438	91.438		
			10			290.413	290.413	290.413		
			20			608.420	608.420	608.421		
			30			911.532	911.532	911.532		

Rec.
30.4813 m .002
300.0 ft .008
952 829 Ct. .032
608.4297m .042
911.5519m .067

Occupied Sta	Pressure	Insturment Height	Target Sta	Target Height	Temp	Reverse Face Measurements (ft)				
						1	2	3	4	5
0			1		78	30.481	30.480	30.480		
			3			91.438	91.438	91.438		
			10			290.413	290.414	290.414		
			20			608.419	608.418	608.418		
			30			911.532	911.531	911.531		

SDGE0253848

NOLTE
BEYOND ENGINEERING
15070 Avenue of Science, Suite 100 San Diego, CA 92128
858.385.0500 TEL 858.385.0400 FAX www.nolte.com

Job Numbers

SDGE Job Number: R071127, S070652
Nolte Job Number: SDB 555200
Survey Number:

Job Information

Job Type: —
DPSS Number: —
W.O. Number: —
T.B. Number:

Sheet 1 of 2
Date: 11-19-07
Survey Crew: HAHN
PANKOSKY

Job Name: RICE FIRE

Job Address: 1500 BLK RICE CYN RD. FLB/C

Bench Mark: ASSUMED EPT1

Basis of Bearings: E. LINE PAR 3, PM.7669

Basis of Coordinates: ASSUMED EPT1

Job Directories

Data Directory Path: N:\SDGE\R071127\S070652\SVR\FLD DTA\R071127SWH1119.CSV
Points Directory Path:
Photograph Directory Path:

Additional Information

Survey Notes: CHECKED WIRE LOCATION

SDGE0253849

RICE FIRE- RICE CYN RD.
SUBJECT

R07 1127 SWH DAP
JOB NO. DESIGNED BY

11-19-07
DATE CHECKED BY

NOLTE

11-19-07

TIME 8:30 56°F, 10:0Am 65°F

Tr7

200- TELCO
201- TELCO
202-209 12KV } S. EDGE/RD. ±

205-207 12kV 20' ± S/O N'LY POLE

Tr11

208-209 TELCO S. EDGE/RD. ±
210-212 12KV "
213-214 TELCO S/O RD
215-217 12KV "

Tr9

218-220 12KV 20-25' ± S/N'LY POLE
221-223 " OPP SYCAMORE ±
224-226 " S/SYCAMORE

Device: Survey Controller (TSCe) on ActiveSync

Receive operation Completed.
2 File(s) Successfully Transferred.
Details are as follows:

1:45:26 PM 11/19/2007 Received File N:\SDGE\R071127\S070652\Survey\Field Data\R071127SWH1030.dc from Default. No Error
1:45:27 PM 11/19/2007 Received File N:\SDGE\R071127\S070652\Survey\Field Data\R071127SWH1119.csv from Export. No Error

SDGE0253851

200	9484.818	9647.199	1026.906	TELCO
201	9485.052	9647.051	1029.937	TELCO
202	9477.786	9642.058	1039.159	12KV
203	9479.479	9645.057	1037.927	12KV
204	9482.852	9651.033	1037.842	12KV
205	9613.263	9643.563	1030.587	12KV
206	9611.395	9646.494	1030.324	12KV
207	9608.246	9652.376	1030.397	12KV
208	9486.416	9647.167	1026.637	TELCO
209	9487.414	9647.028	1029.633	TELCO
210	9490.106	9651.111	1036.949	12KV
211	9490.272	9645.165	1036.594	12KV
212	9489.693	9642.178	1037.678	12KV
213	9390.158	9646.401	1042.262	TELCO
214	9390.193	9646.359	1044.148	TELCO
215	9387.115	9650.021	1054.023	12KV
216	9392.071	9644.121	1052.614	12KV
217	9394.555	9641.165	1052.717	12KV
218	9617.889	9652.448	1030.474	12KV
219	9623.761	9646.611	1030.486	12KV
220	9626.745	9643.646	1030.65	12KV
221	9543.885	9651.66	1032.294	12KV
222	9556.156	9645.835	1031.404	12KV
223	9562.178	9642.976	1031.699	12KV

File N:\SDGE\R071127\S070652\Survey\Field Data\R071127SWH1030.dc

```
SC V10-70       Copyright © Trimble Navigation Ltd, 1995-2003
                Serial no 2060          01-Nov-07 12:07
                Angle Degrees           Dist US Feet            Press inch Hg
                Temp Fahrenheit         Coord N-E-Elv           H.obs Right

JOB             Job ID R071127SWH1030
                Atmos crn Yes           C and R crn Yes         Refrac cnst 0.14
                Elev Yes                Sea level crn No

NOTE    TS      Time Date 10/30/2007 Time 12:57:30

F FILE  FC      File                                    Used    No
                ID          00000                       Name    .

COGO    NM      Azmth       From North                  Dir     North-East

LOCBLL  KI      Local Rad   <null>                      Flat.   <null>

SITE    KI      Prj Lat     <null>                      Nrth Offset 0.000
                Prj Lng     <null>                      East Offset 0.000
                Prj Hgt     <null>                      Scale       1.0000000000

SKFTGRD KI      File name <no text>

PROJ    XI      Scale Only
                Orig Lat    <null>                      Orig Nrth <null>
                Orig Lng    <null>                      Orig East <null>
                Orig Hgt    <null>                      Orig Elev <null>
                Orient 1    <null>                      Orient 2  <null>
                Scale       1.0000000000

DATUM   KI      None
                Srce Rad    <null>                      Srce Flat <null>
                Rotn X      <null>                      Rotn Y    <null>
                Rotn Z      <null>                      Trans X   <null>
                Trans Y     <null>                      Trans Z   <null>
                Scale       <null>

PLANE   KI      Orig Nrth <null>                        Orig East <null>
                Trans N     <null>                      Trans E   <null>
                Rotation    <null>                      Scale     <null>

HGTADJ  KI      Inclined Plane
                Orig Nrth <null>                        Slope N   <null>
                Orig East <null>                        Slope E   <null>
                Hgt Const <null>
                Geoid       <no text>

COORD   NM      System Name             <no text>
                Zone Name               <no text>
                Datum Name              <no text>
                Coord System Option     Scale Only

INSTR   NM      EDM         Topcon Generic
                Serial no <no text>                     Firmware  <no text>
                Mount       Not Applic                  Edm o/s   <null>
                J Constant 279.7                        N Constant 106.133
                H.col       <null>                      V.col     <null>

PRECIS  NM      HA Prec     <null>                      EDM Prec  <null>
                VA Prec     <null>                      EDM (ppm) <null>

INSTR   NM      EDM         Topcon Generic
                Serial no <no text>                     Firmware  <no text>
                Mount       Not Applic                  Edm o/s   <null>
                J Constant 279.7                        N Constant 106.133
                H.col       <null>                      V.col     <null>

PRECIS  NM      HA Prec     <null>                      EDM Prec  <null>
                VA Prec     <null>                      EDM (ppm) <null>

GRDPOS  XI      Point ID 1              Nrth 10000.000          East 10000.000
                Class Normal            Elv  1000.000           Code MO 3/4IP T&D
                Obs  User Input

ATMOS   NM      Press       30.00                       Temp      75.0
                Refrac cnst 0.142                       PPM       <null>

GRDPOS  FD      Point ID 1              Nrth 10000.000          East 10000.000
                Class Normal            Elv  1000.000           Code MO 3/4IP T&D
                Obs  User Input

STN     NM      ID          1                           Theo ht   6.120
                Scale       1.0000000000                Type      Fixed

GNDVEC  TP      Point ID    2                           Reference 1
                Azmth       21°18'40"                   H.dist    <null>
                V.dist      <null>                      Code      MO 3/4IP T&D
                Obs         User Input                  Class     Normal

BKB     NM      1                                       .         2
                Azmth       21°18'40"
                Face 1      21°18'40"                   Face 2    201°18'51"

NOTE    SN      Start of Rounds

TRGET   NM      Target ht 5.700                         P.C. mm   0.0
                Prism Off 0.000
```

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```
OBS     F1  1                              -          2
            H.Angle   21°18'40"            H.Std Err <null>
            V.Angle   87°15'59"            V.Std Err <null>
            EDM Dist  194.580              S.Std Err <null>
            Code      MO 3/4IP T&D         Class     Backsight

TRGST   NM  Target ht 5.160                P.C. mm   0.0
            Prism Off 0.000

OBS     F1  1                              -          3
            H.Angle   222°39'08"           H.Std Err <null>
            V.Angle   92°08'40"            V.Std Err <null>
            EDM Dist  247.520              S.Std Err <null>
            Code      TA PK/WASH           Class     Normal

OBS     F2  1                              -          3
            H.Angle   42°39'08"            H.Std Err <null>
            V.Angle   267°51'33"           V.Std Err <null>
            EDM Dist  247.525              S.Std Err <null>
            Code      TA PK/WASH           Class     Normal

TRGST   NM  Target ht 5.700                P.C. mm   0.0
            Prism Off 0.000

OBS     F2  1                              -          2
            H.Angle   201°18'51"           H.Std Err <null>
            V.Angle   272°44'10"           V.Std Err <null>
            EDM Dist  194.580              S.Std Err <null>
            Code      MO 3/4IP T&D         Class     Backsight

MTA     MA  ID        2                    Code      MO 3/4IP T&D
            H.Angle   0°00'00"             H.Std Err <null>
            V.Angle   87°15'54.5"          V.Std Err <null>
            S.Dist    194.580              S.Std Err 0.000
            Angles    1                    BS Pt ID  2
            Distances 2

TRGST   NM  Target ht 5.160                P.C. mm   0.0
            Prism Off 0.000

MTA     MA  ID        3                    Code      TA PK/WASH
            H.Angle   201°20'22.5"         H.Std Err <null>
            V.Angle   92°08'33.5"          V.Std Err <null>
            S.Dist    247.522              S.Std Err 0.004
            Angles    1                    BS Pt ID  2
            Distances 2

RESIDUALSRR Round     1                    ID        2
            H Ang Res 0°00'00"             V Ang Res 0°00'04.5"
            EDM Res   0.000

RESIDUALSRR Round     1                    ID        3
            H Ang Res 0°00'05.5"           V Ang Res 0°00'06.5"
            EDM Res   -0.003

RESIDUALSRR Round     1                    ID        3
            H Ang Res -0°00'05.5"          V Ang Res -0°00'06.5"
            EDM Res   0.003

RESIDUALSRR Round     1                    ID        2
            H Ang Res 0°00'00"             V Ang Res -0°00'04.5"
            EDM Res   0.000

BKB     NM  1                              -          2
            Azmth     21°18'40"
            Face 1    21°18'40"            Face 2    201°18'55"

NOTE    SN  Start of Rounds

TRGST   NM  Target ht 5.700                P.C. mm   0.0
            Prism Off 0.000

OBS     F1  1                              -          2
            H.Angle   21°18'40"            H.Std Err <null>
            V.Angle   87°15'00"            V.Std Err <null>
            EDM Dist  194.575              S.Std Err <null>
            Code      MO 3/4IP T&D         Class     Backsight

TRGST   NM  Target ht 4.950                P.C. mm   0.0
            Prism Off 0.000

OBS     F1  1                              -          4
            H.Angle   270°09'22"           H.Std Err <null>
            V.Angle   93°39'44"            V.Std Err <null>
            EDM Dist  32.050               S.Std Err <null>
            Code      MO 3/4IP T&D         Class     Normal

OBS     F2  1                              -          4
            H.Angle   90°09'29"            H.Std Err <null>
            V.Angle   266°20'28"           V.Std Err <null>
            EDM Dist  32.050               S.Std Err <null>
            Code      MO 3/4IP T&D         Class     Normal

TRGST   NM  Target ht 5.700                P.C. mm   0.0
            Prism Off 0.000
```

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```
OBS     F2  1                           -           2
            H.Angle   201°18'55"        H.Std Err <null>
            V.Angle   272°44'06"        V.Std Err <null>
            SDM Dist  194.580           S.Std Err <null>
            Code      MO 3/4IP T&D      Class     Backsight

MTA     MA  ID        2                 Code      MO 3/4IP T&D
            H.Angle   0°00'00"          H.Std Err <null>
            V.Angle   87°15'57"         V.Std Err <null>
            S.Dist    194.577           S.Std Err 0.004
            Angles    1                 BS Pt ID  2
            Distances 2

TRGET   NM  Target ht 4.950            P.C. mm   0.0
            Prism Off 0.000

MTA     MA  ID        4                 Code      MO 3/4IP T&D
            H.Angle   248°50'38"        H.Std Err <null>
            V.Angle   93°39'38"         V.Std Err <null>
            S.Dist    32.050            S.Std Err 0.000
            Angles    1                 BS Pt ID  2
            Distances 2

RESIDUALSRR Round     1                 ID        2
            H Ang Res 0°00'00"          V Ang Res 0°00'03"
            SDM Res   -0.003

RESIDUALSRR Round     1                 ID        4
            H Ang Res 0°00'04"          V Ang Res 0°00'06"
            SDM Res   0.000

RESIDUALSRR Round     1                 ID        4
            H Ang Res -0°00'04"         V Ang Res -0°00'06"
            SDM Res   0.000

RESIDUALSRR Round     1                 ID        2
            H Ang Res 0°00'00"          V Ang Res -0°00'03"
            SDM Res   0.003

BKB     NM  1                           -         2
            Azmth     21°18'40"
            Face 1    21°18'40"         Face 2    201°19'43"

NOTE    SN  Start of Rounds

TRGET   NM  Target ht 5.700             P.C. mm   0.0
            Prism Off 0.000

OBS     F1  1                           -         2
            H.Angle   21°18'40"         H.Std Err <null>
            V.Angle   87°15'52"         V.Std Err <null>
            SDM Dist  194.585           S.Std Err <null>
            Code      MO 3/4IP T&D      Class     Backsight

TRGET   NM  Target ht 4.950             P.C. mm   0.0
            Prism Off 0.000

OBS     F1  1                           -         5
            H.Angle   195°58'35"         H.Std Err <null>
            V.Angle   86°36'41"         V.Std Err <null>
            SDM Dist  65.290            S.Std Err <null>
            Code      MO PIN/CAP LS295  Class     Normal

F-CODE  F1  Code MO PIN/CAP LS2961

OBS     F2  1                           -         5
            H.Angle   15°58'36"         H.Std Err <null>
            V.Angle   273°23'34"        V.Std Err <null>
            SDM Dist  65.290            S.Std Err <null>
            Code      MO PIN/CAP LS296  Class     Normal

F-CODE  F2  Code MO PIN/CAP LS2961

TRGET   NM  Target ht 5.700             P.C. mm   0.0
            Prism Off 0.000

OBS     F2  1                           -         2
            H.Angle   201°19'43"        H.Std Err <null>
            V.Angle   272°44'13"        V.Std Err <null>
            SDM Dist  194.580           S.Std Err <null>
            Code      MO 3/4IP T&D      Class     Backsight

MTA     MA  ID        2                 Code      MO 3/4IP T&D
            H.Angle   0°00'00"          H.Std Err <null>
            V.Angle   87°15'49.5"       V.Std Err <null>
            S.Dist    194.582           S.Std Err 0.004
            Angles    1                 BS Pt ID  2
            Distances 2

TRGET   NM  Target ht 4.950             P.C. mm   0.0
            Prism Off 0.000

MTA     MA  ID        5                 Code      MO PIN/CAP LS296
            H.Angle   174°39'24"        H.Std Err <null>
            V.Angle   86°36'33.5"       V.Std Err <null>
            S.Dist    65.290            S.Std Err 0.000
            Angles    1                 BS Pt ID  2
            Distances 2
```

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```
F-CODE   MA  Code MO PIN/CAP LS2961

RESIDUALSRR Round     1                    ID        2
            H Ang Res 0°00'00"             V Ang Res 0°00'02.5"
            EDM Res   0.003

RESIDUALSRR Round     1                    ID        5
            H Ang Res 0°00'31"             V Ang Res 0°00'07.5"
            EDM Res   0.000

RESIDUALSRR Round     1                    ID        5
            H Ang Res -0°00'31"            V Ang Res -0°00'07.5"
            EDM Res   0.000

RESIDUALSRR Round     1                    ID        2
            H Ang Res 0°00'00"             V Ang Res -0°00'02.5"
            EDM Res   -0.003

NOTE     TS  Time Date 10/30/2007 Time 13:32:02

BKB      NM  1                            -         2
             Azmth     21°18'40"
             Face 1    21°18'40"          Face 2    201°18'41"

NOTE     SN  Start of Rounds

TRGET    NM  Target ht 5.700              P.C. mm   0.0
             Prism Off 0.000

OBS      F1  1                            -         2
             H.Angle   21°18'40"          H.Std Err <null>
             V.Angle   87°15'55"          V.Std Err <null>
             EDM Dist  194.580            S.Std Err <null>
             Code      MO 3/4IP T&D       Class     Backsight

TRGET    NM  Target ht 4.950              P.C. mm   0.0
             Prism Off 0.000

OBS      F1  1                            -         6
             H.Angle   215°02'07"         H.Std Err <null>
             V.Angle   91°47'30"          V.Std Err <null>
             EDM Dist  205.750            S.Std Err <null>
             Code      MO PIN/CAP LS296   Class     Normal

F-CODE   F1  Code MO PIN/CAP LS2961

OBS      F2  1                            -         6
             H.Angle   35°02'12"          H.Std Err <null>
             V.Angle   268°12'35"         V.Std Err <null>
             EDM Dist  205.750            S.Std Err <null>
             Code      MO PIN/CAP LS296   Class     Normal

F-CODE   F2  Code MO PIN/CAP LS2961

TRGET    NM  Target ht 5.700              P.C. mm   0.0
             Prism Off 0.000

OBS      F2  1                            -         2
             H.Angle   201°18'41"         H.Std Err <null>
             V.Angle   272°44'11"         V.Std Err <null>
             EDM Dist  194.580            S.Std Err <null>
             Code      MO 3/4IP T&D       Class     Backsight

NTA      MA  ID        2                  Code      MO 3/4IP T&D
             H.Angle   0°00'00"           H.Std Err <null>
             V.Angle   87°15'52"          V.Std Err <null>
             S.Dist    194.580            S.Std Err 0.000
             Angles    1                  BS Pt ID  2
             Distances 2

TRGET    NM  Target ht 4.950              P.C. mm   0.0
             Prism Off 0.000

NTA      MA  ID        5                  Code      MO PIN/CAP LS296
             H.Angle   193°43'29"         H.Std Err <null>
             V.Angle   91°47'27.5"        V.Std Err <null>
             S.Dist    205.750            S.Std Err 0.000
             Angles    1                  BS Pt ID  2
             Distances 2

F-CODE   MA  Code MO PIN/CAP LS2961

RESIDUALSRR Round     1                    ID        2
            H Ang Res 0°00'00"             V Ang Res 0°00'03"
            EDM Res   0.000

RESIDUALSRR Round     1                    ID        6
            H Ang Res -0°00'02"            V Ang Res 0°00'02.5"
            EDM Res   0.000

RESIDUALSRR Round     1                    ID        6
            H Ang Res 0°00'02"             V Ang Res -0°00'02.5"
            EDM Res   0.000

RESIDUALSRR Round     1                    ID        2
            H Ang Res 0°00'00"             V Ang Res -0°00'03"
            EDM Res   0.000
```

5

```
INSTR    NM  EDM        Topcon Generic
             Serial no <no text>              Firmware  <no text>
             Mount     Not Applic             Edm o/s   <null>
             J Constant 279.7                 N Constant 106.133
             H.col     <null>                 V.col     <null>

PRECIS   NM  HA Prec   <null>                 EDM Prec  <null>
             VA Prec   <null>                 EDM (ppm) <null>

ATMOS    NM  Press     30.00                  Temp      75.0
             Refrac cnst 0.142                PPM       <null>

GRDPOS   FD  Point ID 3          Nrth 9818.074          East 9832.411
             Class Normal        Elv  991.707           Code TA PK/WASH
             Obs  User Input

STN      NM  ID        3                      Theo ht   5.390
             Scale     1.000000000n           Type      Fixed

BKB      NM  3                                -         1
             Azmth     <null>
             Face 1    42°39'02.5"            Face 2    222°39'10"

NOTE     SN  Start of Rounds

TRGET    NM  Target ht 5.790                  P.C. mm   0.0
             Prism Off 0.000

OBS      F1  3                                -         1
             H.Angle   42°39'02.5"            H.Std Err <null>
             V.Angle   87°59'44"              V.Std Err <null>
             EDM Dist  247.500                S.Std Err <null>
             Code      MD 3/4IP T&D           Class     Backsight

POLAR D  F1  Azmth          <null>            H.Dist         0.001
                                              V.Dist         0.035

TRGET    NM  Target ht 4.950                  P.C. mm   0.0
             Prism Off 0.000

OBS      F1  3                                -         7
             H.Angle   195°33'55"             H.Std Err <null>
             V.Angle   92°10'45"              V.Std Err <null>
             EDM Dist  286.914                S.Std Err <null>
             Code      TA 50D                 Class     Normal

OBS      F2  3                                -         7
             H.Angle   15°32'58"              H.Std Err <null>
             V.Angle   267°49'23"             V.Std Err <null>
             EDM Dist  286.914                S.Std Err <null>
             Code      TA 50D                 Class     Normal

TRGET    NM  Target ht 5.790                  P.C. mm   0.0
             Prism Off 0.000

OBS      F2  3                                -         1
             H.Angle   222°39'10"             H.Std Err <null>
             V.Angle   272°04'33"             V.Std Err <null>
             EDM Dist  247.505                S.Std Err <null>
             Code      MD 3/4IP T&D           Class     Backsight

MTA      MA  ID        1                      Code      MD 3/4IP T&D
             H.Angle   0°00'00"               H.Std Err <null>
             V.Angle   87°59'35.5"            V.Std Err <null>
             S.Dist    247.502                S.Std Err 0.004
             Angles    1                      BS Pt ID  1
             Distances 2

TRGET    NM  Target ht 4.950                  P.C. mm   0.0
             Prism Off 0.000

MTA      MA  ID        7                      Code      TA 50D
             H.Angle   152°53'50.25"          H.Std Err <null>
             V.Angle   92°10'41"              V.Std Err <null>
             S.Dist    286.914                S.Std Err 0.000
             Angles    1                      BS Pt ID  1
             Distances 2

RESIDUALSRR  Round     1                      ID        1
             H Ang Res 0°00'00"               V Ang Res 0°00'08.5"
             EDM Res   -0.003

RESIDUALSRR  Round     1                      ID        7
             H Ang Res 0°00'02.25"            V Ang Res 0°00'04"
             EDM Res   0.000

RESIDUALSRR  Round     1                      ID        7
             H Ang Res -0°00'02.25"           V Ang Res -0°00'04"
             EDM Res   0.000

RESIDUALSRR  Round     1                      ID        1
             H Ang Res 0°00'00"               V Ang Res -0°00'08.5"
             EDM Res   0.003

BKB      NM  3                                -         1
             Azmth     <null>
             Face 1    42°39'02.5"            Face 2    222°39'12"

NOTE     SN  Start of Rounds
```

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```
TRGET   NM  Target ht 5.790                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  3                               -         I
            H.Angle   42°39'02.5"           H.Std Err <null>
            V.Angle   87°59'44"             V.Std Err <null>
            EDM Dist  247.505               S.Std Err <null>
            Code      MO 3/4IP T&D          Class     Backsight

TRGET   NM  Target ht 5.100                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  3                               -         8
            H.Angle   251°00'02"            H.Std Err <null>
            V.Angle   85°30'36"             V.Std Err <null>
            EDM Dist  225.040               S.Std Err <null>
            Code      TA 50D                Class     Normal

OBS     F2  3                               -         8
            H.Angle   71°00'10"             H.Std Err <null>
            V.Angle   274°29'40"            V.Std Err <null>
            EDM Dist  225.035               S.Std Err <null>
            Code      TA 50D                Class     Normal

TRGET   NM  Target ht 5.790                  P.C. mm   0.0
            Prism Off 0.000

OBS     F2  3                               -         1
            H.Angle   222°39'12"            H.Std Err <null>
            V.Angle   272°00'29"            V.Std Err <null>
            EDM Dist  247.505               S.Std Err <null>
            Code      MO 3/4IP T&D          Class     Backsight

MTA     MA  ID        1                     Code      MO 3/4IP T&D
            H.Angle   0°00'00"              H.Std Err <null>
            V.Angle   67°59'37.5"           V.Std Err <null>
            S.Dist    247.505               S.Std Err 0.000
            Angles    1                     BS Pt ID  1
            Distances 2

TRGET   NM  Target ht 5.100                  P.C. mm   0.0
            Prism Off 0.000

MTA     MA  ID        8                     Code      TA 50D
            H.Angle   208°20'58.75"         H.Std Err <null>
            V.Angle   85°30'28"             V.Std Err <null>
            S.Dist    225.037               S.Std Err 0.004
            Angles    1                     BS Pt ID  1
            Distances 2

RESIDUALSRR Round     1                     ID        1
            H Ang Res 0°00'00"              V Ang Res 0°00'06.5"
            EDM Res   0.000

RESIDUALSRR Round     1                     ID        8
            H Ang Res 0°00'00.75"           V Ang Res 0°00'08"
            EDM Res   0.003

RESIDUALSRR Round     1                     ID        8
            H Ang Res -0°00'00.75"          V Ang Res -0°00'08"
            EDM Res   -0.003

RESIDUALSRR Round     1                     ID        1
            H Ang Res 0°00'00"              V Ang Res -0°00'06.5"
            EDM Res   0.000

NOTE    TS  Time Date 10/31/2007 Time 08:30:22

INSTR   NM  EDM       Topcon Generic
            Serial no <no text>             Firmware  <no text>
            Mount     Not Applic            Edm o/s   <null>
            J Constant 279.7                N Constant 106.133
            H.col     <null>                V.col     <null>

PRECIS  NM  HA Prec   <null>                EDM Prec  <null>
            VA Prec   <null>                EDM (ppm) <null>

ATMOS   EM  Press     30.00                 Temp      65.0
            Refrac cnst 0.142               PPM       <null>

GRDPOS  FD  Point ID 8          Nrth 9745.035          East 9620.288
            Class Normal        Elv  1009.624          Code TA 50D
            Obs  User Input

STN     NM  ID        8                     Theo ht   5.600
            Scale     1.0000000000          Type      Fixed

BKB     NM  8                               -         3
            Azmth     <null>
            Face 1    71°00'01.25"          Face 2    250°59'54"

NOTE    SN  Start of Rounds

TRGET   NM  Target ht 5.000                  P.C. mm   0.0
            Prism Off 0.000
```

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```
OBS     F1  8                           -           3
            H.Angle   71°00'01.25"      H.Std Err <null>
            V.Angle   94°43'14"         V.Std Err <null>
            EDM Dist  225.105           S.Std Err <null>
            Code      TA PK/WASH        Class     Backsight

POLAR D F1  Azmth          <null>       H.Dist        0.006
                                        V.Dist        0.007

TRGET   NM  Target ht 4.860            P.C. mm   0.0
            Prism Off 0.000

OBS     F1  8                           -           9
            H.Angle   212°14'47"        H.Std Err <null>
            V.Angle   98°41'25"         V.Std Err <null>
            EDM Dist  69.365            S.Std Err <null>
            Code      TA 50D            Class     Normal

OBS     F2  8                           -           9
            H.Angle   32°14'54"         H.Std Err <null>
            V.Angle   261°18'52"        V.Std Err <null>
            EDM Dist  69.365            S.Std Err <null>
            Code      TA 50D            Class     Normal

TRGET   NM  Target ht 5.000            P.C. mm   0.0
            Prism Off 0.000

OBS     F2  8                           -           3
            H.Angle   250°59'54"        H.Std Err <null>
            V.Angle   265°16'42"        V.Std Err <null>
            EDM Dist  225.105           S.Std Err <null>
            Code      TA PK/WASH        Class     Backsight

MTA     MA  ID        3                 Code      TA PK/WASH
            H.Angle   0°00'00"          H.Std Err <null>
            V.Angle   94°43'16"         V.Std Err <null>
            S.Dist    225.105           S.Std Err 0.000
            Angles    1                 BS Pt ID  3
            Distances 2

TRGET   NM  Target ht 4.860            P.C. mm   0.0
            Prism Off 0.000

MTA     MA  ID        9                 Code      TA 50D
            H.Angle   141°14'52.875"    H.Std Err <null>
            V.Angle   98°41'16.5"       V.Std Err <null>
            S.Dist    69.365            S.Std Err 0.000
            Angles    1                 BS Pt ID  3
            Distances 2

RESIDUALSRR Round     1                 ID        3
            H Ang Res 0°00'00"          V Ang Res -0°00'02"
            EDM Res   0.000

RESIDUALSRR Round     1                 ID        9
            H Ang Res -0°00'07.125"     V Ang Res 0°00'08.5"
            EDM Res   0.000

RESIDUALSRR Round     1                 ID        9
            H Ang Res 0°00'07.125"      V Ang Res -0°00'08.5"
            EDM Res   0.000

RESIDUALSRR Round     1                 ID        3
            H Ang Res 0°00'00"          V Ang Res 0°00'02"
            EDM Res   0.000

TRGET   NM  Target ht 4.950            P.C. mm   0.0
            Prism Off 0.000

OBS     F1  8                           -           21
            H.Angle   271°28'57"        H.Std Err <null>
            V.Angle   95°01'31"         V.Std Err <null>
            EDM Dist  78.485            S.Std Err <null>
            Code      GSVA              Class     Normal

OBS     F1  8                           -           22
            H.Angle   203°25'42"        H.Std Err <null>
            V.Angle   99°05'54"         V.Std Err <null>
            EDM Dist  150.400           S.Std Err <null>
            Code      ECSP              Class     Normal

TRGET   NM  Target ht 5.700            P.C. mm   0.0
            Prism Off 0.000

OBS     F1  8                           -           33
            H.Angle   178°47'33.459"     H.Std Err <null>
            V.Angle   99°19'33.411"     V.Std Err <null>
            EDM Dist  152.642           S.Std Err <null>
            Code      ECSP              Class     Normal

BKB     NM  8                           -           3
            Azmth     <null>
            Face 1    71°00'01.25"      Face 2    <null>

TRGET   NM  Target ht 5.000            P.C. mm   0.0
            Prism Off 0.000
```

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```
OBS     F1  8                                -       3
            H.Angle   71°00'01.25"           H.Std Err <null>
            V.Angle   94°43'19"              V.Std Err <null>
            EDM Dist  225.100                S.Std Err <null>
            Code      TA PK/WASH             Class     Backsight

TRGET   NM  Target ht 4.950                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  8                                -       24
            H.Angle   178°12'09"             H.Std Err <null>
            V.Angle   98°34'37"              V.Std Err <null>
            EDM Dist  106.690                S.Std Err <null>
            Code      SCGY                   Class     Normal

OBS     F1  8                                -       25
            H.Angle   157°22'42"             H.Std Err <null>
            V.Angle   96°22'29"              V.Std Err <null>
            EDM Dist  77.475                 S.Std Err <null>
            Code      SCGY TELCO             Class     Normal

NOTE    TS  Time Date 10/31/2007 Time 09:58:10

BKB     NM  8                                -       3
            Azmth     <null>
            Face 1    71°00'01.25"           Face 2    <null>

TRGET   NM  Target ht 5.000                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  8                                -       3
            H.Angle   71°00'01.25"           H.Std Err <null>
            V.Angle   94°43'28"              V.Std Err <null>
            EDM Dist  225.105                S.Std Err <null>
            Code      TA PK/WASH             Class     Backsight

TRGET   NM  Target ht 0.000                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  8                                -       26
            H.Angle   168°00'58"             H.Std Err <null>
            V.Angle   82°10'52"              V.Std Err <null>
            EDM Dist  114.140                S.Std Err <null>
            Code      12@INS                 Class     Normal

OBS     F1  8                                -       27
            H.Angle   166°38'54"             H.Std Err <null>
            V.Angle   82°17'16"              V.Std Err <null>
            EDM Dist  115.530                S.Std Err <null>
            Code      12@INS                 Class     Normal

OBS     F1  8                                -       28
            H.Angle   164°01'51"             H.Std Err <null>
            V.Angle   82°28'51"              V.Std Err <null>
            EDM Dist  118.535                S.Std Err <null>
            Code      12@INS                 Class     Normal

OBS     F1  8                                -       29
            H.Angle   165°51'12"             H.Std Err <null>
            V.Angle   82°17'35.842"          V.Std Err <null>
            EDM Dist  115.807                S.Std Err <null>
            Code      SCPP TOP               Class     Normal

OBS     F1  8                                -       30
            H.Angle   166°04'30"             H.Std Err <null>
            V.Angle   82°59'25"              V.Std Err <null>
            EDM Dist  115.420                S.Std Err <null>
            Code      ANC ATT                Class     Normal

OBS     F1  8                                -       31
            H.Angle   165°37'19"             H.Std Err <null>
            V.Angle   82°38'48"              V.Std Err <null>
            EDM Dist  115.155                S.Std Err <null>
            Code      CRSARM ATT             Class     Normal

OBS     F1  8                                -       32
            H.Angle   176°36'36"             H.Std Err <null>
            V.Angle   82°47'44.494"          V.Std Err <null>
            EDM Dist  419.957                S.Std Err <null>
            Code      SCPP TOP               Class     Normal

OBS     F1  8                                -       33
            H.Angle   177°14'14"             H.Std Err <null>
            V.Angle   82°47'57"              V.Std Err <null>
            EDM Dist  419.439                S.Std Err <null>
            Code      12@INS                 Class     Normal

OBS     F1  8                                -       34
            H.Angle   176°49'32"             H.Std Err <null>
            V.Angle   82°47'00"              V.Std Err <null>
            EDM Dist  419.414                S.Std Err <null>
            Code      12@INS                 Class     Normal

OBS     F1  8                                -       35
            H.Angle   175°59'40"             H.Std Err <null>
            V.Angle   82°45'37"              V.Std Err <null>
            EDM Dist  419.284                S.Std Err <null>
            Code      12@INS                 Class     Normal
```

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```
OBS     F1  8                                -       36
            H.Angle   176°36'45"             H.Std Err <null>
            V.Angle   82°52'55"              V.Std Err <null>
            EDM Dist  419.209                S.Std Err <null>
            Code      CRBARM ATT             Class     Normal

OBS     F1  8                                -       37
            H.Angle   176°33'56"             H.Std Err <null>
            V.Angle   83°10'45"              V.Std Err <null>
            EDM Dist  416.319                S.Std Err <null>
            Code      12@ARM                 Class     Normal

OBS     F1  8                                -       38
            H.Angle   176°24'16"             H.Std Err <null>
            V.Angle   83°27'52"              V.Std Err <null>
            EDM Dist  423.599                S.Std Err <null>
            Code      12@ARM                 Class     Normal

OBS     F1  8                                -       39
            H.Angle   176°40'16"             H.Std Err <null>
            V.Angle   83°00'24"              V.Std Err <null>
            EDM Dist  419.659                S.Std Err <null>
            Code      ANC ATT                Class     Normal

OBS     F1  8                                -       40
            H.Angle   176°37'37"             H.Std Err <null>
            V.Angle   84°28'26"              V.Std Err <null>
            EDM Dist  417.369                S.Std Err <null>
            Code      TELCO ANC ATT          Class     Normal

OBS     F1  8                                -       41
            H.Angle   176°36'42"             H.Std Err <null>
            V.Angle   84°38'54"              V.Std Err <null>
            EDM Dist  417.239                S.Std Err <null>
            Code      TELCO ANC ATT          Class     Normal

OBS     F1  8                                -       42
            H.Angle   168°41'27"             H.Std Err <null>
            V.Angle   83°04'51"              V.Std Err <null>
            EDM Dist  225.185                S.Std Err <null>
            Code      LSTR TOP N/FACE        Class     Normal

F-CODE  F1  Code LSTR TOP N/FACE SYC

OBS     F1  8                                -       43
            H.Angle   168°41'26"             H.Std Err <null>
            V.Angle   83°47'03"              V.Std Err <null>
            EDM Dist  224.630                S.Std Err <null>
            Code      LSTR N/FACE SYC        Class     Normal

OBS     F1  8                                -       44
            H.Angle   168°41'26"             H.Std Err <null>
            V.Angle   84°08'16"              V.Std Err <null>
            EDM Dist  224.395                S.Std Err <null>
            Code      LSTR N/FACE SYC        Class     Normal

BKB     NM  8                                -       3
            Azmth     <null>
            Face 1    71°00'01.25"           Face 2    <null>

TRGET   NM  Target ht 5.000                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  8                                -       3
            H.Angle   71°00'01.25"           H.Std Err <null>
            V.Angle   94°43'29"              V.Std Err <null>
            EDM Dist  225.105                S.Std Err <null>
            Code      TA PK/WASH             Class     Backsight

TRGET   NM  Target ht 5.000                  P.C. mm   0.0
            Prism Off 0.000

MTA     MA  ID        3                      Code      TA PK/WASH
            H.Angle   0°00'00"               H.Std Err <null>
            V.Angle   94°43'25.333"          V.Std Err <null>
            S.Dist    225.103                S.Std Err <null>
            Angles    3                      BS Pt ID  3
            Distances 3

INSTR   NM  EDM       Topcon Generic
            Serial no <no text>              Firmware  <no text>
            Mount     Not Applic             Edm o/s   <null>
            J Constant 279.7                 N Constant 106.133
            H.Col     <null>                 V.Col     <null>

PRECIS  NM  HA Prec   <null>                 EDM Prec  <null>
            VA Prec   <null>                 EDM (ppm) <null>

ATMOS   NM  Press     30.00                  Temp      65.0
            Refrac cnst 0.142                PPM       <null>

GRDPOS  FD  Point ID 9          Nrth 9687.041          East 9583.700
            Class Normal        Elv  599.885           Code TA 50D
            Obs  User Input

STN     NM  ID        9                      Theo ht   5.530
            Scale     1.0000000000           Type      Fixed
```


SDGE0253861

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```
SXB     NM  9                                -         8
            Azmth     <null>
            Face 1    32°14'54.125"          Face 2    <null>

TRGET   NM  Target ht 5.160                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  9                                -         8
            H.Angle   32°14'54.125"          H.Std Err <null>
            V.Angle   82°05'05"              V.Std Err <null>
            SDM Dist  69.235                 S.Std Err <null>
            Code      TA SQD                 Class     Backsight

POLAR D F1  Azmth           <null>           H.Dist          -0.006
                                             V.Dist          0.033

TRGET   NM  Target ht 0.000                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  9                                -         45
            H.Angle   129°49'59"             H.Std Err <null>
            V.Angle   75°55'47"              V.Std Err <null>
            SDM Dist  86.560                 S.Std Err <null>
            Code      TRNSFRMR BRCKT         Class     Normal

NOTE    TS  Time Date 10/31/2007 Time 10:30:45

OBS     F1  9                                -         46
            H.Angle   129°02'34"             H.Std Err <null>
            V.Angle   78°29'35"              V.Std Err <null>
            SDM Dist  85.440                 S.Std Err <null>
            Code      UG CRSS ARM ATT        Class     Normal

OBS     F1  9                                -         47
            H.Angle   128°56'23"             H.Std Err <null>
            V.Angle   82°22'55"              V.Std Err <null>
            SDM Dist  84.725                 S.Std Err <null>
            Code      TELCO ARM ATT          Class     Normal

OBS     F1  9                                -         48
            H.Angle   129°18'03"             H.Std Err <null>
            V.Angle   83°04'45"              V.Std Err <null>
            SDM Dist  84.150                 S.Std Err <null>
            Code      TELCO ANC ATT          Class     Normal

OBS     F1  9                                -         49
            H.Angle   129°51'54"             H.Std Err <null>
            V.Angle   82°41'12"              V.Std Err <null>
            SDM Dist  84.725                 S.Std Err <null>
            Code      TELCO ATT              Class     Normal

OBS     F1  9                                -         50
            H.Angle   129°50'06"             H.Std Err <null>
            V.Angle   78°52'44"              V.Std Err <null>
            SDM Dist  85.815                 S.Std Err <null>
            Code      ANC ATT                Class     Normal

OBS     F1  9                                -         51
            H.Angle   129°48'55"             H.Std Err <null>
            V.Angle   83°33'44"              V.Std Err <null>
            SDM Dist  84.780                 S.Std Err <null>
            Code      TELCO ANC ATT          Class     Normal

OBS     F1  9                                -         52
            H.Angle   129°30'00"             H.Std Err <null>
            V.Angle   83°35'46"              V.Std Err <null>
            SDM Dist  84.150                 S.Std Err <null>
            Code      TELCO ATT              Class     Normal

OBS     F1  9                                -         53
            H.Angle   129°07'46"             H.Std Err <null>
            V.Angle   84°15'40"              V.Std Err <null>
            SDM Dist  84.270                 S.Std Err <null>
            Code      TELCO ANC ATT          Class     Normal

TRGET   NM  Target ht 4.950                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  9                                -         54
            H.Angle   129°20'17"             H.Std Err <null>
            V.Angle   95°27'58"              V.Std Err <null>
            SDM Dist  84.020                 S.Std Err <null>
            Code      SCPP 112340            Class     Normal

OBS     F1  9                                -         55
            H.Angle   145°40'22"             H.Std Err <null>
            V.Angle   97°26'33"              V.Std Err <null>
            SDM Dist  89.860                 S.Std Err <null>
            Code      SCGY                   Class     Normal

OBS     F1  9                                -         56
            H.Angle   151°25'28"             H.Std Err <null>
            V.Angle   98°14'23"              V.Std Err <null>
            SDM Dist  104.495                S.Std Err <null>
            Code      GSMC MARKER            Class     Normal
```

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```
OBS     F1  9                                -          57
            H.Angle   133°20'05"             H.Std Err <null>
            V.Angle   95°21'36"              V.Std Err <null>
            EDM Dist  75.020                 S.Std Err <null>
            Code      SV                     Class     Normal

OBS     F1  9                                -          58
            H.Angle   125°30'04"             H.Std Err <null>
            V.Angle   95°11'08"              V.Std Err <null>
            EDM Dist  97.345                 S.Std Err <null>
            Code      SV                     Class     Normal

OBS     F1  9                                -          59
            H.Angle   144°27'30"             H.Std Err <null>
            V.Angle   97°06'24"              V.Std Err <null>
            EDM Dist  110.370                S.Std Err <null>
            Code      TB                     Class     Normal

TRGET   NM  Target ht 0.500                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  9                                -          60
            H.Angle   139°39'30"             H.Std Err <null>
            V.Angle   98°55'04"              V.Std Err <null>
            EDM Dist  117.500                S.Std Err <null>
            Code      TB                     Class     Normal

OBS     F1  9                                -          61
            H.Angle   138°43'14.861"         H.Std Err <null>
            V.Angle   98°54'58.769"          V.Std Err <null>
            EDM Dist  117.505                S.Std Err <null>
            Code      LSTR 1.3 OAK           Class     Normal

TRGET   NM  Target ht 4.950                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  9                                -          62
            H.Angle   152°05'35"             H.Std Err <null>
            V.Angle   98°07'55"              V.Std Err <null>
            EDM Dist  110.925                S.Std Err <null>
            Code      TB                     Class     Normal

NOTE    TS  Time Date 10/31/2007 Time 11:01:46

OBS     F1  9                                -          63
            H.Angle   155°02'57"             H.Std Err <null>
            V.Angle   99°50'55"              V.Std Err <null>
            EDM Dist  114.950                S.Std Err <null>
            Code      TE ER                  Class     Normal

OBS     F1  9                                -          64
            H.Angle   147°35'56"             H.Std Err <null>
            V.Angle   99°06'01"              V.Std Err <null>
            EDM Dist  119.305                S.Std Err <null>
            Code      TE ER                  Class     Normal

OBS     F1  9                                -          65
            H.Angle   141°02'44"             H.Std Err <null>
            V.Angle   98°29'59"              V.Std Err <null>
            EDM Dist  123.515                S.Std Err <null>
            Code      TE ER                  Class     Normal

OBS     F1  9                                -          66
            H.Angle   142°33'56"             H.Std Err <null>
            V.Angle   97°54'12"              V.Std Err <null>
            EDM Dist  131.930                S.Std Err <null>
            Code      ER                     Class     Normal

OBS     F1  9                                -          67
            H.Angle   149°19'33"             H.Std Err <null>
            V.Angle   98°45'02"              V.Std Err <null>
            EDM Dist  126.510                S.Std Err <null>
            Code      ER                     Class     Normal

OBS     F1  9                                -          68
            H.Angle   155°35'31"             H.Std Err <null>
            V.Angle   99°14'32"              V.Std Err <null>
            EDM Dist  123.485                S.Std Err <null>
            Code      ER                     Class     Normal

OBS     F1  9                                -          69
            H.Angle   158°46'42"             H.Std Err <null>
            V.Angle   99°09'43"              V.Std Err <null>
            EDM Dist  126.430                S.Std Err <null>
            Code      RW TOP -3.2BOT         Class     Normal

OBS     F1  9                                -          70
            H.Angle   149°09'07"             H.Std Err <null>
            V.Angle   98°34'50"              V.Std Err <null>
            EDM Dist  129.550                S.Std Err <null>
            Code      RW TOP -2.7BOT         Class     Normal

OBS     F1  9                                -          71
            H.Angle   144°57'14"             H.Std Err <null>
            V.Angle   98°11'15"              V.Std Err <null>
            EDM Dist  132.965                S.Std Err <null>
            Code      RW TOP -2.4BOT         Class     Normal
```

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```
OBS     F1  9                              -          72
            H.Angle   149°41'44"           H.Std Err  <null>
            V.Angle   98°07'13"            V.Std Err  <null>
            EDM Dist  96.025               S.Std Err  <null>
            Code      EDGE LSTR PT61       Class      Normal

OBS     F1  9                              -          73
            H.Angle   158°21'54.005"       H.Std Err  <null>
            V.Angle   100°46'37.248"       V.Std Err  <null>
            EDM Dist  129.212              S.Std Err  <null>
            Code      LSTR 1.3 OAK         Class      Normal

OBS     F1  9                              -          74
            H.Angle   150°45'58"           H.Std Err  <null>
            V.Angle   99°10'00"            V.Std Err  <null>
            EDM Dist  122.365              S.Std Err  <null>
            Code      EDGE LSTR PT73       Class      Normal

TRGET   NM  Target ht 0.000                P.C. mm    0.0
            Prism Off 0.000

OBS     F1  9                              -          75
            H.Angle   134°37'21"           H.Std Err  <null>
            V.Angle   73°21'00"            V.Std Err  <null>
            EDM Dist  87.935               S.Std Err  <null>
            Code      12KV                 Class      Normal

OBS     F1  9                              -          76
            H.Angle   134°37'21"           H.Std Err  <null>
            V.Angle   74°11'23"            V.Std Err  <null>
            EDM Dist  91.880               S.Std Err  <null>
            Code      12KV                 Class      Normal

OBS     F1  9                              -          77
            H.Angle   134°37'21"           H.Std Err  <null>
            V.Angle   75°28'51"            V.Std Err  <null>
            EDM Dist  99.775               S.Std Err  <null>
            Code      12KV                 Class      Normal

OBS     F1  9                              -          78
            H.Angle   140°37'50"           H.Std Err  <null>
            V.Angle   75°07'20"            V.Std Err  <null>
            EDM Dist  97.575               S.Std Err  <null>
            Code      12KV                 Class      Normal

OBS     F1  9                              -          79
            H.Angle   140°37'50"           H.Std Err  <null>
            V.Angle   75°56'12"            V.Std Err  <null>
            EDM Dist  101.970              S.Std Err  <null>
            Code      12KV                 Class      Normal

OBS     F1  9                              -          80
            H.Angle   140°37'49"           H.Std Err  <null>
            V.Angle   77°03'14"            V.Std Err  <null>
            EDM Dist  110.960              S.Std Err  <null>
            Code      12KV                 Class      Normal

OBS     F1  9                              -          81
            H.Angle   154°25'25"           H.Std Err  <null>
            V.Angle   79°14'36"            V.Std Err  <null>
            EDM Dist  139.695              S.Std Err  <null>
            Code      12KV                 Class      Normal

OBS     F1  9                              -          82
            H.Angle   154°25'24"           H.Std Err  <null>
            V.Angle   79°54'16"            V.Std Err  <null>
            EDM Dist  146.215              S.Std Err  <null>
            Code      12KV                 Class      Normal

OBS     F1  9                              -          83
            H.Angle   154°25'24"           H.Std Err  <null>
            V.Angle   80°26'54"            V.Std Err  <null>
            EDM Dist  159.655              S.Std Err  <null>
            Code      12KV                 Class      Normal

OBS     F1  9                              -          84
            H.Angle   153°31'16"           H.Std Err  <null>
            V.Angle   79°54'45"            V.Std Err  <null>
            EDM Dist  182.620              S.Std Err  <null>
            Code      LSTR N/FACE SYC      Class      Normal

OBS     F1  9                              -          85
            H.Angle   153°31'16"           H.Std Err  <null>
            V.Angle   81°39'57"            V.Std Err  <null>
            EDM Dist  181.525              S.Std Err  <null>
            Code      LSTR N/FACE SYC      Class      Normal

OBS     F1  9                              -          86
            H.Angle   153°36'11"           H.Std Err  <null>
            V.Angle   82°22'13"            V.Std Err  <null>
            EDM Dist  180.880              S.Std Err  <null>
            Code      LSTR N/FACE SYC      Class      Normal

BKB     NM  9                              -          8
            Azmth     <null>
            Face 1    32°14'54.125"        Face 2     <null>

TRGET   NM  Target ht 5.360                P.C. mm    0.0
            Prism Off 0.000
```

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```
OBS     F1  9                                   -          8
            H.Angle   32°14'54.125"             H.Std Err <null>
            V.Angle   82°05'02"                 V.Std Err <null>
            EDM Dist  69.230                    S.Std Err <null>
            Code      TA 50D                    Class     Backsight

TRGET   NM  Target ht 5.360                     P.C. mm   0.0
            Prism Off 0.000

MTA     MA  ID        8                         Code      TA 50D
            H.Angle   0°00'00"                  H.Std Err <null>
            V.Angle   82°05'03.5"               V.Std Err <null>
            S.Dist    69.232                    S.Std Err <null>
            Angles    2                         BS Pt ID  8
            Distances 2

NOTE    TS  Time Date 10/31/2007 Time 12:13:46

INSTR   NM  EDM       Topcon Generic
            Serial no <no text>                 Firmware  <no text>
            Mount     Not Applic                Edm o/s   <null>
            J Constant 279.7                    N Constant 106.133
            H.col     <null>                    V.col     <null>

PRECIS  NM  HA Prec   <null>                    EDM Prec  <null>
            VA Prec   <null>                    EDM (ppm) <null>

INSTR   NM  EDM       Topcon Generic
            Serial no <no text>                 Firmware  <no text>
            Mount     Not Applic                Edm o/s   <null>
            J Constant 279.7                    N Constant 106.133
            H.col     <null>                    V.col     <null>

PRECIS  NM  HA Prec   <null>                    EDM Prec  <null>
            VA Prec   <null>                    EDM (ppm) <null>

ATMOS   NM  Press     30.00                     Temp      75.0
            Refrac cnst 0.142                   PPM       <null>

GRDPOS  PD  Point ID 7          Nrth 9541.858   East 9755.562
            Class Normal        Elv  981.244    Code TA 50D
            Obs  User Input

STN     NM  ID        7                         Theo ht   5.540
            Scale     1.0000000000              Type      Fixed

BKB     NM  7                                   -         3
            Azmth     <null>
            Face 1    15°32'52.75"              Face 2    195°33'02"

NOTE    SN  Start of Rounds

TRGET   NM  Target ht 5.000                     P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                                   -         3
            H.Angle   15°32'52.75"              H.Std Err <null>
            V.Angle   88°01'13"                 V.Std Err <null>
            EDM Dist  286.879                   S.Std Err <null>
            Code      TA PK/WASH                Class     Backsight

POLAR*D F1  Azmth           <null>              H.Dist          -0.001
                                                V.Dist          0.010

TRGET   NM  Target ht 4.850                     P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                                   -         10
            H.Angle   235°13'43"                H.Std Err <null>
            V.Angle   89°51'39"                 V.Std Err <null>
            EDM Dist  95.485                    S.Std Err <null>
            Code      TA PIN/CAP                Class     Normal

OBS     F2  7                                   -         10
            H.Angle   55°13'51"                 H.Std Err <null>
            V.Angle   270°08'18"                V.Std Err <null>
            EDM Dist  95.490                    S.Std Err <null>
            Code      TA PIN/CAP                Class     Normal

TRGET   NM  Target ht 5.000                     P.C. mm   0.0
            Prism Off 0.000

OBS     F2  7                                   -         3
            H.Angle   195°33'02"                H.Std Err <null>
            V.Angle   271°58'46"                V.Std Err <null>
            EDM Dist  286.884                   S.Std Err <null>
            Code      TA PK/WASH                Class     Backsight

MTA     MA  ID        3                         Code      TA PK/WASH
            H.Angle   0°00'00"                  H.Std Err <null>
            V.Angle   88°01'13.5"               V.Std Err <null>
            S.Dist    286.882                   S.Std Err 0.004
            Angles    1                         BS Pt ID  3
            Distances 2

TRGET   NM  Target ht 4.850                     P.C. mm   0.0
            Prism Off 0.000
```

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```
MTA     MA  ID         10                    Code       TA PIN/CAP
            H.Angle    219°40'49.625"        H.Std Err  <null>
            V.Angle    89°51'40.5"           V.Std Err  <null>
            S.Dist     95.487                S.Std Err  0.004
            Angles     1                     BS Pt ID   3
            Distances  2

RESIDUALSRR Round      1                     ID         3
            H Ang Res  0°00'00"              V Ang Res  -0°00'00.5"
            EDM Res    -0.003

RESIDUALSRR Round      1                     ID         10
            H Ang Res  0°00'00.625"          V Ang Res  -0°00'01.5"
            EDM Res    -0.003

RESIDUALSRR Round      1                     ID         10
            H Ang Res  -0°00'00.625"         V Ang Res  0°00'01.5"
            EDM Res    0.003

RESIDUALSRR Round      1                     ID         3
            H Ang Res  0°00'00"              V Ang Res  0°00'00.5"
            EDM Res    0.003

GRDPOS  IX  Point ID 87          Nrth 9630.886          East 9808.969
            Class Normal         Elv  994.740           Code CALC
            Obs  User Input

BKB     NM  7                                -          3
            Azmth      <null>
            Face 1     15°32'52.75"          Face 2     195°33'00"

NOTE    SN  Start of Rounds

TRGET   NM  Target ht 5.000                  P.C. mm    0.0
            Prism Off 0.000

OBS     F1  7                                -          3
            H.Angle    15°32'52.75"          H.Std Err  <null>
            V.Angle    88°01'20"             V.Std Err  <null>
            EDM Dist   286.879               S.Std Err  <null>
            Code       TA PK/WASH            Class      Backsight

TRGET   NM  Target ht 4.950                  P.C. mm    0.0
            Prism Off 0.000

OBS     F1  7                                -          12
            H.Angle    30°53'26"             H.Std Err  <null>
            V.Angle    87°28'03"             V.Std Err  <null>
            EDM Dist   103.840               S.Std Err  <null>
            Code       MO PIN/CAP LS296      Class      Normal

F-CODE  F1  Code MO PIN/CAP LS2961

OBS     F2  7                                -          12
            H.Angle    210°53'31"            H.Std Err  <null>
            V.Angle    272°32'12"            V.Std Err  <null>
            EDM Dist   103.840               S.Std Err  <null>
            Code       MO PIN/CAP LS296      Class      Normal

F-CODE  F2  Code MO PIN/CAP LS2961

TRGET   NM  Target ht 5.000                  P.C. mm    0.0
            Prism Off 0.000

OBS     F2  7                                -          3
            H.Angle    195°33'00"            H.Std Err  <null>
            V.Angle    271°58'44"            V.Std Err  <null>
            EDM Dist   286.884               S.Std Err  <null>
            Code       TA PK/WASH            Class      Backsight

MTA     MA  ID         3                     Code       TA PK/WASH
            H.Angle    0°00'00"              H.Std Err  <null>
            V.Angle    68°01'18"             V.Std Err  <null>
            S.Dist     286.882               S.Std Err  0.004
            Angles     1                     BS Pt ID   3
            Distances  2

TRGET   NM  Target ht 4.950                  P.C. mm    0.0
            Prism Off 0.000

MTA     MA  ID         12                    Code       MO PIN/CAP LS296
            H.Angle    15°20'32.125"         H.Std Err  <null>
            V.Angle    87°27'55.5"           V.Std Err  <null>
            S.Dist     103.840               S.Std Err  0.000
            Angles     1                     BS Pt ID   3
            Distances  2

F-CODE  MA  Code MO PIN/CAP LS2961

RESIDUALSRR Round      1                     ID         3
            H Ang Res  0°00'00"              V Ang Res  0°00'02"
            EDM Res    -0.003

RESIDUALSRR Round      1                     ID         12
            H Ang Res  0°00'01.125"          V Ang Res  0°00'07.5"
            EDM Res    0.000
```

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```
RESIDUALSRR Round     1                    ID        12
            H Ang Res -0°00'01.125"        V Ang Res -0°00'07.5"
            EDM Res   0.000

RESIDUALSRR Round     1                    ID        3
            H Ang Res 0°00'00"             V Ang Res -0°00'02"
            EDM Res   0.003

BKB     NM  7                              -         3
            Azmth     <null>
            Face 1    15°32'52.75"         Face 2    195°32'58"

NOTE    SN  Start of Rounds

TRGET   NM  Target ht 5.000                P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                              -         3
            H.Angle   15°32'52.75"         H.Std Err <null>
            V.Angle   88°01'29"            V.Std Err <null>
            EDM Dist  286.879              S.Std Err <null>
            Code      TA PK/WASH           Class     Backsight

TRGET   NM  Target ht 5.030                P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                              -         11
            H.Angle   251°12'49"           H.Std Err <null>
            V.Angle   89°42'06"            V.Std Err <null>
            EDM Dist  217.825              S.Std Err <null>
            Code      TA PIN/CAP           Class     Normal

OBS     F2  7                              -         11
            H.Angle   71°12'53"            H.Std Err <null>
            V.Angle   270°18'02"           V.Std Err <null>
            EDM Dist  217.830              S.Std Err <null>
            Code      TA PIN/CAP           Class     Normal

TRGET   NM  Target ht 5.000                P.C. mm   0.0
            Prism Off 0.000

OBS     F2  7                              -         3
            H.Angle   195°32'58"           H.Std Err <null>
            V.Angle   271°58'44"           V.Std Err <null>
            EDM Dist  286.884              S.Std Err <null>
            Code      TA PK/WASH           Class     Backsight

MTA     MA  ID        3                    Code      TA PK/WASH
            H.Angle   0°00'00"             H.Std Err <null>
            V.Angle   88°01'32.5"          V.Std Err <null>
            S.Dist    286.882              S.Std Err 0.004
            Angles    1                    BS Pt ID  3
            Distances 2

TRGET   NM  Target ht 5.030                P.C. mm   0.0
            Prism Off 0.000

MTA     MA  ID        11                   Code      TA PIN/CAP
            H.Angle   235°39'55.625"       H.Std Err <null>
            V.Angle   89°42'02"            V.Std Err <null>
            S.Dist    217.827              S.Std Err 0.004
            Angles    1                    BS Pt ID  3
            Distances 2

RESIDUALSRR Round     1                    ID        3
            H Ang Res 0°00'00"             V Ang Res 0°00'06.5"
            EDM Res   -0.003

RESIDUALSRR Round     1                    ID        11
            H Ang Res 0°00'00.625"         V Ang Res 0°00'04"
            EDM Res   -0.003

RESIDUALSRR Round     1                    ID        11
            H Ang Res -0°00'00.625"        V Ang Res -0°00'04"
            EDM Res   0.003

RESIDUALSRR Round     1                    ID        3
            H Ang Res 0°00'00"             V Ang Res -0°00'06.5"
            EDM Res   0.003

NOTE    TS  Time Date 10/31/2007 Time 12:45:15

TRGET   NM  Target ht 4.950                P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                              -         88
            H.Angle   230°02'14"           H.Std Err <null>
            V.Angle   89°29'56"            V.Std Err <null>
            EDM Dist  86.340               S.Std Err <null>
            Code      GSMC MARKER          Class     Normal

OBS     F1  7                              -         89
            H.Angle   284°03'50"           H.Std Err <null>
            V.Angle   93°27'32"            V.Std Err <null>
            EDM Dist  84.435               S.Std Err <null>
            Code      LSTR 3.0 OAK         Class     Normal
```

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```
OBS     F1  7                                   -           90
            H.Angle   286°31'27"                H.Std Err <null>
            V.Angle   92°58'46"                 V.Std Err <null>
            EDM Dist  99.785                    S.Std Err <null>
            Code      SV                        Class     Normal

TRGET   NM  Target ht 8.200                     P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                                   -           91
            H.Angle   284°05'32"                H.Std Err <null>
            V.Angle   91°04'50"                 V.Std Err <null>
            EDM Dist  112.365                   S.Std Err <null>
            Code      SV                        Class     Normal

TRGET   NM  Target ht 4.950                     P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                                   -           92
            H.Angle   280°46'49"                H.Std Err <null>
            V.Angle   93°04'47"                 V.Std Err <null>
            EDM Dist  125.440                   S.Std Err <null>
            Code      SV                        Class     Normal

OBS     F1  7                                   -           93
            H.Angle   270°17'17"                H.Std Err <null>
            V.Angle   93°58'07"                 V.Std Err <null>
            EDM Dist  122.875                   S.Std Err <null>
            Code      TB                        Class     Normal

OBS     F1  7                                   -           94
            H.Angle   273°04'15"                H.Std Err <null>
            V.Angle   93°37'29"                 V.Std Err <null>
            EDM Dist  106.630                   S.Std Err <null>
            Code      TB                        Class     Normal

OBS     F1  7                                   -           95
            H.Angle   276°10'13"                H.Std Err <null>
            V.Angle   93°50'26"                 V.Std Err <null>
            EDM Dist  94.860                    S.Std Err <null>
            Code      TB                        Class     Normal

TRGET   NM  Target ht 8.200                     P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                                   -           96
            H.Angle   268°13'40"                H.Std Err <null>
            V.Angle   95°51'16"                 V.Std Err <null>
            EDM Dist  93.670                    S.Std Err <null>
            Code      RIFL                      Class     Normal

OBS     F1  7                                   -           97
            H.Angle   265°18'35"                H.Std Err <null>
            V.Angle   95°32'58"                 V.Std Err <null>
            EDM Dist  107.660                   S.Std Err <null>
            Code      RIFL                      Class     Normal

TRGET   NM  Target ht 4.950                     P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                                   -           98
            H.Angle   264°31'24"                H.Std Err <null>
            V.Angle   94°54'18"                 V.Std Err <null>
            EDM Dist  122.820                   S.Std Err <null>
            Code      RIFL                      Class     Normal

NOTE    NM  Modified 12:56:02 PM 10/31/2007

NOTE    NM  Old target values 8.200sft +0mm

TRGET   NM  Target ht 8.200                     P.C. mm   0.0
            Prism Off 8.000

OBS     F1  7                                   -           99
            H.Angle   252°40'17"                H.Std Err <null>
            V.Angle   90°39'44"                 V.Std Err <null>
            EDM Dist  93.555                    S.Std Err <null>
            Code      TB                        Class     Normal

TRGET   NM  Target ht 4.950                     P.C. mm   0.0
            Prism Off 0.000

OBS     F1  7                                   -           100
            H.Angle   253°06'50"                H.Std Err <null>
            V.Angle   90°11'55"                 V.Std Err <null>
            EDM Dist  112.705                   S.Std Err <null>
            Code      TB                        Class     Normal

OBS     F1  7                                   -           101
            H.Angle   253°39'14"                H.Std Err <null>
            V.Angle   90°04'24"                 V.Std Err <null>
            EDM Dist  126.185                   S.Std Err <null>
            Code      TB                        Class     Normal

OBS     F1  7                                   -           102
            H.Angle   251°09'58"                H.Std Err <null>
            V.Angle   90°04'57"                 V.Std Err <null>
            EDM Dist  126.190                   S.Std Err <null>
            Code      SP                        Class     Normal
```


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OBS	F1	?		-	103
		H.Angle	250°11'09"	H.Std Err	<null>
		V.Angle	90°15'18"	V.Std Err	<null>
		EDM Dist	114.200	S.Std Err	<null>
		Code	EP	Class	Normal
OBS	F1	?		-	104
		H.Angle	249°19'54"	H.Std Err	<null>
		V.Angle	90°27'53"	V.Std Err	<null>
		EDM Dist	96.820	S.Std Err	<null>
		Code	EP	Class	Normal
OBS	F1	?		-	105
		H.Angle	239°47'09"	H.Std Err	<null>
		V.Angle	90°12'01"	V.Std Err	<null>
		EDM Dist	107.470	S.Std Err	<null>
		Code	EP	Class	Normal
OBS	F1	?		-	106
		H.Angle	242°40'00"	H.Std Err	<null>
		V.Angle	90°09'30"	V.Std Err	<null>
		EDM Dist	123.345	S.Std Err	<null>
		Code	EP	Class	Normal
OBS	F1	?		-	107
		H.Angle	244°43'55"	H.Std Err	<null>
		V.Angle	90°08'01"	V.Std Err	<null>
		EDM Dist	140.330	S.Std Err	<null>
		Code	EP	Class	Normal
OBS	F1	?		-	108
		H.Angle	242°15'33"	H.Std Err	<null>
		V.Angle	87°53'28"	V.Std Err	<null>
		EDM Dist	139.755	S.Std Err	<null>
		Code	TB	Class	Normal
OBS	F1	?		-	109
		H.Angle	240°14'57"	H.Std Err	<null>
		V.Angle	87°57'23"	V.Std Err	<null>
		EDM Dist	123.950	S.Std Err	<null>
		Code	TB	Class	Normal
OBS	F1	?		-	110
		H.Angle	236°21'14"	H.Std Err	<null>
		V.Angle	87°45'38"	V.Std Err	<null>
		EDM Dist	108.725	S.Std Err	<null>
		Code	TB	Class	Normal
TRGET	NM	Target ht	0.000	P.C. mm	0.0
		Prism Off	0.000		
OBS	F1	?		-	111
		H.Angle	241°05'31"	H.Std Err	<null>
		V.Angle	89°57'37"	V.Std Err	<null>
		EDM Dist	130.190	S.Std Err	<null>
		Code	LSTR 2.0 OAK	Class	Normal
OBS	F1	?		-	112
		H.Angle	310°35'33"	H.Std Err	<null>
		V.Angle	72°41'38.845"	V.Std Err	<null>
		EDM Dist	147.731	S.Std Err	<null>
		Code	ECPP TOP	Class	Normal
OBS	F1	?		-	113
		H.Angle	309°34'26"	H.Std Err	<null>
		V.Angle	73°08'08"	V.Std Err	<null>
		EDM Dist	151.485	S.Std Err	<null>
		Code	12@INS	Class	Normal
OBS	F1	?		-	114
		H.Angle	310°06'19"	H.Std Err	<null>
		V.Angle	72°50'10"	V.Std Err	<null>
		EDM Dist	148.750	S.Std Err	<null>
		Code	12@INS	Class	Normal
OBS	F1	?		-	115
		H.Angle	311°11'30"	H.Std Err	<null>
		V.Angle	72°11'08"	V.Std Err	<null>
		EDM Dist	143.535	S.Std Err	<null>
		Code	12@INS	Class	Normal
OBS	F1	?		-	116
		H.Angle	308°13'59"	H.Std Err	<null>
		V.Angle	72°52'21"	V.Std Err	<null>
		EDM Dist	148.985	S.Std Err	<null>
		Code	12KV	Class	Normal
OBS	F1	?		-	117
		H.Angle	308°13'58"	H.Std Err	<null>
		V.Angle	72°28'59"	V.Std Err	<null>
		EDM Dist	145.350	S.Std Err	<null>
		Code	12KV	Class	Normal
OBS	F1	?		-	118
		H.Angle	308°13'58"	H.Std Err	<null>
		V.Angle	71°33'25"	V.Std Err	<null>
		EDM Dist	138.190	S.Std Err	<null>
		Code	12KV	Class	Normal

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OBS	F1	?		-	119
		H.Angle	302°22'32"	H.Std Err	<null>
		V.Angle	71°45'41"	V.Std Err	<null>
		EDM Dist	139.640	S.Std Err	<null>
		Code	12KV	Class	Normal
OBS	F1	?		-	120
		H.Angle	302°22'32"	H.Std Err	<null>
		V.Angle	71°24'55"	V.Std Err	<null>
		EDM Dist	136.225	S.Std Err	<null>
		Code	12KV	Class	Normal
OBS	F1	?		-	121
		H.Angle	302°24'50"	H.Std Err	<null>
		V.Angle	70°23'59"	V.Std Err	<null>
		EDM Dist	129.665	S.Std Err	<null>
		Code	12KV	Class	Normal
OBS	F1	?		-	122
		H.Angle	241°35'20"	H.Std Err	<null>
		V.Angle	68°12'09"	V.Std Err	<null>
		EDM Dist	138.930	S.Std Err	<null>
		Code	12KV	Class	Normal
OBS	F1	?		-	123
		H.Angle	241°35'20"	H.Std Err	<null>
		V.Angle	68°08'44"	V.Std Err	<null>
		EDM Dist	135.335	S.Std Err	<null>
		Code	12KV	Class	Normal
OBS	F1	?		-	124
		H.Angle	241°35'20"	H.Std Err	<null>
		V.Angle	67°01'35"	V.Std Err	<null>
		EDM Dist	129.035	S.Std Err	<null>
		Code	12KV	Class	Normal
OBS	F1	?		-	125
		H.Angle	259°39'46"	H.Std Err	<null>
		V.Angle	88°43'58"	V.Std Err	<null>
		EDM Dist	96.095	S.Std Err	<null>
		Code	LSTR E/FACE SYC	Class	Normal
OBS	F1	?		-	126
		H.Angle	260°11'57"	H.Std Err	<null>
		V.Angle	88°29'53"	V.Std Err	<null>
		EDM Dist	96.315	S.Std Err	<null>
		Code	LSTR E/FACE SYC	Class	Normal
OBS	F1	?		-	127
		H.Angle	260°31'39"	H.Std Err	<null>
		V.Angle	83°25'53"	V.Std Err	<null>
		EDM Dist	96.545	S.Std Err	<null>
		Code	LSTR E/FACE SYC	Class	Normal
OBS	F1	?		-	128
		H.Angle	260°51'45"	H.Std Err	<null>
		V.Angle	81°19'35"	V.Std Err	<null>
		EDM Dist	96.760	S.Std Err	<null>
		Code	LSTR E/FACE SYC	Class	Normal
OBS	F1	?		-	129
		H.Angle	260°56'09"	H.Std Err	<null>
		V.Angle	80°29'01"	V.Std Err	<null>
		EDM Dist	96.905	S.Std Err	<null>
		Code	LSTR E/FACE SYC	Class	Normal
NOTE	TS	Time Date 10/31/2007 Time 13:15:45			
OBS	F1	?		-	130
		H.Angle	305°46'32"	H.Std Err	<null>
		V.Angle	77°08'37"	V.Std Err	<null>
		EDM Dist	135.755	S.Std Err	<null>
		Code	TELCO	Class	Normal
OBS	F1	?		-	131
		H.Angle	305°46'31"	H.Std Err	<null>
		V.Angle	78°13'39"	V.Std Err	<null>
		EDM Dist	134.710	S.Std Err	<null>
		Code	TELCO	Class	Normal
OBS	F1	?		-	132
		H.Angle	242°20'25"	H.Std Err	<null>
		V.Angle	70°46'54"	V.Std Err	<null>
		EDM Dist	129.715	S.Std Err	<null>
		Code	TELCO	Class	Normal
OBS	F1	?		-	133
		H.Angle	242°20'25"	H.Std Err	<null>
		V.Angle	71°59'26"	V.Std Err	<null>
		EDM Dist	128.640	S.Std Err	<null>
		Code	TELCO	Class	Normal
BKB	NH	?		-	3
		Azmth	<null>		
		Face 1	15°32'52.75"	Face 2	<null>
TRGET	NH	Target ht	5.000	P.C. mm	0.0
		Prism Off	0.000		

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```
OBS     P1  7                                   -           3
            H.Angle   15°32'57.75"              H.Std Err <null>
            V.Angle   88°01'30"                 V.Std Err <null>
            SDM Dist  286.879                   S.Std Err <null>
            Code      TA PK/WASH                Class     Backsight

INSTR   NM  EDM       Topcon Generic
            Serial no <no text>                 Firmware  <no text>
            Mount     Not Applic                Sdm o/s   <null>
            J Constant 279.7                    N Constant 106.133
            H.col     <null>                    V.col     <null>

PRECIS  NM  HA Prec   <null>                    EDM Prec  <null>
            VA Prec   <null>                    EDM (ppm) <null>

ATMOS   NM  Press     30.00                     Temp      75.0
            Refrac cnst 0.142                   PPM       <null>

GRDPOS  PD  Point ID 10          Nrth 9487.399          East 9677.125
            Class Normal         Elv  982.166           Code TA PIN/CAP
            Obs  User Input

STN     NM  ID        10                        Theo ht   5.470
            Scale     1.0000000000              Type      Fixed

BKB     NM  10                                  -         7
            Azmth     <null>
            Face 1    55°13'42.375"             Face 2    <null>

TRGET   NM  Target ht 5.290                     P.C. mm   0.0
            Prism Off 0.000

OBS     P1  10                                  -         7
            H.Angle   55°13'42.375"             H.Std Err <null>
            V.Angle   90°39'58"                 V.Std Err <null>
            SDM Dist  95.490                    S.Std Err <null>
            Code      TA 50D                    Class     Backsight

POLAR D P1  Azmth           <null>              N.Dist          0.004
                                                V.Dist          0.009

TRGET   NM  Target ht 0.500                     P.C. mm   0.0
            Prism Off 0.000

OBS     P1  10                                  -         114
            H.Angle   136°58'27"                H.Std Err <null>
            V.Angle   77°57'06"                 V.Std Err <null>
            SDM Dist  26.945                    S.Std Err <null>
            Code      GSMC MARKER               Class     Normal

TRGET   NM  Target ht 4.950                     P.C. mm   0.0
            Prism Off 0.000

OBS     P1  10                                  -         135
            H.Angle   295°46'43"                H.Std Err <null>
            V.Angle   99°31'18"                 V.Std Err <null>
            SDM Dist  57.140                    S.Std Err <null>
            Code      LSTR 2.2 OAK              Class     Normal

TRGET   NM  Target ht 8.200                     P.C. mm   0.0
            Prism Off 0.000

OBS     P1  10                                  -         136
            H.Angle   324°33'17"                H.Std Err <null>
            V.Angle   99°46'16"                 V.Std Err <null>
            SDM Dist  59.765                    S.Std Err <null>
            Code      EDGE LSTR PT135           Class     Normal

TRGET   NM  Target ht 0.000                     P.C. mm   0.0
            Prism Off 0.000

OBS     P1  10                                  -         137
            H.Angle   326°39'14"                H.Std Err <null>
            V.Angle   50°38'17"                 V.Std Err <null>
            SDM Dist  49.035                    S.Std Err <null>
            Code      LSTR BRANCH SYC           Class     Normal

OBS     P1  10                                  -         138
            H.Angle   328°59'20"                H.Std Err <null>
            V.Angle   45°33'11"                 V.Std Err <null>
            SDM Dist  44.555                    S.Std Err <null>
            Code      LSTR BRANCH SYC           Class     Normal

OBS     P1  10                                  -         139
            H.Angle   346°05'05"                H.Std Err <null>
            V.Angle   51°18'30"                 V.Std Err <null>
            SDM Dist  59.955                    S.Std Err <null>
            Code      LSTR BRANCH SYC           Class     Normal

OBS     P1  10                                  -         140
            H.Angle   332°13'18"                H.Std Err <null>
            V.Angle   101°50'58"                V.Std Err <null>
            SDM Dist  35.410                    S.Std Err <null>
            Code      LSTR S/FACE SYC           Class     Normal
```

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```
OBS     F1  10                              -         141
            H.Angle   334°28'12"            H.Std Err <null>
            V.Angle   98°19'49"             V.Std Err <null>
            EDM Dist  38.535                S.Std Err <null>
            Code      LSTR S/FACE SYC       Class     Normal

OBS     F1  10                              -         142
            H.Angle   334°42'29"            H.Std Err <null>
            V.Angle   87°33'40"             V.Std Err <null>
            EDM Dist  39.800                S.Std Err <null>
            Code      LSTR S/FACE SYC       Class     Normal

OBS     F1  10                              -         143
            H.Angle   335°09'41"            H.Std Err <null>
            V.Angle   82°05'16"             V.Std Err <null>
            EDM Dist  40.865                S.Std Err <null>
            Code      LSTR S/FACE SYC       Class     Normal

NOTE    TS  Time Date 10/31/2007 Time 13:45:47

OBS     F1  10                              -         144
            H.Angle   335°56'53"            H.Std Err <null>
            V.Angle   76°03'44"             V.Std Err <null>
            EDM Dist  42.510                S.Std Err <null>
            Code      LSTR S/FACE SYC       Class     Normal

OBS     F1  10                              -         145
            H.Angle   336°40'04"            H.Std Err <null>
            V.Angle   70°35'44"             V.Std Err <null>
            EDM Dist  44.430                S.Std Err <null>
            Code      LSTR S/FACE SYC       Class     Normal

OBS     F1  10                              -         146
            H.Angle   337°07'08"            H.Std Err <null>
            V.Angle   65°18'44"             V.Std Err <null>
            EDM Dist  46.655                S.Std Err <null>
            Code      LSTR S/FACE SYC       Class     Normal

OBS     F1  10                              -         147
            H.Angle   338°37'30"            H.Std Err <null>
            V.Angle   57°05'14"             V.Std Err <null>
            EDM Dist  51.130                S.Std Err <null>
            Code      LSTR S/FACE SYC       Class     Normal

OBS     F1  10                              -         148
            H.Angle   320°46'38"            H.Std Err <null>
            V.Angle   54°07'06"             V.Std Err <null>
            EDM Dist  57.740                S.Std Err <null>
            Code      TELCO                 Class     Normal

OBS     F1  10                              -         149
            H.Angle   320°46'41"            H.Std Err <null>
            V.Angle   51°26'57"             V.Std Err <null>
            EDM Dist  95.420                S.Std Err <null>
            Code      TELCO                 Class     Normal

OBS     F1  10                              -         150
            H.Angle   320°46'43"            H.Std Err <null>
            V.Angle   49°54'15"             V.Std Err <null>
            EDM Dist  71.265                S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  10                              -         151
            H.Angle   320°46'49"            H.Std Err <null>
            V.Angle   47°45'39"             V.Std Err <null>
            EDM Dist  67.335                S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  10                              -         152
            H.Angle   320°47'05"            H.Std Err <null>
            V.Angle   41°19'19"             V.Std Err <null>
            EDM Dist  61.490                S.Std Err <null>
            Code      12KV                  Class     Normal

BKB     NM  10                              -         7
            Azmth     <null>
            Face 1    55°13'42.375"         Face 2    <null>

TRGET   NM  Target ht 5.290                 P.C. mm   0.0
            Prism Off 0.000

OBS     F1  10                              -         7
            H.Angle   55°13'42.375"         H.Std Err <null>
            V.Angle   90°39'57"             V.Std Err <null>
            EDM Dist  95.485                S.Std Err <null>
            Code      TA 50D                Class     Backsight

TRGET   NM  Target ht 5.290                 P.C. mm   0.0
            Prism Off 0.000

NTA     MA  ID        7                     Code      TA 50D
            H.Angle   0°00'00"              H.Std Err <null>
            V.Angle   90°39'57.5"           V.Std Err <null>
            S.Dist    95.487                S.Std Err <null>
            Angles    2                     BS Pt ID  7
            Distances 2

NOTE    TS  Time Date 11/01/2007 Time 08:38:48
```

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```
INSTR   NM  EDM       Topcon Generic
            Serial no <no text>              Firmware  <no text>
            Mount     Not Applic             Edm o/s   <null>
            J Constant 279.7                 K Constant 106.133
            H.col     <null>                 V.col     <null>

PRECIS  NM  HA Prec   <null>                 EDM Prec  <null>
            VA Prec   <null>                 EDM (ppm) <null>

ATMOS   NM  Press     30.00                  Temp      65.0
            Refrac cnst 0.142                PPM       <null>

GEOPOS  FD  Point ID 11          Nrth 9471.707          East 9549.341
            Class Normal         Elv  982.894           Code TA PIN/CAP
            Obs  User Input

STN     NM  ID        11                     Theo hc   5.450
            Scale     1.0000000000           Type      Fixed

BKB     NM  11                               -         7
            Azmth     <null>
            Face 1    71°12'48.375"          Face 2    <null>

TRGET   NM  Target ht 5.100                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  11                               -         7
            H.Angle   71°12'48.375"          H.Std Err <null>
            V.Angle   90°31'50"              V.Std Err <null>
            EDM Dist  217.835                S.Std Err <null>
            Code      TA 50D                 Class     Backsight

POLAR D F1  Azmth           <null>           H.Dist          0.000
                                             V.Dist          0.017

TRGET   NM  Target ht 5.750                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  11                               -         153
            H.Angle   108°17'21"             H.Std Err <null>
            V.Angle   79°52'31"              V.Std Err <null>
            SDM Dist  84.595                 S.Std Err <null>
            Code      SV                     Class     Normal

OBS     F1  11                               -         154
            H.Angle   108°09'52"             H.Std Err <null>
            V.Angle   80°46'25"              V.Std Err <null>
            EDM Dist  103.930                S.Std Err <null>
            Code      SV                     Class     Normal

OBS     F1  11                               -         155
            H.Angle   107°50'26"             H.Std Err <null>
            V.Angle   81°01'53"              V.Std Err <null>
            SDM Dist  117.295                S.Std Err <null>
            Code      SV                     Class     Normal

OBS     F1  11                               -         156
            H.Angle   136°01'32"             H.Std Err <null>
            V.Angle   73°10'44"              V.Std Err <null>
            EDM Dist  126.140                S.Std Err <null>
            Code      SV                     Class     Normal

OBS     F1  11                               -         157
            H.Angle   132°03'50"             H.Std Err <null>
            V.Angle   73°51'10"              V.Std Err <null>
            EDM Dist  136.070                S.Std Err <null>
            Code      SV                     Class     Normal

TRGET   NM  Target ht 9.500                  P.C. mm   0.0
            Prism Off 0.000

OBS     F1  11                               -         158
            H.Angle   128°29'42"             H.Std Err <null>
            V.Angle   73°00'16"              V.Std Err <null>
            EDM Dist  147.155                S.Std Err <null>
            Code      SV                     Class     Normal

OBS     F1  11                               -         159
            H.Angle   148°08'59"             H.Std Err <null>
            V.Angle   72°44'37"              V.Std Err <null>
            EDM Dist  173.510                S.Std Err <null>
            Code      SV                     Class     Normal

TRGET   NM  Target ht 21.300                 P.C. mm   0.0
            Prism Off 0.000

OBS     F1  11                               -         160
            H.Angle   139°45'34"             H.Std Err <null>
            V.Angle   68°22'19"              V.Std Err <null>
            EDM Dist  192.380                S.Std Err <null>
            Code      SV                     Class     Normal

NOTE    NM  Modified 8:52:39 AM 11/1/2007

NOTE    NM  Old target values 9.500sft +0mm

TRGET   NM  Target ht 5.800                  P.C. mm   0.0
            Prism Off 0.000
```

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```
OBS     F1  11                              -         161
            H.Angle   145°15'15.69"         H.Std Err <null>
            V.Angle   73°12'12.158"         V.Std Err <null>
            EDM Dist  177.810               S.Std Err <null>
            Code      ECPP 213072           Class     Normal

NOTE    TS  Time Date 11/01/2007 Time 09:09:42

TRGET   NM  Target ht 0.000                 P.C. mm   0.0
            Prism Off 0.000

OBS     F1  11                              -         162
            H.Angle   78°02'12"             H.Std Err <null>
            V.Angle   62°32'01"             V.Std Err <null>
            EDM Dist  106.960               S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  11                              -         163
            H.Angle   78°02'11"             H.Std Err <null>
            V.Angle   63°46'32"             V.Std Err <null>
            EDM Dist  109.195               S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  11                              -         164
            H.Angle   78°12'27"             H.Std Err <null>
            V.Angle   64°57'04"             V.Std Err <null>
            EDM Dist  114.770               S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  11                              -         165
            H.Angle   80°46'26"             H.Std Err <null>
            V.Angle   67°14'48"             V.Std Err <null>
            EDM Dist  107.340               S.Std Err <null>
            Code      TELCO                 Class     Normal

OBS     F1  11                              -         166
            H.Angle   81°12'28"             H.Std Err <null>
            V.Angle   68°46'42"             V.Std Err <null>
            EDM Dist  106.185               S.Std Err <null>
            Code      TELCO                 Class     Normal

OBS     F1  11                              -         167
            H.Angle   129°26'54"            H.Std Err <null>
            V.Angle   61°38'14"             V.Std Err <null>
            EDM Dist  135.010               S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  11                              -         168
            H.Angle   129°26'53"            H.Std Err <null>
            V.Angle   62°25'35"             V.Std Err <null>
            EDM Dist  138.345               S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  11                              -         169
            H.Angle   129°26'53"            H.Std Err <null>
            V.Angle   63°19'43"             V.Std Err <null>
            EDM Dist  146.005               S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  11                              -         170
            H.Angle   129°26'50"            H.Std Err <null>
            V.Angle   66°04'53"             V.Std Err <null>
            EDM Dist  137.415               S.Std Err <null>
            Code      TELCO                 Class     Normal

OBS     F1  11                              -         171
            H.Angle   129°26'49"            H.Std Err <null>
            V.Angle   66°49'45"             V.Std Err <null>
            EDM Dist  136.675               S.Std Err <null>
            Code      TELCO                 Class     Normal

OBS     F1  11                              -         172
            H.Angle   139°36'57"            H.Std Err <null>
            V.Angle   63°18'12"             V.Std Err <null>
            EDM Dist  157.760               S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  11                              -         173
            H.Angle   139°36'57"            H.Std Err <null>
            V.Angle   63°51'25"             V.Std Err <null>
            EDM Dist  162.160               S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  11                              -         174
            H.Angle   139°36'56"            H.Std Err <null>
            V.Angle   64°35'36"             V.Std Err <null>
            EDM Dist  171.200               S.Std Err <null>
            Code      12KV                  Class     Normal

OBS     F1  11                              -         175
            H.Angle   66°16'31"             H.Std Err <null>
            V.Angle   94°03'44"             V.Std Err <null>
            EDM Dist  119.685               S.Std Err <null>
            Code      LSTR W/FACE SYC       Class     Normal
```

```
OBS     F1  11                              -           176
            H.Angle   65°01'50"             H.Std Err <null>
            V.Angle   92°54'07"             V.Std Err <null>
            EDM Dist  120.935               S.Std Err <null>
            Code      LSTR W/FACE SYC       Class     Normal

OBS     F1  11                              -           177
            H.Angle   64°54'52"             H.Std Err <null>
            V.Angle   91°50'36"             V.Std Err <null>
            EDM Dist  121.215               S.Std Err <null>
            Code      LSTR W/FACE SYC       Class     Normal

OBS     F1  11                              -           178
            H.Angle   64°44'30"             H.Std Err <null>
            V.Angle   90°04'32"             V.Std Err <null>
            EDM Dist  121.280               S.Std Err <null>
            Code      LSTR W/FACE SYC       Class     Normal

OBS     F1  11                              -           179
            H.Angle   64°20'58"             H.Std Err <null>
            V.Angle   88°32'31"             V.Std Err <null>
            EDM Dist  121.255               S.Std Err <null>
            Code      LSTR W/FACE SYC       Class     Normal

BKB     NM  11                              -           7
            Azmth     <null>
            Face 1    71°12'48.375"         Face 2    <null>

TRGET   NM  Target ht 5.100                 P.C. mm   0.0
            Prism Off 0.000

OBS     F1  11                              -           7
            H.Angle   71°12'48.375"         H.Std Err <null>
            V.Angle   90°31'44"             V.Std Err <null>
            EDM Dist  217.840               S.Std Err <null>
            Code      TA 50D                Class     Backsight

TRGET   NM  Target ht 5.100                 P.C. mm   0.0
            Prism Off 0.000

MTA     MA  ID        7                     Code      TA 50D
            H.Angle   0°00'00"              H.Std Err <null>
            V.Angle   90°31'47"             V.Std Err <null>
            S.Dist    217.837               S.Std Err <null>
            Angles    2                     BS Pt ID  7
            Distances 2

INSTR   NM  EDM       Topcon Generic
            Serial no <no text>             Firmware  <no text>
            Mount     Not Applic            Edm o/s   <null>
            J Constant 279.7                N Constant 106.133
            H.col     <null>                V.col     <null>

PRECIS  NM  HA Prec   <null>                EDM Prec  <null>
            VA Prec   <null>                EDM (ppm) <null>

ATMOS   NM  Press     30.00                 Temp      65.0
            Refrac cnst 0.142               PPM       <null>

GRDPOS  FD  Point ID 8          Nrth 9745.035        East 9620.288
            Class Normal        Elv  1009.624        Code TA 50D
            Obs  User Input

STN     NM  ID        8                     Theo ht   5.590
            Scale     1.0000000000          Type      Fixed

BKB     NM  8                               -           9
            Azmth     <null>
            Face 1    212°14'54.125"        Face 2    <null>

TRGET   NM  Target ht 4.950                 P.C. mm   0.0
            Prism Off 0.000

OBS     F1  8                               -           9
            H.Angle   212°14'54.125"        H.Std Err <null>
            V.Angle   98°34'43"             V.Std Err <null>
            EDM Dist  69.350                S.Std Err <null>
            Code      TA 50D                Class     Backsight

POLAR D F1  Azmth           <null>          H.Dist          -0.005
                                            V.Dist          -0.033

TRGET   NM  Target ht 6.000                 P.C. mm   0.0
            Prism Off 0.000

OBS     F1  8                               -           180
            H.Angle   172°23'37"            H.Std Err <null>
            V.Angle   87°40'21"             V.Std Err <null>
            EDM Dist  199.310               S.Std Err <null>
            Code      LSTR OAK PT89 @       Class     Normal

F-CODE  FI  Code LSTR OAK PT89 @ TELCO

OBS     F1  8                               -           181
            H.Angle   166°57'29"            H.Std Err <null>
            V.Angle   83°05'54"             V.Std Err <null>
            EDM Dist  196.090               S.Std Err <null>
            Code      LSTR OAK PT89 TO      Class     Normal
```

File N:\SDGE\R071127\S070652\Survey\Field Data\R071127SWH1030.dc

P-CODE F1 Code LSTR OAK PT89 TOP

NOLTE

BEYOND ENGINEERING

15090 AVENUE OF SCIENCE, SUITE 101 SAN DIEGO, CA 92128
858.385.0500 TEL 858.385-0400 FAX WWW.NOLTE.COM

SURVEY NOTES COVER SHEET

SDG&E JOB NO: R071127, S.070652 NOLTE JOB NO: SDB 55-5200

SURVEY NO: _____ JOB TYPE: SHT 1 OF 2

DPSS NO: _____ DATE: 11-28-07

W.O. NO: _____ SURVEY CREW: HAHN

ACCT. NO: _____ PANKOSKY

T.B. NO: 998I-6

JOB NAME: RICE FIRE

JOB ADDRESS: 15008 RICE CYN RD

FLBK

BENCH MARK: EXIST. CONTROL FROM ORIG SURVEY 11-01-07

BASIS OF BEARINGS: " " " "

BASIS OF COORDINATES: " " " "

	REFERENCE DATA MAIN:	BACKGROUND:
DATA DUMP:	N:\SDGE\R071127\S070652\SURV\FLD DTA\R071127SWH128.CSV	
POINTS FILE:		
CAD TECH:		
DWG PATH:		
DWG SIZE:		
DATE:		

NOTES: LARRY HALL (SDGE) REQUESTED, AT ON SITE MEETING, FOR US TO LOCATE OAK BRANCH W/IN OF THE SYCAMORE. BROKEN SYCAMORE BRANCH LAYING ON IT

J:\documents and settings\hahn\desktop\cover sheet.doc

SDGE0253877

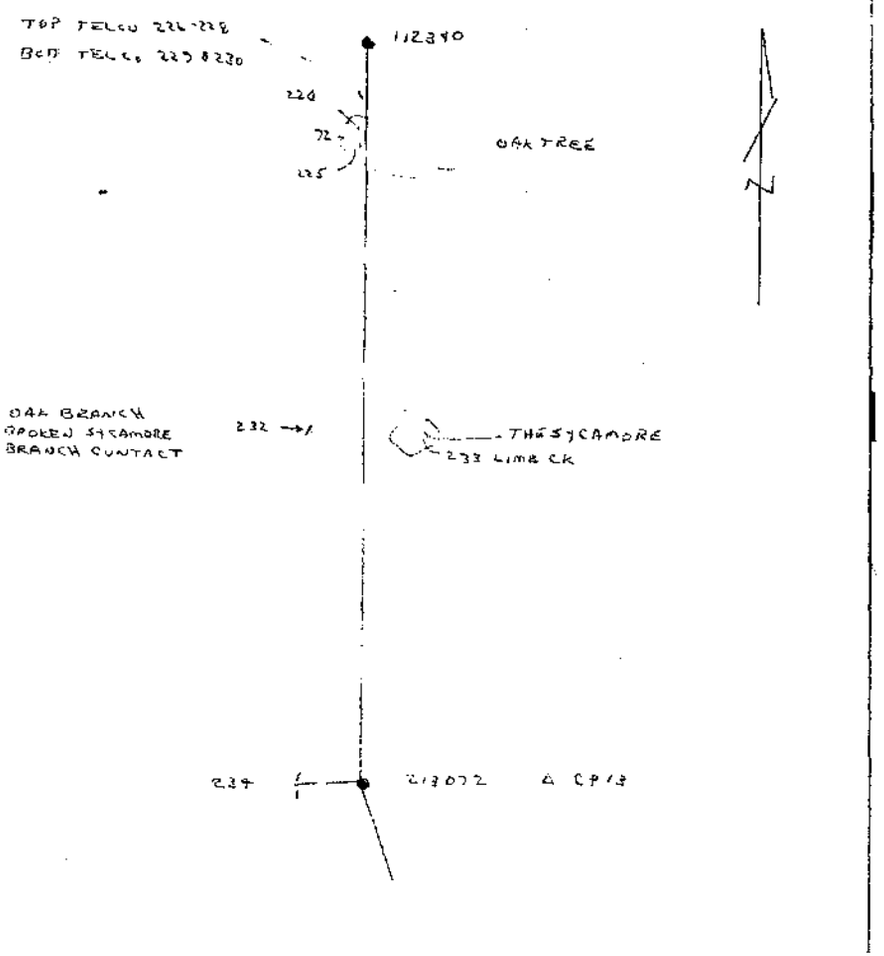
RICE FIRE - RICE CYN. RD.
SUBJECT

R 07127 SVA DAP
JOB NO. DESIGNED BY

11-28-07 DAP
DATE CHECKED BY

NOLTE

8:30A. 66°F - 9:45A 74°F



SDGE0253878

13	9352.734	9738.337	1045.45	CP 50D
224	9597.336	9643.722	1018.335	LSTR TOP
225	9588.508	9640.345	1019.566	LSTR TOP
226	9623.457	9648.167	1016.814	TOP TELCO
227	9575.432	9658.974	1021.583	TOP TELCO
228	9557.828	9650.567	1022.324	TOP TELCO
229	9626.517	9648.56	1014.06	BOTTOM TELCO
230	9596.037	9648.173	1015.622	BOTTOM TELCO
231	9329.54	9645.701	1063.954	X-ARM ATT PT
232	9508.872	9634.069	1028.896	OAK BRANCH
233	9532.716	9665.058	1025.51	LIMB CHECK
234	9327.185	9828.657	1028.117	ECGY

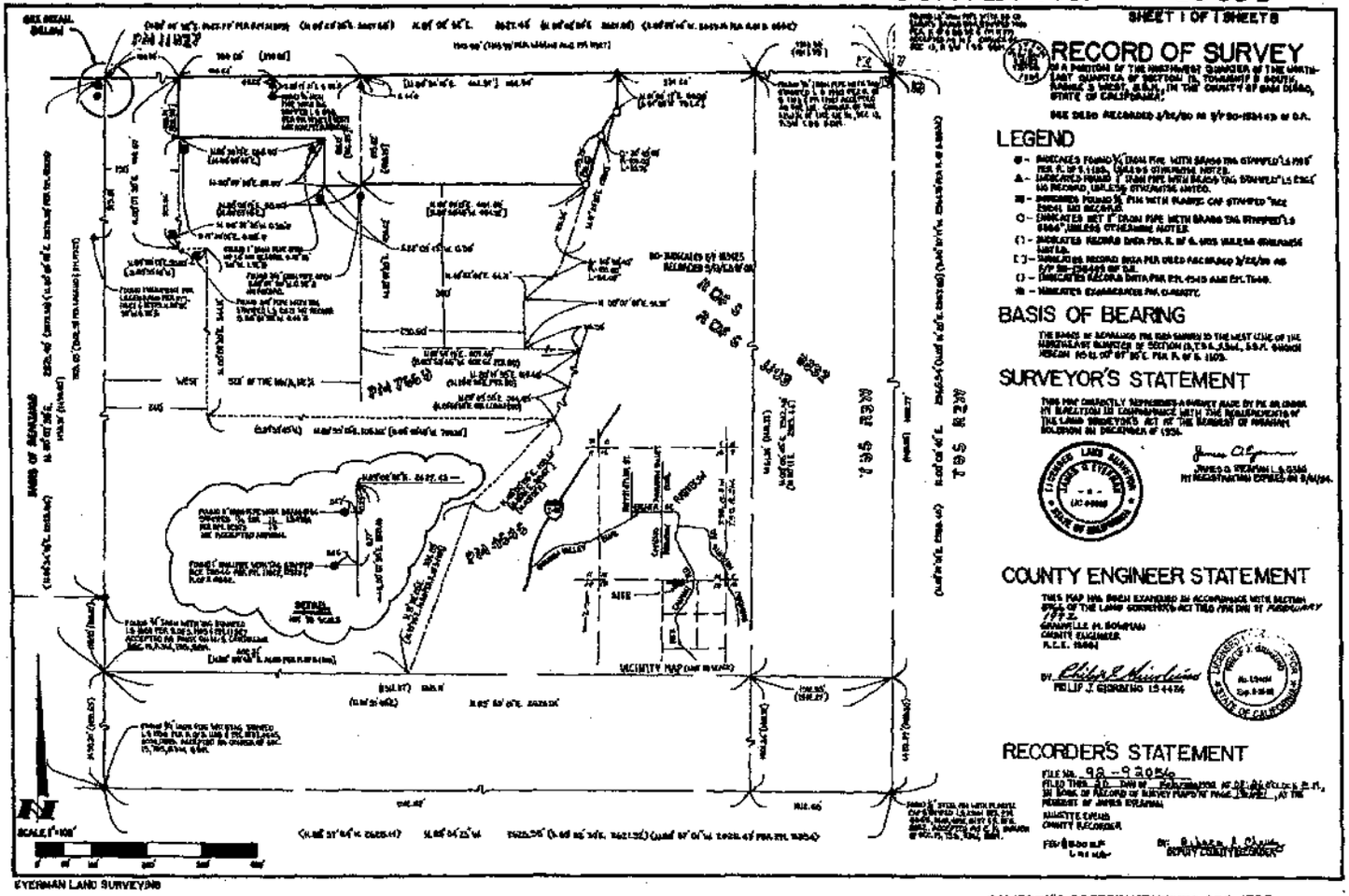
SDGE0253879

Device: Survey Controller (TSCe) on ActiveSync

Receive operation Completed.
2 File(s) Successfully Transferred.
Details are as follows:

11:37:16 AM 11/28/2007 Received File N:\SDGE\R071127\S070652\Survey\Field Data\R071127SWH1030.dc from Default. No Error
11:37:16 AM 11/28/2007 Received File N:\SDGE\R071127\S070652\Survey\Field Data\R071127SWH1128.csv from Export. No Error

RECORD OF SURVEY NO. 13651



SHEET 1 OF 1 SHEETS

RECORD OF SURVEY

OF A PORTION OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 19, TOWNSHIP 9 SOUTH, RANGE 3 WEST, S.B.B.M. IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA.

SEE DEED RECORDED 6/22/80 AS 3/4'80-152143 OF O.R.

LEGEND

- ● - SURVEYED FOUND ¾" IRON PIPE WITH BRASS TAG STAMPED "LS 5985" PER R. OF S. 1109, UNLESS OTHERWISE NOTED.
- ▲ - SURVEYED FOUND ¾" IRON PIPE WITH BRASS TAG STAMPED "LS 5985" AS RECORD, UNLESS OTHERWISE NOTED.
- ■ - SURVEYED FOUND ¾" PIN WITH PLASTIC CAP STAMPED "RCE 23041" AS RECORDED.
- ○ - SURVEYED SET 1" IRON PIPE WITH BRASS TAG STAMPED "LS 6986" UNLESS OTHERWISE NOTED.
- ( ) - INDICATES RECORD DATA PER R. OF S. 1109 UNLESS OTHERWISE NOTED.
- [ ] - INDICATES RECORD DATA PER DEED RECORDED 3/22/80 AS F/P 80-136465 OF O.R.
- ( ) - INDICATES RECORD DATA PER PM 4545 AND PM 7660.
- 18 - INDICATES EXCEPTIONS PER COMMITTEE.

BASIS OF BEARING

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE WEST LINE OF THE NORTHEAST QUARTER OF SECTION 19, T9 S., R3 W., S.B.B.M. SHOWN HEREON AS N 0°11'00" W.P.M. PER R. OF S. 1109.

SURVEYOR'S STATEMENT

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE LAND SURVEYOR'S ACT AT THE REQUEST OF MARIANN SOLOMON ON DECEMBER OF 1994.

LICENSED LAND SURVEYOR — JAMES O. EVERMAN — No. 5346 — STATE OF CALIFORNIA

JAMES O. EVERMAN L.S. 5346
MY REGISTRATION EXPIRES ON 9/30/96.

COUNTY ENGINEER STATEMENT

THIS MAP WAS EXAMINED IN ACCORDANCE WITH SECTION 8766 OF THE LAND SURVEYOR'S ACT THIS 7TH DAY OF FEBRUARY 1995.

GRANVILLE M. BOWMAN
COUNTY ENGINEER
R.C.E. 19661

BY: Philip J. Gibbons
PHILIP J. GIBBONS L.S. 4456

LICENSED LAND SURVEYOR — PHILIP J. GIBBONS — No. 13461 — STATE OF CALIFORNIA

RECORDER'S STATEMENT

FILE NO. 95-92056
FILED THIS 10 DAY OF FEBRUARY AT 08 MINUTES P.M., IN BOOK OF RECORD OF SURVEY MAPS AT PAGE 1 AT THE REQUEST OF JAMES EVERMAN.

ANNETTE EVANS
COUNTY RECORDER

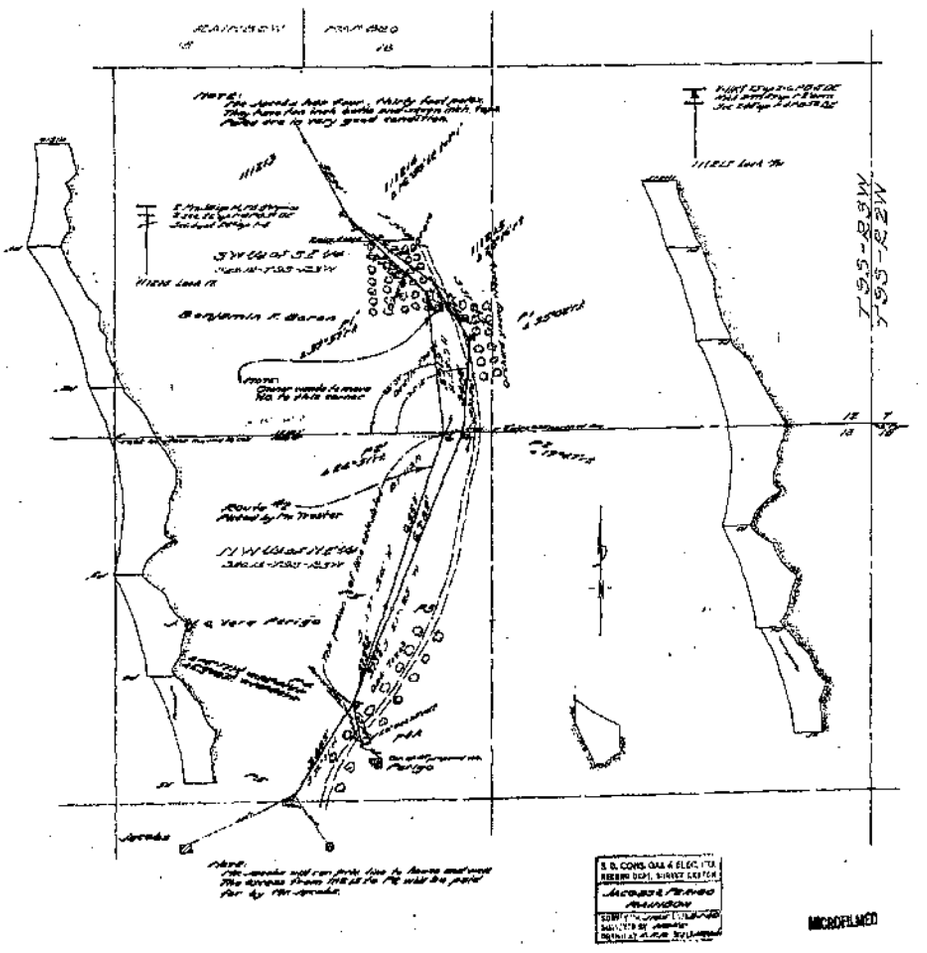
FEE $8.00

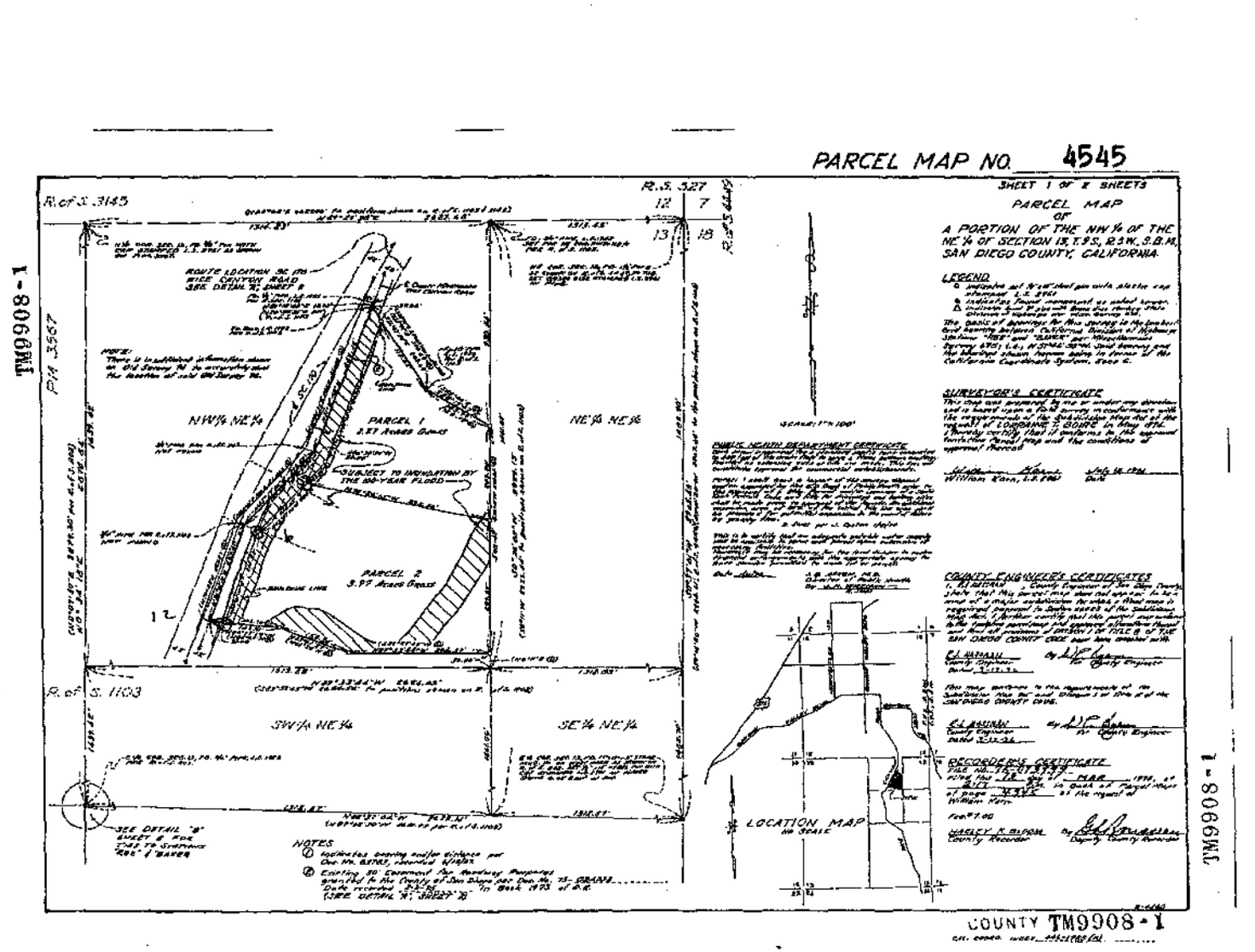
BY: Barbara J. Clark
DEPUTY COUNTY RECORDER

EVERMAN LAND SURVEYING

CALIFORNIA COORDINATE INDEX 450-1725

A.P.N. 108-310-42

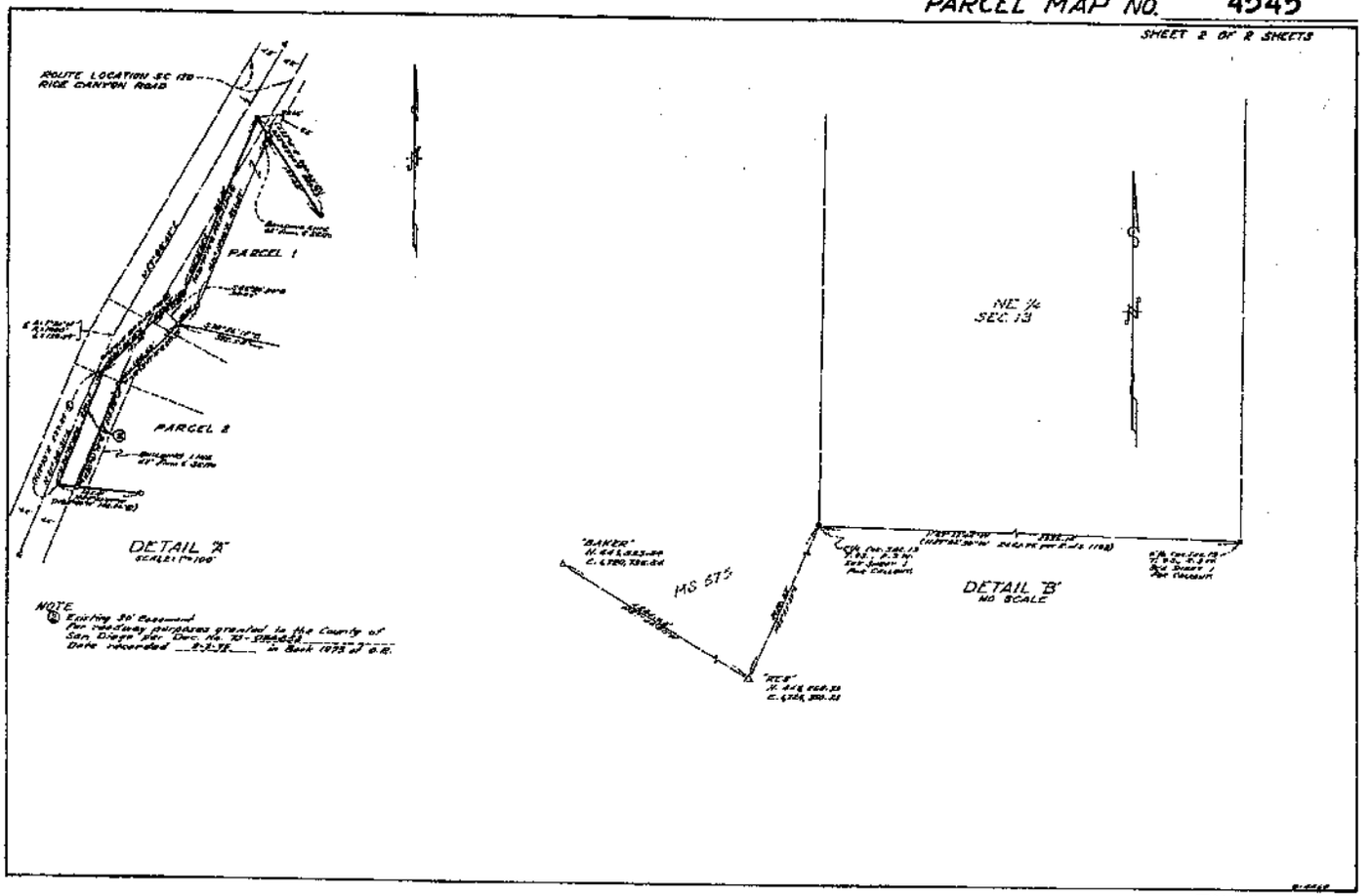

T 55 - R 3 W
T 55 - R 2 W
MICROFILMED
L-145



SDGE0253883

PARCEL MAP NO. 4545

SHEET 2 OF 2 SHEETS



TM9908-1

TM9908-1

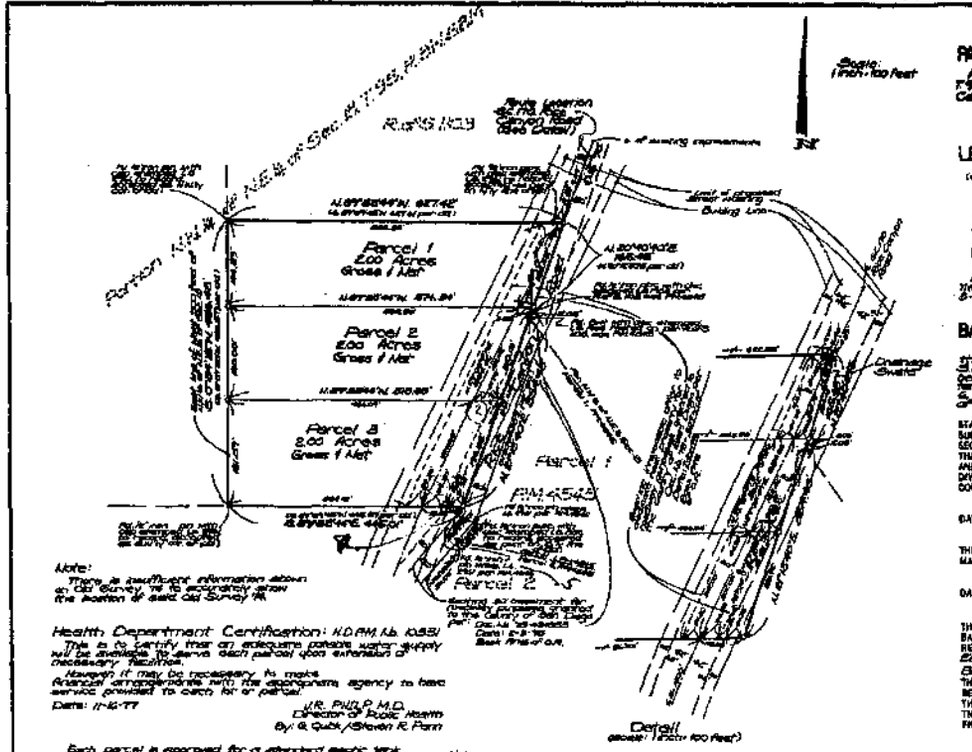
COUNTY TM9908-1

SDGE0253884

TM14201

PARCEL MAP NO. 7669

SHEET 1 OF 2 SHEETS



Scale: 1 inch = 100 feet

N

PARCEL MAP of a Portion of the N½ of NE¼ of Sec 15, T15S, R3W, SBM, San Diego County, California.

LEGEND:

- (calc) Indicates vesting deed to easement recorded 4-9-1977 @ File No. 77-89799 Book 1977 of OR.
- • Found points as noted
- ○ Set ¾" x 18" iron pipe with disc stamped L.S. 5831
- Drainage Swale

Parcel Map Guarantee issued by First American Title Insurance Company, Order No. 1178S-11 on 8-20-98

BASIS OF BEARINGS:

The Basis of Bearings for this survey is the N'ly line of the N½ of Sec. 15 T15S, R3W, SBM as shown on PM 4542 (R) Monument to Monument bearing and distance shown hereon and is identical to the California Coordinate System, Zone 6. Distance bearings may or may not be in terms of said System.

I, R. I. MASSMAN, COUNTY ENGINEER OF SAN DIEGO COUNTY, STATE THAT THIS PARCEL MAP DOES NOT APPEAR TO BE A MAP OF A MAJOR SUBDIVISION FOR WHICH A FINAL MAP IS REQUIRED PURSUANT TO SECTION 66426 OF THE SUBDIVISION MAP ACT. I FURTHER CERTIFY THAT THIS PARCEL MAP CONFORMS TO THE TENTATIVE PARCEL MAP AND APPROVED ALTERATIONS THEREOF AND THAT ALL PROVISIONS OF DIVISION 1 OF TITLE 8 OF THE SAN DIEGO COUNTY CODE HAVE BEEN COMPLIED WITH.

R. I. MASSMAN
COUNTY ENGINEER
DATED 8-2-99 BY: [signature] FOR COUNTY ENGINEER

THIS MAP CONFORMS WITH THE REQUIREMENTS OF THE SUBDIVISION MAP ACT AND DIVISION 1 OF TITLE 8 OF THE SAN DIEGO COUNTY CODE.

R. I. MASSMAN
COUNTY ENGINEER
DATED 8-2-99 BY: [signature] FOR COUNTY ENGINEER

THIS MAP WAS PREPARED BY ME OR UNDER MY DIRECTION AND IS BASED UPON A FIELD SURVEY IN CONFORMANCE WITH THE REQUIREMENTS OF THE SUBDIVISION MAP ACT AT THE REQUEST OF Barry M. Rayton and Lynn E. Rayton, Leonard Bodaile and Carol Bodaile on 8-6-98. I HEREBY STATE THAT THE PARCEL MAP PROCEDURES OF THE LOCAL AGENCY HAVE BEEN COMPLIED WITH AND THAT THIS PARCEL MAP CONFORMS TO THE APPROVED TENTATIVE MAP AND THE CONDITIONS OF APPROVAL THEREOF WHICH WERE REQUIRED TO BE FULFILLED PRIOR TO THE FILING OF THE PARCEL MAP.

[signature] Sidney R. Hale, LS 5831
March 12, 1999
Date

FILE NO. 98-329210
FILED THIS 3 DAY OF August 19 99 AT 3:36 P.m.
IN BOOK OF PARCEL MAPS AT PAGE 7669
AT THE REQUEST OF Sidney R. Hale

HARLEY F. BLOOM
COUNTY RECORDER
BY: [signature] DEPUTY COUNTY RECORDER
FEE: $7.00

Note:
There is insufficient information shown on this survey to accurately show the location of said Old Survey #4.

Health Department Certification: M.D.P.M. No. 1083
This is to certify that an adequate potable water supply will be available to serve each parcel upon extension of necessary facilities.
However it may be necessary to make financial arrangements with the appropriate agency to have service provided to each lot or parcel.
Date: 11-16-77
J.R. PHILP M.D.
Director of Public Health
By: R. Quick / Steven R. Penn

Each parcel is approved for a standard septic tank connected to a field of 150 linear feet to serve a three bedroom dwelling. Provided the septic tank is not connected to any well, such as coming from Agent. This does not constitute approval for Commercial establishments.

* See Percolation tests under the name "Gary Taylor" (4-9-77)
Percolation Data Supplied By Brian Donald R.C.E. Same

Parcel 1 = 150 feet
Parcel 2 = 150 feet
Parcel 3 = 140 feet
} 100% Reserve

Steven R. Penn
11-16-77

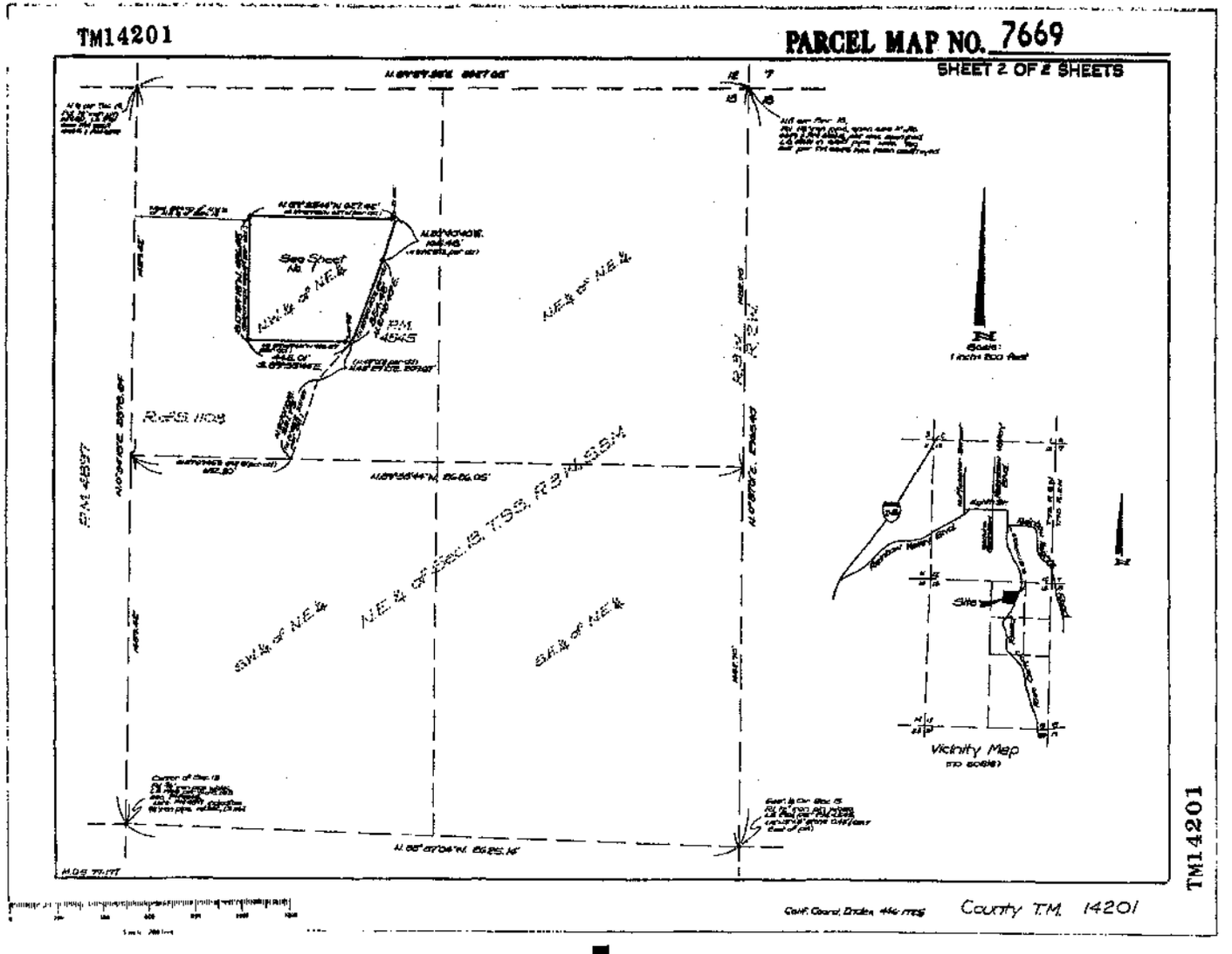
Note:
Access to subject property is by Rice Canyon Road which is a publicly maintained road. Only portions of Rice Canyon Road are known to have easements of record dedicated to the public for roadway purposes. Where not of record, widths are as specified by existing easements. North of Hwy 94 of 40 feet is assumed.

See Sheet No. 2 For Procedure of Survey & Vicinity Map

DALE COORD. INDEX 445-1785 (X) COUNTY TM 14201

TM14201

SDGE0253885



SDGE0253886

BOOK 3305 PAGE 313

RIGHT OF WAY

We, Frederick William Innes and Emma M. Innes

hereinafter called the "Grantor," for and in consideration of the sum of One Dollar, and other value received, do hereby grant to the San Diego Gas & Electric Company, a corporation, its successors and assigns, hereinafter called the "Grantee," the right, easement and privilege of placing, erecting, constructing, repairing, replacing, maintaining and using, for the transmission and distribution of electricity and for all purposes connected therewith, a line of poles with wires suspended thereon and all necessary and proper guys, anchorages, crossarms and braces and other fixtures for use in connection therewith, together with the right of ingress thereto and egress therefrom on and along said line, over and across the Grantor's land situate in the County of San Diego, State of California, and more particularly described as follows: The West 945.39 feet of the North 973.65 feet of the NW¼ of the NE¼ of Section 13, Township 9 South, Range 3 West, San Bernardino Meridian.

Also: That certain portion of the W½ of the NE¼ of said Section 13, described in Deed recorded in Book 1849 at Page 456, Official Records of said County of San Diego.

The route of said line of poles and wires across said land shall be as follows: Adjacent to the South line of said West 945.39 feet of the North 973.65 feet of said NW¼ of the NE¼ of Section 13.

Also: Beginning at a point on the Easterly line of the SW¼ of the NE¼ of Section 13, distant thereon, 1.5 feet Northerly from the Southeast corner thereof; thence from said point of beginning, North 89° 21' 10" West, 1457.9 feet; thence North 0° 32' 10" West, to the Northwesterly boundary line of said property described in the above mentioned Deed.

The Grantee is also hereby granted the right to trim any trees along said line of poles and wires whenever considered by it necessary for the proper operation and use of the rights hereby granted.

In Witness Whereof, the Grantor S executed these presents this 2nd day December, 1948

Executed in the Presence of:

Elaine E. Owen

Witness

Frederick William Innes

Emma M. Innes

DRAWN BY [illegible]
CHECKED BY [illegible]
SKETCHING S-1402C
JOB [illegible]

USE PROPER FORM ON BACK

SDGE0253887

BOOK 3305 PAGE 314

WITNESS FORM

STATE OF CALIFORNIA, County of San Diego } 780410045 9

On this [illegible] day of December A. D. 1948, before me, R. S. Ruffin, a Notary Public in and for the said County and State, residing therein, duly commissioned and sworn, personally appeared Oliver E. Owen, Jr. known to me to be the person whose name is subscribed to the within Instrument, as a Witness thereto, who being by me duly sworn, deposes and says: That he resides in San Diego, California and that he was present and saw Frederick William Innes & Edna M. Innes personally known to him to be the same person.s whose name s are subscribed to the within and annexed Instrument, execute and deliver the same, and they acknowledged to said affiant that they executed the same; and that said affiant subscribed his name thereto as a Witness.

In Witness Whereof, I have hereunto set my hand and affixed my official seal the day and year in this certificate first written.

R. S. Ruffin
Notary Public in and for the County of San Diego, State of California.

My Commission Expires [illegible]

GENERAL FORM

STATE OF ______ }
County of ______ } ss.

On this ____ day of ______ A.D. 19__, before me, ______ a Notary Public in and for the said County and State, residing therein, duly commissioned and sworn, personally appeared ______ personally known to me to be the person__ whose name ____ subscribed to the within Instrument, and duly acknowledged to me that __he__ executed the same.

In Witness Whereof, I have hereunto set my hand and affixed my official seal the day and year in this certificate first above written.

______
Notary Public in and for said County and State.

29647

RIGHT OF WAY

Frederick William Innes and Edna M. Innes

TO

SAN DIEGO GAS & ELECTRIC COMPANY

INDEXED

MICROFILMED

DOCUMENT NO. 70557A
RECORDED AT REQUEST OF [illegible]
AUG 11 1949
at 52 minutes past 10
BOOK 3305 PAGE 313
OFFICIAL RECORDS
SAN DIEGO COUNTY, California
[illegible] County Recorder

COMPARED

4/1/70

CORPORATION FORM

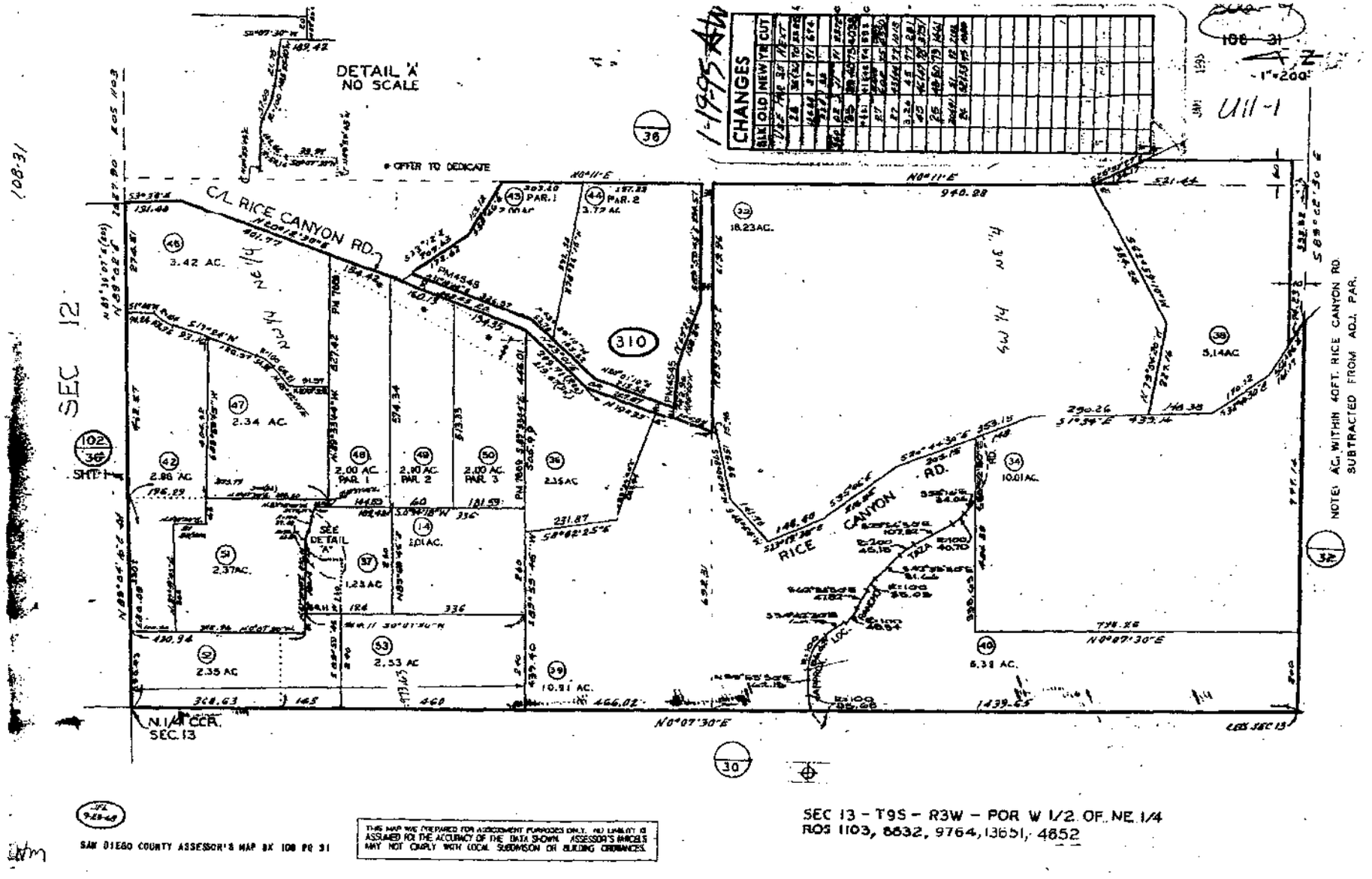
STATE OF ______ }
County of ______ } ss.

On this ____ day of ______ A.D. 19__, before me, ______ a Notary Public in and for the said County and State, residing therein, duly commissioned and sworn, personally appeared ______ known to me to be the ______ President and ______ known to me to be the ______ Secretary of the ______ the Corporation that executed the within Instrument, known to me to be the persons who executed the within Instrument, on behalf of the Corporation therein named, and acknowledged to me that such Corporation executed the same.

In Witness Whereof, I have hereunto set my hand and affixed my official seal the day and year in this certificate first above written.

______
Notary Public in and for said County and State.

SDGE0253888

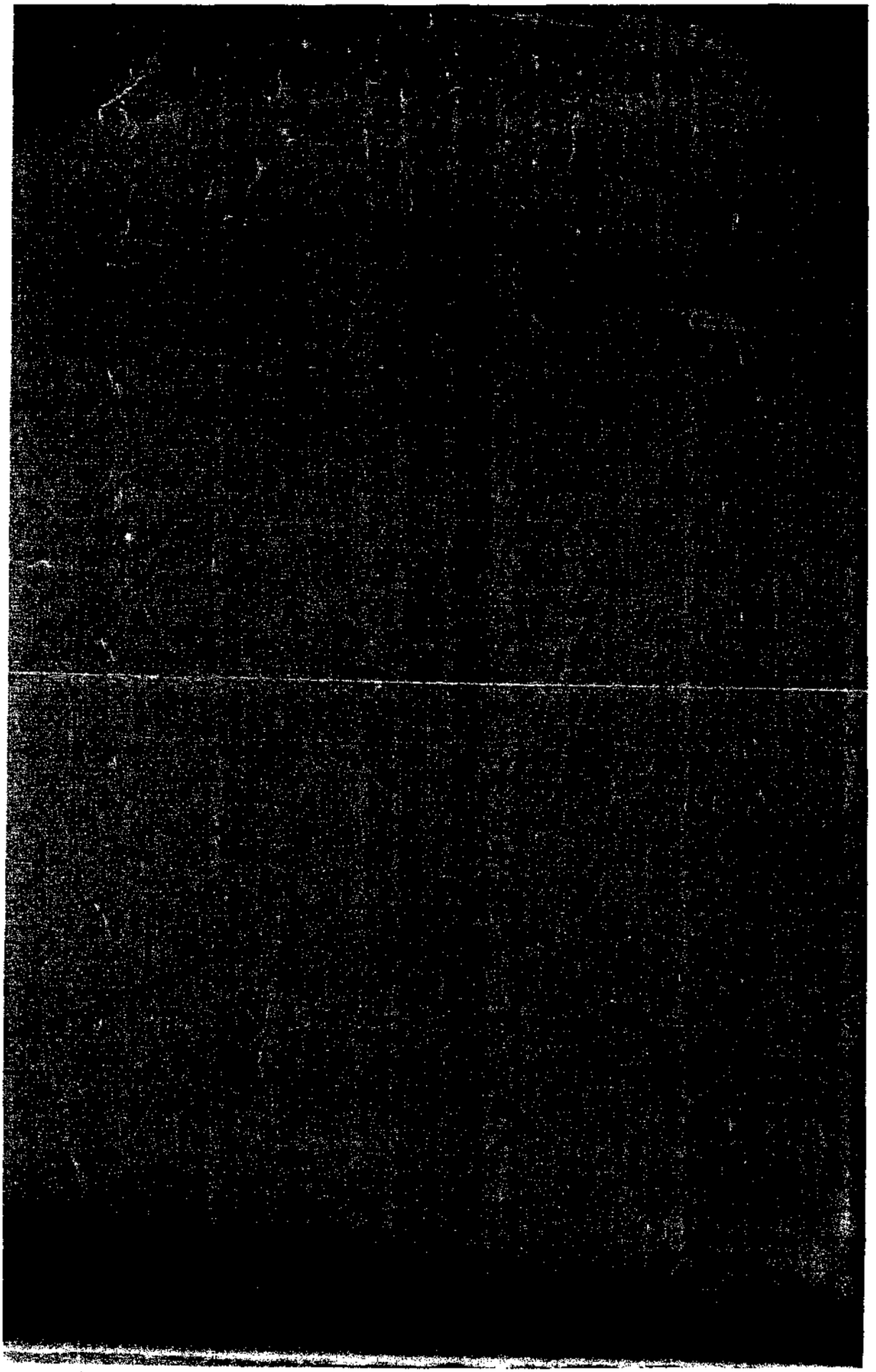


SAN DIEGO COUNTY ASSESSOR'S MAP BK 108 PG 31

THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY. NO LIABILITY IS ASSUMED FOR THE ACCURACY OF THE DATA SHOWN. ASSESSOR'S PARCELS MAY NOT COMPLY WITH LOCAL SUBDIVISION OR BUILDING ORDINANCES.

SEC 13 - T9S - R3W - POR W 1/2 OF NE 1/4
ROS 1103, 8832, 9764, 13651, 4852

SDGE0253889



RECORDING REQUESTED BY

MIGUEL A. MARTINEZ
L.S. 7443

WHEN RECORDED MAIL TO:

ALTA LAND SURVEYING, INC
1530 JAMACHA ROAD, SUITE E
EL CAJON, CA 92019

DOC # 2007-0549794

AUG 17, 2007 11:09 AM

OFFICIAL RECORDS
SAN DIEGO COUNTY RECORDER'S OFFICE
GREGORY J. SMITH, COUNTY RECORDER
FEES: 7.00
PAGES: 1

4383

2007-0549794

CERTIFICATE OF CORRECTION

PURSUANT TO SECTION 66469 OF THE SUBDIVISION MAP ACT, NOTICE IS GIVEN THAT PARCEL MAP NO. 19095, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY ON NOVEMBER 08, 2002 AS FILE NO. 2002-1001436, O.R., IS IN ERROR AND IS CORRECTED AS FOLLOWS IN ACCORDANCE WITH SECTION 66469 OF THE SUBDIVISION MAP ACTAS FOLLOWS:

SHEET 2 & 3 OF 6 SHEETS

1. ALL 2" X 24" IRON PIPES ARE SET WITH A DISC STAMPED "L.S. 7443" IN LIEU OF A DISC STAMPED "L.S. 5770" AS INDICATED ON SAID PARCEL MAP.

2. ALL 1/2" X 18" MONUMENTS ARE SET WITH A ½" X 18" IRON PIPE W/CAP STAMPED "L.S. 7443" IN LIEU OF A CAP STAMPED "R.C.E. 30582" AS INDICATED ON SAID PARCEL MAP.

I CERTIFY THAT THE FOLLOWING ARE THE NAMES OF ALL THE FEE OWNERS OF REAL PROPERTY REFLECTED ON THE DATE OF THE FILING OR RECORDING OF THE ORIGINAL RECORDED MAP.

JUSTINE B. FENTON, TRUST, AS OWNER

CERTIFICATE OF SURVEYOR

I FURTHER CERTIFY THAT THE ABOVE CERTIFICATE OF CORRECTION WAS PREPARED BY ME OR UNDER THE DIRECTION AND CONTROL OF THE UNDERSIGNED REGISTERED CIVIL ENGINEER OR LICENSED LAND SURVEYOR.

PROFESSIONAL LAND SURVEYOR
MIGUEL A. MARTINEZ
L.S. 7443
Exp. 06/30/08
STATE OF CALIFORNIA

07/12/07

MIGUEL A. MARTINEZ
L/S. 7443, LIC. EXP. 06/30/08

I, TERRENCE T. CONNORS, COUNTY SURVEYOR OF THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, CERTIFY THAT I HAVE EXAMINED THE FOREGOING CERTIFICATE OF CORRECTION AND FIND THAT THE ONLY CHANGES SHOWN HEREON ARE CHANGES PROVIDED FOR BY SECTION 66469 OF THE SUBDIVISION MAP ACT.

LICENSED LAND SURVEYOR
TERRENCE T. CONNORS
5099
Expires 6/30/0
STATE OF CALIFORNIA

TERRENCE T. CONNORS
COUNTY SURVEYOR
L.S. 5099, LIC. EXP. 06/30/09 BY: _____ DATE 08/13/07 FEE: _____

1 OF 1

16300C.doc

SDGE0253891

#65

BULK POWER SDGE **SYSTEM REPORT**

A Sempra Energy utility

Sunday, October 21, 2007

ITEMS OF INTEREST:

Nothing to report

FORCED INTERRUPTIONS:

TL:	637
TERMINALS:	Santa Ysabel - Creelman
SUB/S INTERRUPTED:	None
TIME OCCURRED:	0853, 1122, 1223, 1525
TIME FAC. RESTORED:	0853, 1122, 1223, 1525
CAUSE:	Undetermined / High winds reported/ To be patrolled.
TRIPS AND TARGETS:	
ST	3 Trips & reclosed; SEL121F ZN 1 PH, SEL167 ZN 1 PH
CRE	ITH 1, 2, 3

TL:	50001
TERMINALS:	Imperial Valley - Miguel
SUB/S INTERRUPTED:	None
TIME OCCURRED:	1215
TIME FAC. RESTORED:	2400 (In progress)
CAUSE:	Fire retardant drop needed for fire under TL 50001
TRIPS AND TARGETS:	None, cleared for safety

TL:	637
TERMINALS:	Santa Ysabel - Creelman
SUB/S INTERRUPTED:	None
TIME OCCURRED:	1527
TIME FAC. RESTORED:	2400 (In progress)
CAUSE:	Undetermined / High winds reported/ To be patrolled.
TRIPS AND TARGETS:	None, opened for safety

#66

BULK POWER SDGE **SYSTEM REPORT**

A Sempra Energy utility

Sunday, October 21, 2007

ITEMS OF INTEREST:

Nothing to report

FORCED INTERRUPTIONS:

TL:	637
TERMINALS:	Santa Ysabel - Creelman
SUB/S INTERRUPTED:	None
TIME OCCURRED:	0853, 1122, 1223, 1525
TIME FAC. RESTORED:	0853, 1122, 1223, 1525
CAUSE:	Undetermined / High winds reported/ To be patrolled.
TRIPS AND TARGETS:	
ST	3 Trips & reclosed; SEL121F ZN 1 PH, SEL167 ZN 1 PH
CRE	ITH 1, 2, 3

TL:	50001
TERMINALS:	Imperial Valley - Miguel
SUB/S INTERRUPTED:	None
TIME OCCURRED:	1215
TIME FAC. RESTORED:	2400 (In progress)
CAUSE:	Fire retardant drop needed for fire under TL 50001
TRIPS AND TARGETS:	None, cleared for safety

TL:	637
TERMINALS:	Santa Ysabel - Creelman
SUB/S INTERRUPTED:	None
TIME OCCURRED:	1527
TIME FAC. RESTORED:	2400 (In progress)
CAUSE:	Undetermined / High winds reported/ To be patrolled.
TRIPS AND TARGETS:	None, opened for safety

Yellow highlight indicates change since last publication.

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1. PURPOSE

This Standard Operating Procedure outlines the notification and safety procedures required when the Weather Service issues a red flag fire warning for CDF areas within SDG&E's service territory (see Appendix 1).

2. REFERENCES

COM8009 - 900 MHz Radio System

ESP 109 – Hazardous Fire Conditions

RPT6005 – Bulk Power Systems Operations Report

3. DEFINITIONS

3.1. BPOR – Bulk Power Operations Report

3.2. CAISO – California Independent System Operator

3.3. CDF – California Department of Forestry

3.4. DCC WF – Distribution Control Center Working Foreman

3.5. DCC – Distribution Control Center

3.6. GCC – Grid Control Center

3.7. OSS – SDG&E Operations Shift Supervisor

3.8. TSO – SDG&E Transmission System Operator

4. CONTACT NUMBERS

The following phone numbers are for fire purposes only and should only be given to personnel related to this procedure.

4.1. SDG&E Contacts

Contact for emergencies:
Operations Shift Supervisor (24 hours)

Contact for all routine switching operations:
Transmission System Operator (24 hours)

Primary SDG&E Fire Coordinator:
[redacted]

Alternate SDG&E Fire Coordinators:
[redacted]

[redacted]

[redacted]

4.2. CDF Contacts

Emergency Command Center (ECC)/CDF Dispatcher

CDF Battalion Chief [redacted]

Los Pinos Lookout Station

[redacted]

5. GENERAL

5.1. The **Red Flag Warning** is implemented by the Weather Service when hot and dry weather conditions are accompanied by sustained winds above 25 mph and thus increasing fire danger in wild land areas. All notification procedures and safety procedures must be implemented as outlined later in this document.

5.2. The CDF Dispatcher will notify the SDG&E Fire Coordinator who in turn will notify the OSS when a Red Flag Fire Warning is issued that will effect company operations. The OSS is responsible for alerting designated company employees and the CAISO of an impending warning so that they may notify personnel in their area to take appropriate precautionary measures as described in the "safety procedures" section of this document.

5.3. Red Flag Fire Warnings issued by the Weather Service will usually be effective for the day of the warning only. Normal activities may resume in the designated fire areas following the warning period unless the initially declared fire warning remains in effect.

5.4. All incorporated areas, within SDG&E's service territory, are excluded from the safety procedures specified in this procedure.

6. NOTIFICATIONS

The following notification procedures apply during all hours (including weekends and holidays).

6.1. The CDF will notify the SDG&E Fire Coordinator who in turn will notify the OSS by 1500 on the day prior to the forecasted Red Flag Fire Warning. However, notification may occur at any time.

6.2. The OSS or TSO will make notifications to the following personnel:

6.2.1. Gas Control Center - Spence Street, Los Angeles, CA

6.2.1.1. Supervisor: [redacted] or

6.2.1.2. Dispatcher: [redacted]

6.2.2. CAISO Dispatchers

6.2.2.1. Alhambra: [redacted] and/or

6.2.2.2. Folsom: [redacted]

6.2.3. Distribution Control Center personnel (If DCC WF or DCC is notified it is his/her responsibility to notify Distribution Operations management personnel).

6.2.4. Station Y, Service Dispatching personnel: [redacted]

6.3. The OSS or TSO will send a page/email notification via the SDG&E web-based Pager System (http://pager.sempra.com/) to the "Fire Warning" distribution list. This notice should include detailed information as follows:

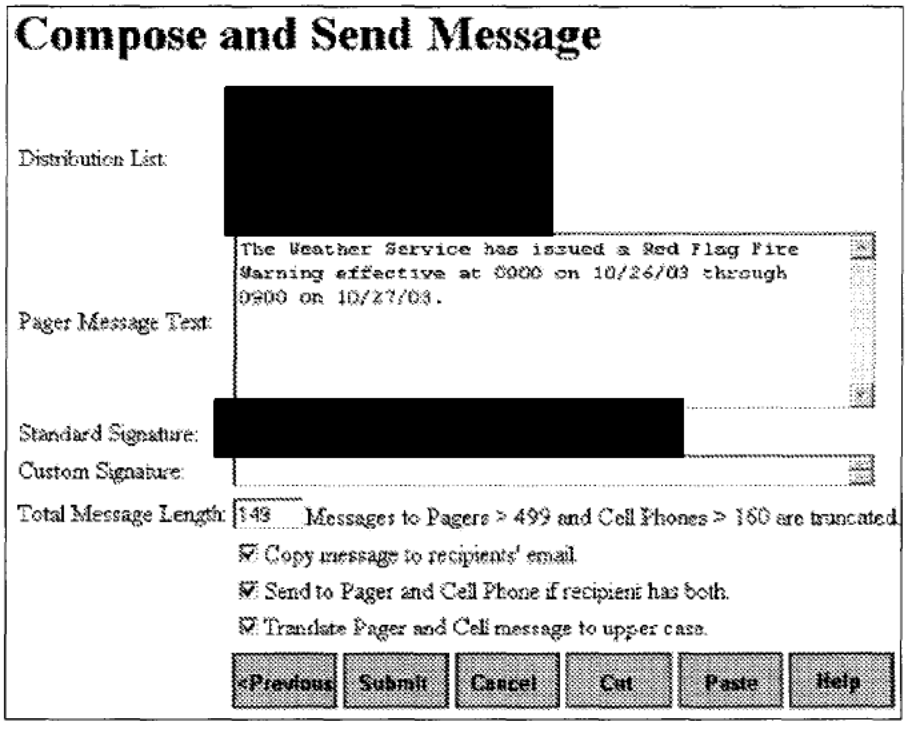
6.3.1. Date Red Flag Fire Warning is in effect.

6.3.2. Time Red Flag Fire Warning is effective and projected time to be terminated.

Sample message:

The Weather Service has issued a Red Flag Fire Warning effective at 0900 on 10/26/03 through 0900 on 10/27/03.

6.3.3. The three check boxes under **Total Message Length** should be checked.



The blast pager system transmits pager messages directly to the pager and cell phone carriers via the Internet. After sending a Red Flag Fire Warning using the blast pager site, the system will email the sender a "Pager System Audit Journal" which contains the message and the list of recipients along with an indication if the message to each recipient was accepted for transmission by the carrier.

6.3.4. If the primary pager system is not available (or does not display any web pages), the following backup systems are available:

6.3.4.1. The backup blast pager website is accessible at http://pagerbackup.sempra.com/. This site is available 24 hours a day, 7 times a week, and is completely independent of the primary pager system.

6.3.4.2. In the event of a major Sempra network outage, the backup blast pager website is accessible via any Internet connection using the Disaster Recovery (DR) web site address: http://pagerdr.sempra.com/. You will need to log in with your Windows network user ID and password, which is the same login information that you use to start up your workstation.

6.3.5. If both the primary and backup pager systems are not available, use the OSS phone system to make the notifications to:

6.3.5.1. Distribution Operations

6.3.5.2. Station Y

6.3.5.3. Emergency Services On-Duty Pager

6.3.5.4. Field crews working under GC authorization

6.4. Department Managers/Supervisors or their designated alternates are responsible for notifying affected personnel within their organization regarding the Red Flag Fire Warning.

6.5. A Red Flag Fire Warning shall be included in the BPOR under "Items of Interest" for the days when the warning is in effect. Refer to RPT6005: Bulk Power Systems Operations Report for more information.

7. 900 MHZ RADIO ANNOUNCEMENTS

Station Y Service Dispatching will initiate the "Fleet Wide Call (group call)" procedure to broadcast the Red Flag Fire Warning notice. Refer to COM8009: 900 MHz Radio System for detailed instructions on transmitting a Fleet Wide Call.

7.1. When notification of a Red Flag Fire Warning is given the day prior to the effective day, a broadcast will be made by 1600 on the notification day and also at 0800 on the day of the alert.

7.2. If the Red Flag Fire Warning is declared for multiple days, the Fleet Wide Call will be broadcast each morning at 0800, each day the Red Flag Fire Warning is in effect.

7.3. When notification is received on the day of the Red Flag Fire Warning, the broadcast will be made at the time of notification.

7.4. The announcement should include the following information:

7.4.1. Geographic description of the CDF area affected.

7.4.2. Date the Red Flag Fire Warning is effective.

7.4.3. Duration of the Red Flag Fire Warning (normally for 24 hours beginning at 0800 on the next day).

Sample Message:

– Station Y to all units. A Red Flag Fire Warning will be in effect from XXXX (begin time) through XXXX (end time) on DD/MM/YY. All of the company designated fire hazard areas will be effected.

7.4.4. The message will be repeated twice within 30 minutes, via the "Fleet Wide Call" procedure.

8. SAFETY PROCEDURES

Transmission lines and/or distribution circuits, which have tripped to lockout, will NOT be tested manually or remotely (see exception below) until the line or line segment has been patrolled or the cause of the interruption has been identified and isolated, or repaired. A line patrol is also required prior to replacing sectionalizing or transformer station fuses that have blown.

Exception: A transmission line may be tested, one time only, if the loss of another transmission facility could lead to system instability or cascading outages.

8.1. Customer outage time should be held to a minimum by sectionalizing, patrolling, and energizing segments of the circuit.

8.2. During a Red Flag Warning:

8.2.1. A fire guard will be assigned to any operation that could cause a fire.

8.2.2. No open burning will be permitted.

8.2.3. All fires will be extinguished.

8.2.4. All non-critical tree pruning and removal activities will cease. Permission may be obtained to continue tree-related work by contacting the Area Forester, Contract Administrator, System Forester, Vegetation Program Manager, or the

Fire Coordinator. Approval will be granted on a case-by-case basis, depending on the situation.

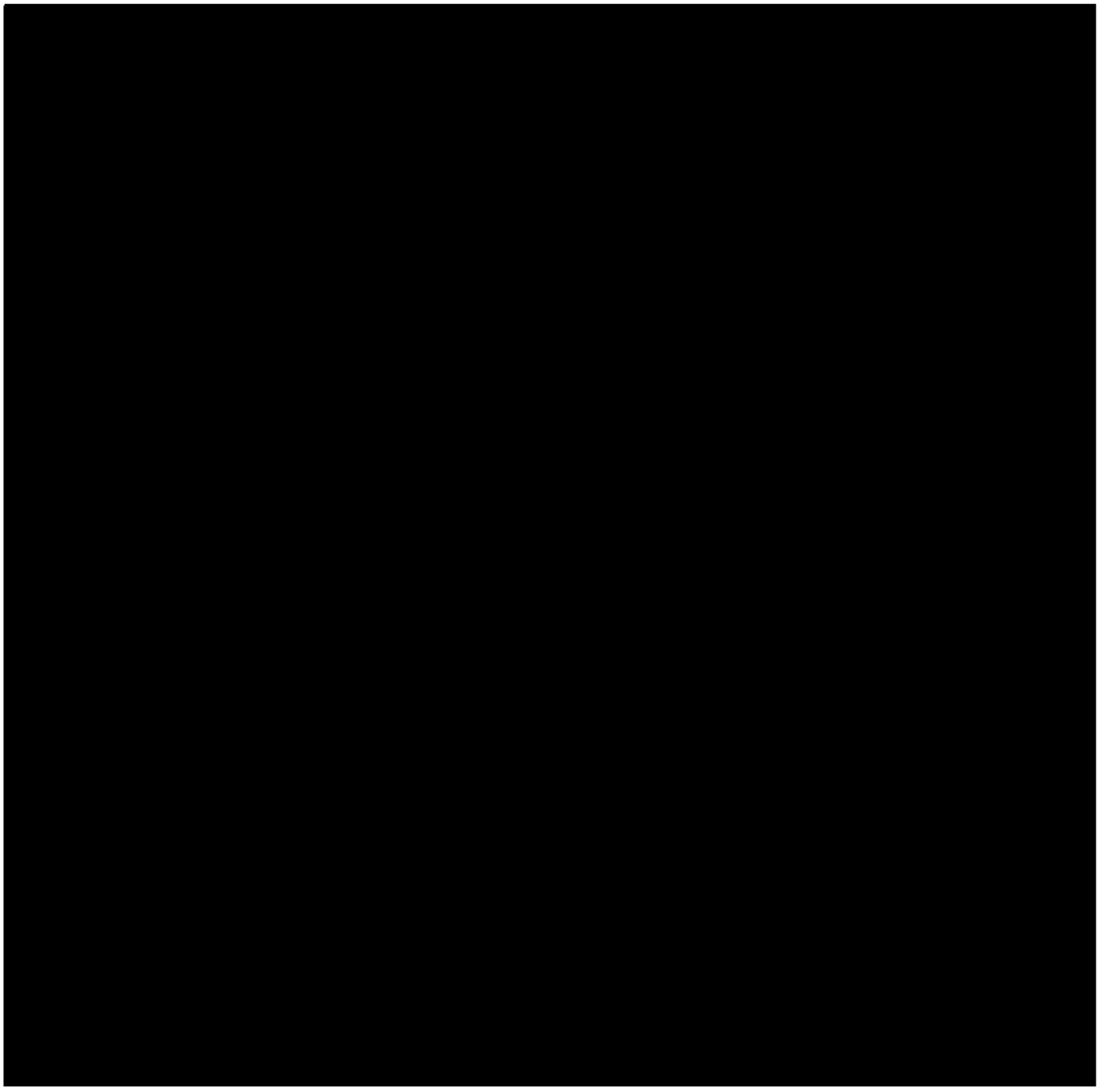
8.2.5. All blasting will be discontinued.

8.2.6. All welding will discontinue, except in enclosed buildings or within areas cleared of all flammable material for a radius of 15 feet.

8.2.7. Vehicular travel will be restricted to cleared roads except in case of an emergency. In no case will vehicles with hot exhaust systems be driven over or parked in grassy areas.

8.2.8. Smoking will not be permitted.

9. APPENDIX 1: DESIGNATED FIRE HAZARD ZONE (SHADED AREA)



10. APPENDIX 2: TIE LINES AND SUBSTATIONS WITHIN THE RED FLAG FIRE AREA

Tie Line	Tie Line Terminals in Red Flag Area	Substations in Red Flag Area
[redacted]		

Tie Line	Tie Line Terminals in Red Flag Area	Substations in Red Flag Area
[redacted]		[redacted]
		[redacted]

DOCUMENT OWNERSHIP

	Name	Date
REVISED BY: Business Analyst – Grid Operations	[redacted]	12/14/06
REVIEWED BY: CDF Battalion Chief		12/18/06
REVIEWED BY: SDG&E Fire Coordinator		12/18/06
REVIEWED BY: Team Lead Training - Grid Control		12/18/06
REVIEWED BY: EMS Project Coordinator - Grid Control		12/26/06
REVIEWED BY: Team Lead Technical Support - Grid Control		12/27/06
APPROVED BY: Chief Operations Manager - Grid Control		12/27/06
ISSUED BY: Business Analyst - Grid Operations		12/27/06
DOCUMENT ISSUE DATES: 2/7/00, 1/4/02, 8/14/02, 9/9/03, 12/01/03, 8/18/04, 12/27/06		

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1. PURPOSE

This Standard Operating Procedure outlines the notification and operating restrictions required during varying levels of Fire Conditions, such as when the National Weather Service issues a Red Flag Warning. The restrictions outlined in this procedure will apply to the SDG&E 2008 Highest Fire Risk Areas or the SDG&E Wildland Fire Area as specified below. These areas and zones are within SDG&E's service territory, excluding facilities in Imperial Valley. This procedure will be reviewed and updated annually, by July 1st.

2. REFERENCES

COM8009 – 900 MHz Radio System

NERC Standard PER-001-0 – Operating Personnel Responsibility and Authority

RPT6005 – Bulk Power Systems Operations Report

TMC1000 – System Operator Responsibility and Authority

TMC1010 – Transmission System Fault-Testing

3. DEFINITIONS

3.1. BPOR – Bulk Power System Operations Report

3.2. C&O – Construction & Operations

3.3. CAISO – California Independent System Operator

3.4. CAL FIRE – California Department of Forestry and Fire Protection

3.5. CB – Circuit Breaker

3.6. DCC – SDG&E's Distribution Control Center (distribution control only)

3.7. DSO – SDG&E Distribution System Operator

3.8. EDO – SDG&E Electric Distribution Operations Department

3.9. EDO WF – SDG&E Electric Distribution Operations Working Foreman

3.10. FC – Fire Coordinator or designee

3.11. Fire Condition GREEN (Normal Operating Condition) – Seasonal Fire Condition based on live fuel moisture > 75%.

3.12. Fire Condition YELLOW (Elevated Fire Condition) – Seasonal Fire Condition based on live fuel moisture <= 75%.

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3.13. Fire Condition RED (Red Flag Warning) – Short-term Fire Condition based on NWS notification.

3.14. GC – SDG&E Grid Control Section

3.15. GCC – SDG&E's Transmission Grid Control Center (transmission control only)

3.16. KM&O – SDG&E's Kearny Maintenance and Operations Department

3.17. NWS – National Weather Service

3.18. OSS – SDG&E Grid Control Operations Shift Supervisor

3.19. RFW – Red Flag Warning – The NWS will declare an RFW when the relative humidity is ≤ 15% with sustained winds of ≥ 25 mph and/or frequent wind gusts of ≥ 35 mph for a duration ≥ 6 hours; or the relative humidity is ≤ 10% for a duration ≥ 10 hours, regardless of wind.

3.20. SCADA – Supervisory Control and Data Acquisition system

3.21. SR – Service Restorer

3.22. SWI - Switch

3.23. TSO – SDG&E Transmission System Operator

3.24. TST – SDG&E Electric Distribution Operations Technical Support Team

4. GENERAL

4.1. This procedure implements specific actions to be taken for the 69kV and below transmission and distribution systems during Fire Conditions within SDG&E's service territory, excluding Imperial County. These actions are staged in various Fire Conditions in order to balance electrical reliability to customers with the risks associated with Fire Conditions. All notification procedures and operating restrictions must be implemented as outlined in this document unless modified by the SDG&E FC during the event.

4.2. Fire Conditions may be implemented independently or the fire situation may escalate or de-escalate between various Fire Conditions.

4.3. The SDG&E FC will declare when SDG&E Fire Conditions GREEN or YELLOW begin and end. The NWS will declare Red Flag Warnings that will initiate SDG&E Fire Condition RED.

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4.4. The Fire Conditions are:

4.4.1. Fire Condition GREEN (Normal Operating Condition)

4.4.1.1. This level is declared when live fuel moisture is > 75% as identified by CAL FIRE and confirmed by the SDG&E FC.

4.4.2. Fire Condition YELLOW (Elevated Fire Condition)

4.4.2.1. This level is declared when live fuel moisture is <= 75% as identified by CAL FIRE and confirmed by the SDG&E FC.

4.4.3. Fire Condition RED (Red Flag Warning)

4.4.3.1. This level is declared when the NWS declares an RFW for SDG&E's service territory.

4.4.3.2. An RFW issued by the NWS will specify the effective period and will end following the expiration of the initial warning period unless the fire warning is extended by the NWS for a longer period.

4.4.3.3. The OSS or EDO Management may consult with the SDG&E FC to determine if weather conditions exist that may allow testing of equipment without patrolling even if an RFW has been declared by the NWS. Example: In the past, there have been times when an RFW has been issued and some parts of the SDG&E service territory are experiencing rain.

4.5. Actions necessary during Fire Condition RED are listed below. Any exception to these actions must be approved by the SDG&E FC:

4.5.1. A fire guard will be assigned to any operation that could cause a fire.

4.5.2. All non-critical tree pruning and removal activities will cease (hand pruning activities are permissible).

4.5.3. All blasting will be discontinued.

4.5.4. All welding and grinding will discontinue except in enclosed buildings or within areas cleared of all flammable material for a radius of 15 feet.

4.5.5. Vehicular travel will be restricted to cleared roads except in case of an emergency. In no case will vehicles with hot exhaust systems be driven over or parked in grassy areas.

4.5.6. Smoking will not be permitted.

4.6. The OSS is responsible for alerting designated company employees and the CAISO of impending Fire Conditions so that they may notify personnel in their area to take appropriate precautionary measures (See NOTIFICATIONS).

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4.7. SDG&E has also identified two specific geographic regions for which Fire Condition levels apply. These are:

4.7.1. SDG&E 2008 Highest Fire Risk Areas. These areas were identified by the SDG&E FC using CAL FIRE fuel ranking and fire history information. Operating restrictions will apply in these areas whenever SDG&E is in Fire Condition YELLOW or Fire Condition RED. (See Appendix 1)

4.7.2. SDG&E Wildland Fire Area. This area was identified by modifying CAL FIRE Hazard Severity Zone data. It covers much of SDG&E's service territory. Operating restrictions will apply in this area during Fire Condition RED. (See Appendix 2) Note: SDG&E 2008 Highest Fire Risk Areas are also part of the SDG&E Wildland Fire Area.

Refer to specific operations sections for further directions.

5. CONTACTS

All phone numbers listed below are for use as outlined in this procedure only. Under no circumstances are these phone numbers to be used for any other purpose or distributed without prior permission of management.

SDG&E

Transmission (Grid) Operations: For **unscheduled** or **emergency** switching operations:	
Operations Shift Supervisor (24 hours)	[redacted]
Facsimile	
Email	
Transmission (Grid) Operations: For all **routine** switching operations:	
Transmission System Operator (24 hours)	[redacted]
Facsimile	
Email	
Distribution Operations Contacts	
STA A DSO - 24 hours	[redacted]
STA L DSO – 24 hours	
STA A & STA L – FAX	
EDO WF	
TST	

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SDG&E Fire Coordinator 1	
Hal Mortier	[redacted]
SDG&E Fire Coordinator 2	
[redacted]	[redacted]
Alternate SDG&E Fire Coordinator	
[redacted]	[redacted]

CAL FIRE

Monte Vista Emergency Command Center (ECC) CAL FIRE Dispatcher	[redacted]
Los Pinos Lookout Station	

NWS Forecast Office – San Diego

[redacted] Fire Weather focal point	[redacted]
[redacted] Assistant Fire Weather focal point	
[redacted]	
[redacted]	
[redacted] – Liaison with Users	
[redacted] Meteorologist In Charge	

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6. NOTIFICATIONS

The following notification procedures apply during all hours (including weekends and holidays). The notification will clearly identify the Fire Condition level so that personnel may take appropriate actions.

6.1. There are two main categories of notifications: long term, staying in effect for months (Fire Condition GREEN and Fire Condition YELLOW); and short term, changing as weather conditions change (Fire Condition RED).

6.2. Anytime a Fire Condition changes, the OSS will make a blast pager notification.

6.3. The OSS or TSO will make all notifications to the following personnel:

6.3.1. Distribution Control Center personnel:

6.3.1.1. TST [redacted], or

6.3.1.2. EDO WF: [redacted]

It is the responsibility of the TST, EDO WF or DSO to notify Distribution Operations management personnel.

6.3.2. Gas Control Center - Spence Street, Los Angeles, CA

6.3.2.1. Supervisor: [redacted], or

6.3.2.2. Dispatcher: [redacted]

6.3.3. CAISO Dispatchers

6.3.3.1. Folsom: [redacted], or

6.3.3.2. Alhambra: [redacted]

6.3.4. Station Y, Service Dispatch: [redacted]

6.4. As a back-up to this notification process, Distribution Operations and SDG&E FC personnel will contact the OSS as soon as they become aware of a Fire Condition change if they have not yet received the OSS blast pager message (as defined in the next paragraph).

6.5. The OSS or TSO will send a page/email notification via the SDG&E web-based Pager System (http://pager.sempra.com/) (click box "Page An Employee", then radio button "Select from Pager System Distribution Lists") to the "SDGE Fire Conditions Notifications" distribution list any time a declared Fire Condition changes. This notice shall include detailed information as follows:

6.5.1. Fire Condition Level [specify color] (e.g. GREEN, YELLOW, or RED)

6.5.2. Date the Fire Condition is in effect.

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6.5.3. Time the Fire Condition is effective and projected time to be terminated if available.

6.5.4. Due to blast pager limitations, text needs to be limited to 160 characters, including spaces and signature.

6.5.4.1. Sample Message – for initiating a seasonal Fire Condition **YELLOW**:

Fire Condition YELLOW effective 0900 on 07/01/08 until rescinded. Operating restrictions apply in SDG&E Highest Fire Risk Areas.

6.5.4.2. Sample Message – for initiating a Fire Condition **RED**:

Fire Condition RED (Red Flag Warning) effective 0900 on 10/26/08 thru 0900 on 10/27/08. Operating restrictions apply in Wildland Fire Area. (Include end time if known)

6.5.4.3. Sample Message – for terminating a Fire Condition RED when Fire Condition YELLOW previously declared:

Fire Condition RED terminated at 0900 on 10/27/08. Fire Condition YELLOW (Elevated Fire Condition) in effect until rescinded.

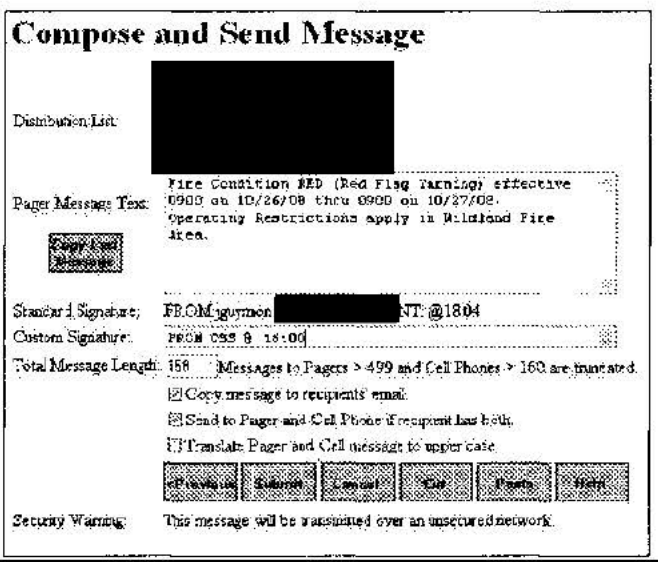
6.5.4.4. Sample Message – for terminating a Fire Condition RED when Fire Condition GREEN previously declared:

Fire Condition RED terminated at 0900 on 03/10/09. Fire Condition GREEN (Normal Operating Conditions) in effect until rescinded.

6.5.4.5. Sample Message – for terminating a Fire Condition YELLOW:

Fire Condition YELLOW terminated effective 0900 on 12/01/08. Fire Condition GREEN (Normal Operating Conditions) in effect until rescinded.

6.5.5. The first two check boxes under **Total Message Length** should be checked.



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The blast pager system transmits pager messages directly to the pager and cell phone carriers via the Internet and email. After sending an alert using the blast pager site, the system will email the sender a "Pager System Audit Journal" which contains the message and the list of recipients along with an indication if the message to each recipient was accepted for transmission by the carrier.

6.5.6. If the primary pager system is not available (or does not display any web pages), the following backup systems are available:

6.5.6.1. The backup blast pager website is accessible at http://pagerdr.sempra.com/. This site is available 24 hours a day, 7 days per week, and is completely independent of the primary pager system. In the event of a major Sempra network outage, the backup blast pager website is accessible via any Internet connection using the same web site address. When you access this site via the Internet, will need to log in with your Windows network user ID and password, which is the same login information that you use to start up your workstation.

6.5.7. If both the primary and backup pager systems are not available, use the OSS phone system to make the notifications to:

6.5.7.1. Emergency Services On-Duty Pager

6.5.7.2. Field crews working under GC authorization

6.6. Department Managers/Supervisors or their designated alternates are responsible for notifying affected personnel within their organization regarding all Fire Condition notifications.

6.7. Enter any change to a Fire Condition in the BPOR under "*Items of Interest*" for the days when the warning is in effect or has been terminated. Refer to RPT6005: Bulk Power Systems Operations Report for more information.

7. 900 MHZ RADIO ANNOUNCEMENTS

Station Y Service Dispatching will initiate the "Fleet Wide Call (group call)" procedure to broadcast the Fire Condition notice. Refer to COM8009: 900 MHz Radio System for detailed instructions on transmitting a Fleet Wide Call.

7.1. When notification of a change in Fire Condition state is given the day prior to the effective day, a broadcast will be made by 1600 on the notification day and also at 0800 on the day of the alert.

7.2. If a Fire Condition RED is declared for multiple days, the Fleet Wide Call will be broadcast each morning at 0800 each day a Fire Condition RED is in effect.

7.3. When notification is received on the day of a Fire Condition RED, the broadcast will be made immediately upon receiving notification.

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7.4. The announcement shall include the following information:

7.4.1. Fire Condition Level [specify color] (e.g. GREEN, YELLOW, or RED)

7.4.2. Date the Fire Condition is in effect.

7.4.3. Time the Fire Condition is effective and projected time to be terminated if available.

7.4.3.1. Sample Message – for initiating a seasonal Fire Condition YELLOW:

Station Y to all units: The SDG&E Fire Coordinator has declared the start of the Fire Condition YELLOW (Elevated Fire Condition) effective HH:mm on MM/DD/YY until rescinded. Operating restrictions apply in the SDG&E 2008 Highest Fire Risk Areas.

7.4.3.2. Sample Message – for initiating a Fire Condition RED:

Station Y to all units. The National Weather Service has declared a Red Flag Warning. Therefore Fire Condition RED (Red Flag Warning) will be in effect from HH:mm on MM/DD/YY thru HH:mm on MM/DD/YY. Operating restrictions apply in SDG&E Wildland Fire Area. (Include end time if known)

7.4.3.3. Sample Message – for terminating a Fire Condition RED when Fire Condition YELLOW previously declared:

Station Y to all units. The SDG&E Fire Coordinator has terminated the Fire Condition RED effective HH:mm on MM/DD/YY. Fire Condition YELLOW (Elevated Fire Condition) is in effect until further notice. Operating restrictions apply in the SDG&E 2008 Highest Fire Risk Areas.

7.4.3.4. Sample Message – for terminating a Fire Condition RED when Fire Condition GREEN previously declared:

Station Y to all units. The SDG&E Fire Coordinator has terminated the Fire Condition RED effecting HH:mm on MM/DD/YY. Fire Condition GREEN (Normal Operating Conditions) is in effect until further notice.

7.4.3.5. Sample Message – for terminating seasonal Fire Condition YELLOW:

Station Y to all units. The SDG&E Fire Coordinator has terminated the Fire Condition YELLOW season effective HH:mm on MM/DD/YY. Fire Condition GREEN (Normal Operating Conditions) is in effect until further notice.

7.4.4. The message will be repeated twice within 30 minutes, via the "Fleet Wide Call" procedure.

8. FIELD COORDINATION

8.1. The OSS is responsible for clarifying patrol and repair priorities for the field personnel based upon the seriousness of the impacts to the transmission system (e.g. system

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security, substations out of service, etc.). The OSS will coordinate with EDO to establish priorities based on system needs.

8.1.1. Grid Control and/or Distribution Operations will request the staging of field personnel and/or equipment in advance of outages depending on:

8.1.1.1. The Fire Condition and the potential for equipment/customer outages

8.1.1.2. The priorities set by the OSS

8.1.1.3. The current operating or fire situation.

9. TRANSMISSION PROCEDURES

The following operating procedures shall be followed by Grid Control for the 69kV transmission system during the following Fire Conditions. **However, transmission operating personnel still have the responsibility and authority to implement real-time actions to ensure the stable and reliable operation of the Bulk Electric System** (Refer to TMC1000 and NERC PER-001-0, R1).

NOTE: Regardless of the Fire Condition, a transmission line may be tested, **one time only**, if the loss of another transmission facility could lead to system instability, uncontrolled separation, or cascading outages **(Refer to TMC1000)**.

9.1. Fire Condition GREEN (Normal Operating Condition)

9.1.1. Normal recloser and line testing operation. (See TMC1010).

9.2. Fire Condition YELLOW (Elevated Fire Condition)

9.2.1. The following applies to the **SDG&E 2008 Highest Fire Risk Areas**.

9.2.2. Once Fire Condition YELLOW is declared, **all but one recloser**, is to be turned off on each 69kV transmission line in these areas. (See Appendix 4 and its exception.)

9.2.2.1. SCADA controlled reclosers will be turned off via SCADA. Non-SCADA controlled reclosers will be turned off via field personnel.

9.2.3. If a 69kV transmission line in this area trips and recloses:

9.2.3.1. Turn off the remaining SCADA controlled recloser on that line.

9.2.3.2. Patrol the transmission line.

9.2.3.2.1. If the cause is identified and repaired, or undetermined, turn the single recloser on.

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9.2.4. If a 69kV transmission line in this area trips, recloses, and trips again:

9.2.4.1. Patrol the transmission line or line section to an open SWI.

9.2.4.1.1. The line or line section to an open SWI can be tested, if the cause is identified and repaired, or undetermined. If it remains energized, turn the single recloser on.

9.3. Fire Condition RED (Red Flag Warning)

9.3.1. The following applies to the **SDG&E Wildland Fire Area**, covering much of SDG&E's service territory. (See Appendix 5.)

9.3.2. Turn off **all** 69kV reclosers in this area.

9.3.2.1. SCADA controlled reclosers will be turned off via SCADA. Non-SCADA controlled reclosers will be turned off via field personnel.

9.3.3. If a 69kV transmission line in this area trips:

9.3.3.1. **Do not test** the transmission line.

9.3.3.2. Patrol the transmission line.

9.3.3.3. The line or line section to an open SWI can be tested after a patrol, if the cause is identified and repaired, or undetermined.

9.3.4. When Condition RED is terminated, reclosers will be returned to the status specified for the new Fire Condition (YELLOW or GREEN).

10. DISTRIBUTION PROCEDURES

The following operating procedures shall be followed by EDO during the following fire condition. Distribution System Operators still have the responsibility and authority to implement real-time actions to ensure the stable and reliable operation of the Distribution Electric System (Refer to DOP1001)

10.1. Fire Condition GREEN (Normal Operating Condition)

10.1.1. Multiple Recloser Operation Permitted

10.2. Fire Condition Yellow (Elevated Fire Condition)

At the start of Fire Condition YELLOW, the reclosing relays will be modified on specified circuits located in the SDG&E 2008 Highest Fire Risk Areas.

10.2.1. SCADA controlled CBs with SEL relays will be modified to allow the reclosing relay to reclose one time (second reclose and timer is disabled.)

10.2.2. SCADA controlled CBs without SEL relays (electro-mechanical relays) will be modified to allow the reclosing relay to reclose one time (second reclose will be disabled, but the timer is still in service).

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10.2.3. Non-SCADA controlled CBs will have the "Single-Shot Cutout Switch" turned on. Turning on this switch will only allow the reclosing relay to close one time and then lock out.

10.2.3.1. Single-Shot Cutout Switch – This is a cutout switch on Non-SCADA circuits that have electro-mechanical relays within the SDG&E 2008 Highest Fire Risk Areas. This cutout switch blocks the second reclose and auto reset on the reclosers.

The reclosing relays will be returned to the normal state once the Fire Condition YELLOW has returned to Fire Condition GREEN.

10.2.4. SCADA CONTROLLED CB'S WITH SEL RELAYS

The reclosing relay will be modified to allow one reclose if the CB should trip and will automatically disable the reclosing relay (reclosing relay will not reset).

10.2.4.1. If the CB trips and recloses, the DSO will check off the reclosing relay and must have the circuit patrolled.

10.2.4.1.1. Load side of fuses will be exempt from the patrol.

10.2.4.2. If the CB trips and locks out the DSO must have the circuit patrolled before re-energizing.

10.2.4.2.1. Load side of fuses will be exempt from the patrol.

10.2.4.2.2. Customer outage time shall be held to a minimum by patrolling, sectionalizing and energizing segments of the circuit.

10.2.4.2.3. If the cause of the trip is identified a crew shall be requested and repairs made immediately.

10.2.4.2.4. The reclosing relay can be turned back on if the cause is identified, isolated or repaired.

10.2.4.2.5. If the cause of the trip is undetermined after a patrol, the reclosing relay will be turned on.

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10.2.5. SCADA CONTROLLED CBS WITHOUT SEL RELAYS (electro-mechanical relays)

The reclosing relays will be physically modified to only allow one reclose if the CB should trip. However, this modification will not affect the timer.

10.2.5.1. If the CB trips and recloses, the DSO will check off/turn off the reclosing relay via SCADA and must have the circuit patrolled.

10.2.5.1.1. Load side of fuses will be exempt from the patrol.

10.2.5.2. If the CB trips and locks out, the DSO will check off/turn off the reclosing relay and must have the circuit patrolled before any further testing.

10.2.5.2.1. Load side of fuses will be exempt from the patrol.

10.2.5.2.2. Customer outage time shall be held to a minimum by patrolling, sectionalizing and energizing segments of the circuit.

10.2.5.2.3. If the cause of the trip is identified a crew shall be requested and repairs made immediately.

10.2.5.2.4. The reclosing relay can be turned back on if the cause is identified, isolated or repaired.

10.2.5.2.5. If the cause of the trip is undetermined after a patrol, the reclosing relay can be turned on.

10.2.6. NON-SCADA CONTROLLED CB

Once Fire Condition YELLOW has been declared, the DSO will have field personnel turn on the "Single-Shot Cutout Switch" on circuits within the SDG&E 2008 Highest Risk Fire Areas. This will allow the CB to trip and reclose one time.

10.2.6.1. If the CB trips and recloses, the DSO must have the circuit patrolled. The reclosing relay will be automatically turned off due to the Single-Shot Cutout Switch.

10.2.6.1.1. Load side of fuses will be exempt from the patrol.

10.2.6.2. If the CB trips and locks out, the DSO shall have the circuit patrolled before any further testing. The reclosing relay will be automatically turned off due to the Single-Shot Cutout Switch.

10.2.6.2.1. Load side of fuses will be exempt from the patrol.

10.2.6.2.2. Customer outage time shall be held to a minimum by patrolling, sectionalizing and energizing segments of the circuit.

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10.2.6.2.3. If the cause of the trip is identified a crew shall be requested and repairs made immediately.

10.2.6.2.4. The reclosing relay can be turned back on if the cause is identified, isolated or repaired.

10.2.6.2.5. If the cause of the trip is undetermined after a patrol, the reclosing relay can be turned on.

10.2.7. SCADA CONTROLLED SRs

The SR will be allowed to go through their reclosing cycle one time.

10.2.7.1. If the SR trips and recloses, the DSO will turn off the reclosing relay and must have the load-side of the SR patrolled.

10.2.7.1.1. Load side of fuses will be exempt from patrol

10.2.7.1.2. If the cause of the trip is identified a crew shall be requested and repairs made immediately.

10.2.7.1.3. The reclosing relay can be turned back on if the cause is identified, isolated or repaired.

10.2.7.1.4. If the cause of the trip is undetermined after a patrol, the reclosing relay can be turned on.

10.2.7.2. If the SR trips and locks out, the DSO will have the reclosing relay turned off and the load side of the SR must be patrolled before any further testing.

10.2.7.2.1. Load side of fuses will be exempt from patrol.

10.2.7.2.2. Customer outage time shall be held to a minimum by patrolling, sectionalizing and energizing segments of the circuit.

10.2.7.2.3. If the cause of the trip is identified a crew shall be requested and repairs made immediately.

10.2.7.2.4. The reclosing relay can be turned back on if the cause is identified, isolated or repaired.

10.2.7.2.5. If the cause of the trip is undetermined after a patrol, the reclosing relay can be turned on.

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10.2.8. NON-SCADA CONTROLLED SRs

Once Fire Condition YELLOW has been declared, the DSO will have field personnel turn off reclosing on Non-SCADA SRs within the SDG&E 2008 Highest Risk Fire Areas.

10.2.8.1. If the SR trips, the DSO will check off the SR reclosing relay and must patrol the load side of the SR before testing.

10.2.8.1.1. Load side of the fuses will be exempt from patrol

10.2.8.1.2. Customer outage time shall be held to a minimum by patrolling, sectionalizing and energizing segments of the circuit.

10.2.8.1.3. If the cause of the trip is identified a crew shall be requested and repairs made immediately.

10.2.8.1.4. The reclosing relay can be turned back on if the cause is identified, isolated or repaired.

10.2.8.1.5. If the cause of the trip is undetermined after a patrol, the reclosing relay can be turned on.

10.2.9. SECTIONALIZING FUSES

10.2.9.1. If a sectionalizing fuse(s) is reported to have blown, patrol the entire section beyond the fuses before testing.

10.2.9.1.1. Customer outage time shall be held to a minimum by patrolling, sectionalizing and energizing segments of this fused section of the circuit.

10.2.9.2. If the cause is determined and repaired or isolated close the fuse(s) restoring service.

10.2.9.3. If the cause is undetermined, close the fuse(s) one time.

10.2.10. TRANSFORMER STATION FUSES

10.2.10.1. If a transformer fuse(s) is reported to have blown, patrol the entire load side of the transformer before refusing.

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10.3. Fire Condition RED (Red Flag Warning)

10.3.1. All reclosing relays will be turned off on all CBs and SRs located in the SDG&E Wildland Fire Area or in area designated by the SDG&E FC

10.3.1.1. If a CB or SR trips open, a Sectionalizing Fuse or Transformer Fuse opens, *testing of this device will not be allowed* until a complete patrol has been performed on the load side of the device.

10.3.1.2. Refer to the above section in Fire Condition YELLOW for procedures on fault testing.

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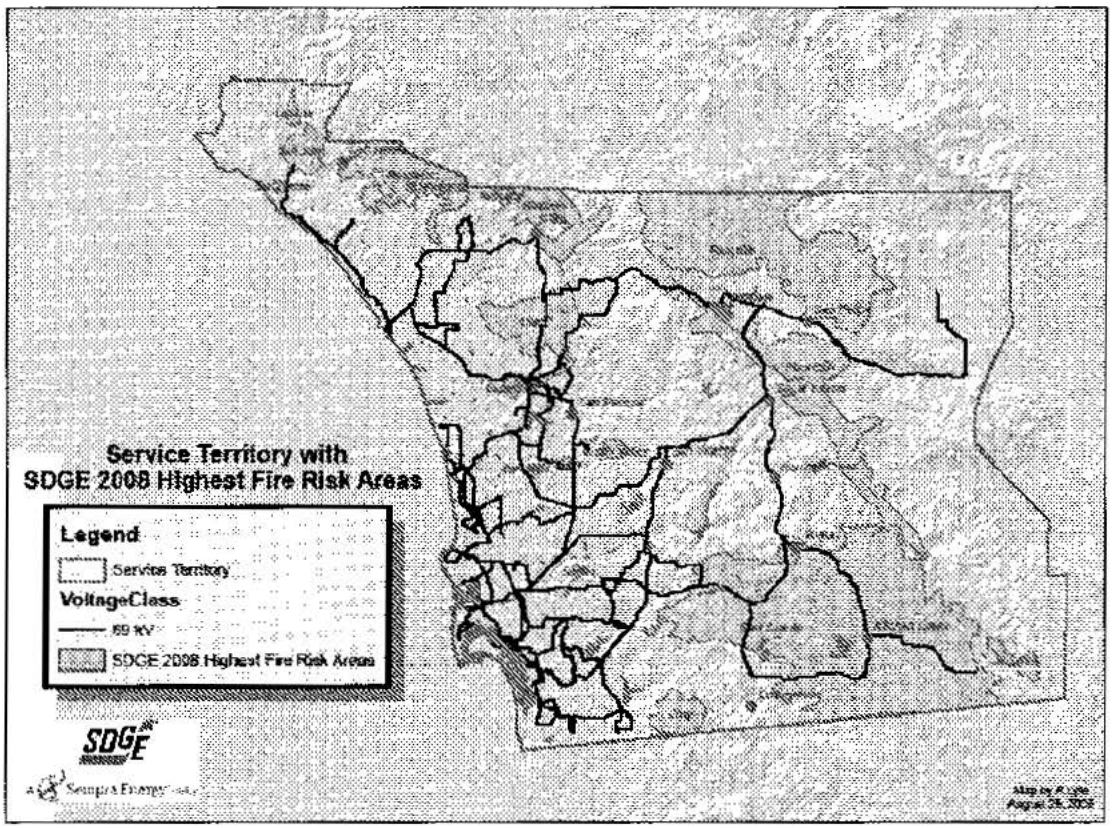
11. APPENDIX 1: SDG&E 2008 HIGHEST FIRE RISK AREAS



The source for this exhibit is the "SDGE 2008 Highest Fire Risk: shapefile provided by the SDG&E Fire Coordinator.

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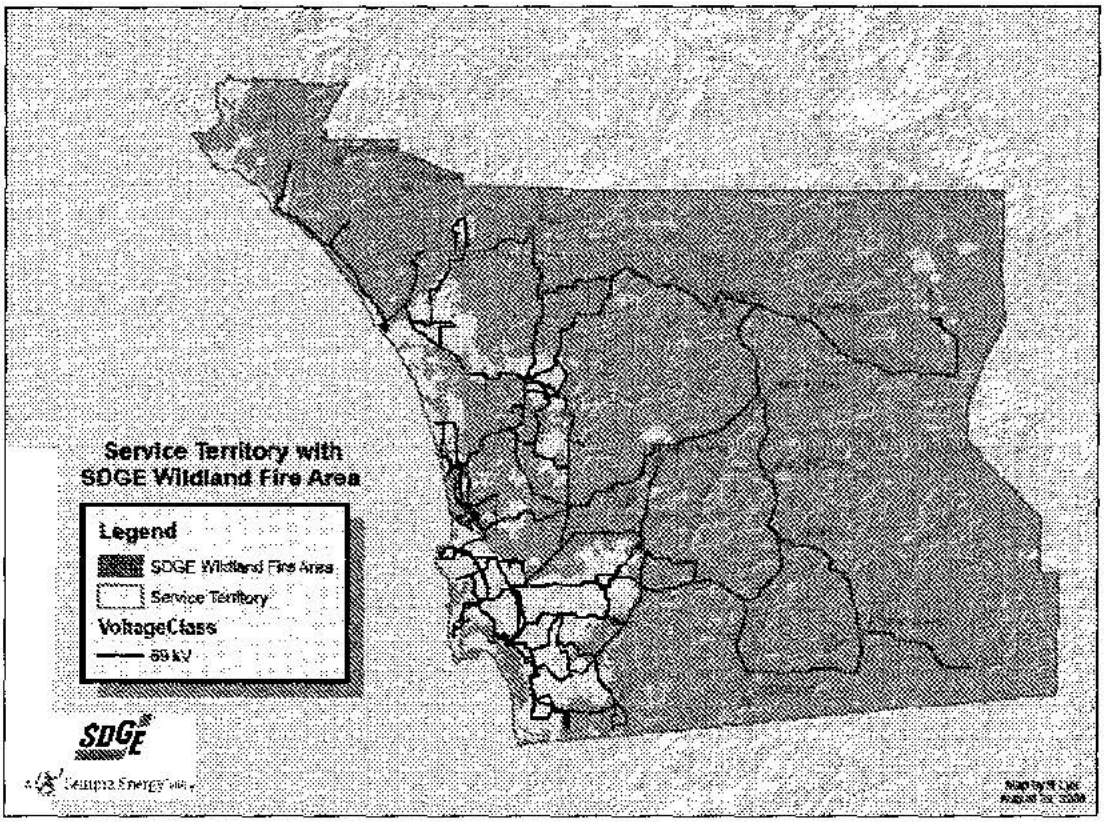
12. APPENDIX 2: SDG&E WILDLAND FIRE AREA



The SDGE Wildland Fire Area layer source is "sde_av.DBO.FireHazSevZones_SD", a copy of which resides in the Land Services GIS Department. It includes Federal Responsibility Areas (FRA), State Responsibility Areas (SRA), and Local Responsibility Areas (LRA).

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13. APPENDIX 3: TRANSMISSION SUBSTATIONS IN SDG&E WILDLAND FIRE AREA

Substation	Substation ID	Voltage Class (kV)	Substation is in SDG&E 2008 Highest Fire Risk Areas
[redacted]			

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Substation	Substation ID	Voltage Class (kV)	Substation is in SDG&E 2008 Highest Fire Risk Areas
[redacted]			

The transmission substations appearing on this list were derived by Land Services GIS Department running two intersect queries using the transmission substation spatial data provided by SDG&E's Transmission Construction and Maintenance Department. One query intersected with the Wildland Fire Area layer (sde_av.DBO.FireHazSevZones_SD) and one intersected with the "SDGE 2008 Highest Fire Risk" shapefile provided by the SDG&E FC.

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14. APPENDIX 4: 69KV TRANSMISSION LINES IN SDG&E 2008 HIGHEST FIRE RISK AREAS

Tie Line	69kV Transmission Lines in SDG&E 2008 Highest Fire Risk Areas	Reclosers to be turned off when in Fire Condition YELLOW		Terminals without Recloser
		SCADA	NON-SCADA	
[redacted]				

Exception for [redacted] It is not necessary to turn off recloser at Narrows when in Fire Condition YELLOW because there is only one electrical feed into this substation.

Note: When IID [redacted] carrying [redacted], if [redacted] at [redacted] trips and recloses, turn off TL 686 recloser at Narrows via SCADA.

The transmission lines appearing on this list were derived by Land Services GIS Department running an intersect query using the transmission line spatial data provided by SDG&E's Transmission Construction and Maintenance Department and the "SDGE 2008 Highest Fire Risk" shapefile provided by the SDG&E FC.

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15. APPENDIX 5: TRANSMISSION LINES IN SDG&E WILDLAND FIRE AREA

15.1. 69kV Transmission Lines subject to operating restrictions during Fire Condition RED:

Tie Line	Transmission Lines in SDG&E Wildland Fire Area	Line is in SDG&E 2009 Highest Fire Risk Areas	Terminals with NON-SCADA Recloser	Terminals without Recloser
[redacted]				

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Tie Line	Transmission Lines in SDG&E Wildland Fire Area	Line is in SDG&E 2008 Highest Fire Risk Areas	Terminals with NON-SCADA Recloser	Terminals without Recloser
[redacted]				

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Tie Line	Transmission Lines in SDG&E Wildland Fire Area	Line is in SDG&E 2008 Highest Fire Risk Areas	Terminals with NON-SCADA Recloser	Terminals without Recloser
[redacted]				

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Tie Line	Transmission Lines in SDG&E Wildland Fire Area	Line is in SDG&E 2008 Highest Fire Risk Areas	Terminals with NON-SCADA Recloser	Terminals without Recloser
[redacted]				

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15.2. The following High Voltage Transmission Lines are listed for reference to location only. They **ARE NOT SUBJECT** to the operating restrictions during Fire Condition RED or Fire Condition YELLOW:

Tie Line	Transmission Lines in SDG&E Wildland Fire Area	Line is in SDG&E 2008 Highest Fire Risk Areas
[redacted]		

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Tie Line	Transmission Lines in SDG&E Wildland Fire Area	Line is in SDG&E 2008 Highest Fire Risk Areas
[redacted]		

The transmission lines appearing on this list were derived by Land Services GIS Department running an intersect query using the transmission line spatial data provided by SDG&E's Transmission Construction and Maintenance Department and the Wildland Fire Area layer shapefile (sde_av.DBO.FireHazSevZones_SD).

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16. APPENDIX 6: DISTRIBUTION SUBSTATIONS WITHIN SDG&E 2008 HIGHEST FIRE RISK AREAS

The following substations are terminals for Distribution Circuits with downstream distribution overhead primary structures in SDG&E 2008 Highest Fire Risk Areas.

Note: Melrose, Creelman, Rincon substations only have OH fire area structures downstream of Service Restorers (i.e. no need to visit sub)

District	Substation	SCADA
[redacted]		

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17. APPENDIX 7: DISTRIBUTION CIRCUITS WITHIN SDG&E 2008 HIGHEST FIRE RISK AREAS

Distribution Circuits with downstream distribution overhead primary structures in SDG&E 2008 Highest Fire Risk Areas.

Note: Circuits whose Fire Area structures are all downstream of Service Restorers are highlighted in gray.

Circuit	District	Substation	SCADA
[redacted]			

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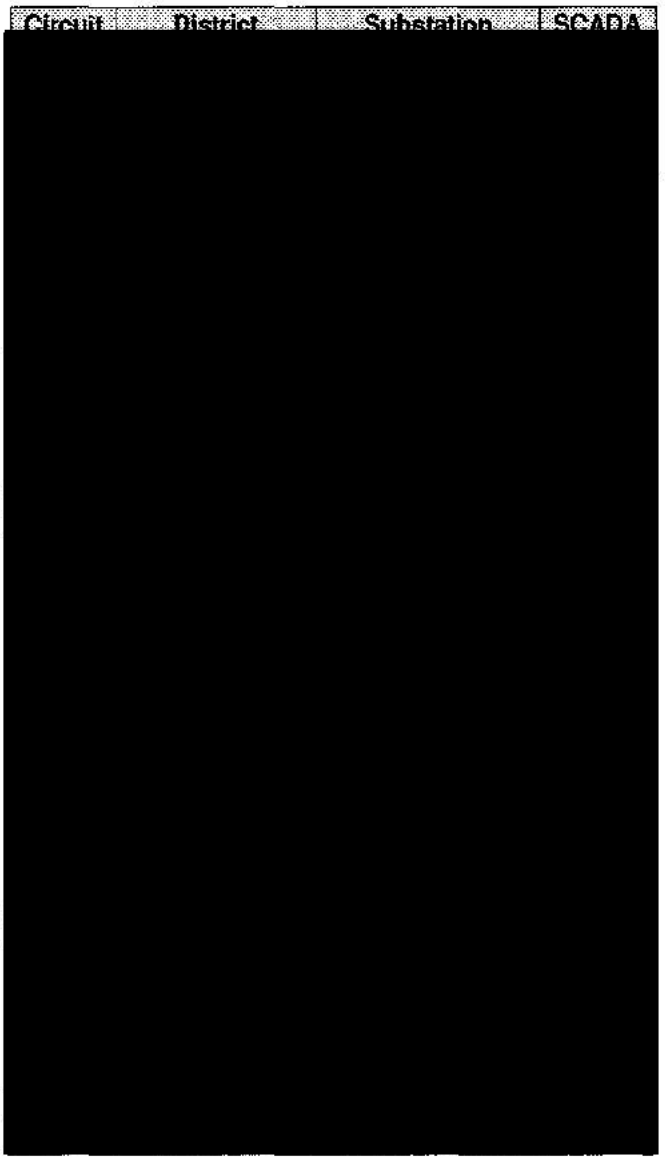

Note: Circuits whose Fire Area structures are all downstream of Service Restorers are highlighted in gray.

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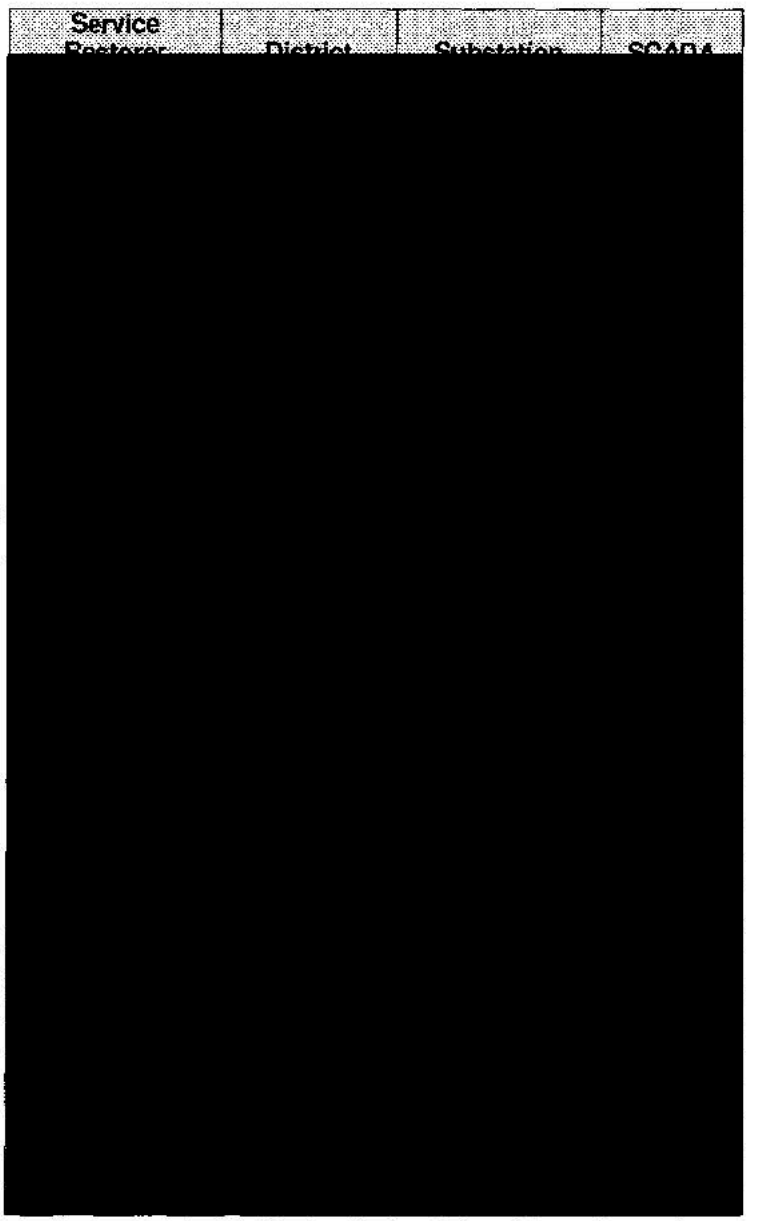
18. APPENDIX 8: DISTRIBUTION SERVICE RESTORERS WITHIN SDG&E 2008 HIGHEST FIRE RISK AREAS

Service Restorers with downstream distribution overhead primary structures in SDG&E 2008 Highest Fire Risk Areas.

Note: Service Restorers that are on circuits that do not require action at the CB are highlighted in gray.



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Service Restorer	District	Substation	SCADA
[redacted]			

Note: Service Restorers that are on circuits that do not require action at the CB are highlighted in gray.

19. APPENDIX 9: DISTRIBUTION SUBSTATIONS WITHIN SDG&E WILDLAND FIRE AREA

The following substations are terminals for Distribution Circuits with downstream distribution overhead primary structures in the SDG&E 2008 Wildland Fire Area.

Note: Paradise substation and Seaview stepdown only have overhead fire area structures downstream of Service Restorers (i.e. No need to visit sub).

District	Substation	SCADA
[redacted]		

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District	Substation	SCADA
[redacted]		

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District	Substation	SCADA
[redacted]		

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20. APPENDIX 10: DISTRIBUTION CIRCUITS WITHIN SDG&E WILDLAND FIRE AREA

Distribution Circuits with downstream distribution overhead primary structures in SDG&E Wildland Fire Area.

Note: Circuits whose Fire Area structures are all downstream of Service Restorers are highlighted in gray.

Circuit	District	Substation	SCADA
[redacted]			

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Circuit	District	Substation	SCADA
[redacted]			

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Circuit	District	Substation	SCADA
[redacted]			

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Circuit	District	Substation	SCADA
[redacted]			

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Circuit	District	Substation	SCADA
[redacted]			

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Circuit	District	Substation	SCADA
[redacted]			

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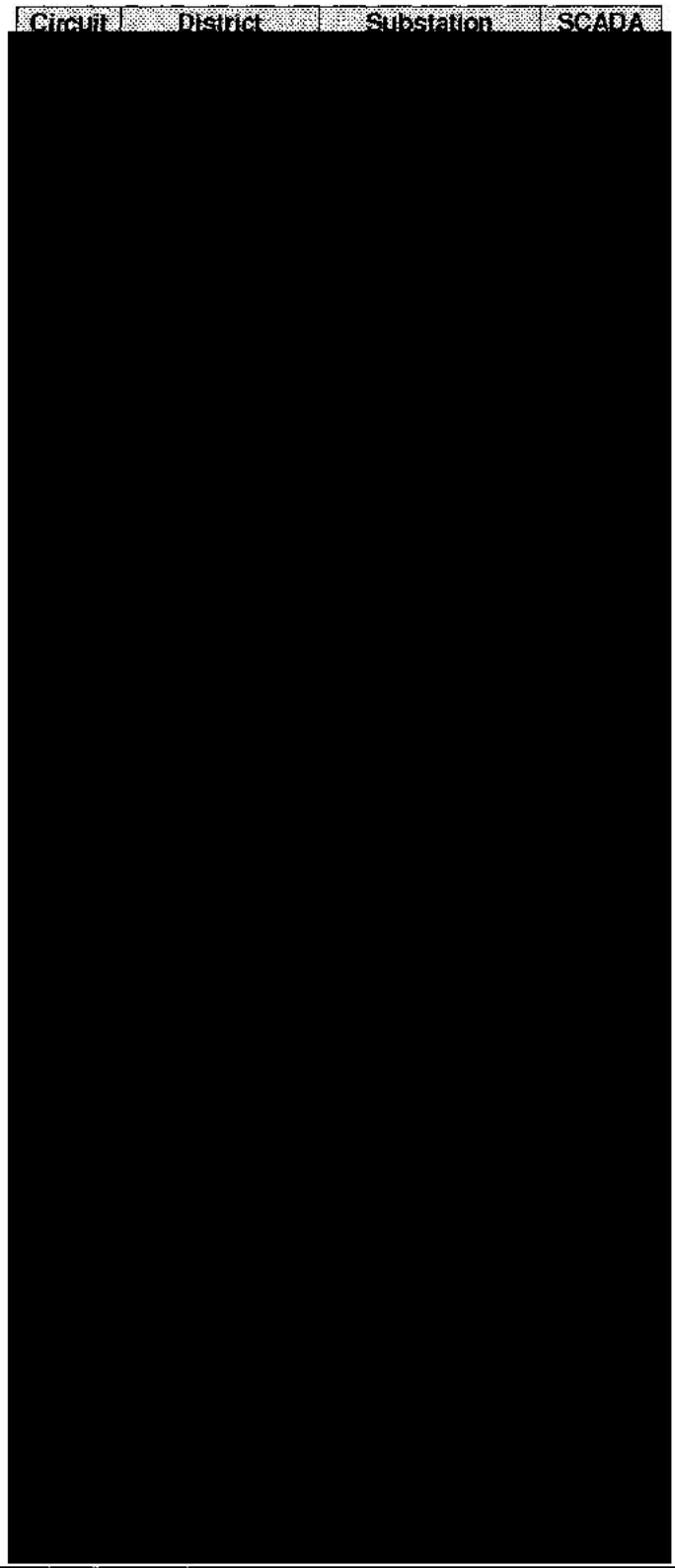

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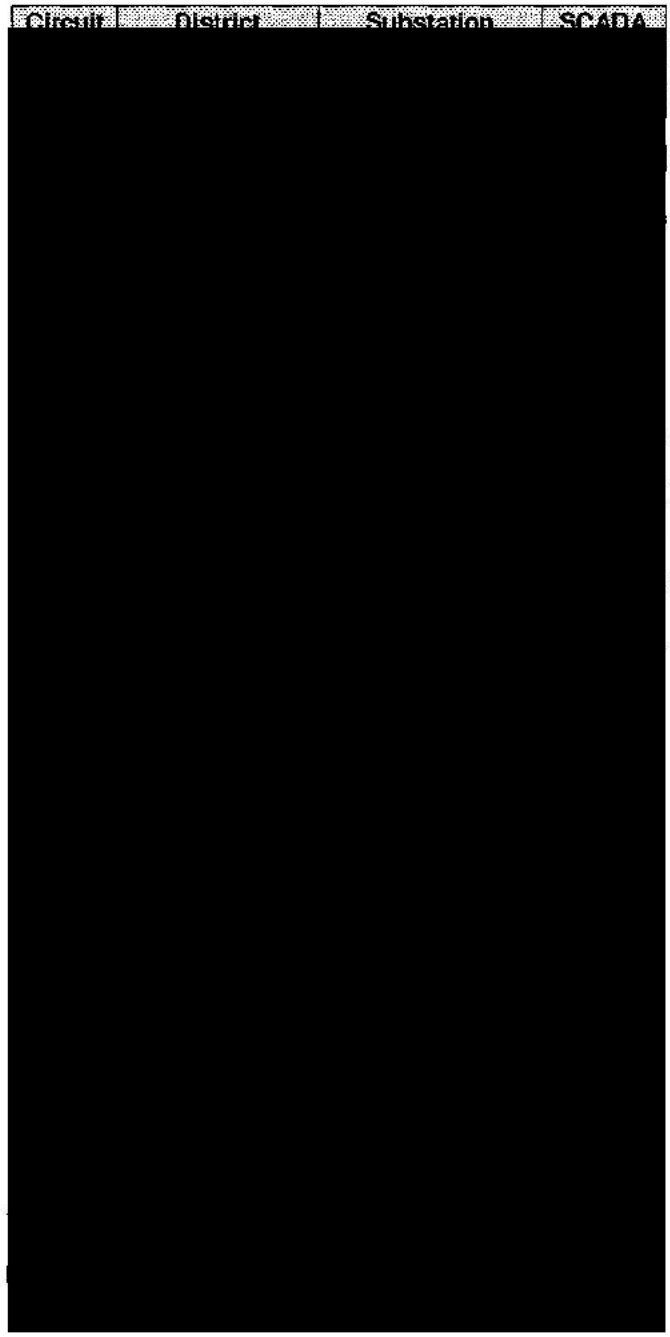

Note: Circuits whose Fire Area structures are all downstream of Service Restorers are highlighted in gray.

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21. APPENDIX 11: DISTRIBUTION SERVICE RESTORERS WITHIN SDG&E WILDLAND FIRE AREA

Service Restorers with downstream distribution overhead primary structures in SDG&E Wildland Fire Area.

Note: Service Restorers that are on circuits that do not require action at the CB are highlighted in gray.

Service Restorer	District	Substation	SCADA
[redacted]			

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Service Restorer	District	Substation	SCADA
[redacted]			

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Service Restorer	District	Substation	SCADA
[redacted]			

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Service Restorer	District	Substation	SCADA
[redacted]			

Note: Service Restorers that are on circuits that do not require action at the CB are highlighted in gray.

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22. DOCUMENT OWNERSHIP

	Name	Date
REVISED BY: Transmission Outage Coordination Adviser	[redacted]	08/28/08
REVIEWED BY: Fire Coordinator 1		08/28/08
REVIEWED BY: Fire Coordinator 2		08/28/08
REVIEWED BY Team Lead Technical Support - Grid Control		09/03/08
APPROVED BY: Electric Distribution Engineering Manager		08/29/08
APPROVED BY Director - Electric Distribution Operations		08/28/08
APPROVED BY: Team Lead Real Time Operations – Grid Control		08/29/08
REGULATORY COMPLIANCE REVIEW BY Director – Grid Operations		09/02/08
ISSUED BY: Administrative Associate – Grid Control		09/03/08
DOCUMENT ISSUE DATES 2/7/00, 1/4/02, 8/14/02, 9/9/03, 12/1/03, 8/18/04, 12/27/06, 09/03/08		

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REVISION HISTORY

Complete revision to bring Standard Practice up to current standards.

1.0 PURPOSE

1.1 This procedure provides guidelines for performing uniform detailed overhead visual inspection and corrective maintenance of the overhead distribution system.

2.0 APPLICABILITY

2.1 This standard applies to all qualified electric personnel performing scheduled inspections of equipment and installations on the electric distribution system. This standard is also applicable to Electric Supervisor and department Engineers directing inspection and maintenance work activity.

3.0 DEFINITIONS

3.1 **GFMS** -- Geographical Facilities Management System

3.2 **DIMS** -- Distribution Inspection & Management System

3.3 **DIMS/Online** -- Distribution Inspection & Management System, Online

3.4 **DIMS/MDT** -- Distribution Inspection & Maintenance System, Mobile Data Terminal

3.5 **C&O** -- Construction & Operation

3.6 **OCMP** -- Overhead Corrective Maintenance Program

3.7 **GMDT** -- Geographical Mapping Discrepancy Transmittal

3.8 **EGIM** – Electric Geographic Information Management

4.0 PROCEDURE

4.1 POLICY STATEMENTS

4.1.1 Pursuant to GO 165, the overhead distribution system shall be inspected on a 5 year cycle. The detailed overhead visual inspection is necessary to verify condition of poles, equipment, conductors, and line hardware. This inspection is required in addition to other patrols that are made to identify system abnormalities. Qualified persons shall perform inspections.

4.1.2 Abnormal conditions found during the detailed overhead visual inspection shall be recorded in DIMS/MDT. See Attachment A “Definition of Overhead Condition Codes”. Any conditions that could cause a failure, jeopardize service, or pose a safety hazard to the public or workers shall be repaired immediately.

4.1.2.1 Make comments in the MDT comments field with any information that will further describe an abnormal condition and that will be useful for follow-up repairs.

4.1.2.2 Abnormal conditions that are not repaired at the time of inspection will be recorded and assigned a pending condition in DIMS/MDT.

4.1.3 Repairs should be made at the time of inspection whenever practical, or within the period of time specified by the CMP manual. Abnormal conditions that are repaired at the time of inspection will be recorded and assigned as a field-cleared condition in DIMS/MDT.

4.1.4 Once follow-up repairs are completed, the pending condition code will be changed and recorded as cleared in DIMS/Online by District personnel.

4.2 SPECIAL INSTRUCTIONS

4.2.1 Remove the old cal-grid pole number or other non-standard pole number on the pole. Replace the old cal-grid number on the pole with the number shown on the MDT/MAP. If the number is not shown in the MDT/Map or unknown, submit a GMDT form to Electric Geographic Information Management (EGIM). Do not remove temporary tagging on transmission poles.

4.2.2 Record in DIMS/MDT infractions caused by a foreign utility. If the District is not able to have the condition corrected, report the infraction for follow-up to Distribution Asset Management via an Investigation Order (I/O) form with the following information:

- Indicate problem
- What foreign utility is causing the problem? (Telephone, cable TV, etc)
- Location of pole (T.B. & street address) and pole number
- Was the foreign utility contacted? If so, when?

4.2.3 Report damaged non-SDG&E poles for follow-up to Distribution Asset Management via an investigating order (I/O) with the following information:

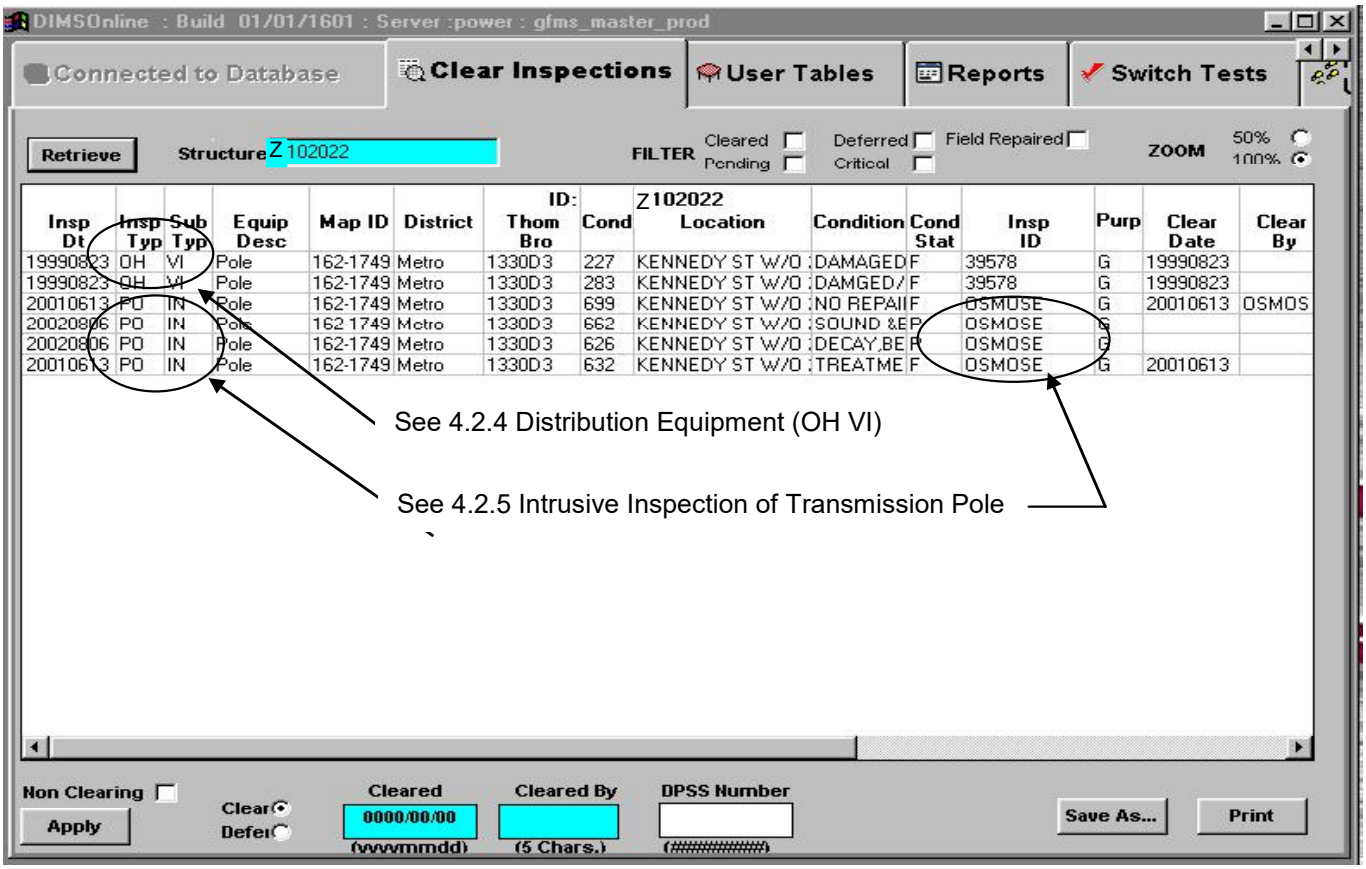
- Indicate problem
- Pole owner
- Location of pole (T.B. & street address) and pole number
- Was the owner contacted? If so, when?

NOTE: Do not record damaged non-SDG&E poles in DIMS/MDT.

4.2.4 Inspect distribution equipment on transmission poles and record abnormal distribution equipment conditions, in the DIMS/MDT. (Intrusive wood pole inspections for Transmission poles will come into DIMS only if Distribution equipment is on the pole. Notify Transmission. For intrusive inspections only, put a note in the comment field “Transmission notified” and clear in DIMS as per Section 4.2.5). The infractions related to the OH visual inspections on the distribution equipment must remain pending until the repairs are completed, then cleared in DIMS/MDT. (See Figure 1)

4.2.5 Transmission poles are not required to be intrusively inspected by GO 165- only distribution poles. Hence, we do not need to record the intrusive inspections in DIMS. This applies only to the Z poles itself under PO IN by Osmose (not OHVI which is the distribution equipment on the pole). However, DIMS shows Transmission poles with distribution underbuild to notify Distribution personnel if a transmission pole with distribution underbuild is in need of repair. For intrusive inspections of transmission poles (PO-IN by Osmose only), notify transmission via e-mail that this came into DIMS, put in the comments that the Transmission Department was notified, date and clear in DIMS (see Figure 1).

Figure 1



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4.2.6 Do not record damaged transmission poles or transmission equipment in DIMS/MDT when inspecting distribution equipment on transmission poles. Instead, report it to Electric Construction and Maintenance (Kearny) via an investigation order (I/0).

4.2.7 When the District cannot resolve an access problem, send a request for follow-up to Distribution Asset Management if access to our facilities is obstructed by a private property owner or foreign utility.

4.3 INSPECTION PROCEDURES

4.3.1 The detailed overhead visual inspection activities shall be scheduled by District Engineering and conducted by facility map in accordance with local needs.

4.3.2 All conditions found during the inspections that require follow-up repairs shall be recorded in DIMS/MDT. Corrective maintenance shall be performed when conditions can be repaired on site and recorded as field cleared in the DIMS/MDT. Preventive or corrective maintenance shall be performed for conditions that require follow-up repairs and recorded as pending conditions in DIMS/MDT.

4.3.3 Details regarding pending conditions should be clearly listed in the comment field.

4.3.4 The detailed overhead inspection requires all inspectors to walk-around the pole. The inspectors shall inspect for the condition of pole, hardware, equipment, clearances, conductors, and other general conditions.

4.3.4.1 Conditions of Pole. Check for:

4.3.4.1.1 Leaning pole

4.3.4.1.2 Broken, cracked, or rotten crossarms

4.3.4.1.3 Broken, cracked, or rotten poles (sound pole)

4.3.4.1.4 Unauthorized attachments

4.3.4.1.5 Washout or excavation around pole or anchor

4.3.4.1.6 Evidence of fire or other structural damage

4.3.4.1.7 Indication of excessive vehicle contact

4.3.4.1.8 Damaged stub poles

4.3.4.2 Conditions of Hardware and Equipment. Check for:

4.3.4.2.1 Broken, chipped or contaminated insulators

4.3.4.2.2 Pole switch indicating need for adjustment, grounds or repair

4.3.4.2.3 Indication of excessive transformer oil leakage or discoloration

4.3.4.2.4 Bulged or discolored capacitor units

4.3.4.2.5 Broken or cracked bushing or fuse holder

4.3.4.2.6 Broken or cracked arrestor

4.3.4.2.7 Evidence of tracking or burning

4.3.4.2.8 Loose hardware or missing nuts

4.3.4.2.9 Guys missing or not installed properly

4.3.4.3 Condition of conductors. Check for:

4.3.4.3.1 Slack conductors or unequal sag

4.3.4.3.2 Indication of bullet nicks or vandalism

4.3.4.3.3 Conductors not properly attached to insulator, including broken tie wires

4.3.4.3.4 Damaged or burned connectors or jumpers

4.3.4.3.5 Bare or wrapped services

4.3.4.4 Clearance and climbing space violations. Check for:

4.3.4.4.1 Crane or other excessive height equipment operating in close proximity to lines

4.3.4.4.2 Hazardous structures in close proximity to lines (i.e. television or radio antennas, campers, scaffolding etc)

4.3.4.4.3 Inadequate ground clearance for primary, secondary and service wires

4.3.4.4.4 Improper conductor clearances

4.3.4.5 General conditions. Check for:

4.3.4.5.1 Damaged or missing keep off warning signs

4.3.4.5.2 Missing high-voltage signs

4.3.4.5.3 Damaged or missing visibility strips (State highways only)

4.3.4.5.4 Damaged, missing or incorrect transformer station or pole identification

4.3.4.5.5 Foreign objects in line (i.e. kites, palm fronds, balloons, etc.)

4.3.4.5.6 Damaged, missing or poorly secured moldings or conduits

4.3.4.5.7 Slack guys

4.3.4.5.8 Damaged or missing guy markers (guards)

4.3.4.5.9 Exposed grounds or neutrals on risers

4.3.4.5.10 Pole steps below 8 ft (height).

4.3.4.5.11 Oil or compound leaks or contaminated potheads.

4.3.4.5.12 Broken or separated risers.

4.4 Report Tree Trim/Conditions

4.4.1 Primary, open wire secondary – send IO to vegetation management

4.4.2 SSC trees in secondary, service - record in MDT (heavy, immediate strain or abrasion)

4.4.3 Climbing space – Send IO to Vegetation Management where no bucket truck access

4.4.4 Guy grounded - record in MDT

4.5 Primary Metering Stations

4.5.1 Check ID tags, pole number, Primary metering station number

4.5.2 Meter number

4.5.3 High sign

4.5.4 With binoculars check all equipment for damage

4.5.5 Check conductors for damage

4.5.6 Check pole and crossarms for cracks and damage

4.6 ADDITIONAL CONSIDERATIONS and Constructions

4.6.1 All materials used in the repairs shall comply with the Overhead Construction Standards (Latest Edition).

4.6.2 A set of binoculars shall be used to inspect suspect equipment where necessary.

4.7 RECORDKEEPING

4.7.1 Districts are responsible for uploading and downloading electronic facility maps and inspection records daily into and from the DIMS/MDT.

4.7.2 Electric Distribution Standards will prepare monthly reports to assist Districts to monitor inspection and backlog goals, and distribution expenses.

4.8 Quality Assurance

4.8.1 District supervision is responsible for auditing CMP inspections and follow up repairs to ensure quality. Each quarter, Overhead Visual (OHVI) cycle inspections shall be audited at a rate of 1% or a minimum of 5 poles, whichever is greater. Follow up repairs shall be audited at a rate of 1% of OHVI total infractions cleared each quarter.

4.8.2 Deficiencies should be noted on the quality assurance report form and discussed with employees. The district shall keep a copy of the quarterly report form for one year.

5.0 ACCOUNTING

5.1 OCMP OH Detail Inspection (Account 593.942)

5.2 OCMP OH Detail Follow-up Repairs (Account 593.943)

5.3 OCMP CPUC OH Inspection (Account 593.9421)

5.4 OCMP CPUC OH Follow-up Repairs (Account 593.944)

5.5 OCMP Intrusive Wood Pole Inspection (Account 593.945)

6.0 REFERENCES

6.1 Overhead Construction Standards Book (latest edition)

6.2 State of California General Order (G.O.) 95 - Rules for Overhead Electric Line Construction (latest revision)

6.3 DIMS - DIMS Manual (latest edition)

6.4 GO 165 – (CPUC Rule for Maintenance of Electric Distribution Facilities)

7.0 ATTACHMENTS

7.1 Attachment A - Definitions of Overhead Condition Codes

7.2 Attachment B – Quality Report Form

ATTACHMENT A

Definitions of Overhead Condition Codes

The following tables are divided into three sections:

1.1 GO conditions (Infractions)

1.1.1 These are conditions which must be corrected in the ten-month internal repair period, not to exceed the twelve month repair period governed by GO95.

1.2 Reliability conditions

1.2.1 These are conditions which do not fall within the General Order, but are determined to affect system reliability and are repaired based on engineering evaluation or experience.

1.3 Discretionary conditions

1.3.1 These are conditions, which are neither governed by General Order, nor are determined to have a significant impact on system reliability, and may be corrected at the discretion of the District.

Overhead GO Conditions

Code	Description	GO 95 Requirements and Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref.
26	Ground rods or studs missing	GO 128 Rule 36.5-C(2) allows conductors and equipment to be effectively grounded by connections at one or more locations to driven ground rods or other suitable grounding electrodes.		Follow-up fix if missing or corroded out; install new rod	SP602 OH 1002.1
096	Conduit damaged	Use this code if cable pole conduit is damaged		Follow-up fix by crew	
098	Conduit not strapped down	Use this code if conduit is not strapped down	Strap conduit	Follow-up fix by crew	
201	Pole steps too low	SDG&E Electric Standard sets minimum height at 7.5 feet.	Remove step(s) below 7.5 feet		OH363
203	Damaged/ missing visibility strips	Delineators are required on all poles on state highways, within 12 feet of traveled roadway.	Install/replace visibility strips on state highways only.		OH208 OH217
206	Damaged/ Missing Pole Hardware	GO 95 Rule 49.8 requires all pole line hardware to be galvanized, otherwise protected by a corrosion, resisting treatment or composed of corrosion resistant material. Use this code when hardware is damaged or missing or to replace damaged or depleted galvanized hardware.	If corrosion effects serviceability now or within cycle length or it is not built to standard, record as infraction.	Follow-up fix by crew; replace damaged hardware	OH390-OH396
207	Pole leaning badly	GO 95 Rule 47.3 & 48 require that loads imposed on poles be balanced. Pole being pulled over and leaning more than 10 degree from the vertical position shall be considered leaning badly. 10 degrees is equal to 7 feet off center for a 45' pole; however, this is adequate for all poles.		Follow-up fix by crew; install guy(s).	OH901

Overhead GO Conditions

Code	Description	GO 95 Requirements and Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref.
209	Foreign attachment/ unauthorized equipment	GO 95 Rule 34 prohibits antenna, signs, posters, banners, decorations, wires, lighting fixtures, guys, rope or any other equipment foreign to the purpose of OH electric line construction. Temporary attachments older than one year old are also prohibited	Remove foreign attachment if practicable and field clear	Follow-up by crew if truck is required to remove foreign attachments	OH225
219	Pole inaccessible	GO 95 Rule 31.2 requires that all supply system be inspected by the operator frequently and thoroughly for the purpose of insuring that they are in good condition and in conformance with all applicable requirements." Inaccessible" occurs where there is a locked gate, animal, material stacked around pole or vegetation that prevent access to the pole. Inspect after the cause of the inaccessibility is cleared. For trees, record as 219 in MDT and send IO to Veg. Management	Fix on site if object causing this condition is removable	Record in DIMS as 219. Code 219 will remain pending until inspected. For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	SP602
228	Exposed conductor	GO 95 Rule 54.6. Use this code whenever there is uncovered vertical and lateral runs, broken or missing PVC conduit.		Follow-up fix by crew; replace PVC conduit	OH225
229	No Climbing / Working Space	GO 95 Rule 54.7 & OH Standard 251-261 require that there be no conflict or encroachment on the climbing and working space; however, GO 95 allows quadrant climbing space up through the communications level. For maintenance only, do not enter this code where there is quadrant-climbing space available below secondary and communications lines are attached to pole. Use this code only when climbing and working space infractions are caused by SDG&E. If caused by foreign utility use code 402. Refer to "climbing space diagrams".		Follow-up fix by crew. If caused by vegetation and no bucket truck access is available, send an IO to Vegetation Management or call the VM help desk when trimming is needed urgently.	OH225 OH251 OH255 OH261
230	Damaged ground molding	GO 95 Rule 54.6B requires that ground wires attached on the surface of wood poles and structures to be covered throughout their length by a suitable protective covering. Use this code if ground molding is broken and ground conductor is exposed.	Replace damaged ground molding.	Follow-up to electric supervisor for molding above conductors energized over 750V	OH393 OH 1002

DIVISION	DEPARTMENT	1/26
DISTRIBUTION OPERATIONS	ELECT. DISTRIBUTION SERVICES	FEBRUARY 27,2006

SECTION
OVERHEAD CORRECTIVE MAINTENANCE

SUBJECT TITLE
VISUAL INSPECTION OF POLES AND EQUIPMENT

Overhead GO Conditions

Code	Description	GO 95 Requirements and Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref.
231	Open/Damaged Ground	GO 95 Rule 52.7F requires equipment grounding. Use this code whenever the pole ground has been broken, burned through or cut.		Follow-up fix by crew	OH1002
234	Damaged/ missing high voltage signs - 2 man	GO 95 Rule 51.6A requires marking the pole to no more than 40" below the lowest conductor of circuit(s) 750 volts or more for poles with no equipment or 6" below equipment. Place high signs on cross-arms on cable poles. Use this condition code where 2 or more linemen are needed to clear the condition.		Follow-up fix by crew	OH208
235	Damaged arrestor/ insulator/ dead-end	Use this code if there is broken or chipped arrestor and insulator and if there is evidence of burning or flashover. Make further comments in the MDT comment box.		Follow-up fix by crew	OH1251 OH750 OH1247
236	Damaged/ missing high voltage sign - 1 man	GO 95 Rule 51.6A requires marking the pole to no more than 40" below the lowest conductor of each circuit 750 volts or more for poles with no equipment or 6" below equipment. Use this code where a 1-man crew can be used to clear the condition.		Follow-up fix by crew	OH208
237	Oil leak	Use this code if there is visible oil leaking from any pole mounted electrical equipment. Refer to SP122 on follow-up requirements.		Follow-up fix by crew	SP122
238	Abandoned Facilities	GO 95 Rule31.6 requires that lines or portions of lines permanently abandoned shall be removed by their owners so that such lines do not become a hazard. Applies to pole and conductors or UG structures.		Follow SPM 200	GO95 Rule31.6
239	Idle Equipment	Use this code if equipment or hardware is no longer in use		Follow-up by electric supervisor	GO95 Rule31.6
240	Damaged cutout	Use this code if there is broken or chipped cutouts and if there is evidence of burning or flashover. Make further comments in the MDT.		Follow-up fix by crew	OH1240 OH1212
241	Damaged crossarm	Use this code if the crossarm is broken, if there is severe cracking, evidence of charring, burning, or severe tracking. Make further comments in the MDT.		Follow-up fix by crew	OH380 OH384
243	Damaged switch	Use this code if any part of the switch is damaged or broken, insulators, switch blades etc.		Follow-up fix by crew	OH1442 OH1444 OH1451 OH1220 OH1222 OH1228 OH1230

Overhead GO Conditions

Code	Description	GO 95 Requirements and Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref.
244	Damaged switch gang operator mechanism	Use this code if the switch gang operator mechanism is broken, bent or missing.		Follow-up fix by crew	OH 1228 OH 1271 OH 1230
246	Damaged SDG&E pole	Use this code if the pole is broken, or if the strength of the pole is questionable due to vehicular contact, severe cracking, shell rot, top rot, evidence at the ground line of butt rot, charred wood or severe tracking. Make further comments in the MDT. Do not turn in to Osmose for damage 8 feet above ground line. If already red or yellow tagged, contact Osmose contract administrator for follow-up.	For severe damage, contact Electric Supervisor for immediate temporary shoring	For SDG&E-owned pole, follow-up fix-notify Electric Supervisor. For foreign utility own poles, send IO to Joint Facilities (Do not record in DIMS).	SP601 OH225
254	Insufficient Clearance	GO 95 sets clearance requirements for various subjects. Refer to OH Standard for review of these requirements. Use this code when there is not adequate clearance or ground to conductor clearances caused by SDG&E except for low service drops (code 262). If caused by foreign utility use code 403.		Follow-up fix by crew	OH221 OH224 OH228 OH262 OH236 OH264 OH908 OH 1406 OH 1509 OH 1530 OH 1533
262	Low service drops	GO 95 rule 54.8B requires service drops above ground, buildings, etc., shall not be less than the following minimum clearances: • over fences -2' (non-walkable), 8' (walkable) • over pedestrian walkways - 10' (residential), 12' (commercial) • over driveways - 12' (residential), 16' (commercial) • over thoroughfares - 18' (centerline), 16' (at curb)		Follow-up fix by crew; notify customers affected	OH241 OH645 OH646

Overhead GO Conditions

Code	Description	GO 95 Requirements and Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref.
264	Bare/wrapped service	Use this code if the service conductor has evidence of fraying, or its insulation or weatherproofing is missing. Use this code also for open wire service that is wrapped or touching. Make further comments in the MDT.		Follow-up fix by crew;	OH225
266	Foreign objects	Use this code when kites, palm frond, balloons, tennis shoes, etc. are on the conductors.		Follow-up fix by crew; remove foreign objects	OH225
267	Damaged capacitor	Use this code when bushings show sign of damage, and cases are swollen or damaged due to foreign contacts.		Follow-up fix by crew	OH1301
268	Slack conductors	Use this code when overbuild has greater sag than the lower wires on the same span or when there's unequal sag of conductor(s) on the same span. Use this code also when lower (secondary) conductors sag. Make further comments in the MDT.		Follow-up fix by crew	OH225
269	Damaged conductors	Use this code if conductors are bent, or severely corroded. Make further comments in the MDT.	Notify electric supervisor for immediate repair for critical condition	Follow-up fix by crew	OH225
270	Damaged/ Missing Guy Marker	GO 95 Rule 56.9 requires guy guard to be securely attached to all anchor guys. Use this code when guy guard is twisted, bent, cut, unsecured or missing.	Replace damaged or install new guy marker		OH225 OH975 OH927
274	Guy grounded above insulator	GO 95 Rule 56.7B requires insulator to be installed in each anchor guy. Use this code when portion of guys above the insulator are grounded by trees, building, messenger, metal-sheathed cables or other similar objects. If condition is caused by trees, use code 328.		Follow-up fix by crew	OH909
276	Slack anchor guy	GO 95 Rule 56.2 requires where mechanical loads imposed on poles are greater than can be supported; additional strength shall be provided by the use of guys or other suitable condition. Use this code when an anchor guy is loose.		Follow-up fix by crew	OH225 OH920

Overhead GO Conditions

Code	Description	GO 95 Requirements and Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref.
277	Damaged guying	Use this code when strands are missing, broken, severely bent or corroded, when there's evidence of vehicular contact, when there's corrosion or damage to guy grips, anchors or hardware. Make comments in the MDT.		Follow-up fix by crew	OH925 OH928 OH961 OH966
278	Slack span guy	Use this code when any guy other than an anchor guy is loose.		Follow-up fix by crew	OH908
280	Damaged SDG&E stub poles	Use this code if the stub pole is broken, or if the strength of the pole is questionable due to vehicular contact, severe cracking, shell rot, top rot, evidence at the groundline of butt rot, etc.		Follow-up fix by crew	SP601 OH225
282	Bolt Covers Missing	Use this code whenever bolt covers are missing.		Follow-up fix by crew.	OH1145
283	Damaged/ Missing/ Incorrect Station Pole ID	Per SDG&E standards, use this code whenever the station identification, size, or pole number is damaged, missing or incorrect. Make further comments in the MDT.	Fix on site if damage. Replace old Cal-grid or other non-standard pole number. Use pole number shown on the map.	If pole number is unknown or missing, submit GMDT to EGIM. Follow-up fix	OH211 OH208
298	Infraction, No Applicable Code	Use this code to identify infraction conditions that do not have an existing code, but need immediate repairs. Provide comments in DIMS/MDT.		Follow-up fix by crew.	CMP manual
318	Trees/Veg in Primary 18" or closer	Use this code when tress are 18 inches or closer to primary conductors	For trees/ veg., use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbrevia-tion key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk.	

Overhead GO Conditions

Code	Description	GO 95 Requirements and Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref.
319	Trees/Veg. Contacting Open wire secondary	Use this code when trees/veg is contacting open wire secondary pole to pole.	For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	
320	Trim-Veg in 2ndry-SSC/Aerial Cable (P/P) Hvy /Immediate Strain or Abrasion	Use this code for Secondary SSC/Aerial Cable (Pole to Pole) with only immediate heavy strain or abrasion for which tree trim is recommended. Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk – 858-654-8608.	For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	
321	Guard-Veg in 2ndry-SSC/Aerial Cable (P/P) Hvy /Immediate Strain or Abrasion	Use this code for Secondary SSC/Aerial Cable (Pole to Pole) with only immediate heavy strain or abrasion for which tree guard is recommended. Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	
322	Reroute-Veg in 2ndry-SSC/Aerial Cable (P/P) Hvy /Immediate Strain or Abrasion	Use this code for Secondary SSC/Aerial Cable (Pole to Pole) with only immediate heavy strain or abrasion for which a reroute is recommended for which reroute is recommended. Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	
323	Guard-Veg in Service-(P/HSE) HVY/Immediate Strain or Abrasion	Use this code for Services (Pole to House) with only immediate heavy strain or abrasion for which tree guard is recommended. Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	

Overhead GO Conditions

Code	Description	GO 95 Requirements and Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref.
324	Slack-Veg in Service-(P/HSE) HVY/ Immediate Strain or Abrasion	Use this code for Services (Pole to House) with only immediate heavy strain or abrasion for which slacking the line is recommended. Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	
325	Reroute-Veg in Service-(P/HSE) HVY/ Immediate Strain or Abrasion	Use this code for Services (Pole to House) with only immediate heavy strain or abrasion for which reroute is recommended. Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	
326	Trim-Veg in Service-(P/HSE) HVY/ Immediate Strain or Abrasion	Use this code for Services (Pole to House) with only immediate heavy strain or abrasion for which tree trim is recommended. Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	
328	Guy Grounded By Trees/ Vegetation	GO 95 Rule 56.7B requires insulator to be installed in each anchor guy. Use this code when portion of guys above the insulator are grounded by tree or vegetation. Use code 274 if grounded by building, messenger, metal-sheathed cables or other similar objects. If vegetation below insulator causes heavy strain on down guy, send IO to Vegetation Management.	For trees/veg, use street address, leave door hanger for effected customers, for vegetation removal obtain signed removal card, quantity of trees, use abbreviation key.	Record in the MDT. Do not send in an IO. Call in emergencies to Vegetation Management Help Desk– 858-654-8608.	

Overhead GO Conditions

Code	Description	GO 95 Requirements and Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref.
402	No Climbing Space Caused By Foreign Utility/Private Property Owner	GO 95 Rule 54.7 & OH Standard 251-261 require that there be no conflict or encroachment on the climbing and working space; however, GO 95 allows quadrant climbing space up through the communications level. For maintenance only, do not enter this code where there is quadrant-climbing space available below secondary and communications lines are attached to pole. Refer to "climbing space diagram". Use this code only when climbing and working space infractions are caused by Foreign Utility.		If caused by vegetation and no bucket truck access is available, send an IO to Vegetation Management or call the VM help desk when trimming is needed urgently. Record in DIMS and send an IO to Joint Facilities. Clear after IO sent. Do Not field clear.	OH 225 OH 51 OH 255 OH 261
403	Insufficient Clearance Due To Foreign Utility	GO 95 sets clearance requirements for various subjects. Refer to OH Standard for review of these requirements. Use this code when there is not adequate clearance or ground to conductor clearances caused by foreign utility. Service poles with two or more services with foreign utilities attached must have four feet separation. Poles with Only one service and foreign utility attached may have two feet separation. Use code 274 if not caused by foreign utility.		Record in MDT and send IO to Compliance Management. Do Not field clear.	OH221 OH224 OH228 OH262 OH236 OH264 OH908 OH1406 OH1509 OH1530 OH1533
481	Pole replacement from POIN	Use this code when a pole coded 682 or 683 for c-truss or fiber-wrap repair is determined by the Electric Supervisor to need replacement.		Use DIMS On-line Condition Entry tab, Follow-Up type, and enter as pending. The original date of the 682 or 683 code shall be the effective date for the new code 481. Add comments referring to the Osmose inspection code and then clear the Osmose POIN in the Clear Inspection screen.	

DIVISION	DEPARTMENT	1/26
DISTRIBUTION OPERATIONS	ELECT. DISTRIBUTION SERVICES	FEBRUARY 27,2006

SECTION
OVERHEAD CORRECTIVE MAINTENANCE

SUBJECT TITLE
VISUAL INSPECTION OF POLES AND EQUIPMENT

Overhead Reliability Conditions

Code	Description	Overhead Standards	Reactive Maintenance	Follow Maintenance -up	Ref.
32	Pothead leaking	Use this code where the insulating gel is leaking from the pothead.		Turn in follow-up to electric supervisor	SP602
33	Pothead chipped/broken	Use this code where the pothead shows signs of cracks, chips or are broken.		Turn in follow-up to electric supervisor	SP602
150	No applicable code	Use this code to identify reliability conditions that do not have existing codes. Provide comments in DIMS/MDT.		Follow-up as required	
208	Tags missing (P/N sign)	SDG&E Electric Standards requires that when the primary phase and primary neutral cannot be distinguished, the primary neutral shall be identified by a “PN” sign.		Follow-up fix by crew; install ‘PN’ sign on primary neutral.	OH208
220	Guy Buried	Use this code when the anchor rod eye is buried or less than six inches above the ground. Install an anchor rod extension.		Follow-up fix by crew	OH927.1
227	Damaged/ Missing Warning Signs	OH Standards requires warning sign (Item 10) on poles with energized electrical facilities (secondary and above).		Fix on site	OH208.4
233	Standoff pin missing or damaged	Use this code when the standoff is damaged or missing.		Follow-up fix by crew	OH1145
438	Foreign utility not transferred to new pole	Use this code where SDG&E has installed a new pole and the communications utilities have not transferred off the old pole. Use code 238 where the communications facilities have been transferred.		Send an IO to Joint facilities and identify which communication utility has not transferred.	
600 Series	Intrusive Wood Pole Inspection (contractor)	Refer Intrusive Wood Pole Inspection Codes 601-699 in DIMS. To be entered only by Wood Pole Inspection Contractor.			

Overhead Discretionary Conditions

Code	Description	Overhead Standards	Reactive Maintenance	Follow-up Maintenance	Ref
006	Cable pole tag missing	Equipment requires labeling	Fix on site		
299	No repairs needed				SP601 OH208

DIVISION	DEPARTMENT	1/26
DISTRIBUTION OPERATIONS	ELECT. DISTRIBUTION SERVICES	FEBRUARY 27,2006

SECTION
OVERHEAD CORRECTIVE MAINTENANCE

SUBJECT TITLE
VISUAL INSPECTION OF POLES AND EQUIPMENT

ATTACHMENT B

Quality Assurance Report Form

CMP Internal Audit for the ____ Quarter of 200_

Type of Inspection	Cycle	Total Facilities Inspected	1% Audited (minimum 5)	# of Infractions Reported by Inspector	# of Infractions Confirmed by GF	% SCORE reported/ confirmed
Overhead Visual (Poles)	5 year					
Above Ground External	3 year					
Above Ground Internal	3 year					
Switches	3 year					
Sub Surface	10 year					
Sub Surface	3 year					

Type of Infraction	Cycle	Total Infractions Repaired	1% Audited (minimum 5)	# Cleared & Confirmed by GF	# To be Cleared in DIMS	% SCORE confirmed/to be cleared
Overhead Visual (Poles)	5 year					
Underground	3 or 5 year					

ISSUED BY	APPROVED BY
JAKE CARDENEZ /DARREN WEIM	J. D. JENKINS

Yellow highlight indicates change since last publication.

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1. PURPOSE

This Standard Operating Procedure establishes guidelines for the notification of Fire Potential Index Ratings and operating restrictions for overhead facilities during varying levels of System Operating Conditions, such as when the National Weather Service (NWS) issues a Red Flag Warning. The restrictions outlined in this procedure will apply to but are not limited to the SDG&E Fire Threat Zone, which includes the Highest Risk Fire Areas. These areas are within SDG&E's service territory, excluding facilities in Imperial Valley.

2. GENERAL

2.1. This procedure outlines the actions to be taken by both Grid and Distribution Control Centers in long-term seasonal and short-term weather-based conditions. EDO and EGO actions are taken in order to balance electrical reliability to customers with the risks associated with Fire Danger. These actions are based on the current or forecasted FPI, system conditions, and major events (i.e. fire, high winds, low relative humidity, etc.).

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2.1.1. Specific actions for the Transmission system are outlined in TMC1320a.

2.1.2. Specific actions for the Distribution system are outlined in DOP3017.

2.2. The Fire Potential Index (FPI) is a planning and decision support tool that incorporates weather and fuels information to rate the overall fire threat at the district level. Below is the FPI Formula and Rating Scale.

2.2.1. $FPI = WX + \frac{DL}{LFM} + G$ where WX represents wind speeds and dew point depression on a scale from 0-6, DL represents the GACC's Dryness Level, LFM represents the Live Fuel Moisture of Chamise, and G represents the greenness of the grasses as determined by satellite observations.

2.2.2. FPI is on a scale of 1-17 and is rated as follows:

FPI	Rating
01-11	Normal
12-14	Elevated
15-17	Extreme

2.3. Based on the current or forecasted FPI, system conditions, and/or major events, EDO and EGO have the authority to take specific actions either independently or in consultation with Meteorology, Fire Coordination, and/or District Leadership. These actions may include operational changes or to request field response.

2.4. SDG&E's Weather Network consists of over 140 weather stations, installed at various locations across the service territory. This weather network supports safe and reliable operation of the Transmission and Distribution systems and permits area specific forecasting and monitoring, especially during adverse weather events.

2.5. EDO, in coordination with EGO, will declare when System Operating Conditions (Normal, Elevated, and Extreme) begin and end based on consultation with the SDG&E FC and/or Meteorologist. The NWS will declare Red Flag Warnings.

2.6. **System Operating Condition Definitions:**

2.6.1. Normal Operating Condition (FPI Rating 01 – 11)

2.6.1.1. The burn environment of a specific area or district is not conducive for a large wildfire within the SDG&E service territory.

2.6.1.2. Refer to Section 6, for references during Normal FPI Rating.

2.6.2. Elevated Operating Condition (FPI Rating 12 – 14)

2.6.2.1. The burn environment of a specific zone or district has potentially become conducive for a large wildfire within the SDG&E service territory.

2.6.2.2. Refer to Section 7, for actions and field restrictions during Elevated FPI Rating.

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2.6.3. Extreme Operating Condition (FPI Rating 15 and above)

2.6.3.1. The burn environment of a specific zone or district has potentially become conducive for a catastrophic wildfire within the SDG&E service territory.

2.6.3.2. Refer to Section 8, for actions and field restrictions during Extreme FPI Rating.

2.6.4. Red Flag Warning:

2.6.4.1. The NWS will declare an RFW when:

2.6.4.1.1. **High Wind**: the relative humidity is ≤ 15% with sustained winds of ≥ 25 mph and/or frequent wind gusts of ≥ 35 mph for a duration ≥ 6 hours; or

2.6.4.1.2. **Dry Lightning**: a lightning event that is not accompanied by enough precipitation to significantly wet fuels that have been identified as critically dry. Significant precipitation is defined as ranging from 0.05 inches for grass or brush fuels to 0.15 inches for closed-canopy timber/heavy fuels.

2.6.4.2. Refer to Section 9, Red Flag Warning Overview, for specific actions during a RFW.

2.6.4.3. Refer to Section 10, Red Flag Warning Restrictions, for field restrictions during a RFW.

2.7. EDO is responsible for communicating to designated company employees of changes to the Fire Operating Conditions so that they may notify personnel in their area to take appropriate precautionary measures (See Notifications).

2.8. SDG&E has identified two specific geographic regions for which the System Operating Conditions (FPI Ratings) apply but are not limited to these regions.

2.8.1. SDG&E HRFA:

2.8.1.1. SDG&E's Highest Risk Fire Areas: These areas were identified by SDG&E FC and SDG&E Meteorology using CAL FIRE Fuel ranking, fire history information, and high wind zones determined by publicly available wind speed data. Operating restrictions may apply in these areas whenever SDG&E has determined a potential for large or greater fires exists, or an RFW.

NOTE: SDG&E HRFA is a subset of the SDG&E FTZ.

2.8.2. SDG&E FTZ:

2.8.2.1. The SDG&E Fire Threat Zone is based on the 2006 CAL FIRE's Fire Threat Zone map that was modified by SDG&E FC, which takes into account Extreme and Very High Fire Threat Zones as defined by California Department of Forestry and Fire Protection's

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Fire and Resource Assessment Program (FRAP) Fire Threat Map. Operating restrictions may apply in these areas whenever SDG&E has determined a potential for large or greater fires exists, or an RFW.

2.9. For further detail on affected SDG&E Transmission facilities, refer to TMC1320a, and for SDG&E Distribution facilities refer to DOP3017.

3. CONTACTS

All phone numbers listed below are for use as outlined in this procedure only. Under no circumstances are these phone numbers to be used for any other purpose or distributed without prior permission of management.

SDG&E

Distribution Operations Contacts	[redacted]
STA A DSO – 24 hours	
STA L DSO – 24 hours	
STA A & STA L – FAX	
EDO WF	
TST	
Meteorologists	
On-Call Meteorologist	
[redacted] SDG&E Senior Meteorologist	
[redacted] SDG&E Senior Meteorologist	
[redacted] SDG&E Meteorologist	
Fire Coordinators	
On-Duty Fire Coordinator	
[redacted] Fire Coordinator 1	

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[redacted] Fire Coordinator 2	[redacted]
[redacted] Fire Coordinator 3	
[redacted] Fire Coordinator 4	
[redacted] Alternate Fire Coordinator	
[redacted] Alternate Fire Coordinator	
[redacted] Alternate Fire Coordinator	
EOC Number (Grid Ops Rep.)	
Gas Control Center – Spence Street, Los	
Supervisor	
Dispatcher	
STA Y, Service Dispatch	
Transmission (Grid) Operations: For **unscheduled** or **emergency** switching operations:	
Operations Shift Supervisor (OSS) (24 hours)	[redacted]
Facsimile	
Email	
Transmission (Grid) Operations: For all **routine** switching operations:	
Transmission System Operator (TSO) (24 hours)	[redacted]
Facsimile	

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Email	[redacted]
Procedure Control: Contact to request revisions to this procedure 0800-1600 M-F:	
Grid Control Procedure Desk	[redacted]

CAISO Dispatchers

Folsom	[redacted]
Alhambra	

CAL FIRE

Monte Vista Emergency Command Center CAL FIRE Dispatcher	[redacted]

YUMA FIRE

BLM Colorado River District	[redacted]
[redacted] Fire Management Officer	
Alternate Contact: [redacted]	
For portions of SWPL running through the Quechan Reservation: Bureau of Indian Affairs Ron Morrison, Fire Management Officer	

4. NOTIFICATIONS

The following notification procedures apply during all hours (including weekends and holidays). The notification will clearly identify the System Operating Condition, which may be based on FPI Rating so that personnel may take appropriate actions.

4.1. Anytime the Operating Condition merits a significant long-term operational change and/or the System Operating Condition changes, EDO will initiate a blast pager notification.

4.1.1. When an RFW is issued, EDO should consult with the SDG&E FC and Meteorologist, if available and time allows, to confirm the type of RFW (High Wind or Dry Lightning) and the NWS Fire Weather Zones affected [San Diego County: 243 (Coastal), 250 (Inland Valleys), 258 (Mountain), 262 (Desert), Orange County: 552 (Coastal), and 554 (Inland).

4.1.2. An RFW could change during an event (e.g. type, zone, duration). In that case, EDO will reissue the blast pager notification with the updated information.

4.1.3. It may be necessary to issue separate blast pager notices if Red Flag Warnings are declared for multiple zones and different RFW types.

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4.2. EDO will make all notifications to the following personnel and document actions taken.

4.2.1. GCC personnel (OSS or TSO):

4.2.1.1. It is the responsibility of the OSS or TSO to:

4.2.1.1.1. Document receiving the notification on the Operator log and/or Electric Switching Order as applicable

4.2.1.1.2. Notify GC Manager.

4.2.1.1.3. Notify CAISO Dispatchers in Folsom or Alhambra:

4.2.1.1.3.1. In addition to notifying them of the Operating Condition, confirm they understand the actions that SDG&E may be taking under that specific rating.

4.2.2. DCC personnel (TST, EDO WF, or DSO):

4.2.2.1. It is the responsibility of the TST, EDO WF, or DSO to notify Distribution Operations management personnel.

4.2.3. Station Y, Service Dispatch

5. FIELD COORDINATION

5.1. The OSS, in collaboration with EDO, is responsible for clarifying patrol and repair priorities for the field personnel based upon the seriousness of the impacts to the transmission system (e.g. system security, substations out of service, etc.). The OSS will coordinate with EDO to establish priorities based on system needs.

EGO, EDO, and district leadership will collaborate on the staging of the field personnel based on the following:

5.1.1.1. The FPI Rating and the potential for equipment/customer outages

5.1.1.2. The priorities set by the OSS in consultation with EDO

5.1.1.3. District leadership knowledge of construction and environment of the concerned areas.

5.1.2. Staging and tracking of the field personnel will be the responsibility of the appropriate Control Center in coordination with the appropriate district leadership.

5.1.2.1. EGO/GCC will coordinate the staging of the Transmission personnel in collaboration with TCM.

5.1.2.2. EDO/DCC will coordinate the staging of the Distribution personnel (Refer to DOP3017).

5.1.2.2.1. EDO and district leadership may use the CFSP Incident Command Structure at [redacted]

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5.2. If weather conditions warrant, additional resources will be coordinated between EDO, EGO, ERO, Construction Services, and Kearny. These resources can include but are not limited to the following: Additional ETS, Electric WF4 Crews, Kearny SCADA Line Crews, Kearny Relay Technician, Kearny Substation Crews, TCM Crews, RTU Technicians, and/or Telecom Technicians.

5.2.1. ETS or any Field Observers requested for the event shall be able to observe the area that is forecasted to have the adverse weather condition and shall be able to report on the following questions:

5.2.1.1. DEBRIS: Have you observed any debris being carried by the wind? If so, where (location, GPS, structure number, etc.)?

5.2.1.2. VEGETATION: Have you observed any damage or significant impacts to the vegetation? If so, where (location, GPS, structure number, etc.)?

5.2.1.3. SYSTEM: Have you observed significant conductor/system movement? If so where (location, GPS, structure number, etc.)?

6. NORMAL OPERATING CONDITION (FPI RATING 01 – 11)

6.1. Normal Operating Condition may be based on FPI Rating but is not limited to this rating. Refer to Section 2.6.1.1 for Normal Operating Condition definition

6.2. GCC will observe normal recloser operation and/or line testing as outlined in TMC1010.

6.3. DCC will observe normal recloser operation and/or circuit testing as outlined in DOP3017.

7. ELEVATED OPERATING CONDITION (FPI RATING 12 – 14)

7.1. Elevated Operating Condition may be based on FPI Rating but is not limited to this rating. Refer to section 2.6.2.1 for Elevated Operating Condition definition.

7.2. GCC will observe reclosing and line testing as outlined in TMC1320a.

7.3. DCC will observe reclosing and circuit testing as outlined in DOP3017.

7.4. GC, EDO, and FC management may decide to turn on reclosers in the FTZ during inclement weather such as rain or lightning storm.

8. EXTREME OPERATING CONDITION (FPI RATING 15 AND ABOVE)

8.1. Extreme Operating Condition may be based on FPI Rating but is not limited to this rating. Refer to section 2.6.3.1 for Extreme Operating Condition definition.

8.2. EGO and EDO will collaborate to determine the Field Personnel staging plan for the event (Refer to Section 5.1.2).

8.3. The actions listed in ESP113.1 Section 4 will apply to the SDG&E FTZ (including HRFA) within the appropriate operating district(s).

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8.4. The following discretionary overhead work will be prohibited in the SDG&E FTZ (including HRFA), within the areas of critical fire weather (FPI 15 and above), for the operating district(s). If, on the day of the job, the Electric Construction Supervisor has had the job field verified and, after consultation with the FC, determines there is no fire risk then work may proceed with Control Center approval (refer to TMC1320a, Table 1 for lines and DOP3017B for circuits in the FTZ).

8.4.1. Capacitors (unless immediate failure/fire risk; includes SCADA devices)

8.4.2. Grounding Banks (unless immediate failure/fire risk)

8.4.3. Regulators (unless immediate failure/fire risk; includes SCADA devices)

8.4.4. Non-emergency switch maintenance (includes SCADA devices)

8.4.5. Non-emergency OH switching

8.4.6. Pole, arm, and insulator replacement unless failure is imminent

8.4.7. Reconductoring

8.4.8. Lightning arrester replacement

8.4.9. Insulator Hot Wash

9. RED FLAG WARNING OVERVIEW

9.1. Red Flag Warning (RFW) – Refer to Section 2.6.4.1 for weather conditions when the NWS will declare an RFW.

9.2. Whenever the NWS declares an RFW, notification will be provided via the Blast Pager System. **Electric Transmission and Electric Distribution operating restrictions may be applied.**

9.3. The NWS will specify which Fire Weather Zones are included when they declare an RFW. SDG&E operating restrictions **may not be limited** to the zones in the RFW declaration.

For Electric Distribution: When an RFW is declared, the NWS Fire Weather Zone listed will be the only zone affected by the operating restrictions. **Example:** When a RFW is declared for NWS Fire Weather Zone 250, the Electric Distribution operating restriction will only apply to Zone 250.

For Electric Transmission: When an RFW is declared, the affected NWS Fire Weather Zone might be extended to adjacent zone as stated in the following examples. **Example 1:** When an RFW is declared for either NWS Fire Weather Zone 250 or 258, Electric Transmission operating restrictions will apply within the FTZ to Zones 250 and 258. **Example 2:** When an RFW is declared for NWS Fire Weather Zone 243, Electric Transmission operating restrictions will apply within the FTZ to Zones 243, 250, and 258.

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9.3.1. The affected SDG&E San Diego County service territory is in NWS Fire Weather Zones 243 (Coastal), 250 (Inland Valleys), 258 (Mountain), and 262 (Desert).

9.3.1.1. Exception: If an RFW is declared **solely** for NWS Fire Weather Zone 262, then SDG&E operating restrictions **may be limited** to Zone 262.

9.3.2. The affected SDG&E Orange County service territory is in NWS Fire Weather Zones 552 (Coastal) and 554 (Inland)

NOTE: While Orange County Fire Weather Zone 257 (Santa Ana Mountains) appears on Appendix 2, no operating restrictions will be applied in this zone because there are no affected facilities in this zone.

9.4. An RFW issued by the NWS will specify the effective period and will end following the expiration of the initial warning period, unless the RFW duration is modified by the NWS.

10. RED FLAG WARNING RESTRICTIONS

10.1. A fire suppression engine or patrol may be dispatched to accompany crews that are performing emergency work in the FTZ that could pose a fire risk. These resources are generally contractors hired to support SDG&E work crews in fire prevention, fire safety, and suppression of small fires that may result from work in the Wildland fire areas

10.2. The actions listed in ESP113.1 Section 4 will apply to the SDG&E FTZ within the corresponding NWS Fire Weather Zone identified for the RFW.

10.3. The following discretionary overhead work will be prohibited in the **SDG&E FTZ, including HRFA,** within the corresponding NWS Fire Weather Zone identified for the RFW (refer to TMC1320a, Table 1 for lines and DOP3017B for circuits in the FTZ).

10.3.1. Capacitors (unless immediate failure/fire risk; includes SCADA devices)

10.3.2. Grounding Banks (unless immediate failure/fire risk)

10.3.3. Regulators (unless immediate failure/fire risk; includes SCADA devices)

10.3.4. Non-emergency switch maintenance (includes SCADA devices)

10.3.5. Non-emergency OH switching

10.3.6. Pole, arm, and insulator replacement unless failure is imminent

10.3.7. Reconductoring

10.3.8. Lightning arrester replacement

10.3.9. Insulator Hot Wash

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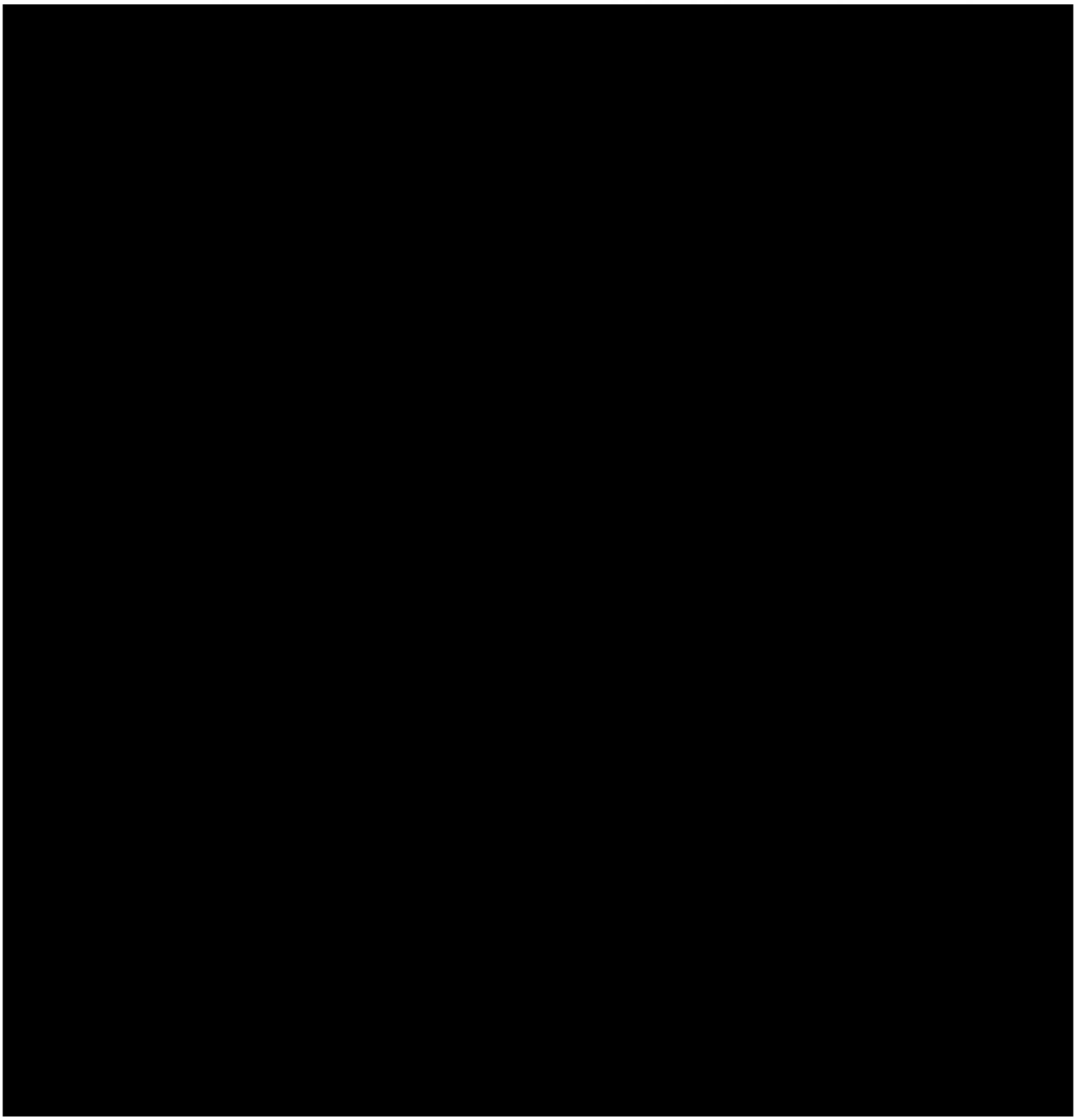
11. APPENDIX 1: SDG&E FTZ, HRFA, AND NWS FIRE WEATHER ZONES MAP



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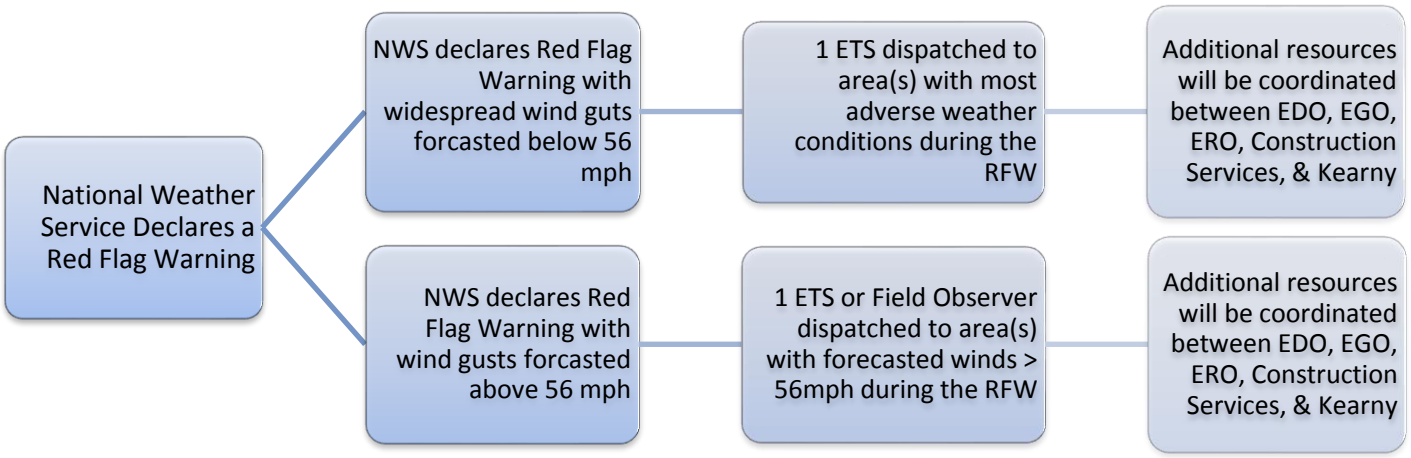
12. APPENDIX 2: SUGGESTED SDG&E FIRE PREPAREDNESS CREW MOBILIZATION FLOWCHART



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13. REFERENCES

DOP3017 – EDO Requirements during SDG&E Fire Conditions

DOP3017B – Distribution Circuits and Service Restorers Associated with Elevated & Red Flag Operating Conditions

ESP 113.1 – Wildland Fire Prevention & Fire Safety

TMC1010 – Transmission System Fault Testing

TMC1320a – SDG&E Fire Preparedness: Transmission Restrictions

14. DEFINITIONS

14.1. Area of Critical Fire Weather – area in which conditions are conducive to rapid fire growth
14.2. CAISO – California Independent System Operator
14.3. CAL FIRE – California Department of Forestry and Fire Protection
14.4. DCC – SDG&E's Distribution Control Center (distribution control only)
14.5. DSO – SDG&E Distribution System Operator
14.6. EDO – SDG&E Electric Distribution Operations Department
14.7. EDO WF – SDG&E Electric Distribution Operations Working Foreman
14.8. EGO – SDG&E Electric Grid Operations Department
14.9. EOC – SDG&E Emergency Operations Center
14.10. ERO – Electric Regional Operations
14.11. ETS – SDG&E Electric Troubleshooter
14.12. FC – Fire Coordinator
14.13. FPI – Fire Potential Index
14.14. FTZ – The SDG&E Fire Threat Zone
14.15. GC – SDG&E Grid Control Section
14.16. GCC – SDG&E's Transmission Grid Control Center (transmission control only)
14.17. HRFA – SDG&E's Highest Risk Fire Areas
14.18. NWS – National Weather Service
14.19. NWS Fire Weather Zones – The NWS uses zones to distinguish different areas:
    14.19.1. Fire Weather Zone 242 – Orange County Coastal Area
    14.19.2. Fire Weather Zone 243 – San Diego County Coastal Area
    14.19.3. Fire Weather Zone 250 – San Diego County Inland Valleys
    14.19.4. Fire Weather Zone 257 – Orange County Inland Valley
    14.19.5. Fire Weather Zone 258 – San Diego County Mountains
    14.19.6. Fire Weather Zone 262 – San Diego County Desert
14.20. OH – Overhead

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14.21. OSS – SDG&E Grid Control Operations Shift Supervisor
14.22. RFW – Red Flag Warning
14.23. RTU – Remote Terminal Unit
14.24. SCADA – Supervisory Control and Data Acquisition system
14.25. SDG&E – San Diego Gas & Electric Company
14.26. TCM – Transmission Construction and Maintenance Section of SDG&E's Kearny Maintenance and Operations Department
14.27. TSO – SDG&E Transmission System Operator
14.28. TST – SDG&E Electric Distribution Operations Technical Support Team

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15. DOCUMENT OWNERSHIP

	Name	Date
REVISED BY: Transmission Documentation Control Advisor	[redacted]	04/14/15
REVIEWED BY: SDG&E Fire Coordinator 1		02/20/15
REVIEWED BY: SDG&E Grid Control Operations Shift Supervisor		02/19/15
REVIEWED BY: SDG&E EDO Document Specialist		04/08/15
REVIEWED BY: SDG&E Grid Control Transmission System Operator		02/20/15
REVIEWED BY: SDG&E Sr. Meteorologist		02/20/15
REVIEWED BY: SDG&E Sr. GIS Analyst		02/23/15
REVIEWED BY: SDG&E Team Lead Technical Support		03/02/15
APPROVED BY: Electric Distribution Operations Manager		04/14/15
APPROVED BY: Grid Control Manager		04/07/15
ISSUED BY: Transmission Documentation Control Advisor		04/15/15

16. VERSION HISTORY

Issue Date	Description of Change	Change Type
	02/07/00, 01/04/02, 08/14/02, 09/09/03, 12/01/03, 08/18/04, 12/27/06, 09/03/08, 10/03/08 (eff. 10/06/08), 11/17/08, 02/27/09, 05/29/09, 07/30/09, 08/24/09, 09/22/09, 10/23/09, 01/11/10, 06/01/10, 06/09/10, 08/26/10, 09/07/10, 10/21/10, 03/18/11, 08/05/11, 10/27/11, 08/24/11	Prior Pubs
09/13/13	Updated Definitions, Section 4.5: Added Fire Potential Index and rating scale, Section 4.6.1.1: Updated Normal Operating Condition declaration criteria, Section 6.3: Remove Gas Control Center from EDO notification of change in operating condition, Section 10.1: Included exception to allow work during Elevated Wind Condition if Electric Construction Supervisor field verifies there is no fire risk, Section 13: Combined SDG&E FTZ Area Map and SDG&E HRFA Map into one Service Area Map, Section 14: Update the Crew Mobilization Flowcharts	Revised
08/12/14	Major revision updating Operating Conditions to include Fire Potential Index Ratings throughout the entire document, Updated References, Section 10.4 and 12.3: Removed "energized" from the description of restricted work, Section 13: Updated 2014 SDG&E FTZ / HRFA map, Section 14, Appendix 2: Removed flowchart for Elevated Wind Operating Condition	Revised

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Issue Date	Description of Change	Change Type
04/15/15	Relocated Reference and Definitions to bottom; Section3: Added Kaite Giannecchini to Meteorologist Contact list; Removed UWPT from Definitions; Section 4.1.1 and Section 9.3.2: Changed Orange County number from 242 to 552 (Coastal) and added 554 (Inland). Section10.1: Removed UWPT and replaced with fire suppression and changed verbiage; Section 11: Appendix 1: Updated Map; Section 9.3.2 & Section 11: NOTE removed Inland Valley and replaced with Santa Ana Mountains.	Revised
04/20/15	Updated hyperlink for DOP3017	Errata

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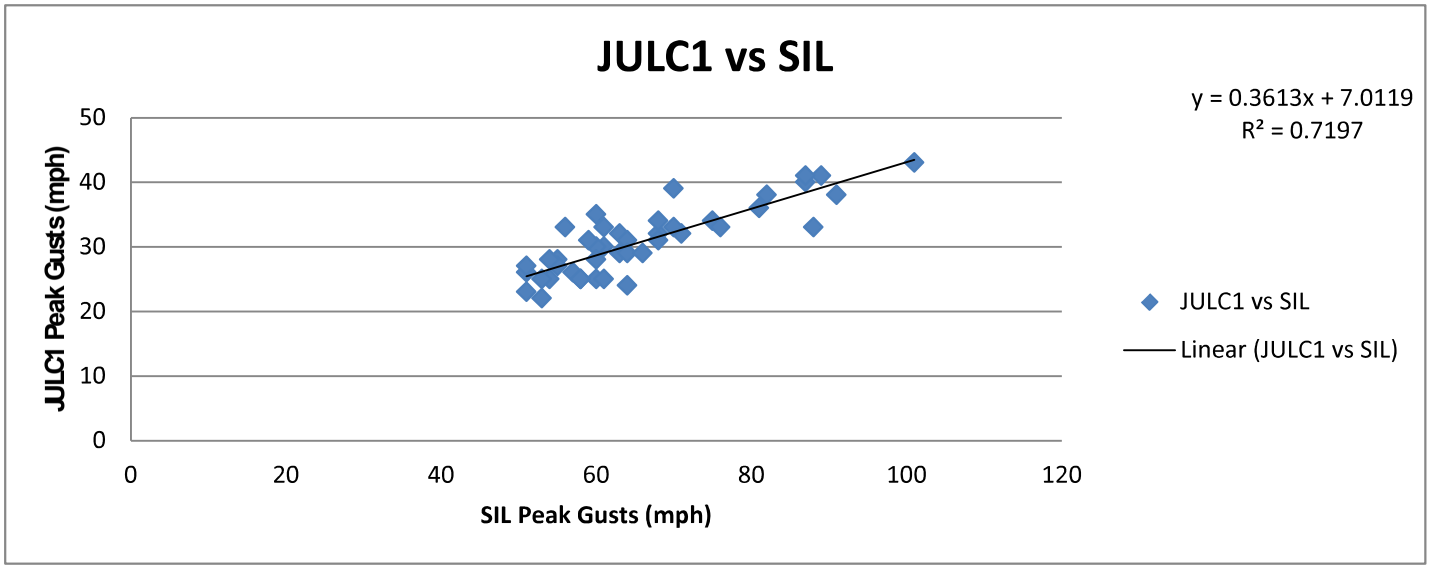
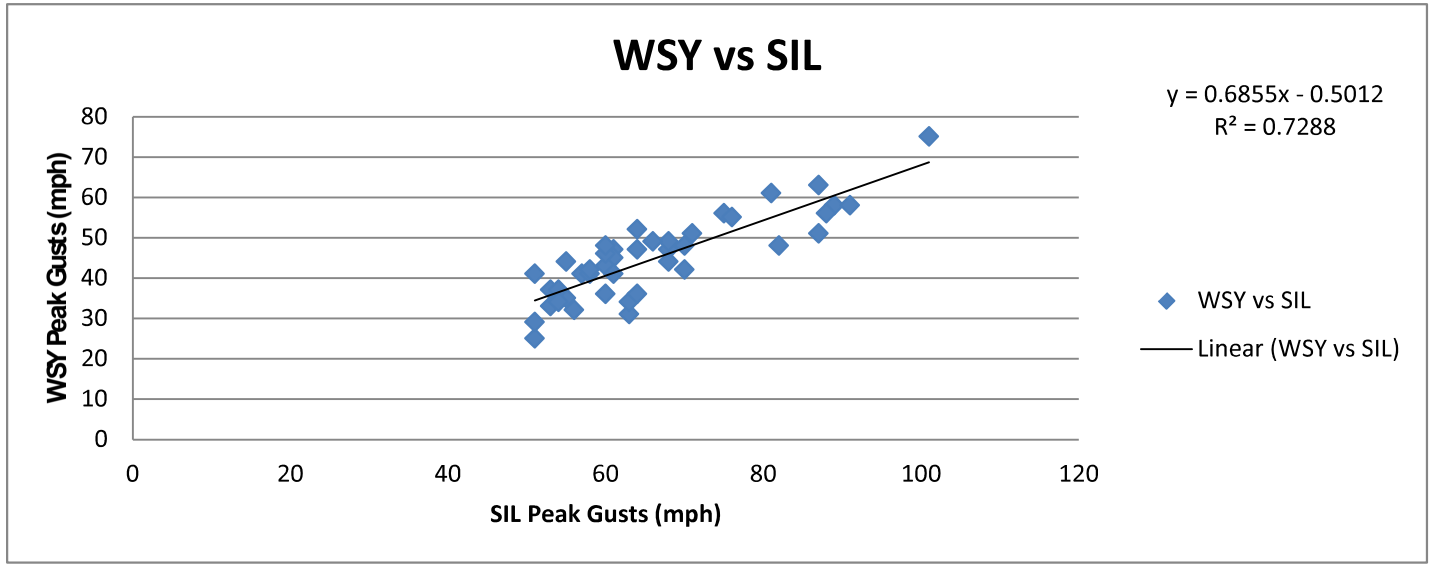
Event Start	Event End	SIL Max	WSY Max	JULC1 Max	WSY/JULC1	SIL/JULC1	WSY/SIL
4/17/2016	4/17/2016	51	25	23	1.09	2.22	0.49
4/6/2016	4/6/2016	61	47	30	1.57	2.03	0.77
2/14/2016	2/15/2016	55	35	28	1.25	1.96	0.64
2/4/2016	2/9/2016	68	47	32	1.47	2.13	0.69
1/25/2016	1/26/2016	61	45	33	1.36	1.85	0.74
1/21/2016	1/21/2016	55	44	27	1.63	2.04	0.80
1/11/2016	1/12/2016	60	43	25	1.72	2.40	0.72
12/26/2015	12/27/2015	70	42	39	1.08	1.79	0.60
11/20/2015	11/21/2015	53	37	22	1.68	2.41	0.70
11/12/2015	11/13/2015	54	37	25	1.48	2.16	0.69
11/6/2015	11/7/2015	57	41	26	1.58	2.19	0.72
4/16/2015	4/16/2015	58	41	25	1.64	2.32	0.71
3/26/2015	3/26/2015	63	31	29	1.07	2.17	0.49
3/13/2015	3/13/2015	56	32	33	0.97	1.70	0.57
3/5/2015	3/7/2015	71	51	32	1.59	2.22	0.72
2/11/2015	2/13/2015	82	48	38	1.26	2.16	0.59
1/22/2015	1/26/2015	89	58	41	1.41	2.17	0.65
1/14/2015	1/15/2015	63	34	32	1.06	1.97	0.54
12/26/2014	12/27/2014	60	46	35	1.31	1.71	0.77
12/23/2014	12/23/2014	60	48	30	1.60	2.00	0.80
11/23/2014	11/25/2014	87	51	40	1.28	2.18	0.59
11/16/2014	11/18/2014	59	N/A	31	N/A	1.90	N/A
11/4/2014	11/5/2014	68	44	34	1.29	2.00	0.65
10/2/2014	10/2/2014	53	33	25	1.32	2.12	0.62
5/12/2014	5/15/2014	87	63	41	1.54	2.12	0.72
4/29/2014	5/1/2014	101	75	43	1.74	2.35	0.74
4/14/2014	4/14/2014	64	47	31	1.52	2.06	0.73
3/8/2014	3/9/2014	57	N/A		N/A	N/A	N/A
1/23/2014	1/24/2014	51	41	26	1.58	1.96	0.80
1/13/2014	1/17/2014	88	56	33	1.70	2.67	0.64
12/14/2013	12/16/2013	81	61	36	1.69	2.25	0.75
12/9/2013	12/9/2013	75	56	34	1.65	2.21	0.75
10/4/2013	10/6/2013	70	48	33	1.45	2.12	0.69
5/2/2013	5/2/2013	58	42	25	1.68	2.32	0.72
4/18/2013	4/19/2013	64	36	24	1.50	2.67	0.56
2/28/2013	3/1/2013	68	49	31	1.58	2.19	0.72
2/24/2013	2/24/2013	60	36	28	1.29	2.14	0.60
2/15/2013	2/16/2013	91	58	38	1.53	2.39	0.64
1/30/2013	1/31/2013	61	41	25	1.64	2.44	0.67

1/15/2013	1/17/2013	76	55	33	1.67	2.30	0.72
1/1/2013	1/2/2013	64	52	29	1.79	2.21	0.81
11/13/2012	11/13/2012	54	34	28	1.21	1.93	0.63
10/26/2012	10/27/2012	66	49	29	1.69	2.28	0.74
10/14/2012	10/14/2012	51	29	27	1.07	1.89	0.57
	Median (all events)				1.52	2.17	0.69
	Standard Deviation (all events)				0.22	0.21	0.08
	Median (SIL ≥ 65 mph)				1.54	2.19	0.69
	Standard Deviation (SIL ≥ 65 mph)				0.19	0.18	0.06


JULC1 vs SIL
y = 0.3613x + 7.0119
R² = 0.7197
JULC1 Peak Gusts (mph)
SIL Peak Gusts (mph)
JULC1 vs SIL
Linear (JULC1 vs SIL)
0
10
20
30
40
50
0
20
40
60
80
100
120


WSY vs SIL
y = 0.6855x - 0.5012
R² = 0.7288
WSY Peak Gusts (mph)
SIL Peak Gusts (mph)
WSY vs SIL
Linear (WSY vs SIL)
0
10
20
30
40
50
60
70
80
0
20
40
60
80
100
120

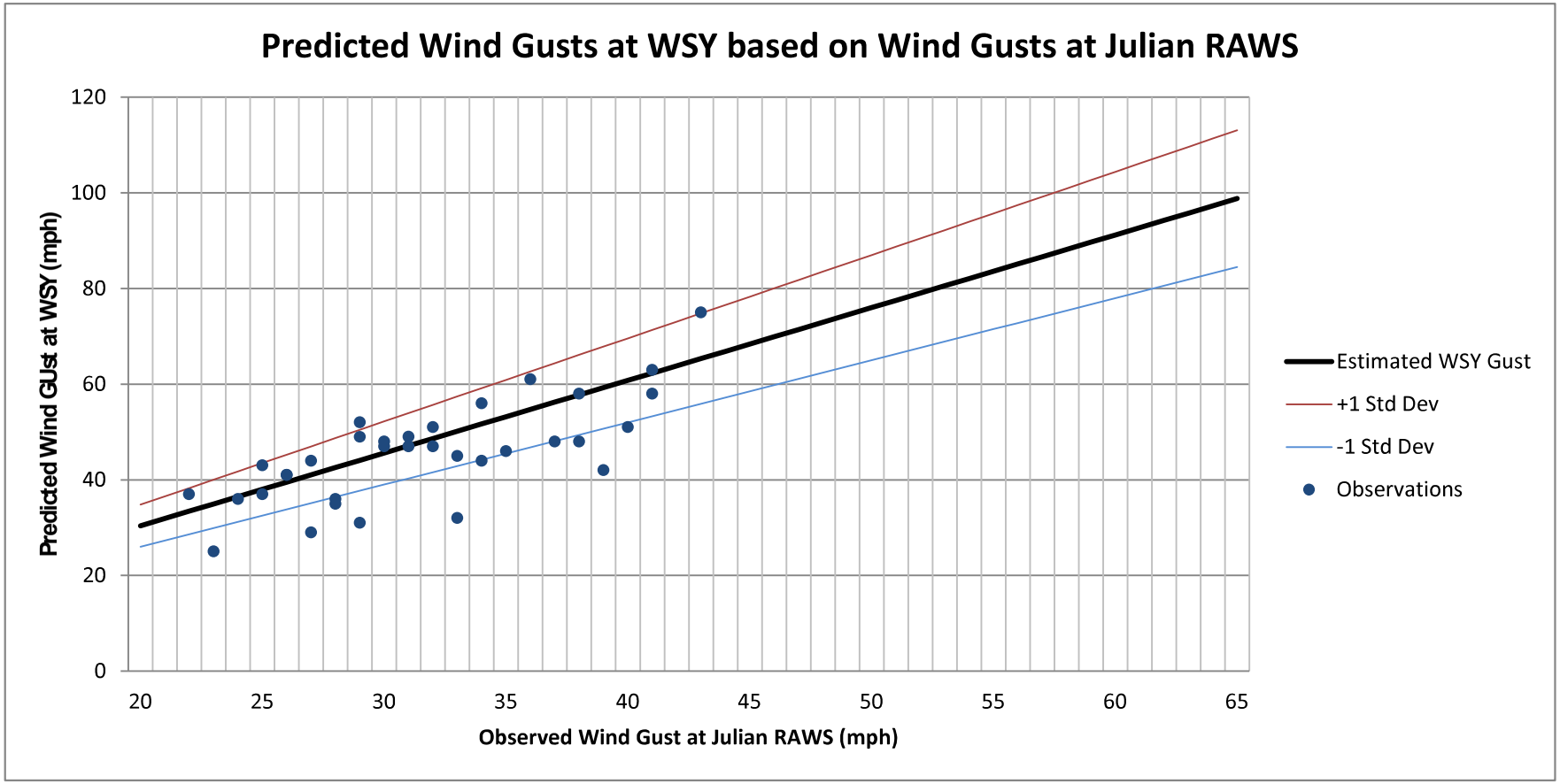
Predicted peak wind gusts at WSY based on wind gusts at JULC1

JULC1 (mph)	WSY (mph)	+1 std dv	-1 std dv
20	30	35	26
21	32	37	27
22	33	38	29
23	35	40	30
24	36	42	31
25	38	44	33
26	40	45	34
27	41	47	35
28	43	49	36
29	44	50	38
30	46	52	39
31	47	54	40
32	49	56	42
33	50	57	43
34	52	59	44
35	53	61	46
36	55	63	47
37	56	64	48
38	58	66	49
39	59	68	51
40	61	70	52
41	62	71	53
42	64	73	55
43	65	75	56
44	67	77	57
45	68	78	59
46	70	80	60
47	71	82	61
48	73	84	62
49	74	85	64
50	76	87	65
51	78	89	66
52	79	90	68
53	81	92	69
54	82	94	70
55	84	96	72
56	85	97	73

Actual WSY Observations

37					
25					
36					
43	37	41	33	42	41
41	41				
44	29				
35	36	34			
31	52	49			
47	48				
47	49				
47	51				
45	32	56	48	55	
44	56				
46					
61					
48					
48	58				
42					
51					
58	63				
75					

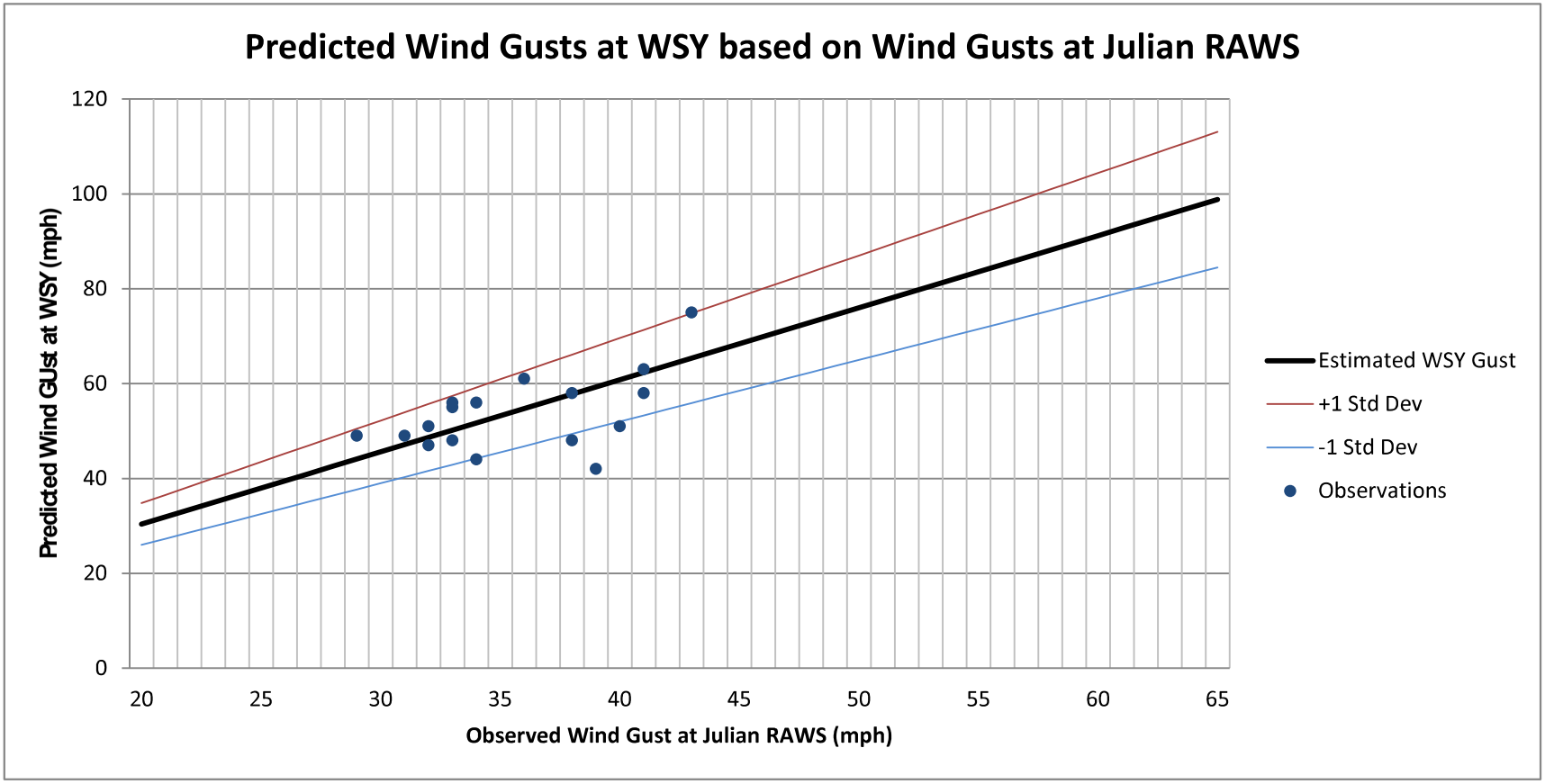
57	87	99	74
58	88	101	75
59	90	103	77
60	91	104	78
61	93	106	79
62	94	108	81
63	96	110	82
64	97	111	83
65	99	113	85



Predicted peak wind gusts at WSY based on wind gusts at JULC1 during Moderate to Strong Santa Ana wind events

JULC1 (mph)	WSY (mph)	+1 std dv	-1 std dv	Actual WSY Observations			
20	30	35	26				
21	32	37	27				
22	33	38	29				
23	35	40	30				
24	36	42	31				
25	38	44	33				41
26	40	45	34				
27	41	47	35				
28	43	49	36				
29	44	50	38	49			
30	46	52	39				
31	47	54	40	49			
32	49	56	42	47	51		
33	50	57	43	56	55	48	
34	52	59	44	44	56		
35	53	61	46				
36	55	63	47	61			
37	56	64	48				
38	58	66	49	48	58		
39	59	68	51	42			
40	61	70	52	51			
41	62	71	53	58	63		
42	64	73	55				
43	65	75	56	75			
44	67	77	57				
45	68	78	59				
46	70	80	60				
47	71	82	61				
48	73	84	62				
49	74	85	64				
50	76	87	65				
51	78	89	66				
52	79	90	68				
53	81	92	69				
54	82	94	70				
55	84	96	72				
56	85	97	73				

57	87	99	74
58	88	101	75
59	90	103	77
60	91	104	78
61	93	106	79
62	94	108	81
63	96	110	82
64	97	111	83
65	99	113	85



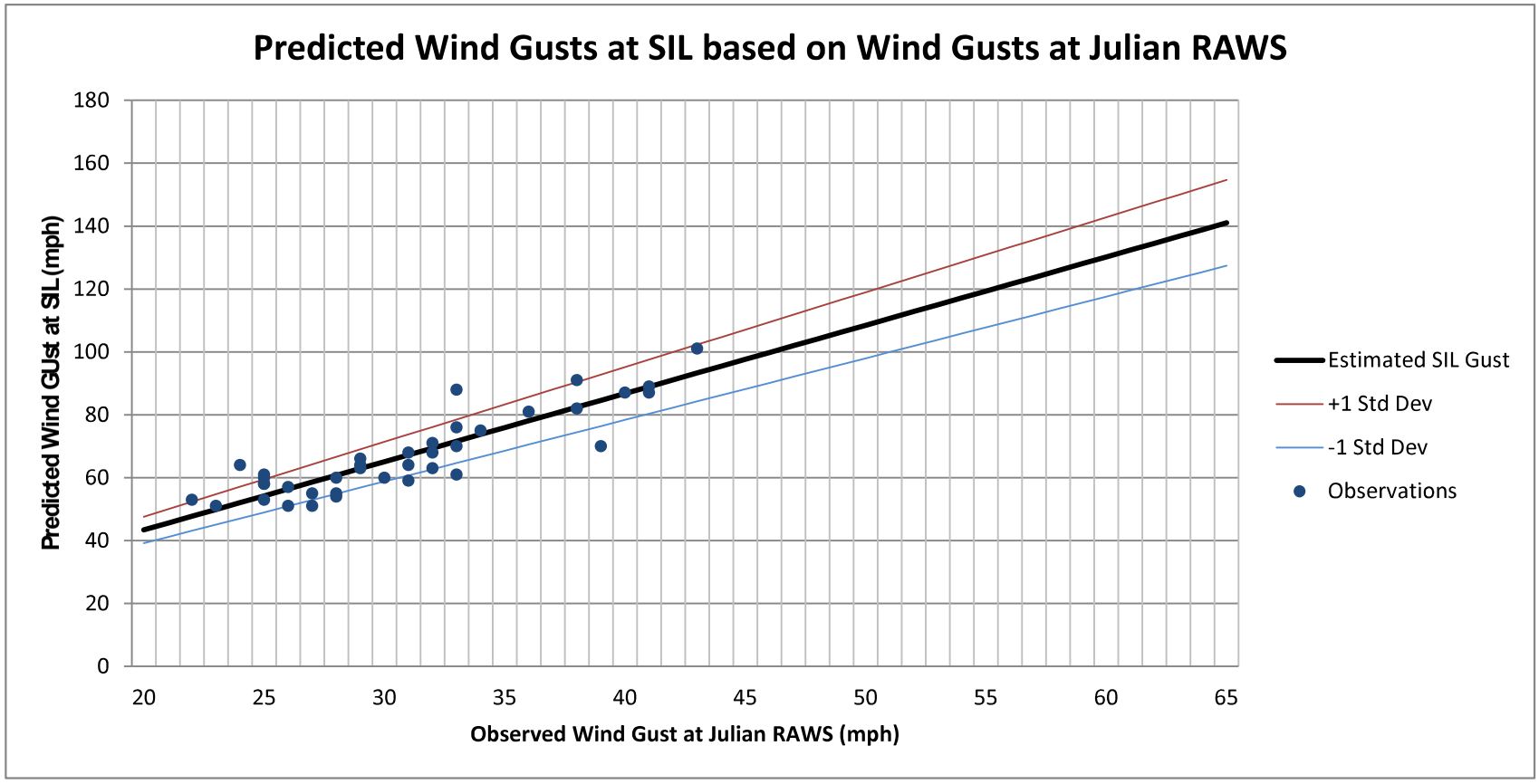
Predicted peak wind gusts at SIL based on wind gusts at JULC1

JULC1 (mph)	SIL (mph)	+1 std dv	-1 std dv
20	43	48	39
21	46	50	41
22	48	52	43
23	50	55	45
24	52	57	47
25	54	60	49
26	56	62	51
27	59	64	53
28	61	67	55
29	63	69	57
30	65	71	59
31	67	74	61
32	69	76	63
33	72	79	65
34	74	81	67
35	76	83	69
36	78	86	71
37	80	88	73
38	82	90	74
39	85	93	76
40	87	95	78
41	89	98	80
42	91	100	82
43	93	102	84
44	95	105	86
45	98	107	88
46	100	109	90
47	102	112	92
48	104	114	94
49	106	117	96
50	109	119	98
51	111	121	100
52	113	124	102
53	115	126	104
54	117	129	106
55	119	131	108
56	122	133	110

Actual SIL Observations

53					
51					
64					
61	60	58	58	54	53
57	51				
55	51				
60	55	54			
66	64	63			
61	60				
68	64	59			
71	68	63			
88	76	70	61	56	
75					
60					
81					
91	82				
70					
87					
89	87				
	30				
101					

57	124	136	112
58	126	138	114
59	128	140	116
60	130	143	118
61	132	145	120
62	135	148	122
63	137	150	123
64	139	152	125
65	141	155	127



- DAVE FALEUMU 760-802-6550

- DAVE FASUAA 619-247-9797

10/23/07

#	Date	GF	Truck#	Foreman	Climber	Vmail	Project	Unit T&M	TB#	Location	City/Town	Yard
1	10/18/07	D. Faasua	LD568	M. Segi	V. Fauolo	701	T&E	Memo		3000 Ave Del Presidente, 205 Ave Pelayo	San Clemente	San Juan Cap Sub
2	10/18/07	D. Faasua	LD823	J. Enriquez	D. Johnson	359	T&E	Memo		28909 Lilac Rd., 12609 Bettsworth, 28630x Valley Center Rd.	Valley Center	Montiel
3	10/18/07	D. Faasua	LD565	F. Graves	R. Trevino	651	T&E	Memo		15641 Las Planideras	RSF	Carlsbad
4	10/18/07	D. Faasua	1500541	J. Crowley	S. Choppin	390	T&E	Memo		40640, 40609 Gavilan Mtn Rd.	Fallbrook	Montiel
		Down	3100202	F. Sanchez	G. Romero	378	Routine	Unit		Traffic control -38921,38648 Pala Temecula	Pala	Montiel
5	10/18/07	D. Faasua	LD540	R. Martinez	J. Pamos	651	T&E	Memo		15641 Las Planideras	RSF	Montiel
6	10/18/07	D. Faasua	LD541	A. Ortiz	T. Xinidakis	313	T&E	Memo		1027 S Live Oak Park	Fallbrook	Day Lily
7	10/18/07	D. Faasua	LD574	T. Maldonado	M. Olmos	351	T&E	Memo		2253 Johnston Rd.	Lake Hodges	Montiel
8	10/18/07	D. Faasua	4000071	D. Kracha	R. Hay	390	T&E	Memo		40640, 40609 Gavilan Mtn Rd.	Fallbrook	Montiel
9	10/18/07	R. Willis	LD511	A. Guerrero	J. Delgado	703	Routine	Unit	952f7	31496 Paseo Christina	San Juan Capistrano	San Juan Cap Sub
10	10/18/07	R. Willis	LD568	L. Laga	A. Sanchez	708	Routine	Unit		33762 Malaga Dr., 33781 Silver Lantern, 33972 Alcazar Dr., 33871 Copper Lantern St.	Dana Point	San Juan Cap Sub
11	10/18/07	R. Willis	LD577	D. Solano	R. Flores	703	Routine	Unit	972c1	5x Ortega Hwy, 2689 Springs St.	San Juan Capistrano	San Juan Cap Sub
12	10/18/07	R. Willis	3300017	L. Tokio		707	Routine	Unit	971c2	31915 9th Ave., 31982 Virginia Way, 31872 8th Ave., 27665 Forbes Rd.	Laguna Hills	San Juan Cap Sub
13	10/18/07	R. Willis	LD516	M. Letuli	J. Rodriguez	708	Routine	Unit		33762 Malaga Dr., 33781 Silver Lantern, 33972 Alcazar Dr., 33871 Copper Lantern St.	Dana Point	San Juan Cap Sub
14	10/18/07	R. Willis	LD1364	F. Ioane	A. Castillo	702	Routine	Unit	972d6	34417 Camino El Molino, 3400 Camino De Estrella, 31281x Bedford Dr.	Dana Point	San Juan Cap Sub
15	10/18/07	R. Willis	LD1360	L. Sialoi	T. Patu	703	Routine	Unit	972b2	26211 Calle Aspero, 31902 Pseo Alto Plano	San Juan Capistrano	San Juan Cap Sub
16	10/18/07	R. Willis	3300045	L. Salamasina		702	Routine	Unit	972d6	34417 Camino El Molino, 3400 Camino De Estrella, 31281x Bedford Dr.	Dana Point	San Juan Cap Sub
17	10/18/07	R. Willis	LD1162	B. Hammond	F. Garcia	707	Routine	Unit	971c2	31915 9th Ave., 31982 Virginia Way, 31872 8th Ave., 27665 Forbes Rd.	Laguna Hills	San Juan Cap Sub
18	10/18/07	J. Orellana	LD1368	L. Simental	J. Gonzales	378	Routine	Unit		35916 Rice canyon Rd., 35825 Rice canyon Rd., 9256 Pala Rd.	Pala	Day Lily
19	10/18/07	J. Orellana	LD513	Edgar Barojas	V. Mondragon	360	Routine	Unit		32425 Verule Vista Ln.	Pauma Valley	Day Lily
20	10/18/07	J. Orellana	LD515	S. Avila	M. Mendoza	379	Routine	Unit		5490 Rainbow Heights Rd.	Rainbow	Day Lily
21	10/18/07	J. Orellana	LD519	E. Barojas	F. Soto	379	Routine	Unit		8827 Clearwater Rd., 1230 Rice Canyon Rd	Rainbow	Day Lily
22	10/18/07	J. Orellana	LD585	A. Avila	M. Vences	379	Routine	Unit		5490 Rainbow Heights Rd.	Rainbow	Day Lily
23	10/18/07	J. Orellana	LD573	K. Allen	F. Lopez	360/ 379	Routine	Unit		11528 Mesa verde Dr., / 236 Old Hwy 395	Pauma Valley/Rainbow	Day Lily
24	10/18/07	J. Orellana	LD476	A. Olibarez		360	Routine	Unit		32425 Vernie Vista Ln.	Pauma Valley	
25	10/18/07	J. Orellana	LD477	A. Razo	R. Mendoza	378	Routine	Unit		13 Pala Mission Rd., 36146 Pala Temecula Rd	Pala	Day Lily
26	10/18/07	J. Orellana	LD913	E. Lesu	T. Sialoi	388	Routine	Unit		6449 Rainbow Heights Rd., 6455 Rainbow Heights, 7447 Rainbow Heights	Rainbow	Day Lily
27	10/18/07	J. Orellana	LD930	M. Rizo	A. Leon	388	Routine	Unit		540 Rice Canyon, 638, 962 Rice Canyon Rd.	Rainbow	Day Lily
		19 Routine					8 Memo Crews			1 Down		

MUTUAL

R. Willis! IS

SDGE0005079

Dates 2-2-83 thru 10-20-07
Types Forced Outages
Facility TL 637

Type	Id	Terminal1	Terminal2	Terminal(s)	kV	Outage Date/Time	Restoration Date/Time	Dead Restoration	Load Drop	Sub Load Dropped	Cause1	Cause2	Field Notes	Description
TL	637				69	2/2/83 16:08	2/2/83 16:09		FALSE		2050			Rain
TL	637				69	6/17/83 16:21	6/17/83 17:57		FALSE		3040			Birds, Nests
TL	637				69	8/16/83 13:35	8/16/83 13:36		FALSE		9999			Undetermined
TL	637				69	8/19/83 17:50	8/19/83 17:51		FALSE		6020			Conductor
TL	637				69	5/30/84 3:54	5/30/84 3:55		FALSE		2010			Lightning
TL	637				69	7/8/84 14:19	7/8/84 14:20		FALSE		2010			Lightning
TL	637				69	7/30/84 19:22	7/30/84 19:22		FALSE		9999			Undetermined
TL	637				69	8/20/84 10:31	8/20/84 10:32		FALSE		9999			Undetermined
TL	637				69	8/21/84 12:56	8/21/84 12:57		FALSE		9999			Undetermined
TL	637				69	5/4/86 9:26	5/4/86 9:27		FALSE		2040			Fire
TL	637				69	7/21/86 15:00	7/21/86 15:01		FALSE		2010			Lightning
TL	637				69	2/6/87 10:10	2/6/87 10:11		FALSE		2020			Wind
TL	637				69	2/7/87 8:13	2/7/87 8:14		FALSE		9999			Undetermined
TL	637				69	3/24/87 14:53	3/24/87 14:54		FALSE		9999			Undetermined
TL	637				69	7/28/87 15:42	7/28/87 18:54		FALSE		5030			Circuit Breaker
TL	637				69	11/28/89 11:55	11/28/89 11:56		FALSE		9999			Undetermined
TL	637				69	11/29/89 8:39	11/29/89 8:40		FALSE		9999			Undetermined
TL	637				69	12/18/89 17:19	12/18/89 22:57		FALSE		6010			Insulator (non-flashover)
TL	637				69	3/31/90 16:29	3/31/90 16:30		FALSE		9999		AFTER PATROL	Undetermined
TL	637				69	8/5/90 23:48	8/5/90 23:49		FALSE		2010		LIGHTNING IN AREA	Lightning
TL	637			ST	69	10/25/90 13:16	10/25/90 13:36		FALSE		5999		BROKE BUS PHSE FUSE	Other Substation Equipment
TL	637				69	3/20/91 23:53	3/21/91 1:06		FALSE		2010		LIGHTNING IN AREA	Lightning
TL	637				69	3/21/91 1:58	3/21/91 17:07		FALSE		9999		AFTER PATROL	Undetermined
TL	637				69	9/5/91 18:28	9/5/91 19:28		FALSE		2010			Lightning
TL	637				69	3/31/92 13:13	3/31/92 13:14		FALSE		2010		LIGHTNING STRIKE	Lightning
TL	637				69	3/31/92 13:17	3/31/92 13:18		FALSE		2010		LIGHTNING STRIKE	Lightning
TL	637				69	5/15/93 16:09	5/15/93 16:09		FALSE		9999		UNDETERMINED	Undetermined
TL	637				69	11/14/93 8:51	11/14/93 8:54		FALSE		2010		LIGHTNING STRIKE	Lightning
TL	637				69	1/1/94 10:05	1/1/94 10:05		FALSE		9999			Undetermined
TL	637				69	7/8/94 9:16	7/8/94 9:16		FALSE		6060		DAMAGED	Guy
TL	637				69	7/8/94 9:55	7/8/94 13:58		FALSE		6010	6060	REPAIR DAMAGED GUY	Repair/Replacement
TL	637				69	8/9/94 13:17	8/9/94 13:17		FALSE		2010			Lightning
TL	637				69	8/13/94 13:53	8/13/94 13:53		FALSE		2010		LIGHTNING IN AREA	Lightning
TL	637				69	8/13/94 13:55	8/13/94 13:55		FALSE		2010		LIGHTNING IN AREA	Lightning
TL	637				69	8/13/94 14:06	8/13/94 14:06		FALSE		2010		LIGHTNING IN AREA	Lightning
TL	637				69	9/1/95 12:51	9/1/95 12:51		FALSE		2010	1010		Lightning
TL	637				69	9/22/95 18:24	9/22/95 18:24		FALSE		9999			Undetermined
TL	637			CREELMAN SANTA YSABEL	69	6/13/96 23:59	6/13/96 23:59		FALSE		9999			Undetermined
TL	637			CREELMAN SANTA YSABEL	69	5/5/97 12:26	5/5/97 12:26		FALSE		3060			Animals
TL	637	Creelman	Ysabel		69	2/9/00 14:37	2/9/00 19:49		FALSE	None	8010	6050	Broken x-arm	Repair/Replacement
TL	637	Creelman	Ysabel		69	6/6/00 5:58	6/6/00 5:58		FALSE	None	9200			Undetermined - After Patrol
TL	637	Creelman	Ysabel		69	7/3/01 14:29	7/3/01 14:29		FALSE	None	2010	6020	repairs	Lightning
TL	637	Creelman	Ysabel		69	7/3/01 14:30	7/3/01 22:09		FALSE	None	2010		repairs	Lightning
TL	637	Creelman	Ysabel		69	2/10/02 10:10	2/10/02 10:11		FALSE		2020		Outage added per CAISO	Wind

SDGE0000788

Type	Id	Terminal1	Terminal2	Terminal(s)	kV	Outage Date/Time	Restoration Date/Time	Restoration	Load Drop	Sub Load Dropped	Cause1	Cause2	Field Notes	Description
TL	637	Creelman	Ysabel		69	2/12/02 12:18	2/12/02 16:27		FALSE	None	8010	6050	Replaced broken cross-arm	Repair/Replacement
			Santa										settings due to failed 12 kV 3-phase voltage	Substation Equip
TL	637	Creelman	Ysabel		69	11/7/02 16:03	11/7/02 16:04		FALSE	None	8020	5060	regulator	Repair/Replacement
TL	637	Creelman	Ysabel		69	1/8/03 15:21	1/8/03 8:31		FALSE	None	2020		Conductor down/high winds/repairs in progress	Wind
TL	637	Creelman	Ysabel		69	3/14/03 12:29	3/14/03 12:29		FALSE	None	1010		Flashed insulators pole Z4165667	wash)
TL	637	Creelman	Ysabel		69	3/29/03 3:14	3/29/03 3:14		FALSE	None	2020		High winds in area/guy wire contact	Wind
TL	637	Creelman	Ysabel		69	3/29/03 3:43	3/29/03 3:43		FALSE	None	2020		High winds in area/guy wire contact	Wind
TL	637	Creelman	Ysabel		69	3/29/03 3:46	3/29/03 3:55		FALSE	None	2020		High winds in area/guy wire contact	Wind
TL	637	Creelman	Ysabel		69	3/29/03 4:01	3/29/03 4:01		FALSE	None	2020		High winds in area/guy wire contact	Wind
TL	637	Creelman	Ysabel		69	3/29/03 9:58	3/29/03 9:58		FALSE	None	2020		High winds in area/guy wire contact	Wind
TL	637	Creelman	Ysabel		69	3/29/03 9:59	3/29/03 21:49		FALSE	None	2020		High winds in area/guy wire contact	Wind
			Santa							Santa			69kv bus fuse holder flashed over creating a phase-	
TL	637	Creelman	Ysabel		69	4/15/03 5:38	4/15/03 6:24	4/15/03 6:24	TRUE	Ysabel	5999		to-phase bus fault; Santa Ysabel only	Other Substation Equipment
TL	637	Creelman	Ysabel		69	10/27/03 7:57	10/27/03 8:17		TRUE	Ysabel	2040			Fire
TL	637	Creelman	Ysabel		69	10/27/03 8:32	11/3/03 19:38		FALSE		2040			Fire
TL	637	Creelman	Ysabel		69	11/27/03 6:15	11/27/03 6:15		FALSE	None	1010	2040	Ash and high winds, flashed over insulators	wash)
TL	637	Creelman	Ysabel		69	11/27/03 6:36	11/27/03 6:36		FALSE	None	1010	2040	Ash and high winds, flashed over insulators	wash)
TL	637	Creelman	Ysabel		69	12/15/03 21:35	12/15/03 21:36		FALSE	None	9200		High winds in area	Undetermined - After Patrol
TL	637	Creelman	Ysabel		69	12/15/03 21:48	12/16/03 5:33		FALSE	None	9200		High winds in area	Undetermined - After Patrol
TL	637	Creelman	Ysabel		69	3/2/04 16:08	3/2/04 16:08		FALSE		9200		Lightning in area	Undetermined - After Patrol
TL	637	Creelman	Ysabel		69	4/3/04 12:04	4/3/04 12:04		FALSE		9200			Undetermined - After Patrol
TL	637	Creelman	Ysabel		69	8/7/04 8:35	8/7/04 8:35		FALSE		8020	5999	Santa Ysabel terminal only	Repair/Replacement
TL	637	Creelman	Ysabel		69	8/11/04 14:51	8/11/04 14:51		FALSE		9200		Storm in area	Undetermined - After Patrol
TL	637	Creelman	Ysabel		69	9/20/05 8:39	9/20/05 8:39		FALSE	None	9200		Lightning reported in area	Undetermined - After Patrol
TL	637	Creelman	Ysabel		69	2/4/06 8:19	2/4/06 8:25		FALSE	None	7020		Santa Ysabel terminal only	Relay Misoperation
TL	637	Creelman	Ysabel		69	3/10/06 7:23	3/10/06 7:25		FALSE	None	1010			wash)
TL	637	Creelman	Ysabel		69	3/10/06 8:09	3/10/06 14:38		FALSE	None	8010	6010		Repair/Replacement
TL	637	Creelman	Ysabel		69	6/24/06 6:19	6/24/06 6:19		FALSE	None	9100			area
TL	637	Creelman	Ysabel		69	7/26/06 15:51	7/26/06 15:51		FALSE	None	1010			wash)

SDGE0000789

PRE-INSPECTION AUDIT RESULTS FOR VMA 379 - Rainbow 1

RANDOM AUDIT SAMPLE POPULATION: 187 **SAMPLE PERCENTAGE:** 6.65% **COMPLIANCE PERCENTAGE:** 99.47% **QUALITY PERCENTAGE:** 99.47%

CONTRACTOR: Davey Resource Group **AUDIT COMPLETION DATE:**

AUDIT TREE ID #	PIC CODES			PIQ CODES															ADDED TREE	REMARKS	LISTER
	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
FF998		2								7												☐	Missing Tree LC Should be LT; Incorrect Clearance	Noah, Brian
EB5269	1																					☑	Missed Tree; Non Inventory;	Unknown Lister
FF2468		2																				☑	Missed Tree LC Should Be LT	Klein, Kevin

PRE INSPECTION COMPLIANCE CODES:

1: MISSED TREE NON-INVENTORY
2: MISSED TREE LC SHOULD BE LT
3: MISSED TREE: MEMO

PRE INSPECTION QUALITY ASSURANCE CODES:

1: INCORRECT SPECIES
2: INCORRECT HEIGHT
3: INCORRECT DBH
4: INCORRECT GROWTH RATE
5: INCORRECT NUMBER OF UNITS
6: INCORRECT STATUS OF LT
7: INCORRECT CLEARANCE
8: INCORRECT MONTH NEXT TRIM
9: INCORRECT ACCESS
10: INCORRECT VOLTAGE
11: INCORRECT TREE-POLE NOTES
12: INCORRECT ADDRESS-STREET
13: INCORRECT CITY-ZIP
14: INCORRECT PROPERTY OWNERSHIP
15: INCORRECT POLE NUMBERS
16: INCORRECT LOCATION NOTES
17: INCORRECT CUSTOMER INFORMATIO
18: NON INVENTORY LC

AUDITOR COMMENTS: EB5269 is a new ID Missed Tree Non Inventory; FYI

SDGE0005775

PRE-INSPECTION AUDIT RESULTS FOR VMA 380 - Pala Mesa

RANDOM AUDIT SAMPLE POPULATION: 748 **SAMPLE PERCENTAGE:** 17.22% **COMPLIANCE PERCENTAGE:** 99.47% **QUALITY PERCENTAGE:** 96.12%

CONTRACTOR: Davey Resource Group **AUDIT COMPLETION DATE:** 05/25/2007

AUDIT	PIC CODES			PIQ CODES																	ADDED	REMARKS	LISTER
TREE ID #	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	TREE		
AW1529									6	7	8											☐	Incorrect Clearance; Incorrect Month Next Trim; Incorrect Status of LT	Fiss, Carl
AW1764									6	7	8											☐	Incorrect Clearance; Incorrect Month Next Trim; Incorrect Status of LT	Fiss, Carl
AW1800		2								7	8											☐	Missed Tree LC Should be LT; Incorrect Clearance; Incorrect Month Next Trim	Fiss, Carl
AW1801		2								7												☐	Missed Tree LC Should be LT; Incorrect Clearance	Fiss, Carl
AW1907									6	7	8											☐	Incorrect Clearance; Incorrect Month Next Trim; Incorrect Status of LT	Fiss, Carl
AW2511		2								7	8											☐	Missed Tree LC Should be LT; Incorrect Clearance; Incorrect Month Next Trim	Rollins, Kathy
AW3423																		15				☐	Incorrect Pole Numbers	Rollins, Kathy
AW3425																		15				☐	Incorrect Pole Numbers	Rollins, Kathy
AW3428																		15				☐	Incorrect Pole Numbers	Rollins, Kathy
AW3467		2								7	8											☐	Missed Tree LC Should be LT; Incorrect Clearance; Incorrect Month Next Trim	Rollins, Kathy
JF3443									6		8											☐	Incorrect Month Next Trim; Incorrect Status of LT	Fiss, Carl
QJ3390									6	7	8											☐	Incorrect Clearance; Incorrect Month Next Trim; Incorrect Status of LT	Fiss, Carl
QT1881																		15				☐	Incorrect Pole Numbers	Rollins, Kathy
SL474									6		8											☐	Incorrect Month Next Trim; Incorrect Status of LT	Treuenfels, Mark
SL540									6		8											☐	Incorrect Month Next Trim; Incorrect Status of LT	Treuenfels, Mark
AW1537									6	7	8											☑	Incorrect Clearance; Incorrect Month Next Trim; Incorrect Status of LT	Fiss, Carl
AW1763									6	7	8											☑	Incorrect Clearance; Incorrect Month Next Trim; Incorrect Status of LT	Fiss, Carl
AW1765									6	7	8											☑	Incorrect Clearance; Incorrect Month Next Trim; Incorrect Status of LT	Fiss, Carl
AW1860		2								7	8											☑	Missed Tree LC Should be LT; Incorrect Clearance; Incorrect Month Next Trim	Treuenfels, Mark
AW2168		2									8											☑	Missed Tree LC Should be LT; Incorrect Month Next Trim	Treuenfels, Mark
AW3421																		15				☑	Incorrect Pole Numbers	Rollins, Kathy

CONFIDENTIAL INFORMATION

SDGE0005778

PRE-INSPECTION AUDIT RESULTS FOR VMA 379 - Rainbow 1

RANDOM AUDIT SAMPLE POPULATION: 471 **SAMPLE PERCENTAGE:** 15.01% **COMPLIANCE PERCENTAGE:** 100.00% **QUALITY PERCENTAGE:** 99.79%

CONTRACTOR: Davey Resource Group **AUDIT COMPLETION DATE:** 08/24/2007

AUDIT TREE ID #	PIC CODES 1 2 3	PIQ CODES 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	ADDED TREE	REMARKS	LISTER
QJ1590		3		Incorrect DBH	Fiss, Carl
ON4664	2		✔	Missed Tree LC Should be LT	Fiss, Carl

PRE INSPECTION COMPLIANCE CODES:

1: MISSED TREE NON-INVENTORY
2: MISSED TREE LC SHOULD BE LT
3: MISSED TREE: MEMO

PRE INSPECTION QUALITY ASSURANCE CODES:

1: INCORRECT SPECIES
2: INCORRECT HEIGHT
3: INCORRECT DBH
4: INCORRECT GROWTH RATE
5: INCORRECT NUMBER OF UNITS
6: INCORRECT STATUS OF LT
7: INCORRECT CLEARANCE
8: INCORRECT MONTH NEXT TRIM
9: INCORRECT ACCESS
10: INCORRECT VOLTAGE
11: INCORRECT TREE-POLE NOTES
12: INCORRECT ADDRESS-STREET
13: INCORRECT CITY-ZIP
14: INCORRECT PROPERTY OWNERSHIP
15: INCORRECT POLE NUMBERS
16: INCORRECT LOCATION NOTES
17: INCORRECT CUSTOMER INFORMATIO
18: NON INVENTORY LC

AUDITOR COMMENTS:

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Tree Work Order Form

Tree ID

FF1090

Month	Day	Year	Crew ID	Clearance
○ Jan	0 ○ ○	○ 06	0 ○ ○ ○ ○ ○	○ 0.0 to 2.0 ft.
○ Feb	1 ○ ○	○ 07	1 ○ ○ ○ ○ ○	○ 2.1 to 4.0 ft.
○ Mar	2 ○ ○	○ 08	2 ○ ○ ○ ○ ○	○ 4.1 to 5.9 ft.
○ Apr	3 ○ ○	○ 09	3 ○ ○ ○ ○ ○	○ 6.0 to 7.9 ft.
○ May	4 ○ ○		4 ○ ○ ○ ○ ○	○ 8.0 to 9.9 ft.
○ Jun	5 ○ ○		5 ○ ○ ○ ○ ○	○ 10 to 11.9 ft.
○ Jul	6 ○ ○		6 ○ ○ ○ ○ ○	○ 12.0 to 14.9 ft.
○ Aug	7 ○ ○		7 ○ ○ ○ ○ ○	○ 15.0 to 19.9 ft.
○ Sep	8 ○ ○		8 ○ ○ ○ ○ ○	○ 20.0 to 30.0 ft.
○ Oct	9 ○ ○		9 ○ ○ ○ ○ ○	
○ Nov				
○ Dec				

Tree Information From VMS

Address: 1548 RICE CANYON RD
FALLBROOK, CA 92028

Poles: P213072 - P112340 **TB:** 998J7

Lat/Long: 33.39861 N 117.14473 W **Num Units:** 1

Climb or Lift: Both **Species:** Sycamore

DBH: 36.0 - 41.9 **Voltage:** P

Traffic Ctrl: Yes

Chemical
- ○ SK26
- ○ OUST
- ○ GLN4
- ○ PF2
- ○ Accord

Equipment
- ○ Split Dump
- ○ Crane
- ○ Standard Lift
- ○ 70 ft. Lift
- ○ 100 ft. Lift

Property Notes:
Beware of Dog[s]; Matt Jane 760 723-4157;

Tree Notes:
Poison oak; Remove direct overhang;

EXCEPT CU

NOTIFY [illegible] 10 16 [illegible]

Work Completed
- ○ Pruned
- ○ Partial Pruning
- ○ No Trimming Required
- ○ Removed - Must add Ticket ID and DBH (Fill out Removal ID Below and DBH Above)
- ○ Refused - Must add Ticket ID (Fill Out Refusal ID Below)

DBH - FOR REMOVAL USE ONLY!
- ○ 0 to 2.9 in.
- ○ 3 to 7.9 in.
- ○ 8 to 12.9 in
- ○ 13 to 17.9 in.
- ○ 18 to 23.9 in
- ○ 24 to 35.9 in.
- ○ 36 to 41.9 in.
- ○ 42 to 47.9 in.
- ○ 48 to 53.9 in.
- ○ 54 to 59.9 in.
- ○ 60 to 80 in.

Time and Equipment Conversion
- ○ Convert to T&E (Time and Equipment)

Crew Type
- ○ CMP Crew
- ○ Climbing Crew
- ○ Cleanup Crew
- ○ Lift Crew
- ○ Extended Lift Crew
- ○ Stump Removal Crew
- ○ Tree Removal Crew
- ○ 100 ft. Lift Crew
- ○ Field Foreman
- ○ Groundsman

Crew Time Spent

Hours	Minutes
0 ○ ○	0 ○ ○
1 ○ ○	1 ○ ○
2 ○ ○	2 ○ ○
3 ○ ○	3 ○ ○
4 ○ ○	4 ○ ○
5 ○ ○	5 ○ ○
6 ○ ○	6 ○ ○
7 ○ ○	7 ○ ○
8 ○ ○	8 ○ ○
9 ○ ○	9 ○ ○

Crew Count
- ○ 1
- ○ 2
- ○ 3

Crew Time Category
- ○ Regular Time
- ○ Overtime
- ○ Double-Time
- ○ Per Diem

Map Page Number	VMA	Dispatch Order	Master Crew ID
B2	379	660014833	10102

Form Version TREE 1.0.1A

5038038591

SDGE

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Exception Form

Tree ID

F	F	1	0	9	0	

1 SYCAMORE.

Month	Day	Year	Crew ID	Clearance	Work Completed
Jan ○	0 ○ ○	06 ○	0 ○ ○ ◐ ○ ○	○ 0.0 to 2.0 ft.	● Exception
Feb ○	1 ● ○	07 ◐	1 ● ○ ○ ○ ○	○ 2.1 to 4.0 ft.	
Mar ○	2 ○ ○	08 ○	2 ○ ○ ○ ○ ○	● 4.1 to 5.9 ft.	
Apr ○	3 ○ ●	09 ○	3 ○ ○ ○ ○ ○	○ 6.0 to 7.9 ft.	
May ○	4 ○ ○		4 ○ ○ ○ ○ ◐	○ 8.0 to 9.9 ft.	
Jun ○	5 ○ ○		5 ○ ● ○ ◐ ○	○ 10.0 to 11.9 ft.	
Jul ○	6 ○ ○		6 ○ ○ ○ ○ ○	○ 12.0 to 14.9 ft.	
Aug ○	7 ○ ○		7 ○ ○ ○ ○ ○	○ 15.0 to 19.9 ft.	
Sep ○	8 ○ ○		8 ○ ○ ○ ○ ○	○ 20.0 to 30.0 ft.	
Oct ○	9 ○ ○		9 ○ ○ ○ ○ ○		
Nov ●					
Dec ○					

Dispatch Order ID

6	6	0	0	1	4	8	3	3	

Comments

1548 RICE CANYON RD.
FALLBROOK, CA. 92028
VMA 379.

Contractor Signature — Month 11 / Day 13 / Year 2007

Forester Signature — Date 11 / Day 13 / Year 2007

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

DECLARATION OF DAVID L. GEIER REGARDING CONFIDENTIALITY OF CERTAIN DATA/DOCUMENTS PURSUANT TO D.16-08-024

I, David L. Geier, do declare as follows:

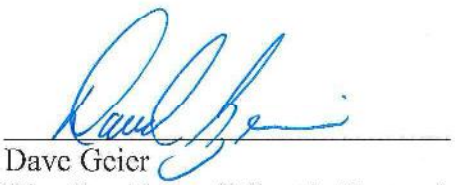
1. I am Vice President of Electric Transmission and System Engineering in the Energy Supply division for San Diego Gas & Electric Company ("SDG&E"). I have reviewed Transmission System Fault Testing TMC1010 submitted concurrently herewith (the "TMC1010"). I am personally familiar with the facts and representations in this Declaration and, if called upon to testify, I could and would testify to the following based upon my personal knowledge and/or belief.

2. I hereby provide this Declaration in accordance with Decision ("D.") 16-08-024 to demonstrate that the confidential information ("Protected Information") provided in the TMC1010 submitted concurrently herewith and as described in specificity in Attachment A, within the scope of data protected as confidential under applicable statutory provisions including, but not limited to, Public Utilities Code § 583, Govt. Code § 6254(k), General Order 66-C, and various federal regulations related to critical infrastructure

3. In accordance with the legal authority described herein, the Protected Information should be protected from public disclosure.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct to the best of my knowledge.

Executed this 29th day of September, 2016, at San Diego.



Dave Geier
Vice President of Electric Transmission and System Engineering

ATTACHMENT A

SDG&E Request for Confidentiality
On the following information in TMC1010

TMC1010 is an SDG&E Electric Grid Operations Standard Operating Procedure that is controlled by the Electric Grid Operations department. Its distribution and use is limited to (North American Electric Reliability Corporation) NERC certified System Operators charged with the responsibility of the safe and reliable operation of the SDG&E Bulk Electric System.

The document contains specific information that provides Transmission Substation and Transmission Line connectivity, construction details, and operating limitations that are considered by SDG&E and NERC to be sensitive information and requires protection from disclosure to non-operations personnel and the public. The document has been assigned and published by SDG&E at a security level of INTERNAL and treated as CONFIDENTIAL under NERC's Rules of Procedure, Section 1500 *et seq*.

There are several laws, regulations, and guides, that seek to protect critical infrastructure information and sensitive security information from public disclosure, for national security reasons. These include, but are not limited to: (i) Homeland Security's regulations related to Protected Critical Infrastructure Information (PCII) Program (6 C.F.R. Part 29) and Sensitive Security Information (49 C.F.R. Part 1520) and (ii) FERC Order No. 630 - Critical Energy Infrastructure Information (CEII) regulations.

SDGE A Sempra Energy utility	DEPARTMENT ELECTRIC	DIVISION GRID OPERATIONS	DOCUMENT SECURITY INTERNAL
	SUBJECT TRANSMISSION MONITORING AND CONTROL		EFFECTIVE DATE 9/8/07
TITLE **TRANSMISSION SYSTEM FAULT-TESTING**			DOCUMENT NUMBER **TMC1010**

Yellow highlight indicates change since last publication.

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1. PURPOSE

This Standard Operating Procedure outlines the fault-testing procedures for equipment on the San Diego Gas and Electric transmission system. Approval must be obtained from the California Independent System Operator prior to fault-testing any facilities.

2. REFERENCES

CAISO Operating Procedure T-113 - Scheduled and Forced Outages

TMC1020 - Bay Cable Oil Spills

TMC1320 - Hazardous Fire Conditions - Red Flag Fire Warning

TMC1505 - Protection Schemes

3. DEFINITIONS

[redacted]

3.2. CAISO – California Independent System Operator

[redacted]

[redacted]

3.11. IID – Imperial Irrigation District

[redacted]

3.24. OSS – SDG&E Operations Shift Supervisor

[redacted]

3.33. SCADA – Supervisory Control and Data Acquisition system

3.34. SDG&E – San Diego Gas & Electric Company

[redacted]

3.39. T&LO – Trip and Lockout

[redacted]

4. GENERAL

4.1. Faults on the Transmission System are divided into four main categories:

4.1.1. Phase to Ground

The phase to ground fault is the least severe and is the most common type experienced. Phase to ground faults are also usually transient in nature and the cause of the fault will generally clear within 10 seconds allowing the line to be restored to service.

4.1.2. Phase to Phase

4.1.3. Phase to Phase to Ground

4.1.4. Three Phase faults

Overhead and underground transmission lines requiring special consideration when fault-testing, are displayed as a dashed line on Grid Control's Transmission map (mimic board).

4.2. Underground Line Faults

Underground transmission line faults tend to be permanent in nature. In most cases, the testing of underground cable will increase the amount of damage caused by the original fault. Therefore, transmission lines that are mostly underground (50% or more of the line is underground cable) should only be tested for special circumstances.

4.2.1. Anytime a mostly underground transmission line is tested, permission must be obtained from the OSS and the CAISO.

4.2.2. If a fault is suspected in the underground line,

4.2.2.1. Have Service Dispatch call out a fault locating van from the "local" district.

4.2.2.2. Have Service Dispatch call for a Metro Underground Supervisor.

Crews from the Metro district usually perform underground transmission line repairs.

4.3. Fault-Testing Equipment Associated With On-Line Generation or Transformers.

4.3.1. **Testing of transmission lines should be avoided from a terminal where generation facilities are online, such as at** [redacted]

4.3.2. Fault-testing should also be avoided at terminals that may cause fault current to flow directly through a transformer. Fault current associated with transmission system faults can be extreme and can cause stress and damage to transformers.

4.3.2.1. In some cases, fault-testing under these conditions cannot be avoided and each case should be carefully analyzed.

4.3.3. Peaker generator units and QFs [redacted] are not large enough to contribute enough fault current to cause system instability or equipment damage. No line testing restrictions have been identified for lines terminating at buses with peaker generators connected to it.

4.4. System Ground References

4.4.1. Ground fault relaying is dependent upon the availability of a ground reference to provide a return path to the fault current source.

4.4.2. Ground references are provided throughout the transmission system in the form of the grounded neutral connections of WYE configured transformers, auto transformers and grounding transformers.

4.4.3. When fault-testing transmission facilities, test using the source that best takes advantage of the available ground reference device. A line to ground fault (phase to ground) will not be cleared without a ground reference.

5. FAULT-TESTING POLICIES

5.1. Substation Bus

5.1.1. If a substation bus section trips, DO NOT fault-test until it has been visually inspected and a Substation Construction and Maintenance Supervisor or designated relief gives approval.

5.1.2. If it is suspected that a bus section relay operation was the result of a false trip, the bus section may be tested upon approval by the OSS and the CAISO without the need to contact Substation personnel.

5.1.3. After the bus section has been visually inspected and approved for testing, it should be tested using a transmission line that does not terminate at a generating station or into a transformer, if possible.

5.2. Transmission Transformers

5.2.1. If a transmission transformer trips because of relay operation, DO NOT test the bank until it has been visually inspected and the Substation Construction and Maintenance Supervisor or designated relief gives approval.

5.2.2. If it is suspected that the transformer relay operation was the result of a false trip, the transformer may be tested upon approval by the OSS and the CAISO without the need to contact Substation personnel.

5.2.3. After the bank has been approved for test, it should be fault-tested (energized) from the delta connected winding.

5.2.4. Auto-transformers can be tested from either side.

5.2.5. Some transformers are equipped with an automatic ground switch that is tripped/closed by the banks' T&LO relay. The switch applies a single phase ground to the bank/line to aid in transfer tripping the remote terminal.

5.2.5.1. The bank T&LO relay must be reset and the ground switch opened before the bank is tested.

5.3. Distribution Transformers

Some relay applications provide for automatic restoration of transmission lines and buses after an associated distribution transformer has relayed and has been isolated by the automatic opening of the banks' motor operated primary disconnect switch. This is initiated through the transformers protective relaying. (Refer to C&P Notes).

5.4. Other Substation Equipment

Faulted substation equipment (station light and power transformers, bus potential transformers, etc.) should never be tested or returned to service without approval from the Substation Construction and Maintenance Supervisor or the System Protection Maintenance Supervisor.

5.5. Transmission Lines (Overhead)

5.5.1. Transmission lines should be tested as soon as practical after a relay action unless:

5.5.1.1. The line has an "OK ON/NEAR" authorization on it (the person having the authorization must give his OK before the line is tested).

5.5.1.2. There is a reliable report of wires down, pole down, or other potential hazards to public safety or property.

5.5.1.3. A Red Flag Fire Warning has been issued by the California Department of Forestry. Refer to TMC1320: Hazardous Fire Conditions – Red Flag Fire Warning.

5.5.2. Transmission lines that are equipped with automatic reclosers are normally **one shot with a 10-second delay**. Refer to the C&P Notes.

5.5.3. Transmission lines with SCADA control but without automatic reclosing at one terminal, and transmission lines without SCADA control but with automatic reclosing at the remote terminal(s), may be fault-tested from the SCADA controlled terminal(s) before the non-SCADA controlled terminal(s) are inspected.

5.5.4. Sectionalize or patrol the line before testing a second time. This may be modified during storms or if other circumstances warrant an additional test. SEL relay fault locating data can be useful in determining what segment of a line to sectionalize.

5.5.7. The following transmission lines terminate into a transformer and should be tested as follows, only after it has been determined that no protective relaying associated with the transformer has operated:

[redacted]

5.5.8. [redacted] is equipped with motorized line switches that operate through an automatic sequence that is coordinated with reclosing at each line terminal. This scheme has been disarmed since [redacted] went online on December 2005. Refer to the [redacted] C&P Notes.

5.6. Transmission Lines (Underground)

5.6.1 [redacted] has less than 50% underground. However, this line should not be fault-tested unless the cause has been determined to be in the overhead section of the line. This line should be tested from the [redacted] terminal if possible due to voltage control devices available at [redacted]. Testing of this line must be approved by the OSS and the CAISO.

5.6.1.1. When this line is energized from [redacted], it will increase [redacted] bus voltage by approximately 1.5kV due to the extended length of the underground cable (bus voltage at [redacted] should never exceed 235.7kV after energizing). The open-end voltage at [redacted] will increase by approximately 6.2kV. When the line is energized from [redacted] it will increase [redacted] bus voltage by approximately 2.5kV due to the extended length of the underground cable. The open-end voltage at [redacted] will increase by approximately 1.3 kV.

5.6.1.2. It is preferred, though not required, to **energize the line from** [redacted] and **de-energize the line from** [redacted]

5.6.2. The following lines are defined as mostly underground, meaning more than 50% of the line is underground cable and normally should not be fault-tested. When indications point to false tripping, storm or fog conditions are present, or customer load is out, the line may be tested one time. Testing of these lines must be authorized by the OSS and the CAISO.

[redacted]

5.6.3. The following transmission lines are 100% underground and should not be fault-tested from the grid unless it is suspected that a false trip HAS occurred AND the test is authorized by the OSS and the CAISO.

[redacted] ee TMC1020: Bay Cable Oil Spills.

5.7. Jointly-owned tie lines

5.7.1. Interconnections

The following facilities are interconnections with SDG&E. Switching and testing procedures are detailed in the indicated SOP.

[redacted]

see GIP2205
see GIP2300
see GIP2340
see GIP2345
see GIP2346
see GIP2347
see GIP2348
see GIP2350
see GIP2605
see SUB4410

5.7.2. Qualifying Facilities

[redacted]

see GIP2530
see GIP2540
see GIP2535
see GIP2505

5.7.3. Facilities Shared with Customers

[redacted]

see GIP2570
see GIP2570
see GIP2560
see GIP2575

5.7.4. Peaker/Renewable Generation

see GIP2545
see GIP2547
see GIP2549
see GIP2551
see GIP2553
see GIP2557

DOCUMENT OWNERSHIP

	Name	Date
REVISED BY: Principal Engineer – Grid Operations Services	[redacted]	8/28/07
REVIEWED BY: Team Lead Training – Grid Control		5/10/07
REVIEWED BY: Team Lead Technical Support - Grid Control		8/28/07
APPROVED BY: Chief Operations Manager - Grid Control		9/7/07
APPROVED BY: Manager - Grid Operations Services		9/7/07
ISSUED BY: Business Analyst - Grid Operations		9/7/07
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METEOROLOGICAL AND STRUCTURE WIND LOAD STUDIES

Prepared for
San Diego Gas & Electric Company
Sunrise PowerLink Project

SDGE

A Sempra Energy utility

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1. Introduction and Executive Summary

As one of the preliminary engineering tasks for the Sunrise Powerlink (Project), Sargent & Lundy Engineers, Ltd (S&L) has performed a meteorological study to evaluate wind and ice conditions that can be expected along the Project Routes. This report describes that study and its results.

Maximum wind speeds, maximum icing, and maximum wind speed during icing are provided in this report for the Sunrise Powerlink transmission corridor through San Diego and Imperial Counties of California. Wind and ice estimates were statistically projected for return periods from 2 through 100 years.

For wind analysis, the transmission corridor was separated into nine segments expected to have unique airflow patterns and wind climatology. Projected maximum winds for each corridor segment were based on multi-decade measurements at a regional government weather station expected to be most representative of the wind climate. Maximum winds were expected at segments through Grapevine Canyon and the valley at Agua Caliente Springs. Those narrow valleys near mountain crests were expected to locally accelerate winds during storms.

An initial "Phase 1" ice and wind-during-ice analysis was done using an ice accretion computer simulation model. Predictions were made for storms during multi-decade periods at eight regional government weather stations. Results indicated no icing using weather observations from seven stations in San Diego and Imperial Counties. Results using weather observations at the Beaumont station 75 miles north in Riverside County indicated relatively small ice thicknesses during rare ice storm events. The Beaumont predictions were incorporated as conservative estimates for the project corridor.

A secondary "Phase 2" " ice and wind-during-ice analysis was done to supplement the Phase 1 analysis. It used the same ice accretion computer simulation model as Phase 1. Phase 2 was intended to merge and extrapolate available regional multi-decade weather data to the target location of the Cayamuca weather station. Cuyamaca is at a higher elevation than any of the weather stations used in Phase 1, and is within the project transmission corridor where it passes over highest topography. The intent was to approximate conditions in that corridor area via a composite weather database. Results supported the Phase 1 prediction that icing events should be rare and maximum ice thicknesses small, and indicated that Phase 1 Beaumont predictions of ice and wind-during-ice are conservative for the project transmission corridor.

Additional analysis of regional precipitation statistics indicated that icing predictions should be applied only to elevations above 3,000 feet above mean sea level.

2. Description of Project and Area Geography

Figure 1 presents a shaded relief map of southern California, with locations of the following annotated: the planned San Diego Gas & Electric Company (SDG&E) 500kV Interconnection Project transmission corridor (the Project), southern California climate zones, and meteorological monitoring stations for which data were analyzed.

Figure 2 presents a three-dimensional perspective view of topography in the transmission corridor area, with locations of the following annotated: meteorological monitoring stations for which data were analyzed, and approximate centerline of the transmission corridor.

Fig 3 presents a profile plot of topography along the transmission corridor, with the following annotated: elevations of meteorological monitoring stations for which data were analyzed, and landmarks along the transmission corridor.

2.1 Conductor Design

In the vicinity of Ramona California the line design will include three bundled wires separated by 18 inches, and individual conductors of diameter 1.212 inches each. Elsewhere, the line design will include the same individual diameters, but two-conductor bundles instead of three.

2.2 Climate Character

The project area includes four main climatic zones: coastal, inland, mountain, and desert (SDG&E 2003). Approximate boundaries of those four climatic zones are annotated on the shaded relief map in Figure 1. The zones are elongated in the north-south direction, and generally are in the shape of north-south strips 10 to 20 miles wide.

2.2.1 Coastal Zone

Character of the coastal zone climate is maritime (WRCC 2003). The source of air is normally over the Pacific Ocean and temperature extremes are moderated by that influence. The adjacent ocean also is a source of moisture. Therefore, mean humidity in the coastal zone is generally the highest of any within the SDG&E service territory. Within the coastal zone, wide variations of climate do occur within short distances at those locations where coastal basins and valleys influence movements of marine air.

2.2.2 Inland Zone

The inland zone is located between the coastal and mountain zones. It is a transition between those two adjacent zones, and is more continental in character than the coastal zone, in the sense that it is primarily marked by larger temperature ranges. Temperatures are slightly warmer than in the coastal zone during summer, and slightly cooler than in the coastal zone during winter.

2.2.3 Mountain Zone

The mountain zone is approximately in the center of the SDG&E service territory. Elevations within the mountain zone vary widely and reach maxima several thousand feet above mean sea level (MSL). Temperatures in the mountain zone are generally lowest of those in the SDG&E service territory. Precipitation within the service territory peaks within the mountain zone, particularly on the west sides of the various adjacent ranges. That precipitation pattern results from flow of moist maritime air towards the east that is forced upwards over the ranges. In spite of that precipitation pattern, mean humidity decreases steadily with distance eastward from the Pacific Ocean across both the inland and mountain climate zones.

2.2.4 Desert Zone

The desert zone (east of the mountain zone) has a classic desert climate, with generally the largest temp range of the service territory, small precipitation amounts and low humidity.

2.3 Winds

Winds from the west and northwest prevail in southern California (WRCC 2003). The cause is airflow out of the east side of a synoptic-scale surface high pressure area that is located during the entire year over the northeast Pacific Ocean. A number of California mountain chains deflect those prevailing winds. Therefore, local wind speeds and directions are strongly affected by local topography except near the Pacific coastline, where the prevailing westerly and northwesterly airflow is not disturbed.

During winter, migratory synoptic-scale low-pressure centers take more southerly tracks across California. When such a center is located off the Pacific coast, and a strong high pressure area is simultaneously located over the Great Basin to the east, strong and occasionally damaging winds can occur. Such strong winds can occur particularly along the coast and in the coastal mountain ranges, when airflow is from the east or southeast. Greater wind velocities can occur during such situations at the higher topographic elevations.

An additional wind condition is the "Santa Ana Wind". It also involves high pressure over the Great Basin and low pressure over the coast. It includes very dry airflow from the Great Basin into the central valleys of California. Wind speeds are strong and gusty, and are particularly strong near the mouths of canyons oriented parallel to the airflow direction.

Winds in all four climate zones can be locally enhanced or reduced by topography and other factors. Funneling of airflow through mountain passes and along deeper valleys can cause unusually high local speeds. While thunderstorms are rare at the Pacific coast, they are more frequent at the mountain ranges when airflow is forced over those ranges. They also occur occasionally over the desert regions to the east, and can have associated high wind gusts and cause dust storm events. Enclosed valleys can have a sheltering effect, reducing winds at the valley floor relative to winds at higher surrounding mountain or plateau elevations that are more exposed to regional upper-level airflow.

2.4 Precipitation and Weather Phenomena

The distribution of annual precipitation in the Project area includes a strip of highest values along the highest elevations of the mountain ranges in central San Diego County. This includes, for example, the following ranges: San Jacinto, Santa Rosa, Vallecito, Laguna, Tierra Blanca, Coyote, In – Ko Pah, Jacumba, and San Ysidro. This north-south oriented strip of maximum precipitation is the result of Pacific Ocean moisture forced up the mountains and precipitated-out near the ridgeline. Dryer air then descends towards the east, reinforcing the desert climate to the east of the mountain ranges.

A 1979 analysis of icing for portions of the Project area by MRI (MRI 1979) stated that line icing was generally not expected at mountain elevations below approximately 4,000

ft MSL. However, no justification or analysis was presented in the report to support selection of that transition elevation, although comments were obtained from personnel who lived and worked in the area and were familiar with wind or icing problems that may have occurred. Occurrence of icing was expected by MRI to be highly dependent on local topographic configurations.

The present study includes predictions of transmission wire icing in Sections 4.2 "Projected Icing and Simultaneous Winds" and 6.2 "Projected Ice and Combined Ice/Wind" below. We concluded that a review of representative regional snowfall statistics was necessary in order to decide at what elevations to apply those icing predictions. To obtain representative data, we examined variation of snowfall with elevation only at locations in a geographic area in and immediately adjacent to the mountain climate zone through which the project corridor extends. Figure 4 presents a shaded relief map with those locations and the project corridor annotated. Data included were National Oceanic and Atmospheric Administration (NOAA) cooperative climate observing (COOP) stations that have elevations above sea level and for which snowfall statistics have been published (NCDC 2001), and other sites at which extreme snowfall events have been observed (Miller 2007). Table 1 presents values of several snowfall statistics for each of those sites. Table 2 presents annual water-equivalent precipitation statistics for COOP stations.

Based on initial review of the snowfall statistics in Table 1 and Figure 4, we selected the following three parameters for determination of elevations at which to apply those icing predictions. Of available statistics, our judgement was that these three parameters, when considered simultaneously, best served as surrogates for potential significant transmission wire icing.

(1) Annual mean number of days with snowfall greater than or equal to one inch

(2) Maximum recorded 24-hour total snowfall amounts

(3) Unusual historic snowfall events of one to seven days duration

We plotted the above three snowfall parameters versus elevation above sea level. Figure 5 presents those plots. Because there were no available snowfall frequency data at elevations between 2,700 and 4,640 ft MSL, we assumed an approximately linear trend would occur between those two elevations. Our conclusion based on review of the plots was that there is a marked transition zone at approximate elevation 3,000 ft MSL. That transition includes a rapid increase of mean days per year with significant (one inch or more) snowfall from near-zero to several days per year. The transition also includes a rapid increase of the magnitude of major snowfall events from near-zero to 10 or more inches over one to seven-day periods.

Summarizing, based on review of snowfall-versus-elevation data for the project corridor area, we selected an elevation of approximately 3,000 ft MSL. We considered that elevation to be the lowest at which we would expect significant icing within the southern California mountain climate zone, and the elevation above which our icing predictions would be applied.

3. Analysis Methods

3.1 Maximum Annual Wind Speeds

The National Bureau of Standards (NBS) Simiu computer program (Simiu 1975) was used to project regional winds to various return intervals between two years and 100 years. For simplification, raw data were assumed to be measured at standardized anemometer heights above ground at all stations and across all monitoring periods. Winds were not extrapolated in the vertical to the line height above ground, because of a small expected difference.

For each of eight regional meteorological monitoring stations, inputs to the program were raw data in the form of a series of annual maximum wind speeds. Those raw values were obtained from the National Climatic Data Center (NCDC 2005). Those input values included the following.

(1) For stations for which LCD publications were available

For stations for which NOAA NCDC Local Climatological Data (LCD) published annual summaries were available, the annual "fastest mile" values were extracted and incorporated into the return interval analysis.

(2) For stations for which no LCD publications were available, but for which archived digitized hourly meteorological data files were available

For stations for which no LCD publications are available, but for which archived digitized hourly meteorological data files were available, annual maximum hourly wind speeds were extracted from those digital files and incorporated into the return interval analysis.

We made the conservative assumption that all values in the final dataset (including both annual fastest mile values from LCD publications for selected stations, and annual maximum hourly values from digital files for other selected stations) were hourly wind speeds.

Gust data were extremely inconsistent and therefore were not analyzed. Data out of range or clearly suspect were manually identified and removed from the analysis. The NCDC archived digital databases were not continuous, but all available years were used. Detailed information was not immediately available why selected years were missing, and that information was not relevant to this analysis. Table 3 presents the raw wind speeds for the eight stations: El Centro, Campo, San Diego Gillespie, Ramona, Carlsbad Palomar Airport, March AFB, Beaumont, and San Diego Lindbergh. Figures 9 through 13 present maps that show the local topographic setting of each meteorological station.

Periods of record available for the series of annual maximum hourly wind speeds shown in Table 3 varied from five to 56 years. A longer period of record is always preferred for this kind of statistical projection. However, our common practice in meteorological analysis of extremes, is to collect and analyze what we believe to be the most representative data available within project budget and time constraints. Therefore, rather than serve as a basis for exclusion of data, we considered the available station

period of record as input information to our sense of relative confidence in predicted results. That is, our confidence in return interval estimates based on such digitized long-term hourly meteorological observations increases with the period of record available and analyzed. Available periods of record were relatively short and less than 10 years for two stations: six years for Ramona and five years for March AFB. We chose to not use wind predictions based on Ramona and March AFB. Instead, we chose predictions based on data from other stations because we considered them more representative of the project corridor sections for which predictions were needed. Nevertheless, we retained the Ramona and March AFB data here to show the breadth of data that were considered, and to provide useful information for comparison purposes

Mount Palomar Observatory, at elevation 5,600 ft MSL, is located 13 miles northwest of the northernmost point of the project corridor. Unfortunately, suitable weather data were not available for Palomar. Our wind and icing analyses used as input "Integrated Surface Hourly" digitized weather observations from the National Climatic Data Center (NCDC). No such data were available from NCDC for the Mount Palomar Observatory, so no numerical analysis was done for that location. However, snowfall statistics for the Palomar observatory were used in an analysis of icing elevations, as described in Section 2.4 "Precipitation and Weather Phenomena".

Miramar Naval Air Station, at elevation 477 ft MSL, is located immediately adjacent to the western end of the project corridor. The Miramar station was not included in the analysis because it is located only a short distance (about eight miles northeast) from San Diego Lindbergh Airport, and in relatively flat terrain, and therefore would have been duplicative.

3.2 Maximum Annual Wire Ice Accumulations

3.2.1 Numerical Ice Accretion Model

The Sargent & Lundy (S&L) LLC computer program system: "Modeling of Ice Accretion on Wires" (MICEAW) (Cluts 1986) was used as a tool to predict the following.

- Maximum radial ice on wires
- Maximum wind speeds at approximately 33 ft above ground, during maximum wire icing

The above values were predicted for several return periods of interest.

MICEAW uses validated algorithms to predict three types of wire icing: in-cloud, rain, and wet snow. A statistical program is used to extrapolate predicted ice thicknesses and observed wind speeds from available years, to desired return periods.

During each hour of weather observations, MICEAW uses three separate prediction algorithms, depending on the icing type during that hour: (1) In-cloud, (2) Freezing rain, and (3) Wet snow. A methodology common to all three techniques is a time-dependent numerical model that includes calculation of heat transfer coefficients, changes in ice density during accretion (for in-cloud only), and changes in the rate of accretion due to increase in deposit size. The model also includes parameterization of water droplet trajectories for in-cloud icing, and variation of droplet/precipitation collection efficiency, particle size, and water content of the air by icing type.

MICEAW is a proprietary program developed by S&L in 1986. It predicts realistic ice loads using a time-dependent, physically-consistent numerical model and routine meteorological observations, and has been tested against actual icing measurements.

The accuracy of MICEAW icing predictions was evaluated by comparing them to laboratory tests by researchers and other available published information. The accuracy was found to be different for each icing type, with freezing rain the most reliable, in-cloud icing somewhat less reliable, and wet snow the least reliable.

Using actual field measurements (collected by others) of ice accretion on wires from storms in three states, test results of the freezing rain model indicated that it will calculate icing rates in good agreement with natural rates. Because available weather data were not representative of the ice measurement locations, exact quantitative comparisons were not possible. However, sensitivity tests showed that reasonable local variations of input wind speeds and rainfall rates would predict the observed maximum icing.

The in-cloud icing model was tested against laboratory and field measurements. National Research Council of Canada laboratory test results indicated a 99% correlation between predicted and measured loads. S&L tests using field wire icing measurements reported by others at mountain sites on the U.S. east and west coasts indicated an average accuracy of 84%.

Tests of the wet snow model with field data reported for one severe storm predicted icing rates approximate to those observed. Although good accuracy was obtained, direct quantitative comparisons were not logical because weather data were not available at the elevation of the test span.

In general, the strong influence of elevation, urbanized areas, and wind exposure on icing rates makes it important to obtain weather data representative of actual transmission line locations.

The first component of MICEAW is a program that pre-processes large multi-year government archive weather databases, identifies potential ice storms based on simple conservative rules, extracts hourly weather data for those potential ice storms, and identifies and extracts maximum annual wind speeds for use in statistical analysis.

The second component of MICEAW is a program that numerically predicts ice accretion for each potential ice storm. It uses the in-cloud, freezing rain, and wet snow algorithms while advancing through hourly weather data extracted by the first program.

The third component of MICEAW is the same NBS Simiu statistical program that was discussed above and used for wind speed projections. It uses a probability distribution function to predict ice and wind values for various return intervals of interest, based on ice predictions and wind data from MICEAW runs for a number of consecutive years.

3.2.2 Icing Analysis Phases

The icing analysis was conducted in two phases, as described in the following report sections.

3.2.2.1 Phase 1 - Icing Predictions for Eight Regional Stations

For the first analysis phase, the MICEAW model was run separately using hourly weather observations for each of the following eight regional stations: El Centro, Campo, San Diego Gillespie Airport, Ramona, Carlsbad Palomar Airport, March Air Force Base, Beaumont, and San Diego Lindbergh Airport.

The only station for which phase 1 predicted icing amounts were significant was Beaumont, California. In other words, wire ice accumulations for all stations except Beaumont were projected to be zero. Typically, dry bulb temperatures during screened potential icing episodes for stations other than Beaumont were too high for icing to occur.

As shown on the shaded relief map in Figure 14, the Beaumont surface meteorological monitoring station is located in Riverside County California, approximately 80 miles north of the mountain zone in eastern San Diego and western Imperial Counties of California. The elevation of Beaumont (2,600 ft MSL) is similar to that of Campo (2,630 ft MSL). Campo, for which an icing analysis was also run, is located on a mountain plateau at the southern boundary of San Diego County. Despite its distance north of the Project corridor and an elevation similar to Campo, Beaumont was included in the icing analysis because predicted icing results for Beaumont were considered to be conservative for the Project area. Our conclusion after comparison of Beaumont and Campo icing results was that icing conditions at this elevation range (near 2,600 ft MSL) are more likely to occur at the San Bernardino and San Jacinto Mountains near Beaumont than at San Diego County because they are at a higher (and slightly colder) latitude, and because there are probably stronger orographic effects near those mountains.

Generally, the original surface weather observations were used without adjustment. Several years of record were excluded from the final analysis of Beaumont because of missing and suspect precipitation data. Much of the hourly precipitation data used in the analysis were manually distributed from six-hourly measurements, when no hourly measurements were available.

3.2.2.2 Phase 2 – Refined Icing Analysis

3.2.2.2.1 Nature of the Refined Icing Analysis

As a second phase, we conducted a more refined icing analysis to supplement the first analysis. The second analysis phase included investigation of the following:

- Whether incorporation of additional regional weather observations into the icing analysis, including merging of databases and extrapolation of weather conditions to higher elevations at and above the upper elevation limits of the Project corridor, was practical, valid, and representative

- Whether such a refined analysis would produce icing results that are different from those for Beaumont

As shown on the shaded relief map in Figure 15, several mountain peaks within San Diego County reach well above the elevation of Campo (the highest elevation station for which icing predictions were developed during analysis phase 1, at 2,630 ft MSL). An elevation range near 5,000 ft MSL was selected as a target for the refined icing analysis,

in order to bound possible final Project corridors across the mountain ranges, should the corridor be rerouted at a later date at higher elevations. Cuyamaca (at 4,640 ft MSL) was the highest NOAA COOP station within San Diego County and generally close to the target elevation range. The San Diego upper-air station was the nearest to the Project area, and data from San Diego balloon soundings were considered representative of air masses that would approach the San Diego County mountain ranges during autumn, winter, and spring storms that approach the continent from the Pacific Ocean and cause icing.

Therefore, for the refined icing analysis, Campo was selected as the source of hourly weather observations. Specific bases for selection of Campo were: it was the highest elevation station (4,640 ft MSL) in the Project San Diego County region for which digital hourly weather observations were available, and a reasonably long period of record (about 20 years) of hourly observations was available for analysis.

After some preliminary experimentation to verify which approaches were practical for the refined analysis, Cuyamaca was selected as a "target" station at which hourly dry bulb temperatures would be predicted. Bases for selection of Cuyamaca were: it was the highest elevation (at 4,640 ft MSL) NOAA COOP station within San Diego County, as shown in Figure 15, it was within the Project corridor area of interest, and data were available to match the Campo period of record.

Because no dew point temperature data were available from a COOP station such as Cuyamaca, the next best solution was to use upper-air sounding data to extend the analysis above the elevation of the Campo station. San Diego was selected as the upper air station from which 850 mb pressure elevation (typically at approximately 4,900 ft MSL) dew point temperatures would be obtained to develop a prediction method.

Cuyamaca was selected as a source of daily total precipitation measurements. Table 2 presents mean total icing season (November through April) water equivalent precipitation for all available southern California NOAA COOP stations, including Cuyamaca. Figure 18 presents a plot of those same values. The Table 2 and Figure 18 values show the following:

- Precipitation in the mountain zone of San Diego County is strongly correlated with elevation, and generally increases with elevation.

- Cuyamaca precipitation (which was used for the phase 2 icing analysis) is the highest observed anywhere in the region.

Orographic precipitation involves the generation of precipitation as moist air is forced up and over a mountain range. That phenomenon will occur in the Project corridor area. Therefore, we concluded that, for our phase 2 icing analysis, higher icing than observed (or predicted) at Cuyamaca for a given ice storm would not be observed at lower elevations than Cuyamaca (which is at elevation 4,640 ft MSL).

3.2.2.2.2 Meteorological Data Input to the Refined Icing Analysis

The following meteorological databases were input to the second phase refined icing analysis.

- Campo hourly surface weather observations for the period of record 1 January 1973 through 31 October 1993 (these were also input to the phase 1 icing analysis)

- Cuyamaca daily total water equivalent precipitation observations for the period of record 1 January 1973 through 31 October 1993

- Dry bulb temperature and dew point temperature values for the period of record 1-30 January 1993, from the following monitoring stations: Campo hourly surface (at 2,630 ft MSL), Cuyamaca daily COOP (at 4,640 ft MSL), and San Diego twice-daily upper air (at 850 mb pressure elevation, typically at approximately 4,900 ft MSL)

3.2.2.2.3 Creation of Composite Meteorological Database for Use in the Refined Icing Analysis

Our objectives in analysis phase 2 were: to create a new composite hourly meteorological database that included the following components, and then to run an icing model analysis using that new database.

Components of the new composite database were as follows:

- Date and time of day in Pacific local standard time (LST)

- Hourly wind speed and wind direction exactly as measured at Campo

- Hourly weather types (for example, rain, snow, etc.) exactly as observed at Campo

- Hourly horizontal visibility exactly as measured at Campo

- Hourly dry bulb temperature representative of conditions at Cuyamaca, based on numerical extrapolation from Campo using an equation correlating conditions at Campo and Cuyamaca

- Hourly dew point temperature representative of conditions at the 850 mb pressure elevation (approximately 4,900 ft MSL), based on numerical extrapolation using an equation correlating conditions at Campo with those within San Diego radiosonde ascents

- Hourly totals of water equivalent precipitation representative of Cuyamaca, based on numerical redistribution of daily totals of water equivalent precipitation measured at Cuyamaca, on an evenly distributed basis, to only those hours when precipitation was actually observed during the same days at Campo

The correlation equations used for numerical extrapolation of dry bulb temperature and dew point temperature were developed and verified using the following steps.

Step (1) Develop Dry Bulb Predictive Equation

The following equation was constructed to estimate Cuyamaca hourly dry bulb temp. The factor (1.194) was the mean ratio of daily mean Campo dry bulb temp to daily mean

Cuyamaca dry bulb temp during January 1993. The offset (-0.201) was a correction based on the mean difference between Cuyamaca mean daily dry bulb temp predicted via the ratio above, and actual Cuyamaca mean daily dry bulb temp during January 1993.

CuyDB = (CamDB / 1.194) – 0.201

Where: CuyDB = Hourly Cuyamaca dry bulb temp (deg F)

CamDB = Hourly Campo dry bulb temp (deg F)

Step (2) Develop Dew Point Predictive Equation

The following equation was constructed to estimate 850 mb pressure elevation hourly dew point temp. The factor (1.052) was the mean ratio of daily mean San Diego 850 mb pressure elevation dew point temp depression to daily mean Campo dew point temp depression during January 1993. The offset (-7.14) was a correction based on the mean difference between San Diego 850 mb pressure elevation mean daily dew point temp predicted via the ratio above, and actual San Diego 850 mb pressure elevation mean daily dew point temp during January 1993.

850DP = [CamDB – (1.052)(CamDPD)] – 7.14

Where: 850DP = Hourly 850 mb pressure elevation dew point temp (deg F)

CamDB = Hourly Campo dry bulb temp (deg F)

CamDPD = Hourly Campo dew point temp depression (deg F)

Step (3) Regression Tests of Predictive Equations

Regression Tests

Plots were constructed and simple linear regression tests were run for the observed versus predicted parameters described above in Steps (1) and (2). Figure 16 presents a plot of observed versus predicted Cuyamaca daily mean dry bulb temp, and the results of a regression test comparing those predictions to actual measurements. Figure 17 presents a plot of observed versus predicted San Diego 850 mb pressure elevation daily mean dew point temp, and the results of a regression test comparing those predictions to actual measurements. For each of the two regression equations, a correlation coefficient "r" and a coefficient of determination "r^2" were estimated.

In Figure 16, the r^2 value for the regression equation is 0.7982, which means that the regression equation for Cuyamaca dry bulb temp explains approximately 80% of the variation in the regressed data. In Figure 17, r^2 value for the regression equation is 0.6951, which means that the regression equation for 850 mb pressure level dew point temp explains approximately 70% of the variation in the regressed data.

Test of Significance of Regression Equation Coefficient of Determination r^2

For each of the two regression equations, the statistical significance of r^2 was determined using a standard method for testing the statistical significance of regression relationships. This technique tests a null hypothesis (Ho) that r equals zero (signifying no linear relationship between the variables), and an alternative hypothesis (Ha) that r is not equal to zero (signifying a systematic, linear relationship). Since Ho tests equality, a "two-tailed" significance test is required. The technique uses a Student T-distribution with N-2 (where N is the sample size) degrees of freedom (DOF).

The following equation was used to estimate a test statistic (Blalock 1972).

$$Ts = (r(N-2)^{0.5}) / (1-r^2)^{0.5}$$

Where: N = Sample size

Ts = Test statistic based on a Student T-distribution with N-2 degrees of freedom

r^2 = Coefficient of determination

The value of the above test statistic Ts was compared to rejection criteria from a Student T-distribution. The data set had 30 observations (N=30) and 28 DOF. For a 99% confidence level, the rejection criteria for a T-distribution with 28 DOF is 2.76.

For dry bulb temp, Table 4 presents a summary of the terms of the equation for test statistic Ts, the test statistic, the null and alternative hypotheses, the rejection point from the Student T distribution, and the result of the statistical test. Since the test statistic value estimated via the Ts equation (10.52) exceeds the rejection criteria value for a Student T-distribution (2.76), the coefficient of determination was statistically different than zero. Therefore, the correlation was statistically significant at the 99% confidence level.

For 850 mb pressure level dew point temp, Table 6 presents a summary of the terms of the equation for test statistic Ts, the test statistic, the null and alternative hypotheses, the rejection point from the Student T distribution, and the result of the statistical test. Since the test statistic value estimated via the Ts equation (7.24) exceeds the rejection criteria value for a Student T-distribution for 23 DOF at a 99% significance level (2.81), the coefficient of determination was statistically different than zero. Therefore, the correlation was statistically significant at the 99% confidence level.

Test of Significance of Regression Equation Slope b

For each of the two regression equations, a "standard error of the slope" (SES) of the regression line slope "b" was also estimated. The slope of the regression equation was tested for statistical significance using a standard method for testing the statistical significance of the slope of a linear regression equation. This technique tests a null hypothesis (Ho) that the slope (b) equals zero, and an alternative hypothesis (Ha) that b is not equal to zero. Since Ho tests equality, a two-tailed test is required. The technique uses a Student T-distribution with N-2 DOF. The following equation was used to estimate the SES (Blalock 1972).

$$Tb = b/SES$$

Where: Tb = The test statistic based on a Student T-distribution with N-2 degrees of freedom

b = the slope of the regression equation

$SES = (\sum(Yi-Yip)^2 / (N-2))^{0.5} / (\sum(Xi-Xm)^2)$

SES = Standard error of the regression equation slope "b"

Yi = the ith temp predicted by the equation in Steps (1) or (2) above

Yip = the ith temp predicted by the regression equation

Xi = the ith observed temp

Xm = the mean observed temp

N = Sample size

The 99% significance level was chosen. For a 99% confidence level, the rejection criteria for a T-distribution with 28 DOF is 2.76.

For dry bulb temp, Table 5 summarizes the terms of the equation for SES and its test statistic, the test statistic values, the null and alternative hypotheses, the rejection point from the Student T-distribution, and the result of the statistical test. Since the test statistic value (10.52) exceeded the rejection criteria for a Student T-distribution for 28 DOF and a 99% significance level (2.76), the regression coefficient was statistically significant at the 99% significance level.

For 850 mb pressure elevation dew point temp, Table 7 summarizes the terms of the equation for SES and its test statistic, the test statistic values, the null and alternative hypotheses, the rejection point from the Student T-distribution, and the result of the statistical test. Since the test statistic value (7.24) exceeded the rejection criteria for a Student T-distribution for 23 DOF at the 99% significance level (2.81), the regression coefficient was statistically significant at the 99% significance level.

3.3 Input Information

As explained in Section 2.2 Climate Character above, the Project area includes four main climatic zones: coastal, inland, mountain, and desert.

San Diego is located in the southern California Coastal Climate Zone at the west end of the project corridor. The Imperial Valley is located in the southern California Desert Climate Zone at the east end of the project corridor. In between are the Inland Climate Zone and the Mountain Climate Zone, which have important contrasts with the Coastal and Desert zones. They both have higher elevations than the Coastal and Desert zones. Also, the Mountain zone includes the lowest temperatures and largest precipitation amounts in this part of southern California. As explained in Section 2.3 "Winds" above, greater wind velocities can occur at such higher topographic elevations,

and can be locally enhanced due to funneling of airflow through mountain passes and along valleys.

The Project corridor traverses all four southern California climate zones. It also enters elevated mountain passes and valleys. Therefore, the meteorological study should address, as possible, wind and ice phenomena unique to those locations.

The technical literature characterizes mountain climates as having potential for more extreme wind and ice conditions. For example, the World Meteorological Organization (WMO 1981) lists topographic features indicative of high wind energy. Those features include: long, sloping valleys parallel to prevailing winds, high elevation plateaus in areas of strong geostrophic winds, valleys with persistent downslope winds associated with strong pressure gradients, and exposed ridge crests and mountain summits in areas of strong geostrophic winds.

As another example, Kessler (in Houghton 1985) explains that fierce mountain winds can originate from a variety of causes, including increased pressure gradients at higher elevations and air speed-up as it is forced around and over mountain barriers.

Geiger (1965) describes windswept ridges as a key factor in the distribution of micro-scale climates within a mountain environment. He also notes that the distribution of precipitation over a mountainous area is extremely varied, depending on wind and exposure, although it typically increases with height.

The meteorological study that was performed by MRI for SDG&E in 1979 (MRI 1979) addressed a proposed transmission corridor approximately parallel to Interstate 8. That corridor extended between Miguel Substation and Laguna Dam on the west, and between Rainbow Substation and Laguna Dam on the east. The MRI study used wind measurements from three mechanical weather stations (MWS). All three MWS sites were located within the southern California mountain climate zone, and were at elevations of 2,160, 3,980, and 3,040 ft feet above mean sea level (ft MSL). Approximately one year of hourly wind observations were recorded at each of those three MWS sites. MRI's stated purpose for selection of those MWS sites was to investigate ridge and canyon winds. The MRI analysis included an effort to statistically correlate the single year of wind observations at each MWS site with simultaneous wind observations at the coastal climate zone to the west or at the desert climate zone to the east. Very generally, the analysis results indicated that winds at the mountain sites were approximately twice as high as those at the lower-elevation coastal and desert sites. The purpose of our description here of the MRI analysis of MWS station data is to provide an additional example of a published reference that emphasizes the importance of assessment of mountain-specific microclimate, in this case directly applicable to the project geographic region.

Summarizing, we were obligated in our meteorological study to address, based on published theory and results in the technical literature, anticipated significant variation of extreme winds and icing over the mountain climate zone through which the project corridor extends.

Information input to the ice and wind analysis included the following:

- Digitized hourly surface meteorological observations for the following southern California stations: El Centro, Campo, San Diego Gillespie Airport, Ramona,

Carlsbad Palomar Airport, March Air Force Base, Beaumont, and San Diego Lindbergh Airport (NCDC 2005)

- Published summaries of annual, maximum daily, and maximum monthly snowfall, mean annual number of days with snowfall, and monthly mean water equivalent precipitation and for the following southern California NOAA COOP surface observing stations: Alpine, Beaumont 1 E, Borrego Desert Park, Campo, Chula Vista, Cuyamaca, El Capitan Dam, El Centro 2 SSW, Henshaw Dam, Idyllwild Fire Department, Indio Fire Station, La Mesa, Mecca Fire Station, Oceanside Marina, Palm Springs, Palomar Mountain Observatory, Redlands, Riverside Citrus Experimental Station, Riverside Fire Station, San Diego Lindbergh Airport, Santa Ana Fire Station, and Vista 2 NNE (NCDC 2001).

- Digitized daily surface meteorological observations of daily maximum and minimum dry bulb temperature for the Campo and Cuyamaca southern California NOAA COOP surface observing stations, and daily total water equivalent precipitation for the Cuyamaca COOP station (NCDC 2007a, 2007b).

- Digitized Integrated Global Radiosonde Archive (IGRA) twice-daily upper-air meteorological observations for the San Diego California upper-air station (NCDC 2007c).

- Detailed maps of the planned transmission corridor, and planned conductor diameters

- U. S. Geological Survey topographic maps of the transmission corridor and surrounding region

- Published information on weather conditions in the region

4. Projections and Results

4.1 Projected Winds

Table 8 presents results of the Simiu program analysis of maximum winds for each of the eight stations. Either a type 1 or a type 2 statistical distribution was selected, based on which produced the largest wind values. Figure 6 presents a plot of estimated winds for various return intervals for each of the eight regional meteorological monitoring stations. These are the same estimates as presented in Table 8.

4.2 Projected Icing and Simultaneous Winds

4.2.1 Phase 1 Analysis

Wire ice accumulations for all stations except Beaumont were projected to be zero. Typically, dry bulb temps during screened potential icing episodes were too high for icing to occur. Table 9 presents annual icing predictions for Beaumont. Table 10 presents results of the Simiu program analysis of icing and winds after maximum ice accumulation, for Beaumont.

4.2.2 Phase 2 Analysis

Wire ice accumulations were projected for the composite meteorological database that was created for phase 2. Table 11 presents annual icing predictions for the phase 2 analysis. Table 12 presents results of the Simiu program analysis of icing and winds after maximum ice accumulation, for phase 2.

5. Factor for Adjustment of Wind Speeds from Hourly to Three-Second Gust and from Fastest Mile to Three-Second Gust

5.1 Wind Speed Observation Averaging Time

Calculations of wind pressures for the project required input wind speeds averaged over a three-second period.

As explained above in Section (3.1), raw data used in this analysis were in the form of a series of annual maximum wind speeds. We made the conservative assumption that all values in the input raw dataset (including both annual fastest mile values from LCD publications for selected stations, and annual maximum hourly values from digital files for other selected stations) were hourly mean wind speeds. The purpose of that assumption was to simplify and span all of the various averaging time procedures that were originally used to record the raw wind speed values at the weather stations through all periods of record. Our estimated three-second wind speed values were therefore expected to be conservative for all periods of record, for all stations.

5.2 MRI Gust Factor

Various methods are available to convert the raw hourly wind speeds to three-second gusts. For example, in its 1979 meteorological evaluation of proposed southern California transmission routes (MRI 1979), Meteorology Research, Inc. (MRI) reviewed available information on the relationship between wind gusts and steady wind. They determined that there were no hard and fast relationships to use in relating speeds of different averaging times. Their final recommendation was to use the following formula to predict two-second gusts from hourly average wind speeds.

$$G_{2\,sec} = 6.4 + (1.43)\,(V)$$

Where: $G_{2\,sec}$ = Two-second gust speed (mph)

V = Hourly average wind speed (mph)

For direct comparison to the Simiu and Scanlan and Burton gust factors presented in report sections 5.4 and 5.5, it would be necessary to adjust the MRI equation to provide a thee-second value. For that purpose, we would use a wind speed conversion factor of (1.51 / 1.53 = 0.987) based on the graph presented in Figure 7 from Simiu and Scanlan (1986). Therefore, our "revised" form of the MRI gust factor equation would be as follows.

$$G_{3\,sec} = (0.987)\,[\,6.4 + (1.43)\,(V)\,]$$

Where: $G_{3\,sec}$ = Three-second gust speed (mph)

V = Hourly average wind speed (mph)

5.3 ASCE Gust Factor

Another example is the American Society of Civil Engineers (ASCE 2006) standard for wind loads, which uses basic wind speeds in the determination of design wind loads on transmission structures. Those basic wind speeds are required by the standard to already be adjusted for equivalence to a three-second gust wind speed. But no techniques are provided in the ASCE standard for that adjustment.

5.4 Simiu and Scanlan Gust Factor

Another example is Simiu and Scanlan (1986), who present a relatively sophisticated equation for converting mean wind speeds between averaging times, as follows.

$$U_{T(Z)} = (U_{3600(Z)}) [1 + (\beta^{0.5} c(t)) / (2.5 \ln (z/zo))]$$

Where:

$U_{T(Z)}$ = Wind speed of interest, at time T and elevation above ground Z

$U_{3600(Z)}$ = Wind speed at time T and elevation above ground Z for an averaging time of 3,600 seconds, or one hour

β = Coefficient that varies with roughness length (roughness of the ground surface)

c(t) = Coefficient that represents fluctuation of atmospheric turbulence in the longitudinal direction – that is, in a direction parallel to the wind direction

Z = Height above ground elevation of wind speed of interest

Zo = Roughness length coefficient (which varies with roughness of the ground surface)

While the Simiu and Scanlan equation above is attractive because of its applicability to any ground surface scenario, a drawback is that use of it for a project requires detailed information on the ground surface character at various locations. Simiu and Scanlan (1986) also include a graph, reproduced in this report as Figure 7, that presents the ratio of probable maximum wind speed averaged over a period "t" to that averaged over one hour. It includes results applicable to open terrain conditions (roughness length approximately equal to 0.005 meters) and a wind speed elevation above ground of 10 meters. We extracted from that graph a multiplicative conversion factor of approximately (1.51) for adjusting hourly wind speed to a three-second wind speed.

5.5 Burton Gust Factor

Another example is Burton et al. (2001), who present a more recent method for converting mean wind speeds between averaging times. They recommend it for the sensitive application of design and specification of wind energy systems. Their gust factor for conversion of one-hour wind speeds to three-second average wind gusts for use in structure design is as follows.

$$G(T) = 1 + [\,(0.42)\,(Iu)\,\ln(3{,}600/T)\,]$$

Where: G(T) = Gust factor for specific gust time length, which is multiplied times the one-hour mean wind speed

= ratio of: [(gust wind speed) / (hourly mean wind speed)]

T = Gust length (seconds)

Iu = Coefficient representing the longitudinal turbulence intensity (%)

The longitudinal turbulence intensity "Iu" is the standard deviation of the fluctuating component of the wind in an along-wind direction. According to Burton et al. (2001), Iu depends on the ground surface roughness, and can be estimated via a complex calculation using information on the ground surface boundary layer wind speed profile with height. We assumed for our example calculation a turbulence intensity of 20%, which is a higher value specified in some standards, according to Burton et al. (2001). That higher value would result in a slightly conservatively higher calculated gust factor.

To estimate a G value to use with results of the present analysis, which approximate hourly mean wind speeds, we made the following calculation using the Burton et al. (2001) equation.

$$G(3\text{ seconds}) = 1 + [\,(0.42)\,(0.20)\,\ln(3{,}600 / 3) = 1.5956$$

5.6 Recommended Gust Factor

Our final conclusion was to use the Burton et al. (2001) multiplicative factor of (1.5956) to adjust hourly winds predicted in this analysis to three-second gusts. The Burton three-second gust speed of 1.5956V is of a similar order of magnitude to the MRI three-second gust speed of (6.4 + 1.43V).

Generally, the magnitudes of such gust factors depend on site-specific weather conditions and topography. Our recommended value is based on a simplified approach found in recent industry reference sources, to be applied over all cases. We believe this approach is preferred to a more detailed approach that would account for detailed site-specific characteristics, but that may not significantly improve accuracy and cannot be verified by on-site measurements at this time.

6. Conclusions

6.1 Maximum Annual Winds

We reached several conclusions via review of wind analysis results, as follows.

6.1.1 Independent Checks of Wind Speed Projections

Three comparisons were made of wind speed projections. Those comparisons were made with results of previous studies for the same California weather monitoring stations, and published by other organizations. The comparisons were made of wind speeds adjusted to hourly values, and after projection to various return intervals.

Purpose of those comparisons was to perform an independent check on the overall wind speed projection methodology and raw wind data handling approach used for the present study.

6.1.1.1 Present versus MRI 1979 and PNL 1987 Projections

First and second comparisons were of projected hourly wind values from the present analysis with projected hourly wind values from previous MRI (MRI 1979) and Pacific Northwest Laboratory (PNL 1987) analyses. Those comparisons could only be made for the San Diego Lindbergh, El Centro, and March AFB stations. As described above in Section 3.1 "Maximum Annual Wind Speeds", raw input wind speed data were not always available for contiguous periods of years. Projections for San Diego/Lindbergh were based on raw data for the following periods of record: 1948-1964 (17 years) for the MRI study; 1888-1904 and 1912-1985 (86 years) for the PNL study; and 1949-2004 (56 years) for the present analysis. Projections for El Centro were based on raw data for the following periods of record: 1945-1958 (14 years) for the MRI study; 1945-1947, 1949-1950, and 1952-1958 (12 years) for the PNL study; and 1945-1960 and 1984-2004 (37 years) for the present analysis. Projections for March AFB were based on raw data for the following periods of record: 1949-1982 (34 years) for the PNL study; and 2000-2004 (5 years) for the present analysis. In addition to using different periods of record, the three analyses probably also used some different sets of maximum hourly winds for matching years, because of likely differences in subjective interpretation of database quality.

A comparison of projections is presented in Figure 8. For Lindbergh, both MRI and PNL projected hourly wind speeds were lower than for the present analysis by about 10 mph or 20%. For El Centro, MRI projected hourly wind speeds were higher than for the present analysis by about 6 mph or 9%, and PNL projected hourly wind speeds were lower than for the present analysis by about 5 mph or 8%. For March AFB, PNL projected hourly wind speeds were lower than for the present analysis by about 2 mph or 5%. We interpreted the above differences to indicate reasonable consistency between the three studies.

6.1.1.2 Present Projections versus Observer Experience

A third comparison was made with documentation of a personal communication with a Mount Laguna, California Federal Aviation Administration employee during previous research (S&L 1993). That contact's subjective judgement was that a 50 mph 10- year return interval peak hourly wind speed can be expected at that location. Mount Laguna is at approximate elevation 6,000 ft MSL, which is about 2,000 ft higher than the highest segment of the Project corridor. The 50 mph value is consistent with projections made in the present study for Beaumont.

6.1.2 General Effect of Elevation on Extreme Winds

High winds in this region are not strongly correlated with or controlled by monitoring station elevation alone.

6.1.3 Effects of Local Topography on Extreme Winds at Beaumont and March AFB

As illustrated by the local shaded relief map in Figure 9, the Beaumont weather monitoring station is located at the west "entrance" to the San Gorgonio Pass. That narrow valley funnels and accelerates airflow between the Los Angeles Basin to the west and the desert Coachella Valley to the east, and is the site of numerous wind energy turbines. The Beaumont wind projections for return periods above 20 years are much higher than for other regional stations because of those terrain-induced local airflow enhancements.

Also on Figure 9, it can be seen that March AFB is located in a shallow valley that trends from north-northwest to south-southeast. That trend causes some wind direction funneling.

6.1.4 Effects of Local Topography on Extreme Winds at Palomar

As illustrated by the shaded relief map in Figure 10, the Carlsbad/Palomar weather station is located at 328 ft elevation in a foothill area with good exposure but no other obvious local topographic effects.

6.1.5 Effects of Local Topography on Extreme Winds at San Diego Lindbergh, San Diego Gillespie, and Ramona

As illustrated by the shaded relief map in Figure 11, the San Diego Lindbergh, San Diego Gillespie, and Ramona weather stations are located about 15 miles apart, but have markedly different exposures. Lindbergh is at the Pacific coast, and is well exposed to winds from all directions. Gillespie and Ramona are both located on the floors of small (approximately five mile wide) enclosed valleys with narrow outlets and surrounding mountains that rise several thousand feet higher. These site exposure differences apparently explain why wind projections are lower for Gillespie and Ramona than for Lindbergh, even though both Gillespie and Ramona are at are at significantly higher elevations above sea level than Lindbergh.

6.1.6 Effects of Local Topography on Extreme Winds at Campo

As illustrated by the shaded relief map in Figure 12, the Campo weather station is located at 2,630 ft elevation on a major mountainous plateau with good exposure but no other obvious local topographic effects. This good exposure at high elevation apparently explains the third-highest projected winds at Campo of the eight regional stations analyzed.

6.1.7 Effects of Local Topography on Extreme Winds at El Centro NAF

As illustrated by the shaded relief map in Figure 13, the El Centro NAF weather station is located at elevation (- 43) ft MSL on the desert floor of the Imperial Valley. Exposure is very open, and terrain is mostly flat. The second-highest projected wind speeds (of all eight regional stations analyzed) at El Centro are remarkable but appear to be real. They include blowing dust and were occasionally due to thunderstorms.

6.1.8 List of Projected Extreme Winds

For various stations, our projected wind speeds and recommended wind directions are provided in Table 8. Our recommendations for which stations should be used to represent winds for each corridor segment are presented in Table 13, except where other wind directions are recommended for valleys and mountain passes in this text section.

6.1.9 Special Extreme Wind Recommendations for High Elevation Valley Locations Based on Beaumont

As discussed in section 3 "Analysis Methods" above, our interpretation was that extreme winds observed at Beaumont are to a large extent caused by funneling of airflow through a narrow, deep valley at high elevation. A 100-year return interval peak wind of 91 mph was projected based on Beaumont observations.

As recommended in Table 13, the projected wind speeds based on observations at Beaumont were expected to occur at two west-northwest to east-southeast trending valleys – at Grapevine Canyon and at Agua Caliente Springs - near the highest elevations crossed by the transmission corridor. Those projected peak winds were expected to be oriented parallel to the valley long axes, blowing approximately from either directions 280 deg or 100 deg.

Plans are for the transmission lines through those two valleys to be parallel to the valley long axes. The projected peak winds would therefore be parallel to the transmission lines, and wind loads on the lines due to the projected winds would be longitudinal. During such extreme events, transverse loads on the wires would be minimal.

An additional concern we have is that extreme winds may also occur with transverse components across the high-elevation Grapevine Canyon and Agua Caliente Springs valleys. But we do not believe the peak projections for Beaumont, such as the 100 year return interval 91 mph wind, should be directly applied as winds blowing in directions transverse to those two valleys.

Therefore, we constructed an alternative procedure which we used to synthesize a hypothetical peak 100 year return interval wind which would approach the high elevation Grapevine Canyon and Agua Caliente Springs valleys from directions perpendicular to the valley long axes. That procedure was done as follows.

(a) We started with the projected 100 year return interval wind speed of 91 mph based on Beaumont

(b) We conservatively assumed that the 91 mph peak wind will approach across the high mountain plateau from directions perpendicular to the valley long axes.

(c) We realistically reduced the peak wind downward from 91 mph to represent slowing that would occur during a transverse descent into the valleys. Peak wind speeds at the conductors within the valleys would be less than at higher elevations over the surrounding plateau, because of valley sheltering effects (Munn 1966). We assumed an approximate mean vertical height difference between surrounding plateau and valley floor of 1,200 ft (the difference between 1,300 ft and 100 ft elevations above ground) for both valleys. We used a generic

equation (US EPA 1995) for vertical extrapolation of wind speed in the atmospheric boundary layer, as follows.

$$Unew = (Uref) [Znew / Zref]^{P}$$

Where: Unew = Wind speed estimated at "Znew" (mph)

Uref = Wind speed "measured" at "Zref"

Znew = New elevation above ground (feet)

Zref = Reference elevation above ground at which wind was "measured" (feet)

P = Exponent dependent on atmospheric stability class, that equals 0.15 for neutral or "D" stability class, which is a very turbulent atmosphere normally present during peak wind speeds

Calculating: $U(100\ ft) = (91\ mph)) [100\ ft / 1{,}300\ ft]^{0.15} = 62\ mph$

Summarizing, we recommend application to load calculations at the Grapevine Canyon and Agua Caliente Springs valleys of the following peak 100 year return interval projected hourly wind speeds.

- 100 year return interval, in a longitudinal direction through the valleys = 91 mph
- 100 year return interval, in a transverse direction across the valleys = 62 mph

6.1.10 Application of Recommended Design Winds to Conductors and Structures

Projected winds estimated via this study should be applied to conductors and structures as follows.

- Where the recommendations do not include application of wind speeds to specific wind directions, the pressures should be applied to both towers and wires, including transversely to the towers.
- In select cases, the recommendations include application of peak wind speeds to specific wind directions. The only cases of that kind in this study were for several valleys where peak winds were predicted to be oriented longitudinally down the valley long axes. In those cases, calculated peak wind pressure values should be applied longitudinally only to the towers, not to the wires.

6.2 Projected Ice and Combined Ice/Wind

6.2.1 Phase 1 Analysis

We concluded from phase 1 wire icing predictions and projections that significant conductor icing episodes should be relatively rare events in the Project area. Most precipitation in the region will not result in icing. Conductor icing events should be concentrated where the corridor crosses the highest ridge lines. At those highest ridges,

the Phase 1 Beaumont icing projections and combined icing/wind projections were developed for design at the Project corridor.

6.2.2 Phase 2 Analysis

A second set of wire icing predictions and projections, analysis phase 2, were prepared using a composite weather database. That composite database combined best available actual regional weather observations. It also included adjustments to the 850 mb pressure elevation and the elevation of Cuyamaca California, or from 4,640 to approximately 4,900 ft MSL. The objective of phase 2 was to develop more refined and representative icing predictions that could also be applied to higher elevations, should the Project corridor be rerouted to those higher elevations at a later date.

Phase 2 icing analysis results confirmed the major conclusions of the phase 1 analysis. Those conclusions included: (1) significant conductor icing episodes should be relatively rare events in the Project area, (2) most precipitation in the region will not result in icing, and (3) conductor icing events should be concentrated where the corridor crosses the highest ridge lines.

The actual phase 2 analysis ice thickness predictions differed from phase 1. Figure 19 presents a plot of both the phase 1 and phase 2 icing analysis curves. That plot shows that the phase 2 radial ice thicknesses are slightly larger for the shortest return intervals from two to 10 years. The plot also shows that that the phase 2 radial ice thicknesses are significantly lower for the largest return intervals from 20 to 100 years, and in fact diverge from the phase 1 results with increased return interval.

Comparison of wind speeds predicted to occur during icing in Tables 10 and 12 shows that phase 2 wind speeds during icing were higher than phase 1 for return intervals from two through 60 years. The table data also show that that the phase 2 wind speeds during icing were lower for the largest return intervals from 70 to 100 years.

6.2.3 Overall Conclusions on Icing Predictions

Our overall conclusions regarding icing predictions are as follows.

(1) The heights of application should be approximately above 3,000 ft MSL, as described above in Section 2.4 "Precipitation and Weather Phenomena".

(2) We recommend use of the phase 2 ice predictions, because we believe that they are more representative of Project corridor conditions than the phase 1 results. We also recommend use of phase 2 results, should the Project corridor be rerouted to higher elevations at a later date.

(3) Comparison of the present phase 2 conductor icing results with previous study results (MRI 1979) indicate significantly lower (from about 15% to about 30% of the MRI values) for return intervals of 25, 50, and 100 years. Our interpretation of why there are differences between the two studies included the following potential factors:

- Adjustments/enhancements of local raw meteorological data sets were more extensive during the earlier study,

- Meteorological station periods of record were smaller in 1979,
- The MRI ice prediction methodology was different, and
- The 1979 transmission corridor was located differently than the present design.

Conductor icing results of this study have been limited by: available stations and their unique topographic exposures, available periods of record, and daily total precipitation measurements. Actual ice accumulation along the planned transmission corridor is probably very dependent on elevation and local topographic configuration and their effects on air temperature and precipitation-producing weather systems. Therefore, we recommend that standard industry code ice and combined ice/wind design values should be relied on, unless their recommended load values are exceeded by those predicted by this study, in which case results of this study should be used.

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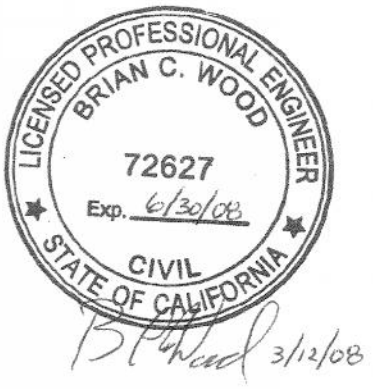

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Appendices

A Table 1 - Snowfall versus Elevation

COOP Station Name	Station Elevation above Mean Sea Level (feet)	Mean Annual Snowfall (inches) (a)	Max. Recorded 24-hour Snowfall (inches) (b)	Max. Recorded One-Month Total Snowfall (inches) (b)	Annual Mean Number of Days with Snowfall Greater than or Equal to One Inch (a,b)	Unusual Snowfall Events	
						Snow Depth (inches) (c)	Date
Oceanside Marina	10	0.0	0.0	0.0	0.0		
San Diego Lindbergh AP	13	0.0	0.0	0.0	0.0		
Chula Vista	56	0.0	0.0	0.0	0.0		
Palm Springs	425	0.1	1.5	1.5	0.0		
Vista 2 NNE	510	0.0	trace	trace	0.0		
La Mesa	530	0.0	trace	trace	0.0		
El Capitan Dam	600	0.0	0.0	0.0	0.0		
Borrego Desert Park	805	0.0	trace	trace	0.0	4.5	13-19 Dec 1967
Temecula	1,000	-----	-----	-----	-----	6	13 Dec1967
Alpine	1,735	0.1	1.0	2.0	0.1		
Campo	2,630	0.1	2.0	2.0	0.0	20	13 Jan 1882
Henshaw Dam	2,700	1.0	5.0	15.0	0.2	6	29 Jan 1957
						9 to 12	20-22 Nov 2004
Warner Springs	3,132	-----	-----	-----	-----	13	10-11 Mar 2006
Mesa Grande	3,230	-----	-----	-----	-----	10	29 Jan 1957
Descanso	3,396	-----	-----	-----	-----	7 to 9	1-2 April 1999
Pine Valley	3,736	-----	-----	-----	-----	6	22-25 Feb 1987
						7 to 9	1-2 April 1999
Julian	4,220	-----	-----	-----	-----	12	29 Jan 1957
						24	16-17 Dec 1987
Cuyamaca	4,640	29.0	16.0	53.3	7.0	14	15 Jan 1932
						18	9-11 Jan 1949
						20	29 Jan 1957
						4	4 Jan 1987
						22	22-25 Feb 1987
						6	19 Mar 1991
						25	10-11 Mar 2006
Idyllwild Fire Dept	5,380	31.9	18.5	33.1	8.6	29	22-24 Mar 1964
						38	13-19 Dec 1967
						18.5	26-27 Mar 1991
						10	25-28 Feb 1996
						13 to 18	10-11 Jan 2001
						27	10-11 Mar 2006
Palomar Mountain Obs	5,550	27.9	25.0	31.0	5.4	6	13 Apr 1956
						21	29 Jan 1957
						23	22-24 Mar 1964
						24	13-19 Dec 1967
						25	18 Mar 1982
						6	19 Mar 1991

(a) Information based on snow climatology (NCDC 2001).
(b) Information based on 1971-2000 daily data (NCDC 2001).
(c) Information from San Diego NWS (Miller 2007).

B Table 2 – Comparison of Mean Icing Season Total Water Equivalent Precipitation at NOAA COOP Stations in Southern California

Southern CA COOP Station	Station Elevation (ft MSL)	Mean Monthly Water Equiv PCP Nov (inches)	Mean Monthly Water Equiv PCP Dec (inches)	Mean Monthly Water Equiv PCP Jan (inches)	Mean Monthly Water Equiv PCP Feb (inches)	Mean Monthly Water Equiv PCP Mar (inches)	Mean Monthly Water Equiv PCP Apr (inches)	Station Elevation (ft MSL)	Mean Monthly Water Equiv PCP 6-month Total (inches)
Mecca Fire Station	-180	0.20	0.31	0.69	0.62	0.38	0.08	-180	2.28
El Centro 2 SSW	-30	0.17	0.43	0.51	0.36	0.31	0.05	-30	1.83
Indio Fire Station	-21	0.18	0.28	0.78	0.68	0.47	0.06	-21	2.45
Oceanside Marina	10	0.92	1.34	2.42	2.23	2.11	0.92	10	9.94
San Diego Lindbergh AP	13	1.07	1.31	2.28	2.04	2.26	0.75	13	9.71
Chula Vista	56	1.11	1.18	1.99	1.99	2.07	0.69	56	9.03
Santa Ana Fire Station	135	1.17	1.79	3.18	3.05	2.78	0.67	135	12.64
Palm Springs	425	0.29	0.61	1.27	1.15	0.63	0.08	425	4.03
Vista 2 NNE	510	1.28	1.53	3.13	2.66	2.83	0.94	510	12.37
La Mesa	530	1.32	1.52	2.69	2.52	2.98	1.05	530	12.28
El Capitan Dam	600	1.49	2.01	3.19	3.35	3.67	1.21	600	14.92
Borrego Desert Park	805	0.44	0.75	1.43	1.41	0.94	0.19	805	5.16
Riverside Citrus Exp Stn	986	0.78	1.17	2.47	2.39	2.19	0.60	986	9.60
Redlands	1,318	0.91	1.51	2.96	3.04	2.58	0.81	1,318	11.83
Alpine	1,735	1.72	1.99	3.49	3.44	3.92	1.26	1,735	15.82
Beaumont 1E	2,600	1.44	2.00	4.18	4.07	3.72	1.10	2,600	16.51
Campo	2,630	1.24	1.80	3.30	3.04	3.02	0.94	2,630	13.34
Henshaw Dam	2,700	2.36	3.19	5.74	5.56	5.85	1.78	2,700	24.48
Cuyamaca	4,640	3.45	4.39	6.34	6.62	7.02	2.58	4,640	30.40
Idyllwild Fire Dept	5,380	2.28	3.16	5.52	5.23	5.00	1.76	5,380	22.95
Palomar Mountain Obs	5,550	2.60	3.47	5.77	6.29	6.13	1.76	5,550	26.02

C **Table 3 - Annual Maximum Wind Speeds (mph) at Weather Monitoring Stations in the SDG&E 500 kV Interconnect Project Region**

	El Centro	Campo	San Diego Gillespie	Ramona	Carls-bad / Palomar	March AFB	Beaumont	San Diego Lindbergh
Elevation (ft MSL)	**- 43**	**2,630**	**385**	**1,393**	**328**	**1,409**	**2,600**	**12**
Total Years Analyzed	**37**	**29**	**32**	**6**	**32**	**5**	**33**	**56**
Year								
1945	46							
1946	58							
1947	53							
1948	54						41	
1949	40						41	34
1950	46						41	28
1951	44						36	35
1952	48						30	45
1953	43						30	30
1954	40							36
1955	39							39
1956	44							32
1957	40							34
1958	43							37
1959	38							30
1960	46							33
1961								31
1962								31
1963								32
1964								34
1965								33
1966								33
1967								32
1968								32
1969								35
1970								34
1971								30
1972								29
1973		29	29		31		17	33
1974		34	29		29		17	33
1975		34	25		29		17	30
1976		40	25		28		17	32
1977		34	29		34		21	33

Table 3 (continued) Annual Maximum Wind Speeds (mph) at Weather Monitoring Stations in the SDG&E 500 kV Interconnect Project Region

	El Centro	Campo	San Diego Gillespie	Ramona	Carls-bad / Palomar	March AFB	Beaumont	San Diego Lindbergh
Elevation (ft MSL)	- 43	2,630	385	1,393	328	1,409	2,600	12
Total Years Analyzed	37	29	32	6	32	5	33	56
Year								
1978		34	23		30		23	36
1979		29	29		34		32	28
1980		46	46		29		69	56
1981		31	25		29		34	28
1982		52	29		34		34	39
1983		31	29		40		23	35
1984	40	40	26		25		31	32
1985	46	40	28		29		30	30
1986	32	40	23		25		23	26
1987	39	31	29		23		23	30
1988	28	40	29		23		22	40
1989	34	40	34		29		34	23
1990	29	40	23		23		57	26
1991	32	32	29		29		22	30
1992	30	40	23		25		23	29
1993	55	29	23		23		69	40
1994	34		22		23		23	34
1995	41		21		29		21	32
1996	34		22		30		28	29
1997	41	44	21		23		25	34
1998	35	39	28		29		21	38
1999	45	48	23	28	22		30	32
2000	39	38	34	33	25	31		38
2001	40	37	18	25	23	23		33
2002	36	39	23	36	30	30		31
2003	43	48	23	32	36	32		30
2004	46	40	23	31	32	33		46

D Table 4 – Significance Test of Coefficient of Determination (R^2) between Observed and Predicted Cuyamaca California Dry Bulb Temperatures

Parameter		Comment
Sample size (N)	30	
DOF (N-2)	28	
R^2 (from Figure 1)	0.7982	
t_s (from Eqn. 1)	10.52	
Rejection points from Student T-distribution (28 DOF; 1% probability in both tails)	2.76	The probability in each tail of the distribution is 0.005.
Null hypothesis (H_0) (R=0)		
Alternative hypothesis (H_a) (R not equal to 0)		Result of hypothesis test: Since 10.52 exceeds 2.76, reject H_0 at 99% significance level.

E **Table 5 – Significance Test of the Slope of the Regression Line between Observed and Predicted Cuyamaca California Dry Bulb Temperatures**

Parameter		**Comment**
Sample size (N)	30	
DOF (N-2)	28	
Slope of regression line (B)	0.9136	
SES (from Eqn. 3)	0.0695	0.0695 = $\sqrt{}$ (114.72/28)/ $\sqrt{}$(848.04)
t_B (from Eqn. 2)	10.52	
Rejection points from Student T-distribution (28 DOF; 1% probability in both tails)	2.76	The probability in each tail of the distribution is 0.005.
Null hypothesis (H_0) (R=0)		
Alternative hypothesis (H_a) (R not equal to 0)		Result of hypothesis test: Since 10.52 exceeds 2.76, reject H_0 at 99% significance level.

F **Table 6 – Significance Test of Coefficient of Determination (R^2) between Observed and Predicted San Diego California 850 mb Pressure Elevation Dew Point Temperatures**

Parameter		**Comment**
Sample size (N)	25	
DOF (N-2)	23	
R^2 (from Figure 2)	0.6951	
t_s (from Eqn. 1)	7.24	
Rejection points from Student T-distribution (28 DOF; 1% probability in both tails)	2.81	The probability in each tail of the distribution is 0.005.
Null hypothesis (H_0) (R=0)		
Alternative hypothesis (H_a) (R not equal to 0)		Since 7.24 exceeds 2.81, reject H_0 at 99% significance level.

G Table 7 – Significance Test of the Slope of the Regression Line between Observed and Predicted San Diego California 850 mb Pressure Elevation Dew Point Temperatures

Parameter		Comment
Sample size (N)	25	
DOF (N-2)	23	
Slope of regression line (B)	0.9676	
SES (from Eqn. 3)	0.1336	.1336 = √(566.95/23)/ √(1380.52)
t_B (from Eqn. 2)	7.24	
Rejection points from Student T-distribution (28 DOF; 1% probability in both tails)	2.81	The probability in each tail of the distribution is 0.005.
Null hypothesis (H_0) (R=0)		
Alternative hypothesis (H_a) (R not equal to 0)		Since 7.24 exceeds 2.81, reject H_0 at 99% significance level.

H Table 8 - Maximum Annual Wind Speeds Statistically Estimated with the NBS Simiu Program based on Input Annual Maximum Wind Speeds (mph) at Weather Monitoring Stations in the SDG&E 500 kV Interconnect Project Region (a)

Return Period (years)	El Centro	Campo	San Diego Gillespie	Ramona	Carls-bad / Palomar	March AFB	Beaumont	San Diego Lindbergh
Appli-cable Statis-tical Distri-bution Type	1	1	2	1	1	1	2	2
2	40.00	36.98	25.03	30.36	27.54	29.40	28.47	32.02
3	43.11	39.61	26.94	32.25	29.46	31.11	34.10	33.99
4	45.11	41.29	28.30	33.46	30.69	32.20	37.70	35.37
5	46.59	42.53	29.39	34.35	31.60	33.01	40.36	36.46
10	50.95	46.21	33.05	37.00	34.29	35.40	48.23	40.00
20	55.13	49.74	37.26	39.53	36.86	37.69	58.44	43.94
25	56.46	50.86	38.76	40.34	37.68	38.41	62.29	45.31
30	57.54	51.77	40.04	40.99	38.34	39.00	65.59	46.47
40	59.23	53.20	42.19	42.02	39.39	39.93	71.10	48.39
50	60.54	54.30	43.96	42.81	40.20	40.65	75.64	49.95
60	61.61	55.20	45.48	43.46	40.85	41.24	79.54	51.28
70	62.52	55.96	46.82	44.01	41.41	41.73	82.97	52.44
80	63.30	56.62	48.02	44.48	41.89	42.16	86.05	53.47
90	63.99	57.20	49.11	44.90	42.31	42.54	88.85	54.40
100	64.60	57.72	50.11	45.27	42.69	42.87	91.43	55.25
Station Elevation (ft MSL)	- 43	2,630	385	1,393	328	1,409	2,600	12
Recom-mended Most Likely Wind Directions (deg) (from)	270	60	260	80	70 or 270	70 or 340	10 or 100	315 or 180

(a) Wind speeds in this table are hourly values, and have not been adjusted to represent gusts.

Table 9 – Icing Analysis Phase 1 Maximum Annual Radial Ice Thicknesses and Loads and Simultaneous Maximum Wind Speeds Predicted for Beaumont, California

Year	Maximum Radial Ice Accumulation (inches)	Maximum Wind Speed Simultaneous with Maximum Radial Ice Accumulation (a) (mph)	Simultaneous Wind Direction (from – deg)	Predicted Ice Density (lb/ft)
1949	0.155	6.93	158	0.262
1950	0			
1951	0			
1952	0			
1953	0			
1973	0			
1974	0			
1975	0			
1976	0			
1977	0			
1978	0			
1979	0.020	8.05	180	0.030
1985	0.018	17.00	120	0.026
1986	0.177	14.09	90	0.117
1987	0			
1988	0			
1989	0.018	4.92	360	0.027
1990	0			
1991	0			
1992	0			
1993	0			

(a) Wind speeds in this table are hourly values, and have not been adjusted to represent gusts.

J Table 10 - Icing Analysis Phase 1 Maximum Annual Radial Ice Thicknesses and Loads and Simultaneous Maximum Wind Speeds Predicted for Beaumont, California Based on a Type 2 Statistical Distribution

Return Period (years)	Maximum Radial Ice Accumulation (inches)	Maximum Wind Speed Simultaneous with Maximum Radial Ice Accumulation (a) (mph)
2.0	0.00	1.32
3.0	0.01	3.03
4.0	0.02	4.39
5.0	0.03	5.56
10.0	0.07	10.03
20.0	0.16	16.21
25.0	0.20	18.69
30.0	0.25	20.92
40.0	0.33	24.88
50.0	0.42	28.36
60.0	0.50	31.50
70.0	0.59	34.39
80.0	0.67	37.07
90.0	0.76	39.59
100.0	0.85	41.98

(a) Wind speeds in this table are hourly values, and have not been adjusted to represent gusts.

K Table 11 – Icing Analysis Phase 2 Maximum Annual Radial Ice Thicknesses and Loads and Simultaneous Maximum Wind Speeds

Year	Maximum Radial Ice Accumulation (inches)	Maximum Wind Speed Simultaneous with Maximum Radial Ice Accumulation (a) (mph)	Simultaneous Wind Direction (from – deg)	Predicted Ice Density (lb/ft)
1973	0.014	6.04	250	0.022
1974	0.009	21.03	230	0.014
1975	0.036	21.03	260	0.056
1976	0			
1977	0			
1978	0.053	10.96	230	0.083
1979	0.097	17.00	230	0.158
1980	0			
1981	0.017	4.03	350	0.025
1982	0.018	14.99	270	0.028
1983	0.163	10.96	60	0.278
1984	0			
1985	0.024	10.96	230	0.036
1986	0			
1987	0.069	10.96	80	0.108
1988	0			
1989	0.038	19.91	280	0.059
1990	0.025	21.03	260	0.037
1991	0.049	14.09	280	0.076
1992	0			
1993	0			

(a) Wind speeds in this table are hourly values, and have not been adjusted to represent gusts.

L Table 12 - Icing Analysis Phase 2 Maximum Annual Radial Ice Thicknesses and Loads and Simultaneous Maximum Wind Speeds Predicted Based on a Type 2 Statistical Distribution

Return Period (years)	Maximum Radial Ice Accumulation (inches)	Maximum Wind Speed Simultaneous with Maximum Radial Ice Accumulation (a) (mph)
2.0	0.02	8.47
3.0	0.03	11.97
4.0	0.04	14.21
5.0	0.05	15.87
10.0	0.09	20.76
20.0	0.14	25.46
25.0	0.15	26.95
30.0	0.17	28.16
40.0	0.20	30.07
50.0	0.23	31.54
60.0	0.26	32.74
70.0	0.28	33.75
80.0	0.30	34.63
90.0	0.32	35.40
100.0	0.34	36.09

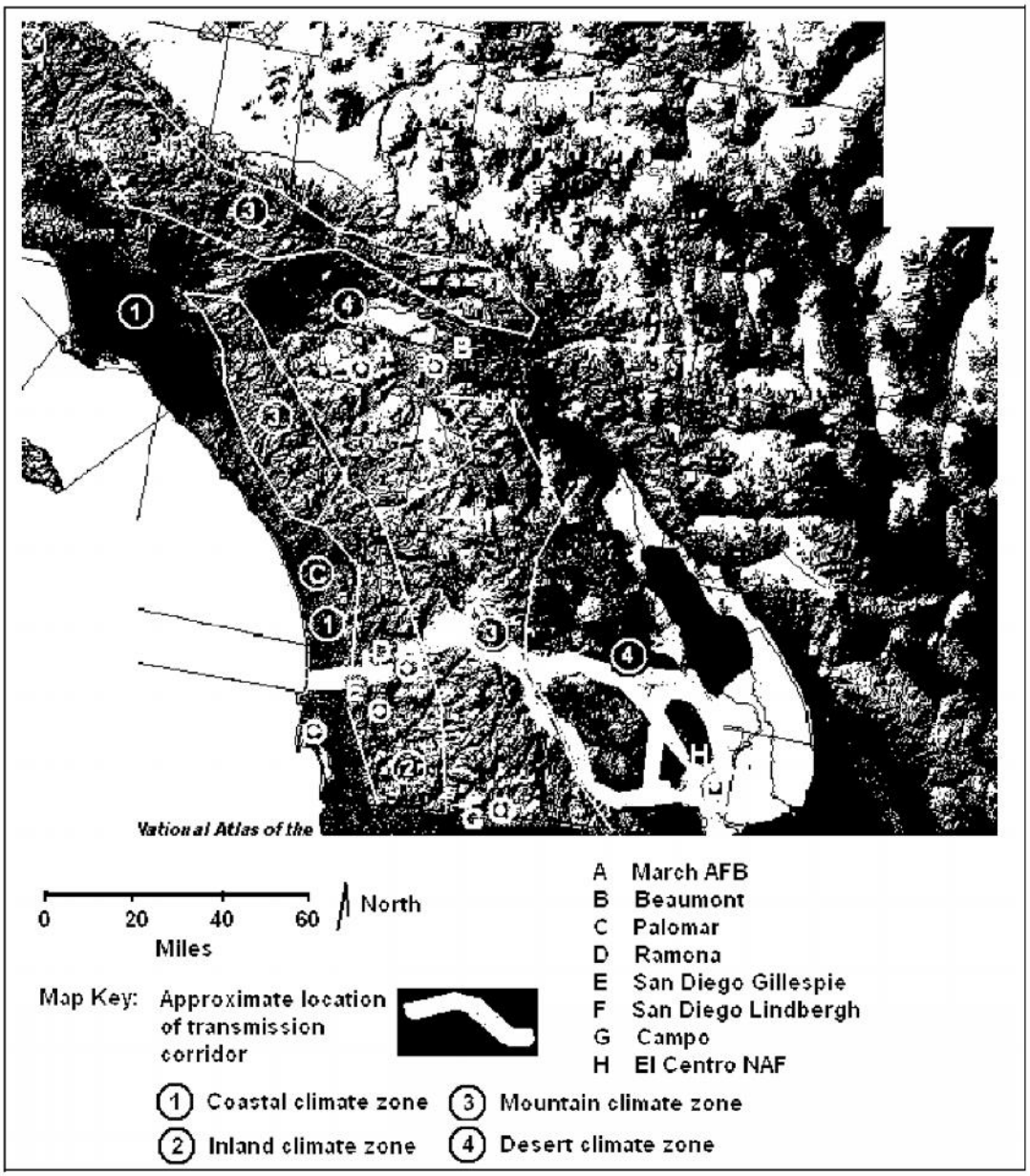
(a) Wind speeds in this table are hourly values, and have not been adjusted to represent gusts.

M Table 13 - Recommendations of Selected Station Sources for Projected Wind Speeds for Individual Segments of the 500 KV Interconnection Project

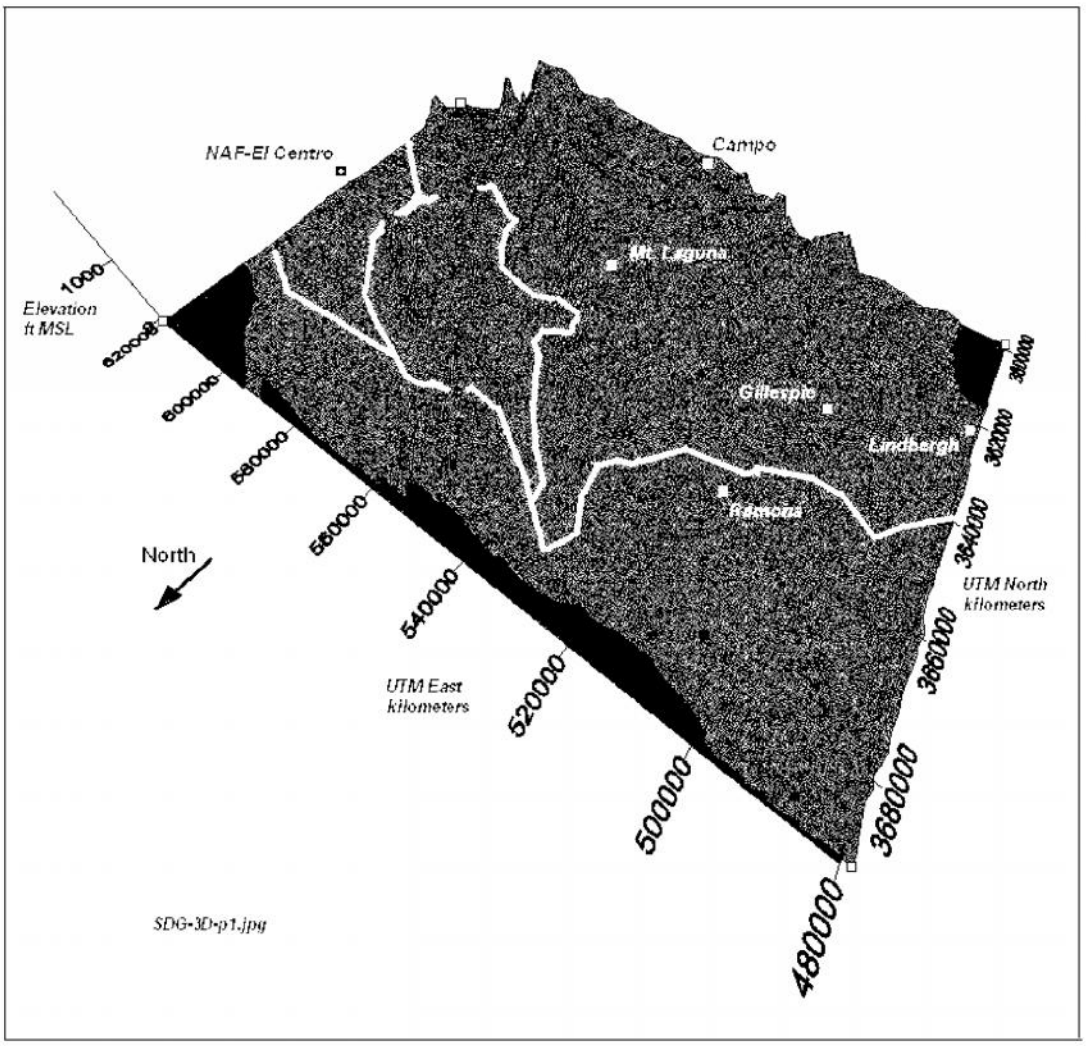
The following corridor segments correspond to those identified in Figure 3

	Segment of 500 KV Corridor	Recommended Station Source for Wind Speed Projections
(A)	From the Penasquitos substation to an elevation of about 2,200 ft MSL just south of the Santa Maria Valley (about 35 km inland).	San Diego Lindbergh
(B)	The Santa Maria Valley area southeast and east of Ramona (about 35-45 km inland)	Ramona
(C)	From the east edge of the Santa Maria Valley to a few km southeast of Ranchita (about 45-55 km inland).	Campo
(D)	The short stretch of corridor (about 10 km long) through the Grapevine Canyon mountain pass, north of Grapevine Mountain and the Volcan Mountains, and about 10 km southeast of Ranchita, California. Wind direction should be parallel to the pass orientation, from either the west-northwest or the east-southeast (about 55-65 km inland).	Beaumont
(E)	From the east end of Grapevine Valley, to the playa at the edge of the Borrego Valley (about 65-75 km inland along the corridor).	Campo
(F)	From about 1,000 ft MSL (about 60 km northwest of the El Centro weather station, and about 80 km from the Pacific coast) to the El Centro weather Station, anywhere on the flat desert surface, and the first leg of the westward corridor "return loop" through the east entrance to the narrow valley at Agua Caliente Springs.	El Centro
(G)	The narrow valley at Agua Caliente Springs, including an east-west length of about five km. Wind direction should be parallel to the valley orientation, from either the west or the east.	Beaumont
(H)	The segment from the west end of the narrow valley at Agua Caliente Springs, through Earthquake Valley, to the east end of the San Felipe Valley.	Campo
(I)	The San Felipe Valley just southwest of Ranchita, just prior to the point where the corridor loop rejoins the main corridor (a northwest-southeast oriented stretch about 10 km long) at an elevation of about 3,500 ft MSL. Wind direction should be parallel to the valley orientation, from either the northwest or the southeast.	Beaumont

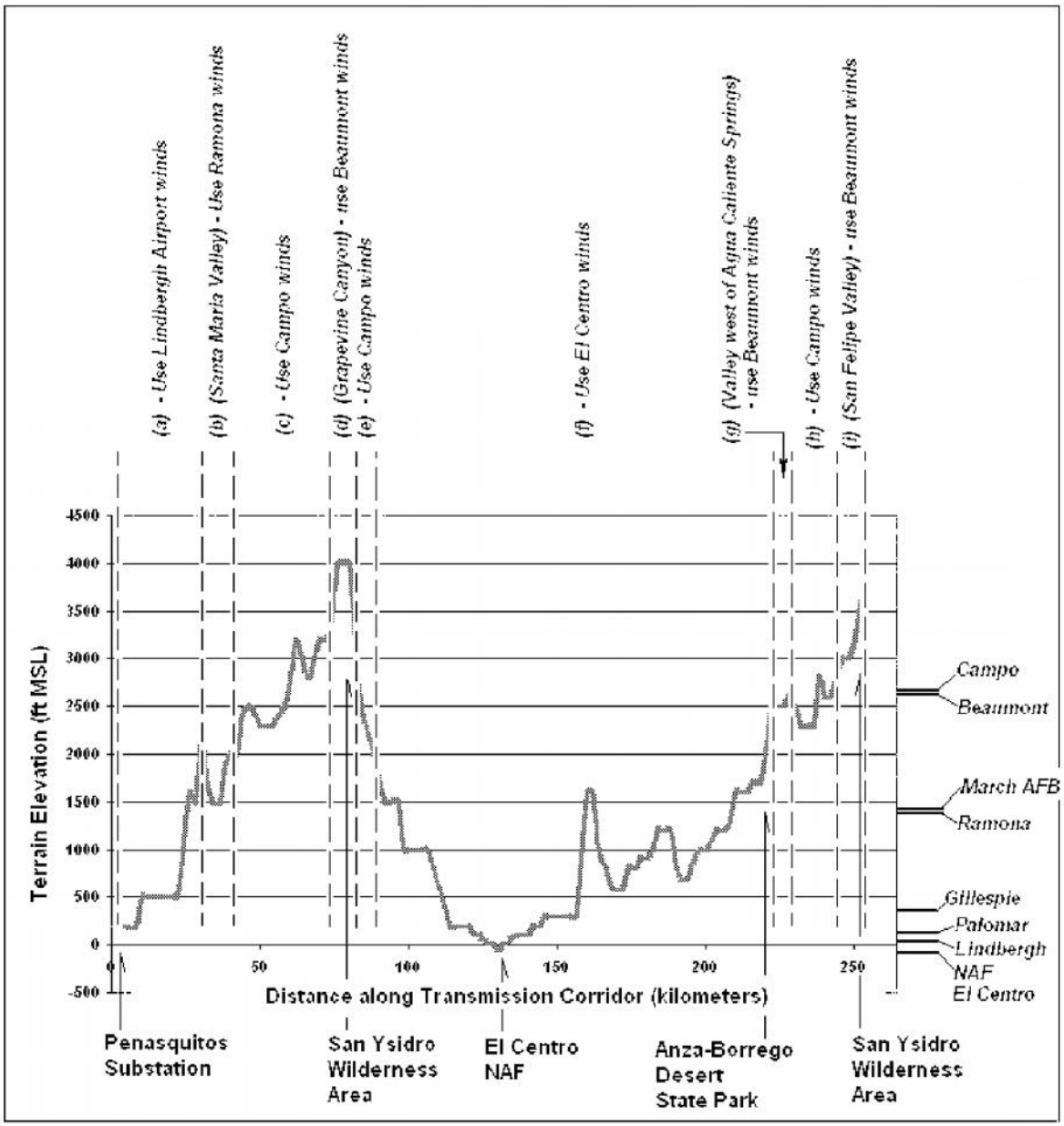
N **Figure 1 - Shaded Relief Map of Southern California with Annotated Locations of: Climate Zones, Meteorological monitoring stations for which winds were analyzed, and the Transmission Corridor**



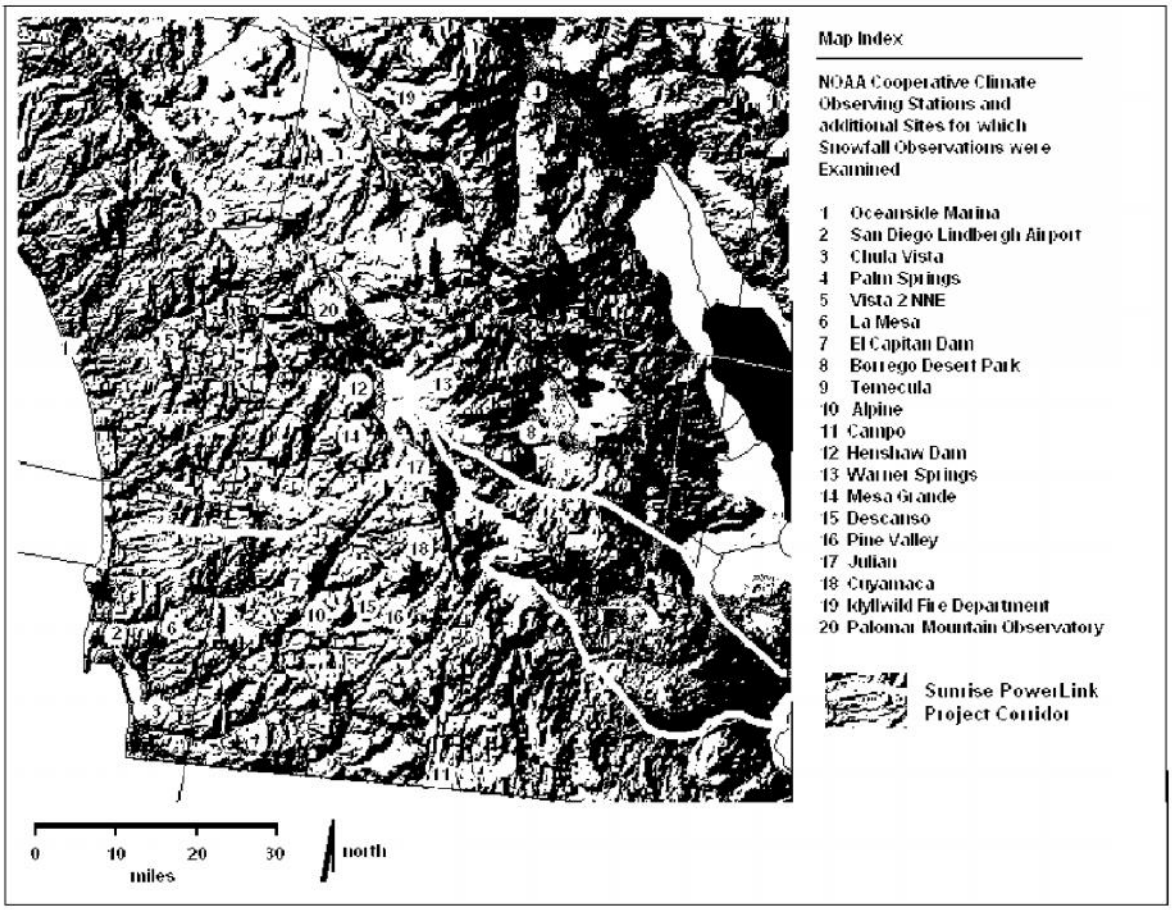
O **Figure 2 - Three-Dimensional Perspective View of Topography in the Transmission Corridor Area, with Annotated Locations of Meteorological monitoring stations for which winds were analyzed, and the Transmission Corridor**



P **Figure 3 - Profile of Topographic Elevations along the Transmission Corridor, with Annotated Elevations of Meteorological Monitoring Stations for which Data were Analyzed, and Corridor Segments for which Specific Wind Projections Are Recommended**

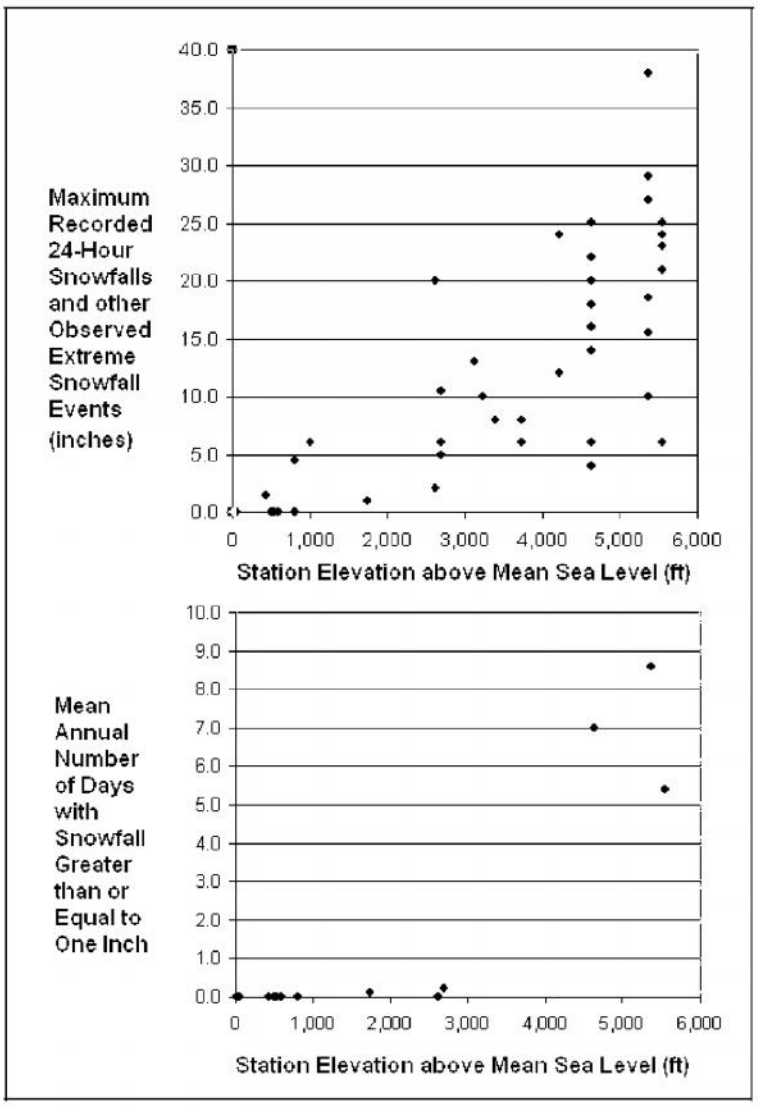


Q Figure 4 - Map of NOAA Cooperative Climate Monitoring Stations and Locations of Selected Extreme Observed Snowfall Events



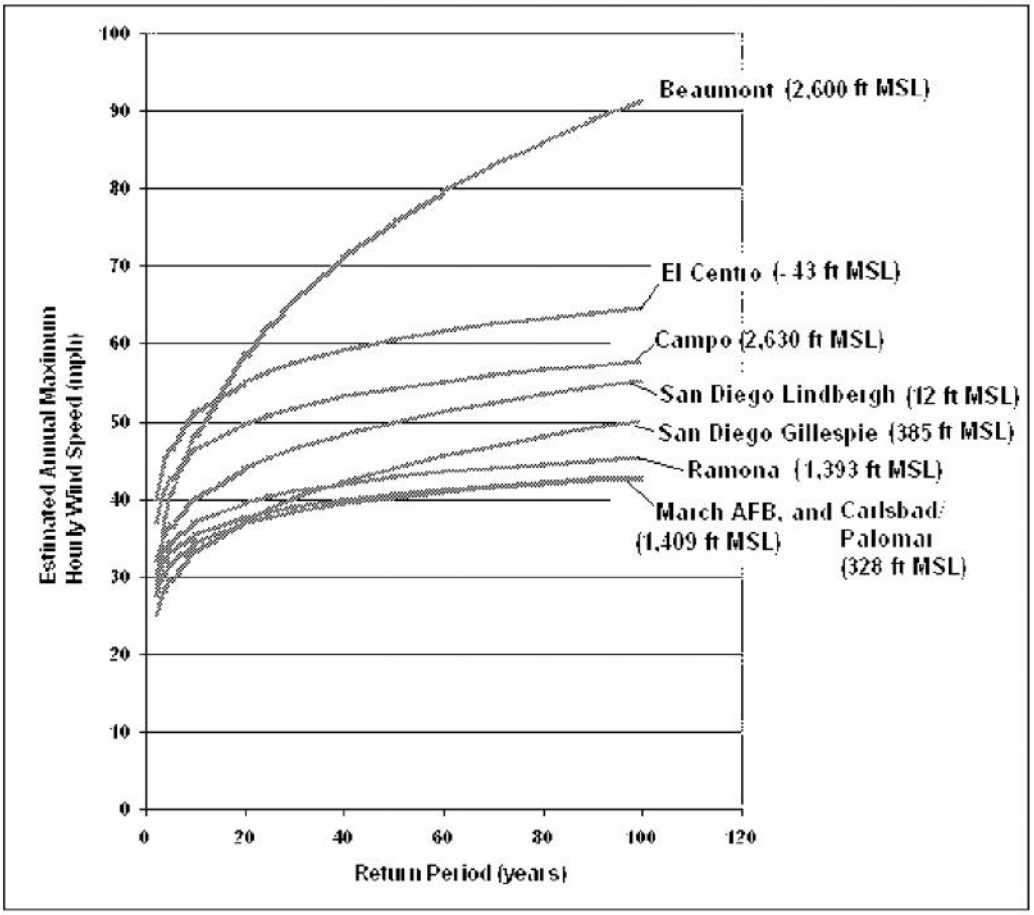
Notes:
Input information was obtained from Miller (2007) and NCDC (2001).

R Figure 5 - Plots versus Station Elevation of Snowfall Extremes and Mean Days per Year with One Inch or Greater Snowfall

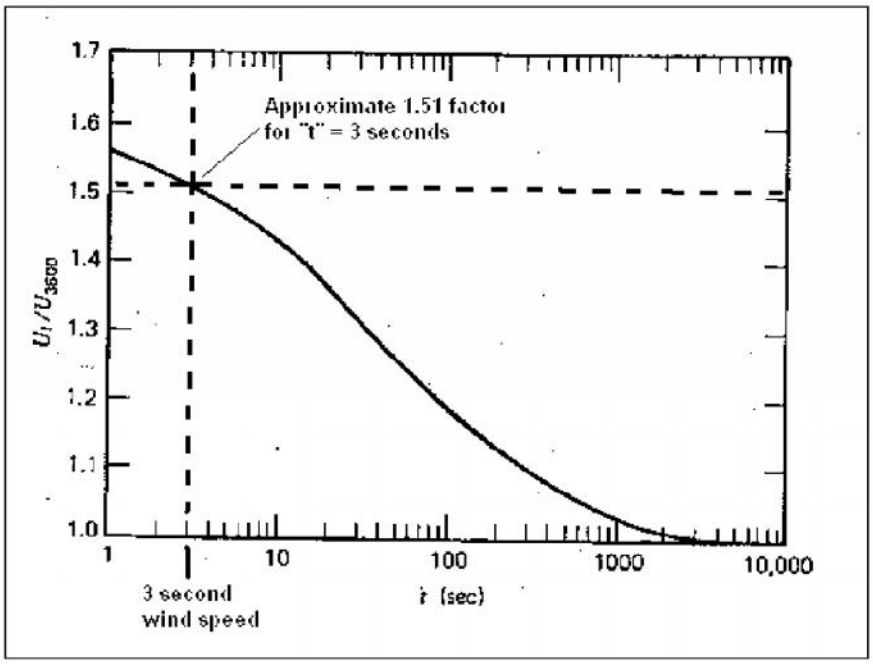


Notes:
Input information was obtained from Miller (2007) and NCDC (2001).

S Figure 6 - Plot of Estimated Annual Maximum Hourly Wind Speeds for Various Return Intervals for Selected Meteorological Monitoring Stations



T Figure 7 - Ratio of Probable Maximum Wind Speed Averaged over Period "t" to That Averaged over One Hour



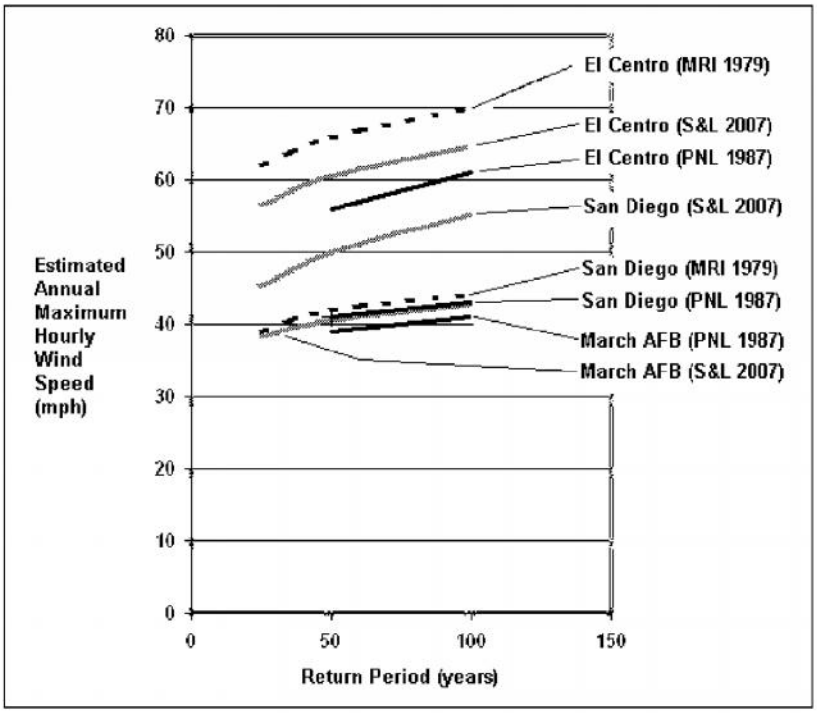
Notes:

1. Abscissa is wind speed averaging time "t" in seconds.

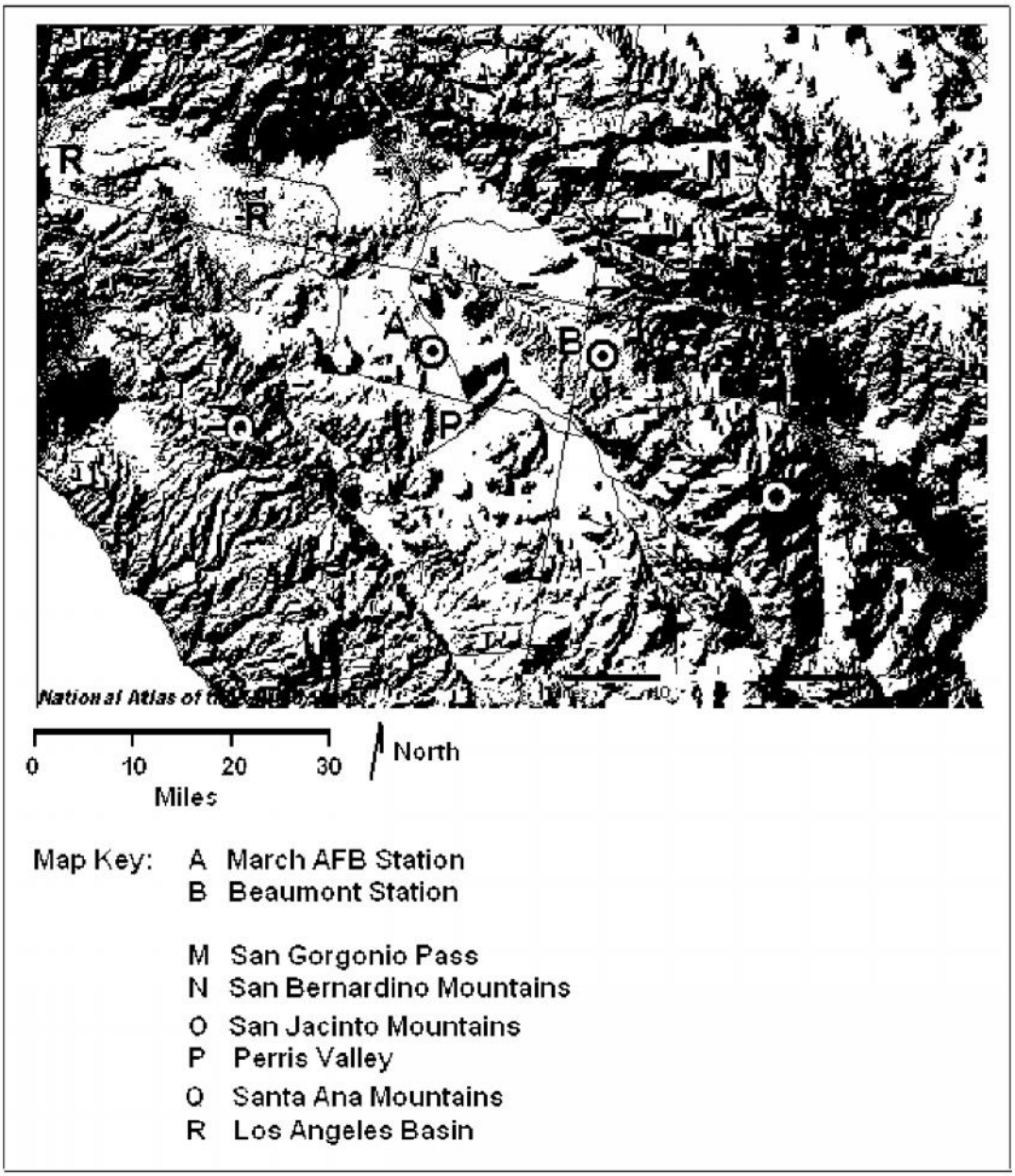
2. Ordinate is ratio of probable maximum wind speed averaged over period "t" ("Ut"), to that averaged over one hour ("U3600").

3. Reference source is Simiu and Scanlan (1986).

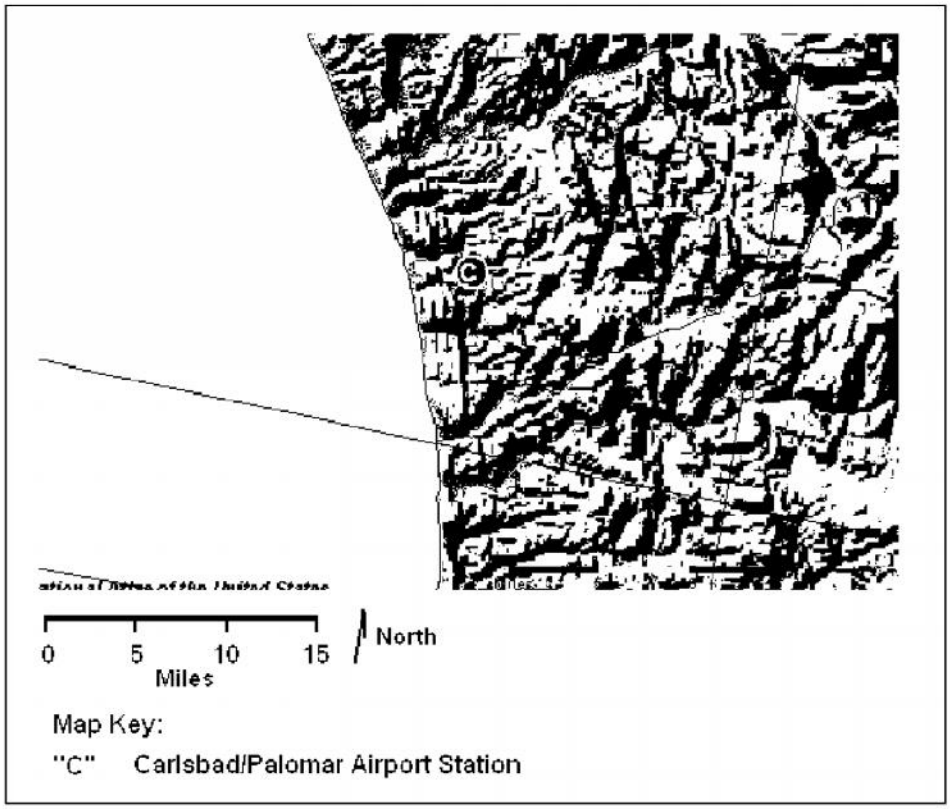
U **Figure 8 - Comparison Plot of Estimated Annual Maximum Hourly Wind Speeds for Various Return Intervals for El Centro and San Diego Lindbergh Meteorological Monitoring Stations as Analyzed in the 1979 MRI Study, versus the Present Study**



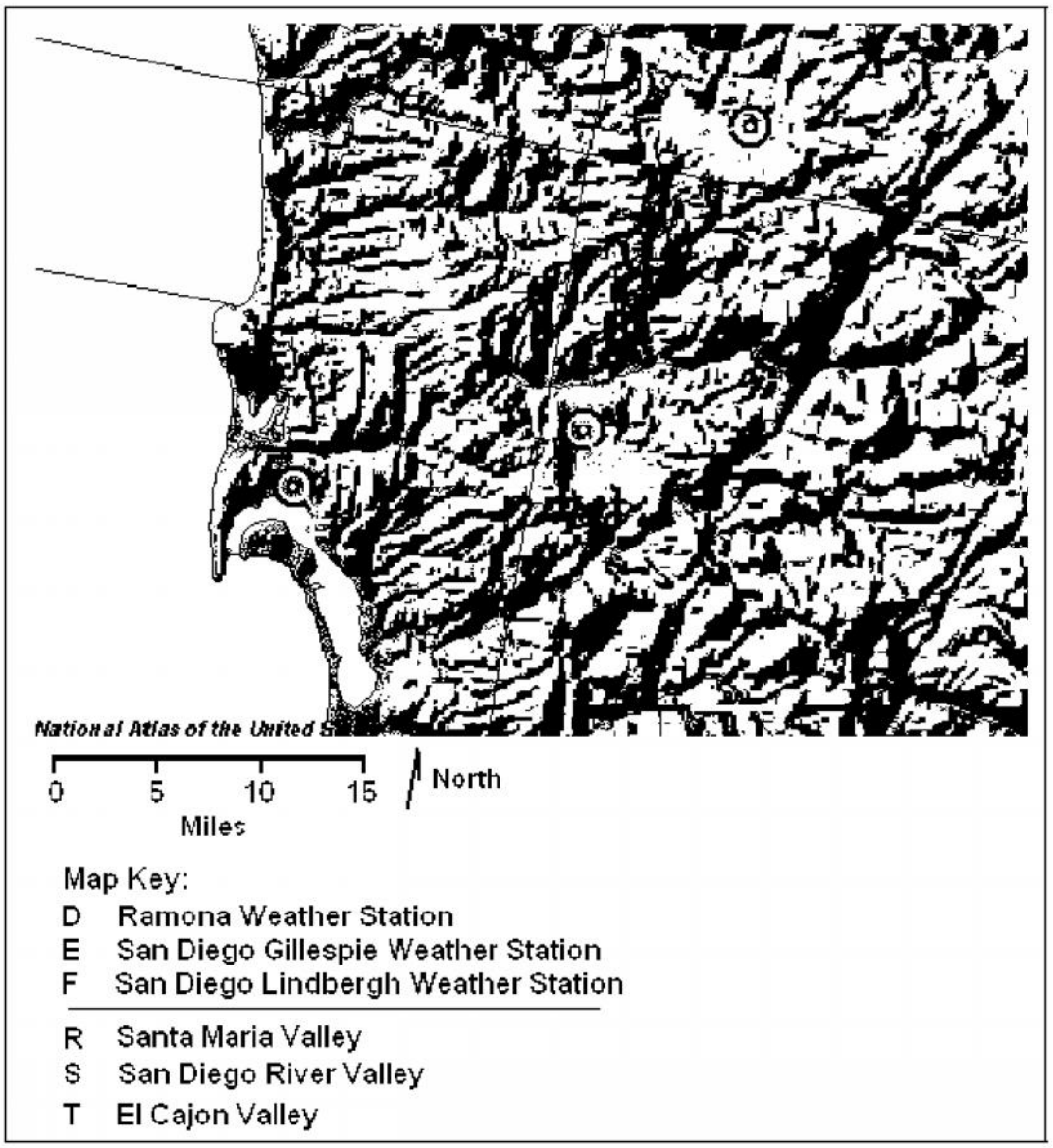
V Figure 9 - Shaded Terrain Map Showing Locations of the March AFB and Beaumont Weather Stations Relative to Topography at the Eastern End of the Los Angeles Basin



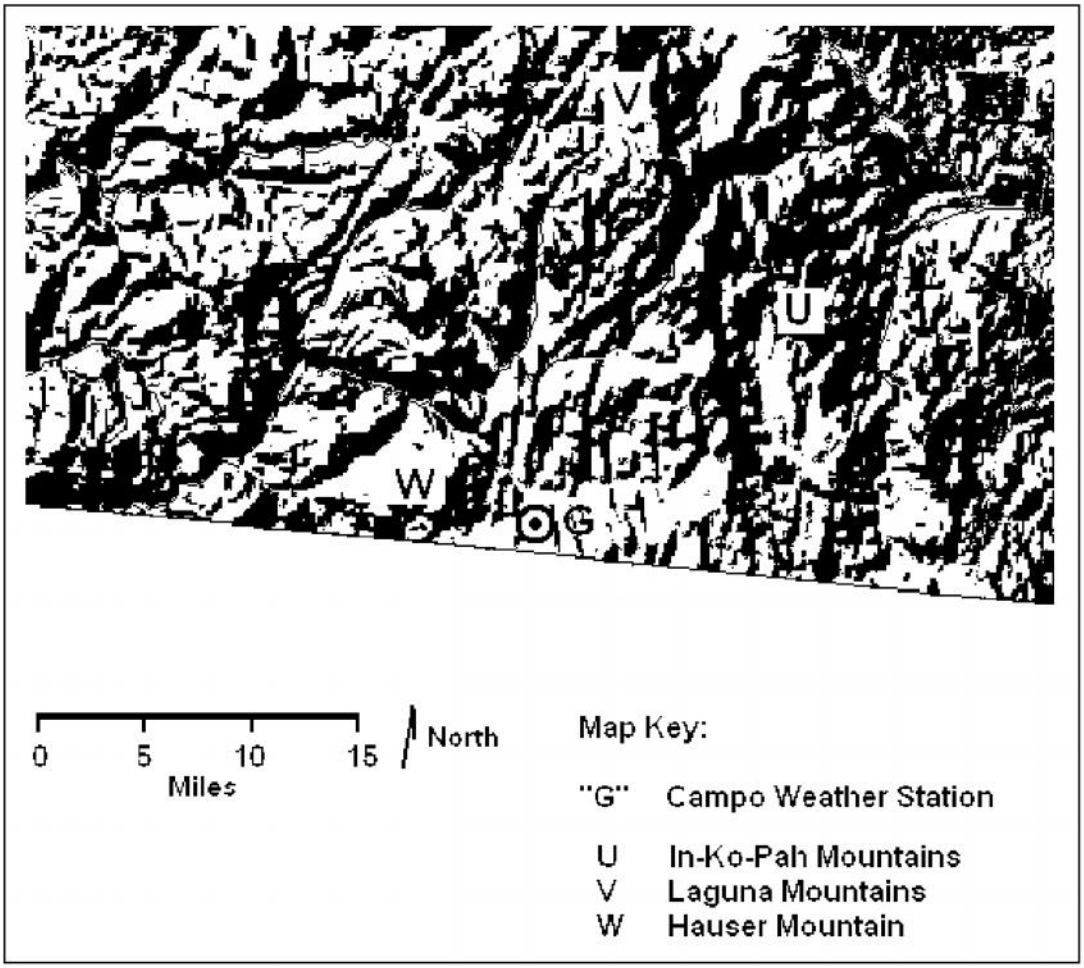
W Figure 10 - Shaded Terrain Map Showing Location of the Carlsbad/Palomar Airport Weather Station Relative to Local Topography



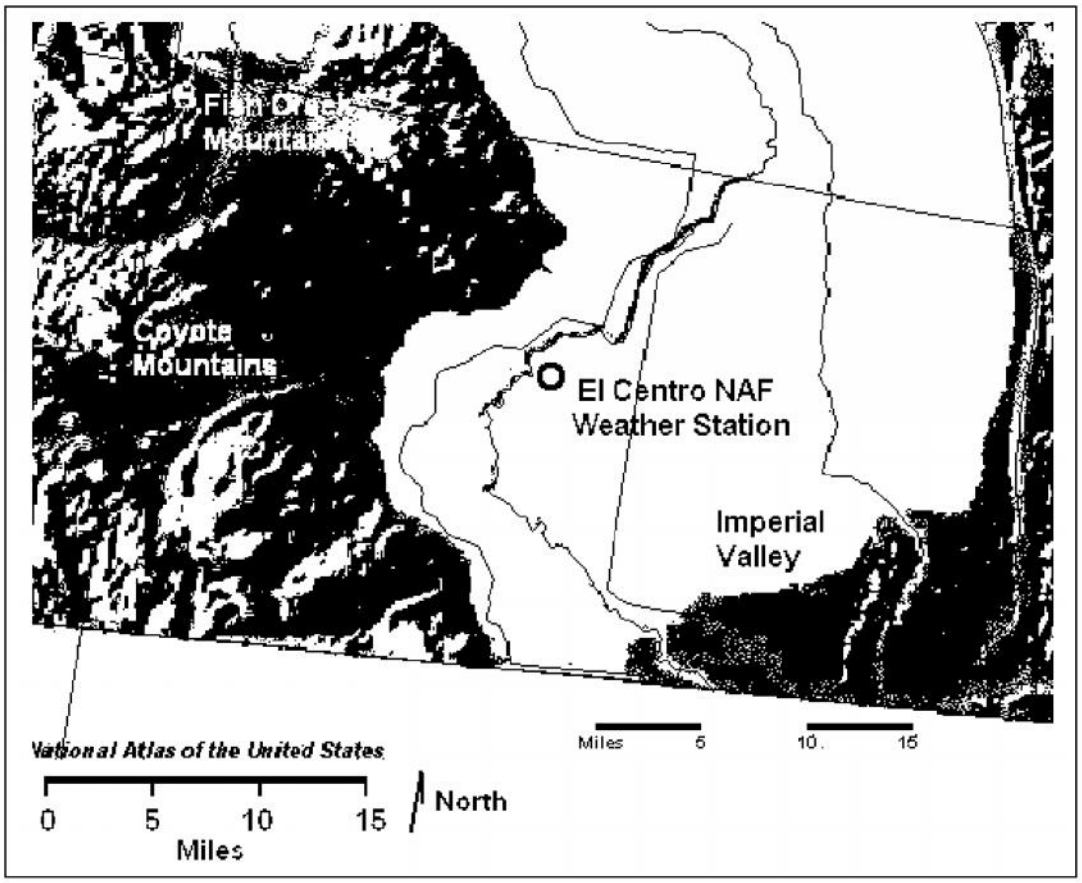
X Figure 11 - Shaded Terrain Map Showing Locations of the San Diego Lindbergh, San Diego Gillespie, and Ramona Weather Stations Relative to Local Topography



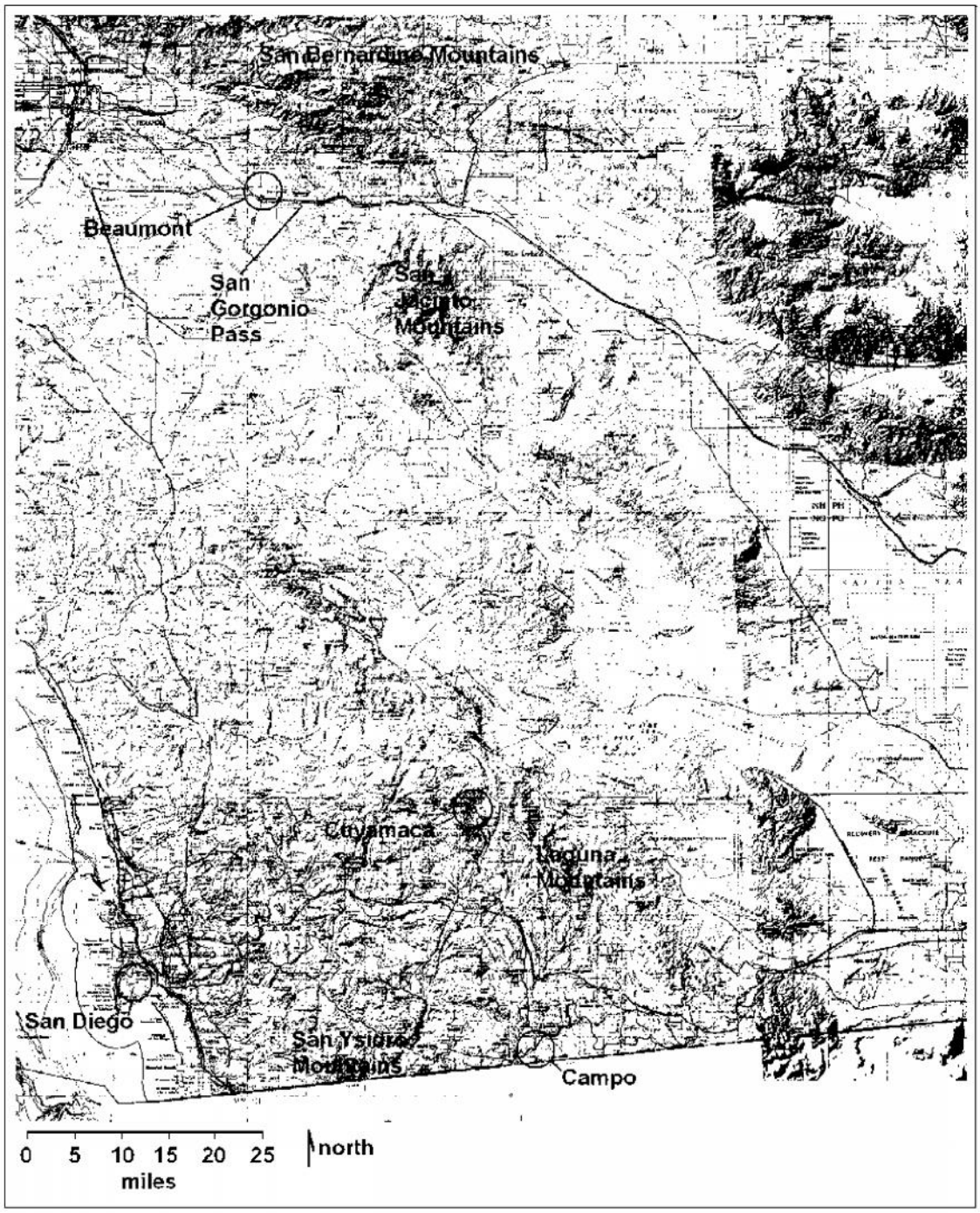
Y **Figure 12 - Shaded Terrain Map Showing Location of the Campo Weather Station relative to Local Topography**



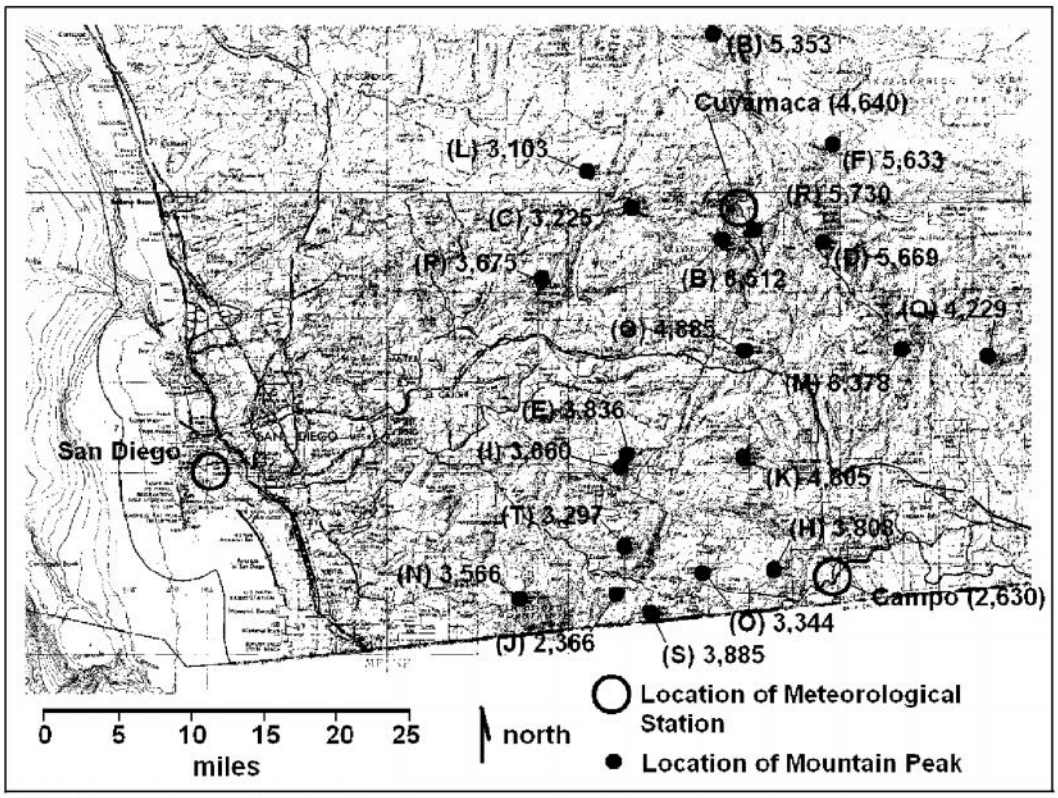
Z Figure 13 - Shaded Terrain Map Showing Location of the El Centro Weather Station relative to Local Topography



AA Figure 14 - Locations of Weather Monitoring Stations for which Data were Obtained for Use in Phase 1 Analysis and Phase 2 Analysis Refined Icing Predictions



AB Figure 15 - Locations of Weather Monitoring Stations for which Data were Obtained for Use in Phase 2 Analysis Refined Icing Predictions, and Elevations of Major Regional Mountain Peaks

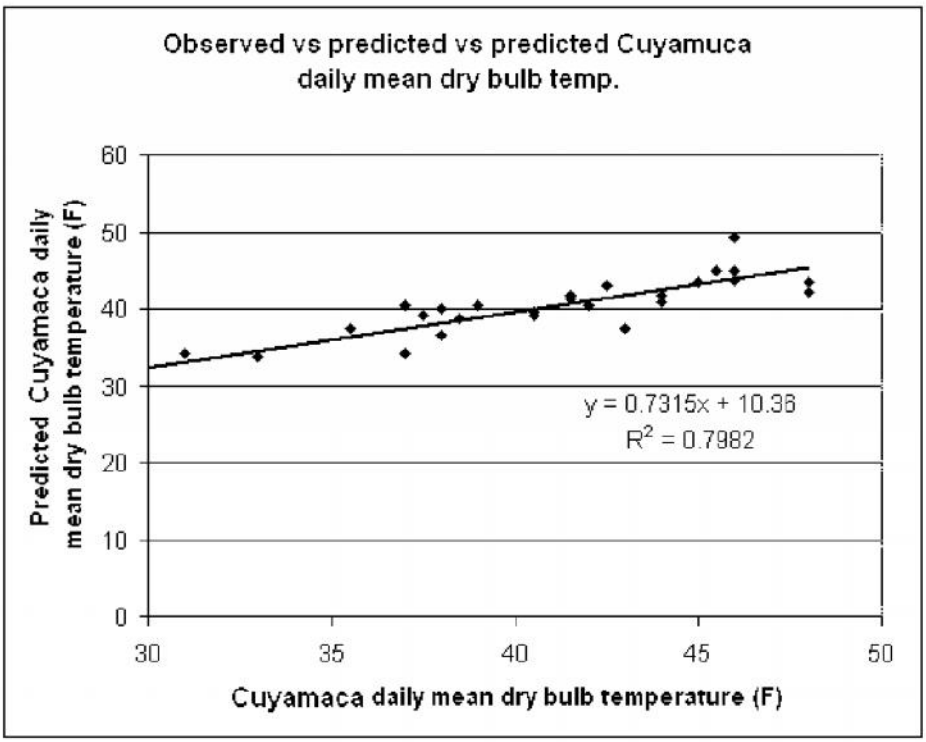


Elevations are in numeric units of feet above mean sea level

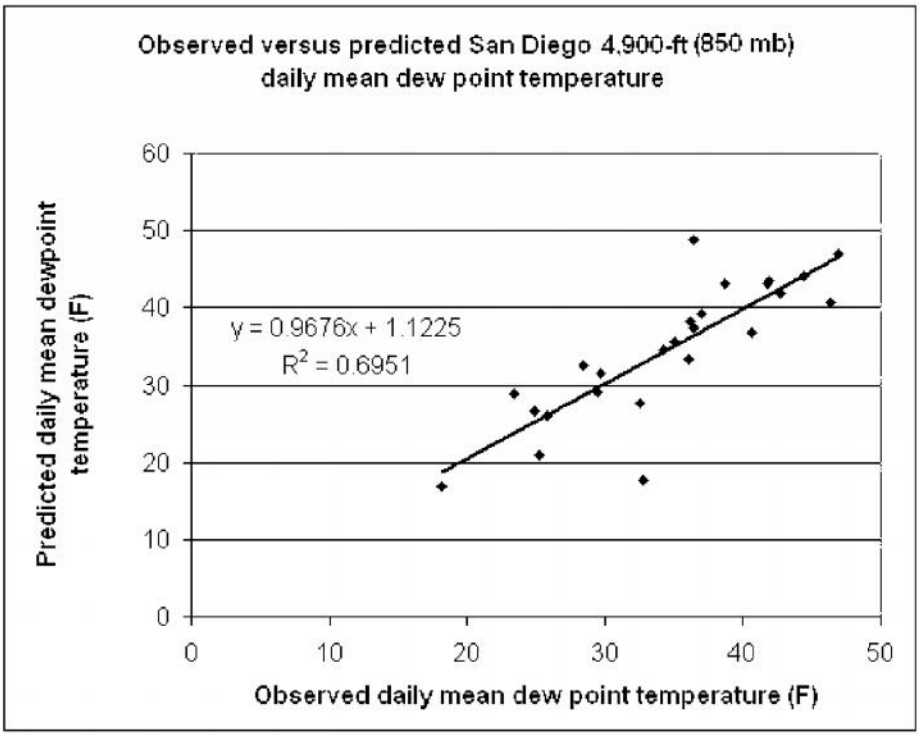
Identification of Regional Mountain Peaks Annotated on Map

Map ID Code	Name	Elevation (ft MSL)
A	Beacon Peak	5,353
B	Cuyamaca Peak	6,512
C	Eagle Peak	3,225
D	Garnet Mountain	5,669
E	Gaskill Peak	3,836
F	Granite Mountain	5,633
G	Guatay Mountain	4,885
H	Hauset Mountain	3,808
I	Lawson Peak	3,660
J	Little Tecate Peak	2,366
K	Los Pinos Mountain	4,805
L	Mount Gower	3,103
M	Mount Laguna	6,378
N	Otay Mountain	3,566
O	Potrero Peak	3,344
P	Rock Mountain	3,675
Q	Sombrero Peak	4,229
R	Stonewall Peak	5,730
S	Tecate Peak	3,885
T	White Mountain	3,297

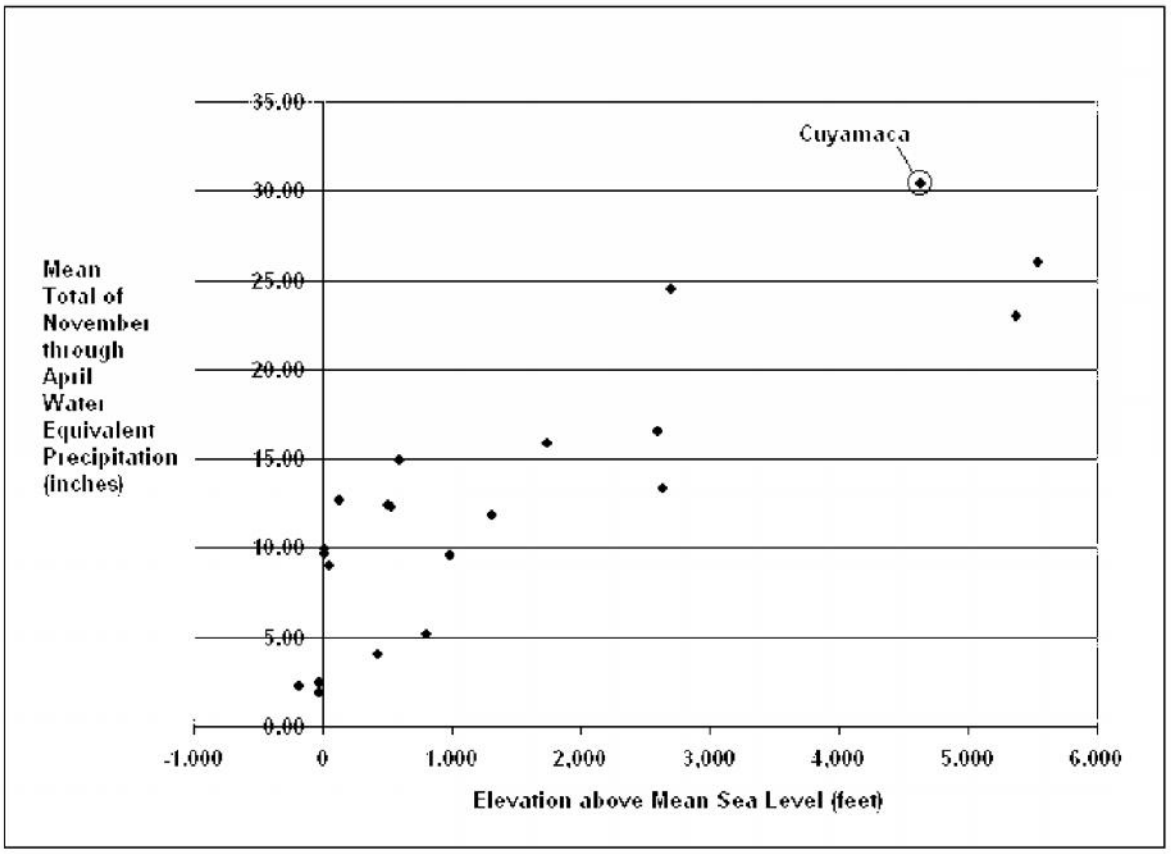
AC Figure 16 – Plot of Observed versus Predicted Cuyamaca Daily Mean Dry Bulb Temperature, and Results of Regression Line Fit



AD Figure 17 - Plot of Observed versus Predicted San Diego 850 mb Pressure Elevation Daily Mean Dew Point Temperature, and Results of Regression Line Fit

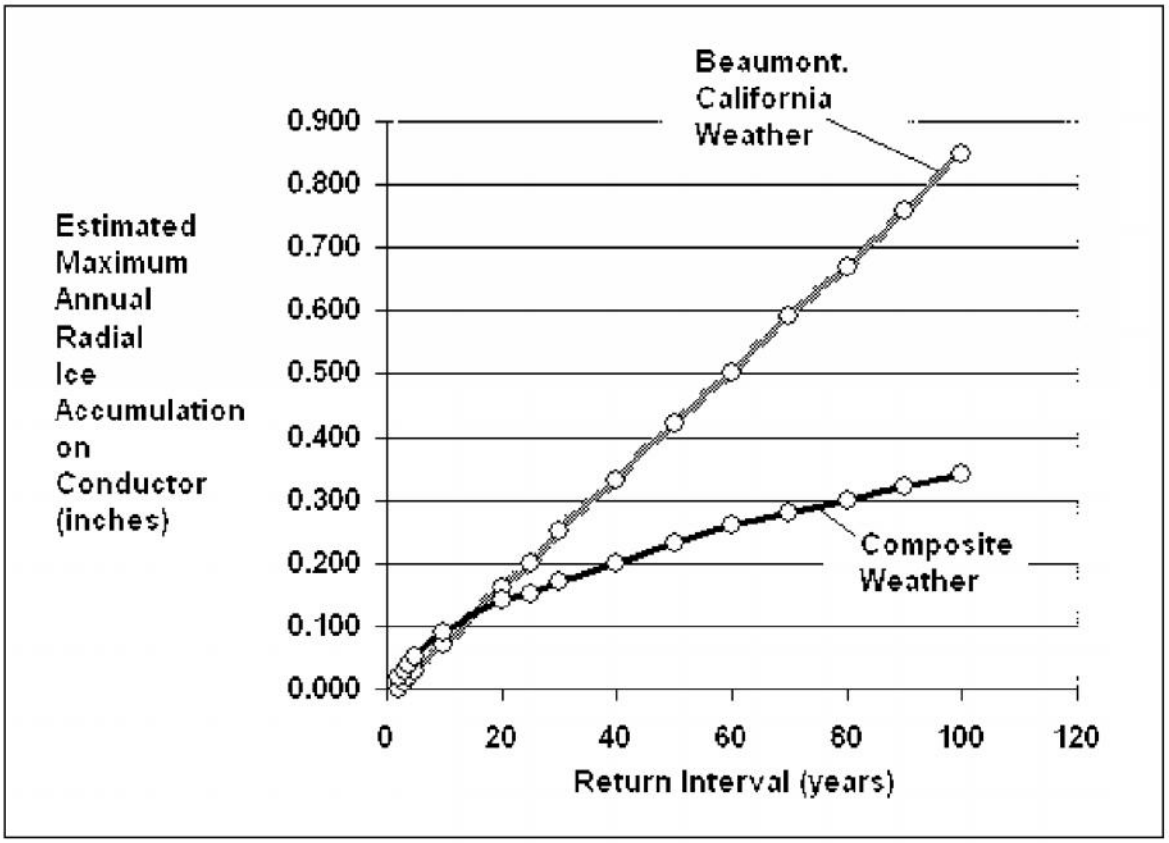


AE Figure 18 - Plot of NOAA Southern California COOP Station Total November through April Water Equivalent Precipitation versus Elevation



See Table ___ for numerical values.

AF Figure 19 – Plot of Predicted Phase 1 Beaumont Icing versus Predicted Phase 2 Refined Analysis Composite Weather Icing, for Various Return Intervals



STRUCTURE WIND LOAD STUDY

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1. Introduction and Executive Summary

As one of the preliminary engineering tasks for the Sunrise Powerlink (Project), Sargent & Lundy Engineers, Ltd (S&L) has prepared a project design criteria. One element of the criteria involves climatic loading conditions to be used for structure design. The process to determine the appropriate wind loading criteria included the following activities:

- Review current SDG&E standards, practices, and reliability data
- Consider codes, design guides, and industry practice
- Conduct a meteorological study using weather data from the Project vicinity
- Estimate the Project cost impact of varying extreme wind loads

Based on this study and consultation with SDG&E Civil/Structural engineers, the following extreme wind loading conditions are recommended for the Project:

Table 1 – Recommended Extreme Wind Pressures on Conductors for Structure Design

Line Segment	Wind Pressure (psf)	Overload Factor	Factored Wind Pressure (psf)
Imperial Valley – Suncrest (500-kV)	27	1.0	27
Suncrest – San Diego Country Estates (230-kV)	19	1.0	19
San Diego Country Estates – Penasquitos (230-kV)	16	1.0	16

The values presented were developed from the meteorological study performed for the Project. These values are greater than those provided by other sources including California General Order 95, the National Electrical Safety Code, or current SDG&E practice. Special wind conditions were identified in the Grapevine Canyon and Agua Caliente Springs areas due to funneling in these canyons. A 55psf wind pressure to be applied in the longitudinal direction on the structure only, is recommended in these areas.

2. Scope of Study

The purpose of the study was to evaluate the various sources of wind loading data including codes, SDG&E practice, and a meteorological study for the Project. From this data, an extreme wind loading design pressure was to be developed for the Project. The wind load selected is a function of the Project location, topography, meteorological conditions, costs, and industry practice.

The Project spans a length of approximately 150 miles over a varying range of elevations and topography. The Project is divided into three segments based on line voltage and elevation.

500-kV Imperial Valley – Suncrest Substation

The line segment will be constructed as a single circuit 500-kV line, with 69- or 92-kV underbuild installed in a few short sections. At Imperial Valley, the transmission line will be located in open desert and agricultural lands that vary from approximately 150 feet below to nearly three thousand feet above sea level. The west portion of this segment increases in elevation to over 4000 feet, and is located in canyons.

230-kV Suncrest – San Diego Country Estates

This line segment is currently proposed as a double circuit 230-kV line sharing the right-of-way with an adjacent 69-kV line. Most of the segment is located above 3000 feet on rough terrain.

230-kV San Diego Country Estates – Penasquitos

Double circuit 230-kV construction is proposed for this line segment, located adjacent to an existing double circuit line. The line segment is located primarily in a coastal area below 3000 feet elevation, with varying terrain.

3. SDG&E Design Practice

SDG&E has developed the "Guidelines for Establishing Loading Requirements for Steel Pole Structures and Lattice Towers" as a design guide to be used for designing transmission line structures at 230 kV and below. The guide is based on the requirements of California General Order 95, along with internally developed load cases to represent ice, wind, and construction and maintenance loading conditions. An extreme wind case is provided for line segments above 3000 feet elevation. Below 3000 feet, G.O. 95 Light loading is used as the only case involving wind.

Table 2 – SDG&E Extreme Wind Loading Conditions on Conductors

Loading Case	Wind Pressure	Ice Thickness	Overload Factor	Factored Wind Pressure
< 3000 feet	8 psf	0 inch	1.5	12 psf
> 3000 feet	12 psf	0 inch	1.25	15 psf

SDG&E has constructed an extensive transmission system throughout the 230-kV segments of the Project area. These transmission lines are rated at 69- through 230-kV and have not experienced any failures due to extreme wind loading.

In the 500-kV Project area, there are relatively few existing SDG&E-designed transmission lines. The main transmission line in this area is the 500-kV Southwest Powerlink Project. This line was designed for an 8 psf wind load on the conductors and a 46 psf wind load on the structures. There have been no structure failures due to extreme wind loading on this line. The Sunrise Powerlink preferred route parallels the Southwest Powerlink for approximately 15 miles in the Imperial Valley area. However, the lines diverge and the preferred route extends north and west into an area without significant existing transmission lines. Since the area has few structures, none of which are 500 kV, there is little knowledge of structure wind load performance.

4. Industry Codes and Design Guides

4.1 General Order 95

Transmission line designs in California are required to conform to General Order 95 (G.O. 95), published by the California Public Utilities Commission. G.O. 95 prescribes a set of environmental loading conditions to be used for structure design:

Table 3 – General Order 95 Loading Conditions on Conductors

Loading Case	Application	Wind Pressure	Ice Thickness	Overload Factor	Factored Wind Pressure
G.O. 95 Light	< 3000 feet	8 psf	0 inch	1.5	12 psf
G.O. 95 Heavy	> 3000 feet	6 psf	½ inch	1.5	9 psf

G.O. 95 does not specify an extreme wind loading case.

4.2 National Electrical Safety Code

Although not adopted by SDG&E for transmission line design, the National Electrical Safety Code (NESC) includes an extreme wind loading for the Project area. The NESC extreme wind loading is based on the requirements of ASCE-74.

The equation for calculating extreme wind pressure is:

$P = V^2 \times .00256 \times Grf \times kz \times I \times Cf$

Where:

- P – Pressure in psf
- V – Basic Wind Speed (3-second gust)

- Grf - Gust Response Factor
- kz - Height Adjustment Factor
- I - Importance Factor
- Cf - Force Coefficient, Shape Factor

Wind Speed

Wind speed maps provided in the Code for the Project area, show that the basic extreme wind speed is 85 miles per hour.

Gust Response Factor

The gust response factor accounts for the dynamic effects of gusts on the transmission line structures and wires. The values of Grf are dependent on structure height, span length, and terrain. Dividing the project into 500- and 230-kV segments, the following values are determined using the ASCE Guide 74 and NESC 2007 Code:

Table 4 – Gust Response Values

Variable	**500-kV**	**230-kV**
Terrain	Open	Open
Structure Height	160 ft	120 ft
Span Length	1500-2000 ft	750-1000 ft
Gust Response Factor (Structure)	0.86	0.86
Gust Response Factor (Wires)	0.64	0.69

Height Adjustment Factor

The height adjustment factor accounts for increased wind pressures at higher points above the ground. As elevation increases, the wind experiences less ground surface drag. For this project, kz values for the structures and wires would be 1.3 and 1.4 respectively.

Importance Factor

Importance factor is a variable assigned to designate certain facilities which are more critical. This factor can be used as an alternative to varying return periods or overload factors. A value of 1.0 is typically assigned to transmission lines.

Force Coefficient (Shape Factor)

The force coefficient is dependent on the exposed surface of the structure or wire. For round surfaces, Cf has a value of 1.0. For flat surfaces, Cf has a value of 1.6.

Wind Pressure

Resulting wind pressures including safety factors specified in the NESC are as follows:

Table 5 – NESC Extreme Wind Loading Conditions

Loading Case	Ice Thickness	Overload Factor	Factored Wind Pressure
Round Surface (Wires)	0 inch	1.0	18 psf
12-Sided Surface (Poles)	0 inch	1.0	21 psf
Flat Surface (Towers)	0 inch	1.0	33 psf

Extreme wind speeds specified in the NESC are based on a 50-year return period. This is consistent with the American Society of Civil Engineers (ASCE) and general practice in the industry. Specific exceptions to this practice are taken in cases where reliability is a priority and/or projects are subjected to large areas of exposure. Long EHV transmission lines can be placed in this category. The use of 100-year return period loads can be justified for these projects. The 500-kV segment of the Project from Imperial Valley to Suncrest Substation can be placed in this classification. Using a 100-year return period has an increase in load factor of 15 percent over 50-year return loads.

Table 6 – Line Segments with Associated Wind Pressures and Return Period

Line Segment	50-Year Return Pressure (psf)	100-Year Return Pressure (psf)
Round Surface (Wires)	18	21
12-Sided Surface (Poles)	21	25
Flat Surface (Towers)	33	38

While the 230-kV line segment between Suncrest and Sycamore Canyon Substations is important to system reliability, SDG&E is able to operate existing facilities to maintain service in the event of a 230-kV structure failure. Also, SDG&E is planning to add new 230-kV lines from Suncrest Substation to meet growing demand and increase system reliability. Based on these factors, a 50-year return period is acceptable for this line segment.

5. Meteorological Study

A meteorological study was performed by S&L for the Project. The results of this study were submitted to SDG&E in a draft report dated April 27, 2006.

Historical weather data from numerous weather stations in the project vicinity was collected. The weather station locations and corresponding project areas are as follows:

Table 7 – Project Areas and Associated Weather Stations

Project Area	Weather Station Source
From the Penasquitos substation to an elevation of about 2,200 ft MSL just south of the Santa Maria Valley (about 20 miles inland).	San Diego Lindbergh
The Santa Maria Valley area southeast and east of Ramona (about 20-30 miles inland)	Ramona
From the east edge of the Santa Maria Valley to a few miles southeast of Ranchita (about 30-35 miles inland).	Campo
The short stretch of corridor (about 5 miles long) through the Grapevine Canyon mountain pass, north of Grapevine Mountain and the Volcan Mountains, and about 5 miles southeast of Ranchita, California. Wind direction should be parallel to the pass orientation, from either the west-northwest or the east-southeast (about 35-40 miles inland).	Beaumont
From the east end of Grapevine Valley, to the edge of the Borrego Valley (about 40-45 miles inland along the corridor).	Campo
From about 1,000 ft MSL (about 40 miles northwest of the weather station, and about 50 miles from the Pacific coast) to the El Centro weather Station, anywhere on the flat desert surface, and the first leg of the westward corridor "return loop" through the east entrance to the narrow valley at Agua Caliente Springs.	El Centro
The narrow valley at Agua Caliente Springs, including an east-west length of about three miles. Wind direction should be parallel to the valley orientation, from either the west or the east.	Beaumont
The segment from the west end of the narrow valley at Agua Caliente Springs, through Earthquake Valley, to the east end of the San Felipe Valley.	Campo

The data was analyzed and used to determine localized extreme wind loading pressures for 100- and 50-year return periods. Using Table 3 of the meteorological study and the gust response adjustments from that study, the values provided in Table 8 were calculated using the following equation:

$P = 0.00256V^2$

Where:

P – Wind pressure (psf)

V – 3 second gust wind velocity = speed from Met. Study Table 3 multiplied by 1.5956.

Table 8 – Project Areas and Wind Pressures on Conductors

Area	100-Year Return Wind Pressure (psf)	50-Year Return Wind Pressure (psf)	Project Segment
Desert	27	24	Imperial Valley – Suncrest Substation (500-kV)
Agua Caliente Springs	25	18	
Earthquake Valley	22	19	
San Felipe Valley	25	18	
Borrego Valley	22	19	
Grapevine Canyon	25	18	
Santa Maria Valley – Ranchita	22	19	Suncrest – San Diego Country Estates (230-kV)
Santa Maria Valley	14	12	San Diego Country Estates – Penasquitos (230-kV)
Penasquitos-Santa Maria Valley	20	16	

In order to minimize the number of different wind pressures to be considered along the Project length, the above data was grouped by voltage level and elevation into the following line segments:

Table 9 – Line Segments and Associated Wind Pressures on Conductors

Line Segment	100-Year Return Wind Pressure (psf)	50-Year Return Wind Pressure (psf)
Imperial Valley – Suncrest (500-kV)	27	24
Suncrest – San Diego Country Estates (230-kV)	22	19
San Diego Country Estates – Penasquitos (230-kV)	20	16

Longitudinal Wind

The codes assume wind forces applied to the transmission line components will be applied in any direction. However, there are areas of the Project where the recommended longitudinal wind pressures will be different than the transverse wind loads. The meteorological study identified Grapevine Canyon and Agua Caliente Springs as locations where there are local concentrations of increased wind speeds as winds are funneled and accelerated along the length of the canyon. As discussed in the meteorological study, similar conditions to these locations have been measured in the Beaumont area. Although Beaumont is located a considerable distance from the Sunrise Project, both locations are at high elevations and have canyons with the same west-northwest to east-southeast trending valleys.

As reported in the meteorological report, a 91 mph wind corresponding to the Beaumont data was selected. Using the conversion factors presented in the report, this wind speed converts to a 55 psf pressure. Since the wind is acting along the canyon length, the wind is applied to the structures only, and not the supported wires.

The meteorological study also provides a means to calculate transverse wind loads from longitudinal wind speeds. Using the equations presented in the report, the 91 mph longitudinal wind speed was converted to a transverse wind pressure as follows:

Step 1: Conversion from Longitudinal to transverse wind speed:

$$Unew = (Uref) [Znew / Zref]^{P}$$

Where: Unew = Wind speed estimated at "Znew" (mph)

Uref = Wind speed "measured" at "Zref"

Znew = New elevation above ground (feet)

Zref = Reference elevation above ground at which wind was "measured" (feet)

P = Exponent dependent on atmospheric stability class, that equals 0.15 for neutral or "D" stability class, which is a very turbulent atmosphere normally present during peak wind speeds

$$U(100\ ft) = (91\ mph)) [100\ ft / 1{,}300\ ft]^{0.15} = 62\ mph$$

Step 2: Conversion from wind speed to wind pressure:

$$(V \times Gt)^{2} \times .00256$$

Where V = Fastest mile wind speed

Gt = conversion factor from fastest mile to three-second gust

$$(62\ mph \times 1.5956)^{2} \times .00256 = 25\ psf$$

Since the Grapevine Canyon and Agua Caliente Springs areas fall within the 500-kV line segment area, the 27 psf wind pressure identified earlier will govern over the 25 psf transverse canyon pressure.

6. Cost Impact of Extreme Wind Loads

A sensitivity analysis was performed to determine the variability of material and installation costs for varying wind pressures. Tangent poles were selected for review, since the design of these structures is governed by extreme wind and they comprise the vast majority of structures on the line. This portion of the analysis assumed only intact wire loading cases. Assumptions for the cost analysis were as follows:

- 500-kV span length – 1500 feet
- 230-kV span length – 1000 feet
- Line angle – 0 degrees
- Steel material and erection cost per Project Estimates – $2.05/lb
- Foundation installation cost per Project Estimates – $900/yd

Wind pressures considered – 12, 16, 19, 27 psf

Table 10 – Estimated Pole Weights and Costs with Varying Wind Pressure

	500-kV Poles	**230-kV Poles**
Groundline Moment		
12 psf	4400 kip-ft	2500 kip-ft
16 psf	5000 kip-ft	2900 kip-ft
19 psf	5600 kip-ft	3300 kip-ft
27 psf	7000 kip-ft	4200 kip-ft
Pole Weight		
12 psf	27,000 lbs	21,000 lbs
16 psf	30,000 lbs	22,000 lbs
19 psf	33,000 lbs	23,000 lbs
27 psf	41,000 lbs	25,000 lbs
Erected Steel Cost per Structure		

12 psf	$55,350		$43,050	
16 psf	$61,500		$45,100	
19 psf	$67,650		$47,150	
27 psf	$84,050		$51,250	
Foundation Cost per Structure				
12 psf	$36,900		$21,600	
16 psf	$43,600		$26,200	
19 psf	$48,600		$29,700	
27 psf	$52,200		$32,400	
Project Pole Quantity	42		148 Penasquitos-SDCEstates 154 SDCEstates-Suncrest	
Project Suspension Pole and Foundation Cost		% Decrease From Project Estimates		% Decrease From Project Estimates
12 psf	$3,874,500	32	$19,524,300	23
16 psf	$4,414,200	23	$21,432,600	15
19 psf	$4,882,500	15	$23,208,700	8
27 psf	$5,722,500	0	$25,262,300	0

Project cost estimates prepared for the PEA filing are based on 27 psf wind pressure on all line segments. Therefore, maintaining a 27 psf wind load for the 500-kV structures will not change the estimated cost for the Project. This also applies to the lattice structures in the 500-kV line segment.

The 230-kV segment is assumed to be constructed exclusively with tubular steel poles. If 12 and 15 psf wind pressures for the 230-kV poles with intact loadings were used, the Project cost is expected to decrease by approximately five million dollars, which represents 0.4 percent of the total Project cost. However, additional analysis of the structures with a broken bundle loading under GO 95 loading conditions result in pole designs that are comparable to the 16 and 19 psf wind pressures. This would eliminate any cost savings that could be realized by using the lower wind pressure values.

7. Conclusions

A review of SDG&E design standards, transmission design codes, and a meteorological study was performed to develop a recommended extreme wind loading case for the Project. Following this review, the Project has been divided into three segments based on line voltage and elevation. Wind pressures based on SDG&E standards, codes, and the meteorological study and objectives for reliability levels for the project were determined and are presented as follows:

Table 11 – Summary of Extreme Wind Pressures on Conductors

Line Segment	SDG&E Standards (psf)	G.O. 95 (psf) / Light, Heavy	NESC (psf)	Meteorological Study (psf) / Return Period	Selected Value - Factored (psf)
Imperial Valley – Suncrest (500-kV) (1)	15	12 / Light	21	27 / 100	27
Suncrest – San Diego Country Estates (230-kV)	15	9 / Heavy	18	19 / 50	19
San Diego Country Estates – Penasquitos (230-kV)	12	12 / Light	18	16 / 50	16

Note: 1. 55psf longitudinal extreme wind pressure is proposed for Grapevine Canyon and Caliente Springs areas.

Summarizing this data, a wind pressure of 27 psf is proposed for the 500-kV line segments, 19 psf for the 230-kV line segment between Suncrest Substation and San Diego Country Estates, and 16 psf for the 230-kV segment between San Diego Country Estates and Penasquitos. These values are all from the meteorological study performed for the Project.

A special longitudinal wind pressure was determined for the Grapevine Canyon and Agua Caliente Springs areas of the Project. The 55 psf pressure on the structures only is a result of funneling effects of wind through the canyons. Transverse loads in these locations would be 27 psf since this is in the 500-kV line segment.

References

"Guidelines for Establishing Loading Requirements for Steel Pole Structures and Lattice Towers", SDG&E Transmission Engineering Standard, July 6, 2004.

General Order 95 - Rules for Overhead Electric Line Construction, Public Utilities Commission of the State of California

National Electrical Safety Code C2-2007, IEEE

RUS Bulletin 1724E-200 – Design Manual for High Voltage Transmission Lines, Electric Staff Division Rural Utilities Service U.S. Department of Agriculture

Prepared:

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METEOROLOGICAL STUDY

FOR THE

APS/SDGE INTERCONNECTION PROJECT

Prepared April 1981

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SGDE0300519

ABSTRACT

This report documents the development and utilization of meteorologic data used for the design of the 500 kV transmission line for the APS/SDG&E Interconnection Project.

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INTRODUCTION

The minimum meteorological loading conditions are established by rule 43 of the California Public Utilities Commission's General Order No. 95 (G.O. 95). Because of the importance of the 500 kV transmission line, a meteorological study covering the specific area traversed by the proposed line was performed to confirm the minimum loading required by G.O. 95 or to establish a more severe loading criteria.

The meteorologic study was conducted by Meteorology Research, Inc. (MRI) of Altadena, California. The original study was completed in February of 1979.

SCOPE OF STUDY

The purpose of the meteorological study was to determine the probable extreme values of wind, temperature, ice loading, and combined wind on ice loading to be experienced along the proposed transmission line routes from the Miguel Substation to Laguna Dam on the Colorado River. The study consisted of four phases: a field survey, climatology survey, data acquisition and reduction, analysis of data and application to the proposed route.

MRI REPORT

The original study was completed and submitted to SDG&E in February of 1979. The original study documents all of the data and recommendations performed by MRI. The final reports and all correspondence are kept in the project files of the APS/SDG&E Interconnection Project maintained in Transmission Engineering.

The data obtained by MRI was applied to a line routing supplied by the Transmission Engineering Section of SDG&E. The exact location of the PI's of this line routing are recorded on U.S.C.G.S. Quads maintained in Transmission Engineering. A general descriptive location of each PI is also contained within the MRI report. The actual line route is not necessarily the same route as the one supplied to MRI. Therefore, as the actual line route is established, the meteorologic data is reviewed. If the actual line route varies significantly, or traverses different terrain than the route originally supplied to MRI, then a formal request is made to MRI to interpolate the meteorologic data for the new route. This new information is documented and kept in the project files in Transmission Engineering.

UTILIZATION OF METEOROLOGIC DATA

The meteorologic data utilized in the design of the 500 kV transmission line is the probable extreme values of ice loading, wind on ice loading, and wind loading. The probable extreme values for each of these items was provided for a return period of 25, 50 and 100 years. Assuming the transmission line has a book life of 34 years, the risk factor associated with a 25, 50 and 100 year return period is 75%, 50% and 30% respectively. (The risk factor is the probability of exceeding the design criteria within the selected time duration, i.e., book life). A risk factor of 50% has been selected as the design criteria for the 500 kV transmission line. Therefore, the meteorologic data for a 50 year return period is utilized in the design of the transmission line.

The meteorologic data used for the design of the 500 kV transmission line is the probable maximum sustained 1-minute wind speed and it's probable direction. In order to analyze the effect of the wind upon a particular line section, the wind is broken up into two components: an axial component, which is parallel to the axis of the wire, and a component normal to the longitudinal axis of the wire. Only the normal component is used in the design, the axial component is negligible and is neglected. The axial component may produce a longitudinal load on the towers. However, the towers are designed to handle longitudinal loads produced during construction or due to differential ice loading and are capable of withstanding the small magnitude of longitudinal load which may be produced by the axial component of the wind.

In order to ascertain the maximum impact, the design value used for a particular line section is equal to the maximum normal component of wind which occurs when the probable wind direction is varied $\pm$ 22.5 degrees from the value given in the MRI report. The variation of the wind from the probable direction given in the MRI report is based on consultation with MRI.

Once the wind component for a particular section is obtained, then the unit wind pressure (lb/ft^2) which will be used for the line design is calculated. These calculations are performed by a program written on the HP 9825. The program generates all of the meteorologic parameters used for the design of the 500 kV transmission line. The program output is shown in Figures 1 and 2. The documentation of the program is attached as Appendix A.

APPENDIX A

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ABSTRACT

This appendix documents the meteorologic program which was developed to calculate the design parameters used for the design of the 500 kV transmission line for the APS/SDG&E Interconnection project. This appendix contains a user's guide, documentation of the basic equations used, and a copy of the program.

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INTRODUCTION

This computer program generates a tabulation of all the meteorologic parameters used for the design of the 500 kV transmission line. The meteorologic parameters dictated by rule 43 of G.O. 95 are applied to the line independently of line orientation. The MRI meteorologic data for light loading conditions is dependent upon line orientation and terrain adjacent to the line. The MRI meteorologic data for heavy loading conditions is independent of line orientation. However, it was derived upon consideration of the general terrain which the line traverses.

The program output is basically divided into two sections: (1) MRI light loading data, and (2) G.O. 95 data and MRI heavy loading data. Since MRI light loading data is dependent upon line orientation, the data is defined by line segments which are defined by angle points, or terrain differential between angle points. The G.O. 95 data and MRI heavy loading data are independent of line orientation. Therefore, they are simply tabulated on the lower right-hand portion of the program output.

The program output for the MRI light loading data is divided into three categories: (1) line data, (2) weather data, and (3) design data. The line data identifies the particular line segment bounded by PI's. The PI's, along with their corresponding tower numbers are provided. The weather data is the meteorologic data compiled by MRI for the particular line segment. The design data is the per unit component and resultant loads which are calculated from the meteorologic data. The design data is the information used for the design of each particular line segment.

The program automatically flags all line segments in which the MRI meteorologic data is less than the requirements for the light loading conditions defined by rule 43 of G.O. 95. The line segment which must be designed for heavy loading is denoted in the footnotes of the program output and is identified by the towers which bound the heavy loading area.

MRI WIND PROGRAM
USER'S GUIDE

The following are the questions you will encounter while running this program. The program is set up to do the conductor first, then the OHGW for the same section of line.

QUESTIONS:

1. Your name (initials)
2. Date (xx/xx/xx)
3. Line or project name (50 spaces)
4. Section of line (50 spaces)
5. Enter either C or G for conductor or OHGW
6. Wire size and TYPE (i.e., 2156 ACSR/AW)
7. No. of PI's this page (21 max.)
   a. Output will be one less than the number entered.
8. Wire Dia. (in)
9. Wt (lb/ft)
10. SDG&E PI No?
11. MRI PI - Press continue if PI's are the same.
12. Tower No.
13. Line Angle
    a. Degree or decimal equivalent
       (if decimal is entered, zero's are entered for minutes and seconds)
    b. Angle (L) or (R)

       Angle (L) = Left
       Angle (R) = Right
       This refers to the direction the line deviates from the tangent position.
       (if zero is entered for degrees, the program skips Angle (L) or (R))

14. North Cal Grid No. of 1st tower
15. East Cal Grid No. of 1st tower
16. North Cal Grid of next PI

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QUESTIONS: (cont)

17. East Cal Grid of next PI
    a. The angle is calculated from the Cal Grid No. and is used to figure the line bearings for each segment entered.
18. Storm bearing (MRI data)
19. Wind mph (MRI data)
20. Is there MRI ice? Y/N

    if Y: a. Between what towers (xxx to xxx)
    b. MRI radial ice C=1.1, GW=1.45
    c. MRI ice density (24.972)
    d. MRI wind (psf) C=2.48, GW=1.24
    then input is printed

    if N: Program goes to OUTPUT DATA

Once output is finished, the following questions are asked?

1. Do you have more entries? Y/N
    a. N will end program.
    b. Y will ask "Do you want OHGW?" Y/N

2.
    a. N will start program from very beginning.
    b. Y will ask "Does OHGW change size?" Y/N

3.
    a. N will start at wire size for OHGW.
    b. Y will ask you the Tower Nos. at which the OHGW changes, along with diameters and weights of the wire.

AFTER THESE QUESTIONS ARE ANSWERED THE OUTPUT IS PRINTED.

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DESCRIPTION OF EQUATIONS

Resultant Load

The per unit resultant load is the vectoral addition of the per unit vertical load (v) and the per unit transverse lose (T). The magnitude of the per unit resultant load is calculated as follows:

$$|R| = \left(v^2 + T^2\right)^{1/2} \quad \text{lb/ft}$$

Transverse Load

The per unit transverse load is calculated using an equation documented by the IEEE Subgroup on Line Loading and Strength of Transmission Line Systems (1). The equation is as follows:

$$T = a\ q\ C_D\ (d + 2R/12) \quad \text{lb/ft}$$

Where: a = Span factor

q = Unit wind pressure on wires, lb/ft^2

C_D = Drag factor

d = Conductor diameter, inches

R = Radial inches of ice, inches

The span factor accounts for non-uniform wind force integrated over the span acting on the tower. Span factors generally vary from 0.5 to 1.0. The majority of line designs in the United States use a value of 1.0 for the span factor (1,3). For this project, a span factor of 1.0 is used.

The drag coefficient compensates for the effect of the air stream on the object due to it's shape, or surface roughness. For the wire size used for this project, a drag coefficient of 1.07 is used. This value was derived from Figure 5 of Reference 1. However, a drag coefficient of unity is assumed for conditions of ice loading.

The unit wind pressure for G.O. 95 conditions are dictated by rule 43 of G.O. 95. The unit wind pressure from the meteorologic study are provided by MRI. The unit wind pressure for the G.O. 95 conditions and the MRI heavy loading conditions are constant and as follows:

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Condition	Wind Pressure (PSF)
G.O. 95 Light Loading	8
G.O. 95 Heavy Loading	6
MRI Heavy Loading - COND	2.48
MRI Heavy Loading - OHGW	1.24

The unit wind pressure for the MRI light loading conditions are dependent upon line orientation. The unit wind pressure for the MRI light loading conditions are calculated using the following equation:

$$q = 0.00256\ V^2\ F_H^2\ F_G^2\ \sin^2 |\gamma - \alpha| \qquad \text{lb/ft}$$

Where: V = Wind speed, MPH
F_H = Height factor
F_G = Gust factor
γ = Wind bearing
α = Line bearing

The height factor adjusts the wind speed for a particular altitude. Wind speed is usually assumed to increase with height. The variation with height is calculated as follows (1,3):

$$F_H = \left(\frac{H}{H_a}\right)^{1/N}$$

Where: H_a = Height above ground of anemometer, ft.
H = Height above ground, ft.
N = Constant

The constant N is dependent on the recorded wind velocity. An N-value of 8 is used for wind speeds up to 58 MPH and a value of 12.5 is used for wind speeds in excess of 58 MPH (3).

The value of H was selected by MRI as 80 feet. The value of F_H was calculated by MRI and is included in the values of wind velocity in the MRI report.

The gust factor compensates for the difference between the average speed and the maximum speed. The gust

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factor generally decreases with increasing wind speed and height. The majority of the line designs in the United States use a value of 1.0 for the gust factor (1,3). For this project, a gust factor of 1.0 is used.

The wind speed and bearing for each particular line section is taken directly from Table VIII-3 on Page 58 of the MRI report. The line bearing is calculated by the program from the line angles.

Vertical Load

The per unit vertical load is calculated as follows:

$$V = W + 1.362 \quad (R^2 + dR)$$

Where: W = Conductor weight, lb/ft
d = Conductor diameter, inches
R = Radial inches of ice, inches
D = Ice density, g/cm^3

The radial thickness of the ice and it's density used for the design are as follows:

Condition	Radial Ice	Ice Density
G.O. 95	0.5"	0.913 g/cm^3
MRI - COND	1.1"	0.4 g/cm^3
MRI - OHGW	1.45"	0.4 g/cm^3

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PROGRAM LISTING

```
0: dsp "MRI WIND DATA";stp
1: dsp "REVISED 0410811413 GMV";stp
2: dsp "PRINTER REQ'D FOR OUTPUT";stp
3: dsp "MAX OF 21 ENTRIES / PAGE";stp
4: dim A[21,4],B[21,5],A$[50],B$[50],C$[30],D$[2],E$[21,4],F$[21,4],G[21]
5: dim H$[10],M$[20],V$[20],Z$[2],G$[2],P$[2]
6: deg;0)r69
7: ent "YOUR NAME (INITIALS only)",M$
8: ent "TODAY'S DATE (xx/xx/xx)",V$
9: "START":cfg
10: ent "LINE NAME-A$-[50 spaces]",A$;cap(A$))A$;len(A$[1,50]))r30
11: " "))A$[r30+1,50]
12: ent " SECTION-B$-[50 spaces]",B$;cap(B$))B$;len(B$[1,50]))r30
13: " "))B$[r30+1,50]
14: ent "C-for Cond.** G-for Ohgw",Z$
15: if cap(Z$)="G";gto "OHGW"
16: "2":ent "Wire size and type[30 spaces]",C$;cap(C$))C$
17: len(C$[1,30]))r30;" "))C$[r30+1,30]
18: ent "No. of PI'S THIS PAGE[21max]",N
19: if flg4=1;gto "3"
20: if r7)0;gto +2
21: ent "WIRE DIA.(in)",D,"WIRE WT.(lb/ft)",W
22: for I=1 to N
23: ent "SDGE PI No.",E$[I];len(E$[I,1,4]))r30;"  "))E$[I,r30+1,4]
24: prt "PI No.",E$[I]
25: E$[I]))F$[I];ent "MRI PI No.",F$[I];len(F$[I,1,4]))r30;" "))F$[I,r30+1,4]
26: ent "Tower No.",G[I]
27: if flg5;gto "9"
28: ent "North 'coordinate of this PI",r40,"East coordinate",r41
29: ent "North  coordinate of next PI",r42,"East coordinate",r43
30: r42-r40)r44;r43-r41)r45;atn(r44/r45))r46
31: if sgn(r45)=1;if sgn(r44)=1;90-abs(r46))A[I,2]
32: if sgn(r45)=-1;if sgn(r44)=1;270+abs(r46))A[I,2]
33: if sgn(r45)=-1;if sgn(r44)=-1;270-abs(r46))A[I,2]
34: if sgn(r45)=1;if sgn(r44)=-1;90+abs(r46))A[I,2]
35: sfg 5
36: "9";dsp "LINE ANGLE-press continue";stp
37: ent "Degrees or decimal equiv.",r50
38: if r50=0;if I=1;gto "8"
39: if r50=0;A[I-1,2))A[I,2];gto "8"
40: ent "Minutes",r51,"Seconds",r52
41: r50+r51/60+r52/3600))A[I,1]
42: ent "Angle Left(L) or Right(R)?",P$
43: if cap(P$)="L";A[I-1,2)-A[I,1]))A[I,2]
44: if cap(P$)="R";A[I-1,2)+A[I,1]))A[I,2]
45: "8":ent "STORM BEARING [ MRI DATA]",A[I,3]
46: ent "WIND (mph)[ MRI DATA]",A[I,4]
47: next I
48: "3":ent "Is there MRI ice ? Y/N",D$;cfg 1
49: if cap(D$)="Y";ent "Between what towers[ xxx to xxx ]",H$;sfg 1
50: if cap(D$)="N";cfg 1;gto "4"
51: ent "MRI Radial ice(in))C=1.1,GW=1.45",r14
52: 24.972)r15;ent "MRI ice density(lb/ft)[24.972]",r15
53: ent "MRI wind(psf))C=2.48,GW=1.24",r16;gto "4"
54: "***LOADS***":
55: "GO95 LT LOAD":
56: 8)r13
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57: "WIND LOAD":D*r13*1.07/12)r17
58: "RESULT LT LOAD":\(W^2+r17^2))r18
59: "GO95 HVY LOAD":
60: .5)r10;57)r11;6)r12
61: "WT+ICE WT":W+r11*(C/144)(((D+2r10)/2)^2-(D/2)^2))r19
62: "WIND LOAD":(D+2r10)*r12/12)r20
63: "RESULT HVY LOAD":\(r19^2+r20^2))r21
64: "MR1 HVY LOAD":if flg1=0;gto +5
65: "WT+ICE WT":W+r15*(C/144)(((D+2r14)/2)^2-(D/2)^2))r22
66: "WIND LOAD":(D+2r14)*r16/12)r23
67: "RESULT MR1 HVY":\(r22^2+r23^2))r24
68: ret
69: "4":for I=1 to N-1
70: 0)r0)r3
71: "psf":1.07*.00256*A[I,4]*A[1,4])B[I,1]
72: A[I,3]-22.5)r1
73: for J=0 to 45
74: abs(B[I,1]*sin(r1+J-A[I,2])sin(r1+J-A[I,2])))r2
75: if r2)r0;r2)r0;r1+J)r3
76: next J
77: "twind;SB2":r0)B[I,2];r3)B[I,3]
78: next I
79: "COMP":wtb 701,27,38,107,50,83
80: "LINES/in=6":wtb 701,27,38,108,54,68
81: fmt 1,50x,c50
82: fmt 2,50x,c50
83: fmt 3,50x,"DESIGN LOADS FOR ",c30
84: wrt 701.1,A$
85: wrt 701.2,B$
86: wrt 701.3,C$
87: wtb 701,10
88: fmt 1,18x,"APPROXIMATE LINE",30x,"WEATHER DATA",26x,"DESIGN DATA"
89: fmt 2,4x,"SDGE",5x,"MRI",3x,"TOWER",4x,"ANGLE",3x,"BEARING",6x,z
90: fmt 3,"BEARING",6x,"WIND",4x,"WIND",4x,"TWIND",7x,"WIND",4x,z
91: fmt 4,"VERT.",4x,"HORIZ.",4x,"RESULT."
92: fmt 5,5x,"PI",7x,"PI",5x,"No.",4x,"(deg)",4x,"(deg)",z
93: fmt 8,4x,z
94: fmt 6,4x,"(deg)",7x,"(mph)",3x,"(psf)",3x,"(psf)",3x,z
95: fmt 8,4x,z
96: fmt 7,"(psf)",2x,"(lb/ft)",2x,"(lb/ft)",4x,"(lb/ft)"
97: wrt 701.1,A$
98: wtb 701,10
99: wrt 701.2,B$
100: wrt 701.3,C$
101: wrt 701.4
102: "on":wtb 701,27,38,100,68
103: wrt 701.5
104: "off":wtb 701,27,38,100,65
105: wrt 701.8
106: "on":wtb 701,27,38,100,68
107: wrt 701.6
108: "off":wtb 701,27,38,100,65
109: wrt 701.8
110: "on":wtb 701,27,38,100,68
111: wrt 701.7
112: "off":wtb 701,27,38,100,65
113: wtb 701,10
114: for I=1 to N-1
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115: if G[I]=X or G[I]=Y;fmt 1,5x,c4,5x,c4,x,f3.," **",3x,f2.;gto +2
116: fmt 1,5x,c4,5x,c4,x,f3.,6x,f4.1
117: fmt 2,37x,f5.1,6x,f5.1," (",f5.1,") ",2x,f2.,4x,f5.2,3x,f5.2,z
118: if B[I,2]<8;fmt 3,5x,"* ",f5.2,3x,f5.3,4x,f5.3,6x,f5.3;gto +2
119: fmt 3,7x,f5.2,3x,f5.3,4x,f5.3,6x,f5.3
120: "PI-PI-TWR-ANG":
121: wrt 701.1,E$[I],F$[I],G[I],A[I,1]
122: "LB-SB1-SB2-MPH-WIND-TWIND":
123: wrt 701.2,A[I,2],A[I,3],B[I,3],A[I,4],B[I,1],B[I,2]
124: if G[I]>-X*and G[I]<Y;B[I,2]*r7/12)r25;\(r25^2+r9^2))r26;r9)r27;gto +2
125: B[I,2]*D/12)r25;\(r25^2+W^2))r26;W)r27
126: "TWIND-WT-WL-RES":
127: wrt 701.3,B[I,2],r27,r25,r26
128: next I
129: fmt 1,5x,c4,5x,c4,x,f3.,6x,f4.1
130: wrt 701.1,E$[I],F$[I],G[I],A[I,1]
131: fmt 1,78x,"RADIAL ICE",2x,"WIND",4x,"VERT.",4x,"HORIZ.",z
132: fmt 2,4x,"RESULT."
133: fmt 3,80x,z
134: fmt 4,"(in)",5x,"(psf)",2x,"(lb/ft)",2x,"(lb/ft)",4x,"(lb/ft)"
135: fmt 5,62x,"GO 95 LIGHT LOAD",4x,f3.1,6x,f3.1,4x,f5.3,4x,f5.3,6x,f5.3
136: fmt 6,62x,"GO 95 HEAVY LOAD",4x,f3.1,6x,f3.1,4x,f5.3,4x,f5.3,6x,f5.3
137: if flg1=0;gto +2
138: fmt 7,62x,"MRI   HEAVY LOAD",4x,f4.2,5x,f4.2,3x,f5.3,4x,f5.3,6x,f5.3
139: wrt 701.1
140: wrt 701.2
141: wrt 701.3
142: "on":wtb 701,27,38,100,68
143: wrt 701.4
144: "off":wtb 701,27,38,100,65
145: gsb "***LOADS***"
146: wrt 701.5,r69,r13,W,r17,r18
147: wrt 701.6,r10,r12,r19,r20,r21
148: if flg3=0;gto +6
149: r7)D;r9)W
150: gsb "***LOADS***"
151: wtb 701,10
152: wrt 701.5,r69,r13,W,r17,r18
153: wrt 701.6,r10,r12,r19,r20,r21
154: if flg1;wrt 701.7,r14,r16,r22,r23,r24
155: fmt 1,5x,"NOTES:"
156: fmt 2,11x,"1. HEAVY LOADING BETWEEN TOWERS ",c10
157: fmt 3,11x,"2."" * "" DENOTES LESS THAN 8 PSF WIND",36x,"TMS/",c20
158: fmt 4,11x,"3.""**"" DENOTES WIRE CHANGE",50x,c20
159: wrt 701.1
160: wrt 701.2,H$
161: wrt 701.3,cap(M$)
162: wrt 701.4,V$
163: ent "DO YOU HAVE MORE ENTRIES Y/N",D$
164: if cap(D$)="N";gto "1"
165: wtb 701,12
166: ent "DO YOU WANT OHGW's Y/N",D$
167: if cap(D$)="Y";gto "OHGW"
168: if cap(D$)="N";gto "START"
169: "OHGW":ent "DOES OHGW CHANGE SIZE?Y/N",D$
170: if cap(D$)="N";0)r7;sfg 4;gto "2"
171: if cap(D$)="Y";sfg 3;if N>0;sfg 4
172: ent "OHGW CHANGES @ WHAT TOWER ?",X
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172: ent "OHGW CHANGES @ WHAT TOWER ?",X
173: ent "OHGW CHANGE ENDS @ WHAT TOWER ?",Y
174: ent "ENTER FIRST DIA.",D
 75: ent "ENTER CHANGE DIA.",r7
176: ent "ENTER FIRST WT/FT.",W
177: ent "ENTER CHANGE WT/FT.",r9
178: gto "2"
179: "1":dsp "THAT'S ALL FOLKS";stp
*6699
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REFERENCES

1. IEEE, "Loading and Strength of Transmission Line Systems - Part 2 Designing for Wind Loads", Paper A77299-8 presented January 30 - February 4, 1977 at the IEEE PES Winter Meeting, New York, N.Y.

2. U.S. Department of Energy, "Electrical and Mechanical Design Criteria for EHV and UHV Overhead Transmission Lines", June 1980, DOE/RA/2133-01.

3. "Meteorological Evaluation of the Proposed 500 kV Transmission Routes Miguel Substation - Laguna Dam and Rainbow Substation - Laguna Dam", February 1979, SDG&E Contract #Z820078.

times the maximum hourly or maximum hourly average values.

HEIGHT FACTORS

Wind speed generally increases with height above the surface of the earth. The rate of increase is dependent on the speed of the wind, the variation with height of the air temperature, and the roughness of the terrain over which the wind is flowing.

There have been many studies undertaken and theories presented on the variations of wind speed with height above the surface. There is general agreement that wind profiles tend to obey a power law [1, 2, 3]. This relationship is normally used when neutral stability exists.

RETURN PERIODS

Wind speeds for design purposes are frequently expressed in terms of return periods (25-year return period, 50-year return period, etc.). These values are usually derived by assuming that the distribution of the yearly extreme wind speeds is well approximated by a Fisher-Tippett Type I (sometimes called Gumbel) distribution of extreme values [4, 5]. This symmetric extreme probability distribution cited by Court [6] as particularly applicable to extreme surface winds, is used by both the National Weather Service in the U.S. and the Canadian Department of Transport.

Return period values of maximum wind speeds may be computed using the relationship given by Weiss (1955).

$$W_t = \overline{W} + \sigma K_t \qquad (1)$$

where: W_t = magnitude of the wind speed for return period, t

$\overline{W}$ = mean of the extreme yearly wind speeds on record

σ = standard deviation of the series of extreme yearly wind speeds

K_t = constant for return period t and based on the period of record

Input data are the yearly extreme wind speeds for a given station for as long a period of record as possible. At least 20 years of record is desirable and return periods based on less than 10 years of consistent records must be used with caution. Unfortunately, stations with 20 years of hourly wind records are scarce in areas where transmission lines are constructed.

After return period values of the maximum wind speeds to be expected at the weather station site are developed, these return period wind speeds must be related to the various locations and exposures of the planned line route. In most cases, the weather stations with significant periods of recorded wind speeds will be located at airports which are usually situated in relatively flat, open areas, or broad valleys. To be meaningful for design purposes these values must be extrapolated to areas frequently quite different in altitude and exposure and perhaps many miles removed from the nearest site with records. This extrapolation should be done by someone knowledgeable in the effects of terrain and exposure on wind patterns and velocities.

In the use of return period wind speed values, it must be understood that these are only a guide as to how frequently these extreme values are expected to occur. They give no indication as to when they are expected to occur. The once in 200 years storm may occur next year or a hundred years from now. The probability of occurrence of the extreme value within the selected return period is quite high. The probability that the extreme value will occur in a given year is the inverse of the return period.

$$P = \frac{1}{T} = \frac{1}{50} = .02 \qquad (2)$$

The probability that the extreme value will not occur in a given year is then

$$= 1 - .02 = .98$$

$$S = 1 - P = 1 - \frac{1}{T} \qquad (3)$$

The probability that the extreme value will not occur within n years is

$$S = S^n = \left(.98\right)^{34} = .50 \qquad (4)$$

where S is the probability of survival, "survival factor," of the loading criteria for "n" years duration. The chance of exceeding the loading criteria within the selected period (n) is the "risk factor" (R)

$$= 1 - .50 = .50$$

$$R = 1 - S \qquad (5)$$

R and S may be determined by the following equation

$$S = 1 - R = \left(1 - \frac{1}{T}\right)^n = .50 \qquad (6)$$

where T is the return period in years and n the selected duration or lifetime in years.

For a 50-year return period (T) and a selected duration or lifetime of 50 years (n), the risk of having the loading criteria exceeded within the 50-year lifetime is then 63 per cent.

Return period values of extreme wind speed have been developed for most major weather stations in the U.S. [7] and Canada [8]. Thom in 1968 prepared maps of isotachs in miles per hour for various return periods. Figure 1 shows the 50-year Mean Recurrence Interval Map for the United States. Of course, these are smoothed isotachs drawn for the station data and do not reflect local variations in terrain.

Figure 2 shows a typical return period wind speed graph. While the slope of the curve will vary from station to station, there frequently will be only 4 or 5 mi/h (1.8 or 2.2 m/s) difference between 25-year and 50-year return period values. In most cases a small increase in design wind speeds will double the return period probability.

WIND GUSTS

Gusts are sudden brief increases in the speed of the wind resulting from eddies superimposed on the basic flow of air. Many studies of the relationship of gusts to the steady wind and their variation with speed, height, thermal stratification, and terrain have culminated in general agreement concerning the nature of these relationships [9 – 19]. However, quantitative results have varied depending on the data and analytical methods used.

Most studies of gustiness are from micrometeorological research. Though measurements obtained from such experiments are generally superior to operational data because of refined anemometry, such studies hardly ever provide data for the very high wind speeds important in design of transmission towers and conductors. Sissenwine, et al [19] analyzed a more meaningful spectrum of wind speeds and this work appears to be one of the better recent efforts in this field. Their study included the analysis of 548 wind observations taken at anemometer heights varying from 10 to 85 feet, (3.0 to 25.9 m) with one-minute steady wind speeds varying from 20 to over 80 mi/h (8.9 to 35.8 m/s) and locations varying from tropical Pacific islands to Alaska and Greenland. Since recorder charts of steady winds greater than 80 mi/h (35.8 m/s) were scarce (only 10 cases of the 548 studied), they also used 26 observations of gust factors for 5-minute steady winds ranging from 82 to 188 mi/h (36.7 to 84.0 m/s) taken at Mt. Washington, New Hampshire.

Actually, accurate data on short period gusts are quite rare. In weather station climatological records the steady state wind speed corresponding to maximum peak gusts is usually not available. The maximum hourly wind speed and maximum peak gust for the

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SOUTHWEST POWERLINK
MIGUEL TO IMPERIAL VALLEY
DESIGN LOADS FOR 2156 ACSR STANDARD

APPROXIMATE LINE				WEATHER DATA				DESIGN DATA			
SDGE PI	MRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
-	-	999	11.3									
				126.4	0.0 (22.5)	65	11.57	10.90	10.90	2.511	1.601	2.978
M1	-	22	28.9									
				97.5	0.0 (7.5)	65	11.57	11.57	11.57	2.511	1.699	3.032
M2	-	23	11.3									
				108.8	0.0 (18.5)	65	11.57	11.57	11.57	2.511	1.699	3.032
M3	-	24	23.8									
				132.5	0.0 (22.5)	65	11.57	10.21	10.21	2.511	1.500	2.925
1	1	25	39.5									
				93.1	0.0 (3.5)	65	11.57	11.57	11.57	2.511	1.699	3.032
2	2	36	6.8									
				99.9	270.0 (247.5)	65	11.57	3.32	* 3.32	2.511	0.487	2.558
-	2A	38	0.0									
				99.9	270.0 (247.5)	84	19.33	5.54	* 5.54	2.511	0.813	2.639
-	23	43	0.0									
				99.9	67.5 (45.0)	78	16.67	11.14	11.14	2.511	1.636	2.997
3	3	50	13.3									
				113.1	67.5 (45.0)	73	16.67	14.35	14.35	2.511	2.107	3.278
3A	3A	57	40.1									
				153.2	157.5 (180.0)	70	13.42	2.72	* 2.72	2.511	0.399	2.543
3B	3B	60	6.0									
				147.3	157.5 (180.0)	70	13.42	3.92	* 3.92	2.511	0.576	2.576
-	3B1	64	0.0									
				147.3	67.5 (57.0)	78	16.67	16.66	16.66	2.511	2.447	3.506
-	3B2	66	0.0									
				147.3	157.5 (180.0)	70	13.42	3.92	* 3.92	2.511	0.576	2.576
3C	3C	68	53.4									
				93.9	45.0 (22.5)	78	16.67	14.76	14.96	2.511	2.197	3.337
3D	3C1	71	3.7									
				90.1	67.5 (45.0)	70	13.42	6.75	* 6.75	2.511	0.991	2.699
3D1	-	77	1.2									
				88.9	67.5 (45.0)	70	13.42	6.46	* 6.46	2.511	0.948	2.684
3D2	-	78	2.0									
				90.9	67.5 (45.0)	70	13.42	6.92	* 6.92	2.511	1.016	2.709
3D3	3C3	79	0.7									
				90.1	0.0 (0.5)	65	11.57	11.57	11.57	2.511	1.699	3.032
-	3C4	83	0.0									
				90.1	90.0 (67.5)	70	13.42	1.99	* 1.99	2.511	0.292	2.528
3F	-	86	2.6									
				92.8	90.0 (67.5)	70	13.42	2.45	* 2.45	2.511	0.359	2.537
9A	-	90	15.9									

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	9.56	2.511	1.257	2.808
GO 95 HEAVY LOAD	0.5	6.0	3.917	1.381	4.154

NOTES:

1. HEAVY LOADING BETWEEN TOWERS
2. " * " DENOTES LESS THAN 0.56 PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL A RACK

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SOUTHWEST POWERLINK
MIGUEL TO IMPERIAL VALLEY
DESIGN LOADS FOR 2156 ACSR STANDARD

	APPROXIMATE LINE				WEATHER DATA					DESIGN DATA			
SDGE PI	MRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)		WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
9A	-	90	15.9										
				108.6	90.0 (67.5)	78	16.67	7.19	*	7.19	2.511	1.056	2.724
9B	-	92	3.9										
				112.5	90.0 (67.5)	78	16.67	8.32	*	8.32	2.511	1.222	2.793
9C	-	93	2.4										
				110.1	90.0 (67.5)	78	16.67	7.64	*	7.64	2.511	1.121	2.750
11	11	106	19.8										
				90.3	247.5 (225.0)	84	19.33	9.75		9.75	2.511	1.432	2.890
-	11A	120 A	39.5										
				90.3	45.0 (22.5)	84	19.33	16.56		16.56	2.511	2.431	3.495
12	12	124	11.8										
				78.5	247.5 (225.0)	84	19.33	5.88	*	5.88	2.511	0.863	2.655
14	14	130	5.3										
				83.7	247.5 (225.0)	84	19.33	7.56	*	7.56	2.511	1.110	2.746
16	16	148	3.8										
				79.9	247.5 (225.0)	84	19.33	6.34	*	6.34	2.511	0.931	2.678
16A	16A	151	4.5										
				84.5	247.5 (225.0)	84	19.33	7.81	*	7.81	2.511	1.147	2.761
16B	16B	160	19.6										
				104.1	247.5 (225.0)	84	19.33	14.24		14.24	2.511	2.090	3.267
18A	18A	163	23.4										
				80.7	247.5 (225.0)	84	19.33	6.59	*	6.59	2.511	0.968	2.691
19A	19A	187	4.9										
				75.8	247.5 (225.0)	84	19.33	5.07	*	5.07	2.511	0.744	2.619
19B	19B	188	5.1										
				70.7	247.5 (225.0)	84	19.33	3.64	*	3.64	2.511	0.534	2.567
19C	19C	189	4.0										
				66.7	247.5 (270.0)	84	19.33	3.02	*	3.02	2.511	0.443	2.550
19D	19D	193	17.3										
				84.0	247.5 (225.0)	84	19.33	7.66	*	7.66	2.511	1.125	2.751
-	20B	198	1.2										
				84.0	225.0 (202.5)	84	19.33	14.93		14.93	2.511	2.193	3.334
20B	-	201	5.5										
				89.5	247.5 (225.0)	84	19.33	9.49		9.49	2.511	1.393	2.872
-	20D	208	0.7										
				89.5	202.5 (180.0)	85	19.79	19.79		19.79	2.511	2.906	3.840
21	21	213	56.4										
				33.0	202.5 (180.0)	95	24.72	7.35	*	7.35	2.511	1.079	2.733
22	22	221	6.1										
				27.0	225.0 (247.5)	85	19.79	8.36	*	~~0.36~~ 12.55	~~2.511~~ 2.511	~~1.227~~ 1.843	~~2.795~~ 3.115
-	-	223	15.9										

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	8.56	2.511	1.257	2.808
GO 95 HEAVY LOAD	0.5	6.0	3.917	1.381	4.154
MRI HEAVY LOAD	1.19	2.48	4.226	0.819	4.305

NOTES:

1. HEAVY LOADING BETWEEN TOWERS 130 TO 223
2. " * " DENOTES LESS THAN 8.56 PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL A RACK

TMS/ GMV
09/17/82

SGDE0300539

SOUTHWEST POWERLINK
MIGUEL TO IMPERIAL VALLEY
DESIGN LOADS FOR 2156 ACSR STANDARD

APPROXIMATE LINE					WEATHER DATA				DESIGN DATA			
SDGE PI	MRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
-	-	223	0.0						12.55		1.843	3.115
				27.0	225.0 (247.5)	85	19.79	8.36	* ~~8.36~~	2.511	~~1.227~~	~~2.795~~
-	23	241	0.0									
				27.0	225.0 (247.5)	80	17.53	7.40	* 7.40	2.511	1.087	2.736
24	24	254	49.7									
				76.6	225.0 (202.5)	75	15.41	10.12	10.12	2.511	1.486	2.918
26	25	278	13.5									
				90.2	225.0 (202.5)	70	13.42	11.49	11.49	2.511	1.687	3.025
27	-	280	27.5									
				117.7	247.5 (225.0)	70	13.42	12.23	12.23	2.511	1.796	3.087
28A	-	313	27.4									
				90.3	247.5 (225.0)	70	13.42	6.78	* 6.78	2.511	0.996	2.701
-	-	999	0.0									
				90.3	247.5 (225.0)	66	11.93	6.03	* 6.03	2.511	0.885	2.663
-	-	999	25.3									

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	8.56	2.511	1.257	2.808
GO 95 HEAVY LOAD	0.5	6.0	3.917	1.381	4.154

NOTES:

1. HEAVY LOADING BETWEEN TOWERS
2. " * " DENOTES LESS THAN 8.56 PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL A RACK

TMS/ GMV
09/21/82

SGDE0300540

SOUTHWEST POWERLINK
IMPERIAL VALLEY TO COLORADO RIVER
DESIGN LOADS FOR 2156 ACSR STANDARD

APPROXIMATE LINE					WEATHER DATA				DESIGN DATA			
SDGE PI	MRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
-	-	999	25.3									
				65.8	247.5 (270.0)	66	11.93	2.13	* 2.13	2.511	0.313	2.530
-	-	316	26.3									
				90.3	247.5 (225.0)	66	11.93	6.03	* 6.03	2.511	0.885	2.663
29B	-	323	2.1									
				88.3	247.5 (225.0)	66	11.93	5.60	* 5.60	2.511	0.823	2.642
29A	29	326	2.6									
				90.9	247.5 (225.0)	66	11.93	6.15	* 6.15	2.511	0.903	2.669
29B	-	328	2.1									
				88.8	247.5 (225.0)	66	11.93	5.72	* 5.72	2.511	0.840	2.648
29C	-	330	1.6									
				89.5	247.5 (225.0)	66	11.93	5.85	* 5.85	2.511	0.859	2.654
30A	30	336	3.8									
				85.9	270.0 (292.5)	66	11.93	2.39	* 2.39	2.511	0.351	2.535
30B		- 338	3.9									
				89.8	270.0 (292.5)	66	11.93	1.77	* 1.77	2.511	0.260	2.524
31A	31	340	1.2									
				89.6	270.0 (292.5)	66	11.93	1.80	* 1.80	2.511	0.265	2.525
32A	32	358	1.1									
				88.5	270.0 (292.5)	66	11.93	1.97	* 1.97	2.511	0.289	2.528
33A	33	361	1.9									
				87.6	270.0 (292.5)	66	11.93	2.11	* 2.11	2.511	0.310	2.530
34A	-	373	2.6									
				85.0	270.0 (292.5)	66	11.93	2.54	* 2.54	2.511	0.373	2.539
35A	-	376	2.3									
				87.3	270.0 (292.5)	66	11.93	2.16	* 2.16	2.511	0.317	2.531
36A	-	380	67.9									
				155.3	270.0 (247.5)	66	11.93	11.91	11.91	2.511	1.749	3.060
36B	-	382	58.4									
				96.9	270.0 (247.5)	66	11.93	2.88	* 2.88	2.511	0.422	2.546
37A	-	383	9.5									
				87.4	270.0 (292.5)	66	11.93	2.15	* 2.15	2.511	0.316	2.531
38A	38	388	0.1									
				87.2	270.0 (292.5)	66	11.93	2.17	* 2.17	2.511	0.319	2.531
39A	-	392	2.2									
				85.0	270.0 (292.5)	66	11.93	2.54	* 2.54	2.511	0.373	2.539
40A	-	396	2.2									
				87.2	270.0 (292.5)	66	11.93	2.18	* 2.18	2.511	0.320	2.531
41A	41	410	10.8									
				98.0	270.0 (247.5)	66	11.93	3.07	* 3.07	2.511	0.451	2.551
41B	-	411	5.5									

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	8.56	2.511	1.257	2.808
GO 95 HEAVY LOAD	0.5	6.0	3.917	1.381	4.154

NOTES:
1. HEAVY LOADING BETWEEN TOWERS
2. " * " DENOTES LESS THAN 8.56 PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL A RACK

THS/ GMV
09/30/82

SGDE0300541

SOUTHWEST POWERLINK
IMPERIAL VALLEY TO COLORADO RIVER
DESIGN LOADS FOR 2156 ACSR STANDARD

APPROXIMATE LINE					WEATHER DATA				DESIGN DATA			
SDGE PI	MRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
41B	-	411	5.5									
				105.8	270.0 (247.5)	66	11.93	4.58	* 4.58	2.511	0.672	2.599
42	34	417	16.3									
				89.5	270.0 (292.5)	66	11.93	1.83	* 1.83	2.511	0.268	2.525
43	-	460	4.7									
				84.8	270.0 (292.5)	66	11.93	2.58	* 2.58	2.511	0.379	2.539
44	-	466	0.0									
				84.8	270.0 (292.5)	66	11.93	2.58	* 2.58	2.511	0.379	2.539
45	45	472	56.7									
				28.1	270.0 (292.5)	66	11.93	11.82	11.82	2.511	1.736	3.052
50	50	478	22.2									
				50.3	270.0 (292.5)	66	11.93	7.34	9.34	2.511	1.371	2.861
51	51	479	14.9									
				65.2	247.5 (270.0)	66	11.93	2.09	* 2.09	2.511	0.308	2.530
52	52	484	23.9									
				41.3	90.0 (112.5)	66	11.93	10.69	10.69	2.511	1.569	2.961
53	53	489	21.8									
				63.2	292.5 (315.0)	65	11.57	10.44	10.44	2.511	1.534	2.942
54	54	515	18.2									
				45.0	90.0 (112.5)	65	11.57	9.88	9.88	2.511	1.450	2.900
55	55	517	19.2									
				25.9	90.0 (112.5)	65	11.57	11.53	11.53	2.511	1.693	3.029
56	56	522	62.5									
				88.3	315.0 (337.5)	70	13.42	11.72	11.72	2.511	1.721	3.044
57	57	556	43.9									
				132.3	292.5 (270.0)	65	11.57	5.24	* 5.24	2.511	0.769	2.626
58	58	562	14.8									
				117.5	292.5 (270.0)	65	11.57	2.46	* ~~8.46~~ 15.4	2.511	~~0.362~~ 2.26	2.537 3.38
APS	-	461	51.1									

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	8.56	2.511	1.257	2.808
GO 95 HEAVY LOAD	0.5	6.0	3.917	1.381	4.154

NOTES:

1. HEAVY LOADING BETWEEN TOWERS
2. * ' * ' DENOTES LESS THAN 8.56 PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL A RACK

TMS/ GMV
09/30/82

SGDE0300542

SOUTHWEST POWERLINK
MIGUEL TO IMPERIAL VALLEY
DESIGN LOADS FOR 7#8 ALUMOWELD

APPROXIMATE LINE				WEATHER DATA					DESIGN DATA			
SDGE PI	MRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
-	-	999	11.3									
				126.4	0.0 (22.5)	65	11.57	10.90	10.90	0.262	0.350	0.437
M1	-	22	20.9									
				97.5	0.0 (7.5)	65	11.57	11.57	11.57	0.262	0.371	0.454
M2	-	23	11.3									
				108.8	0.0 (18.5)	65	11.57	11.57	11.57	0.262	0.371	0.454
M3	-	24	23.8									
				132.5	0.0 (22.5)	65	11.57	10.21	10.21	0.262	0.328	0.419
1	1	35	39.5									
				93.1	0.0 (3.5)	65	11.57	11.57	11.57	0.262	0.371	0.454
2	2	36	6.8									
				99.9	270.0 (247.5)	65	11.57	3.32	* 3.32	0.262	0.106	0.283
-	2A	38	0.0									
				99.9	270.0 (247.5)	84	19.33	5.54	* 5.54	0.262	0.178	0.316
-	2B	43	0.0									
				99.9	67.5 (45.0)	78	16.67	11.14	11.14	0.262	0.358	0.443
3	3	50	13.3									
				113.1	67.5 (45.0)	78	16.67	14.35	14.35	0.262	0.460	0.530
3A	3A	57	40.1									
				153.2	157.5 (180.0)	70	13.42	2.72	* 2.72	0.262	0.087	0.276
3B	3B	60	6.0									
				147.3	157.5 (180.0)	70	13.42	3.92	* 3.92	0.262	0.126	0.290
-	3B1	64	0.0									
				147.3	67.5 (57.0)	78	16.67	16.66	16.66	0.262	0.535	0.595
-	3B2	66	0.0									
				147.3	157.5 (180.0)	70	13.42	3.92	* 3.92	0.262	0.126	0.290
3C	3C	68	53.4									
				93.9	45.0 (22.5)	78	16.67	14.96	14.96	0.262	0.480	0.547
3D	3C1	71	3.7									
				90.1	67.5 (45.0)	70	13.42	6.75	* 6.75	0.262	0.216	0.340
3D1	-	77	1.2									
				88.9	67.5 (45.0)	70	13.42	6.46	* 6.46	0.262	0.207	0.334
3D2	-	78	2.0									
				90.9	67.5 (45.0)	70	13.42	6.92	* 6.92	0.262	0.222	0.343
3D3	3C3	79	0.7									
				90.1	0.0 (0.5)	65	11.57	11.57	11.57	0.262	0.371	0.454
-	3C4	83	0.0									
				90.1	90.0 (67.5)	70	13.42	1.99	* 1.99	0.262	0.064	0.269
3F	-	86	2.6									
				92.8	90.0 (67.5)	70	13.42	2.45	* 2.45	0.262	0.079	0.273
9A	-	90	15.9									

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	8.56	0.262	0.275	0.379
GO 95 HEAVY LOAD	0.5	6.0	0.312	0.693	1.067

NOTES:

1. HEAVY LOADING BETWEEN TOWERS
2. " * " DENOTES LESS THAN 8.56 PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL # RACK

IMS/ GMV
09/17/82

SGDE0300543

SOUTHWEST POWERLINK
MIGUEL TC IMPERIAL VALLEY
DESIGN LOADS FOR 7#8 ALUMOWELD AND 1/2" EHS

APPROXIMATE LINE				WEATHER DATA					DESIGN DATA			
SDGE PI	MRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
9A	-	90	15.9									
				108.6	90.0 (67.5)	78	16.67	7.19	* 7.19	0.262	0.231	0.349
9B	-	92	3.9									
				112.5	90.0 (67.5)	78	16.67	8.32	* 8.32	0.262	0.267	0.374
9C	-	93	2.4									
				110.1	90.0 (67.5)	78	16.67	7.64	* 7.64	0.262	0.245	0.359
11	11	106	19.8									
				90.3	247.5 (225.0)	84	19.33	9.75	9.75	0.262	0.313	0.408
-	11A	120	39.5									
				90.3	45.0 (22.5)	84	19.33	16.56	16.56	0.262	0.531	0.592
12	12	124	11.8									
				78.5	247.5 (225.0)	84	19.33	5.88	* 5.88	0.262	0.189	0.323
14	14	130 **	5									
				83.7	247.5 (225.0)	84	19.33	7.56	* 7.56	0.517	0.312	0.604
16	16	148	3.8									
				79.9	247.5 (225.0)	84	19.33	6.34	* 6.34	0.517	0.261	0.579
16A	16A	151	4.5									
				84.5	247.5 (225.0)	84	19.33	7.81	* 7.81	0.517	0.322	0.609
16B	16B	160	19.6									
				104.1	247.5 (225.0)	84	19.33	14.24	14.24	0.517	0.587	0.782
18A	18A	163	23.4									
				80.7	247.5 (225.0)	84	19.33	6.59	* 6.59	0.517	0.272	0.584
19A	19A	187	4.9									
				75.8	247.5 (225.0)	84	19.33	5.07	* 5.07	0.517	0.209	0.558
19B	19B	188	5.1									
				70.7	247.5 (225.0)	84	19.33	3.64	* 3.64	0.517	0.150	0.538
19C	19C	189	4.0									
				66.7	247.5 (270.0)	84	19.33	3.02	* 3.02	0.517	0.125	0.532
19D	19D	193	17.3									
				84.0	247.5 (225.0)	84	19.33	7.66	* 7.66	0.517	0.316	0.606
-	20B	198	1.2									
				84.0	225.0 (202.5)	84	19.33	14.93	14.93	0.517	0.616	0.804
20B	-	201	5.5									
				89.5	247.5 (225.0)	84	19.33	9.49	9.49	0.517	0.391	0.648
-	20D	208	0.7									
				89.5	202.5 (180.0)	85	19.79	19.79	19.79	0.517	0.816	0.966
21	21	213	56.4									
				33.0	202.5 (180.0)	95	24.72	7.35	* 7.35	0.517	0.303	0.599
22	22	221	6.1									
									12.55	.517	.517	0.731
27.0				225.0 (247.5)	85	19.79	8.36	*	8.36	0.517	0.345	0.621
-	-	223	15.9									

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	8.56	0.262	0.275	0.379
GO 95 HEAVY LOAD	0.5	6.0	0.812	0.693	1.067
GO 95 LIGHT LOAD	0.0	8.56	0.517	0.353	0.626
GO 95 HEAVY LOAD	0.5	6.0	1.136	0.748	1.360
MRI HEAVY LOAD	1.45	1.24	2.053	0.351	2.083

NOTES:

1. HEAVY LOADING BETWEEN TOWERS 130 to 223
2. " * " DENOTES LESS THAN 8.56 PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL A RACK

TMS/ GMV
09/17/02

SOUTHWEST POWERLINK
MIGUEL TO IMPERIAL VALLEY
DESIGN LOADS FOR 7#8 ALUMOWELD

APPROXIMATE LINE				WEATHER DATA					DESIGN DATA			
SDGE PI	PRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
-	-	223	0.0									
				27.0	225.0 (247.5)	85	19.79	9.36	12.55 * ~~8.36~~	.262 ~~0.262~~	.403 ~~0.268~~	.481 ~~.325~~
-	23	241	0.0									
				27.0	225.0 (247.5)	80	17.53	7.40	* 7.40	0.262	0.238	0.353
24	24	254	49.7									
				76.6	225.0 (202.5)	75	15.41	10.12	10.12	0.262	0.325	0.417
26	25	270	13.5									
				90.2	225.0 (202.5)	70	13.42	11.49	11.49	0.262	0.369	0.452
27	-	280	27.5									
				117.7	247.5 (225.0)	70	13.42	12.23	12.23	0.262	0.392	0.472
28A	-	313	27.4									
				90.3	247.5 (225.0)	70	13.42	6.78	* 6.78	0.262	0.218	0.340
-	-	999	0.0									
				90.3	247.5 (225.0)	66	11.93	6.03	* 6.03	0.262	0.193	0.326
-	-	999	25.3									

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	8.56	0.262	0.275	0.379
GO 95 HEAVY LOAD	0.5	6.0	0.812	0.693	1.067

NOTES:

1. HEAVY LOADING BETWEEN TOWERS
2. " * " DENOTES LESS THAN 8.56 PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL A RACK

TMS/ GHV
09/21/82

SGDE0300545

SOUTHWEST POWERLINK
IMPERIAL VALLEY TO COLORADO RIVER
DESIGN LOADS FOR 795 ALUMOWELD

APPROXIMATE LINE				WEATHER DATA				DESIGN DATA			
SDGE PI	MRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
-	-	999	25.3									
				65.0	247.5 (270.0)	66	11.93	2.13	* 2.13	0.262	0.068	0.271
-	-	316	25.3									
				90.3	247.5 (225.0)	66	11.93	6.03	* 6.03	0.262	0.193	0.326
28B	-	323	2.1									
				88.3	247.5 (225.0)	66	11.93	5.60	* 5.60	0.262	0.180	0.318
29A	29	326	2.6									
				90.9	247.5 (225.0)	66	11.93	6.15	* 6.15	0.262	0.197	0.328
29B	-	328	2.1									
				88.8	247.5 (225.0)	66	11.93	5.72	* 5.72	0.262	0.184	0.320
29C	-	330	0.6									
				89.5	247.5 (225.0)	66	11.93	5.85	* 5.85	0.262	0.188	0.322
30A	30	336	3.6									
				85.9	270.0 (292.5)	66	11.93	2.39	* 2.39	0.262	0.077	0.273
30B		- 338	3.9									
				89.8	270.0 (292.5)	66	11.93	1.77	* 1.77	0.262	0.057	0.268
31A	31	340	0.2									
				89.6	270.0 (292.5)	66	11.93	1.80	* 1.80	0.262	0.058	0.268
32A	32	358	1.1									
				88.5	270.0 (292.5)	66	11.93	1.97	* 1.97	0.262	0.063	0.269
33A	33	361	0.9									
				87.6	270.0 (292.5)	66	11.93	2.11	* 2.11	0.262	0.068	0.270
34A	-	373	2.6									
				85.0	270.0 (292.5)	66	11.93	2.54	* 2.54	0.262	0.082	0.274
35A	-	376	2.3									
				87.3	270.0 (292.5)	66	11.93	2.16	* 2.16	0.262	0.069	0.271
36A	-	380	67.9									
				155.3	270.0 (247.5)	66	11.93	11.91	11.91	0.262	0.382	0.463
36B	-	382	58.4									
				96.9	270.0 (247.5)	66	11.93	2.88	* 2.88	0.262	0.092	0.278
37A	-	383	9.5									
				87.4	270.0 (292.5)	66	11.93	2.15	* 2.15	0.262	0.069	0.271
38A	38	388	0.1									
				87.2	270.0 (292.5)	66	11.93	2.17	* 2.17	0.262	0.070	0.271
39A	-	392	2.2									
				85.0	270.0 (292.5)	66	11.93	2.54	* 2.54	0.262	0.082	0.274
40A	-	396	2.2									
				87.2	270.0 (292.5)	66	11.93	2.18	* 2.18	0.262	0.070	0.271
41A	41	410	10.8									
				98.0	270.0 (247.5)	66	11.93	3.07	* 3.07	0.262	0.098	0.280
41B	-	411	5.5									

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	8.56	0.262	0.275	0.379
GO 95 HEAVY LOAD	0.5	6.0	0.812	0.693	1.067

NOTES:

1. HEAVY LOADING BETWEEN TOWERS
2. " * " DENOTES LESS THAN 8.5A PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL A RACK

TMS/ GMV
09/30/82

SGDE0300546

SOUTHWEST POWERLINK
IMPERIAL VALLEY TO COLORADO RIVER
DESIGN LOADS FOR 7#8 ALUMOWELD

APPROXIMATE LINE				WEATHER DATA					DESIGN DATA			
SDGE PI	MRI PI	TOWER No.	ANGLE (deg)	BEARING (deg)	BEARING (deg)	WIND (mph)	WIND (psf)	TWIND (psf)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
41B	-	411	5.5									
				105.0	270.0 (247.5)	66	11.93	4.58	* 4.58	0.262	0.147	0.300
42	34	417	16.3									
				89.5	270.0 (292.5)	66	11.93	1.83	* 1.83	0.262	0.059	0.268
43	-	460	4.7									
				84.8	270.0 (292.5)	66	11.93	2.58	* 2.58	0.262	0.083	0.275
44	-	466	0.0									
				84.8	270.0 (292.5)	66	11.93	2.58	* 2.58	0.262	0.083	0.275
45	45	472	56.7									
				28.1	270.0 (292.5)	66	11.93	11.82	11.82	0.262	0.379	0.461
50	50	478	22.2									
				50.3	270.0 (292.5)	66	11.93	9.34	9.34	0.262	0.300	0.398
51	51	479	14.9									
				65.2	247.5 (270.0)	66	11.93	2.09	* 2.09	0.262	0.067	0.270
52	52	484	23.9									
				41.3	90.0 (112.5)	66	11.93	10.69	10.69	0.262	0.343	0.431
53	53	489	21.8									
				63.2	292.5 (315.0)	65	11.57	10.44	10.44	0.262	0.335	0.425
54	54	515	18.2									
				45.0	90.0 (112.5)	65	11.57	9.88	9.88	0.262	0.317	0.411
55	55	517	19.2									
				25.9	90.0 (112.5)	65	11.57	11.53	11.53	0.262	0.370	0.453
56	56	522	62.5									
				88.3	315.0 (337.5)	70	13.42	11.72	11.72	0.262	0.376	0.458
57	57	556	43.9									
				132.3	292.5 (270.0)	65	11.57	5.24	* 5.24	0.262	0.168	0.311
58	58	562	14.8									
				117.5	292.5 (270.0)	65	11.57	2.46	* ~~2.46~~ 15.4	0.262	~~0.079~~ .494	~~0.273~~ .559
APS	-	461	51.0									

	RADIAL ICE (in)	WIND (psf)	VERT. (lb/ft)	HORIZ. (lb/ft)	RESULT. (lb/ft)
GO 95 LIGHT LOAD	0.0	8.56	0.262	0.275	0.379
GO 95 HEAVY LOAD	0.5	6.0	0.812	0.693	1.067

NOTES:

1. HEAVY LOADING BETWEEN TOWERS
2. " * " DENOTES LESS THAN 8.56 PSF WIND
3. "**" DENOTES WIRE CHANGE
4. TOWERS 999 EQUAL A RACK

TMS/ GMV
09/31/82

SGDE0300547

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for
October 21, 2007

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10/21/07	12:00:56	PM	10/21/07	12:01:52	PM	2007_10-21	jcampbel_datarequest_10-21-2007_1A5	82172	5676
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10/21/07	12:01:53	PM	10/21/07	12:02:48	PM	2007_10-21	jcampbel_datarequest_10-21-2007_1A7	82174	5678
10/21/07	12:02:34	PM	10/21/07	12:03:32	PM	2007_10-21	jcampbel_datarequest_10-21-2007_1A8	82175	5679

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10/21/07	12:03:36	PM	10/21/07	12:04:47	PM	2007_10-21	jcampbel_datarequest_10-21-2007_1AA	82177	5681
10/21/07	12:06:08	PM	10/21/07	12:07:28	PM	2007_10-21	jcampbel_datarequest_10-21-2007_1AB	82178	5682
10/21/07	12:06:08	PM	10/21/07	12:07:06	PM	2007_10-21	jcampbel_datarequest_10-21-2007_1AC	82179	5683
10/21/07	12:07:29	PM	10/21/07	12:09:50	PM	2007_10-21	jcampbel_datarequest_10-21-2007_1AD	82180	5684
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10/21/07	10:57:57	PM	10/21/07	11:01:43	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2D3	82474	5978
10/21/07	10:58:19	PM	10/21/07	10:59:10	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2D4	82475	5979
10/21/07	10:59:11	PM	10/21/07	11:01:01	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2D5	82476	5980
10/21/07	11:01:13	PM	10/21/07	11:01:38	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2D6	82477	5981
10/21/07	11:02:28	PM	10/21/07	11:02:39	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2D7	82478	5982
10/21/07	11:03:04	PM	10/21/07	11:05:42	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2D8	82479	5983

10/21/07	11:06:38	PM	10/21/07	11:06:56	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2D9	82480	5984
10/21/07	11:20:23	PM	10/21/07	11:20:39	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2DA	82481	5985
10/21/07	11:27:01	PM	10/21/07	11:27:33	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2DB	82482	5986
10/21/07	11:28:00	PM	10/21/07	11:31:16	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2DC	82483	5987
10/21/07	11:46:16	PM	10/21/07	11:46:32	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2DD	82484	5988
10/21/07	11:46:32	PM	10/21/07	11:47:20	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2DE	82485	5989
10/21/07	11:48:37	PM	10/21/07	11:50:13	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2DF	82486	5990
10/21/07	11:55:21	PM	10/21/07	11:56:02	PM	2007_10-21	jcampbel_datarequest_10-21-2007_2E0	82487	5991

SDGE0246773

Please see attached audio CD for SDG&E Control Center Audio Recordings (13 files).

SDGE

A Sempra Energy utility®

Vegetation Management Program

Tree Pre-inspection Procedures

May 2007

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San Diego Gas and Electric Company
Vegetation Management Contacts

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Section 1: Introduction

Overview

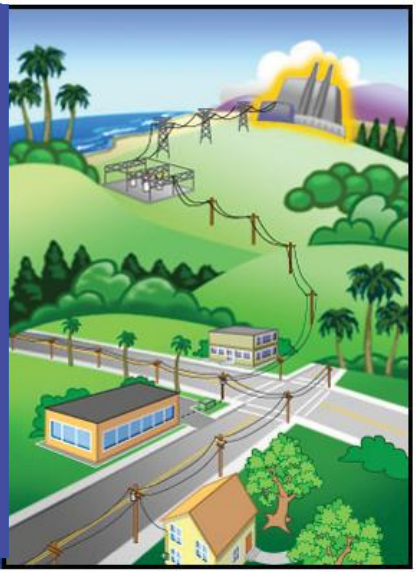
The Vegetation Management Department's role within San Diego Gas and Electric Company (SDG&E) involves identifying, recording, and managing an inventory of vegetation within SDG&E's service territory. The main purpose of this inventory is to ensure vegetation does not encroach within the required minimum clearance zones mandated by the California Public Utilities Commission (CPUC), and other applicable laws and regulations. Maintaining an accurate database helps to ensure safe, reliable, and cost-effective service to SDG&E customers. The entire SDG&E service area is sub-divided into 133 Vegetation Management Areas known as VMAs. Each VMA is given a unique three-digit number identifying its location within the service area.
This guide is a supplement to the GFMS – MDT User Guide.

Pre-inspection accuracy is critical to the effectiveness of SDG&E's Vegetation Management Program. High quality pre-inspection ensures adherence to the Vegetation Management Master Schedule and compliance requirements, and improves the pruning contractors' ability to work efficiently and productively. If the pre-inspection contractor performance is below SDG&E's standards, the pre-inspector contractor may be required to re-inspect a VMA, spending additional time and resources at the contractor's expense to make the necessary corrections.

Missed trees puts both the pre-inspection contractor and SDG&E at risk for compliance infractions, fires, safety issues, tree caused outages, and delays to schedule. Over-listing can result in unnecessary pruning, additional costs to SDG&E, and increased customer complaints and refusals. The pruning contractor relies on a forecasted number of trees to be worked and adjusts their resource levels accordingly.

How is Electricity generated and delivered to your home?

- Generation
- Transmission Lines
- Substations
- Distribution Lines



How does it work?

GENERATING STATIONS or power plants are where electricity is produced by utilizing resources such as natural gas, the sun, wind and steam heat from within the earth. With the use of magnets on a spinning shaft, mechanical energy is converted to electrical energy.

TRANSMISSION LINES are the "energy superhighways" of an electric system, carrying large amounts of electricity from power plants over long distances and at very high voltages – typically 69,000 to 500,000 volts. SDG&E has over 1,800 miles of transmission lines in its service territory, but has only two connections to the state's electric grid.

SUBSTATIONS are specialized equipment to reduce or "step down" transmission line voltage and connect high voltage transmission lines to lower voltage distribution lines. SDG&E currently operates more than 200 substations.

DISTRIBUTION LINES are the "local streets" that deliver electricity directly to homes and businesses. SDG&E operates over 15,000 miles of distribution lines.

Vegetation Management Definitions

Area Forester: SDG&E individual responsible for managing the tree contractor and the scheduled work completion and compliance of each VMA in his or her territory.

Bubble Sheet: A “machine-readable” form used by the tree contractor to document the completion status of each tree that has been assigned in a Work Release.

Cal Fire: (Previously known as California Department of Forestry and Fire Protection, CDF): State fire agency responsible for fire suppression in the State Responsibility Area, and enacting and regulating state forest practice rules.

California Public Utilities Commission (CPUC): The governing body that regulates the business practices of utilities throughout the state of California.

Canned Comment: Standard, pre-defined wording found in selected tree notes that are used to clarify work requirements. Canned comments are not to be altered except when required for date and initials.

Clearance: Measurement, typically in units of feet and inches, of the closest distance between vegetation and an energized overhead electric conductor.

Clustering: Using one icon for multiple trees sharing the same characteristics (DBH, height, species, clearance, etc) when the amount of trees in a span makes it impractical to have all trees as individual icons.

Conductor: Path through which an electric current flows, metal wire or cable.

Crown Reduction: Reducing the height of a tree under the powerlines in order to comply with minimum clearance regulations.

Customer: Person or entity who is a customer of SDG&E who either owns, manages, or occupies the property upon which work is to be performed.

Customer Notification: Notice to SDG&E customers prior to the commencement of scheduled work.

Customer Refusal: Property owner refusing SDG&E or representative contractor access to property for purposes of inspection, or from performing pruning to maintain required clearances for the duration of the pruning cycle.

Cycle (Pre-inspection): The twelve month period of time between scheduled inspections of the same VMA.

Cycle Busters: Trees that are very fast growing and do not hold compliance for the complete VMA cycle.

Deleted Tree: A tree or brush that does not meet inventory specifications or does not physically exist in the field and is removed from the inventory (VMS).

Diameter at Breast Height (DBH): Measurement of a tree's diameter in inches, taken at 4 ½ feet above ground level. Trees existing on a slope are measured from the upslope side of the tree.

Dispatch Order: A subset of a work release. A specific group of tree and pole brush records to be updated.

Environmentally Sensitive Area (ESA). An area that contains or provides habitat for sensitive, threatened, or endangered species, or encompasses a protected cultural resource. May require an evaluation by a biologist or archaeologist to determine if any work restrictions apply.

Exception Tree: Tree issued to pruning contractor whose completion is delayed due to uncontrollable circumstances such as environmental restriction, property access, etc.

File Upload: The process of connecting an MDT unit to a phone cable connection to transfer files from the unit to the SDG&E server.

General Order 95, Rule 35 (GO 95, Rule 35): Mandate set forth by the California Public Utilities Commission requiring a minimum clearance between vegetation and overhead high voltage conductors. Requirement applies year round in SDG&E territory.

Geographic Facilities Mapping System (GFMS): The mapping, facilities management, and geographic information system used by SDG&E to manage aspects of its operations including vegetation management and planning.

Geonet: The *Windows*-version mapping application installed on the MDT that uses GFMS.

Icon: A symbol used in the MDT computer to represent an inventory tree.

Institute of Electrical and Electronics Engineers (IEEE): Professional association of engineers, scientists and professionals for the advancement of technology.

Inventory Brush: Vegetation with a DBH of less than three (3) inches that has the potential to encroach within the applicable minimum clearance to overhead conductors, or otherwise poses a potential threat to SDG&E

facilities, within 3 years from date of inspection.

Inventory Tree: Vegetation with a DBH of three (3) inches or greater that has the potential to encroach within the minimum clearance requirements of overhead conductors, or otherwise poses a potential threat to SDG&E facilities, within 3 years from date of inspection.

Local Responsibility Area (LRA): Urban areas of California where the local fire agency has the primary responsibility of fire suppression. GO 95, Rule 35 clearance requirements apply.

Major Woody Stem (MWS): Tree trunk (minimum 10 inches diameter at breast height) or tree limb (minimum 6 inches diameter) with less than 18 inches but greater than 6 inches from distribution voltage conductor, with sufficient strength and vigor to be exempt from G.O. 95, Rule 35 and PRC 4293 clearance requirements.

Matrix Address: a fictitious property address used for properties that have no posted street address number.

MDT Refresh: The process of updating vegetation data and graphics files on a desk top computer or MDT unit.

Memo Tree: Tree that is pruned outside routine schedule because it poses an accelerated threat to the high voltage electrical facilities (i.e. closer than minimum clearance requirements). Memos are classified as same day, next day, or grouped.

Mobil Data Terminal (MDT): The tablet PC used by pre-inspectors to update information in the GFMS.

Months to Next Trim: Estimated months it will take a tree to grow out of compliance. Consider species, growth rate, conditions, irrigation.

North American Reliability Council (NERC): Group of regional reliability councils formed to ensure the bulk electric systems that serve North America are adequate, reliable, and secure.

Ownership Type: The person or entity who owns the property where the tree exists.

Pole Number: The unique number assigned to any electrical pole or tower in SDG&E's service area.

Pre-inspector (PI): Contract individual responsible for field inspection of SDG&E tree and pole inventory, and updating data to reflect current conditions for the purpose of ensuring compliance with all applicable laws and regulations.

Primary Conductor: A conductor with a voltage between 2,400 volts (2.4kV) and 12,000 volts (12kV).

Property Owner: The person or entity who holds title to a property as recognized by the county.

Public Resource Code 4292: Requires 10 feet radial horizontal ground clearance of all flammable vegetation from the outer circumference of poles carrying non-exempt electrical hardware. Also requires a vertical clearance of 8 feet of all vegetation, and the removal of all dead and dying vegetation from ground level to top of pole.

Public Resource Code 4293: Minimum clearance requirement between all vegetation and high voltage electrical conductors in the SRA. Minimum clearances are:

- For any line operating at 2,400 to 72,000 volts, 4 feet
- For any line operating at 72,000 to 110,000 volts, 6 feet
- For any line operating at 110,000 or more volts, 10 feet

Qualified Line Clearance Arborist: Individual who has successfully completed the Line Clearance Arborist OSHA training for working on trees near high voltage equipment.

Reliability Tree: Any tree, located inside or outside the utility right of way, that has a reasonably good potential for interrupting service to an overhead circuit (excluding secondary) with the current routine cycle.

Removal: Vegetation (brush or tree) that is cut to ground level and all brush less than 3" diameter removed from site. Re-sprouting species are treated with an approved herbicide.

Secondary Distribution: Low voltage (0-750 volt) circuit between transformer and point of use.

Service Drop: Portion of the powerline from the secondary distribution line to the point of use (between pole and house).

Side Trim: Term for type of pruning conducted on a tree whose crown is predominately above the powerlines.

Span: The space between two power poles connected by powerlines.

Stand Alone: When only one type of voltage exists on a power pole (transmission, primary, or secondary).

State Responsibility Area (SRA). Designated areas of California where Cal Fire (CDF) has the primary responsibility of fire suppression. Public Resource Codes 4292 and 4293 and GO 95, Rule 35 clearance requirements apply.

Status Code: Identifies the current work status of an inventory tree (i.e., AT = assigned to contractor for pruning or removal, LC = listed clear and requires no pruning for cycle, LT = listed for pruning for cycle, PR = pending removal, RF = refusal, CT= completed pruning, RM = tree

removed, GR = grouped reliability, CJ = palm removals assigned to contractor *Connie Jo Services*, XT = exception).

Vegetation Management System (VMS): SDG&E computer software and hardware used to track, dispatch, and manage wrork.

Work Release: A function of the Vegetation Management System which allows dispatch orders to be created for work activities.

VMS

The Vegetation Management System (VMS) is a software application designed to record various layers of tree data and graphic images within a dynamic inventory of vegetation having the potential to grow into or fall into SDG&E electric power lines and facilities. VMS requires regular updates to maintain accuracy because trees continually grow and encroach the minimum clearance zones of overhead power lines. Trees also decline and die, and are removed by others. The VMS inventory needs to reflect these changes. The purpose of pre-inspection is to identify vegetation that requires pruning or removal in order to ensure compliance, and to maintain an accurate inventory of trees.

Rules and Regulations regarding Utility Vegetation Management

Two state laws pertaining to utilities and vegetation form the foundation of SDG&E's compliance efforts: 1) CPUC G.O. 95, Rule 35, and 2) Public Resource Code 4293.

California Public Utilities Commission (CPUC) General Order 95, Rule 35 requires an 18 inch radial clearance of all vegetation be maintained around conductors between 750 and 22,500 volts. The clearance requirements increase as the voltage increases. **GO 95, Rule 35 applies to the entire SDG&E territory year round**. (See *Table 1* for transmission clearance requirements). In VMAs where the **second digit** of the VMA number is 4 or less, only GO 95, Rule 35 applies (examples: VMA 2**1**0 or 2**2**0).

In the State Responsibility Areas where Cal Fire (CDF) is responsible for fire suppression, Public Resource Code (PRC), section 4293 requires that a 4 foot radial clearance be maintained for conductors between 2,400 and 72,000 volts. Clearance requirements increase as the voltage increases. Refer to the *CDF Power line Fire Prevention Manual* for additional information. The VMAs where PRC 4293 applies are identified with a **second digit** number of 5 or greater (examples: VMA 4**5**3 or 4**6**3 or 3**7**5). The exception is VMA 552 which is treated as LRA.

Additionally, the Federal Energy Regulatory Commission (FERC) requires specific minimum vegetation clearances for all overhead transmission circuits

energized at 230kV or higher, and any lower voltage transmission circuits determined by the Regional Reliability Organization (RRO) to be critical to the reliability of the region.

Refer to the Vegetation Management *Pole Brush Pre-Inspection Guidelines* for information and procedures regarding Public Resource Code 4292, pole brushing requirements.

Routine Pre-inspection

The purpose of routine pre-inspection is to identify vegetation for pruning or removal that will not maintain required clearances for a full cycle (fourteen months). Any tree that could possibly encroach non-compliant clearances within fourteen months should be flagged for pruning (LT).

It is required on a routine pre-inspection that every span of overhead conductors and all vegetation within each span be accurately surveyed and all inventory records updated. This includes transmission, primary, and open wire stand alone secondary conductors (not to include house/service drops or triplex secondary lines). Factors to consider when determining if a tree requires pruning for cycle include current clearance from facilities, tree species, potential tree growth rate, past pruning practices, site conditions, wind sway of trees and wire, wire sag, conductor voltage, and VMA location (LRA vs. SRA).

Environmentally Sensitive Areas (ESA)

The unique geography and climate of San Diego County combine to provide a rich diversity of flora and fauna species, including several that are threatened or endangered under state and/or federal law. SDG&E is committed to complying with all applicable environmental regulations. SDG&E's Subregional Natural Community Conservation Plan was implemented to avoid or minimize potential impacts or threats to sensitive species. The Plan, also referred to as the 50-Year Permit follows a comprehensive habitat approach to species protection while allowing the utility to provide and expand service to its customers, and to meet its regulatory responsibilities.

Procedures developed between SDG&E and state and federal wildlife agencies serve to ensure Vegetation Management activities follow applicable protocol. In designated environmentally sensitive areas of the service territory SDG&E schedules routine pruning and brushing activities outside the breeding season (March 1 - September 1) of protected bird species. Disturbance related to tree pruning and pole brushing activities is also avoided at protected cultural resource areas such as archaeological sites.

Clearance Requirements

Table 1: Bare Minimum Year-Round Radial Clearances Requirements for Trees and Energized Conductors
The clearances shown are to be maintained year round and in all weather conditions (during storms, high winds, and extreme temperatures both hot and cold which can cause power lines to sag).

Conductor Voltage	PRC 4293 (SRA)	CPUC General Order 95, Rule 35 (LRA)	*NERC FAC-003-1 (IEEE 516-2003)
500kV	10.0 ft	9.7 ft	14.7 ft
230kV	10.0 ft	2.7 ft	5.1 ft
138kV	10.0 ft	1.9 ft	2.9 ft
69kV	4.0 ft	1.5 ft	N/A
12kV	4.0 ft	1.5 ft	N/A
4.0kV	4.0 ft	1.5 ft	N/A
2.4kV	4.0 ft	1.5 ft	N/A
<750V	No strain or abrasion	No strain or abrasion	N/A

*NERC FAC-003-1 applies to transmission lines operated at 200kV and above or any lower voltage lines designated by the RRO (Regional Reliability Organization) as critical to the reliability of the electricity system in the region.

Vegetation Management Cycle

The VM cycle is the annual timeframe within the vegetation management master schedule that includes pre-inspection, pre-inspection auditing, pruning, and post-prune auditing activities. One cycle is defined as the time between two consecutive pre-inspections in the same VMA.

- Pre-inspection of a VMA is completed in a 30 day timeframe within the schedule.
- Pre-inspection audit is conducted the first month after the scheduled completion of pre-inspection.
- Pruning commences two months after pre-inspection. Pruning contractor has a 65-calendar day timeframe to complete all assigned work and to certify VMA per contract specifications.
- Post prune audit commences the first month after the scheduled completion of pruning. All trees pruned must maintain the required minimum clearance in *Table 1* above for a period of 12 months after completion.

Table 2: VMA Cycle – Example of the activity cycle for VMAs pre-inspected in the month of January. Master schedule includes approximately 10-12 VMAs per month.

	Activity	Start	Finish
1	Pre-inspection	01/01/2007	02/01/2007
2	Pre-inspection Audit	02/08/2007	02/28/2007
3	Routine Pruning	03/01/2007	05/01/2007
4	Pruning Audit	05/08/2007	05/31/2007
5	Pruning Compliance Cycle	03/01/2007	02/28/2008

Table 3.1 and 3.2: Clearances and Tree Growth Rates - Use the following clearances as a guideline when determining whether to list a tree for pruning in LRA and SRA. Note: Tree growth rates are averages per year.

Table 3.1: Clearance Guidelines for listing in LRA

Tree Growth Rate per year	Open wire 2ndary	Primary	Transmission			
	up to 750 volts	up to 12kV	69kV	138kV	230kV	500kV
Very Fast = 6 ft & greater	2 ft or less	10 ft or less	12 ft or less	14 ft or less	20 ft or less	30 ft or less
Fast = 4 to 6 ft	2 ft or less	8 ft or less	10 ft or less	12 ft or less	20 ft or less	30 ft or less
Medium = 2 to 4 ft	in contact	6 ft or less	8 feet or less	10 ft or less	18 ft or less	25 ft or less
Slow = 0 to 2 ft	in contact	4 ft or less	8 feet or less	10 ft or less	18 ft or less	25 ft or less

Table 3.2: Clearance Guidelines for listing in SRA

Tree Growth Rate per year	Open wire 2ndary	Primary	Transmission			
	up to 750 volts	up to 12kV	69kV	138kV	230kV	500kV
Very Fast = 6 ft & greater	2 ft or less	12 ft or less	14 ft or less	16 ft or less	20 ft or less	30 ft or less
Fast = 4 to 6 ft	2 ft or less	10 ft or less	12 ft or less	16 ft or less	20 ft or less	30 ft or less
Medium = 2 to 4 ft	in contact	8 ft or less	10 ft or less	14 ft or less	18 ft or less	25 ft or less
Slow = 0 to 2 ft	in contact	6 ft or less	10 ft or less	12 ft or less	18 ft or less	25 ft or less

Pre-inspector should always consider the individual tree (not just the species in general) when determining whether to list a tree for pruning.

Clearances are to be measured from the closest point of the tree to the closest "high voltage" line. Clearances to secondary voltage shall only be used when the construction is stand-alone pole to pole.

Table 4: Minimum Radial Clearance Requirements – Post pruning clearances to be established at time of pruning.

SRA and LRA	Open wire 2ndary	Primary	Transmission			
Tree Growth rate per year	**up to 750 volts**	**up to 12kV**	**69kV**	**138kV**	**230kV**	**500kV**
Very Fast = 6 ft & greater	**4 feet**	**10 feet**	**20 feet**	**25 feet**	**30 feet**	**35 feet**
Fast = 4 to 6 ft	**4 feet**	**10 feet**	**15 feet**	**20 feet**	**25 feet**	**35 feet**
Medium = 2 to 4 ft	**4 feet**	**10 feet**	**15 feet**	**20 feet**	**25 feet**	**35 feet**
Slow = 0 to 2 ft	**4 feet**	**10 feet**	**15 feet**	**20 feet**	**25 feet**	**30 feet**

Figure 1: Powerline Facilities
Error! Objects cannot be created from editing field codes.

Typically, only high-voltage (distribution and transmission) overhead powerlines are cleared of vegetation. These lines are found on the highest position of power poles. The words "*High Voltage*" are marked on poles or cross-arms carrying conductors greater than secondary voltage.

Trees growing near open wire secondary voltage wire running pole to pole shall be added to the inventory and listed for pruning if they have the potential to contact the secondary lines within 14 months of pre-inspection date (See *Table 3* for specific criteria based on growth rate and clearance.

Trees growing adjacent to service drop wires running pole to house are the responsibility of the customer. Although SDG&E does not typically clear vegetation near service drops, the customer must hire a qualified third-party contractor to safely complete the work; or alternately, contact SDG&E to reroute the line in a clear path through the tree(s).

Key steps to follow during routine Pre-inspection

- Verify you have all materials required to perform pre-inspection (open dispatch order, VMA map, field reports, forms, highlighters, flagging tape, white tree paint and Vegetation Management Department contact numbers.
- Inspect every span of all required overhead electrical power lines in a VMA.
- Open and edit every record and verify that all data fields are accurate.
- Add new or missed trees that meet the criteria for inventory tree as needed.
- Trees in the current inventory that do not meet the criteria shall be noted with the proper comments and removed from the inventory.
- Place a markup symbol on the tree icon after update to help track progress.
- Pursue removals of fast growing and memo trees.
- Fully document all refusals. Trees that are refused and non-compliant are to be reported immediately to the Pre-Inspection Supervisor.
- Document memos according to procedure (see *Memo procedures* page 35).
- Carefully inspect for reliability issues. A reliability tree may or may not be in the inventory. If a reliability tree requires immediate attention notify your Lead,

otherwise record and update the record as needed (see *Reliability Trees* page 30).

- Highlight hard copy of VMA map as you pre-inspect daily.
  -Use different color for each day
  -Include dates
  -On VMA's with multiple pre-inspectors, record pole numbers on map indicating the boundary between inspection areas.
- Communicate with Leads and Foresters.
- Report your start and end locations by phone daily to your Leads.
- Upload data daily before 6:45pm.

Non-SDG&E Facilities
Certain facilities, such as some government-owned military properties, are not maintained by SDG&E and are not reflected on VMA or GFMS maps. Special criteria are to be followed concerning these properties. Call your Supervisor or Lead if you are unsure of facility ownership. Private meters on power poles and conductors beyond the meter are the responsibility of the customer. SDG&E is not responsible for the inspection and maintenance of these lines.

Section 2: Inventory Criteria

Tree Inventory and Voltage
A tree/brush unit will be created when it meets one or more of the following conditions:

- All High Voltage (750 volts or greater): Trees that are dead or in decline and have the potential of interrupting electrical service within the current routine cycle (Reliability trees).

- All High Voltage (750 volts or greater): Green trees with indications of structural defects that have the potential of interrupting electrical service within the current routine cycle (Green Reliability trees).

- Transmission Voltage: Tree or brush is or has the potential to grow or otherwise encroach the minimum clearances required within three years of inspection date (refer to *Table 1*).

- Primary Voltage: Tree or brush is or has the potential to grow or otherwise encroach the minimum clearances required within three years of

inspection date (refer to *Table 1*).

- Stand Alone Open-Wire Secondary: Tree or brush is or will be in contact with stand-alone open wire secondary conductors within 14 months of pre-inspection date. Trees shall only be added to the system for stand alone secondary when they are listed for pruning (see *Table 3*).

- Tree or brush has branches that directly overhang conductors of 2400 volts or greater regardless of the clearance above the conductor.

The following trees/brush shall <u>not</u> be included in the tree inventory:

- trees/brush encroaching service drops only (pole to house)
- trees/brush encroaching triplex secondary (pole to pole)
- trees/brush affecting telephone or cable TV facilities.

<u>Palms</u>

To minimize the occurrence of outages during high wind conditions, palms with dead fronds and/or seed pods shall be flagged for pruning if they meet the following criteria:

- on transmission conductors and primary/mainline feeders (minimum of three wires), dead palm skirts and all seed pods will be flagged for pruning when the head of the palm is above the conductors and the trunk is within 15 feet

- palms growing above and within 15 feet of single phase primary (two wires) where the conductors have less than 3 feet of separation

- palms growing above and within 15 feet of primary where the conductors are strung vertically

- specific construction conditions (i.e., corner pole, closely-spaced underbuilt, high voltage connection wire between conductor and transformer [jumper]). Contact Lead for specific instructions.

Palms that are farther than 15 feet from the lines should not be flagged for pruning or reliability and should not be in VMS unless otherwise specified by the Area Forester.

If there is an existing icon for a palm over 15 feet to the side of the lines select the drop down comment – "***Remove from Inv-doesn't meet Inv specs*****".**

Palm skirts (circumference of dead fronds around the trunk) should only be flagged for pruning for open wire secondary if they are in contact with the conductors. If you feel you have a special situation, call your Lead.

<u>Trees that do not meet VMS inventory requirements and should be</u>

removed from the system include:

- trees where overhead facilities have been removed or rerouted
- trees removed by property owner
- trees that do not exist in the field
- trees that do not have the potential to encroach the minimum clearance requirement, or otherwise affect the facilities within 3 years of inspection date

Note: Pre-inspectors are NOT to delete trees

A tree is removed from the inventory in the MDT in the Tree Tab under *Misc Tree Comments* using the following canned comment criteria:

- *Remove from Inv - tree has been removed*
- *Remove from Inv - doesn't meet Inv specs*
- *Remove from Inv - tree not found*
- *Remove from Inv - grouped trees to clean map*

If a tree has been removed in the field, do not reuse the icon or tree ID. Each tree ID represents a specific tree which has a history that needs to be retained. It is very important to keep the information in VMS accurate.

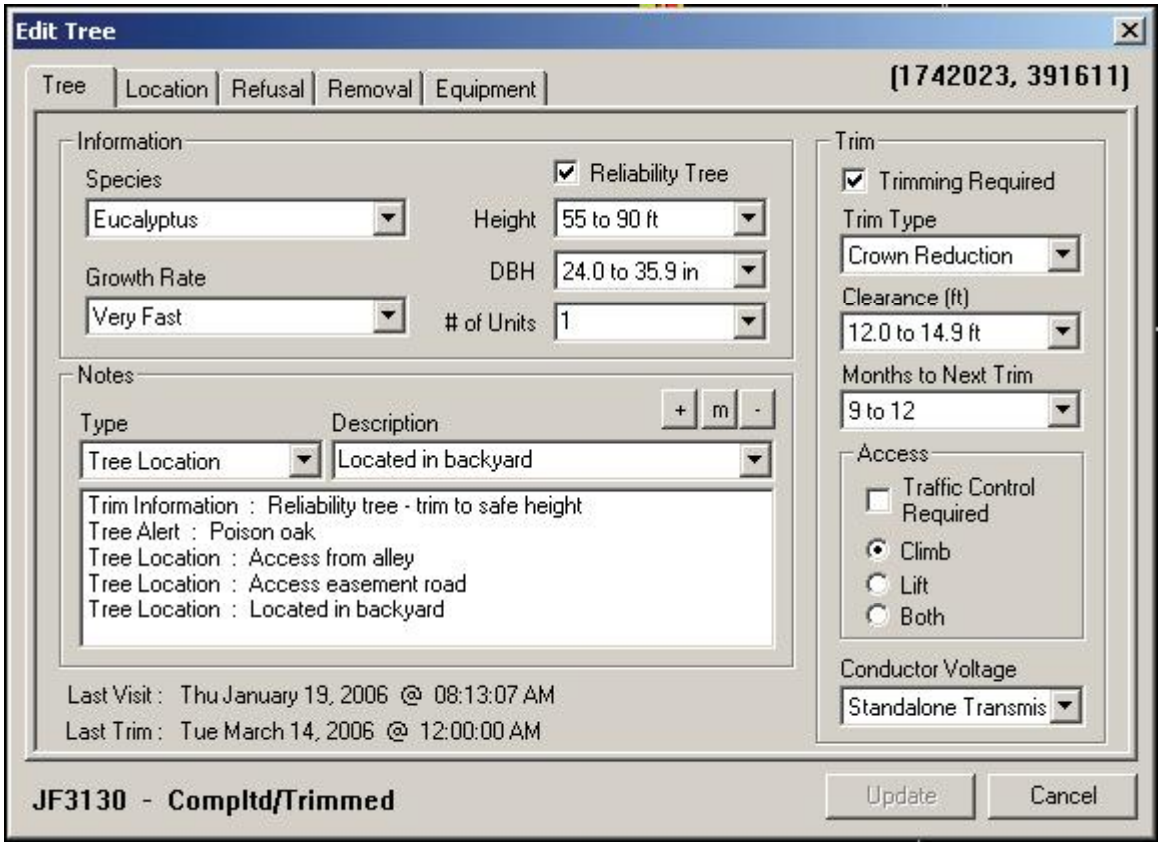
example: If GFMS shows a fan palm icon and the fan palm no longer exists in the field, do not use this icon/ID# to represent an ash tree you need to add to the system.

Maintaining Data in VMS

The pre-inspector is required to update all fields in VMS during each inspection cycle. It is critical to verify the accuracy of all fields before updating. Once you update a record you are responsible for its accuracy. The record will be recorded with the date, time, and MDT crew ID for history. The information contained in the record is very important. It will be used to identify work required for the cycle, for forecasting work in the future, and may be used for reporting to regulators monitoring compliance. If you have any questions or need clarification, contact your Lead.

Section 3: Tree Tab Information

Figure 2: Tree Tab in GFMS Record



Species

Use the drop down menu to select the correct tree species. If you are unsure of the species contact your Lead for assistance. If unsure you can temporarily enter the species by growth rate type (*very fast, fast, medium* or *slow*). See page 46 for individual species and growth rates.

Growth Rate

Each tree species has an assigned growth rate to be used as a guideline. The assigned growth rate should be changed when appropriate.

Table 5: Growth Rates

Very Fast	Over 6 feet/year
Fast	4-6 feet/year
Medium	2-4 feet/year
Slow	Less than 2 feet/year

The pre-inspector should select the rate that best reflects growth of the individual tree. Some factors to consider when determining if a change in growth rate is warranted include:

- **less growth** due to stress from drought or lack of irrigation, tree in decline, or planted in a location with poor soil

- **more growth** due to irrigation, good soil, cultural practices (i.e., heavy pruning, fertilization)

Example:

- Very fast grower: ex. eucalyptus: (6-8 feet per year x 3 years = (18-24 feet)

- Fast grower: ex. silk oak: (4-6 feet per year x 3 years = (12-18 feet)

- Medium grower: ex. California pepper (2-4 feet per year x 3 years = (6-12 feet)

- Slow grower; ex. Magnolia (0-2 feet per year x 3 years = up to 6 feet)

Note: Palms are considered “fast growers” when the heart begins to encroach the minimum required clearances near conductors. The upward trunk growth is relatively slow, averaging 1 to 2 feet per year. Once the heart of a palm is in close proximity to the conductor, however, the quick generation of leaves (fronds) will require the palm be pruned frequently or removed.

Height

Enter the range in the drop down menu that most accurately reflects the tree’s height. Accuracy in height can help the tree contractor in the field identify the correct tree to prune.

Diameter at Breast Height (DBH)

The trunk of a tree grows incrementally in girth. The DBH of each inventory tree shall be updated as necessary each inspection cycle. Measurement is to be taken using a DBH tape four feet six inches above ground level. If the tree is located on a slope, take the measurement from the upslope side of the tree. Select the correct range in the drop down field.

Units

It is essential that the number of inventory units represent actual field conditions. Unit counts need to be updated each inspection cycle because of trees removed and planted, or previous pre-inspection inaccuracies.

The number of units each icon represents is always one (1) unless the tree/brush density within the span is so high that accurate placement of graphics is not practical. If density is so high that you must cluster tree/brush icons, always use the fewest number of units possible.

The criteria for clustering trees is as follows:

- Trees must share the same species, DBH, clearance, and height range, and pruning type.

- Trees must not cross property boundaries.

- Trees must be located within the same span.

- Property or tree notes must pertain to every tree in the cluster.

- Multiple trunk trees can be clustered as long as they meet all of the requirements above.

To determine whether to list a tree as one unit or multiple units, visually inspect the base. If the trunks appear to originate from one main root system, list as one tree with multiple trunks.

If a group of trees does not meet the cluster requirements above, separate the graphics accordingly. For example, if a group of eucalyptus trees previously clustered as one unit now includes one tree with 2.1-4 feet clearance and three trees with 8-9.9 feet clearance, use the original tree icon for the tree with 2.1-4 feet clearance and change units to one. Create a new three unit icon for the trees with 8-9.9 feet clearance.

Note: Despite appearance, palms do not have multiple trunks. Palms (monocotyledons) that grow in clusters shall be counted as individual units. The exception to this is palm brush removals (see *Palm Removals* page 39).

Brush Units

Inventory trees with a DBH of less than 3 inches are considered part of a brush unit. This includes a multi-trunk tree (either from one common root or a cut stump) where no single stem is larger than 3 inches. One brush unit equals a 25 square foot pruning area (5ft x 5ft) (*i.e. 100 square feet of bamboo equals 4 brush units).* Brush units are estimated by the canopy area that requires pruning, not the square footage on the ground.

Bamboo*:* ("Brush 5ft x 5ft Bamboo") Regardless of the diameter of the bamboo, record as brush.

Palm: ("Brush 5ft x 5ft palm") Includes any palm species whose height is less than 5 feet measured from ground to the heart of the palm. Note: Brush palm records should only be added to the inventory if they are to be removed (see *Palm Removals* page 39).

Sapling*:* Special consideration is given to species with fast growth rates. A sapling is defined as a single stem whose DBH is less than 3 inches. Six saplings of the same species within one span comprise one brush unit. In the Tree Notes specify number of saplings. Note the quantity and brush

species in the system using the Misc Tree Comments in the Tree Tab under the Type drop down menu (ex. *six eucalyptus saplings*).

Figure 3: Brush Unit – Eucalyptus brush originating from old cut stump (each stem < 3"). In this example the unit count would be based on the total square foot area to be pruned or removed, not the total number of individual stems.

Use the appropriate brush code based on growth rate. For instance, a Melaleuca with a DBH of less than three (3) inches would be listed as "Brush Fast 5ftx5ft".

Brush unit categories:

- Brush Very Fast 5ftx5ft
- Brush Fast 5ftx5ft
- Brush Med 5ftx5ft
- Brush Slow 5ftx5ft
- Brush 5ftx5ft Bamboo
- Brush Fast 5ftx5ft Palm

Trimming Required

Trees that require pruning must have the Trimming Required box checked. Pre-inspector shall determine whether a tree is to be pruned within the 14 month

specification based on VMA (LRA vs. SRA), tree species, current clearance, growth rate, last prune date, conductor voltage, and previous pruning clearance obtained. Checking the Trimming Required box will update the status of the tree to LT (listed for trim).

Trim Type

Pre-inspector must select a trim type when a tree is listed to be pruned. Select the appropriate type based on which portion of the tree requires pruning relative to its position with the conductors. Trees to the side whose canopy is predominately above the lines shall be identified as "side trim". Trees whose canopy is predominately below the lines shall be identified as "crown reduction". Select "removal" for trees to be removed. Do not use any other trim type in the drop down unless directed to do so by your supervisor.

Clearance

Clearance is the estimated distance in feet between the overhead electrical conductors and the closest portion of the tree or brush. When determining clearance, always use the most conservative range. For instance, if a tree is 4 feet from the primary, select *2.1 to 4*, versus *4.1 to 5.9* ft. Remember, the tree will continue to grow and the clearance will decrease from the date of inspection.

Months to Next Trim

Use this field to estimate how many months will elapse before the tree grows out of compliance. Months to next trim does not indicate the length of time before the tree will be pruned. Months to next trim serves two purposes; 1) allows SDG&E to monitor compliance, and 2) helps forecast future workload. Some factors when considering months to next trim:

- species and potential growth rate
- last pruning and inspection date
- clearance obtained at last pruning or clearance listed during last inspection
- amount of regrowth since last prune or pre-inspection
- local site conditions, water availability
- overall health of tree

Trim Status Code Definition

- AT Assigned to Trimmers *(contact supervisor before updating)*
- CJ Connie Jo *(contact Help Desk before updating)*
- CT Completed Trim *(update as required)*
- GR Group Reliability *(contact supervisor before updating)*
- LC Listed & Clear *(update as required)*
- LR Limited Refusal *(contact Forester)*
- LT Listed & Requires Trim *(contact supervisor before updating)*
- PR Pending Removal *(contact Help Desk before updating)*
- RF Refused *(contact Forester)*

- RM Removed *(contact supervisor before updating)*
- XT Exception *(contact supervisor before updating)*

Tree Crew Access

Provide the pruning contractor the best access route to the tree. It is important that the pre-inspector pay close attention when entering and leaving a property. Remember that the contractor will be driving a large lift truck and towing a chipper. Look for anything that may restrict a crew's ability to enter or leave a property. Take into consideration heavy erosion, soft sand, saturated soil, steep grade, concrete driveways, etc. If flagging or lane closure is required to safely complete the pruning, select the **"Traffic Control Required"** box in the Tree Tab.

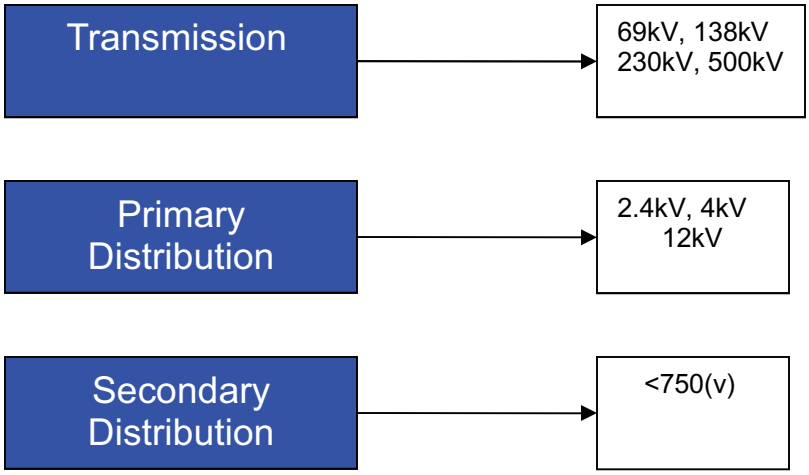
Select "Climb" if the contractor will encounter any of the following:

- narrow gates or narrow drives with no turnaround
- low tree limb or signs that overhang entry points
- bridges – some are not passable due to vehicle weight
- customer restriction of truck access

Select "Both" if the contractor's route to the tree is not impeded by any obstructions but the tree is too tall, too wide, or partially obstructed for the lift to work the entire portion of the tree.

Select "Lift" if there is no access restriction or obstruction to the portion of the tree that requires work.

Figure 4: Conductor Voltage



Underbuilt Construction Guidelines

Transmission with no other conductors on pole or towers:

- select Standalone Transmission in Conductor Voltage

Transmission with primary underbuilt:

- If the tree requires pruning for both transmission and primary conductors
    1. Select Transmission in Conductor Voltage
    2. List Clearance in relation to the transmission

- If the tree requires pruning for primary underbuilt only
    1. Select Primary in Conductor Voltage
    2. List Clearance in relation to the primary conductors

Transmission with open wire secondary underbuilt:

- If the tree requires pruning for both transmission and secondary conductors
    1. Select Transmission in Conductor Voltage
    2. List Clearance in relation to the transmission
    3. List Months to Next Trim in relation to the transmission

- If the tree requires pruning for the secondary conductors ***only***

    1. Select Transmission in Conductor Voltage
    2. List Clearance in relation to the transmission
    3. Select *Open 2ndary underbuilt-reqs trimming*

Primary distribution with open wire secondary underbuilt:

- If the tree requires pruning for both distribution and secondary conductors
    1. Select Primary in Conductor Voltage
    2. List Clearance in relation to the primary conductors
    3. List Months to Next Trim in relation to the primary conductors

Primary distribution with open wire secondary underbuilt:

- If the tree requires pruning for the secondary conductors ***only***
    1. Select Primary in Conductor Voltage
    2. List Clearance in relation to the primary conductors
    3. List Months to Next Trim in relation to the primary conductors
    4. Select ***Open 2ndary underbuilt-reqs trimming*** in the Tree Tab, under the Trim Information pull down menu

Note: The canned comment *Open 2ndary underbuilt-reqs trimming* is only to be used where open wire secondary requires pruning **and** the distribution and/or transmission overbuilt ***does not*** require pruning for the cycle.

Tree Tab Notes

Tree tab notes are specific to the tree and are not copied to all records listed with the same property. It is important that the pre-inspector update tree notes for all records during each inspection. Notes originating from a previous inspection may no longer apply, or may require updating. If notes are no longer accurate, the pre-inspector should remove them.

Example:

- Trim Information drop down states "*Overhang requires trim*". If the tree has been cleared of all overhangs the comment should be removed.
- Tree Alert drop down states "*Poison oak*". If the poison oak is no longer an issue the comment should be removed.

Work Requirements

The following conditions are considered part of routine pruning maintenance. Additional canned or miscellaneous comments may need to be added by the pre-inspector to the tree record using the pull down menus.

Direct Overhang

As a general rule, all inventory trees that have limbs directly overhanging the vertical ground to sky plane above primary distribution and transmission conductors shall be listed for pruning. Use the canned comment, "*Remove direct overhang*". An exception to this rule would be when a customer has refused an overhang to be removed and the Area Forester has entered these notes into the system. Follow the instructions in the record on how to proceed with the record.

Figure 5: Direct Overhang – Oak branch crossing vertical ground-to-sky plane

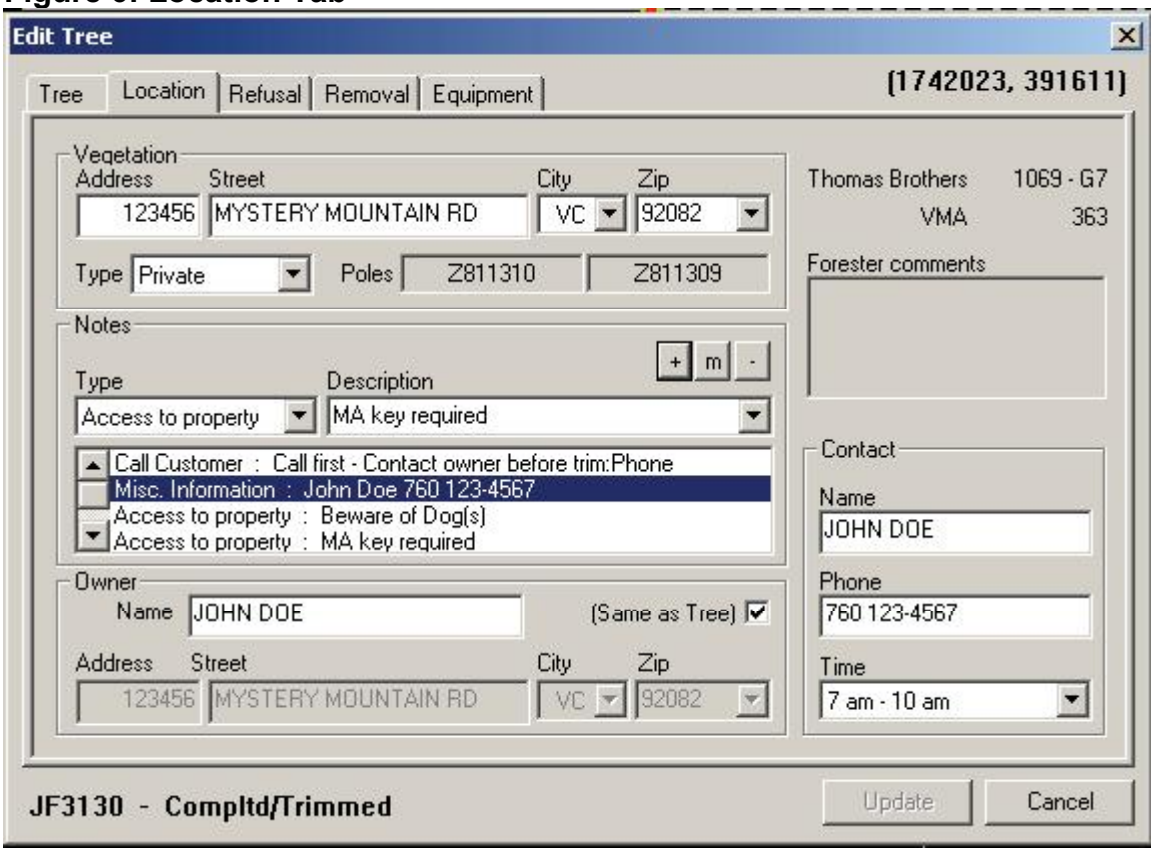
If you encounter trees with **old growth overhang** (limbs greater than 6 inches in diameter that cross the ground to sky vertical plane) and there are no notes in the system, contact the Area Forester for instructions on how to proceed with the record.

Deadwood
Dead limbs or branches that have the potential for detaching from the tree and interrupting overhead facilities (excluding stand alone open-wire secondary and triplex wire), shall be listed for pruning using the drop down comment "*Remove dead wood*" in the Tree Page under Trim Information. This comment may be used for reliability and non-reliability trees as conditions require.

*Always use the drop down canned comment when possible. **Do not alter canned comments** except to add date and initials where required. If the appropriate comment is not in the drop down menu create a miscellaneous comment.

Section 4: Location Tab Information

Figure 6: Location Tab



Address Guidelines

Within VMS both the Tree Trim and Pole Brush program share the location page. Any changes to this page will affect every tree and pole sharing the same property number, street name, city and zip code. Attention to detail is paramount when entering information. If a misspelling of a street name or a street number exists and you need to edit, understand that the change will occur to all records that carry that same street name spelling and street number. Before you make a change to an address take the time to verify that no other records are going to be affected besides the one(s) you intend to change.

The Area Forester, forester assistant or the Lead will at times edit sensitive or customer information. These updates are important to make all of SDG&E's Vegetation Management personnel and contractors aware of properties with special work requirements. Customer notes need to be preserved to ensure SDG&E can get the work done as efficiently as possible. Take the time to identify correct address and owner information (name and number) for each property. This will improve the contractor's productivity and notification, and will help reduce the number of future refusals and/or sensitive customers.

Locating Customer Address

- We need the actual physical address for a property. This means the number and street name in the Customer @ Transformer box, the number on the mailbox, or the number on the house where the tree/pole is located. No additional spaces, punctuation marks or fractions allowed. If the property contains one of the following (1245A, 1245.5, 1245 1/2, or if the structure has an alpha character) insert the unique property address in the Misc. Comments in the Tree Page.

- The information in the Customer @ Transformer box is considered to be accurate, but confirmation in the field is required. If the Customer @ Transformer has a Point Loma address for the customer and you are on Mt. Laguna, obviously the address is the billing address and not the physical address where the tree/pole is located. If the Customer @ Transformer address is incorrect you will need to get the number from the house or mailbox. If there is no posted address on the house or mailbox you can also enter the meter number using the "Go to Customer" to get the correct address. If the meter does not come up with a match you will need to use a Matrix address (defined on the next page).

- Street names shall be spelled out and only approved alpha characters will be used for street, road, highway etc (see *Table 6*). Example: HARBISON CANYON RD or OLD HWY 80. For numbered streets always use the number and proper suffix; Example: 2nd, 3rd, 4th, 21st etc.

Remember, no punctuation marks or additional spaces are allowed in the street name. Every additional space or mark will make the property separate from the actual address. All addresses and street names must be exactly the same in order to share important property/Location Page notes. Always check the Customer @ Transformer box to make sure the street name in the system is correct. You may come across properties with driveways that are along a street different than the actual street address (ex. a driveway on Community Building Rd with an address of HWY 94). Note the correct address and street in the Address/Street field (HWY 94) and note in the Misc. Information drop down in the Location Page: *"Access property from Community Building Rd"*.

Table 6: Approved Street Alpha Characters

AVE	Avenue	**I 15**	Interstate 15
BLVD	Boulevard	**Ln**	Lane
CIR	Circle	**PKWY**	Parkway
CT	Court	**RD**	Road
DR	Drive	**ST**	Street
FWY	Freeway	**TERR**	Terrace
HWY	Highway	**TRL**	Trail

An example of what you may come across is a road that has more than one name. Example: HWY 76 also known as (AKA) Pala Road. Use the street that the Customer @ Transformer box indicates, (ex: 243 HWY 76), and note in the Location Page under Misc. Information: *AKA Pala Rd*.

Use Customer @ Transformer to copy and paste the customer name and phone number into the Location page under Misc. Information. If there is an existing customer name and number in the Location Page validate the name and phone number from Customer @ Transformer.

Remember, the last person to update a record owns the record and is responsible for the accuracy of the location and the notes.

Matrix Address

If no address or customer information can be found follow the matrix procedure. Pre-inspector shall use the closest physical address (number) and add an "X" to the end of the number to identify the location. Example: 3036X Oak Dr. Pre-inspectors may use this matrix address for several trees or in some cases several spans until a closer posted address is reached.

Directions for all trees at a matrix address shall be added in the Tree Tab under the Tree Location pull down menu. Direction notes entered into the Tree Page should be cardinal only (N, S, E, W), and any physical landmarks used for reference must be stationary (i.e., mailbox, call box, bridge, or a starting point that is easy to find). If a posted address is not readily observable, notes should be entered to orient to the location.

Pay close attention to data populating or disappearing from the Location Page notes section. This would signify that the same matrix address is being used somewhere else. If this occurs you need to cancel out and select another matrix number address. Remember that when you remove notes in the Location Page for the tree you are updating, it will erase the note from all tree and pole records with that address. If in doubt call your Lead before deleting a note from a record.

Ownership Type

When entering property information for trees, select the appropriate ownership from the drop-down menu:

- Private
- City
- County
- State
- Federal
- Cal Trans
- Trolley
- BIA (Bureau of Indian Affairs)
- BLM (Bureau of Land Management)
- US Forest Service
- CDFG (California Dept of Fish & Game)

VMS will allow one ownership type for trees within each property boundary. If there are multiple ownership types for the inventory trees within a single property boundary, select the priority from the following table.

Table 7: Ownership Priority

Possible Combination	Priority
Private/City	Private
Private/County	Private
Caltrans/City	Caltrans
Caltrans/County	Caltrans
Caltrans/Federal	Caltrans
Trolley/City	Trolley
State Park/Federal	State Park
State Park/County	State Park
Federal/County	Federal
BIA/County	BIA

The ownership field is tied to the address and will apply to all trees that share the same address. Enter the lower priority ownership in the Tree tab under the pull down Tree Location so that the secondary municipality or agency is identified.

Check VMA maps and Thomas Brothers Guide for boundaries. Call your Lead with any questions you may have regarding ownership.

Pole Numbers

The MDT is always right when it comes to pole numbers. When updating, creating a tree record, or copying a tree within a span, always verify your pole numbers are correct. On occasion the physical tag on a pole is not correct. If a pole is numbered incorrectly in the field you must add a note under the Tree Location in the Tree Page (e.g., *Pole 1 is P21346 not P21364*).

When creating a tree you will be prompted to snap to pole one and pole two. Be sure the tree icon is placed in its correct location relative to the selected poles. When updating a tree that has been copied from one span to another where the pole numbers are incorrect follow these instructions:

1) Go to VM (drop down menu)
2) Select Trees
3) Select Change Poles
4) Snap to tree
5) Snap to first pole (no preference)
6) Snap to second pole

Location Tab Notes

Notes in the location tab carry over to all tree and pole records sharing the same property address. With the exception of matrix addresses, all trees/poles in the VMS System are required to have customer information and notes that pertain to the property. Customers move, phone numbers change, and some properties require special instruction, so updates are necessary to keep current with customer information. Do not remove refusal or sensitive customer information before speaking with your Lead or Supervisor. Forester notes should never be removed by a pre-inspector unless directed to do so by the Area Forester.

Below are some examples of location tab notes:

- Customer Name (First & Last), Phone
  Example: John Doe 858 277 5860

- Company Name/Business/Ranch-Misc. Comments, Phone
  Example: John Doe Enterprises or Bar None Ranch 858 555 0001

- Property specific notes-Misc. Notes
  Examples: Gate Code 12345
  Schlage key required
  Private lock call for access

***Reminder: Never modify a canned comment**

Table 8: Special Characters

Acceptable Characters	Unacceptable Characters
Dash (-)	(!) (@) (#) ($) (%) (^)
Backslash for dates (/)	(&) (*) (() ()) (+) (=) (~)
	(`) ([) (]) ({) (}) (\) (|) (;)
	(:) (‘) (“) (<) (>) (,) (?)

Owner
If the property owner is different than the person inhabiting the home include both names and contact numbers under Miscellaneous Information in the Location Page (ex. *Tenant – Bob Jones 619 555 1234; Owner – Jane Smith 760 555 8842*).

Customer Contact
If a customer is present during pre-inspection confirm the contact information fields for accuracy and update as required. Include date and pre-inspector initials if owner information does not match transformer information.

Section 5: Reliability Trees

Hazard or reliability trees pose a threat to the safe and reliable delivery of electricity. Identifying hazard trees that have the potential to fail completely or drop limbs onto powerlines is critical to Vegetation Management operations. Trees that uproot or break out and fall into overhead utility lines can injure people and property, cause fires, power outages, power surges, and other damage to electrical facilities. Reliability trees may be located inside or outside of the utility right of way, and may or may not require pruning for compliance with clearance requirements.

A majority of tree-related outages that occur in the utility right-of-way are the result of tree or limb failure, not tree growth. A common cause of outages is palm fronds or seed pods that detach and blow into conductors. When hazards are identified the pre-inspector shall select check both the reliability and trimming required box in the Tree Tab. The proper reliability canned comment(s) located under Trim Information in the Tree Tab, or a Miscellaneous Tree Comment must also be entered. All reliability trees shall be marked with a white tag stapled to the tree that includes the tree ID, pre-inspector name, and pre-inspection date.

Reliability trees are not pruned or removed near stand-alone open wire secondary or triplex wire unless directed by the Pre-inspection Supervisor or Area Forester. Contact your Lead if clarification is required.

Tree Hazard Checklist

Consider these factors when evaluating trees for reliability:

- Is there a target? Can the hazard tree affect the electrical facilities?
- Are there any dead and/or detached branches in the tree that could fall and strike the pole or high voltage line?
- Does the tree have visible cavities or rotten wood along the trunk or in major branches?
- Are there indications of disease (fruiting bodies, wood rot) at the base or along the tree branches?

- Are there visible cracks or splits in the trunk or where branches are attached?
- Have any branches fallen from the tree that may indicate structural problems?
- Have adjacent trees fallen or died?
- Has the trunk developed a strong lean?
- Are there multiple vertical branches originating from one point that may indicate weak attachment?
- Are there narrow-angled branch crotches that may indicate included bark?
- Have the roots been excessively pruned, or damaged by grade change, pavement installation, sidewalk repair, or trench digging?
- Has the site recently been changed by construction, wind or water erosion, saturated soil, raising the soil level, lawn installation?
- Have the leaves prematurely developed an unusual color or size?
- Have adjacent trees been removed creating the potential for windthrow (exposure to wind causing tree failure)?
- Has the tree been topped or otherwise heavily pruned?
- Any indication of decline, disease, or structural damage from insect borers?

Figure 8: Potential hazard tree showing evidence of poor pruning practices, branch dieback, and overall decline.

Figure 9: Example of green reliability tree exhibiting extensive trunk cracking.

Figure 10: Potential green reliability oak exhibiting evidence of included bark and interior rot.

Figure 11: Interior rot at base of eucalyptus that may lead to future failure.

Figure 12: Reliability trees may not always be readily observable. In the example below, the tall, slender eucalyptus tree has a slight lean and may be well clear of the electrical facilities during normal weather conditions.

Figure 13: Minutes later the winds pick up and the tree may now pose a potentially hazard. Keep in mind pre-inspection must anticipate tree and weather conditions through all seasons including high winds, rain, and snow.

Section 6: Memo Procedures

Memo trees are those that are non-compliant with minimum clearance requirements *and/or* fit the Vegetation Management criteria to be pruned within a priority timeframe. Memos are classified *same day*, *next day,* or *group*. The priority timeframe for pruning memo trees is based on voltage, clearance, and location (SRA vs. LRA VMAs). ***All* memos shall be documented on a Memo Sheet.**

Same Day Memo

- Tree crew dispatched that day if called in to Help Desk by 12:30pm.
- Same day memo calls received after 12:30pm are usually issued the following day. If same day prune is absolutely necessary after 12:30pm, pre-inspector shall notify Area Forester.
- Help Desk radio is shut off after 3:30pm; all calls after 3:30pm shall be made to landline number (858) 654-8608. If no answer, leave detailed voicemail regarding memo.

Next Day Memo

- Same day memo tree found after 12:30pm. Tree crew will be dispatched to complete pruning on the business day following inspection.

Group Memo

- Trees are completed by pruning contractor within two weeks of being issued.

Primary Voltage Memos:

State Responsibility Area (SRA) VMAs

- Trees in continuous contact with primary conductors shall be called in to the Help Desk as a same day memo. Document on Memo Sheet.

- Trees with intermittent or wind contact with primary conductors shall be called in as a next day memo. Document on Memo Sheet.

- Trees with less than 18 inches of clearance from primary conductors, but not in contact, shall be documented on a Memo Sheet and turned in bi-weekly to Help Desk to be issued as a group memo. Group memo trees are *not* to be called in to the Help Desk unless they are to be pruned with same or next day memo trees located on the same property. Contact Area Forester for instruction.

Local Responsibility Area (LRA) VMAs

- Trees in continuous contact with primary conductors shall be called in to the Help Desk as a same day memo. Document on Memo Sheet.

- There are no group memo trees in LRA VMAs for primary voltages.

Transmission Voltage Memos (SRA & LRA):

Trees identified near transmission conductors that do not meet the minimum arc clearance requirements per NERC FAC 003-01 (IEEE 516-2003) shall be called in to the Vegetation Management Help Desk as a same day memo. A tree crew will be dispatched immediately to correct the hazard. Minimal arc clearances for transmission are defined as:

- **2.9 feet for 138kV**
- **5.1 feet for 230kV**
- **14.7 feet for 500kV.**

Trees identified near transmission conductors that meet the minimum arc clearance requirements but are within the following clearances shall be documented on a memo sheet as a group memo and turned in bi-weekly to the Help Desk. A tree crew will be dispatched to prune the tree(s) within two weeks.

Group memos shall be issued for trees within:

- 6 feet from 69kV conductors
- 10 feet from 138kV and 230kV conductors
- 20 feet from 500kV conductors

Table 9: Memo Types

Conductor Voltage	Distance from Tree	Type of Memo
Primary (SRA & LRA)	0	Same day
Primary (SRA only)	< 18 inches	Group
69kV and138kV (SRA & LRA)	3 feet or less	Same day
230kV (SRA & LRA)	5 feet or less	Same day
500kV (SRA & LRA)	15 feet or less	Same day
69kV (SRA & LRA)	6 feet	Group
138kV & 230kV (SRA & LRA)	10 feet	Group
500kV (SRA & LRA)	20 feet	Group

Processing a Memo

- All Memo Trees shall be flagged with green tape and labeled with tree(s) ID.
- All memos shall be documented on a Memo Sheet and turned into SDG&E's Vegetation Management Help Desk.
- Pre-inspector shall make attempt to notify all memo tree customers. If the

customer is not at home a door hanger or voice message shall be left.

- In the tree record under, *Misc Tree Comments*, note "*Memo submitted by*" and include the following:
  - Your initials
  - Inspection date of memo.
  - *Example "Memo submitted by JW 8 13 06".*
- Pre-inspector shall pursue removals on all memo trees that fit removal criteria, and document the attempt using the canned comment, "*Left removal request*" including date and initials.

When calling in memos, pre-inspector shall identify the tree ID alpha characters using the International Phonetic Alphabet.

Table 10: International Phonetic Alphabet

A	**Alpha**	**N**	**November**
B	**Bravo**	**O**	**Oscar**
C	**Charlie**	**P**	**Papa**
D	**Delta**	**Q**	**Quebec**
E	**Echo**	**R**	**Romeo**
F	**Foxtrot**	**S**	**Sierra**
G	**Golf**	**T**	**Tango**
H	**Hotel**	**U**	**Uniform**
I	**India**	**V**	**Victor**
J	**Juliett**	**W**	**Whiskey**
K	**Kilo**	**X**	**Xray**
L	**Lima**	**Y**	**Yankee**
M	**Mike**	**Z**	**Zulu**

Section 7: Removal Guidelines

Tree removals are an important component of vegetation management. Removals reduce the need for repeated pruning, reduce the frequency of property visits, reduce overall costs, and help ensure regulatory compliance.

Pre-inspector should pursue removals of fast and very fast inventory trees and palms. For removals of green and dying reliability trees, work with the Area Forester, forester assistant, or your supervisor to determine appropriate candidates and criteria.

- Confirm property ownership of all trees to be removed. If the tree sits on a property line <u>all</u> property owners must sign the removal card.

- Fill out all portions of removal card including quantity, species, address, VMA#, Tree ID, Crew type, Start/Stop Poles, Ownership. Make sure exact DBH of each tree (with the exception of palms) is written on the card. Include pre-inspector name on top left corner of card.

- Property owner must sign card. Make sure printed name and phone numbers are legible. If removing more than 5 trees on the same property, you must use a "*Tree Removal Authorization List Continued*" form. If using a continued list, owner must sign both yellow card and continued list.

- Palm removals are issued to a separate contractor. All palm removals must be documented on a separate removal card from other species.

- Removal of trees 24" DBH or greater, with a height of 30 feet or taller, growing to the side of the lines, will be worked on T&E (time and equipment) and requires Area Forester approval. Approval must be noted on bottom of card.

- Removal of trees 36" DBH or greater growing directly under the lines will be worked on T&E and requires Area Forester approval. Approval must be noted on bottom of card.

- Removal of trees less than 36" DBH growing under the primary conductors will be performed on a unit basis. Area Forester approval is *not* required. Pre-inspector must indicate this on the card with the comment "*T&E not applicable*".

- Explain removal process to owner – wood over 3 inches in diameter will be cut into manageable lengths and left on site (*not* stacked); branch debris will be removed; stumps will be cut as close to the ground as is safely possible; resprouting stumps will be treated with an EPA-approved herbicide; stumps will *not* be ground. **Clearly set the expectation for the customer what will and will not occur during cleanup**.

- Replacement trees require Area Forester approval. If replacements are offered, indicate replacement species, quantity (up to 3), and size (up to 15 gal.) on removal card. Replacements species are chosen from the SDG&E approved list (*see Figure 19*). Explain to owner that he or she must contact the Area Forester after trees are removed to initiate replacements. SDG&E does not plant replacement trees.

- Paint a small white "X" or dot at base of tree(s) to be removed.

- Enter DBH in the Tree Tab – Removal, "*DBH is* ___". Measure DBH to the nearest whole inch of diameter attained. Round down to the nearest whole number (ex: a tree measuring 12.7 inches diameter should be entered in the comments as "*DBH is 12"*, not 13 inches). Make sure the DBH specified matches the DBH range selected.

- Enter ticket ID number in the tree record removal tab. On properties with multiple removals, each tree record with the same ticket ID requires a sequential number be entered (i.e., 345479**-1**, 345479**-2**, 345479**-3**) in the removal tab. Enter owner name and number in the removal tab.

- Leads are to turn in removal cards and *Tree Removal Authorization List Continued* sheets to SDG&E Help Desk.

Note: If a tree is a memo removal, note on the top portion of the removal card "*MEMO"*. Removal cards for memo trees must be turned in immediately for same and next day memos, or with memo sheets for group memos.

Palm Removals - Species Definition and Removal Ticket Documentation

Special consideration is given to the removal of palms. In addition to mature palms, VMS allows for the removal of brush and small palms that would otherwise not be included in the inventory because of size. Pre-inspectors can pursue the removal of brush and small palms under certain conditions.

The removal of brush fast and small palms should be pursued on those properties where full size palm removals are to take place*. It is otherwise not necessary to inventory brush or small palms in the MDT.*

The cost of palm removals is based on species and height. Correct species identification and documentation is essential.

GFMS Palm Species Code:

- ***Palm-Fan*** - *all* fan palms with the exception of California Fan Palm
- ***Palm-Fan California / Filifera*** - California Fan Palm (*W. filifera)* only
- ***Palm-Feather*** - *all* feather palms with the exception of Date palms
- ***Palm-Feather Date / Phoenix*** - *all* date palms
- ***Brush Fast 5x5 Palm*** - *all* palm species whose trunk height is less than 5 feet measured from the ground to where the new fronds emerge.
- ***Small Palm* (*no species code in GFMS*)** - *all* palm species whose trunk height is 5.1 -15 feet measured from the ground to where the new fronds emerge. Use species code *Palm-Fan* or *Palm-Feather* code as appropriate.

Removal Ticket Documentation

- All palm removals shall be entered on a removal ticket separate from all other non-palm removals.

- At the top of the removal ticket where species is entered, use the generic word *palm* for all species.

- Enter Thomas Bros map # on top right hand corner of removal ticket.
- Each palm removal shall be documented in the comments section of the removal ticket with the specific identifier word next to the tree ID**:**

Species	Identifier
• ***Palm-Fan***	***fan***
• ***Palm-Fan California / Filifera***	***filifera***
• ***Palm-Feather Date / Phoenix***	***date***
• ***Palm-Feather***	***feather***
• ***Brush Fast 5x5 Palm***	***brush***
• **small palm** (No species code in GFMS)	***small***

Figure 14: Example of Palm Removal Ticket

Ex: Authorization to remove 6 palms including: 1 palm (4 feet tall to the heart), 1 fan (12 feet tall to the heart), 1 California fan, 2 Queen, 1 Canary Island Date.

Document the removal ticket as**:**

SDG&E EXAMPLE

Ticket I.D. Nº 357907

A Sempra Energy utility

SDG&E - Vegetation Management Program

TREE REMOVAL AUTHORIZATION

TB 1149-B7

As the authorized agent, I John Smith *(print name)* do hereby authorize SDG&E to remove 6 *(quantity)* palm *(species)* located at 123 Main St. San Diego, 92117 *(property address, city, & zip code).*

This work will be done by SDG&E **at no cost to me.** I understand that; (1) wood over 3 inches in diameter will be cut, whenever practical, into a manageable size and left at the site, unless requested otherwise, (2) branch debris will be removed from the site by SDG&E, (3) SDG&E will not grind/remove stumps.

Signature: _____ Date: _____

Phone No. _____ (hm) Phone No. _____ (wk)

VMA # 220 Tree I.D.# AB12 (brush)

Crew type: lift/climb (circle one) Start pole# P12345 Stop pole # P123456

Ownership: private/city/county/state/federal (circle one)

Comments: AB13 (small) AB14 (filifera) AB15 (2 feather) AB16 (date)

FORM 111-04152 1/99

Palm Removal Documentation in GFMS

- use appropriate codes as defined above
- for *small palm* removals use species code *Palm-Fan* or *Palm-Feather* code as appropriate
- for palm removals, enter trunk height to base of fronds
- it is not necessary to specify the DBH on the removal ticket or in the comments section of the tree record

All palms with fronds that sweep out of compliance are potential cycle busters and shall be pursued for removal.

Section 8: Refusals

Customers who refuse tree pruning can delay schedule, jeopardize compliance, require extra time and effort to resolve, and are costly to manage. Pre-inspection contractor shall attempt to resolve customer refusals unless otherwise instructed by the Supervisor or Area Forester.

Full refusal tree or pole records have an "X" over the icon in GFMS. This indicates a historic refusal location or one currently pending. In some instances all records on a property are listed as full refusals because of circumstances requiring special attention. Pre-inspectors must pay close attention to all notes relating to a refusal property.

Note: All trees will be pruned if they become non-compliant with the power lines.

Potential reasons for refusals:

- The property owner has been verbally or physically hostile to SDG&E or contractors.
- The property owner refuses to allow SDG&E to complete the work according to required clearances and/or pruning specifications.
- The property owner indicates the desire to prune the tree(s) themselves or by a third party contractor.
- The customer is a historical refusal and the Forester monitors the status of the tree(s) annually. The Forester will update the tree data during the pre-inspection cycle and schedule the work as necessary.

Procedure for Refusals Initiated During Pre-inspection:

If a customer communicates the refusal to allow pruning, the pre-inspector shall make the attempt to resolve. Gather all pertinent information from the customer, actively listening to and acknowledging the customer's concerns and complaints. If unable to persuade the customer to allow pruning or brushing, the pre-inspector shall:

- Communicate the legal and safety requirements and subsequent contact steps that will be taken by pre-inspection and SDG&E supervisors.
- Provide a hard copy of the SDG&E *Refusal Fact Sheet* and fully document the refusal on the *Vegetation Management Services Refusal Form*.

- Forward the refusal to the Lead for further contact.

Refusal Updates in MDT:

- When you come across a FULL REFUSAL open the record, read and follow the instructions in the refusal, location, and tree tab.
- If the instructions are unclear or there are no refusal notes, call your supervisor or the Area Forester for clarification.
- Pre-inspector is required to update the clearance of the tree(s) unless instructed not to by the supervisor or the Area Forester.
- DO NOT erase or delete any sensitive, difficult or refusal customer notes or information.
- DO NOT change the address or street name on any tree ID with sensitive customer notes.
- DO NOT skip over full refusal properties or trees without opening the tree and following the instructions.
- If a tree ID is noted on the wrong address contact your Lead about the needed correction.

Call your Lead or SDG&E Supervisor with any questions or concerns about refusal situations.

Major Woody Stems

Major woody stems (MWS) are tree trunks or tree limbs that are exempted from the minimum vegetation clearance requirements in G.O. 95, Rule 35 and PRC 4293. To qualify as an exemption, the trunk or branch must be of sufficient strength and rigidity to prevent it from encroaching within 6 inches of distribution voltage conductors, and must meet all requirement criteria outlined in the *MWS Exemption Form* (see Fig. 22). Major woody stems must be reviewed by a qualified ISA Certified Arborist annually and documented on a *MWS Exemption Form*. All MWS must be recorded in the Tree Tab-Tree Alert field using the canned comment, *Major Woody Stem*.

Figure 15: Major Woody Stem

Section 9: Icon Placement

Placing Trees and Brush Units

- Place Tree and Brush icons accurately in the MDT.
- Position each icon correctly within the span relative to SDG&E facilities. In some areas the facilities map in GFMS does not accurately reflect actual conditions in the field.
- Place icons as they are in relation to the facilities, not the property lines. Add a note to Tree Location to explain the discrepancy.
- Provide accurate and concise directions to the tree to help the tree contractor locate in the field.
- When several trees exist in a span, place them as accurately as possible and avoid overlapping graphics and text. The tree ID must always be legible.
- Avoid clustering trees unless high tree density requires it.

For high tree density, refer to *Units* (page 18). Keep in mind that the contractors need to be able to read the Tree ID#'s on the VMS map.

If SDG&E facility locations on the map do not accurately reflect their position in the field, place the tree graphic relative to the facility and add an explanation selected from Notes/Type and Description drop-down menus to explain.

SDG&E periodically updates the GFMS map on the MDT. The new map file may include the addition of new line extensions and the removal of lines that no longer exist. The position of SDG&E facilities may be updated as well. This may offset previous tree icon placement. When this occurs, the tree icons will need to be moved to their proper location in the appropriate span. Contact field supervisor for further directions.

In some cases new overhead facilities will not be reflected in GFMS. Place the tree graphics as accurately as possible using street and/or property delineation, and add an explanation selected from Notes/Type and Description drop-down menus. Make sure to provide accurate and concise directions to inventory trees near new lines since the tree crew will not have the overhead facilities drawn on their maps.

Section 10: Updating VMA Map

VMA Map Updating

Hardcopy VMA maps are provided to pre-inspectors to track progress and document completion in each VMA. Each pre-inspector is responsible to patrol every span of overhead transmission, primary, and stand alone secondary

conductors, including any new line segments within the assigned VMA.

1) Use highlighters to indicate the progress of each day. Use different colors for different days and write the date next to each day's work.

2) Ensure all border sections between pre-inspectors in the same VMA are patrolled in their entirety. Write pole numbers on the map indicating start and stop position of each bordering section. **No missed or overlapped inspections**.

3) Write complete name and the "start date" and "end date" in the space provided on the VMA map.

4) Use the map to write down addresses or phone numbers as needed.

5) Add any new construction or line extensions to the VMA map relative to existing circuits.

6) Add gate codes and other useful information as a reference for subsequent inspections.

7) VMA maps are to be handed in to your Supervisor and checked for completeness and accuracy before being turned in to SDG&E.

8) Pre-inspection contractor shall complete and sign a VMA certification sheet upon completion of the VMA and turn in to the SDG&E Pre-inspection Supervisor.

Section 11: Pre-inspector Call In

All pre-inspectors shall call in their nightly location log Monday-Friday before 7:00 p.m. The pre-inspector shall provide the following information:

1) VMA
2) estimated # of days to complete the VMA
3) last tree ID
4) total hours worked
5) the following day's starting tree ID
6) the following day's starting property address
7) the following day's starting Thomas Brothers map #

- When working in more than one VMA in a workday, the pre-inspector must specify the total hours worked in each of the VMAs.
- Pre-inspectors are to call their Lead before leaving their VMA during working hours.
- The Lead must authorize time spent out of the VMA during normal work

hours.

- Pre-inspection Leads are to call the Area Forester the first day in a new VMA to notify that pre-inspection has begun.

Section 12: Tree Growth Rates – Very Fast to Slow

Each tree's growth rate will be affected by the specifics of the site, the tree's health, and pruning history.

Very Fast = > 6 ft/yr **Fast = 4-6ft/yr**	
Ash	very fast
Cottonwood	very fast
Eucalyptus	very fast
Mulberry	very fast
Willow	very fast
Ailanthus	very fast
Avocado	fast
Bamboo	fast
Jacaranda	fast
Melaleuca	fast
Palm (Fan)	fast
Palm (Feather)	fast
Poplar	fast
Silk Oak	fast
Sycamore	fast
Tamarisk	fast
Walnut	fast
Acacia	medium
Alder	medium
Brisbane Box	medium
Camphor	medium
Carob	medium
Carrotwood	medium
Casuarina	medium
Catalpa	medium
Cherry	medium
Chinaberry	medium
Citrus	medium
Coral	medium
Eugenia	medium
Ficus	medium
Floss Silk	medium
Hackberry	medium
Locust	medium
Maple	medium
Mesquite	medium
Myoporum	medium

Medium = 2-4 ft/yr **Slow= 0-2 ft/yr**	
Pecan	medium
Pepper (California)	medium
Pine	medium
Pittosporum	medium
Plum	medium
Podocarpus	medium
Privet	medium
Redwood	medium
Rubber	medium
Sumac	medium
Tulip	medium
Aspen	slow
Bay	slow
Birch	slow
Bottle	slow
Bottlebrush	slow
Cow Itch	slow
Crape Myrtle	slow
Cypress	slow
Deodar Cedar	slow
Fir	slow
Gingko	slow
Italian Cypress	slow
Juniper	slow
Koelreuteria	slow
Magnolia	slow
Mimosa	slow
Monkey Puzzle	slow
Italian Cypress	slow
Oak	slow
Oleander	slow
Palo Verde	slow
Pepper (Brazilian)	slow
Pistache	slow

Olive	medium
Orchid	medium
Pear	medium

Section 13: Vegetation Management Areas

= LRA = SRA

210	Point Loma	357	Lake Wohlford
212	Mission Bay	358	Valley Center East 1
215	La Jolla	359	Valley Center West 1
220	Mission Valley	360	Pauma Valley 1
221	Mira Mesa	361	Pauma Valley 2
302	San Marcos	362	Jesmond Dene
304	Escondido North	363	Hidden Meadows
305	Escondido Central	364	Couser Canyon 1
306	Escondido South	365	Ramona West
309	Rancho Bernardo	366	Rincon
310	Poway North	367	Pine Hills 2
311	Poway South	368	Pine Hills 1
312	Fallbrook West 1	369	Harrison Park
313	Fallbrook West 2	370	Palomar Mtn 2
314	Fallbrook West 3	371	Warner Springs
350	Lake Hodges South	372	Borrego
351	Lake Hodges North	373	Mesa Grande 2
352	San Pasqual	374	Mesa Grande 1
353	Highland Valley	375	Palomar Mtn 1
354	Ramona South 1	376	Lilac 1
355	Ramona East 1	377	Whispering Pines 1
356	Ramona North	378	Pala
379	Rainbow 1	403	Lemon Grove / Spring Valley

380	Pala Mesa	405	La Mesa West

Section 13: Vegetation Management Areas cont.

= LRA = SRA

381	Winterwarm	406	La Mesa East
382	Gopher Canyon East 1	408	Mount Helix
383	Bonsall 1	410	El Cajon West
384	Fallbrook East 1	412	Rancho San Diego
385	De Luz 1	414	El Cajon East
386	Santa Ysabel	416	Santee
387	Gopher Cyn East 2	420	Lakeside
388	Rainbow 2	450	Blossom Valley 1
389	De Luz 2	451	Eucalyptus Hills 1
390	Fallbrook East 2	452	San Vincente
391	Valley Center East 2	453	Barona
392	Valley Center East 3	454	Dehesa
393	Ramona South 2	455	Crest
394	Ramona East 2	456	Singing Hills
395	Courser Canyon 2	458	Alpine
396	Lilac 2	460	Jamul West
397	Whispering Pines 2	462	Potrero
398	Bonsall 2	463	Jamul East
399	Valley Center West 2	464	Boulevard
400	Allied Garden / San Carlos	465	Barrett Lake
466	Buckman Springs 1	606	Vista North 1
467	Descanso	607	Oceanside North 1
468	Viejas	610	Vista South

469	Mount Laguna	**611**	Oceanside South
475	Blossom Valley 2	**614**	Encinitas South 2

Section 13: Vegetation Management Areas cont.

= LRA **= SRA**

477	Eucalyptus Hills 2	**616**	Oceanside North 2
479	Buckman Springs 2	**623**	Encinitas North 2
510	Mission Hills	**624**	Vista North 2
512	State College	**651**	Rancho Santa Fe South 1
513	Center City	**652**	Rancho Santa Fe North 1
514	East San Diego	**653**	Rancho Santa Fe North 2
518	National City	**654**	Buena Vista 1
519	Paradise Hills	**655**	Gopher Canyon West
520	Chula Vista West	**670**	Buena Vista 2
521	Chula Vista East	**673**	Rancho Santa Fe South 2
527	Coronado -Imp	**674**	Rancho Santa Fe South 3
552	Bonita	**701**	San Clemente
553	Otay Mesa	**702**	Dana Point 1
601	Del Mar	**703**	San Juan Capistrano
602	Solana Beach	**707**	Laguna Hills
603	Encinitas South 1	**708**	Dana Point 2
604	Encinitas North 1	**752**	Ortega
605	Carlsbad		

Section 14: Approved Abbreviations

Abbreviation	Translation
1st, 2nd, 3rd, 4th, etc…	First, second, third, fourth
1st O:	Primary Owner (where the majority of the pole sits)
2nd O:	Second Owner
3rd O:	Third Owner
4th O:	Fourth Owner
A/F	Across From
AKA	Also known as
Appt	Appointment
AVE	Avenue
Avo grove	Avocado grove
BLVD	Boulevard
C/O	Corner Of
CDF	California Department of Forestry
C-	Cell phone, avoid ( ) use – or blank space to separate numbers
Cir	Circle
Cit grove	Citrus grove, fruit grove
CT	Court
DR	Drive
ESA	Environmentally Sensitive Area
FS	Fire Station
FT	Feet
FWY	Freeway
HQ	Headquarters
H-	Home phone, avoid ( ) use – or blank space to

	separate numbers
HWY	Highway
I/O	Intersection of
I-15	Interstate 15, replace the number keep I- as the standard

Section 14: Approved Abbreviations cont.

Abbreviation	Translation
Jnct	Junction
Lg Vol	Large Volume
Ln	Lane
Mi	Mile
MM	Mile Marker
N, E, W, S	North, East, West, South
N/O E/O W/O S/O	North of, East of, West Of, South Of
NE NW SE SW	North East, North West, South East, South West
PKWY	Parkway
PL	Place
RD	Road
Rdside	Roadside
ST	Street
Tenant:	Tenant information. (Not the owner but they may have special requests, i.e. call first for access to property, or animal concerns)
Terr	Terrace
TRL	Trail
YD YDs	Yard, Yards
W-	Work phone, avoid ( ) use – or blank space to separate numbers

Table 11.1: VMA Schedule (Northern SDG&E Territory)

VMA	North	VMA Name	Estimated Trees	Pre-inspection Start	Pre-inspection Audit Start	Tree Trim Start	Tree Pruning Finish
378	N E	Pala	1,559	July	August	September	November
379	N E	Rainbow 1	2,736	July	August	September	November
388	N E	Rainbow 2	2,131	July	August	September	November
702	N W	Dana Point 1	943	July	August	September	November
703	N W	San Juan Capistrano	2,104	July	August	September	November
707	N W	Laguna Hills	1,288	July	August	September	November
708	N W	Dana Point 2	932	July	August	September	November
752	N W	Ortega	946	July	August	September	November
360	N E	Pauma Valley 1	4,176	August	September	October	December
361	N E	Pauma Valley 2	1,797	August	September	October	December
364	N E	Courser Canyon 1	3,465	August	September	October	December
370	N E	Palomar Mtn 2	2,683	August	September	October	December
375	N E	Palomar Mtn 1	2,579	August	September	October	December
607	N W	Oceanside North 1	2,882	August	September	October	December
611	N W	Oceanside South	2,432	August	September	October	December
616	N W	Oceanside North 2	2,541	August	September	October	December
701	N W	San Clemente	2,083	August	September	October	December
371	N E	Warner Springs	4,106	September	October	November	January
374	N E	Mesa Grande 1	3,196	September	October	November	January
386	N E	Santa Ysabel	4,084	September	October	November	January
604	N W	Encinitas North 1	2,729	September	October	November	January
605	N W	Carlsbad	5,399	September	October	November	January
357	N E	Lake Wohlford	4,596	October	November	December	February
366	N E	Rincon	2,509	October	November	December	February
373	N E	Mesa Grande 2	1,093	October	November	December	February
603	N W	Encinitas South 1	1,959	October	November	December	February
614	N W	Encinitas South 2	1,338	October	November	December	February
652	N W	Rho S Fe N 1	3,605	October	November	December	February
358	N E	Vly Center East 1	2,561	November	December	January	March
391	N E	Vly Center East 2	3,348	November	December	January	March
651	N W	Rho S Fe S 1	3,555	November	December	January	March
673	N W	Rho S Fe S 2	2,552	November	December	January	March
674	N W	Rho S Fe S 3	1,643	November	December	January	March
350	N E	Lk Hodges South	3,780	December	January	February	April
351	N E	Lk Hodges North	3,150	December	January	February	April
610	N W	Vista South	2,307	December	January	February	April
623	N W	Encinitas North 2	2,218	December	January	February	April
653	N W	Rho S Fe N 2	3,269	December	January	February	April
363	N E	Hidden Meadows	5,480	January	February	March	May
606	N W	Vista North 1	2,973	January	February	March	May
654	N W	Buena Vista 1	2,798	January	February	March	May
670	N W	Buena Vista 2	2,041	January	February	March	May
304	N E	Escondido North	3,512	February	March	April	June
305	N E	Escondido Central	4,227	February	March	April	June
398	N E	Bonsall 2	2,266	February	March	April	June
624	N W	Vista North 2	2,684	February	March	April	June
655	N W	Gopher Cyn West	3,171	February	March	April	June

306	N E	Escondido South	2,521	March	April	May	July
362	N E	Jesmond Dene	4,479	March	April	May	July
382	N W	Gopher Cyn East 1	3,765	March	April	May	July
383	N W	Bonsall 1	1,545	March	April	May	July
387	N W	Gopher Cyn East 2	3,450	March	April	May	July
359	N E	Vly Center West 1	3,489	April	May	June	August
380	N W	Pala Mesa	4,177	April	May	June	August

Table 11.1: VMA Schedule (Northern SDG&E Territory) cont.

VMA	North	VMA Name	Estimated Trees	Pre-inspection Start	Pre-inspection Audit Start	Tree Trim Start	Tree Pruning Finish
384	N W	Fallbrook East 1	4,401	April	May	June	August
392	N E	Vly Center East 3	3,711	April	May	June	August
302	N E	San Marcos	4,609	May	June	July	September
312	N W	Fallbrook West 1	2,092	May	June	July	September
313	N W	Fallbrook West 2	3,077	May	June	July	September
314	N W	Fallbrook West 3	2,487	May	June	July	September
390	N W	Fallbrook East 2	3,518	May	June	July	September
399	N E	Vly Center West 2	4,340	May	June	July	September
376	N E	Lilac 1	2,325	June	July	August	October
381	N W	Winterwarm	4,468	June	July	August	October
385	N W	De Luz 1	2,323	June	July	August	October
389	N W	De Luz 2	3,058	June	July	August	October
395	N E	Courser Canyon 2	3,156	June	July	August	October
396	N E	Lilac 2	1,930	June	July	August	October

Table 11.2: VMA Schedule (Southern SDG&E Territory)

VMA	North	VMA Name	Estimated Trees	Pre-inspection Start	Pre-inspection Audit Start	Tree Trim Start	Tree Pruning Finish
462	S E	Potrero	4,264	July	August	September	November
464	S E	Boulevard	2,802	July	August	September	November
520	S W	Chula Vista West	3,846	July	August	September	November
521	S W	Chula Vista East	3,189	July	August	September	November
527	S W	Coronado -Imp	1,988	July	August	September	November
553	S W	Otay Mesa	1,016	July	August	September	November
460	S E	Jamul West	4,109	August	September	October	December
463	S E	Jamul East	3,109	August	September	October	December
518	S W	National City	3,647	August	September	October	December
519	S W	Paradise Hills	2,906	August	September	October	December
552	S W	Bonita	2,654	August	September	October	December
412	S W	Rancho San Diego	5,075	September	October	November	January
414	S W	El Cajon East	2,991	September	October	November	January
465	S E	Barett Lake	3,107	September	October	November	January
466	S E	Buckman Sprgs 1	1,968	September	October	November	January
475	S E	Blossom Vly 2	1,203	September	October	November	January
479	S E	Buckman Sprgs 2	2,568	September	October	November	January
210	S W	Point Loma	4,515	October	November	December	February
455	S E	Crest	2,267	October	November	December	February
456	S E	Singing Hills	4,266	October	November	December	February
510	S W	Mission Hills	2,774	October	November	December	February
513	S W	Center City	2,430	October	November	December	February

405	S W	La Mesa West	3,550	November	December	January	March
420	S E	Lakeside	5,334	November	December	January	March
450	S E	Blossom Valley 1	1,647	November	December	January	March
452	S E	San Vincente	1,849	November	December	January	March
512	S W	State College	2,503	November	December	January	March

Table 11.2: VMA Schedule (Southern SDG&E Territory) cont.

VMA	North	VMA Name	Estimated Trees	Pre-inspection Start	Pre-inspection Audit Start	Tree Trim Start	Tree Pruning Finish
514	S W	East San Diego	4,419	November	December	January	March
212	S W	Mission Bay	4,069	December	January	February	April
220	S W	Mission Valley	5,473	December	January	February	April
453	S E	Barona	808	December	January	February	April
454	S E	Dehesa	3,986	December	January	February	April
458	S E	Alpine	3,197	December	January	February	April
367	S E	Pine Hills 2	1,850	January	February	March	May
369	S E	Harrison Park	896	January	February	March	May
400	S W	Allied Gd San Carlos	2,512	January	February	March	May
410	S W	El Cajon West	3,009	January	February	March	May
416	S W	Santee	1,926	January	February	March	May
467	S E	Descanso	2,470	January	February	March	May
469	S E	Mt Laguna	3,855	January	February	March	May
368	S E	Pine Hills 1	2,944	February	March	April	June
372	S E	Borrego	2,495	February	March	April	June
377	S E	Whispering Pines 1	2,286	February	March	April	June
397	S E	Whispering Pines 2	3,613	February	March	April	June
403	S W	Lem Grv-Sp Vly	3,111	February	March	April	June
408	S W	Mount Helix	3,383	February	March	April	June
309	S W	Rancho Bernardo	2,489	March	April	May	July
355	S E	Ramona East 1	1,846	March	April	May	July
393	S E	Ramona South 2	1,953	March	April	May	July
394	S E	Ramona East 2	3,143	March	April	May	July
451	S W	Eucalyptus Hills 1	1,960	March	April	May	July
477	S W	Eucalyptus Hills 2	1,472	March	April	May	July
601	S W	Del Mar	2,575	March	April	May	July
311	S W	Poway South	4,745	April	May	June	August
353	S W	Highland Valley	5,475	April	May	June	August
354	S E	Ramona South 1	2,913	April	May	June	August
468	S E	Viejas	4,385	April	May	June	August
215	S W	La Jolla	4,118	May	June	July	September
310	S W	Poway North	2,841	May	June	July	September
356	S E	Ramona North	3,595	May	June	July	September
365	S E	Ramona West	3,295	May	June	July	September
602	S W	Solana Beach	1,647	May	June	July	September
221	S W	Mira Mesa	4,969	June	July	August	October
352	S E	San Pasqual	5,666	June	July	August	October
406	S W	La Mesa East	4,139	June	July	August	October

Figure 16: VMA and Area Forester Boundary

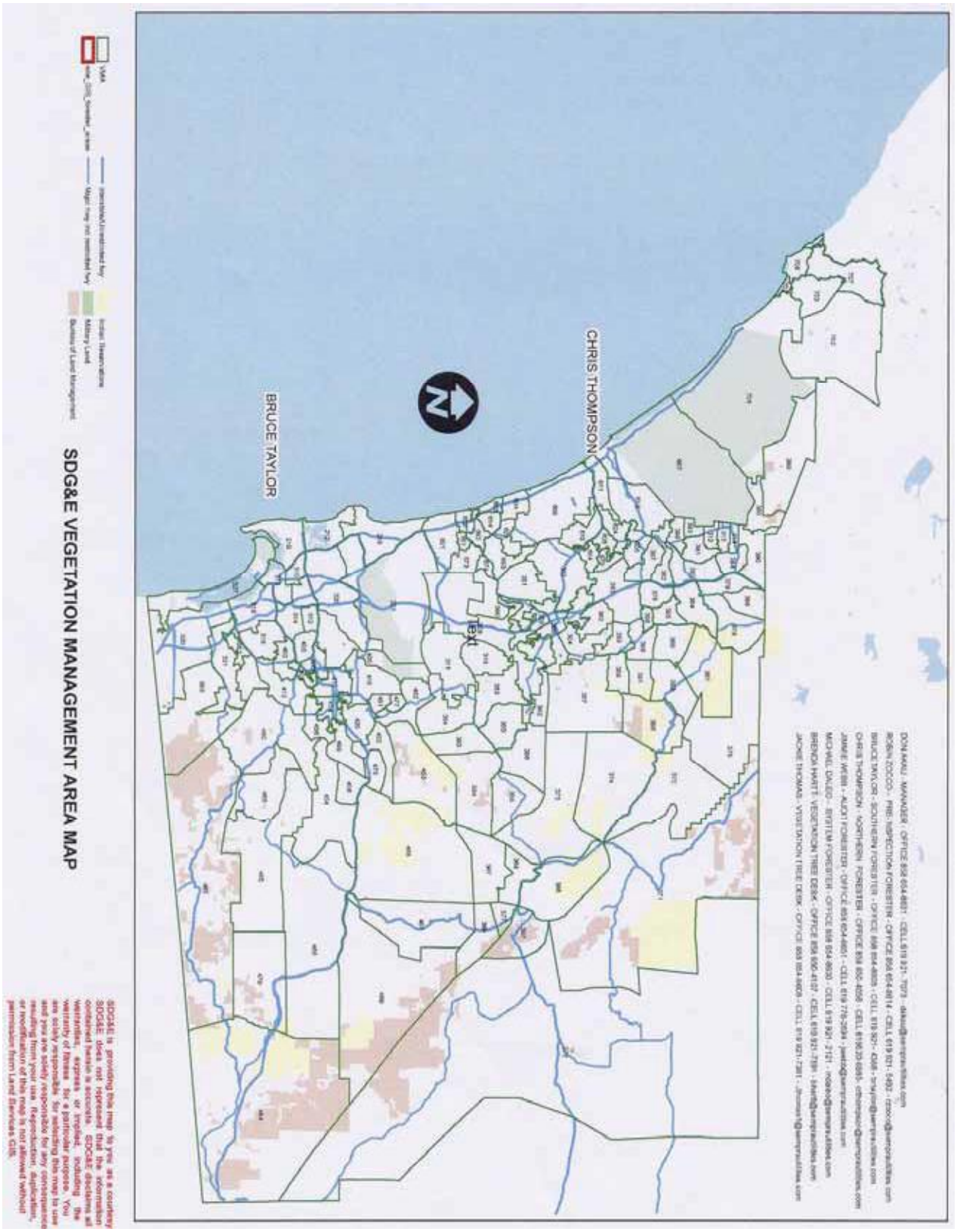


Figure17: Refusal Form

SDGE

A Sempra Energy utility

26137

Vegetation Management Services
REFUSAL FORM

VMA Number_____

To be filled out after property owner/agent refuses permission to enter property or to complete required work.

Important: San Diego Gas & Electric is required by law to maintain safe distances between trees and powerlines. Refusal of necessary line clearance work increases the risk of safety hazards on your property such as power outages, electrocution, and fires.

PROPERTY OWNER ☐ AGENT ☐			CONTRACTOR INFORMATION	
NAME OF PERSON REFUSING			CONTRACTOR NAME	
STREET	CITY	ZIP	CONTRACTOR'S REPRESENTATIVE	TITLE
( ) PHONE NUMBER		T.B. MAPs	( ) PHONE NUMBER	
SIGNATURE		DATE	SIGNATURE	DATE

DESCRIPTION OF VIOLATION (Required):

CODE VIOLATION (Please Circle One) PRC 4293 PRC 4292 G.O. 95 Other_____

Tree(s) clearance to nearest primary conductors_____ ft (If more than one tree enter the range e.g. 4-6 ft)
Tree(s) species_____
Tree ID number(s)_____
Facility numbers_____

DISCUSSION WITH PROPERTY OWNER:

Representative / Company	Date	Type of Contact	Reason for Refusal

Original = SDG&E Yellow = Contractor Pink = Property Owner

Figure 18: Tree Removal Authorization List Continued

VMA _____ TICKET # _____

TREE REMOVAL AUTHORIZATION LIST CONTINUED

This work will be done by SDG&E **at no cost to me.** I understand that; (1) wood over 3 inches in diameter will be cut, whenever practical, into a manageable size and left at the site, unless requested otherwise, (2) branch debris will be removed from the site by SDG&E, (3) SDG&E will not grind/remove stumps.

Signature: _____ **Date:** _____

#	TREE ID#	START POLE	END POLE	UNIT #	SPECIFIC DBH
1					
2					
3					
4					
5					
6					
7					
8					
9					
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11					
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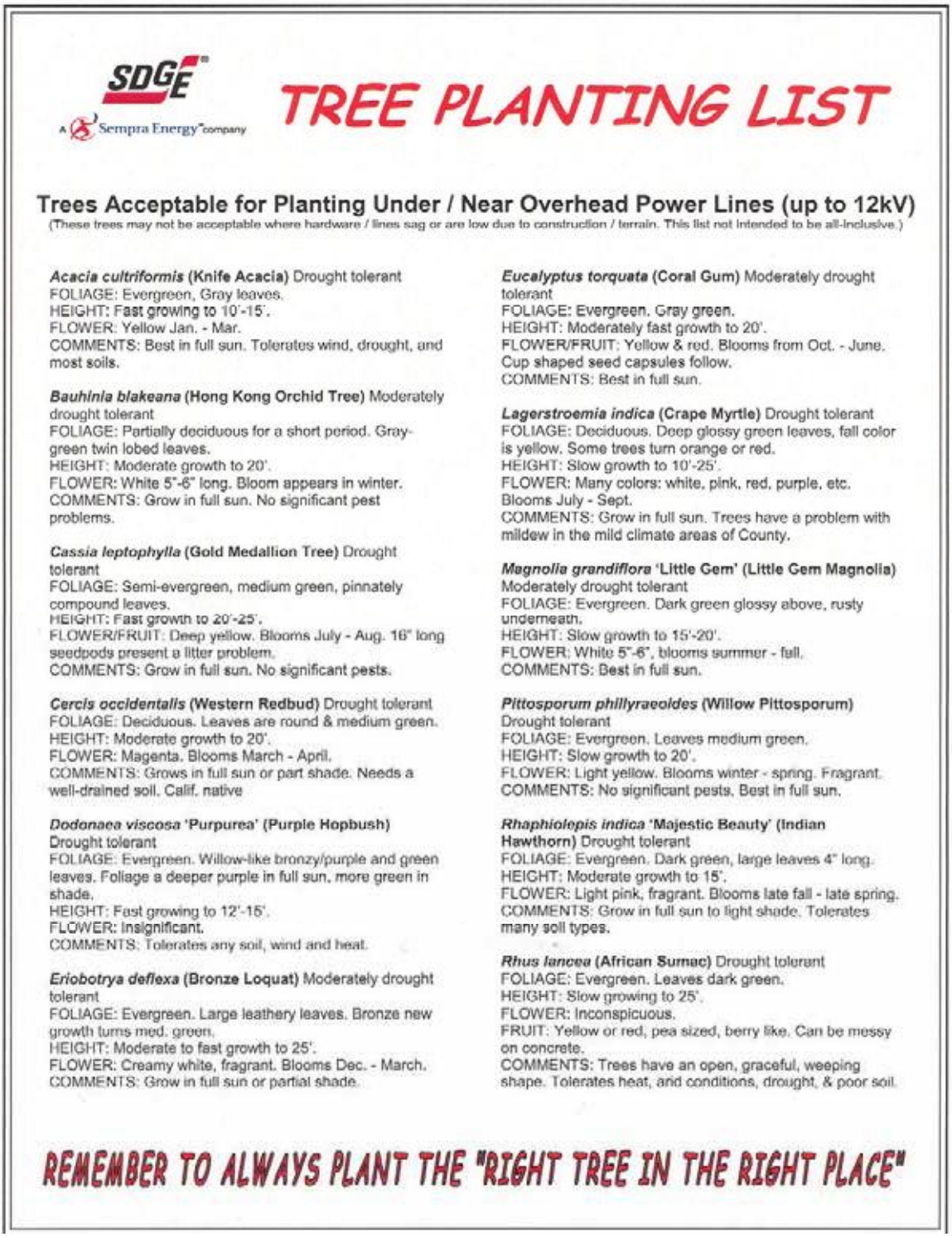
33					

Figure 19: Tree Replacement List



SDGE
A Sempra Energy company

TREE PLANTING LIST

Trees Acceptable for Planting Under / Near Overhead Power Lines (up to 12kV)

(These trees may not be acceptable where hardware / lines sag or are low due to construction / terrain. This list not intended to be all-inclusive.)

***Acacia cultriformis* (Knife Acacia)** Drought tolerant
FOLIAGE: Evergreen, Gray leaves.
HEIGHT: Fast growing to 10'-15'.
FLOWER: Yellow Jan. - Mar.
COMMENTS: Best in full sun. Tolerates wind, drought, and most soils.

***Bauhinia blakeana* (Hong Kong Orchid Tree)** Moderately drought tolerant
FOLIAGE: Partially deciduous for a short period. Gray-green twin lobed leaves.
HEIGHT: Moderate growth to 20'.
FLOWER: White 5"-6" long. Bloom appears in winter.
COMMENTS: Grow in full sun. No significant pest problems.

***Cassia leptophylla* (Gold Medallion Tree)** Drought tolerant
FOLIAGE: Semi-evergreen, medium green, pinnately compound leaves.
HEIGHT: Fast growth to 20'-25'.
FLOWER/FRUIT: Deep yellow. Blooms July - Aug. 16" long seedpods present a litter problem.
COMMENTS: Grow in full sun. No significant pests.

***Cercis occidentalis* (Western Redbud)** Drought tolerant
FOLIAGE: Deciduous. Leaves are round & medium green.
HEIGHT: Moderate growth to 20'.
FLOWER: Magenta. Blooms March - April.
COMMENTS: Grows in full sun or part shade. Needs a well-drained soil. Calif. native

***Dodonaea viscosa* 'Purpurea' (Purple Hopbush)** Drought tolerant
FOLIAGE: Evergreen. Willow-like bronzy/purple and green leaves. Foliage a deeper purple in full sun, more green in shade.
HEIGHT: Fast growing to 12'-15'.
FLOWER: Insignificant.
COMMENTS: Tolerates any soil, wind and heat.

***Eriobotrya deflexa* (Bronze Loquat)** Moderately drought tolerant
FOLIAGE: Evergreen. Large leathery leaves. Bronze new growth turns med. green.
HEIGHT: Moderate to fast growth to 25'.
FLOWER: Creamy white, fragrant. Blooms Dec. - March.
COMMENTS: Grow in full sun or partial shade.

***Eucalyptus torquata* (Coral Gum)** Moderately drought tolerant
FOLIAGE: Evergreen. Gray green.
HEIGHT: Moderately fast growth to 20'.
FLOWER/FRUIT: Yellow & red. Blooms from Oct. - June. Cup shaped seed capsules follow.
COMMENTS: Best in full sun.

***Lagerstroemia indica* (Crape Myrtle)** Drought tolerant
FOLIAGE: Deciduous. Deep glossy green leaves, fall color is yellow. Some trees turn orange or red.
HEIGHT: Slow growth to 10'-25'.
FLOWER: Many colors: white, pink, red, purple, etc. Blooms July - Sept.
COMMENTS: Grow in full sun. Trees have a problem with mildew in the mild climate areas of County.

***Magnolia grandiflora* 'Little Gem' (Little Gem Magnolia)** Moderately drought tolerant
FOLIAGE: Evergreen. Dark green glossy above, rusty underneath.
HEIGHT: Slow growth to 15'-20'.
FLOWER: White 5"-6", blooms summer - fall.
COMMENTS: Best in full sun.

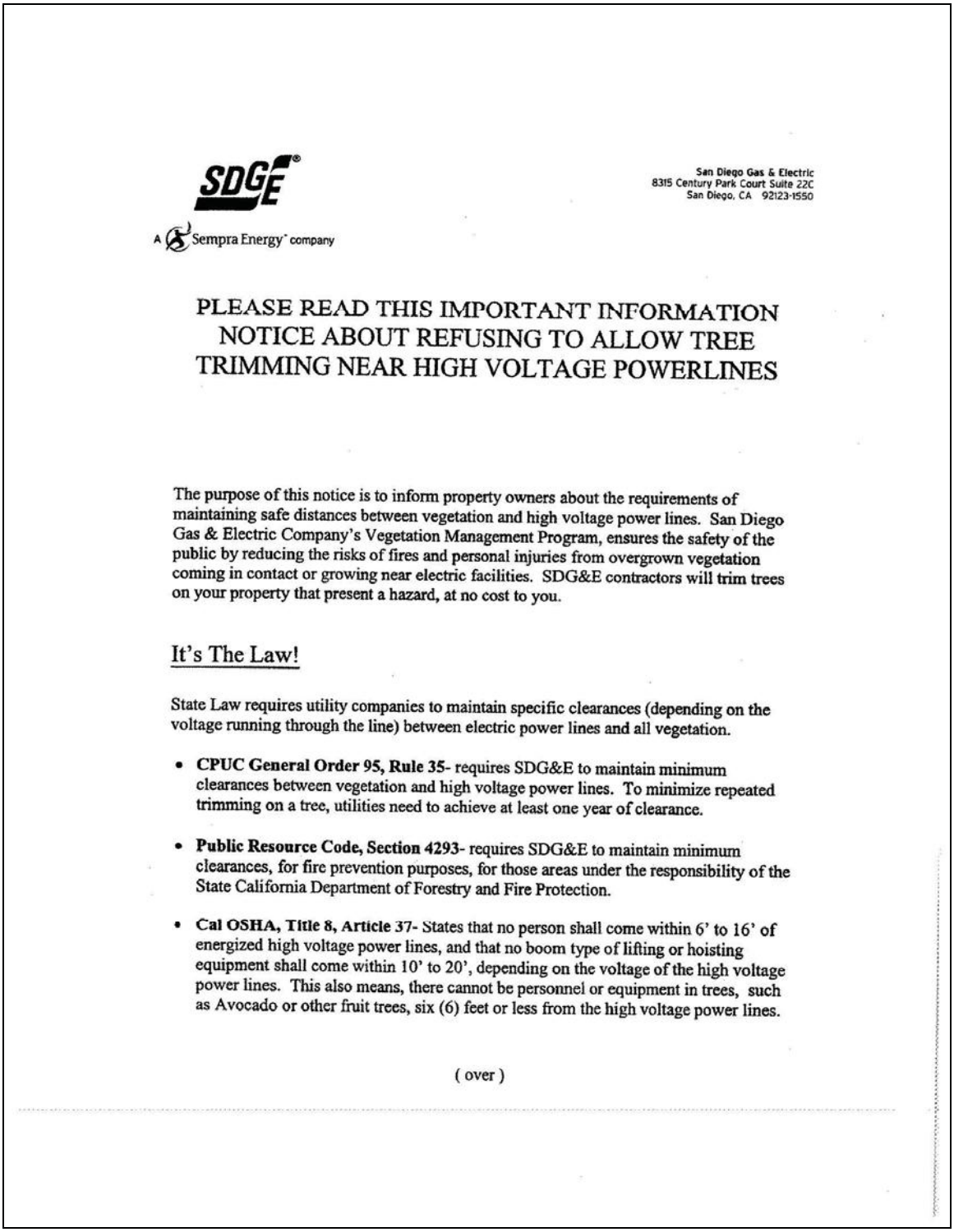
***Pittosporum phillyraeoides* (Willow Pittosporum)** Drought tolerant
FOLIAGE: Evergreen. Leaves medium green.
HEIGHT: Slow growth to 20'.
FLOWER: Light yellow. Blooms winter - spring. Fragrant.
COMMENTS: No significant pests. Best in full sun.

***Rhaphiolepis indica* 'Majestic Beauty' (Indian Hawthorn)** Drought tolerant
FOLIAGE: Evergreen. Dark green, large leaves 4" long.
HEIGHT: Moderate growth to 15'.
FLOWER: Light pink, fragrant. Blooms late fall - late spring.
COMMENTS: Grow in full sun to light shade. Tolerates many soil types.

***Rhus lancea* (African Sumac)** Drought tolerant
FOLIAGE: Evergreen. Leaves dark green.
HEIGHT: Slow growing to 25'.
FLOWER: Inconspicuous.
FRUIT: Yellow or red, pea sized, berry like. Can be messy on concrete.
COMMENTS: Trees have an open, graceful, weeping shape. Tolerates heat, arid conditions, drought, & poor soil.

REMEMBER TO ALWAYS PLANT THE "RIGHT TREE IN THE RIGHT PLACE"

Figure 20: Refusal Handout (page 1)



SDGE

A Sempra Energy company

San Diego Gas & Electric
8315 Century Park Court Suite 22C
San Diego, CA 92123-1550

PLEASE READ THIS IMPORTANT INFORMATION NOTICE ABOUT REFUSING TO ALLOW TREE TRIMMING NEAR HIGH VOLTAGE POWERLINES

The purpose of this notice is to inform property owners about the requirements of maintaining safe distances between vegetation and high voltage power lines. San Diego Gas & Electric Company's Vegetation Management Program, ensures the safety of the public by reducing the risks of fires and personal injuries from overgrown vegetation coming in contact or growing near electric facilities. SDG&E contractors will trim trees on your property that present a hazard, at no cost to you.

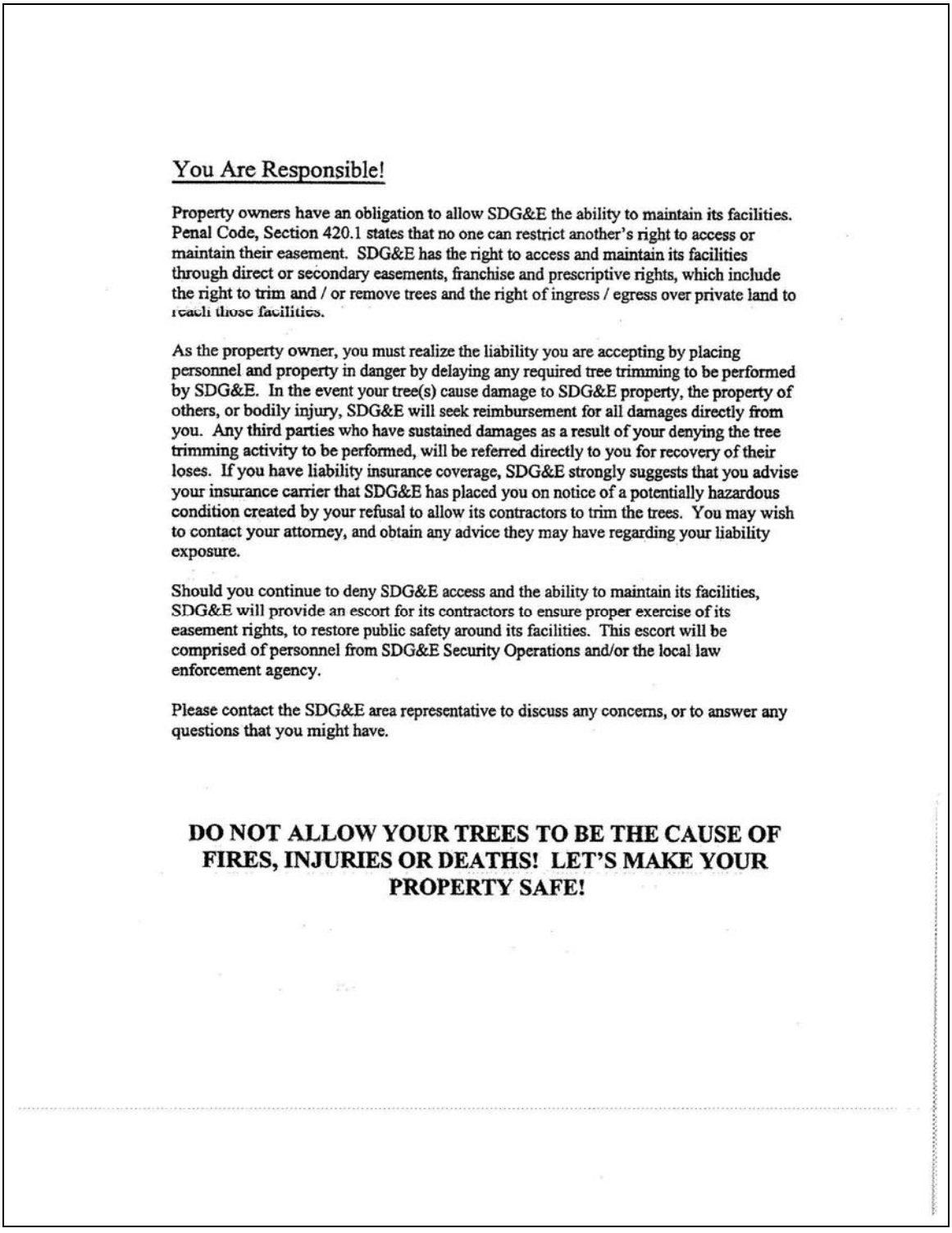
It's The Law!

State Law requires utility companies to maintain specific clearances (depending on the voltage running through the line) between electric power lines and all vegetation.

- **CPUC General Order 95, Rule 35**- requires SDG&E to maintain minimum clearances between vegetation and high voltage power lines. To minimize repeated trimming on a tree, utilities need to achieve at least one year of clearance.
- **Public Resource Code, Section 4293**- requires SDG&E to maintain minimum clearances, for fire prevention purposes, for those areas under the responsibility of the State California Department of Forestry and Fire Protection.
- **Cal OSHA, Title 8, Article 37**- States that no person shall come within 6' to 16' of energized high voltage power lines, and that no boom type of lifting or hoisting equipment shall come within 10' to 20', depending on the voltage of the high voltage power lines. This also means, there cannot be personnel or equipment in trees, such as Avocado or other fruit trees, six (6) feet or less from the high voltage power lines.

(over)

Figure 21: Refusal Handout (page 2)



You Are Responsible!

Property owners have an obligation to allow SDG&E the ability to maintain its facilities. Penal Code, Section 420.1 states that no one can restrict another's right to access or maintain their easement. SDG&E has the right to access and maintain its facilities through direct or secondary easements, franchise and prescriptive rights, which include the right to trim and / or remove trees and the right of ingress / egress over private land to reach those facilities.

As the property owner, you must realize the liability you are accepting by placing personnel and property in danger by delaying any required tree trimming to be performed by SDG&E. In the event your tree(s) cause damage to SDG&E property, the property of others, or bodily injury, SDG&E will seek reimbursement for all damages directly from you. Any third parties who have sustained damages as a result of your denying the tree trimming activity to be performed, will be referred directly to you for recovery of their loses. If you have liability insurance coverage, SDG&E strongly suggests that you advise your insurance carrier that SDG&E has placed you on notice of a potentially hazardous condition created by your refusal to allow its contractors to trim the trees. You may wish to contact your attorney, and obtain any advice they may have regarding your liability exposure.

Should you continue to deny SDG&E access and the ability to maintain its facilities, SDG&E will provide an escort for its contractors to ensure proper exercise of its easement rights, to restore public safety around its facilities. This escort will be comprised of personnel from SDG&E Security Operations and/or the local law enforcement agency.

Please contact the SDG&E area representative to discuss any concerns, or to answer any questions that you might have.

DO NOT ALLOW YOUR TREES TO BE THE CAUSE OF FIRES, INJURIES OR DEATHS! LET'S MAKE YOUR PROPERTY SAFE!

Figure 22: Major Woody Stem Exemption Form

Major Woody Stem (MWS) Exemption Form

The following criteria shall be applied to any tree being considered for MWS exemption*. Each condition below must exist for the tree to qualify for exemption. Exemption status shall be reviewed and documented annually by a qualified ISA Certified Arborist. MWS are those trees that meet the exemption criteria where clearances are within 4 feet but greater than 6 inches of primary conductor in the State Responsibility Area (SRA) of SDG&E territory; and within 18 inches but greater than 6 inches of primary conductor in the Local Responsibility Area (LRA) of SDG&E territory**.

Inspector / Company_____ Date_____

Vegetation Management Area (VMA) _____

Tree ID _____

Species_____

Tree Address_____

Current Clearance to Primary Conductor_____

Date of digital photo_____

Please check box for each condition that applies:

☐ Tree is at least 10 inches diameter at breast height (DBH)

☐ Tree limb or trunk is at least 6 inches diameter at line height (DLH)

☐ Tree has been established for at least ten years.

☐ Tree is sufficiently rigid so as not to encroach within 6 inches of primary during wind or storm event.

☐ Tree is healthy, showing no signs of decay, disease, structural defect, or lean.

☐ Tree does not show signs of previous contact with the conductor.

*MWS exemption applies only to primary voltages.
**MWS exemption for SRA is an interim rule which expires December 31, 2008. The State Board of Forestry will then review the process to determine whether the exemption shall continue.

(3/07)

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Investigation on the Commission's Own Motion into the Operations and Practices of San Diego Gas & Electric Company Regarding the Utility Facilities linked to the Witch and Rice Fires of October 2007	))))))	Filed Public Utilities Commission November 6, 2008 San Francisco Office I.08-11-006

DAVEY TREE SURGERY COMPANY RESPONSE TO SAN DIEGO GAS & ELECTRIC COMPANY'S DATA REQUEST REGARDING THE RICE FIRE OF OCTOBER 2007

Randy W. Gimple
David Bona
Lynde Selden III
353 Sacramento Street, 16th Floor
San Francisco, CA 94111
Telephone: (415) 391-3911
Facsimile: (415) 391-3898

May 27, 2009

BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

Investigation on the Commission's Own Motion into the Operations and Practices of San Diego Gas & Electric Company Regarding the Utility Facilities linked to the Witch and Rice Fires of October 2007	))))))	Filed Public Utilities Commission November 6, 2008 San Francisco Office I.08-11-006

DAVEY TREE SURGERY COMPANY RESPONSE TO SAN DIEGO GAS & ELECTRIC COMPANY'S DATA REQUEST REGARDING THE RICE FIRE OF OCTOBER 2007

Davey Tree Surgery Company responds to San Diego Gas & Electric Company's Data Request Regarding the Rice Fire of October 2007, as follows:

Request 1-1

Did DAVEY TREE SURGERY view TREE FF1090 on October 15, 2007?

Response to Request 1-1

Yes.

Request 1-2

If DAVEY TREE SURGERY viewed TREE FF1090 on October 15, 2007, please (i) identify the individuals who viewed TREE FF1090 on October 15, 2007; and (ii) state the clearance between TREE FF1090 and SDG&E's conductors as observed by DAVEY TREE SURGERY on October 15, 2007.

Response to Request 1-2

(i) Jorge Orellana.

(ii) The clearance between the tree and conductors was greater than that required by Public Resources Code section 4293.

Request 1-3

Please provide a full and complete explanation of the entry by DAVEY TREE SURGERY in the TREE HISTORY REPORT for TREE FF1090 of an "Exception" under the category of "Pruning History," which indicates an "Exception" as to "Pruning Performed," a "Clearance" of 4.1 to 5.9 ft. and a "Pruning Date" of November 13, 2007. This explanation should include at least the following information:

a. When this "Exception" was entered by DAVEY TREE SURGERY in the TREE HISTORY REPORT;
b. The reasons why a November 13, 2007 "Pruning Date" was noted by DAVEY TREE SURGERY with respect to this "Exception";
c. Whether DAVEY TREE SURGERY was at the site of TREE FF1090 on November 13, 2007; and
d. Whether DAVEY TREE SURGERY is representing that it observed a clearance of 4.1 to 5.9 ft. with respect to TREE FF1090 as of November 13, 2007.

Response to Request 1-3

The Exception Form for Tree FF1090 was signed and dated November 13, 2007. Pursuant to SDG&E procedures, where a tree is scheduled for trimming but not trimmed, the VMA which includes that tree may not be closed out without an SDG&E Exception Form being executed. The entry "Exception" under the column heading "Pruning Performed," on the document entitled Information for Tree FF1090, and the 11/13/2007 date under the heading on "Pruning Date," were not intended to indicate that any pruning was performed on 11/13/2007. Rather, the 11/13/2007 date is the date that the Exception Form was executed. The reason an Exception Form was executed for Tree FF1090 was because, due to the Rice Canyon Fire and the work that was performed at the direction of SDG&E immediately thereafter, Tree FF1090 was not trimmed in the regular course of work, thus making it an "exception." Therefore, the Exception Form was completed on 11/13/2007 to note that Tree FF1090 was an exception, which was required in order to close out VMA 379.

The observed clearance of 4.1 to 5.9 feet refers to the clearance observed by Mr. Orellana on October 15, 2007.

Request 1-4

Please provide a copy of all DOCUMENTS describing a timeline or schedule for the trimming of vegetation in SDG&E Vegetation Management Area ("VMA") 379 in connection with the tree trim cycle that began on September 1, 2007.

Response to Request 1-4

Davey Tree Surgery Company is aware of only the attached scheduling document and scheduling parameters in its contract with SDG&E, which was previously provided to SDG&E.

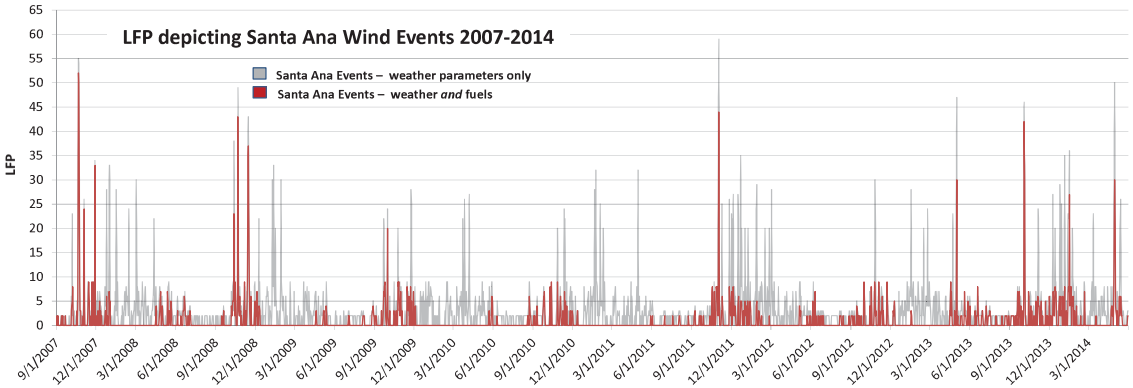
CARLSON, CALLADINE & PETERSON LLP

By_____
RANDY W. GIMPLE
Attorneys for DAVEY TREE SURGERY COMPANY

Developing and Validating the Santa Ana Wildfire Threat Index

Tom Rolinski[1], Robert Fovell[2], Scott B Capps[3], Yang Cao[2], Brian D"Agostino[4], Steve Vanderburg[4]

(1)USDA Forest Service (Predictive Services), Riverside, CA, United States, (2)Department of Oceanic and Atmospheric Sciences UCLA, Los Angeles, CA, United States, (3)Vertum Partners, Los Angeles, CA, United States, (4)SDG&E, San Diego, CA, United States



1- Introduction

From the fall through spring, offshore winds, commonly referred to as "Santa Ana" winds, occur across southern California from Ventura County south to Baja California and west of the coastal mountains and passes. Each of these synoptically driven wind events vary in frequency, intensity, duration, and spatial coverage, thus making them difficult to categorize. Since fuel conditions tend to be driest from late September through the middle of November, Santa Ana winds occurring during this time have the greatest potential to produce large, devastating fires when an ignition occurs. Such catastrophic fires occurred in 2003, 2007, 2008, and 2014. Because of the destructive nature of such fires, there has been a growing desire to categorize Santa Ana wind events in much the same way that tropical cyclones and tornadoes have been categorized.

Major passes in southern California that favor Santa Ana winds. Zones were used in beta test product.

High resolution satellite image showing the fires that occurred across southern California in 2003

During the past three and a half years, the Forest Service (through Predictive Services) has collaborated with the San Diego Gas and Electric utility (SDG&E) and the University of California at Los Angeles (UCLA) to develop the Santa Ana Wildfire Threat Index (SAWTI), which categorizes Santa Ana wind events according to the potential for a large fire to occur. This unique approach addresses the main impact Santa Ana winds could have on the population of southern California beyond experiencing the casual effects of windy, dry weather.

2- Methodology

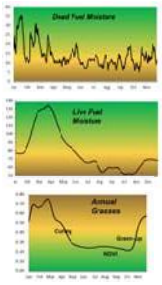
- The SAWTI which predicts Large Fire Potential (LFP) during Santa Ana wind events, is informed by both **weather** and **fuels** information.
- We define LFP to be the likelihood of an ignition reaching or exceeding 250 acres or approximately 100 ha.
- For SAWTI, the following equation was formulated:

$$LFP = W_s^2 D_d FMC$$

Where W_s is the near surface wind speed, D_d is the near surface dew point depression, and FMC is the Fuel Moisture Component expressed by this equation:

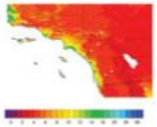
$$FMC = \left\{\left(\frac{DL}{LFM} - 1\right) + G\right\}^{1.7}$$

Where DL is a Dryness Level index (a function of the Energy Release Component [ERC] and Dead Fuel Moisture [DFM]). LFM is the Live Fuel Moisture of Chamise (Adenostoma fasciculatum), and G is the green-up/curing of the annual grasses using the Normalized Difference Vegetation Index (NDVI).



3- Fuels

Fuel moisture plays a critical role in the propagation of wildfires. FMC incorporates 3 kinds of fuel moisture (DFM, LFM, and G) because each component can be in phase or out of phase with each other.



Considering any one component alone may give a false representation of fuel moisture.

Used by fire agencies and the general public, the Santa Ana Wildfire Threat Index (SAWTI) was made publically available on September 17, 2014. The product can be accessed at: santaanawildfirethreat.com

The SAWTI shown on The Weather Channel (TWC) on the day of the press conference (September 17, 2014).

KUSI news in San Diego showing a direct link to the product on their main web page.

Google search provides a list of news articles on the release of the SAWTI

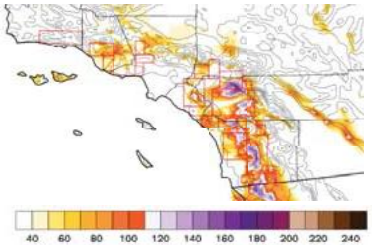
4- Operational SAWTI

In 2013, the SAWTI was beta tested through a controlled release via a password protected website. On September 17, 2014, the USDA Forest Service conducted a press conference at which time the product was made publically available. Since then it has been featured on numerous southern California news stations and on The Weather Channel. When discussing upcoming Santa Ana wind events, The Weather Channel uses the SAWTI output.

5- APPLICATION

SAWTI in beta test mode provided operational guidance during 13-14 May 2014

- Extreme weather and fuel conditions (map below left) were forecasted for this event up to 5 days in advance
- Multiple fires occurred over San Diego County on 13-14 May 2014



Map above depicts fire potential during the May 14, 2014 Santa Ana event. Colors represent the product of wind speed squared (mph) and the dew point depression (°F)

Map depicts active fires (icons) on May 14, 2014 across San Diego County.

The authors acknowledge: Dr. Robert Fovell and Dr. Yang Cao, UCLA Brian D'Agostino and Steve Vanderburg, San Diego Gas and Electric

For more information, please contact : Dr. Scott B. Capps at scott@allvertum.com Tom Rolinski at thomasrolinski@fs.fed.us

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California Department of Forestry and Fire Protection

INVESTIGATION REPORT

NAME: Witch Fire **CASE NO.** 07-CDF-570

DATE: October 21, 2007 **INCIDENT NO.** 07-CA-MVU-10432

LOCATION: Highway 78 west of Santa Ysabel, San Diego County

1 - VIOLATION:

Health and Safety Code Section 13001 – Every person is guilty of a misdemeanor who, through careless or negligent action, throws or places any lighted cigarette, cigar, ashes, or other flaming or glowing substance, or any substance or thing which may cause a fire, in any place where it may directly or indirectly start a fire, or who uses or operates a welding torch, tar pot or any other device which may cause a fire, who does not clear the inflammable material surrounding the operation or take such other reasonable precautions necessary to insure against the starting and spreading of fire.

2 - SUMMARY:

On October 21, 2007 at approximately 12:29 PM Air Tanker Pilot Mike VENABLE reported a vegetation fire in the area of State Highway 78 and Santa Ysabel. At approximately 12:35 PM same date units from the California Department of Forestry and Fire Protection were dispatched to a vegetation fire located near Highway 78 and Santa Ysabel, San Diego County. The fire was identified as the Witch Fire. Between the Witch Fire and the Guejito Fire (which merged with the Witch Fire) approximately 197,990 acres burned. During the Witch Fire two civilian fatalities occurred and approximately forty fire fighters were injured. Approximately 1,141 homes, 509 outbuildings and 239 vehicles were destroyed during the fire. Additionally seventy-seven homes and twenty-five outbuildings were damaged.

During my investigation into the origin and cause of the Witch Fire I eliminated all other causes for the fire, determining the cause to be power lines. During my investigation I observed areas on Tie Line #637 between Pole #416675 and #416676 where it appeared arcing had occurred. While at the origin, I observed the lines coming in contact with each other in the wind. I also interviewed the tanker pilot who reported the Witch Fire and saw bluish arcing coming from the lines.

I also learned Tie Line #637 had faulted four times on the day of October 21, 2007. These faults were determined to have occurred in the area where the fire's origin was located. I believe hot particles were created when the lines faulted and landed in the light grassy fuels in the Specific Origin Area. These fuels ignited, and the fire spread with the wind in a westerly direction.

3 - SUBJECT:

San Diego Gas and Electric/Sempra Energy
8330 Century Park Court
San Diego, CA 92123
San Diego Gas and Electric operates Tie Line #637, which is the line determined to be the cause of the Witch Fire.

4 - VICTIMS, WITNESSES & OTHERS:

Victims – During the course of the Witch and Guejito Fires approximately 197,990 acres burned. Two persons suffered the loss of their lives and approximately 1,141 homes and 509 outbuildings were destroyed. Seventy-seven homes and eight outbuildings were damaged during the fire. Approximately 239 vehicles were destroyed. Reference Missing Person Report #07070683 and Event #623176 from the San Diego Sheriffs for information on the two fatalities.

W-1 Glen DROWN

Resident

[redacted]

DROWN observed the fire burning in a westerly direction, away from his residence.

W-2 Fire Captain Eric JOHNSON, ID #2217

[redacted]

JOHNSTON was one of the first arriving engine companies, and identified the general area where the fire had came from.

W-3 Jeff WOOD

Resident

[redacted]

WOOD met with an SDGE Representative, near the origin of the fire. WOOD also had 35mm photographs of the fire area, which he will be providing to investigators.

W-4 Pilot Mike VENABLE

Tanker 73 Pilot

California Department of Forestry and Fire Protection

[redacted]

W-5 Pilot Lynn McGREW

Tanker 71 Pilot

California Department of Forestry and Fire Protection

[redacted]

McGREW was one of the first Tankers to arrive at the scene

W-6 Pilot Bill HOSKINS

Tanker 70 Pilot

California Department of Forestry and Fire Protection

[redacted]

HOSKINS was one of the first Tankers to arrive at the scene

O-1 Fire Captain Specialist Preston FOUTS, ID #2654

[redacted]

FOUTS assisted with the origin and cause investigation

O-2 Brian CROUCH

Gas/Electrical Design Analyst

San Diego Gas and Electric

8315 Century Park Court, CP22A

San Diego, CA 92123

CROUCH was present on the October 25, 2007 inspection

O-3 Tim KNOWD
Construction Manager-Electric
San Diego Gas and Electric
662 Camino De Los Mares, Sd1425
San Clemente, CA 92673
KNOWD was present on the October 25, 2007 inspection

O-4 Larry DAVIS
Sempra Energy
Managing Attorney
101 Ash Street
San Diego, CA 92101
(619) 699-5023 work
[redacted]

O-5 Larry HALL
Electrical Engineer
8575 Renown Drive
San Diego, CA 92119
[redacted]
[redacted]

5 - EVIDENCE:

Photographs P-1 MG thru P-40 MG, taken on October 22, 2007

Photographs P-1 MG thru P-12 MG, taken on October 24, 2007

Photographs P-1 MG thru P-6 MG, taken on October 27, 2007

Photographs P-1 MG thru P-71 MG, taken on November 14, 2007

Photographs P-1 thru P-4 taken by W-3 Jim WOOD

6 - CONDITIONS:

During the Witch Fire a Red Flag Warning was in effect for the Southern California area. The possibility of east winds gusting over 35 miles per hour with relative humidity fifteen percent was broadcast.

Relative Humidity: 16%
Temperature: 58° Fahrenheit
Wind Direction: East
Wind Speed: 24 MPH, gust to 43 MPH
Aspect: North-West facing slope
Slope: 5% slope

The above weather information was obtained from the Julian Remote Automated Weather Station (RAWS) for October 21, 2007 at approximately 12:14 PM. Additionally, the wind speeds were so great when W-4 Mike VENABLE attempted to drop retardant on the fire the retardant drops were blown away.

7 - EQUIPMENT:

The equipment associated with the cause of the Witch Fire is a 69KV line operated by San Diego Gas and Electric. The line is referred to as Tie Line #637. The fire originated mid-span, between Pole #416675 and #416676. When I arrived at the fire scene, the lines were intact and the poles appeared to be in good condition. The line runs on a bearing of North 30° East towards Santa Ysabel.

Tie Line #637 is a three phase line, and the conductors cross midspan between the effected poles. Reference Attachment J for a sketch from O-5 HALL detailing the orientation of these lines.

In a letter from O-5 HALL I learned Tie Line #637 faulted four times on October 21, 2007 between the hours of 8:53 AM to 3:25 PM. One of the faults occurred at 12:23 PM, same date.

8 - PROPERTY:

The Witch Fire merged with the Guejito Fire and the two fires burned approximately 197,990 acres. During the course of these fires approximately 1,141 homes and 509 outbuildings were destroyed. Seventy-seven homes and eight outbuildings were damaged during the fire. Approximately 239 vehicles were destroyed. Reference the Damage Assessment Report for further details concerning the losses associated with the Witch Fire. Investigators are working to determine the perimeters of the Witch and Guejito Fires and further identify the damages associated with each fire.

The Specific Origin Area for the Witch Fire is located at the following coordinates:

North 33° 04' 59.1"

West 117° 41' 38.9"

The land on which the Specific Origin Area is located is owned by the Tulloch Family Partners. W-1 Glen DROWN is a member of this group, and is who I obtained the information from.

9 - NARRATIVE:

On October 21, 2007 at approximately 12:29 PM W-4 Air Tanker Pilot Mike VENABLE reported a vegetation fire near Highway 78 and Santa Ysabel. At approximately 12:35 PM same date units from the California Department of Forestry and Fire Protection were dispatched to a vegetation fire located near Highway 78 and Santa Ysabel, San Diego County. The Witch Fire merged with the Guejito Fire and the fires eventually burned approximately 197,990 acres combined. During the Witch Fire two civilian fatalities occurred and approximately forty fire fighters were injured. Approximately 1,141 homes, 509 outbuildings and 239 vehicles were destroyed during the fire. Additionally seventy-seven homes and twenty-five outbuildings were damaged. Investigators are working to determine the perimeters of the Witch and Guejito Fires and further identify the damages associated with each fire.

On October 21, 2007 I was assigned to respond to the Witch Fire to conduct an origin and cause investigation. I arrived in the area and met with W-1 Glen DROWN. DROWN informed me the fire had begun to the south of his residence, near a power line road. Due to the fire conditions, I was unable to access the Incident Command Post in Ramona via State Highway 78 and had to detour around on State Highway 76. I arrived at the Incident Command Post later in the evening, where I met with W-2 Fire Captain Eric JOHNSON. JOHNSON was assigned to the initial dispatch to the Witch Fire and described the area to me where he had first seen the fire. The area he described was located on the eastern perimeter of the fire. I arrived in this area at approximately 12:30 AM, October 22, 2007. Due to darkness, high winds, and being un-familiar with the area, I waited for sunrise to begin my investigation.

On October 22, 2007 at approximately 6:30 AM I began my investigation into the origin and cause of the fire. I contacted O-1 Fire Captain Specialist Preston FOUTS and requested he respond to my location to assist with the investigation.

Perimeter Search

I began the investigation by conducting a perimeter search of the area. During this time, I observed burn indicators such as staining and sooting, and angle of char which indicated the fire traveled away from the area I was located. I observed the power lines were intact, with no lines or poles down. I did not observe any items of evidence in the area, beyond the power lines.

Origin Determination

I entered the burned area from an area I identified as an advancing fire. The indicators I used to determine this were staining on rocks, angle of char on bushes, and angle of char on grass clumps. All of these indicators I observed showed fire advancing in a westerly direction. I walked around this area, and observed retardant to the southwest. I also observed the fire perimeter had not extended far to the northwest. I identified this area as the general origin area.

Within the general origin area I utilized red colored flags to mark fire directional indicators. I observed cupping in grass stems and staining on rocks which showed fire advancing. I continued up-slope, in an easterly direction, continuing to observe these advancing indicators. As I worked my way to the east, I worked in an "S" pattern. I observed the lateral movement of fire, away from the main run. I marked these indicators with yellow flags, which showed lateral movement of the fire. I continued to work towards the east into a transitional area where I observed indicators of a backing fire. These indicators included cupping on grass stems, staining on rocks, and areas of protection. I also observed die out patterns in the area, which indicated a backing fire. I marked these indicators with blue flags.

I identified this area where the fire transitioned from an advancing fire to a backing fire, and where the lateral movement on the two flanks began to come together as the Specific Origin Area. Within this area I conducted the following cause exclusion analysis.

Cause Exclusion

Lightning – The skies were clear with no thunderhead or cloud build-up observed. Based upon the above and lightning detection data I eliminated a lightning caused fire.

Spontaneous Combustion – Within the Specific Origin Area I did not observe any accumulation of fuels which could have the potential to self-heat and spontaneously combust. Based on the lack of these materials which are known to contribute to spontaneous combustion caused fires, I eliminated spontaneous combustion as a cause.

Campfire – There are no campgrounds in the area where the Specific Origin Area is located. During my perimeter search I did not locate any rock fire rings, campsites, or piled materials typically associated with a campfire. Based upon the lack of the above items, I eliminated a campfire caused fire.

Smoking – The relative humidity was low enough to support a cigarette caused fire, however I did not observe any cigarette butts or other smoking materials within the Specific Origin Area, nor did I observe any cigarette butts or smoking materials during my perimeter search. The area where the Specific Origin Area was located is away from public roads and trails. Based upon the above facts, I eliminated a smoking caused fire.

Debris Burning – San Diego County currently has a burn ban in effect which prohibits debris burning. I did not observe any piles of debris or trash within the Specific Origin Area nor during my perimeter search. I did not observe any drums which are typically used for burning. Based on the above facts, I eliminated a debris burning caused fire.

Vehicles – The area where the Specific Origin Area was located is away from roads. To access the area one must walk up-hill through a group of oak trees, or downhill from the power line road through a rocky area. The Specific Origin Area was located over seventy feet from the nearest road. Additionally, I saw no signs

of Off Highway Vehicle use in the area. The access to the Specific Origin Area included traveling through two gates. Based upon the above facts, I eliminated a vehicle caused fire.

Equipment use – During my examination of the Specific Origin Area and during the perimeter search I saw no signs of recent equipment use. I did not observe any disturbed soils, or any area where equipment had been used. In observing the rocks around the Specific Origin Area, I did not observe any rock strikes. Based upon the above facts I eliminated an equipment caused fire.

Railroad – There are no railroads in the area which could have contributed to the cause of the fire, and I eliminated a railroad caused fire.

Fireworks – The Specific Origin Area is located on range land, away from any homes. During my perimeter search and investigation in the Specific Origin Area I did not locate any remnants of fireworks, nor did I observe any signs of fireworks being used in the area. Based upon the above facts I eliminated a fireworks caused fire.

Playing with Fire – The Specific Origin Area is located on range lands, away from any homes. During the investigation I did not observe any forts, play areas, or hideouts typically associated with a playing with fire caused fire. Based on these facts I eliminated a playing with fire caused fire.

Power lines – During my investigation I observed power lines approximately fifty-six feet from the Specific Origin Area. During my investigation I observed what appeared to be marks on the lines above the Specific Origin Area. During my investigation I interviewed Air Tanker Pilot Mike VENABLE who reported seeing the lines arcing in the area where he observed the fire when it was approximately one and one quarter acres in size. This was reported at approximately 12:29 PM on October 21, 2007. I also learned Tie Line #637 faulted at approximately 12:23 PM on October 21, 2007. I have eliminated all other causes for the fire, determining the Witch Fire to be a power line caused fire.

Glass refraction – During my perimeter search and investigation I did not observe any broken glass or mirrors, or any other debris which could have contributed to

a glass refraction caused fire. Based on these facts, I eliminated a glass refraction caused fire.

Incendiary – During my investigation I did not observe any incendiary devices in the Specific Origin Area. To access the Specific Origin involves passing through two gates, onto private property. Additionally, Air Tanker Pilot Mike VENABLE did not see any persons or vehicles in the area when he first observed the fire. Based upon the above facts and lack of evidence supporting an arson caused fire, I eliminated an arson caused fire.

October 24, 2007

On October 24, 2007 FOUTS and I returned to the scene of the Witch Fire. We re-inspected the overall burn indicators leading towards the General Origin Area, and confirmed our original findings. During this inspection, I also observed the power lines through a monocular and observed numerous small marks on the power lines, directly in-line with and up-wind of the Specific Origin Area. I photographed these marks with a 300mm lens. In examining these marks, they appear to be in locations where the lines were either close-together, or made contact with one another.

October 25, 2007

On October 25, 2007 FOUTS and I met with O-2 Brian CROUCH and O-3 Tim KNOWD of San Diego Gas and Electricity (SDG&E) at the origin of the Witch Fire. I explained our findings to them, and asked for their input. KNOWD said the lines can short to each other, if they come close enough together. I asked KNOWD how I can obtain the records from SDG&E which would show when the line was de-energized, if and when it shorted out, and any other information pertaining to the line which would assist in the investigation. I also advised him we were interested in obtaining the lines for examination and evidentiary purposes. KNOWD said he would work on making the notifications for us to obtain the records.

Later in the day KNOWD contacted me, and advised me the point of contact for

SDG&E records would be O-4 Larry DAVIS. I contacted DAVIS and explained to him what I needed to complete my investigation. DAVIS said he would have to talk to the management of SDG&E prior to releasing any items or document. He estimated approximately one to two weeks to gather the personnel needed to collect the power lines, and advised the records had already been pulled relating to the 69kv lines, and he would be in contact with me when he determined if he could release the records.

October 26, 2007

On October 26, 2007 O-5 Larry HALL contacted me via telephone. HALL is retired from SDG&E and has been brought back to assist with the fires in San Diego County. HALL said he can arrange to inspect the power line with a bucket truck, and after that can coordinate for the line removal and inspection. He said he will not give up the line to us, since it is SDG&E property. He will arrange to have the line inspected by a metallurgist. He said they can measure the damage to the line, and calculate the mass of the metal missing and its weight. I then contacted DAVIS, who advised me there would be no problem with CAL FIRE maintaining custody of the affected lines.

I also interviewed W-5 Air Tanker Pilot Lynn McGREW. McGREW said she was flying to the Harris Fire when VENABLE reported the fire, later identified as the Witch Fire. When she saw the fire, it was well established and spotting across State Highway 78. The fire was traveling in a westerly direction, and the smoke was laying down, not rising up.

I also interviewed W-6 Air Tanker Pilot Billy HOSKINS. HOSKINS said he was returning from the Harris Fire and saw the smoke. He called VENABLE to ask him to take a look while he landed and reloaded with retardant. He was then diverted to the Witch Fire and dropped 1000 gallons on the right shoulder and 1000 gallons on the left shoulder.

On October 26, 2007 I also obtained a copy of the log from the Ramona Air Attack Base from the day of October 21, 2007. The log shows at 12:29 PM on October 21, 2007 Tanker 73 (Piloted by W-4 Mike VENABLE) reported smoke approximately fifteen minutes NE of the airport, 090 degrees and eleven miles. At approximately 1:00 PM same date the location was up-dated to 060 degrees and eleven miles, near the area of State Highway 78 and Santa Ysabel. At approximately 1:10 PM same date the drops were reported as not being effective due to the winds.

October 29, 2007

On October 29, 2007 I met with W-4 Air Tanker Pilot Mike VENABLE. VENABLE said he was assigned to the Harris Fire and had re-loaded his airtanker at Ramona Air Attack Base. He was enroute to the Harris Fire when he saw smoke. He flew to the area, later identified as the Witch Fire and observed approximately one and one quarter acres of vegetation burning. He identified the poles as not being typical power poles and not having a regular cross arm. I showed VENABLE a picture of the power poles from the Specific Origin Area and he identified them as being similar to the ones he observed.

He described the fire as burning in light fuels with a slow rate of spread, under the oaks. The fire then bumped a dirt road and when it jumped the road, grew to over twenty acres at a rapid rate of spread. He said he and the three other pilots each dropped retardant on the fire, but couldn't contain it. He also observed a slight amount of a backing fire, against the wind.

While flying the fire scene he observed arcing coming from the power lines. He observed a line of bluish colored flashes, going with the wind. As he flew, he was able to focus on these flashes on two separate occasions. He described them as looking like tracers and flashes which would catch his eye. He described them as unusual and shooting down wind.

While working on the Witch Fire he did not observe any vehicles or people in the area. He did not see any smoke or other fire upwind from the area later identified as the Specific Origin Area. He said he typically looks for vehicles and/or people near fire scenes and did not see any on the Witch Fire.

November 2, 2007

On November 2, 2007 at approximately 1:05 PM I met with representatives from SDG&E at the Sempra Energy Headquarters in San Diego, CA. DAVIS provided me with documentation compiled by HALL from SDG&E records concerning the operation of the 69kV Tie Line #637 from October 21, 2007. I learned Tie Line #637 experienced four interruptions on October 21, 2007. The times for these interruptions are as follows: 08:53 hours, 11:22 hours, 12:23 hours and 15:25 hours. The line was de-energized at 15:27 hours and left out of service. Reference Attachments I and J for the letter from HALL.

November 14, 2007

On the morning of November 14, 2007 I met with members from SDG&E, including DAVIS and HALL, to inspect Tie Line #637 between Pole #416675 and #416676. A SDG&E bucket truck was available for our use. During the day we inspected three sections of the line where damage was visible from the ground.

During the inspection of these sections of line I observed numerous areas where arcing had occurred, resulting in spackling and damage to the line. I also observed two areas in the line where the line had separated and a section of the strand was missing. The area where this damage occurred was located at Location #3, which was located up-wind of the Specific Origin Area I previously identified.

I also interviewed HALL, who said he was able to track the times and determine the location of the four faults which occurred on Tie Line #637. He was able to locate the area where the faults occurred as being between Pole #416675 and #416676. I

also learned Tie Line #637 had faulted since it had been re-energized after the Witch Fire and additional data on the fault will be provided as it comes available.

Opinions & Conclusions

Based on my training and experience I have determined the Witch Fire was a power line caused fire. I determined the Specific Origin Area was located approximately fifty-six feet down wind of the lines and approximately 215 feet north-east of Pole #416675. Within the Specific Origin Area I eliminated all other causes for the fire, determining the cause to be power lines. During my investigation I observed areas on Tie Line #637 between Pole #416675 and #416676 where it appeared arcing had occurred. While at the origin, I observed the lines coming in contact with each other in the wind. However, at the time I observed this, the lines had been de-energized. I interviewed W-4 Tanker Pilot Mike VENABLE who had reported the Witch Fire at approximately 12:29 PM, October 21, 2007. He reported the fire was approximately one and one quarter acres in size, and he also saw bluish arcing coming from the lines.

I also learned Tie Line #637 had faulted four times on the day of October 21, 2007. These faults were determined to have occurred on the stretch of line spanning between Pole # 416675 and #416676. One of these faults occurred at approximately 12:23 PM, October 21, 2007. This fault occurred between Phase B and Phase C. I believe hot particles were created when the lines faulted and came in contact with each other. These hot particles from the power line were created during this fault, separating from the line, becoming wind borne and landing in the light grassy fuels in the Specific Origin Area. These fuels ignited, and the fire spread with the wind in a westerly direction. VENABLE reported once the fire crossed the dirt road located in the meadow area west of the oaks, the fire grew to twenty acres within minutes. At approximately 1:15 PM on October 21, 2007 the pilot of Tanker 82 reported the fire "blew up."

10 - ATTACHMENTS:

a. Photographs P-1 MG thru P-40 MG, taken on October 22, 2007
b. Photographs P-1 MG thru P-12 MG, taken on October 24, 2007
c. Photographs P-1 MG thru P-6 MG, taken on October 27, 2007
d. Photographs P-1 MG thru P-36 MG, taken on November 14, 2007
e. Photographs P-1 thru P-4, taken by WOOD
f. Sketch of Specific Origin Area
g. Sketch of November 14, 2007 photo locations
h. Ramona Air Attack Base logs from October 21, 2007
i. Letter from HALL regarding Tie Line #637, dated October 28, 2007
j. Sketch from HALL detailing the phasing on Tie Line #637
k. RAWS Data
l. Incident Summary Report

Case Disposition

This case remains open and as additional information and testing is conducted the information will be attached in supplemental reports.

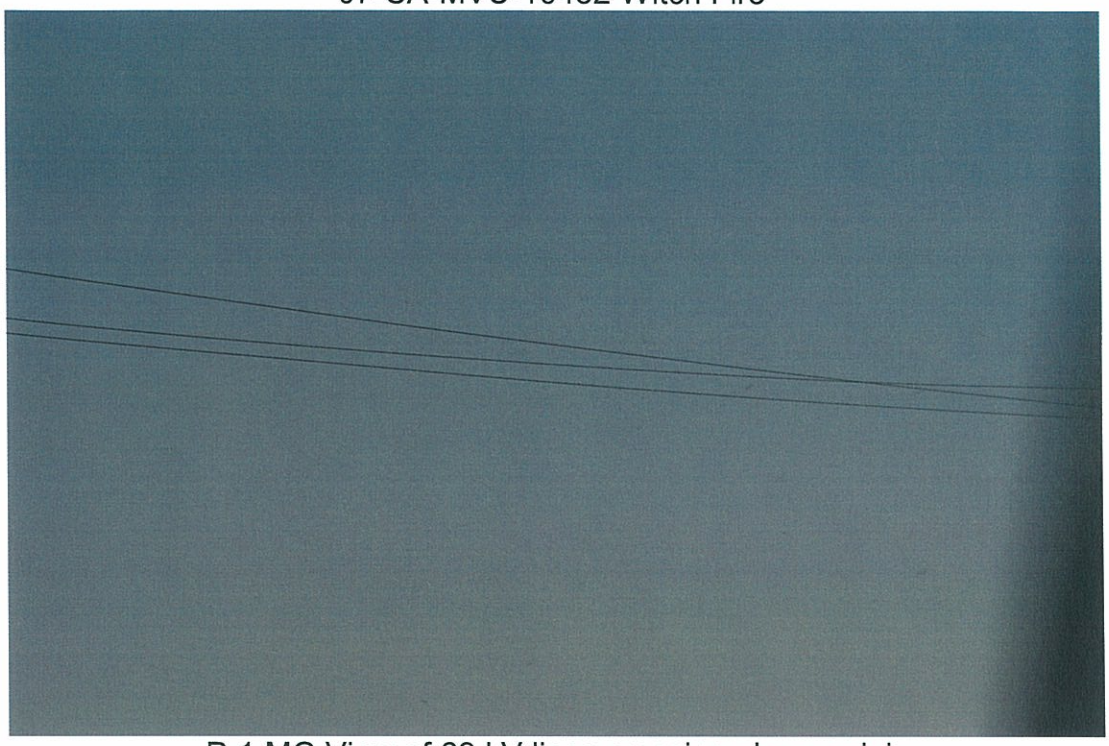
INVESTIGATING OFFICER:

7-1-2008

Signature Date

Matthew Gilbert, ID #22
Fire Captain Specialist
210 W. San Jacinto Avenue
Perris, CA. 92570
(951) 940-6900

Attachment A

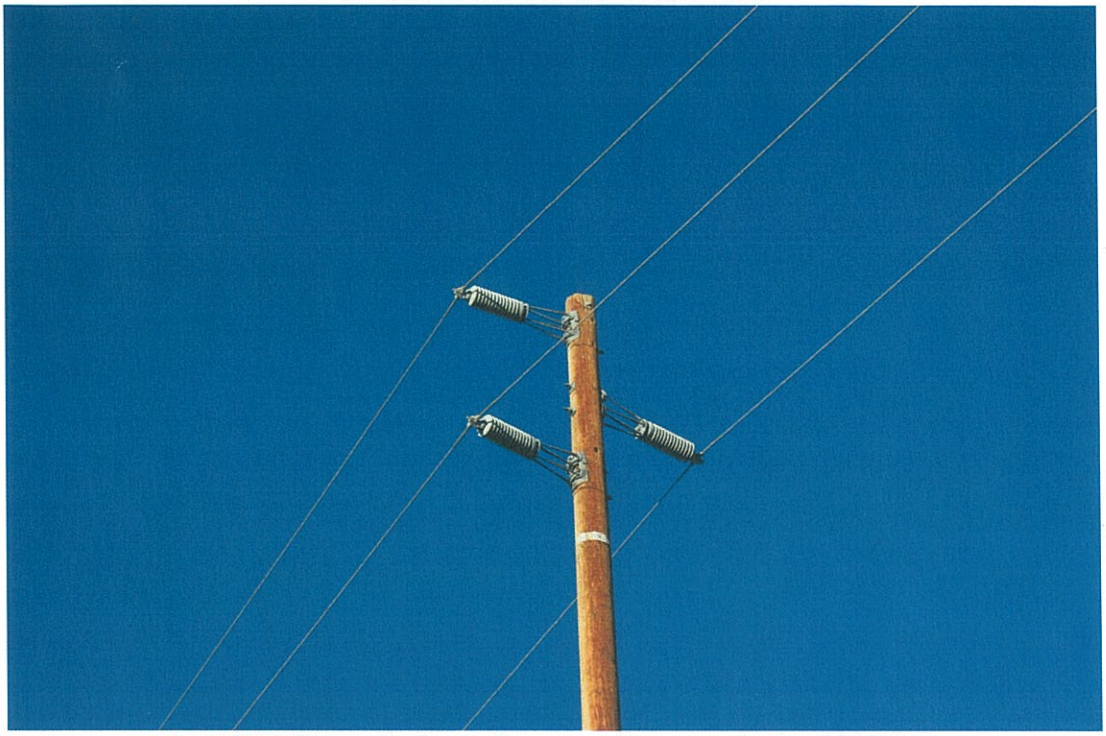


P-1 MG View of 69 kV lines crossing above origin

P-2 MG View of 69 kV lines crossing above origin

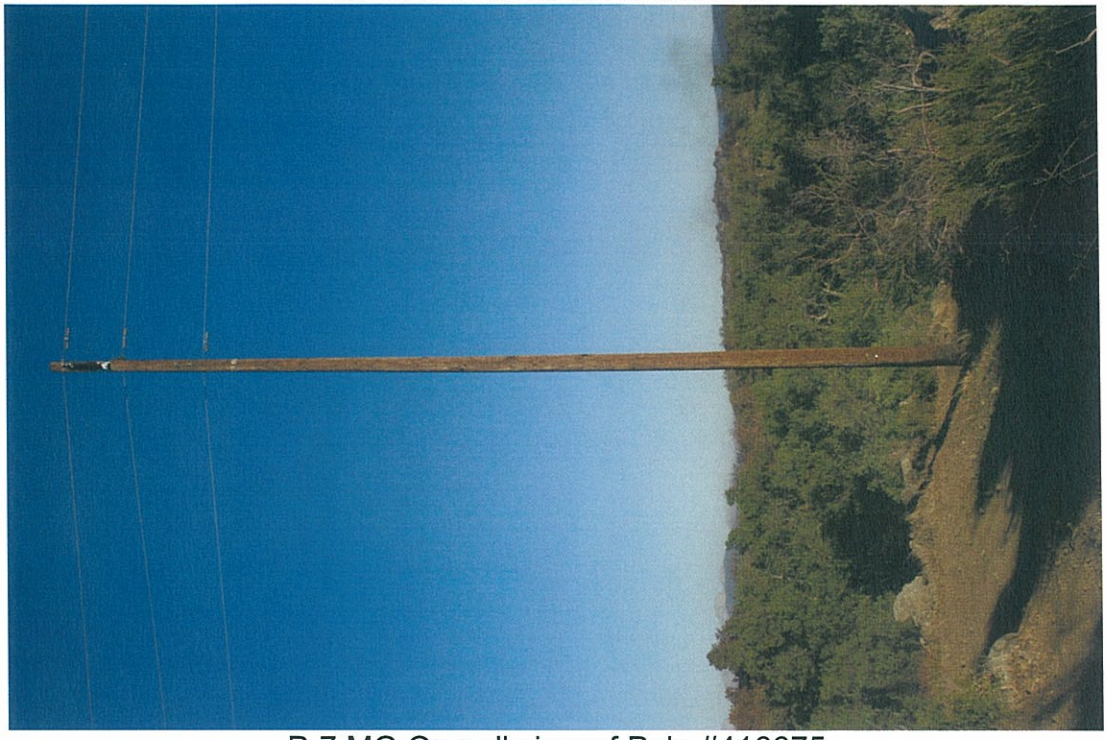
P-3 MG View of Pole #416676

P-4 MG Overall view of Pole #416676

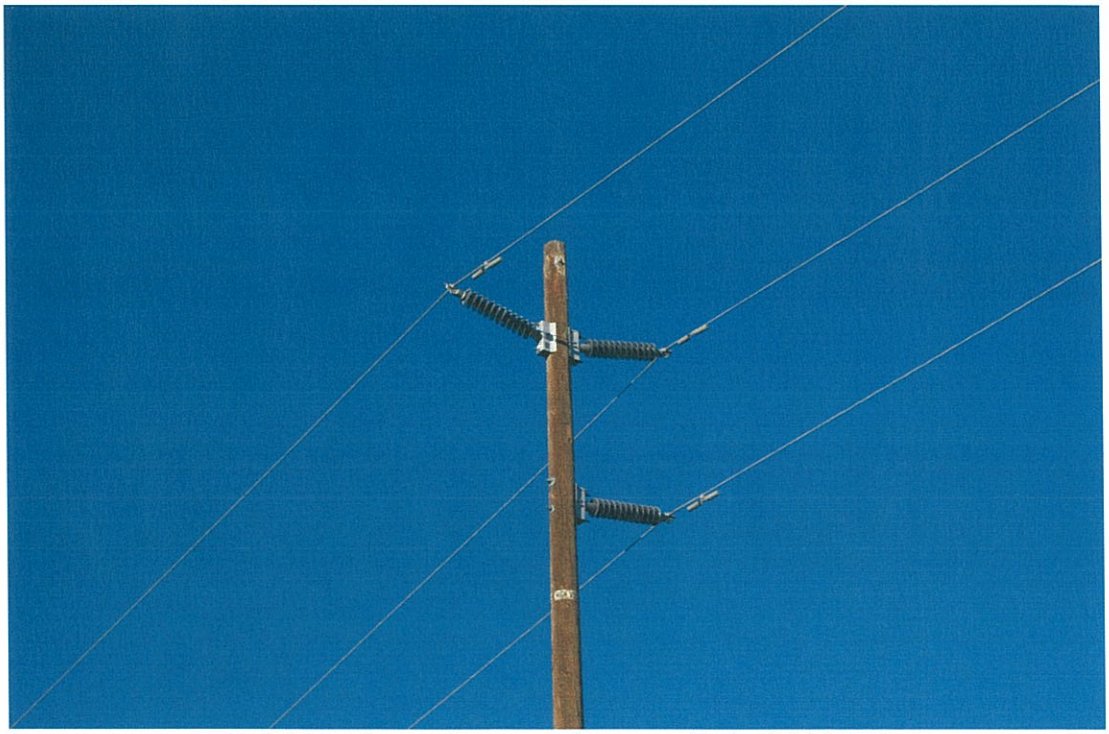


P-5 MG Overall view of connections on Pole #416676

P-6 MG View of Pole #416675



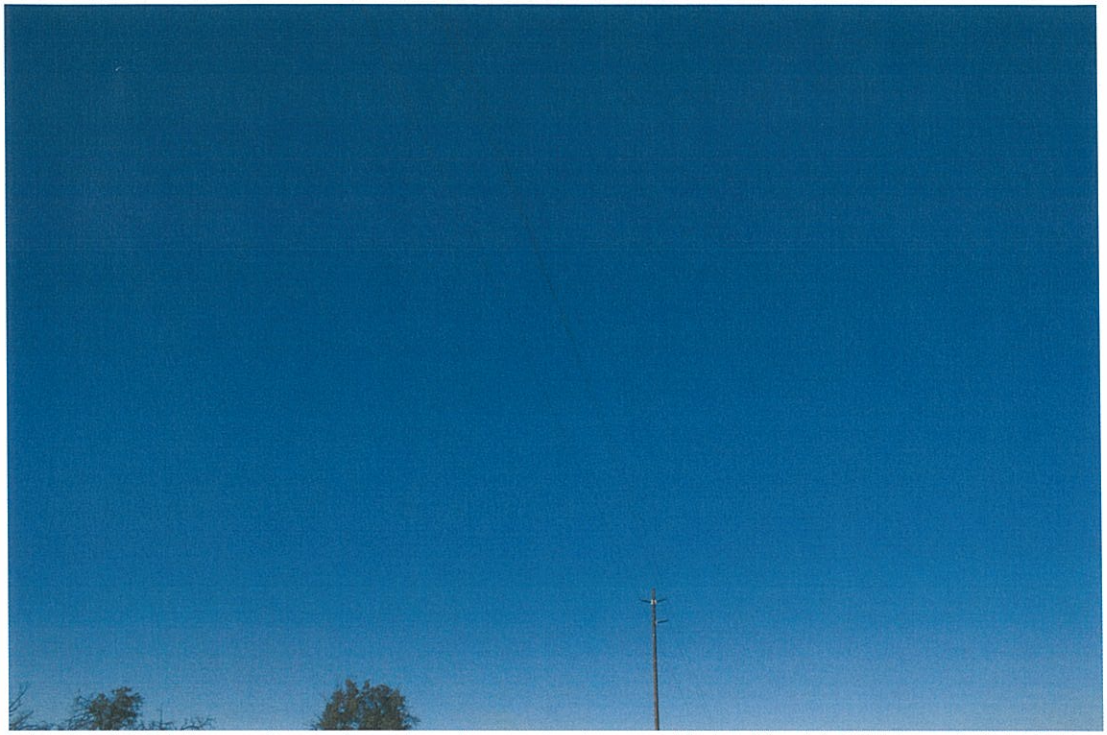
P-7 MG Overall view of Pole #416675



P-8 MG View of connections on Pole #416675

P-9 MG View of indicator showing advancing fire, west of power line

P-10 MG View of indicator showing advancing fire, west of power line



P-11 MG View of overlapping lines, between Pole #'s 416675 and 416676

P-12 MG Overall view of advincing fire, facing east

P-13 MG View of flags showing advancing fire

P-14 MG Overall view of indicator showing advancing fire

P-15 MG View of protected side of indicator

P-16 MG View of exposed side of indicator

P-17 MG View of protected side of rock

P-18 MG View of exposed side of rock, showing advancing fire

P-19 MG Overall view of indicator showing lateral fire

P-20 MG View of staining on rock showing lateral fire

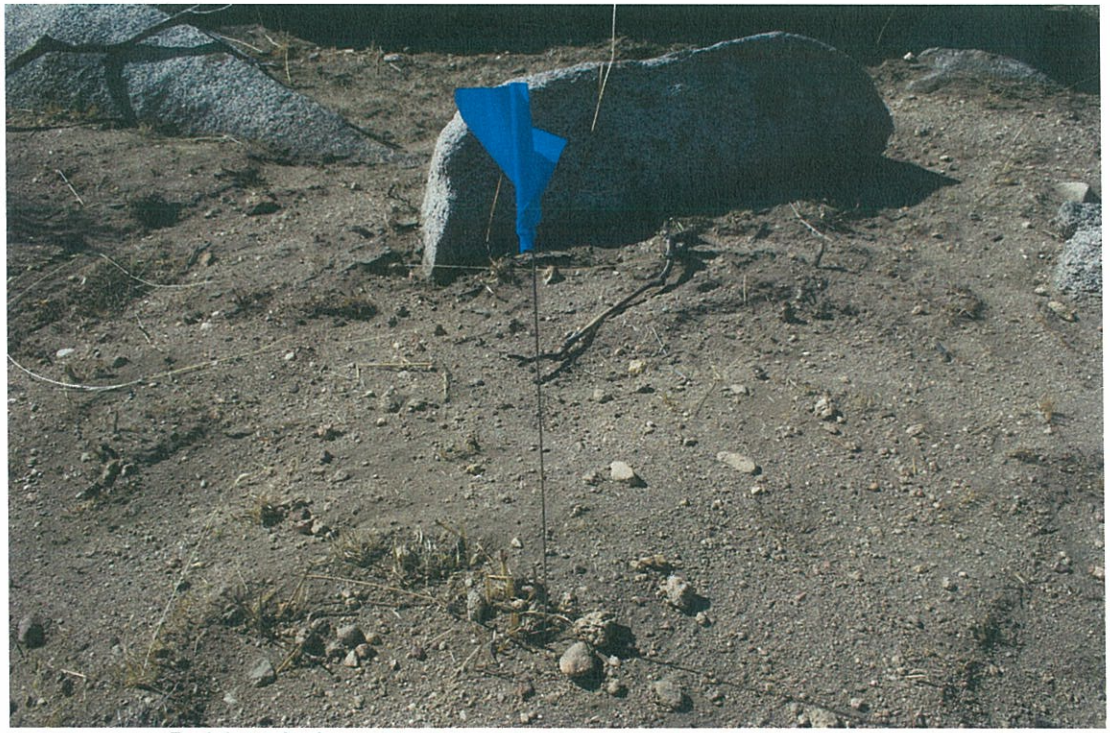
P-21 MG Overall view of indicator showing backing fire

P-22 MG Close-up view of cupping showing backing fire

P-23 MG Overall view of indicator showing backing fire

P-24 MG Close-up view of indicator showing backing fire

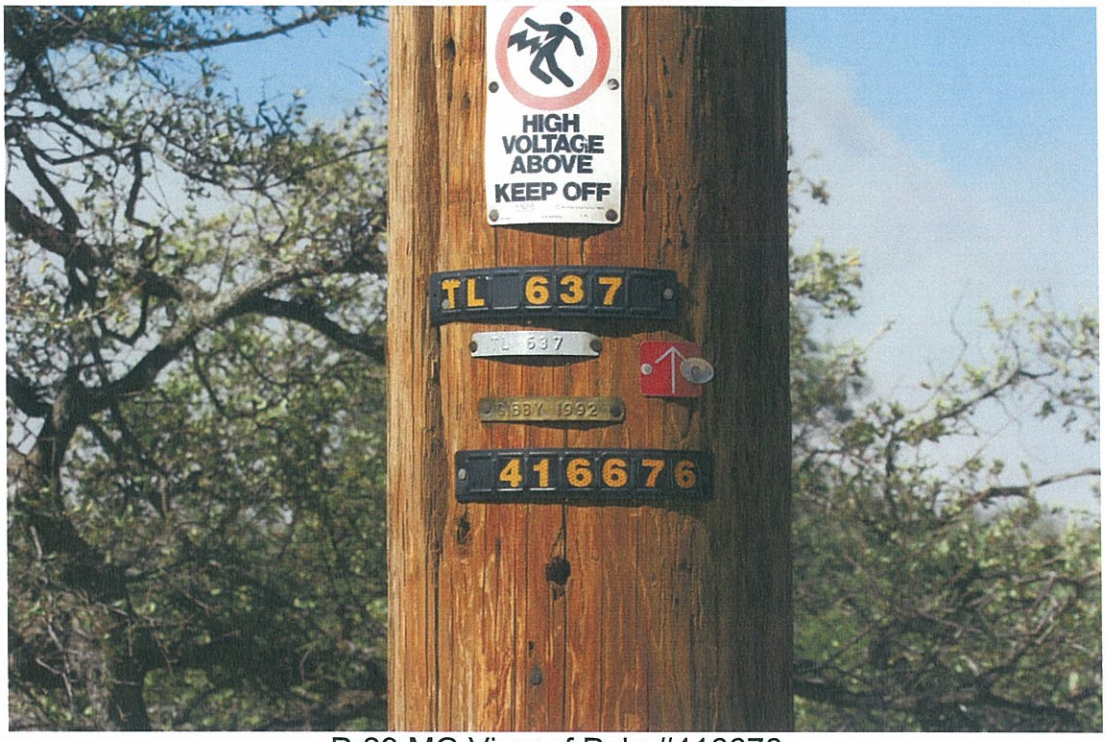
P-25 MG Overall view of indicator showing backing fire



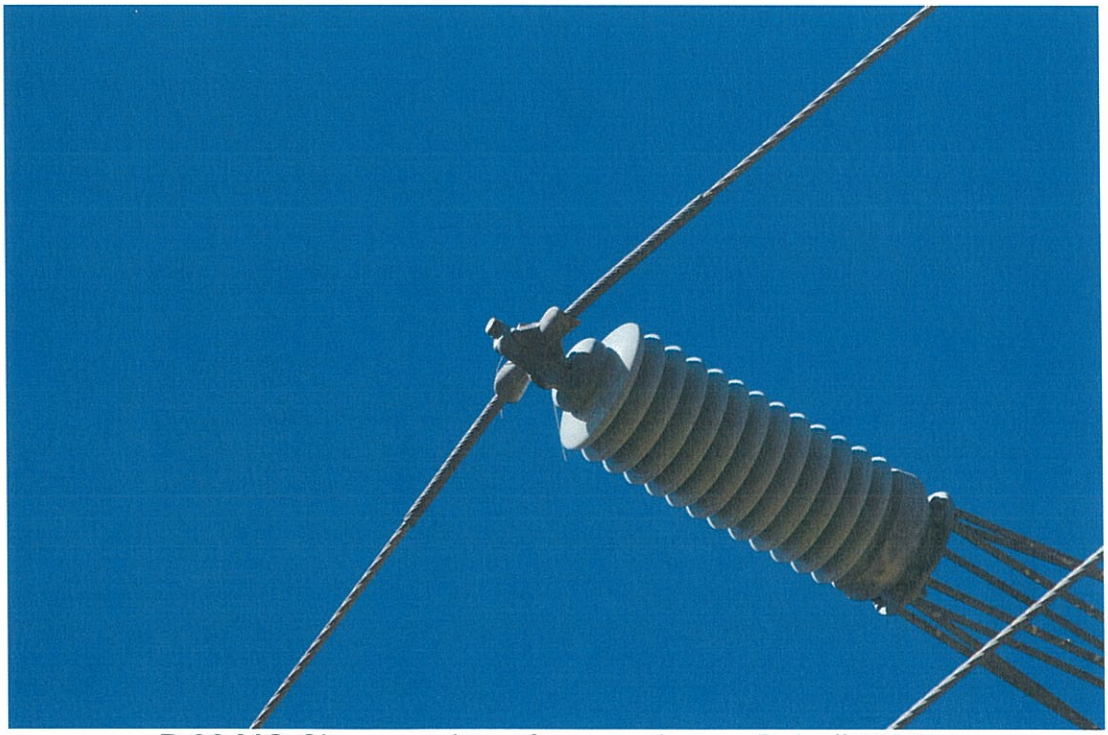
P-26 MG Overall view of indicator showing backing fire

P-27 MG Close-up view of cupping, showing backing fire

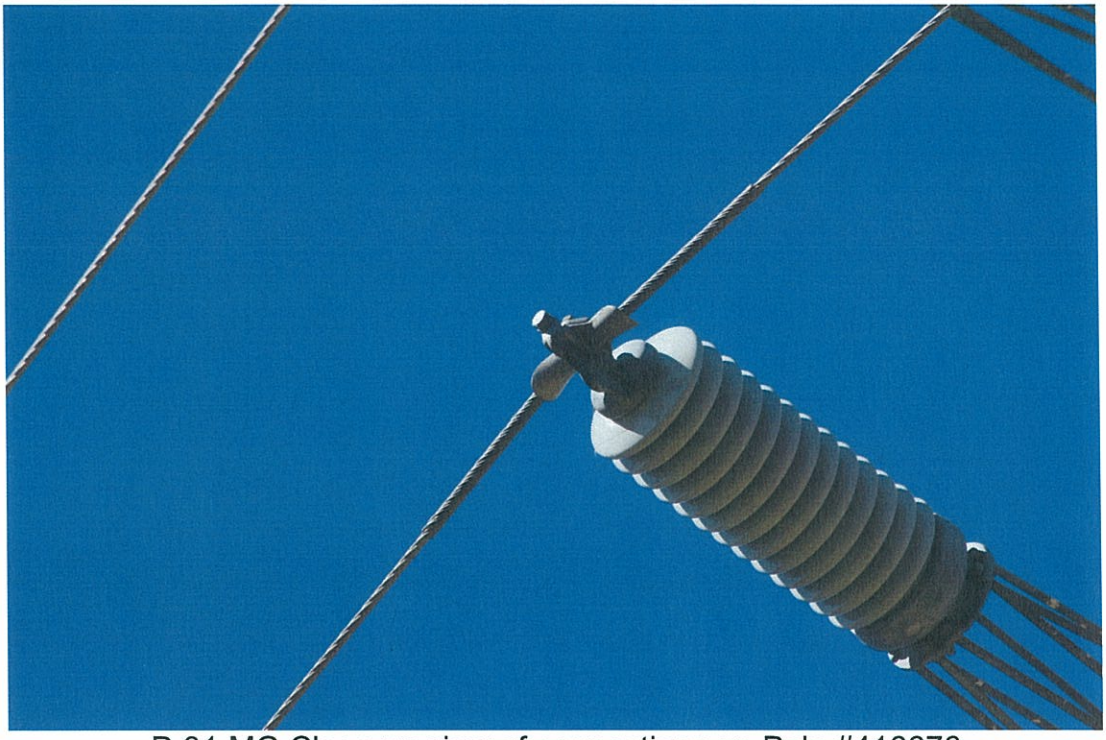
P-28 MG Close-up view of cupping showing backing fire



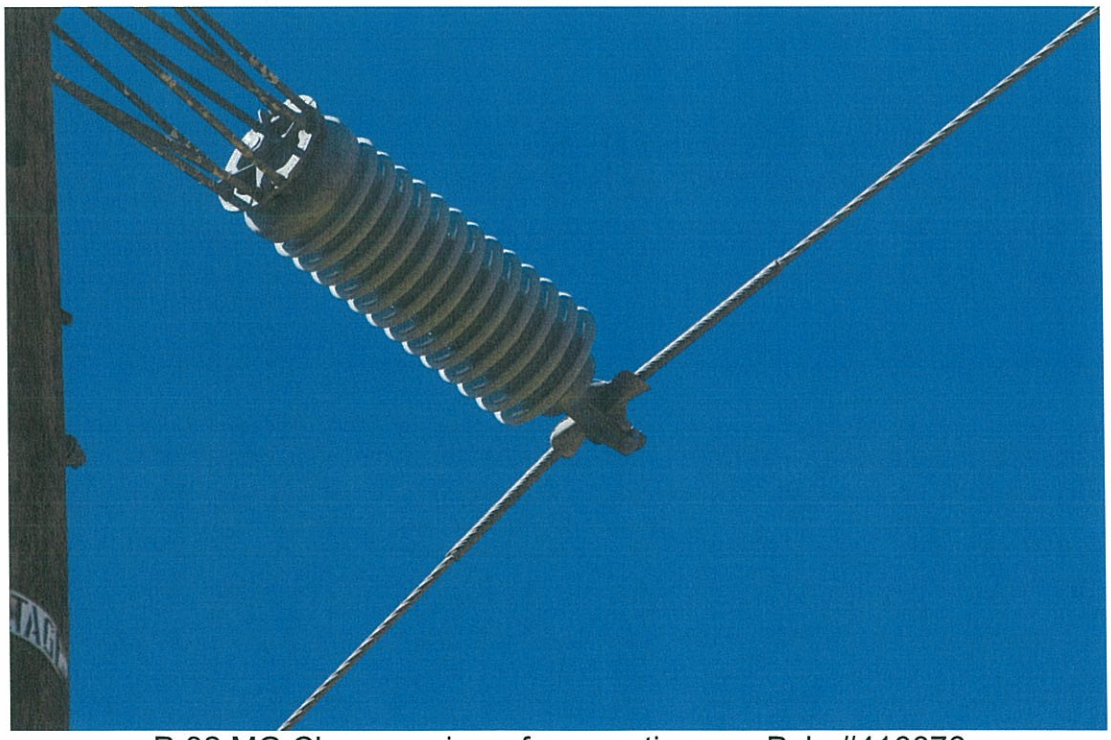
P-29 MG View of Pole #416676



P-30 MG Close-up view of connection on Pole #416676

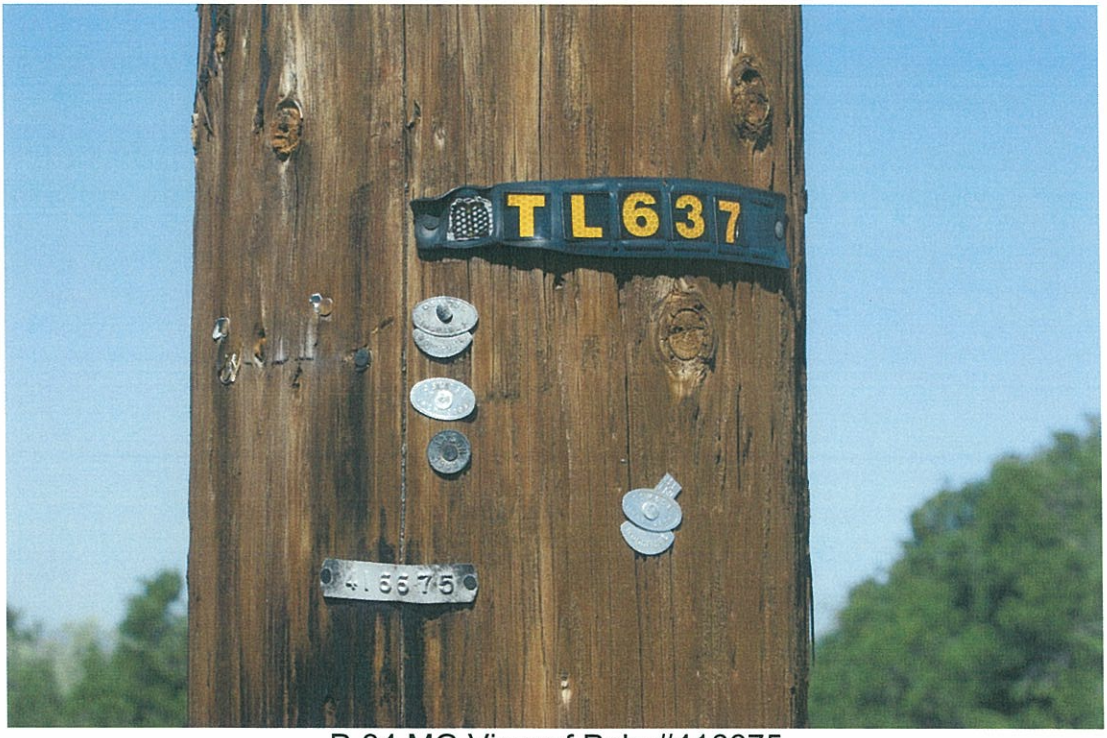


P-31 MG Close-up view of connections on Pole #416676

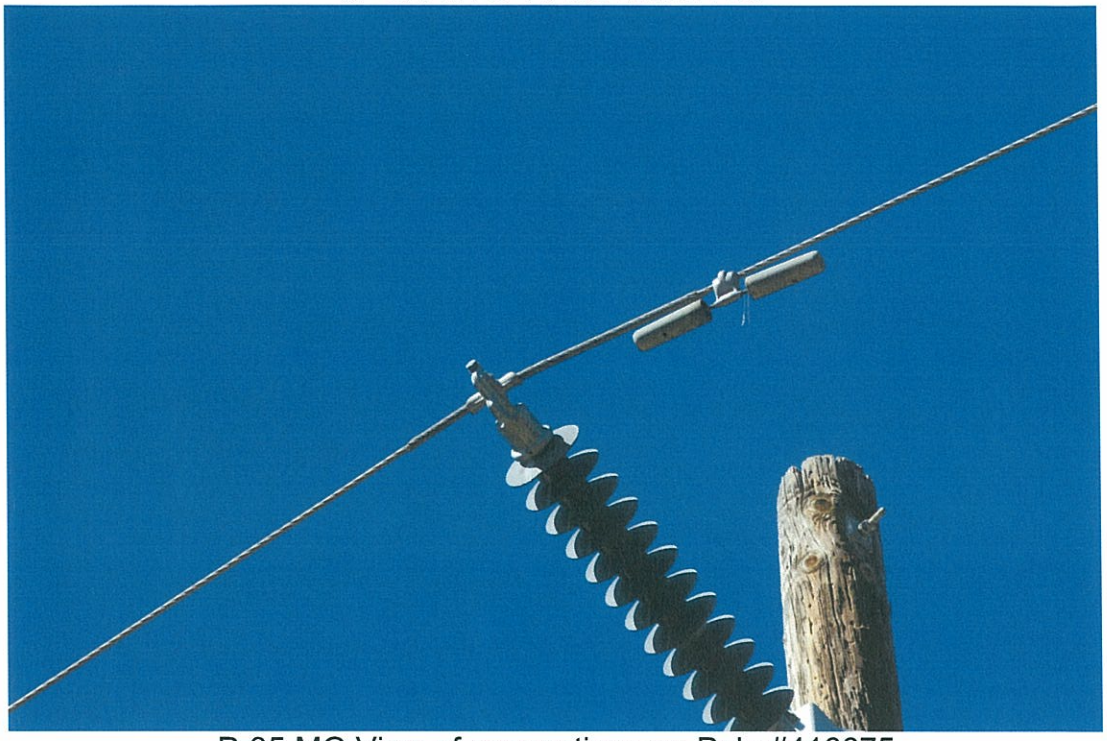


P-32 MG Close-up view of connections on Pole #416676

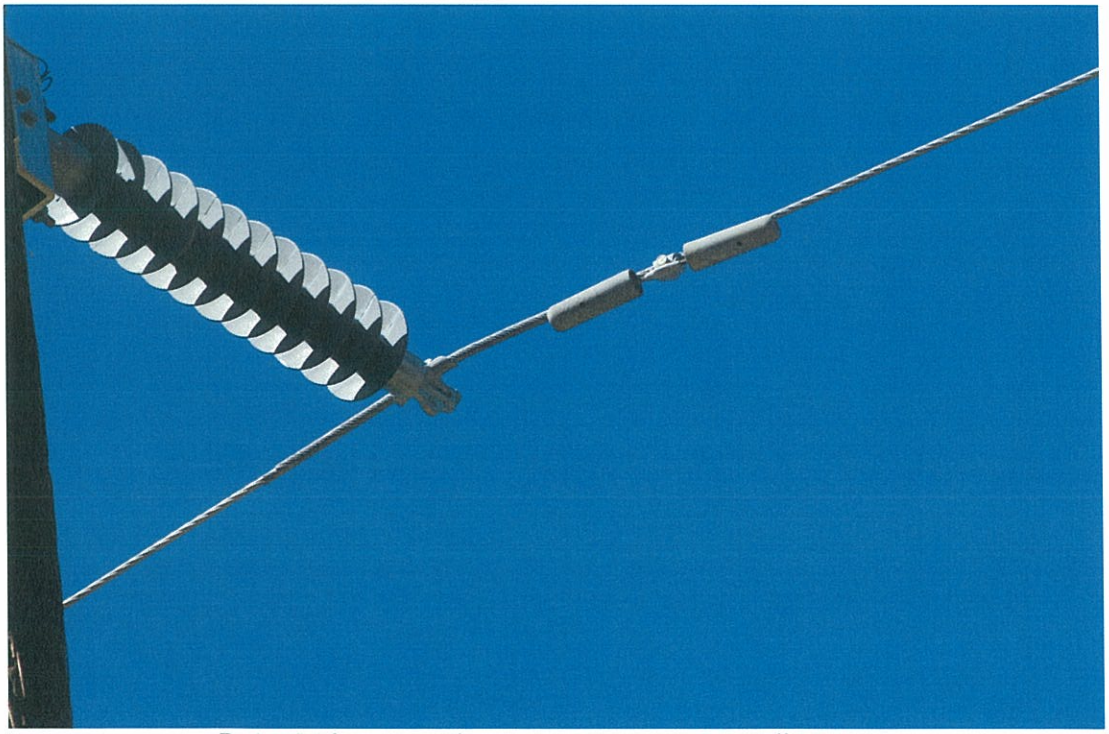
P-33 MG Overall view of connections on Pole #416676



P-34 MG View of Pole #416675

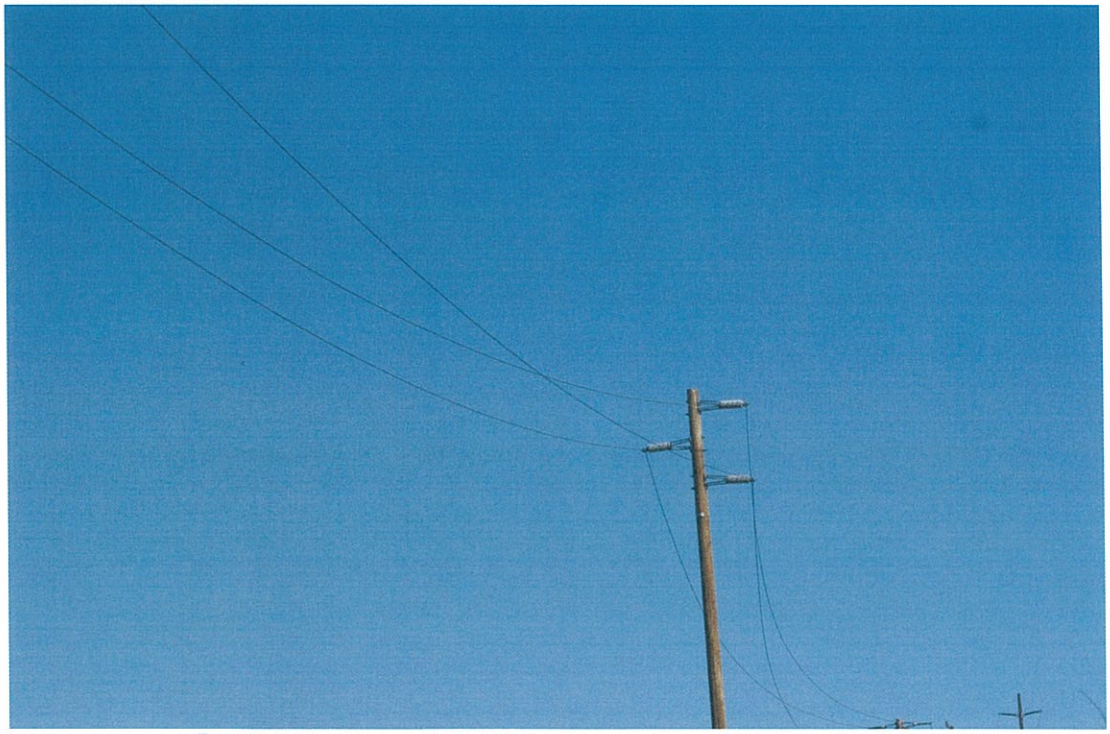


P-35 MG View of connections on Pole #416675

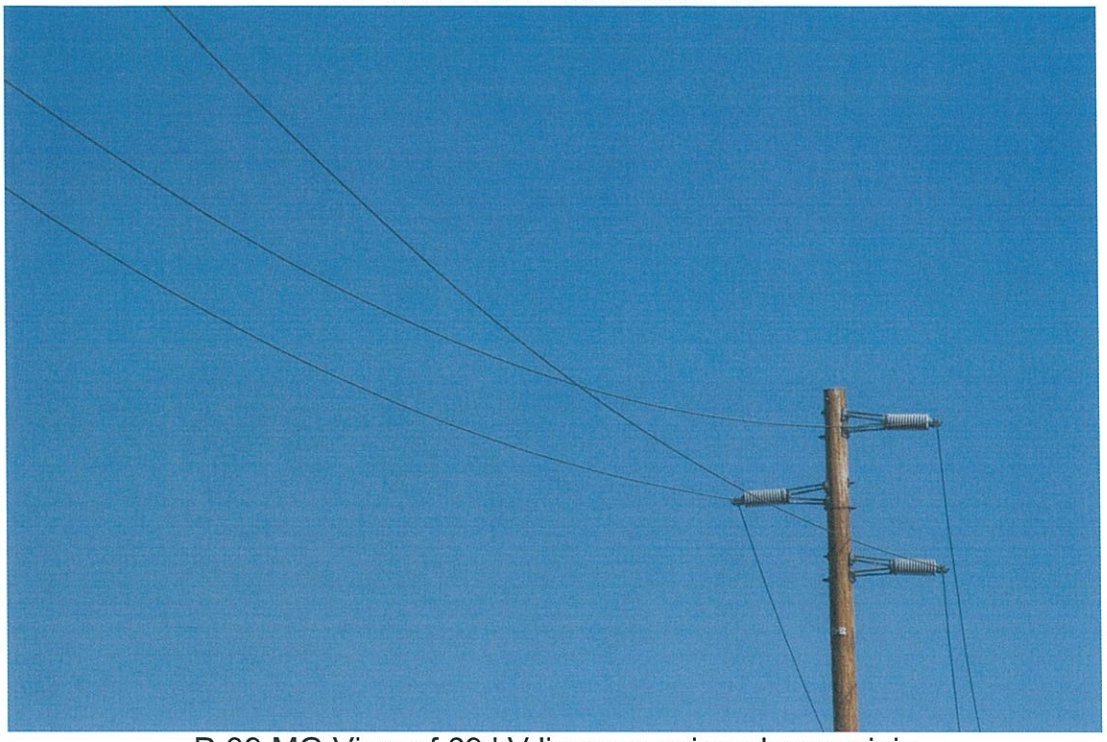


P-36 MG View of connections on Pole #416675

P-37 MG View of connections on Pole #416675



P-38 MG View of 69 kV lines crossing above origin



P-39 MG View of 69 kV lines crossing above origin

P-40 MG View of fuels east of origin, on opposite side of road

Attachment B

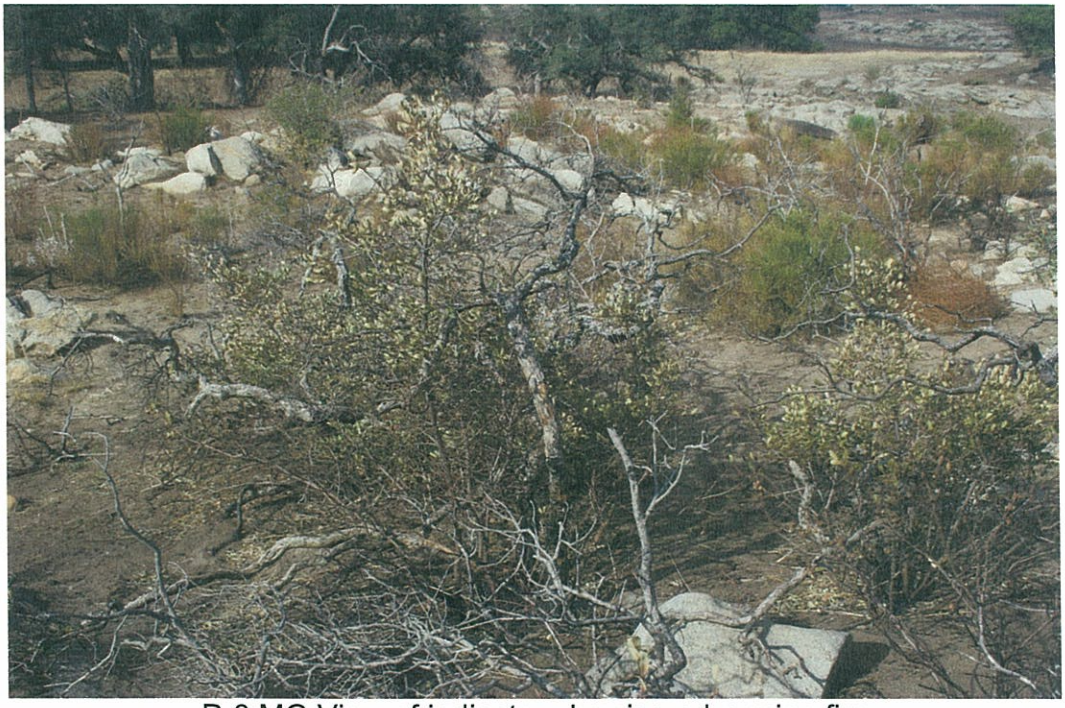
P-1 MG Overall view of tanker drop, west of SOA

P-2 MG Close-up view of tanker drop

P-3 MG Overall view of tanker drop, south of SOA

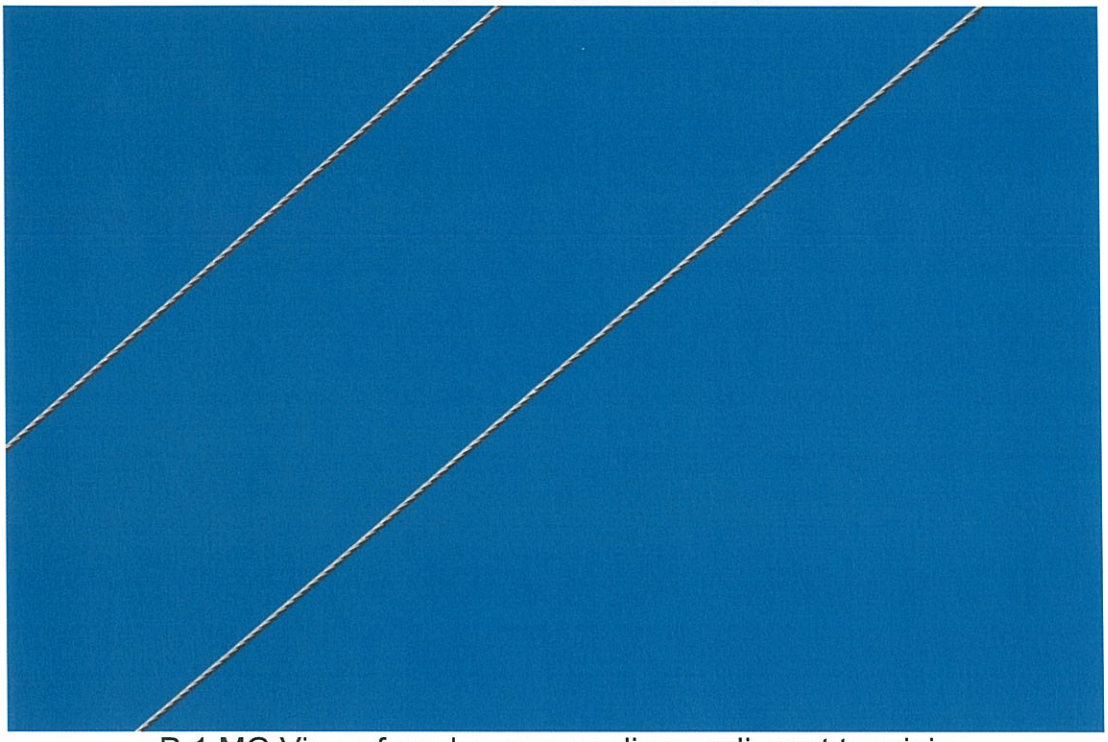
P-4 MG Close-up view of tanker drop

P-5 MG Overall view of indicators showing advancing fire

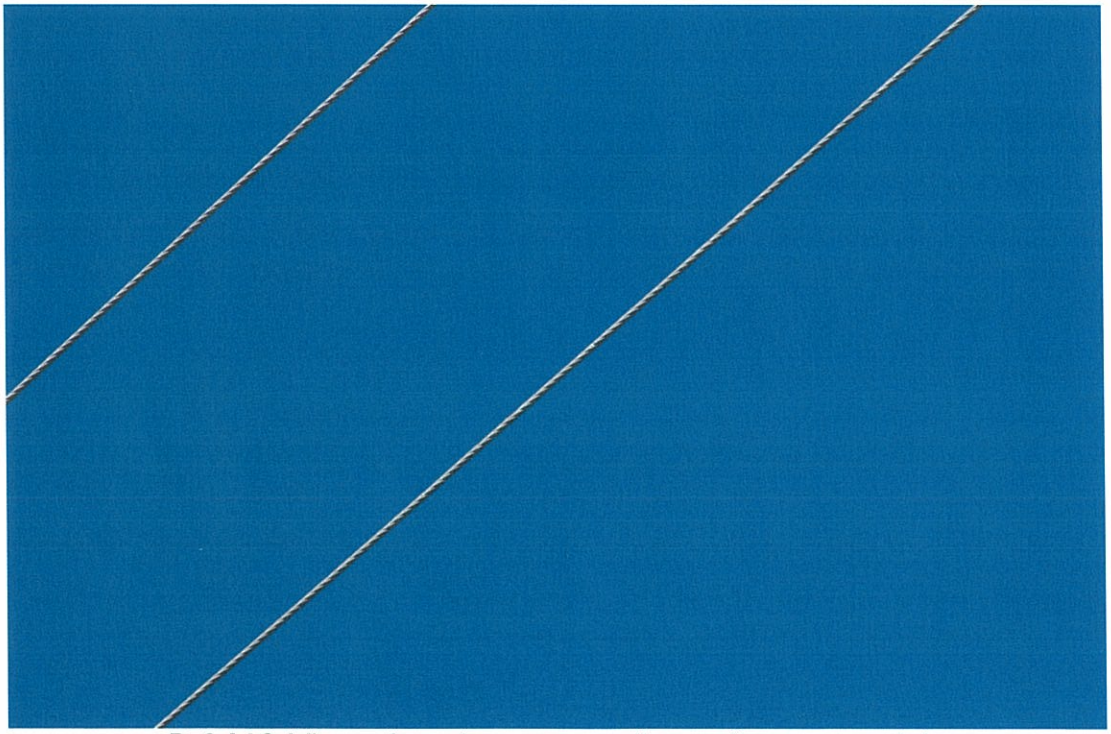


P-6 MG View of indicator showing advancing fire

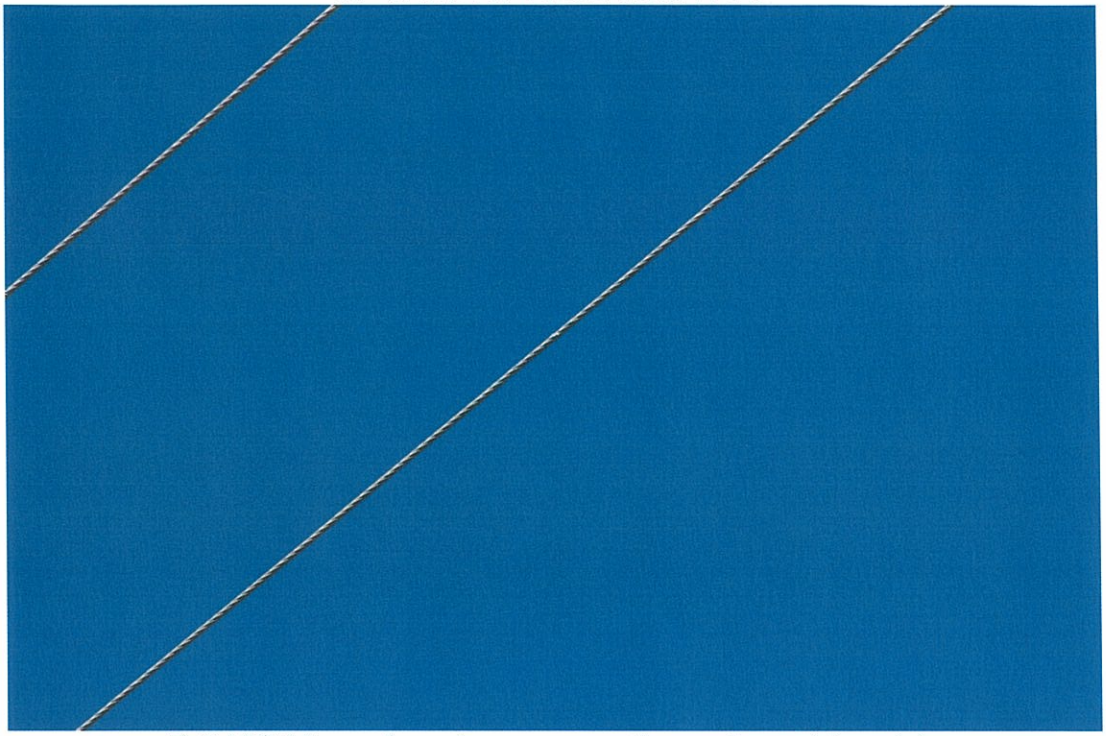
Attachment C



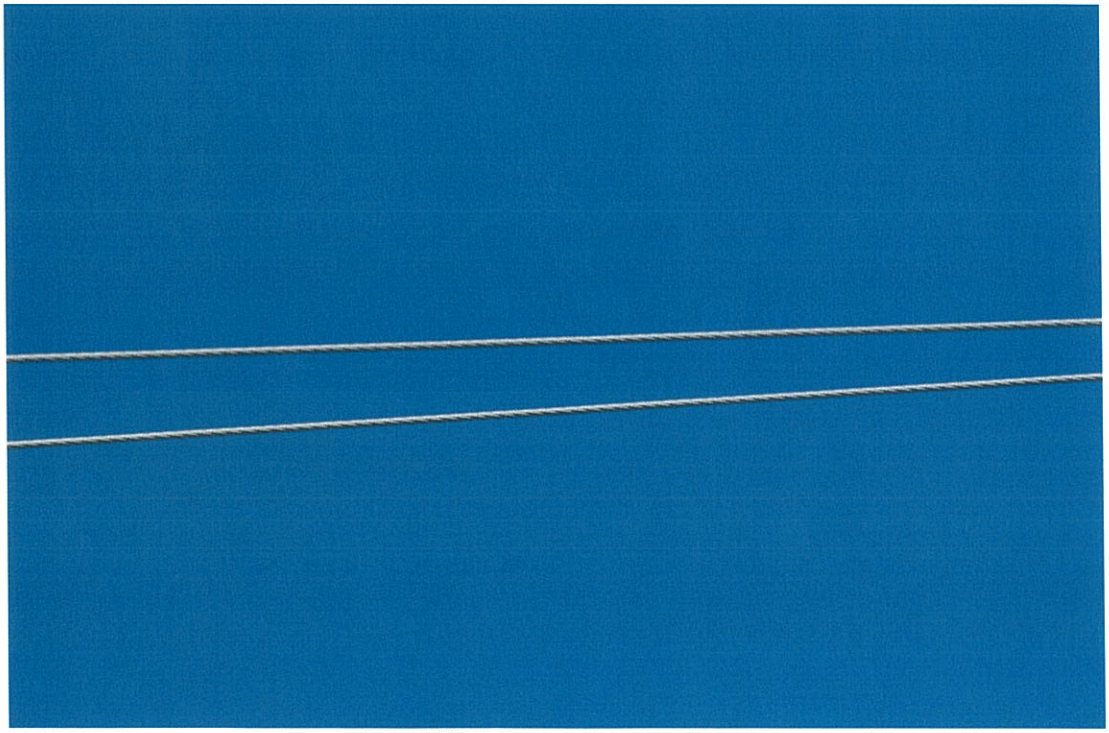
P-1 MG View of marks on powerlines, adjacent to origin



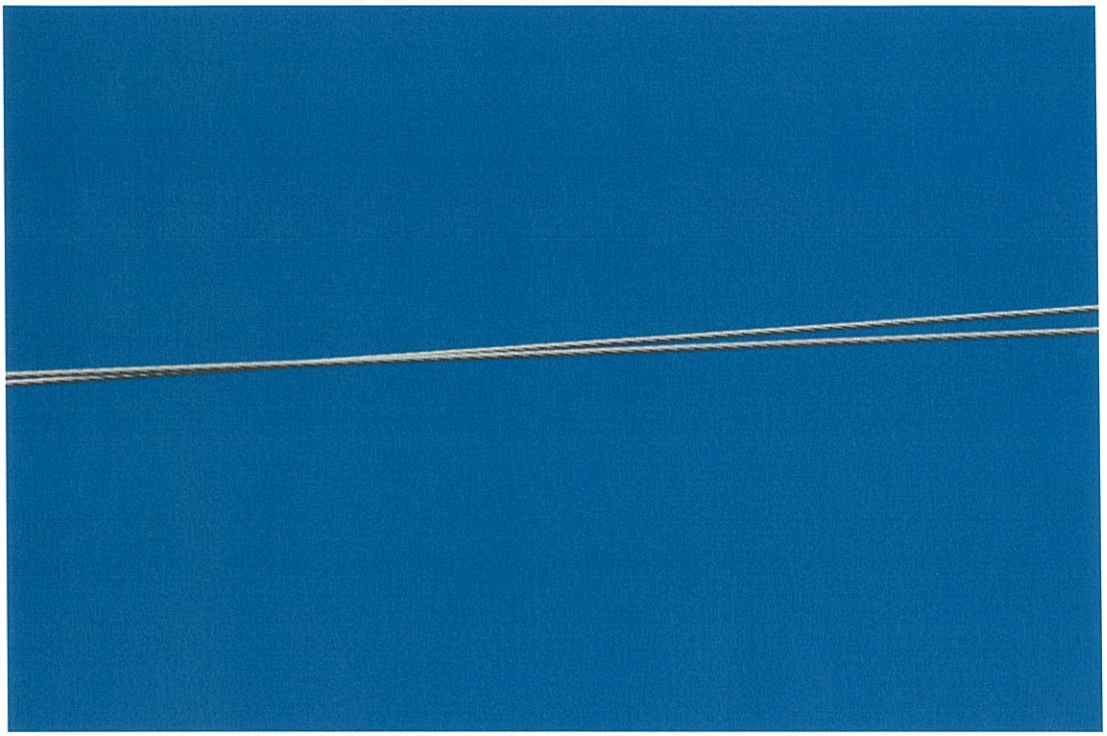
P-2 MG View of marks on powerline, adjacent to origin



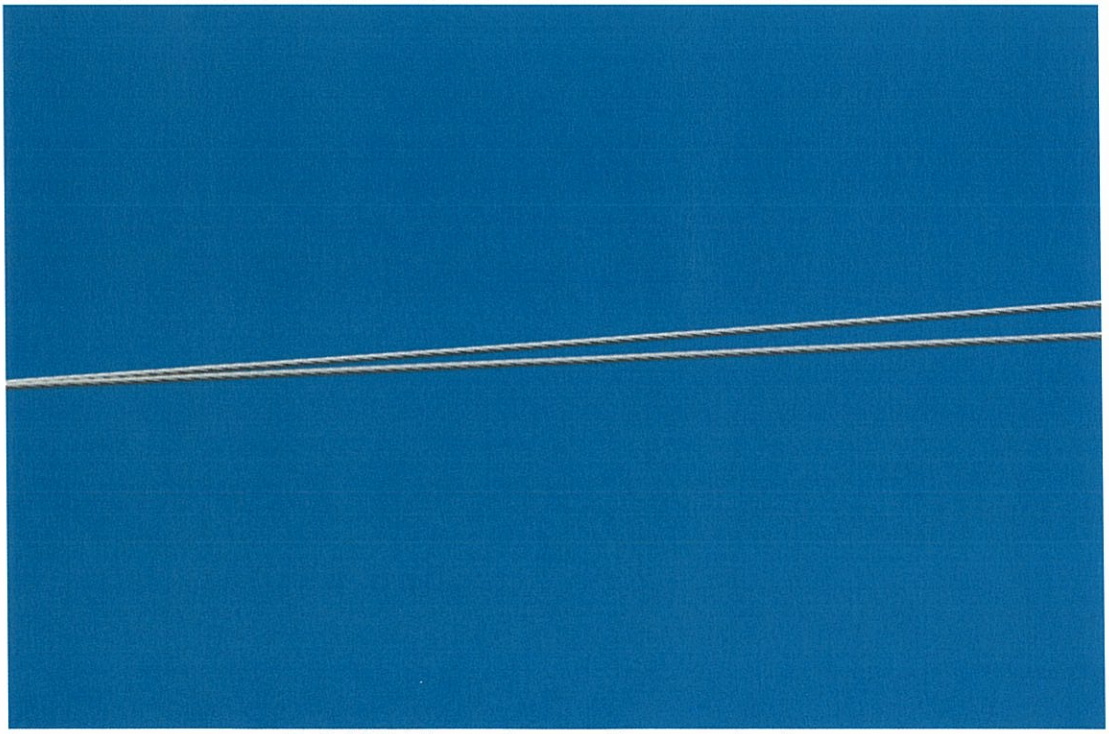
P-3 MG View of marks on powerline, adjacent to origin



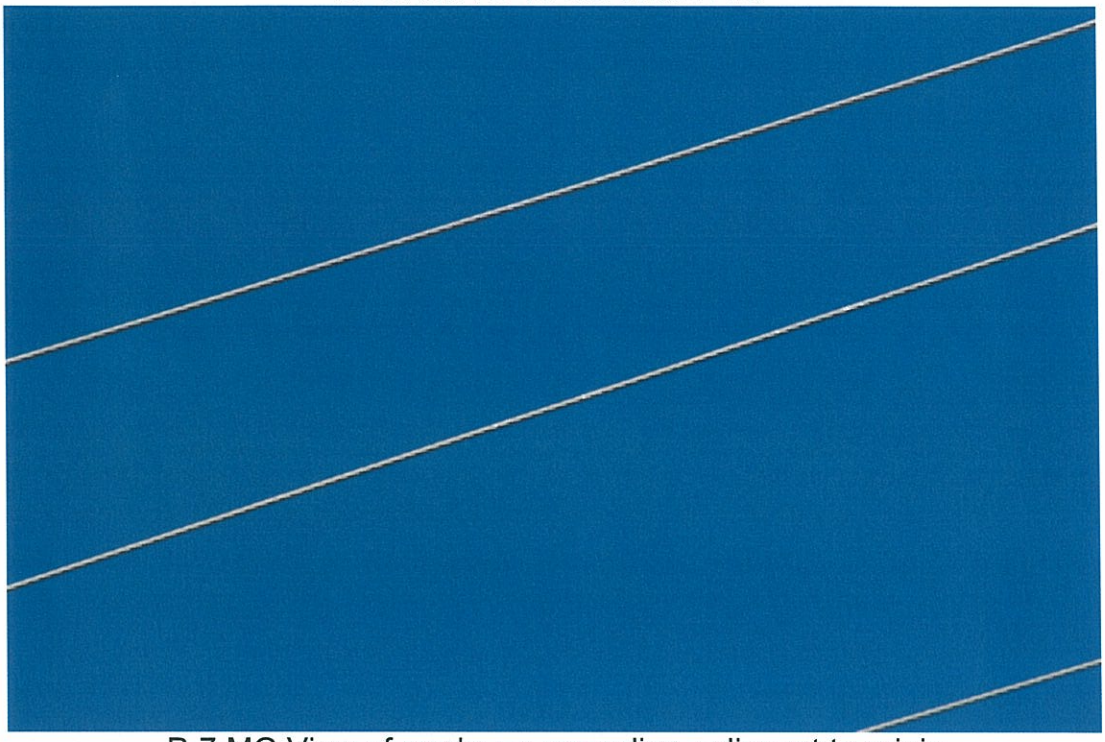
P-4 MG View of powerlines



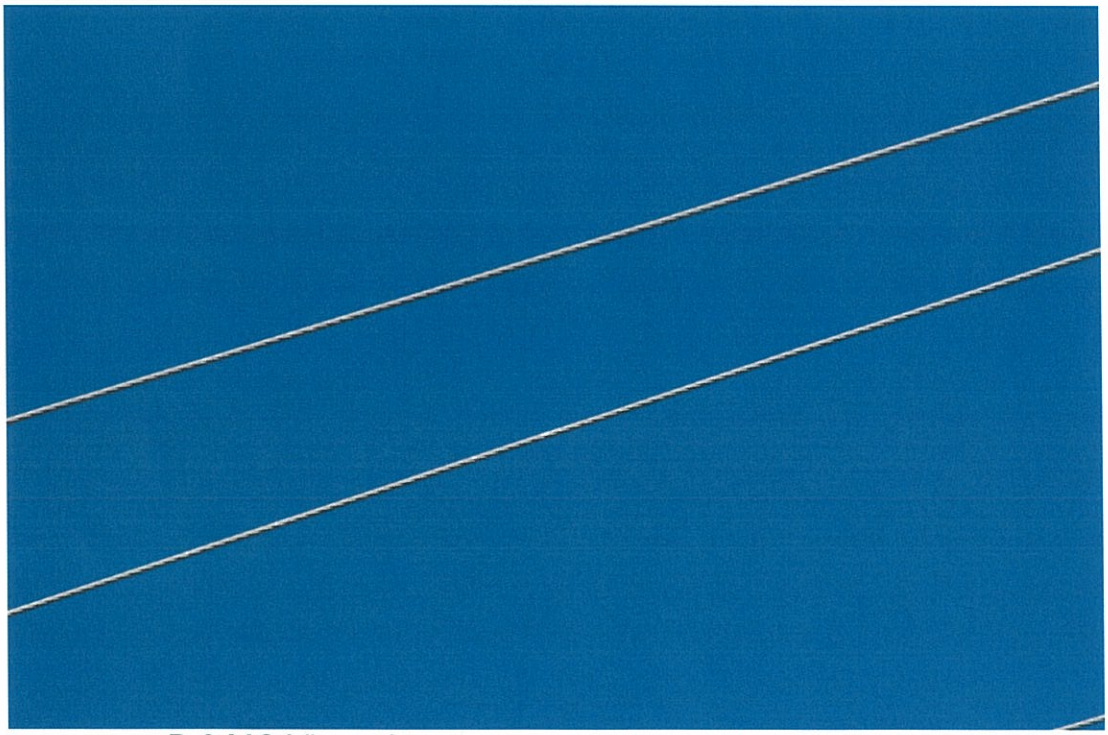
P-5 MG View of powerlines contacting



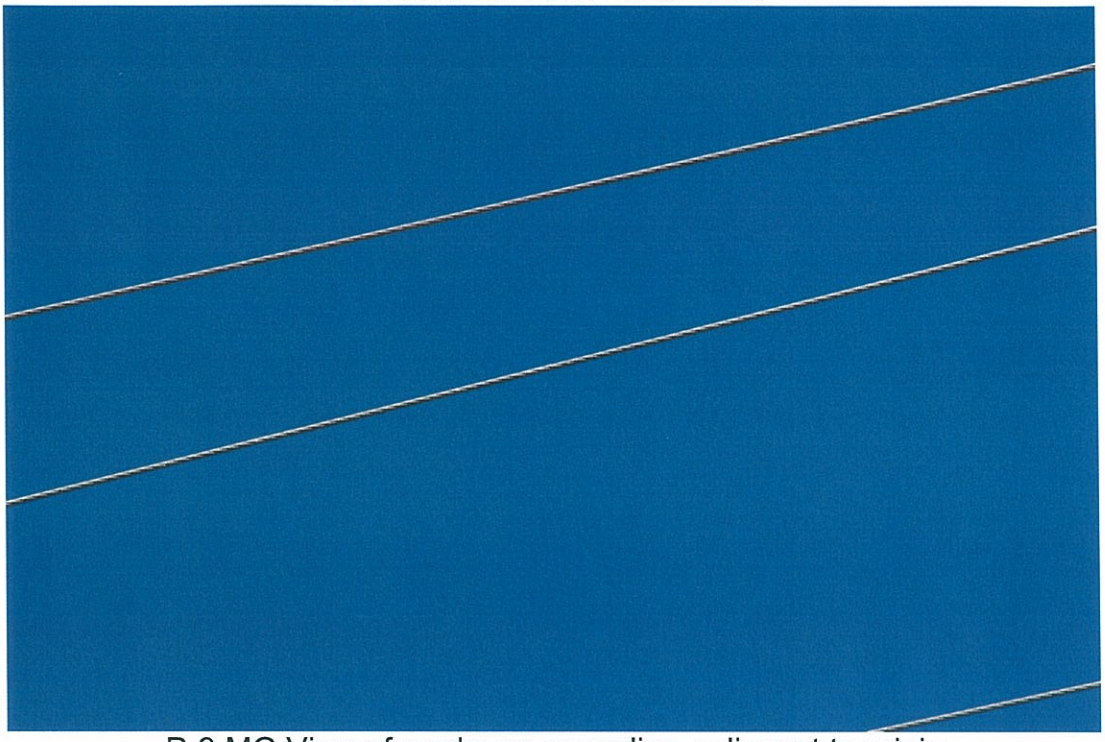
P-6 MG View of powerlines contacting



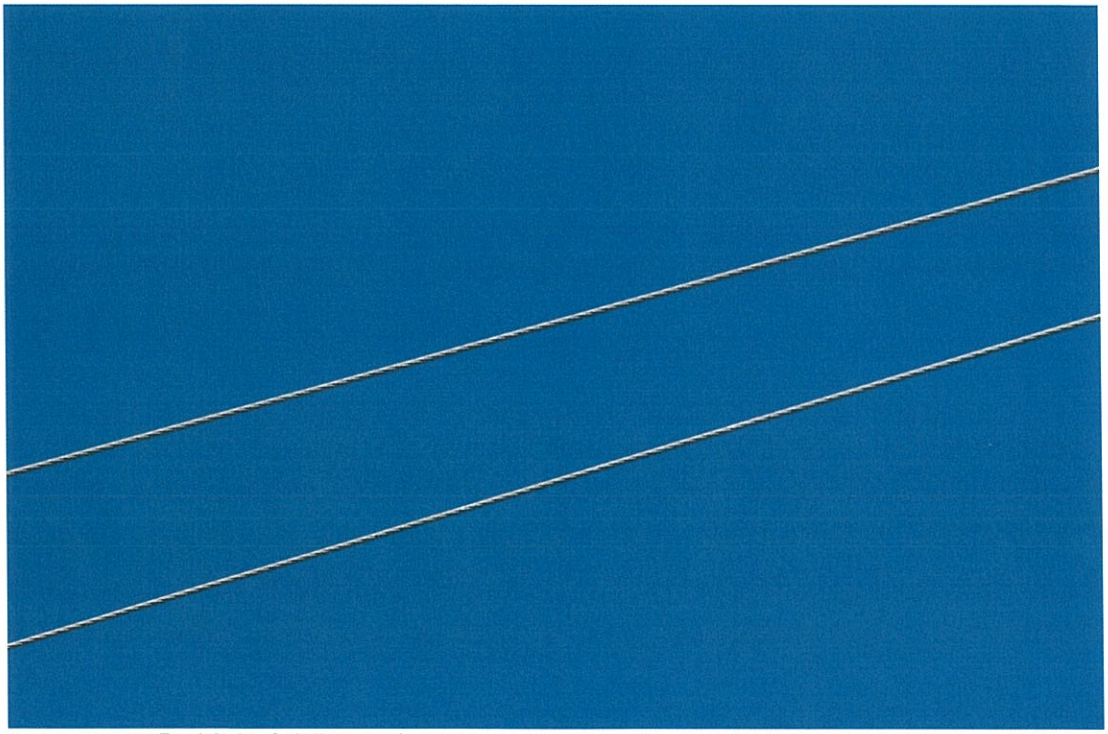
P-7 MG View of marks on powerline, adjacent to origin



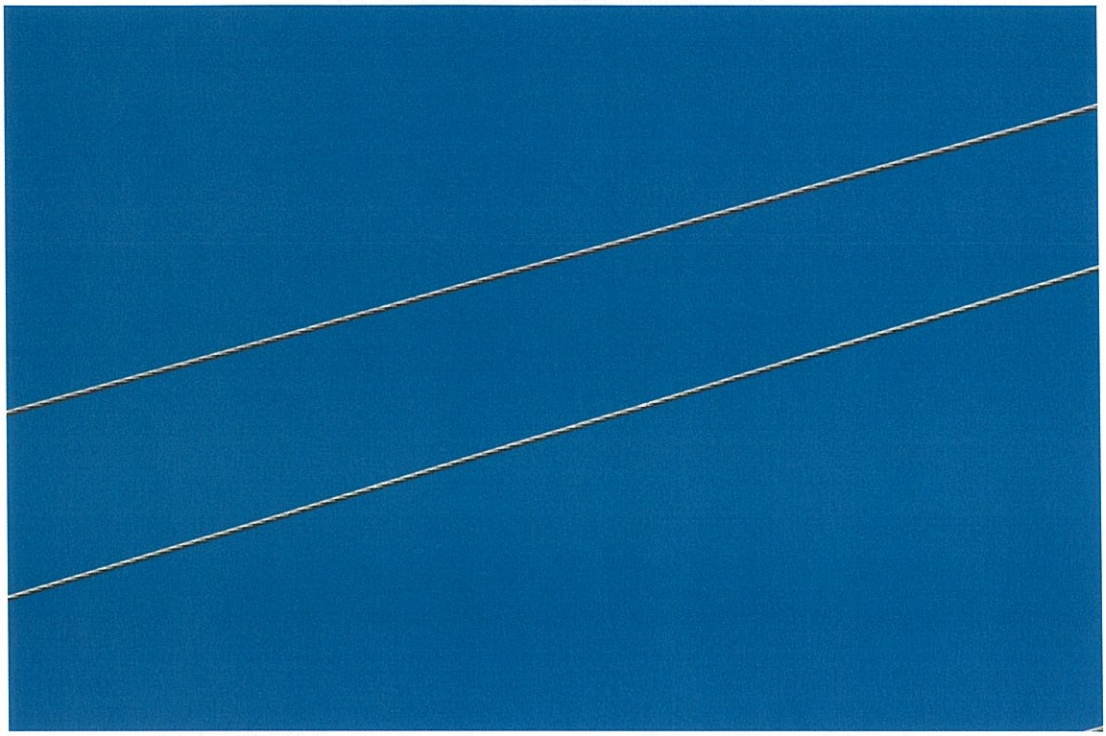
P-8 MG View of marks on powerline, adjacent to origin



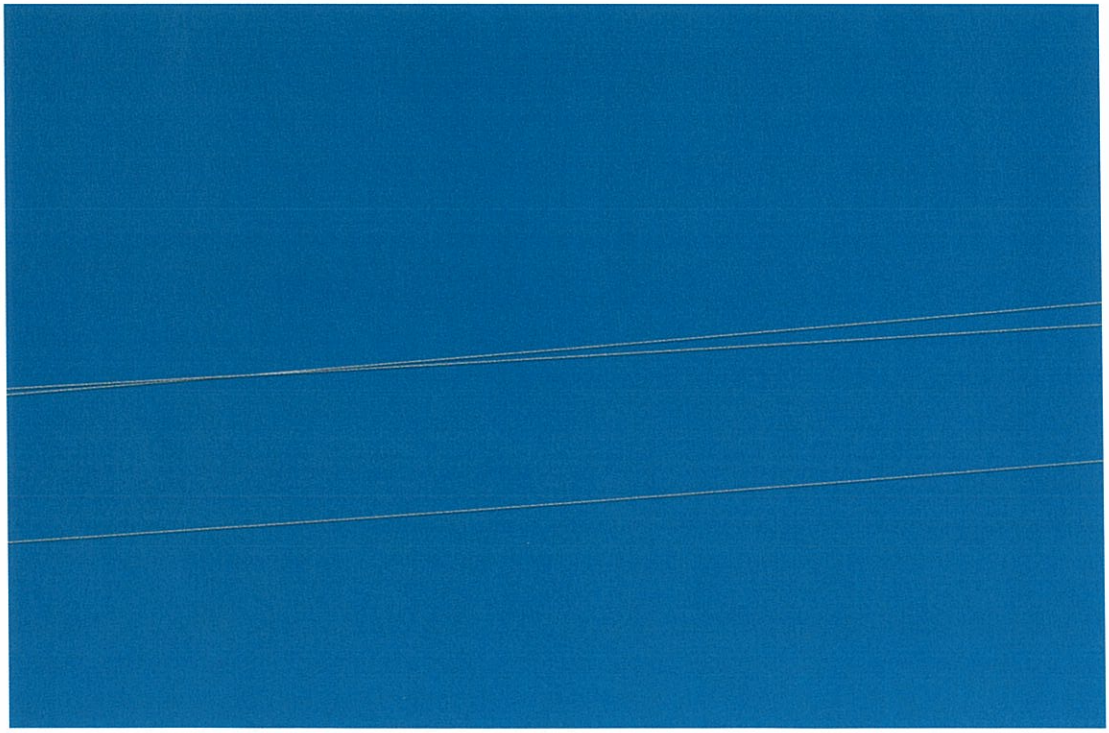
P-9 MG View of marks on powerline, adjacent to origin



P-10 MG View of marks on powerline, adjacent to origin



P-11 MG View of marks on powerline, adjacent to origin



P-12 MG View of powerlines contacting each other

Attachment D

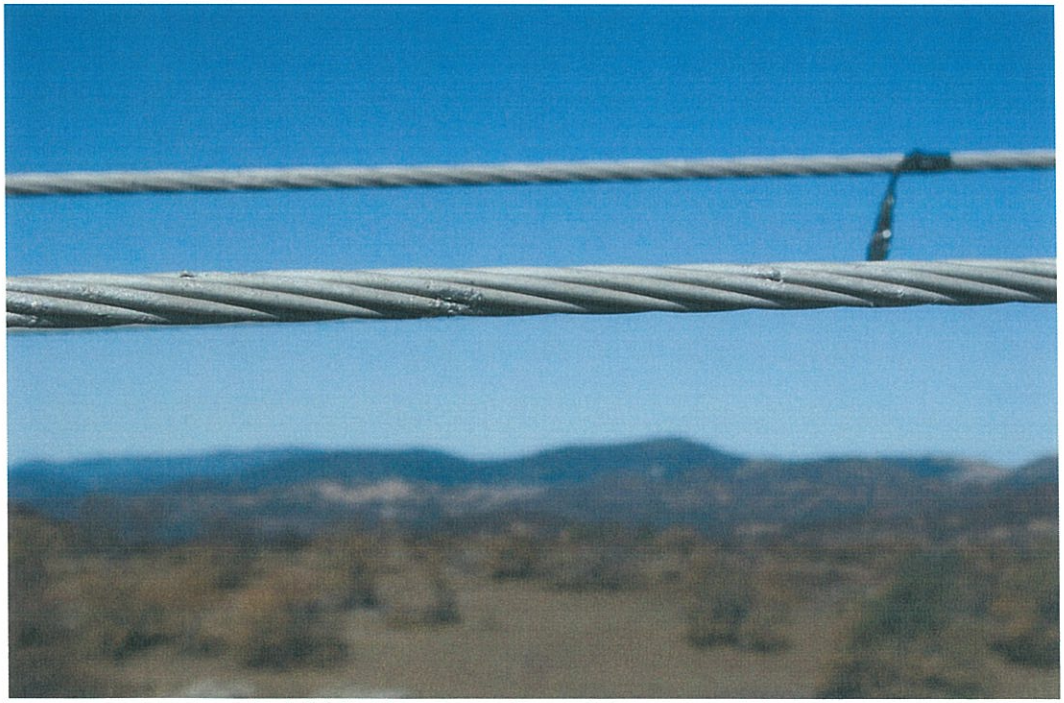
P-1 MG View of damage to lines from location #1

P-2 MG Close-up view of damage to lines

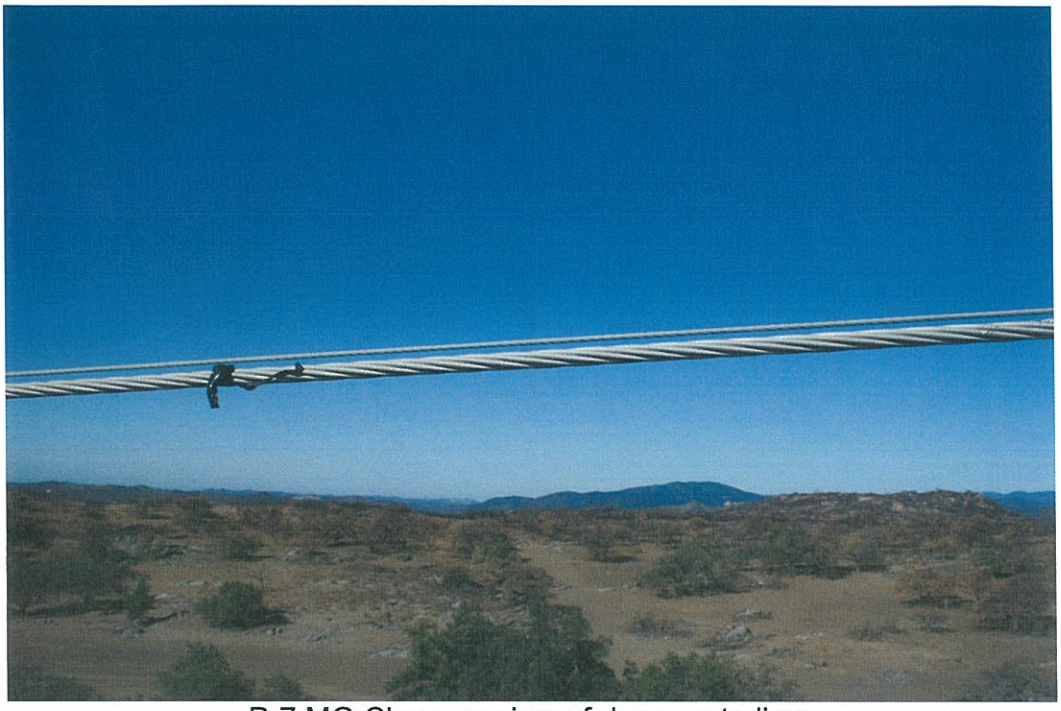
P-3 MG Overall view of damage to lines

P-4 MG Close-up view of damage to lines

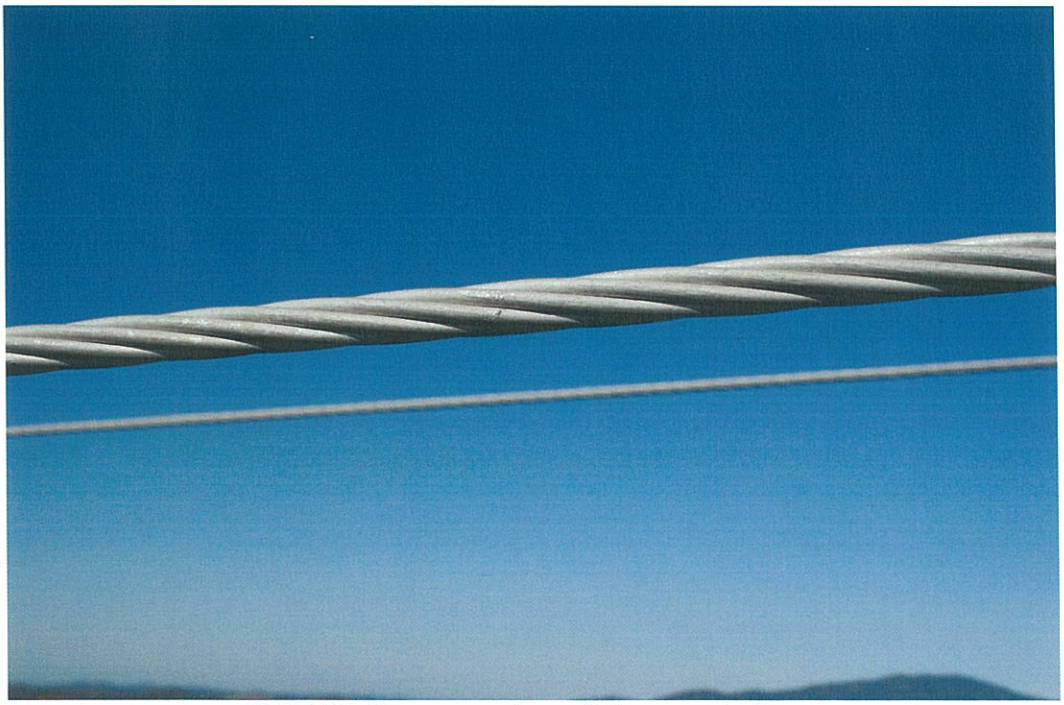
P-5 MG Overall view of damage to lines



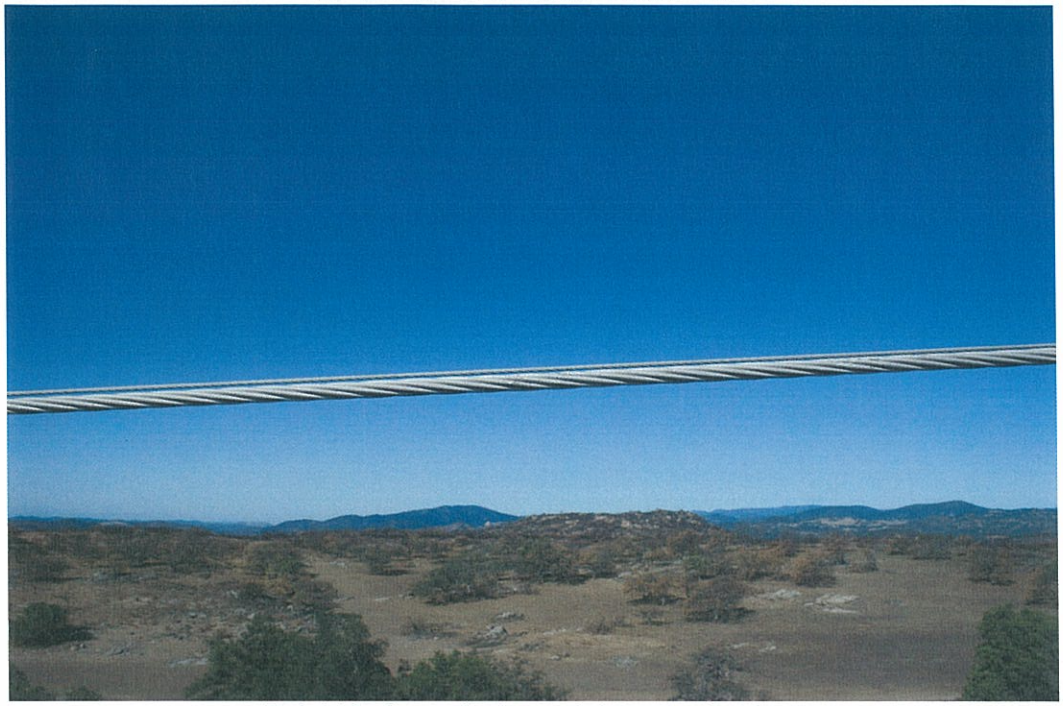
P-6 MG Close-up view of damage to lines



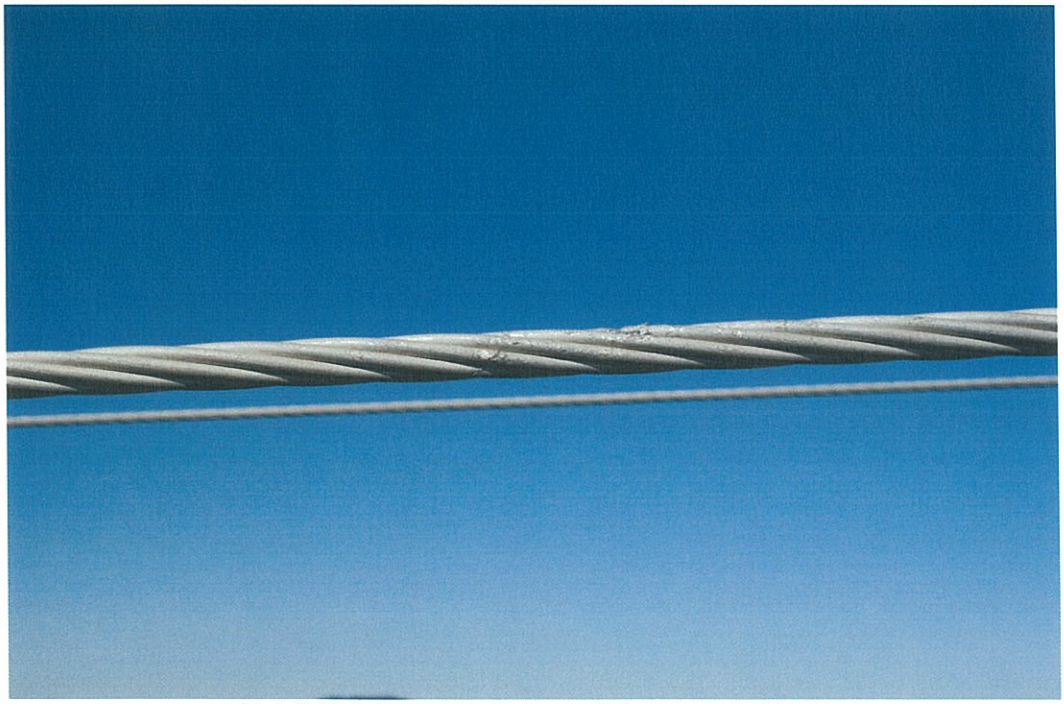
P-7 MG Close-up view of damage to lines



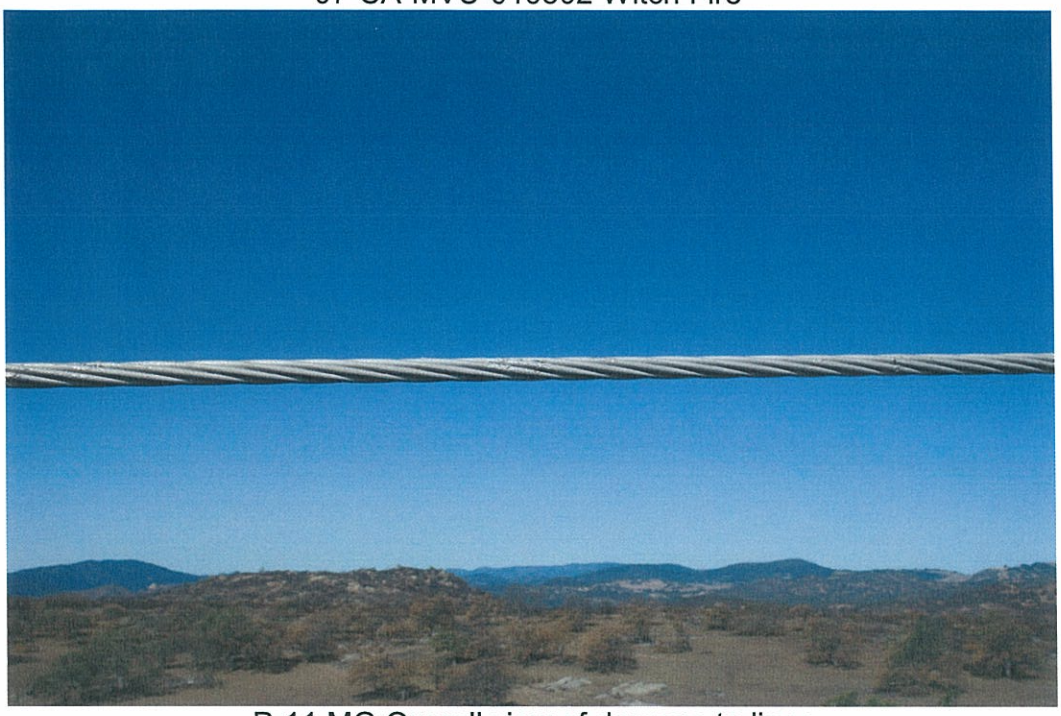
P-8 MG Close-up view of damage to lines



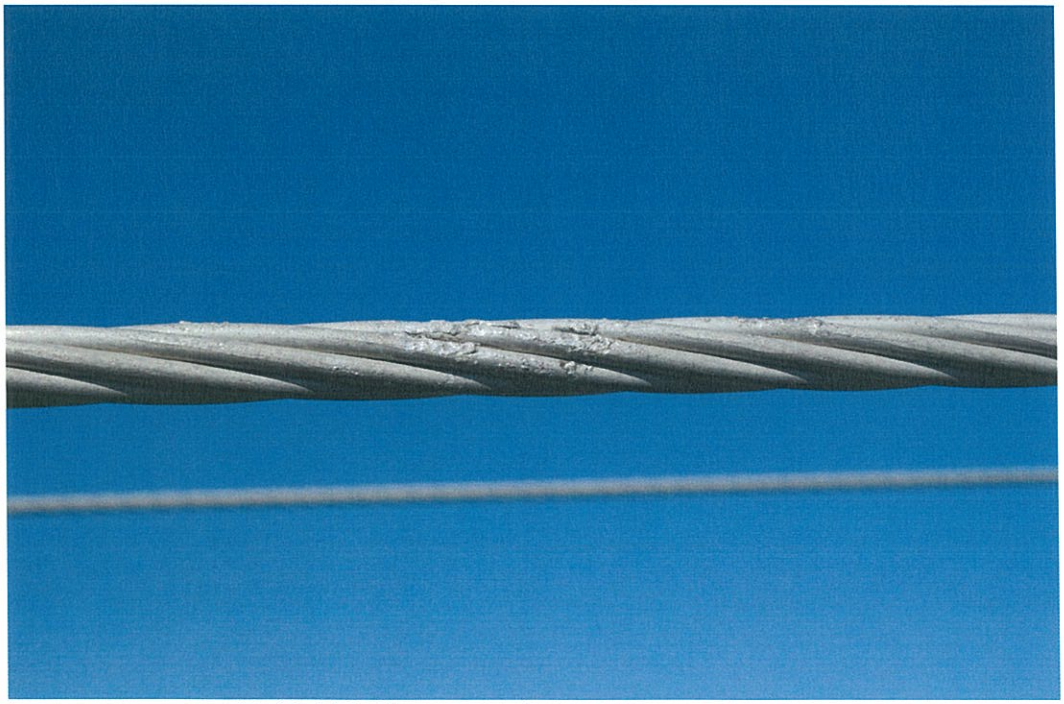
P-9 MG Overall view of damage to lines



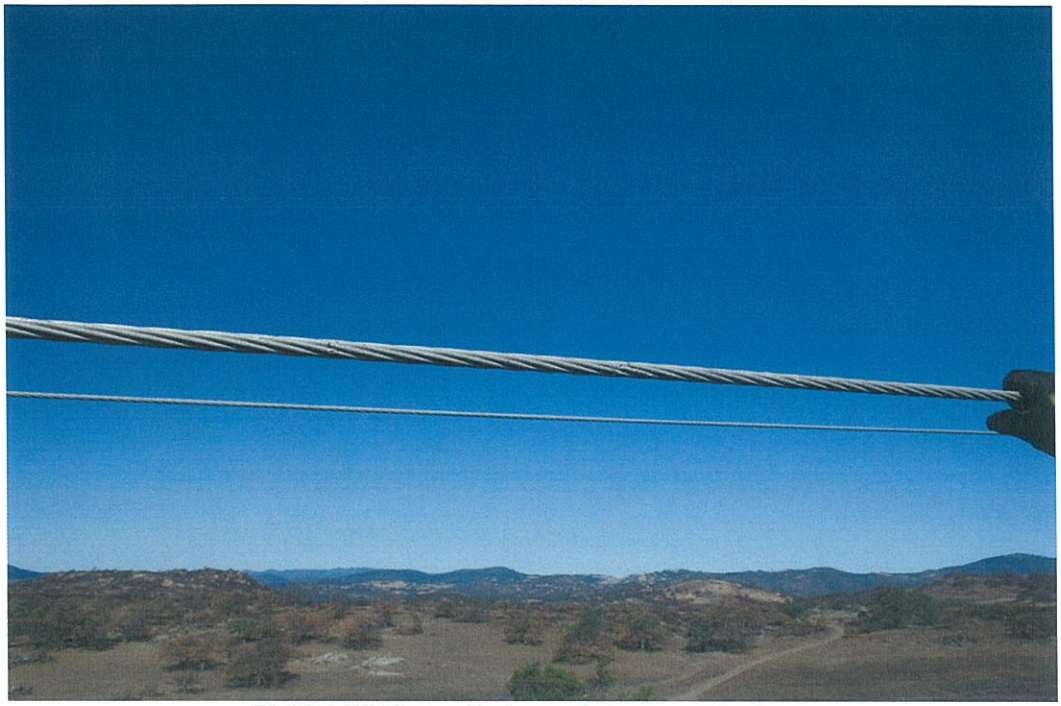
P-10 MG Close-up view of damage to lines



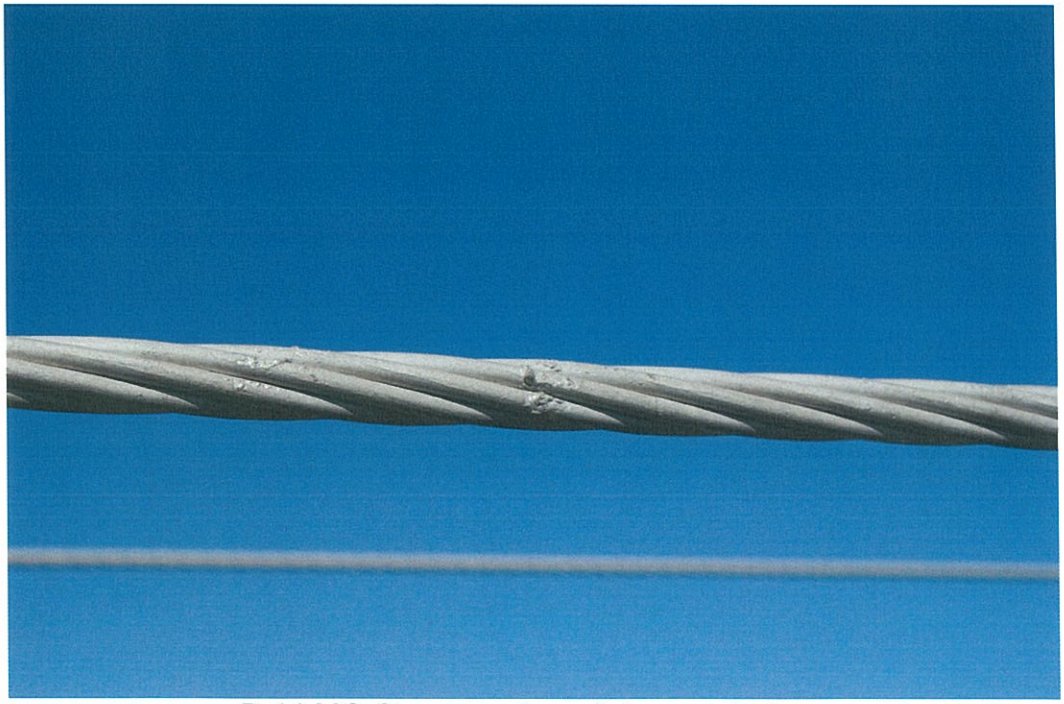
P-11 MG Overall view of damage to lines



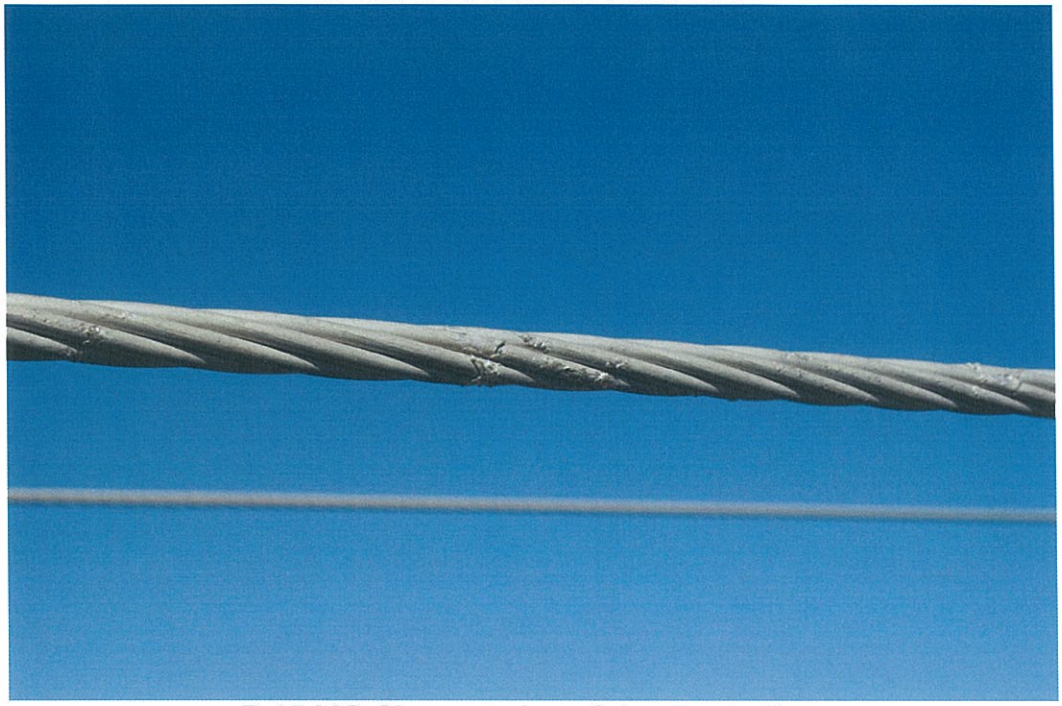
P-12 MG Close-up view of damage to lines



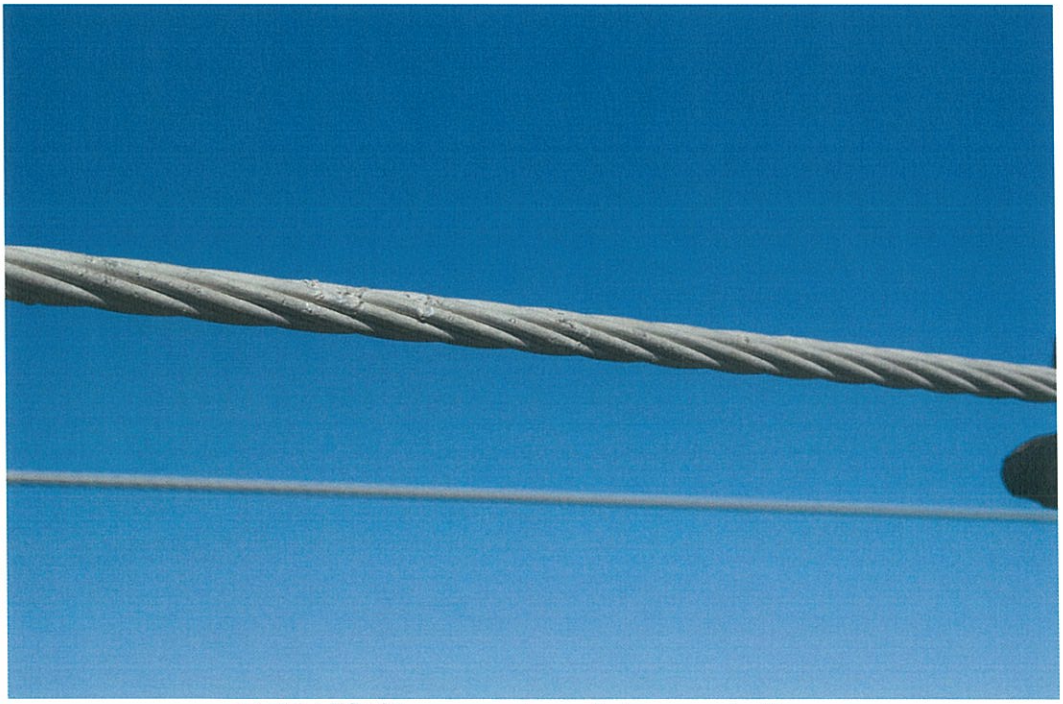
P-13 MG Overall view of damage to lines



P-14 MG Close-up view of damage to lines



P-15 MG Close-up view of damage to lines



P-16 MG Close-up view of damage to lines

P-17 MG View from Location #1 of GOA

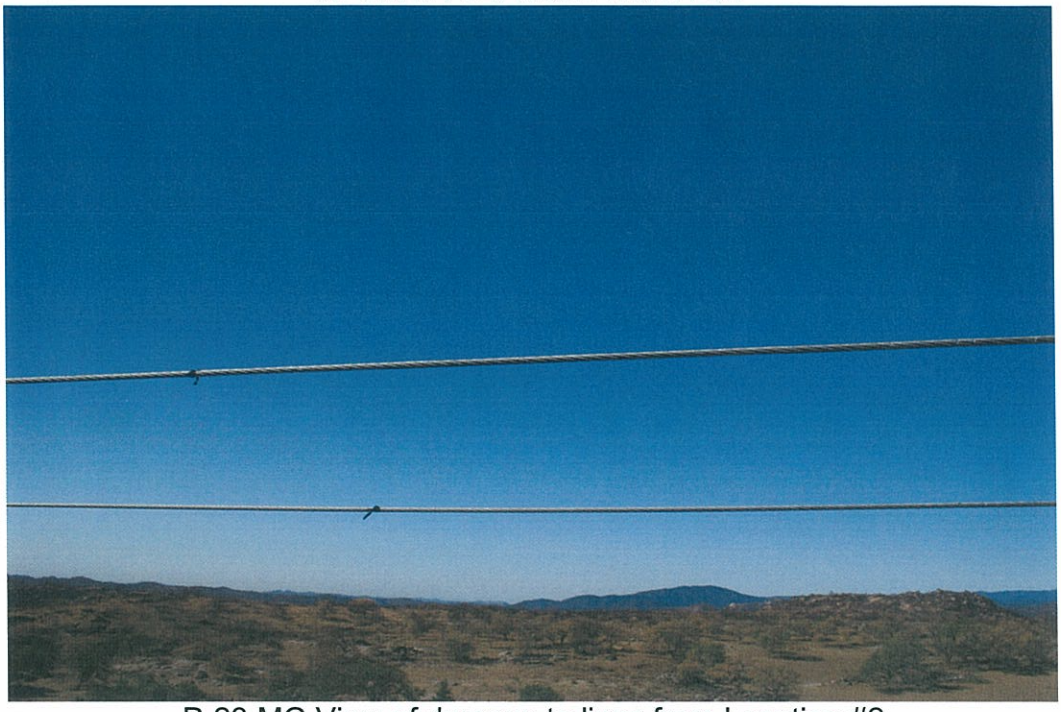
P-18 MG View from Location #1 of GOA

P-19 MG View from Location #1 of GOA

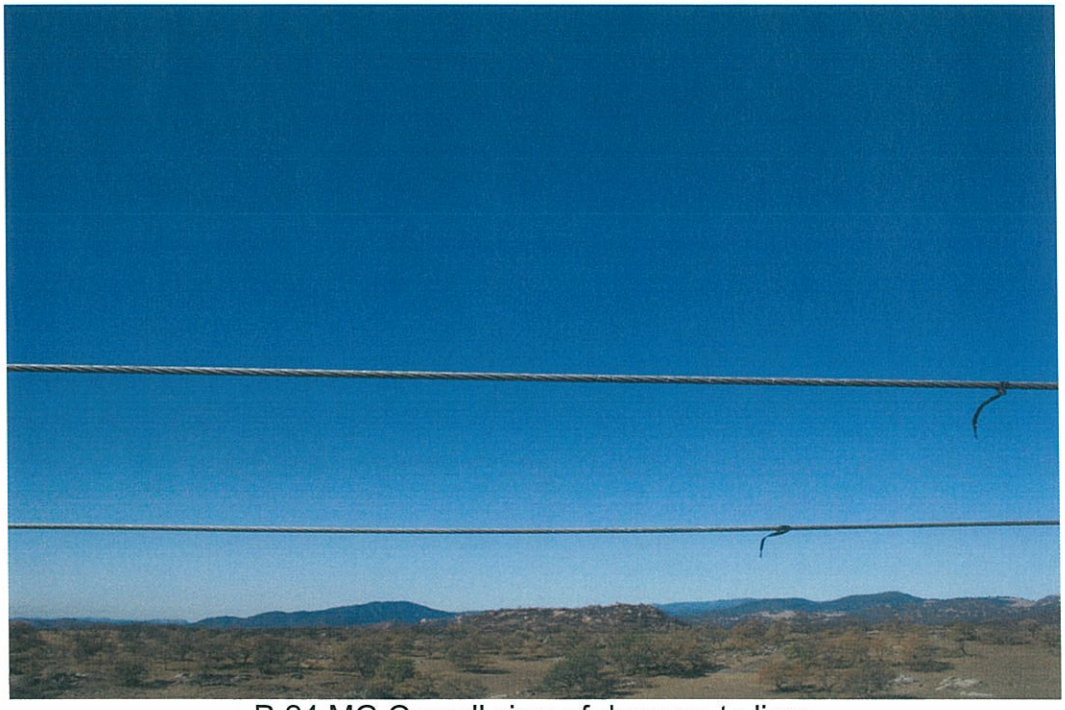
P-20 MG View from Location #1 of GOA

P-21 MG View from Location #1 of GOA

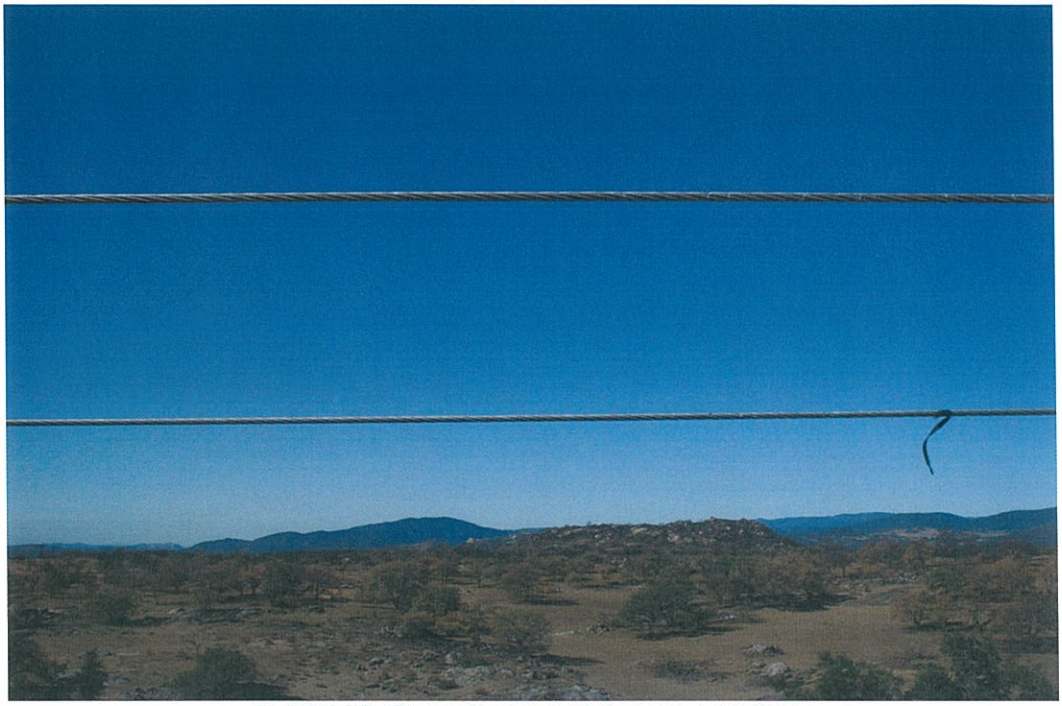
P-22 MG View of SOA in center of photograph



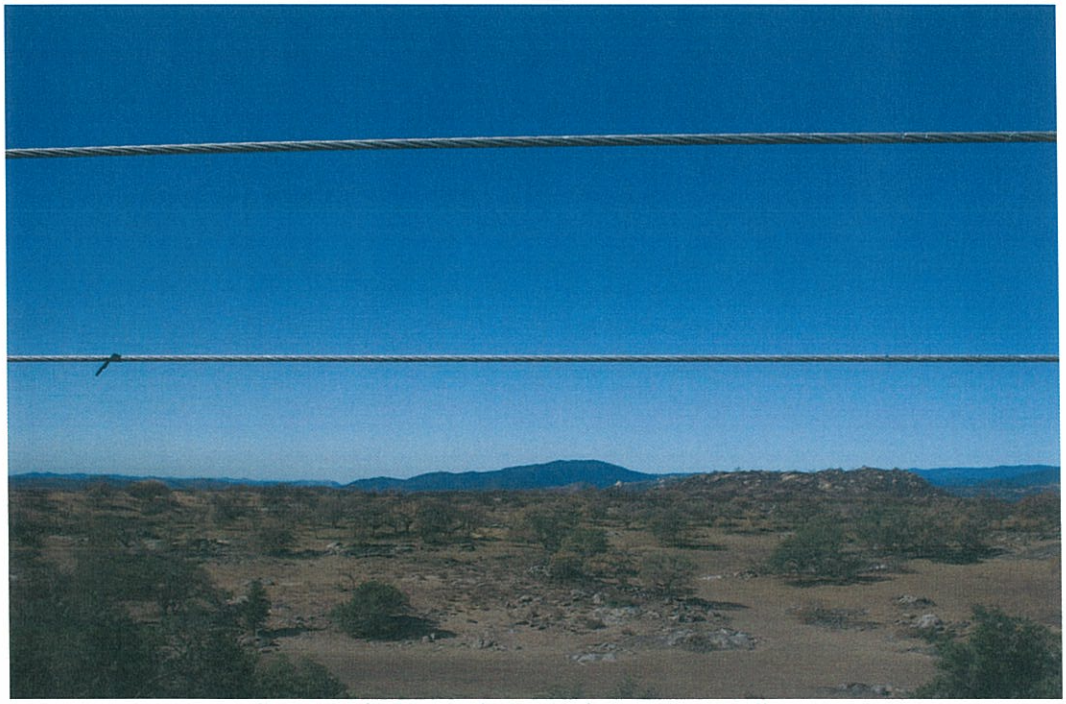
P-23 MG View of damage to lines from Location #2



P-24 MG Overall view of damage to lines

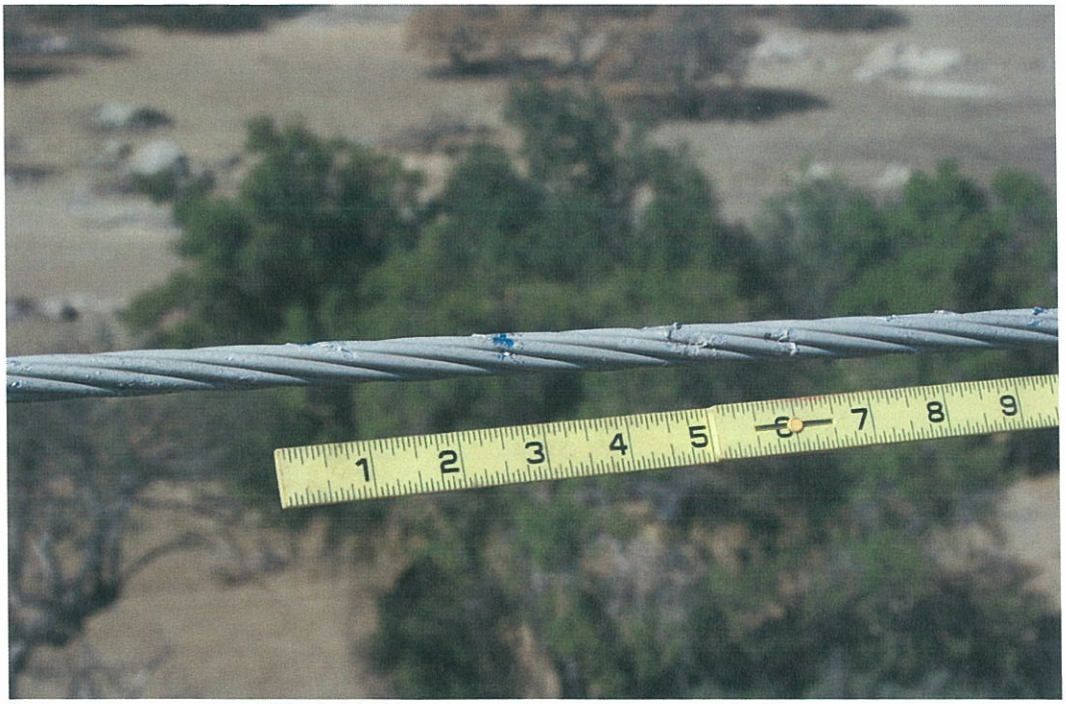


P-25 MG Overall view of damage to lines

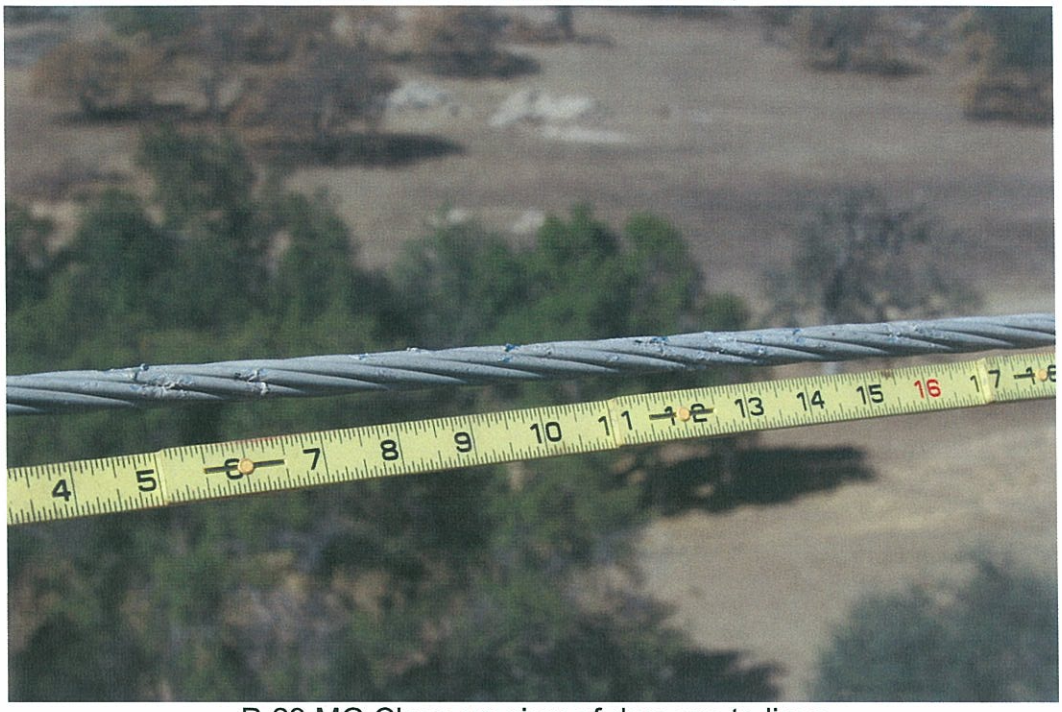


P-26 MG Overall view of damage to lines

P-27 MG Close-up view of damage to lines



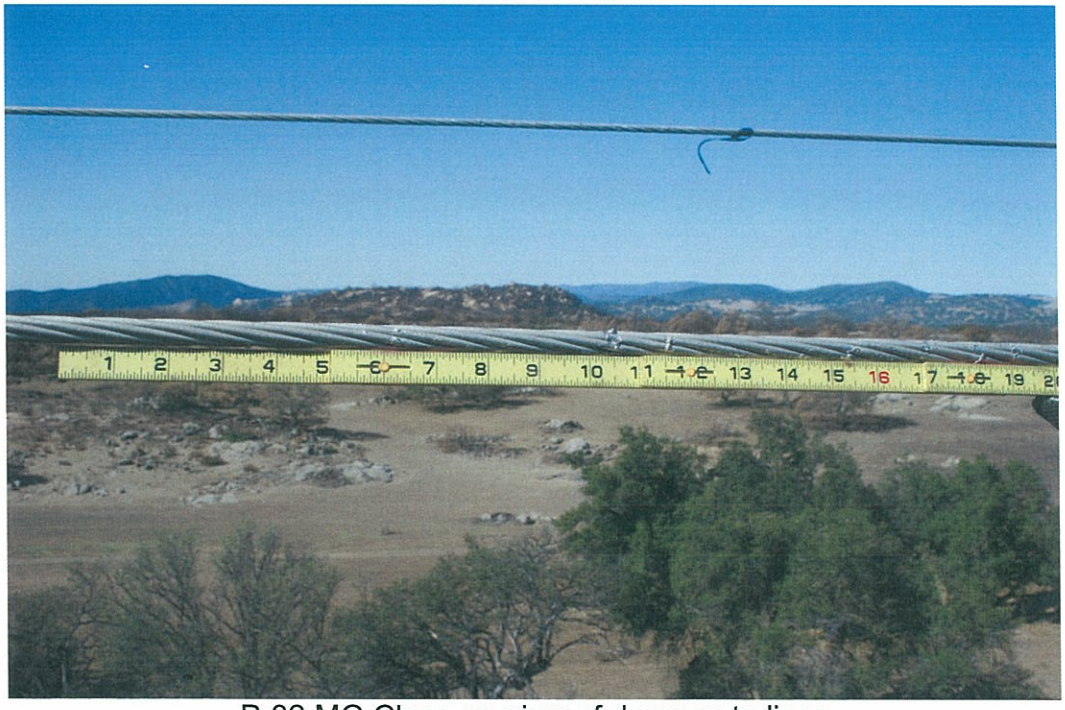
P-28 MG Close-up view of damage to lines



P-29 MG Close-up view of damage to lines

P-30 MG Close-up view of damage to lines

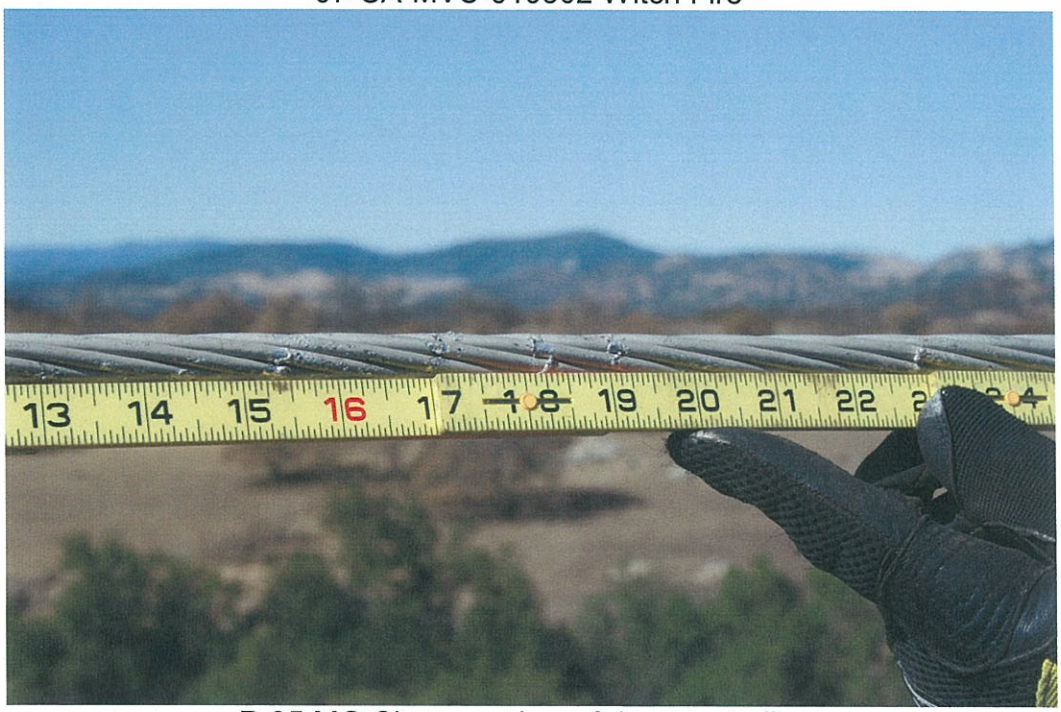
P-31 MG Close-up view of damage to lines



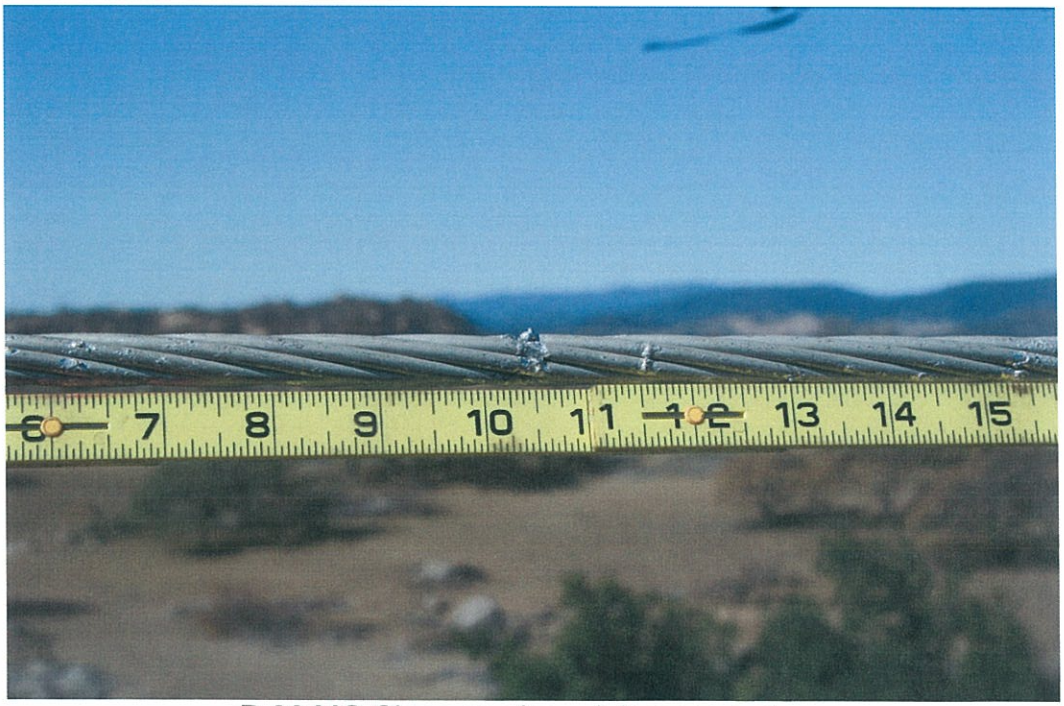
P-32 MG Close-up view of damage to lines

P-33 MG Close-up view of damage to lines

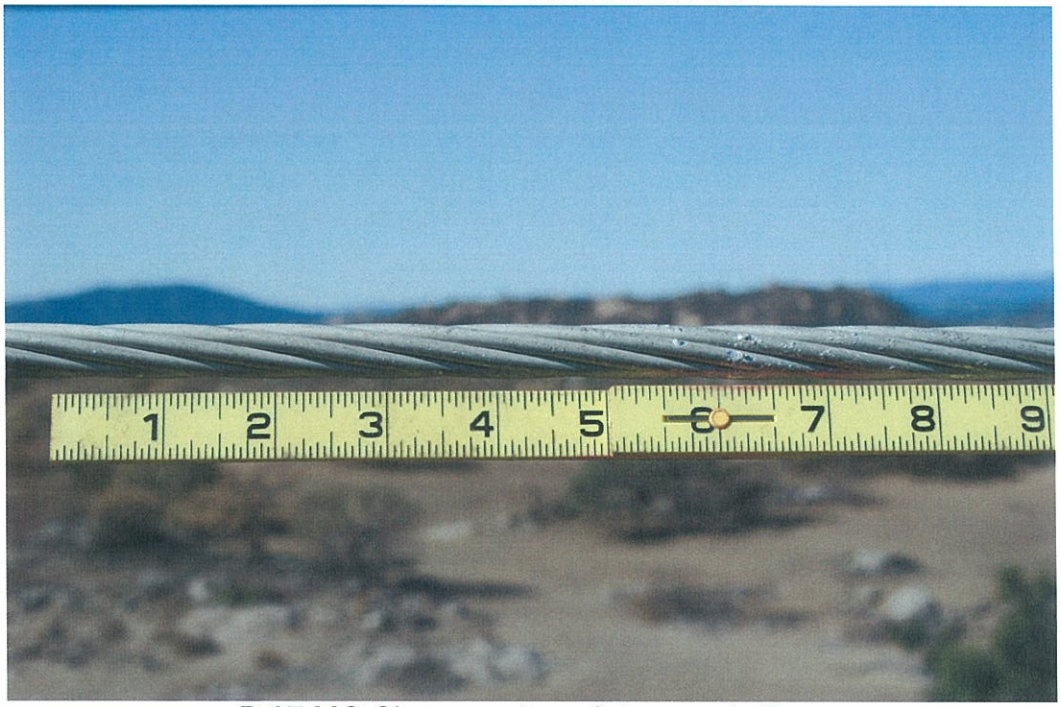
P-34 MG Close-up view of damage to lines



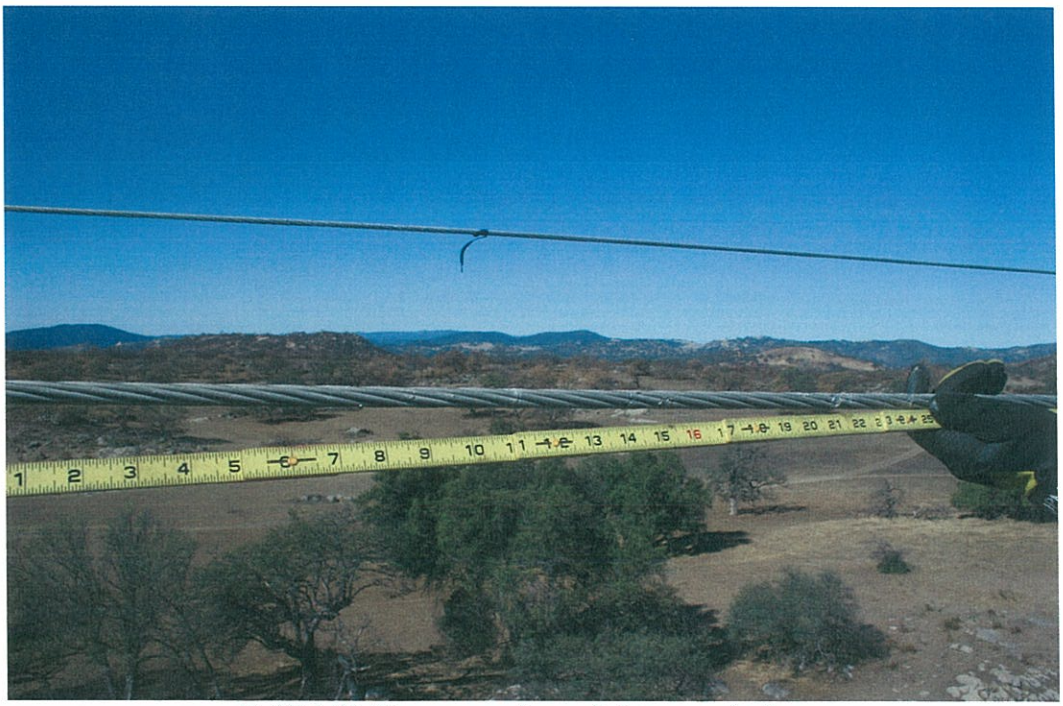
P-35 MG Close-up view of damage to lines



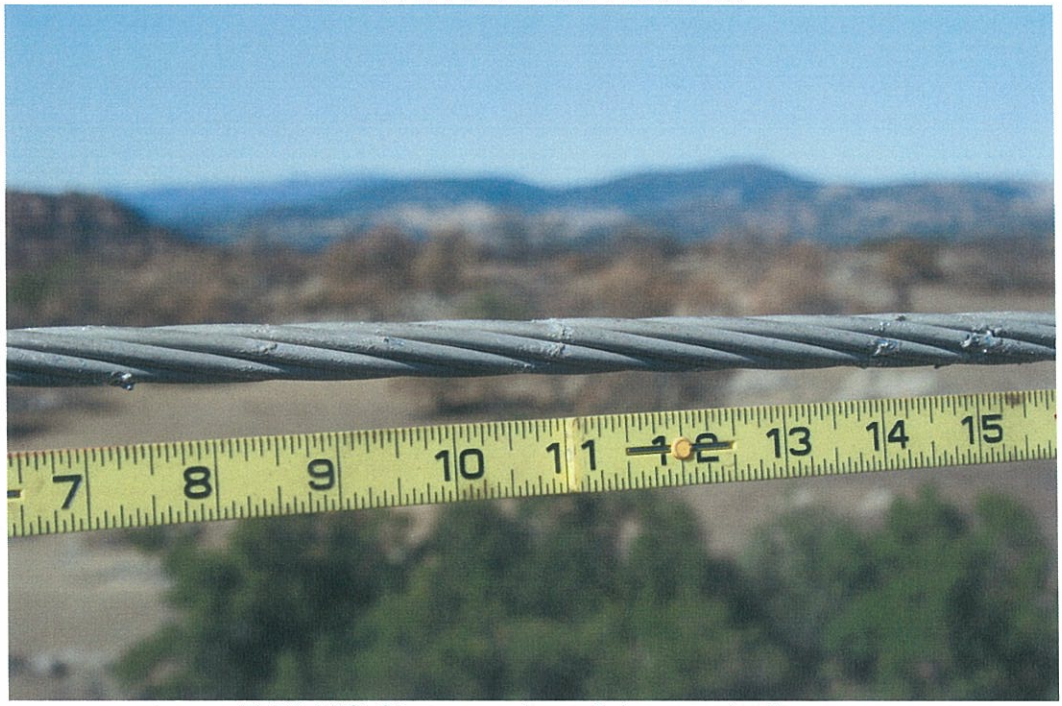
P-36 MG Close-up view of damage to lines



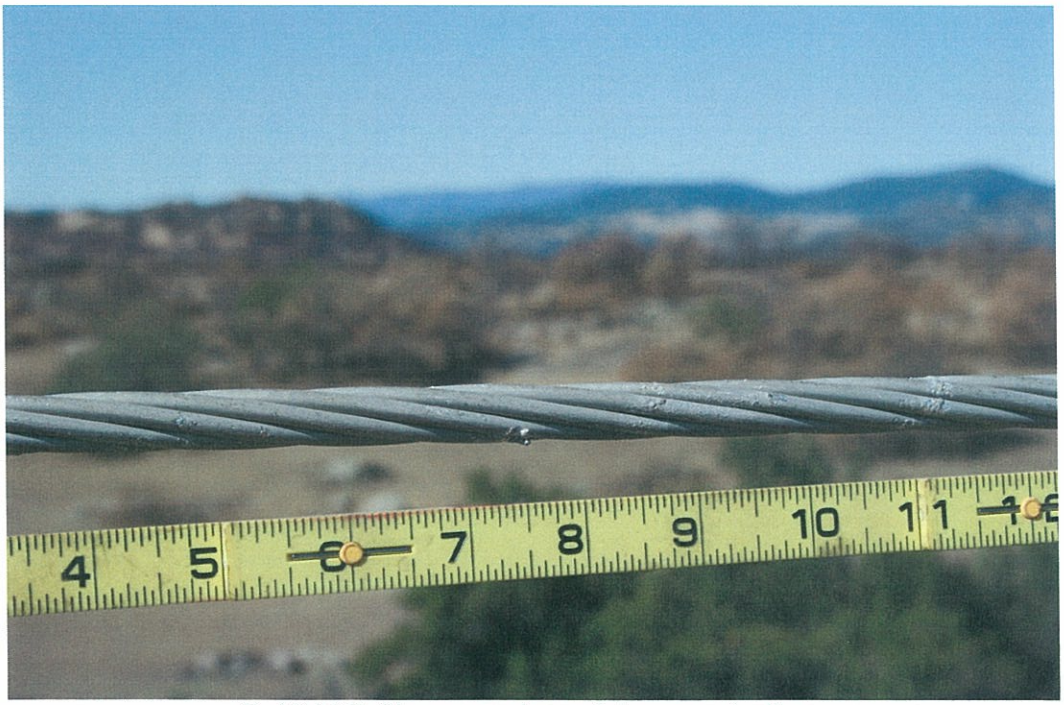
P-37 MG Close-up view of damage to lines



P-38 MG Close-up view of damage to lines



P-39 MG Close-up view of damage to lines

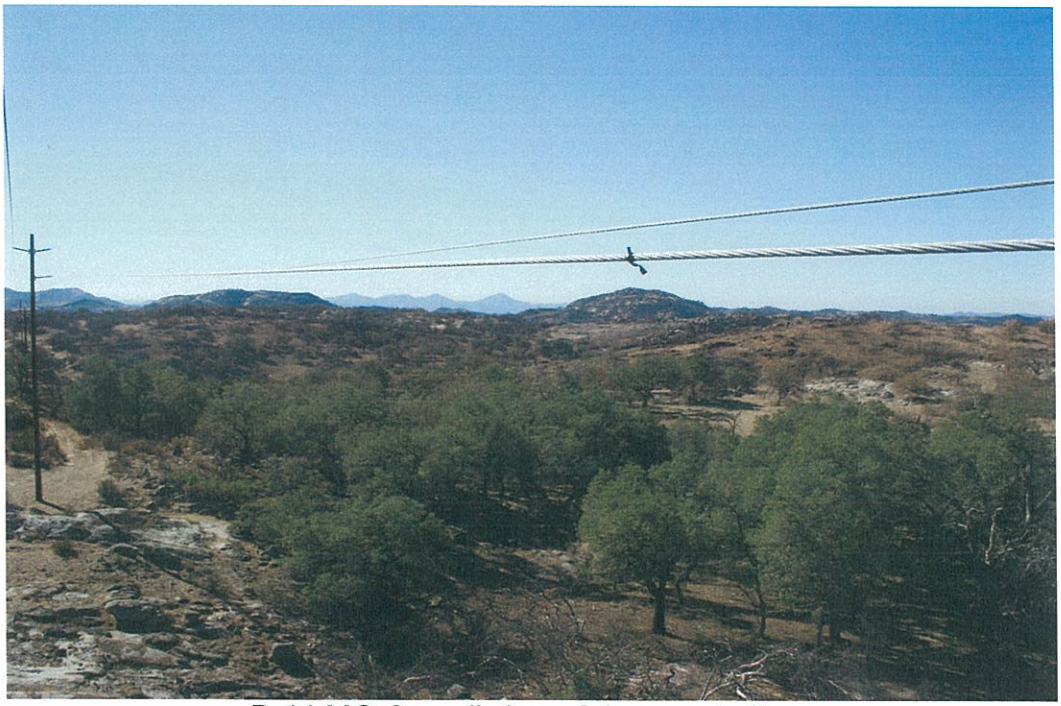


P-40 MG Close-up view of damage to lines

P-41 MG Close-up view of damage to lines

P-42 MG Close-up view of damage to lines

P-43 MG View of SOA from Location #2



P-44 MG Overall view of damage to lines

P-45 MG Overall view of lines

P-46 MG Overall view of damage to lines

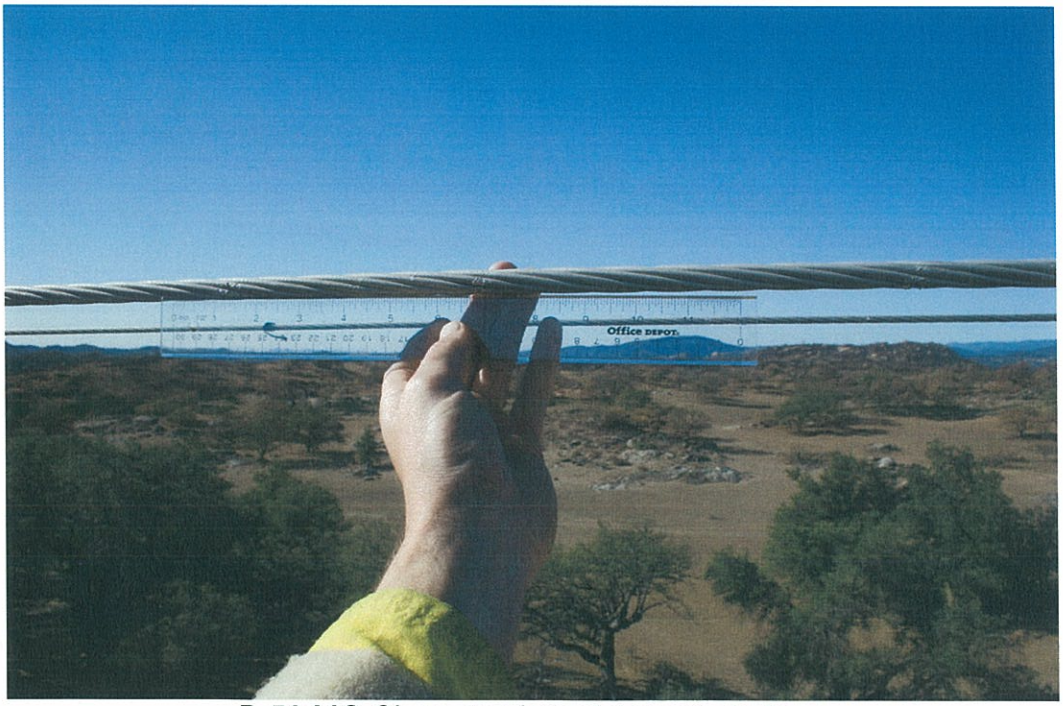
P-47 MG View of SOA from Location #2

P-48 MG View of Pole #416674

P-49 MG View of tanker drop behind Pole #416675

P-50 MG View of damaged lines from Location #3

P-51 MG Overall view of damaged lines



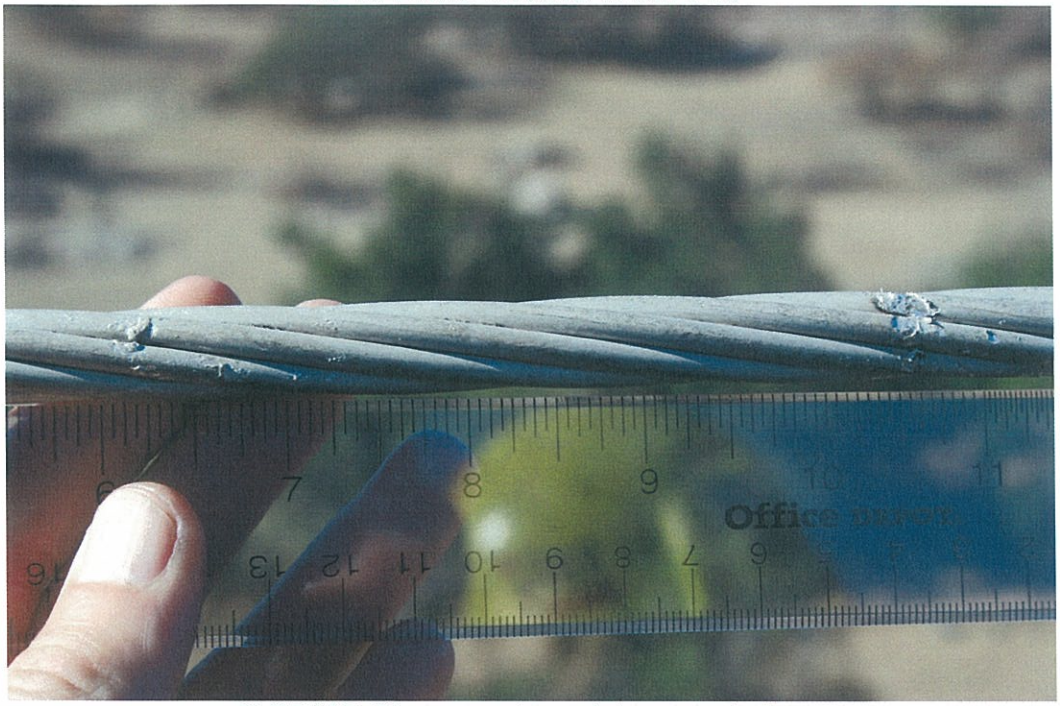
P-52 MG Close-up view of damage to lines

P-53 MG Close-up view of damage to lines

P-54 MG Close-up view of damage to lines

P-55 MG Close-up view of damage to lines

P-56 MG Close-up view of damage to lines



P-57 MG Close-up view of damage to lines

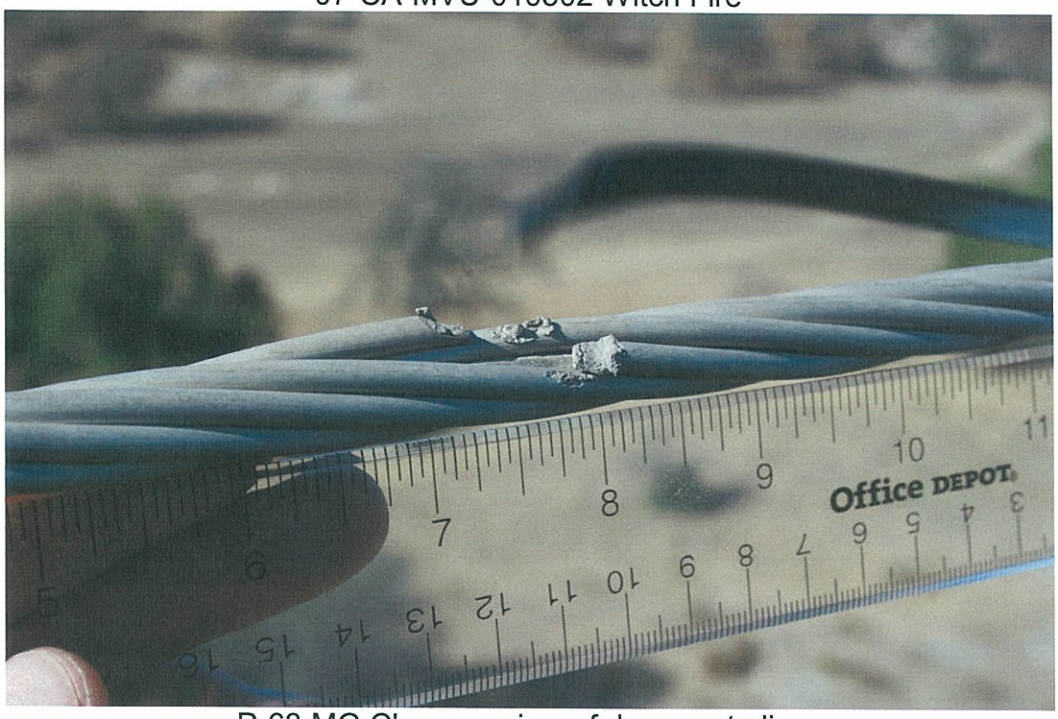
P-58 MG Close-up view of damage to lines

P-59 MG Close-up view of damage to lines

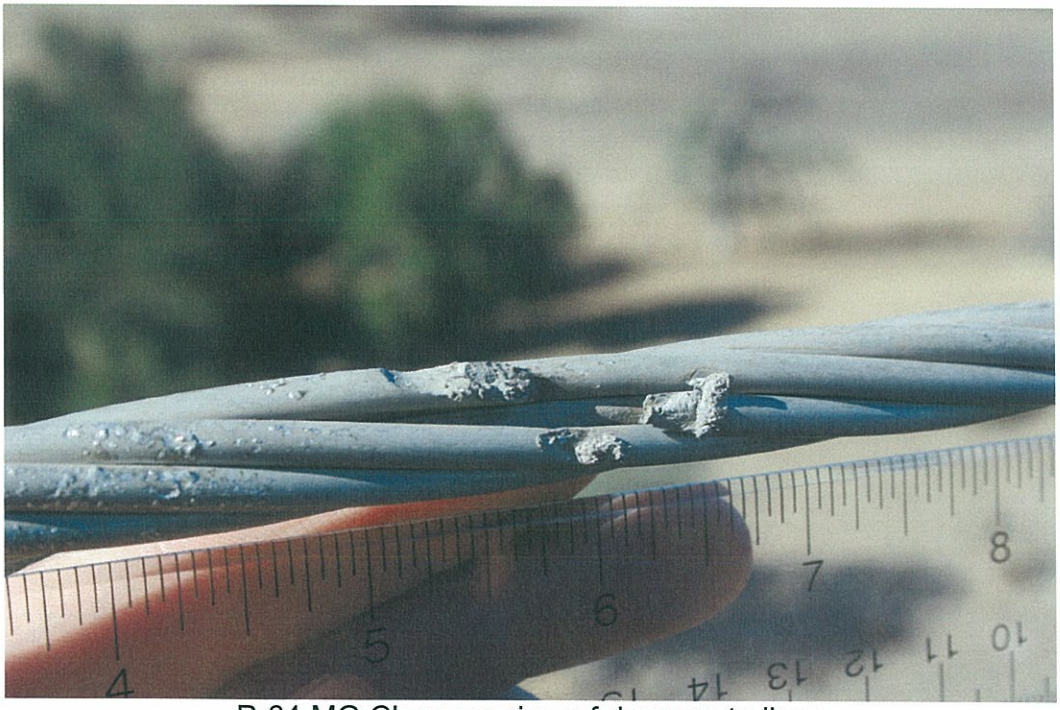
P-60 MG Close-up view of damage to lines

P-61 MG Overall view of damage to lines

P-62 MG Overall view of lines



P-63 MG Close-up view of damage to lines



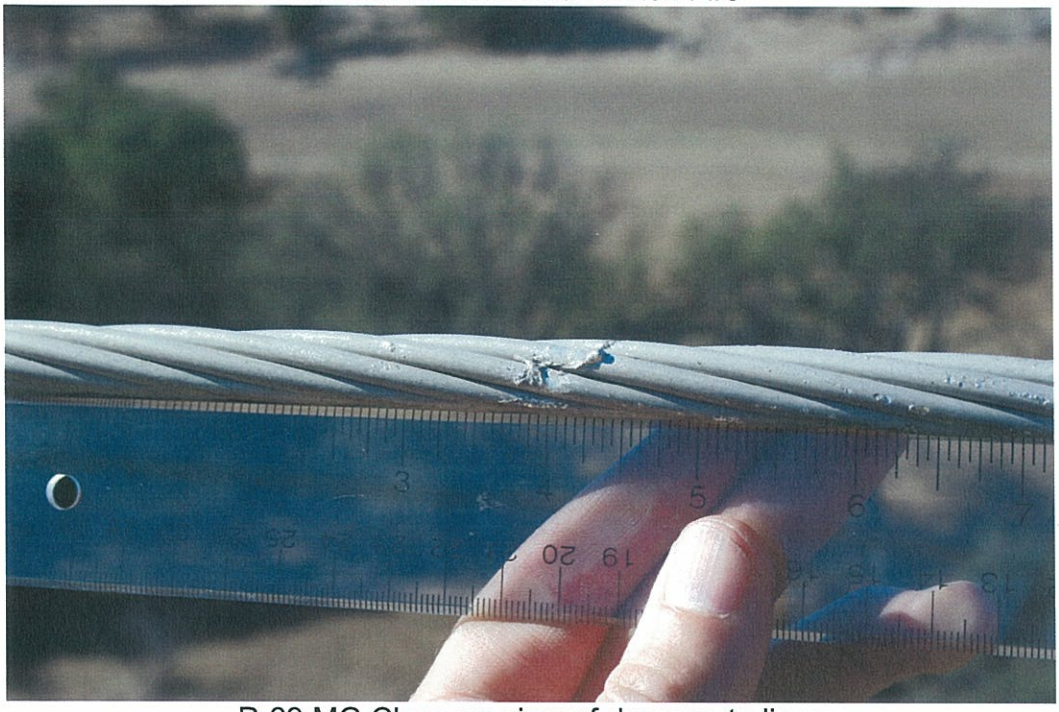
P-64 MG Close-up view of damage to lines

P-65 MG Close-up view of damage to lines

P-66 MG Close-up view of damage to lines

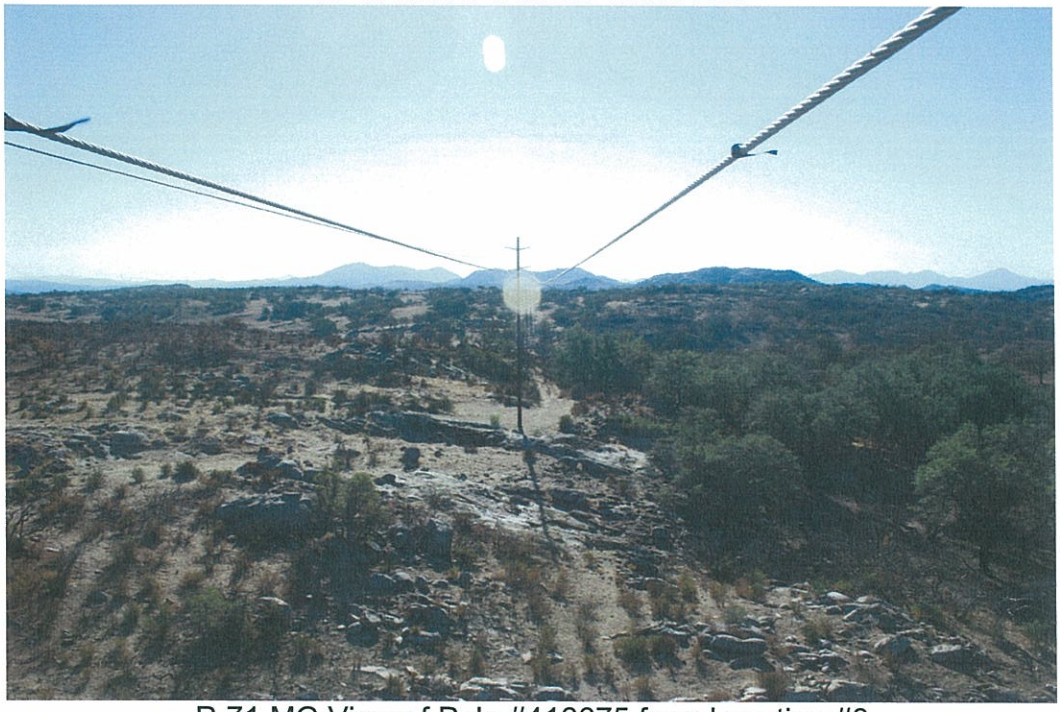
P-67 MG Close-up view of damage to lines

P-68 MG Close-up view of damage to lines



P-69 MG Close-up view of damage to lines

P-70 MG View of SOA from Location #3



P-71 MG View of Pole #416675 from Location #3

Attachment E

P-1 Close up looking North

P-2 Distance looking North

P-3 Looking North at Conductors

P-4 North Power Pole

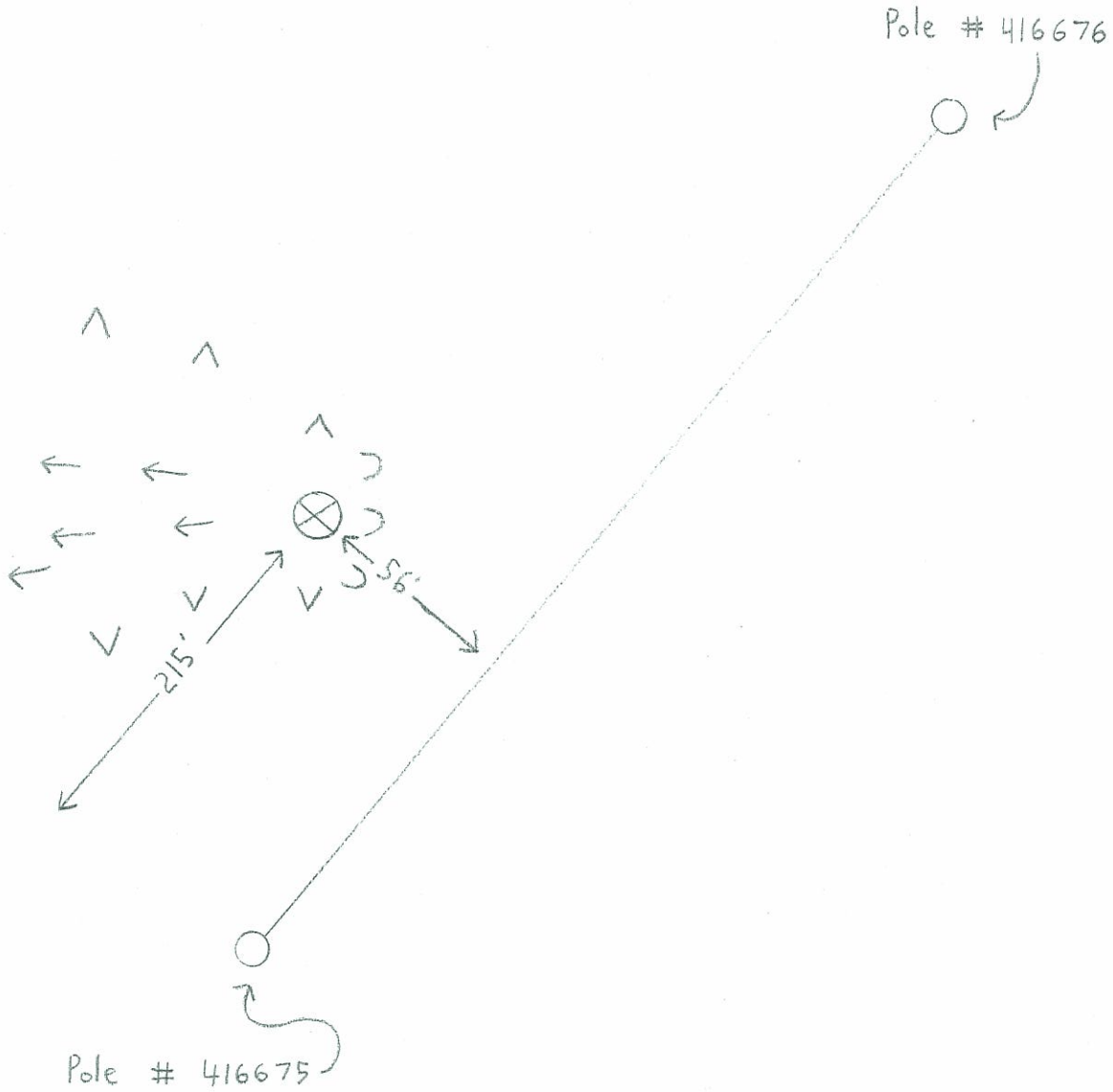
Attachment F

SUPPLEMENTARY INVESTIGATION REPORT

STATE OF CALIFORNIA
DEPARTMENT OF FORESTRY AND
FIRE PROTECTION

ORIGINATORS CASE NUMBER
07-CDF-570
ORDER NUMBER

CASE TITLE	MONTH	DATE	YEAR	COUNTY	REG	RU	INCIDENT #
Witch Fire	Oct	21	2007	San Diego	CSR	MVU	010432



COPIES TO	INVESTIGATION STATUS
RU ☐ REG ☐ HQ ☐ DA ☐ AG ☐ OTHER ☐	CLOSED ☐ CONTINUING ☐ OTHER_____

PRINTED NAME OR REPORTING OFFICER	SIGNATURE OF REPORTING OFFICER	OFFICER'S TITLE	DATE OF REPORT
Matthew Gilbert ID #22		FCS	

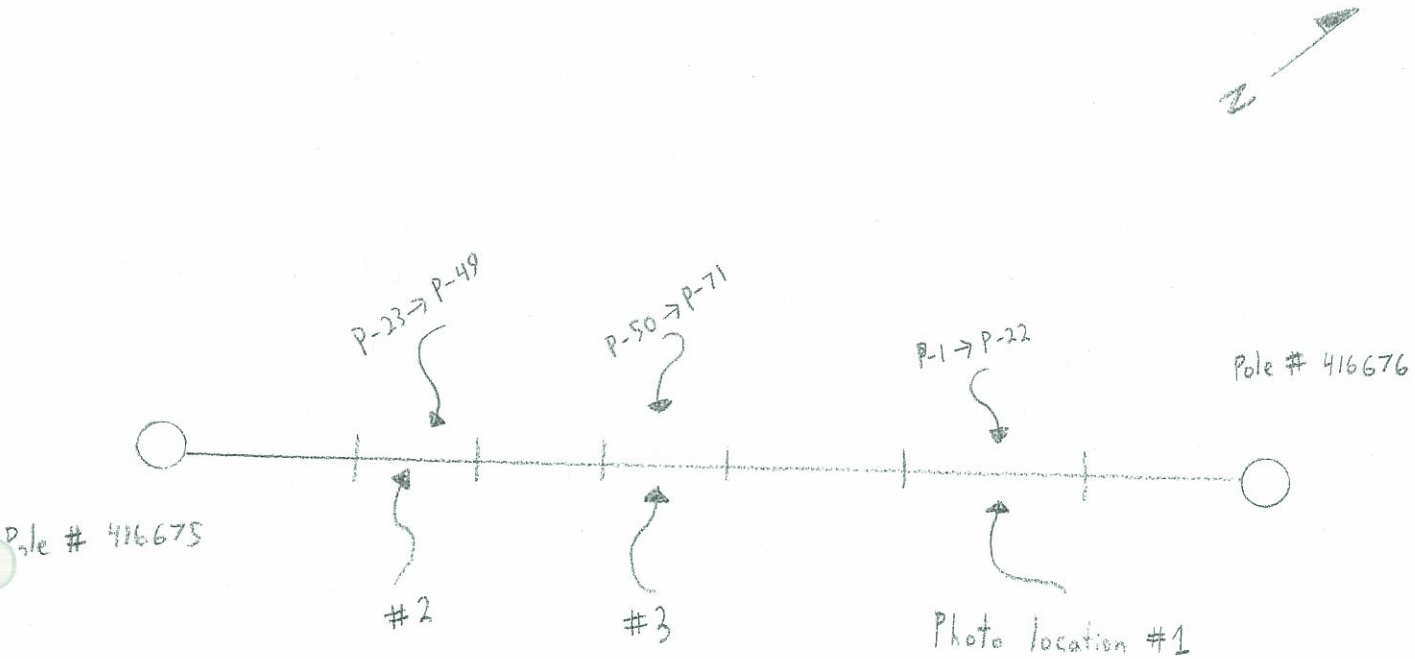
Attachment G

SUPPLEMENTARY INVESTIGATION REPORT

STATE OF CALIFORNIA
DEPARTMENT OF FORESTRY AND
FIRE PROTECTION

ORIGINATORS CASE NUMBER
07-CDF-570
ORDER NUMBER

CASE TITLE	MONTH	DATE	YEAR	COUNTY	REG	RU	INCIDENT #
Witch Fire	Oct	21	2007	San Diego	CSR	MVU	010432



View of 11-14-2007 Photo locations

COPIES TO	INVESTIGATION STATUS
RU ☐ REG ☐ HQ ☐ DA ☐ AG ☐ OTHER ☐	CLOSED ☐ CONTINUING ☐ OTHER_____

PRINTED NAME OR REPORTING OFFICER	SIGNATURE OF REPORTING OFFICER	OFFICER'S TITLE	DATE OF REPORT
Matthew Gilbert ID #22		FCS	

Attachment H

TIME	MAJOR EVENTS
	MVM 100427
1012	CRASH/RESCUE ORDERED. TO BE FILLED W/ E82 UNTIL IT CAN BE FILLED BEHIND W/ ANOTHER.
1035	RELIEF AA ORDERED TO BE @ RAAB 1230 MAY BE REVISED TO OVER THE FIRE
1100	T82 HYDRALIC PRESSURE PROBLEM (PHIL CHECKING)
1110	NOTIFIED CHUCK HALL/PAC. EXEC. ABOUT TANKER STATUS
1120	AA-340 off 11:15 ETA 12:30
1125	E-82 (CRASH RESCUE) ON BASE
1220	T-95 radio problem / OUT OF SERVICE
1228	T-82 back up.
1229	15 mi NE of airport T-73 reported 090 x 11 miles
1300	New info - 060 x 11 miles Hwy 78 & Santa Ysa
1310	Winds ~~[illegible]~~ - not effective (Drops)
1325	ALL AIRCRAFT ON BASE, OPERATIONS STOPPED ZERO VISIBILITY
1330	Helo module heading to Oceanside Fire Co
1350	Brief w all
1415	FF MALONE HELPING ANSWER NUMEROUS PHONE CALLS RE: WITCHCREEK FIRE
1545	HT-718 WAS INSTRUCTED TO NOT TAKE OFF PER CHIEF LUTZ
1350	SAFETY MEETING WITH BASE PERSONNEL + PILOTS (PILOTS TOOK LUNCH + REST)
1615	BRIEFING ABOUT TURBULENCE, VISIBILITY & SAFETY CONCERNS ALL BASE PERSONNEL & PILOTS
1615	HT-718 LAUNCHED THROUGH CLEARING SAFELY
1625	AA 500 WILL LAUNCH TO CHECK BOTH HARRIS & WITCH FIRE AN ADVISE SITUATIONS
1700	T-73, T-82 WILL LAUNCH TO WITCH FIRE TO ACCESS THE SITUATION AND POSSIBLY DROP RETARDANT THEN HEADING TO HMT 44-460 Harris or Witch
1828	H-538 Landed Ramona
	10/22/07
0600	PERS
0825	AA340 REQUESTED RELIEF AA OVER THE HARRIS FIRE @ 1130

TIME	MAJOR EVENTS
	MVM 100427
1012	CRASH/RESCUE ORDERED. TO BE FILLED W/ E82 UNTIL IT CAN BE FILLED BEHIND W/ ANOTHER.
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1310	Winds ~~increasing~~ - not effective (Drops)
1325	ALL AIRCRAFT ON BASE, OPERATIONS STOPPED ZERO VISIBILITY
1330	Helo module heading to Alpine Fire Co
1350	Brief w all
1415	FF MALONE HELPING ANSWER NUMEROUS PHONE CALLS RE: WITCHCREEK FIRE
1545	HT-718 WAS INSTRUCTED TO NOT TAKE OFF PER CHIEF LUTZ
1350	SAFETY MEETING WITH BASE PERSONNEL + PILOTS (PILOTS TOOK LUNCH + REST)
1615	BRIEFING ABOUT TURBULENCE, VISIBILITY & SAFETY CONCERNS ALL BASE PERSONNEL & PILOTS
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	AA-460 Harris or Witch
1828	H-538 Landed Ramona
	10/22/07
0600	PERS
0825	AA340 REQUESTED RELIEF AA OVER THE HARRIS FIRE @ 1130

Deb Lutz & Trish Huston were both working the radio communications, aircraft flight times and answering phone calls. At 1300 a new fire was reported 1.5 mi. NE of Ramona Air Attack Base from Tanker 73. Within minutes of the initial report the radio traffic between tankers increased and the exact location of the fire was very sketchy. After the initial report Deb notified Dispatch via telephone. The aircraft that were assigned to MVU10427 made the decision to take immediate action on the new (WITCH) fire due to immediate structure threat and rapid rate of spread toward Ramona. The location of the fire was confirmed at 060×11 near Santa Ysabel. The air tankers (73, 82, 71, 70) made the decision that their drops were ineffective due to the winds and they weren't going to drop on it anymore.

(090×11 from T-73)

(We heard over the [illegible] about a burnover on the Harris incident. The only tanker over the fire at that time was T-73)

At approx 1315 T-82 notified me over the base radio that the correct location was 11 mi. NE of Ramona Hwy 78 × Witchcreek, and the fire "blew-up". Within minutes a large header of smoke was visible from the

[illegible]

to advise them of corrected location. I also notified Di Mortier that the size up per T82 "had blown up". She got upset and said "Who told you that? What do you mean it has blown up?" I repeated exactly what was relayed to me again.

The phones were ringing off the hook with public citizens asking questions. We were both answering phones, talking on the radios and keeping track of flight times. We were also relaying over the phones important information to Cleveland Dispatch. It was extremely busy in the tower. At 1350 the pilots met in the kitchen to have a safety briefing with base personnel. It was decided to shut-down base operations due to extremely poor visibility and extreme turbulence.

Attachment I

Sempra Energy®

C. Larry Davis
Managing Attorney
101 Ash Street, 11th Floor
San Diego, CA 92101
Tel: 619.699.5023
Fax: 619.696.4838
cldavis@sempra.com

October 30, 2007

Matt Gilbert
CAL FIRE
210 W. San Jacinto Avenue
Perris, CA 92570

Dear Capt. Gilbert:

You have requested that SDG&E provide you with information regarding faults on SDG&E Tie Line 637 on October 21, 2007. I asked SDG&E consultant Larry Hall to identify that factual information. Enclosed is a letter from Mr. Hall, which I believe is self-explanatory.

Should you have any questions please contact me.

Very truly yours,

C. Larry Davis

CLD/sma

#209057

Lawrence S. Hall, P.E.
ELECTRICAL ENGINEER

8575 Renown Drive • San Diego, Ca 92119 • (619) 462-2019

October 28, 2007

Mr. C. L. Davis, Esq.
Sempra Energy Inc.
101 Ash Street
San Diego, CA 92101

Re: Operation of 69KV Tie Line 637 on October 21, 2007

Dear Mr. Davis,

I have reviewed the available data concerning the operation of 69KV Tie Line 637 (TL 637) on Sunday, October 21, 2007. This information was obtained from the digital fault recorders at the Los Coches and Descanso substations as well as the type SEL relay at the Santa Ysabel terminal of TL 637. The information for the nature of the faults and the clearing times from the Creelman Substation in Ramona was obtained from the Los Coches digital fault recorder since there is a direct tie between the substations.

TL 637 experienced four interruptions on October 21, 2007. It must be noted that the type SEL relay for the tie line at Santa Ysabel does not have a synchronized clock. The relay time is approximately 12 minutes slow and has been corrected by using the times from the digital fault recorders and the main system control computer at the Mission Control Center. The fault times, types, and clearing times were as follows:

Time	Type	CRE Clearing*	ST Clearing**
0853	C-A	6 cycles	7.31 cycles
1122	B-C	5.5 cycles	7.07 cycles
1223	B-C	***	7.37 cycles
1525	B-C	5.5 cycles	7.37 cycles

* Creelman clearing time
** Santa Ysabel clearing time
*** Record not available from Los Coches. The fault cleared via the type CEY distance relay at Creelman, as did all others.

TL 637 was deenergized at 1527 and was left out of service.

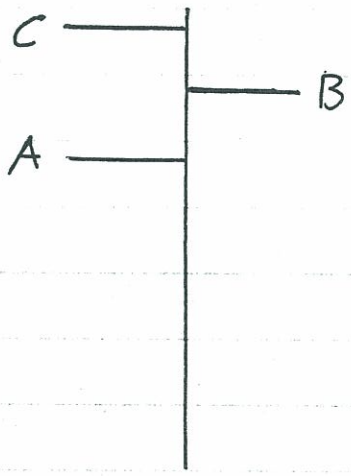
Please feel free to contact me if additional information is needed.

Yours truly,

Lawrence S. Hall – P.E.

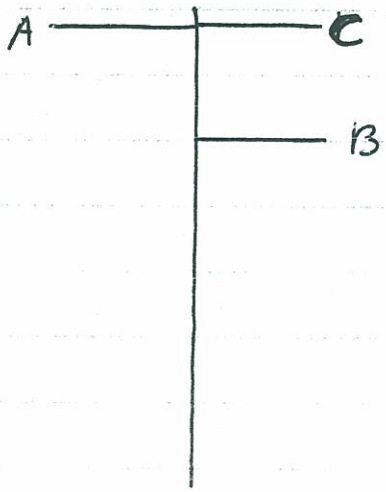
Attachment J

TIE LINE 637
PHASING



NOT TO SCALE

POLE 416676
LOOK SOUTHWEST



NOT TO SCALE

POLE 416675
LOOK SOUTHWEST

L.S. Hall
11/1/07

Attachment K

SITE INFORMATION

ID: JULC1
NAME: JULIAN
LATITUDE: 33.0758
LONGITUDE: -116.5908
ELEVATION: 4240 ft
MNET: RAWS

(Click for topo map)
(Click for satellite)

SITE LINKS

Help

ROMAN

Metric Units

Greenwich Mean Time

Past Data

Station Information

Restrictions

Data in Spreadsheet Format

DATA COURTESY OF
Bureau of Land Management
and
California Dept of Water Resources

Past Weather Conditions for JULC1

Observations prior to selected time: October 21, 2007 - 13:00 PDT

Weather Conditions at October 21, 2007 - 12:14 PDT

	12:14	24 Hour Max	24 Hour Min
Temperature	58.0° F	73.0 at 13:14	52.0 at 0:14
Dew Point	12.1° F	38.0 at 19:14	12.1 at 12:14
Relative Humidity	16%	49 at 19:14	16 at 12:14
Wind Speed	24 mph from E	24 at 11:14	1 at 0:14
Wind Gust	43 mph	48 at 11:14	5 at 1:14
Solar Radiation	825.0 W/m*m	825.0 at 12:14	0.0 at 18:14
Fuel Temperature	67.0° F	84.0 at 13:14	45.0 at 1:14
10 hr Fuel Moisture	6 gm	10 at 20:14	6 at 11:14
Battery voltage	14.40 volt	14.40 at 10:14	12.70 at 4:14

Precipitation accumulated since midnight: 0.00", in 24 hours: 0.00"

Tabular Listing: October 20, 2007 - 12:00 through October 21, 2007 - 13:00 PDT

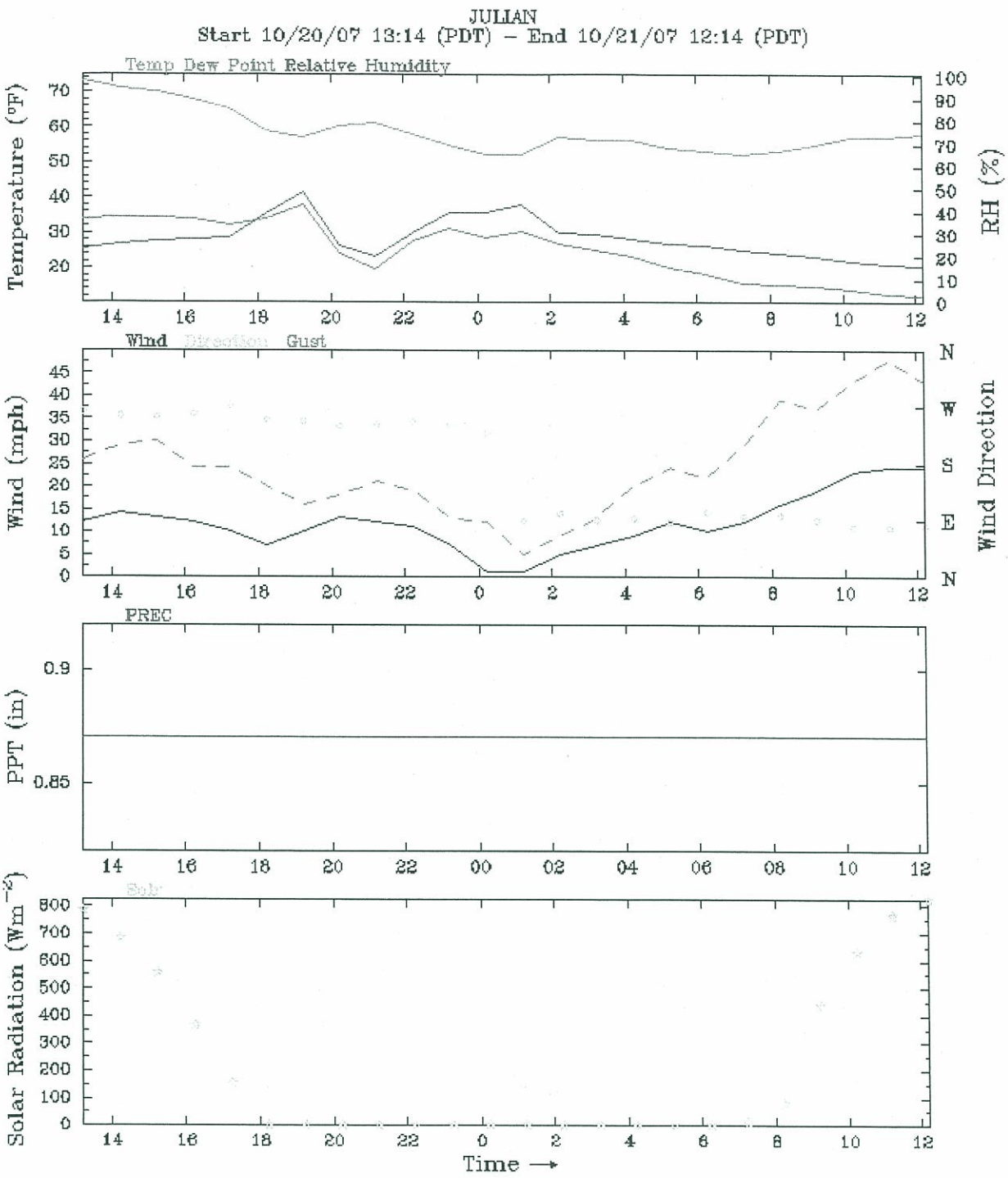
Time(PDT)	Temperature	Dew Point	Relative Humidity	Wind Speed	Wind Gust	Wind Direction	Quality check	Solar Radiation	Precipitation accumulated	Precipitation 24hr	Fuel Temperature	10 hr Fuel Moisture	Battery voltage
	° F	° F	%	mph	mph			W/m*m	in	in	° F	gm	volt
12:14	58.0	12.1	16	24	43	E	OK	825.0	0.87		67.0	6	14.40
11:14	57.0	12.6	17	24	48	ENE	OK	766.0	0.87		65.0	6	14.40
10:14	57.0	13.9	18	23	43	E	OK	630.0	0.87		63.0	7	14.40
9:14	55.0	14.7	20	19	37	E	OK	436.0	0.87		58.0	8	13.80
8:14	53.0	15.2	22	16	39	E	OK	78.0	0.87		52.0	9	12.80
7:14	52.0	15.4	23	12	29	E	OK	11.0	0.87		50.0	10	12.70
6:14	53.0	18.1	25	10	22	ESE	Suspect	0.0	0.87		50.0	9	12.70
5:14	54.0	19.9	26	12	24	E	Suspect	0.0	0.87		50.0	10	12.70
4:14	56.0	23.4	28	9	20	E	OK	0.0	0.87		52.0	10	12.70
3:14	56.0	25.0	30	7	13	E	Suspect	0.0	0.87		52.0	10	12.80
2:14	57.0	26.7	31	5	9	E	Suspect	0.0	0.87		51.0	10	12.80
1:14	52.0	30.2	43	1	5	E	Suspect	0.0	0.87		45.0	10	12.80
0:14	52.0	28.4	40	1	12	SW	Suspect	0.0	0.87		46.0	10	12.80
23:14	55.0	31.1	40	7	13	WSW	Suspect	0.0	0.87		51.0	9	12.80
22:14	58.0	27.5	31	11	19	WSW	Suspect	0.0	0.87		55.0	9	12.80
21:14	61.0	19.7	20	12	21	WSW	Suspect	0.0	0.87		57.0	10	12.90
20:14	60.0	24.1	25	13	18	WSW	OK	0.0	0.87		56.0	10	12.90
19:14	57.0	38.0	49	10	16	WSW	Suspect	0.0	0.87		55.0	9	12.90
18:14	59.0	34.1	39	7	20	WSW	Suspect	0.0	0.87		57.0	9	12.90
17:14	65.0	32.0	29	10	24	W	OK	153.0	0.87		70.0	9	14.30
16:14	68.0	33.7	28	12	24	W	OK	366.0	0.87		75.0	9	14.30
15:14	70.0	34.5	27	13	30	WSW	OK	557.0	0.87		77.0	9	14.30
14:14	71.0	34.4	26	14	29	WSW	OK	681.0	0.87		80.0	9	14.30
13:14	73.0	34.1	24	12	26	W	OK	784.0	0.87		84.0	9	14.20
12:14	72.0	31.1	22	12	26	WSW	OK	798.0	0.87	0.00	83.0	9	14.20

University of Utah Mountain Meteorology Group

For Questions or Comments about this page or MesoWest contact meteo-mesowest@lists.utah.edu

Privacy Policy

Select Previous Periods: 12 Hours 24 Hours 2 Days 5 Days 7 Days 10 Days 30 Days
Hodograph



University of Utah Mountain Meteorology Group

For Questions or Comments about this page or MesoWest contact meteo-mesowest@lists.utah.edu

Privacy Policy

Attachment L

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

Incident Location

Incident Status: ONS

Location: 27790 HWY 78 / 27098 DEER CANYON DR ,WITCH_CREEK *Apartment:*
Lo Cross: *Hi Cross:*
City: WITCH_CREE *County:* SAN DIEGO *Map Page:* 1154_E2
Loc Com:

Latitude:	33.066564	*Agency:*	CAMVU	*Dispatch Zone:*	2
Longitude:	-116.725912	*Jurisdiction:*	CAMVU	*Battalion:*	6
Legal:	01_T13S_R02E_S	*DPA Agency:*	CAMVU	*Resp. Area:*	S10
UTM:	11 525585 3658700			*Atom:*	S10

LEGAL 01_T13S_R02E_S *0*

Reporting Party Information

Caller Name: *Caller Phone:*
Caller Loc: *Call Source:* 1615

Incident Type/Response Information

Incident Type: FIRE, WILDLAND *Response Plan:* FWL2
Dispatch Level: M *Response Level:* 1

Incident Date/Time Summary

Incident Call Rec.:			
Incident Keystroke:	10/21/2007 12:35:42	*Personnel ID*	*CAD Workstation*
Incident Entry:	10/21/2007 12:36:00	LCRAIG	MVUCAD02
Incident Dispatch:	10/21/2007 12:36:49	DCASTER	MVUCAD02
Incident Closed:			

Fire Information

Status: *Contained:* *Controlled:*

Time Summary:

WAI	DSP	ENR	ONS
12:36.00	12:36.49	12:43.18	13:19.35

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

Unit Status Details

B3312

DSP	ENR	ONS
12:36:47	12:53:58	17:22:03

B3315

DSP	ENR	ONS
12:43:30	12:52:50	17:22:03

BR6460

DSP	ENR	ONS	AIQ
20:14:46	20:14:52	21:58:05	19:11:11

D3341

DSP	ENR	ONS
12:36:49	12:53:58	17:22:03

E27

DSP	AIQ
19:42:02	19:44:45

E273

DSP	ENR	ONS
19:50:48	19:56:12	21:58:05

E280

DSP	ENR	ONS	AIQ
19:43:18	19:49:53	21:58:05	6:54:51

E282

DSP	AIQ	DSP	ONS	AIQ
19:42:02	19:49:35	1:13:35	1:13:35	8:14:52

E3356

DSP	ENR	ONS
12:36:48	12:52:22	17:22:03

E3357

DSP	ONS
12:36:49	17:22:06

E3360

DSP	ENR	ONS
13:31:45	13:32:05	17:22:03

E3361

DSP	ENR	ONS
13:31:45	13:32:05	17:22:03

E3367

DSP	ENR	ONS
12:36:48	12:52:24	13:19:35

E3370R

DSP	ENR	RTQ	AIQ	DSP	ONS
13:31:45	13:32:05	14:09:33	14:09:41	14:32:19	14:32:44

,76R

DSP	ENR	ONS
12:36:48	12:43:18	17:21:43

E3377

Detail Report-All Segments

DSP	ONS	AIQ
12:36:49	13:21:44	3:58:33

E3378R

DSP	ENR	ONS
13:31:45	13:32:05	17:21:43

E3388

DSP	ENR	ONS
13:31:45	13:32:05	15:01:23

E3390C

DSP	ENR	ONS	AIQ
22:53:05	23:00:21	2:17:08	3:58:01

E3391C

DSP	ENR	ONS
23:00:13	23:00:21	2:17:08

E6662

DSP	ENR	ONS
20:14:45	20:14:52	21:58:05

E6711

DSP	ONS	AIQ
3:30:27	3:30:27	21:29:31

E80

DSP	ENR	ONS	AIQ	DSP	ONS	AIQ
19:42:01	19:44:02	21:58:05	4:38:25	4:42:20	4:42:20	4:44:42

E82

DSP	ENR	ONS	AIQ	DSP	ONS	AIQ
19:42:02	19:45:52	21:58:05	1:01:46	1:13:46	1:13:46	1:15:23

DSP	ONS	AIQ
3:35:42	3:35:42	22:38:12

IOF

DSP	AIQ
12:36:49	12:36:52

PLC1

DSP	ENR	ONS
12:36:48	13:32:14	17:21:38

PLC2

DSP	ENR	ONS
12:36:48	13:32:14	17:21:38

PLC3

DSP	ENR	ONS
13:32:26	13:32:33	17:21:38

PLC4

DSP	ENR	ONS
13:32:27	13:32:33	17:21:38

5

DSP	ENR	ONS
13:02:15	13:32:16	17:21:38

RBW1

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

DSP	ENR	ONS
14:09:01	14:22:29	17:21:38

RBW2

DSP	ENR	ONS
14:09:01	14:22:29	17:21:38

RBW3

DSP	ENR	ONS
14:09:01	14:22:29	17:21:38

RBW4

DSP	ENR	ONS
14:09:02	14:22:29	17:21:38

RBW5

DSP	ENR	ONS
14:09:02	14:22:29	17:21:38

SDRE77

DSP	ENR	AIQ
11:36:09	11:36:09	17:15:17

T95

DSP	ONS
12:36:48	17:22:13

W6

DSP	ENR	ONS
12:56:40	13:32:00	17:22:13

Attachment L

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

Incident Location

Incident Status: ONS

Location: 27790 HWY 78 / 27098 DEER CANYON DR ,WITCH_CREEK *Apartment:*
Lo Cross: *Hi Cross:*
City: WITCH_CREE *County:* SAN DIEGO *Map Page:* 1154_E2
Loc Com:

Latitude:	33.066564	*Agency:*	CAMVU	*Dispatch Zone:*	2
Longitude:	-116.725912	*Jurisdiction:*	CAMVU	*Battalion:*	6
Legal:	01_T13S_R02E_S	*DPA Agency:*	CAMVU	*Resp. Area:*	S10
UTM:	11 525585 3658700			*Atom:*	S10

LEGAL 01_T13S_R02E_S 0

Reporting Party Information

Caller Name: *Caller Phone:*
Caller Loc: *Call Source:* 1615

Incident Type/Response Information

Incident Type: FIRE, WILDLAND *Response Plan:* FWL2
Dispatch Level: M *Response Level:* 1

Incident Date/Time Summary

Incident Call Rec.:			
Incident Keystroke:	10/21/2007 12:35:42	*Personnel ID*	*CAD Workstation*
Incident Entry:	10/21/2007 12:36:00	LCRAIG	MVUCAD02
Incident Dispatch:	10/21/2007 12:36:49	DCASTER	MVUCAD02
Incident Closed:			

Fire Information

Status: *Contained:* *Controlled:*

Time Summary:

WAI	DSP	ENR	ONS
12:36.00	12:36.49	12:43.18	13:19.35

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

Unit Status Details

B3312

DSP	ENR	ONS
12:36:47	12:53:58	17:22:03

B3315

DSP	ENR	ONS
12:43:30	12:52:50	17:22:03

BR6460

DSP	ENR	ONS	AIQ
20:14:46	20:14:52	21:58:05	19:11:11

D3341

DSP	ENR	ONS
12:36:49	12:53:58	17:22:03

E27

DSP	AIQ
19:42:02	19:44:45

E273

DSP	ENR	ONS
19:50:48	19:56:12	21:58:05

E280

DSP	ENR	ONS	AIQ
19:43:18	19:49:53	21:58:05	6:54:51

E282

DSP	AIQ	DSP	ONS	AIQ
19:42:02	19:49:35	1:13:35	1:13:35	8:14:52

E3356

DSP	ENR	ONS
12:36:48	12:52:22	17:22:03

E3357

DSP	ONS
12:36:49	17:22:06

E3360

DSP	ENR	ONS
13:31:45	13:32:05	17:22:03

E3361

DSP	ENR	ONS
13:31:45	13:32:05	17:22:03

E3367

DSP	ENR	ONS
12:36:48	12:52:24	13:19:35

E3370R

DSP	ENR	RTQ	AIQ	DSP	ONS
13:31:45	13:32:05	14:09:33	14:09:41	14:32:19	14:32:44

,76R

DSP	ENR	ONS
12:36:48	12:43:18	17:21:43

E3377

Detail Report-All Segments

DSP	ONS	AIQ
12:36:49	13:21:44	3:58:33

E3378R

DSP	ENR	ONS
13:31:45	13:32:05	17:21:43

E3388

DSP	ENR	ONS
13:31:45	13:32:05	15:01:23

E3390C

DSP	ENR	ONS	AIQ
22:53:05	23:00:21	2:17:08	3:58:01

E3391C

DSP	ENR	ONS
23:00:13	23:00:21	2:17:08

E6662

DSP	ENR	ONS
20:14:45	20:14:52	21:58:05

E6711

DSP	ONS	AIQ
3:30:27	3:30:27	21:29:31

E80

DSP	ENR	ONS	AIQ	DSP	ONS	AIQ
19:42:01	19:44:02	21:58:05	4:38:25	4:42:20	4:42:20	4:44:42

E82

DSP	ENR	ONS	AIQ	DSP	ONS	AIQ
19:42:02	19:45:52	21:58:05	1:01:46	1:13:46	1:13:46	1:15:23

DSP	ONS	AIQ
3:35:42	3:35:42	22:38:12

IOF

DSP	AIQ
12:36:49	12:36:52

PLC1

DSP	ENR	ONS
12:36:48	13:32:14	17:21:38

PLC2

DSP	ENR	ONS
12:36:48	13:32:14	17:21:38

PLC3

DSP	ENR	ONS
13:32:26	13:32:33	17:21:38

PLC4

DSP	ENR	ONS
13:32:27	13:32:33	17:21:38

5

DSP	ENR	ONS
13:02:15	13:32:16	17:21:38

RBW1

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

DSP	ENR	ONS
14:09:01	14:22:29	17:21:38

RBW2

DSP	ENR	ONS
14:09:01	14:22:29	17:21:38

RBW3

DSP	ENR	ONS
14:09:01	14:22:29	17:21:38

RBW4

DSP	ENR	ONS
14:09:02	14:22:29	17:21:38

RBW5

DSP	ENR	ONS
14:09:02	14:22:29	17:21:38

SDRE77

DSP	ENR	AIQ
11:36:09	11:36:09	17:15:17

T95

DSP	ONS
12:36:48	17:22:13

W6

DSP	ENR	ONS
12:56:40	13:32:00	17:22:13

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
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Detail Report-All Segments

Incident Remarks:

10/21/2007	15:06:20	icp now at Ramona Station 80	SFOSTER
10/21/2007	15:24:28	27438 Sawday TT ...several families congregating in areaa 20 people several animals...they are trapped with no way out...Ops advised and sending resources now	SFOSTER
10/21/2007	15:26:58	FMAG ....working now w/sdso ne ramona into Black Canyon evacuations and country estates for voluntary evacuation	SFOSTER
10/21/2007	16:11:43	Request rep from Escondido Fire to ICP and notification of PD for planning purposes	GWHITE
10/21/2007	16:12:28	Intermountain station 95 threatened...IC notified	GWHITE
10/21/2007	16:20:08	fire moving N and will soon be in the Sutherland drainage	GWHITE
10/21/2007	19:33:57	REQ FROM B3312 FOR B225 THE TYPE 6 ENGINE FROM VIEJAS FIRE TO RESPOND TO STATION 80 FOR STRUCTURE PROTECTION	DCASTER
10/21/2007	23:45:18	PER IC - AND OPS - FIRE IS NOW IN S.D. RIVER DRAINAGE - SAME AREA AS CEDAR FIRE - IN AREA OF BOULDER PEAK X EAGLE PEAK - TBROS 1155-G4	SFOSTER
10/21/2007	23:50:32	IC NEEDS REP FROM MESA GRANDE TO ICP	SFOSTER
10/22/2007	0:13:15	PER IC - UPDATED EVAC AREAS - ESC HS, MIRA MESA HS, RAMONA HS (FOR RAM RESIDENTS)	SFOSTER
10/22/2007	0:50:50	FIRE IS MAKING A RUN FROM S/W OF HAVERFORD X HWY 78 BACK NORTH TO HWY 78 X WEEKEND VILLA RD	SFOSTER
10/22/2007	1:37:26	NEW START IS 1.5 MI E/O WILD ANIMAL PARK ON SOUTH SIDE OF HWY 78; 'WELL-ESTABLISHED'	SFOSTER
10/22/2007	1:45:28	PERIC - HWY 78 IS IMPASSABLE DUE TO FIRE DIRECTIONAL CHANGE	SFOSTER
10/22/2007	3:09:50	IC ADVISES SDFD HAS ORDERED EVACUATIONS - N/E PORTION OF RANCHO BERNARDO, N/END OF POWAY O/LOOKING LAKE HODGES, RANCHO SAN PASQUAL, AND SIERRA LINDA	SFOSTER
22/2007	3:40:53	PER B3317 THE WITCH FIRE IS AT TB 1150 G3 (15000 BLOCK OF HIGHLAND VALLEY]	DCASTER
10/22/2007	8:34:19	structure loss at 554 cedar st and end of lilac.	SFOSTER
10/22/2007	8:38:57	family trapped 1311 cedar X ellis palm tree down on fire blocking access. branch 2 notified	SFOSTER
10/22/2007	8:42:59	roof on fire 19150 horizon view. notified branch 2.	SFOSTER
10/22/2007	8:51:56	units now in poeay on old coach rd	SFOSTER
10/22/2007	8:57:57	fire picking up intensity on old coach in poway	SFOSTER
10/22/2007	9:05:17	78 @ horizon view, fire is there, might think about evacing elfin forest west of I-15	SFOSTER
10/22/2007	9:19:59	air attack off ramona to evaluate flight safety will advise	SFOSTER
10/22/2007	9:24:45	notified ops of residents resident off crealman and gym trapped 20 residents. also homes on fire 20403 rancho villa	SFOSTER
10/22/2007	9:31:20	air attack no aircraft can fly due to turbulance	SFOSTER
10/22/2007	9:38:55	sdso reports fire in the area of highland and sky valley	SFOSTER
10/22/2007	10:07:29	sdso advises that creelman and gym residence are trying to fight a spot fire. ops has 2 strike teams going to area.	SFOSTER
10/22/2007	10:10:09	reports of structures burning 732 creelman ln cross of ashley and 16344 eagle crest in highland valley. also 1509 elm st.	SFOSTER
10/22/2007	10:19:40	operations says no additional resources available for north comm. only has lima strike team.	SFOSTER
10/22/2007	10:23:12	fire in the north has merged with witch creek incident.	SFOSTER
10/22/2007	10:34:25	diverted 4801 A to del dios. report to del dios hwy @ bing crosby blvd. contact 2602 on white 3	SFOSTER
10/22/2007	10:50:53	fire entering wild animal park. can access from back north east entrance. ops notified.	SFOSTER
'22/2007	11:02:39	structure treatened old wagon and yucca, units enroute. wood meadow & 78 unable to get confirmation on units going to this	SFOSTER
10/22/2007	11:05:34	fire from animal park to hwy 78 in valley center	SFOSTER
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Detail Report-All Segments

10/22/2007	11:55:01	Cloverdale and Rockwood rd closed Mandatory EVAC Escondido	SFOSTER
10/22/2007	12:02:16	structures threatened 20891 viento valle, escondido notified ops	SFOSTER
10/22/2007	12:18:25	called witch operations several times along with ramona structure group no communication. reported flare up pine and washington in ramona	SFOSTER
10/22/2007	12:36:36	structure threatened 1420 cross winds @ halverford	SFOSTER
10/22/2007	12:50:49	direct threat to 25129 hwy 78 and 635 old julian hwy structure groups notified	SFOSTER
10/22/2007	13:14:43	118 harper st ramona structure threatened	SFOSTER
10/22/2007	13:23:29	ramona structure will get some one out to harper as soon as they can	SFOSTER
10/22/2007	13:27:54	engine enroute to harper 15 min eta	SFOSTER
10/22/2007	14:38:17	ramona structure group, e280 out of service @ station 80 need mechanic	SFOSTER
10/22/2007	15:01:55	fire in pitts valley and both sides of el cap. mandatory evac orders for harbison cyn and town of alpine. per air attack 500	SFOSTER
10/22/2007	15:18:06	homes in cedar st and cedar summit in ramona.	SFOSTER
10/22/2007	15:26:52	branch 1 release all 5 rbw crews for night @ 1700 so can be used tomorrow	SFOSTER
10/22/2007	16:30:48	fire making run on eagle peak	SFOSTER
10/22/2007	18:12:28	report of structure threat @ 287 via tiquita, branch has no one available send ramona station units.	SFOSTER
10/22/2007	20:55:51	5150 CALLING FIRE VIA RADIO STATING EMERGENCY TRAFFIC; STATED THERE WAS 6 CIVILIANS BURNED AND WAITING TRANSPORT AT HWY 78 XST ZOO ROAD; SDFD SENT SEVERAL MEDICS AND FOUND 5150 AT 17054 ROCKWOOD ROAD	DCASTER
10/23/2007	7:02:32	in 22 hours ramona will be out of water due to lack of water	SFOSTER
10/23/2007	8:05:46	phone call that development in mt woodson is being threatend. e3361 is enroute	SFOSTER
10/23/2007	9:00:48	e282 requesting assistance @salida del sol	SFOSTER
10/23/2007	10:03:32	air attack reporting significant fire front at base of palomar mtn.	SFOSTER
10/23/2007	10:06:07	air attack reports 3 mile fire front on palomar, should be priority, recommend initate palomar evac plan. have direct fire from ramona to palomar. need ground resources to work section, will put tankers in area to work area. no available ground resources at this rime from operations. This will be branch 5	SFOSTER
10/23/2007	10:09:10	bat 8 reporting west winds in ramona	SFOSTER
10/23/2007	10:16:43	made announcement over radio to advise units of significant wind cahange to the west. had to call and notify comm 27 by phone no radio contact	SFOSTER
10/23/2007	10:20:05	air attack unable to work fire at base of palomar, too turbulant. this also may be a seperate fire?	SFOSTER
10/23/2007	10:32:05	air attack pre treating left side of woodson to anticipate wind shift to west.	SFOSTER
10/23/2007	10:45:06	fire has spotted at del dios and lake hodges, 2 too 3 acres.	SFOSTER
10/23/2007	11:26:43	branch 2 has medical emergency on engine 230. chest pains @ highland valley	SFOSTER
10/23/2007	11:32:07	fire established on west side of lake hodges, is burning homes and threating harmony grove	SFOSTER
10/23/2007	11:40:15	reported persons trapped 16637 highland valley and green valley TT	SFOSTER
10/23/2007	13:14:35	chp reporting structure threat 78 east of magnolia	SFOSTER
10/23/2007	13:50:04	poway EOC called re-energizing electrical on Div G branch 2. branch notified	SFOSTER
10/23/2007	13:50:38	Ramona structure group needing immediate need ST to 1760 weekend villa /78	SFOSTER
10/23/2007	14:06:16	branch 3 needs air assistance for slop over. in Div Y	SFOSTER
10/23/2007	14:24:22	report of flare up starvation mtn and highland valley. bat 8	SFOSTER

Detail Report-All Segments

10/23/2007	14:31:41	10 to 12 homes threatened in willow glen area	SFOSTER
10/23/2007	14:50:43	el cap mountain has flare up	SFOSTER
10/23/2007	14:57:24	flare up on vista ramona	SFOSTER
10/23/2007	15:06:44	confirmed that electrical lines are re energized in poway - high valley	SFOSTER
10/23/2007	15:12:55	structure threat olive and pine	SFOSTER
10/23/2007	16:37:08	sdge requesting to turn on power @ west bernardo dr. & Aguamel. If no responce from us they will energize within 5-20 min. Gave message to sylvia in Witch communications, she is to give to IC and or ops.	SFOSTER
10/23/2007	17:25:32	report of flare up om barona mesa and thunder mtn. E82 @ starvation mtn asking for strike team.	SFOSTER
10/23/2007	17:26:52	SDGE turning power on Bernardino and Aguamel	SFOSTER
10/23/2007	17:35:23	fully involved structure thunder mtn / Barona mesa	SFOSTER
10/23/2007	17:51:46	eagle peak and pine hills are problem areas	SFOSTER
10/23/2007	17:54:18	spot fire in avacado grove in highland valley	SFOSTER
10/23/2007	18:17:32	mt woodson has been boxed in by retardent	SFOSTER
10/23/2007	18:44:03	ts81 on scene what they think is a spot out of esisting lines. 24993 painted rock ln	SFOSTER
10/23/2007	18:44:30	reported structure fire @ mt woodson making run toward repeaters	SFOSTER
10/23/2007	18:56:58	fire in rocks still below repeaters	SFOSTER
10/23/2007	18:57:18	report of flare up vista ramona and old julian hwy	SFOSTER
10/24/2007	7:52:23	SDSO reports fire has burned through fire retardant on mt woodson and could be threating repeaters	SFOSTER
10/24/2007	8:00:53	work heavy helo in el cap today. recon the mt woodson / ramona area today	SFOSTER
10/24/2007	8:09:50	report of flare up 635 old julian, manure pile on fire.	SFOSTER
10/24/2007	8:21:11	fire midslope of el cajon mtn 4 spot fires on east side of el cap resavoir	SFOSTER
10/24/2007	8:37:33	fire creeping on mtn woodson, fire has held at fire retardant per air attack eagle peak looks pretty good.	SFOSTER
10/24/2007	8:38:51	flare up pamo and dump rd and jack and jill ln.	SFOSTER
10/24/2007	8:40:08	per air attack, can geet ground access to base of el cajon mtn.	SFOSTER
10/24/2007	8:45:04	branch 3 significant out break minimal line construction in area. div x & y might be slop over.	SFOSTER
10/24/2007	8:57:32	smoke in in the existing line not a slop over	SFOSTER
10/24/2007	9:07:41	ramona structure group locations, san pasqual, 78, & mt woodson area	SFOSTER
10/24/2007	9:19:34	branch 2 requesting that someone come out and open the gates to El Capitan resivor. Gates are locked and impacting getting resources into the Dam area.	SFOSTER
10/24/2007	9:29:27	div A looking real good mopped up 100 ft in.	SFOSTER
10/24/2007	9:35:18	2 helo in mt woodson, attempting to hold. fire spotted on east side of El Capt resivor. tankers are remaining helos are working on the EL Cap resivor spot.	SFOSTER
10/24/2007	9:46:25	off boulder creek rd, has crossed drainage (eagle Peak) requesting some air support.	SFOSTER
10/24/2007	9:54:11	san diego river drainage, fire is creeping along if coves out could make a run to Julian. If is 3 miles south of Santa Isabel. They will make drops to shold it in check, send in hand crew to start working area.	SFOSTER
10/24/2007	10:09:22	reported structures threatened Ash & Harper in Ramona.	SFOSTER
10/24/2007	10:26:52	ramona structure group reporting steady wind of 16 mph out of east	SFOSTER
10/24/2007	10:31:31	Up date from Air attack, rock mtn long string of fire at base of el cap res east side.	SFOSTER
10/24/2007	10:34:50	Branch 2 ... any reports on 67 wildcat and barona is big ... Outside	SFOSTER

Detail Report-All Segments

10/24/2007	10:37:14	city copter 1 is making bucket drops on own with no communication with any branch or ground personnel. need to contact city had have copter switch over to cdf air to ground freq to initate communications with fire personnel.	SFOSTER
10/24/2007	10:42:27	dilian ranch requesting permission to continue fireing ops. affirmative given, go slow and report any problems.	SFOSTER
10/24/2007	11:00:54	from witch comm: flare up bear valley blvd.	SFOSTER
10/24/2007	11:24:38	requesting 2 type 1 strike teams for ramona out of staging	SFOSTER
10/24/2007	11:43:00	passed to ops structure threatened bear valley and gutjito rd, valley center	SFOSTER
10/24/2007	11:47:41	REPORT OF AIRCRAFT DOWN NEAR EL CAP RES. PRIVATE CALLER CHP TRANSFER	DHOWELL
10/24/2007	11:48:44	ADVISED HEARTLAND	DHOWELL
10/24/2007	11:58:11	branch 2 all air resources accounted for.	SFOSTER
10/24/2007	12:16:55	ALL AIRCRAFT ACCOUNTED FOR NO FIRE AIR CRAFT DOWN	DHOWELL
10/24/2007	12:24:02	fire has moved into section 35 on the new map will be a concern tomorrow.	SFOSTER
10/24/2007	12:28:20	structure threat rancho vista / hwy 78.	SFOSTER
10/24/2007	12:40:55	sdge re-energizing area of west bernardo drive that was suppose to be done last night. tb 1169 j1, j2 & tb 1149 j7	SFOSTER
10/24/2007	12:42:51	structure threat old julian hwy @ 3 MM. by CHP.	SFOSTER
10/24/2007	13:10:53	SDGE EOC REP CALLED RE GUARDING WEST BERNARDINO RE-ENERGIZING. THEY DID TURN IT ON LAST NIGHT BUT SOMEONE CALLED TO SAY SHUT IT OFF. HE WOULD LIKE SOMEONE TO CALL HIM. I CALLED WITCH COMM TO GIVE TO IC. CALL ELLIS JONES 858-636-6957	SFOSTER
10/24/2007	13:58:28	Div C requesting a helo for bucket work on Div C	SFOSTER
10/24/2007	14:15:33	2330C reporting structure starting at the end of lake hodges.	SFOSTER
10/24/2007	15:29:00	there are fixed water tanks available to use 1532 weekend & 24654 high country rd.	SFOSTER
10/24/2007	16:11:46	flare up 565 la cama. at rear of the address.	SFOSTER
10/24/2007	16:17:41	Branch 4, Escondido FF has lower leg injury. comm unit starting ambulance. to 3301 Bearvalley.	SFOSTER
10/24/2007	16:22:47	Report of flare up on Old Julian hwy 7 MM.	SFOSTER
10/24/2007	16:36:37	16615 highland valley rd. 40 yrd storage container fire next to a structure. @ 4.5 MM dirt raod turn left. Branch 2 copies	SFOSTER
10/24/2007	16:37:42	Ramona structure group @ 7 MM on Julian hwy. Fire is a large island burning out. It's been flagged.	SFOSTER
10/24/2007	16:50:52	Ramona STR GRP: Old Julian island making a pretty good run.	SFOSTER
10/24/2007	17:37:41	ellis jones called again SDGE EOC; WAITNG FOR IC TO CALL HIM BACK. GAVE MESSAGE TO WITCH COMMUNICATIONS	SFOSTER
10/24/2007	17:51:11	called baack eliss jones fron sdge eoc; advised him that witch communications had delivered the message to the ic to call him.	SFOSTER
10/24/2007	18:46:11	575 rancho trails / Lilac Generator fire	SFOSTER
10/25/2007	8:01:49	Per Witch Communications, All road closures in Ramona have been lifted	SFOSTER
10/25/2007	8:44:41	from ramona structure group; 1.5 acre island burning on old julian @ starlight. not a threat homes at top of hill are gone.	SFOSTER
10/25/2007	10:33:15	per chp: aircraft down sunrise vista / rancho del sol branch notified along with witch communications. this is sdge aircraft, sending ramona response. branch 2 enroute.	SFOSTER
10/25/2007	10:37:55	r80 @ scene; conformed helo down. occupants out uninjured. branch 2 notified he will continue code 2.	SFOSTER
10/25/2007	10:54:10	branch 2 clear of SDGE helo incident @ 10:53	SFOSTER
10/25/2007	11:25:06	CHP reporting possible flare up or new fire, weekend villa and hwy 78, chevron mtn. Branch 2 notified	SFOSTER
10/25/2007	11:51:45	heartland reporting flareup sawday / little page. branch notified	SFOSTER

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

10/25/2007	13:26:43	SDGE CALLED, SAID THAT THEY ARE WORKING ON THE LINES IN RAMONA AND DON'T HAVE A TIME FRAME YET FOR RESTORATION. IF ANY QUESTIONS PLEASE CALL 800-411-7343. NAME IS DEBBIE.	SFOSTER
10/25/2007	13:34:52	GETTING CALLES FOR WEEKEND AND LITTLE PAGE. BRANCH 2 STATES THIS IS A ISLAND BURNING AT THSI TIME NO THREAT. THEY ARE TRYING TO GET A CLOSER LOOK.	SFOSTER
10/25/2007	13:41:24	UPDATED LOCATION FOR THE 923 OLD JULIAN. NEW LOCATION HWY 78 AND PASSING LN. PASSED ON TO BRANCH	SFOSTER
10/25/2007	14:14:50	CHP NOTIFIED TREE ON FIRE NEAR RD. 1528 BLACK CYN / PILE BRANCH NOTIFIED	SFOSTER
10/25/2007	14:29:10	Branch 2 stopped by chp of a medical aid. 19860 hwy 78, they started BLS rig. need medic. sent Medic 80 engine is oes 251.. Also notified branch of sopt on 67 and mt woodson. @ mm 60.5	SFOSTER
10/25/2007	14:36:37	branch 2 equipment in area unable to find with reference to 60.5. they are checking the area of 67 and mt woodson.	SFOSTER

Detail Report-All Segments

LOCVER	10/21/2007	12:35:56	LCRAIG	MVUCAD02
ENTRY	10/21/2007	12:36:00	LCRAIG	MVUCAD02
SUGDEF	10/21/2007	12:36:17		
Level 1, Path: A 1 AA, Path: A 1 T, Path: A 2 C, Path: G 3 E*USFS				
SUGG	10/21/2007	12:36:17		
Primary: B3312._, T95.*_[A/T3]#1, E3376R._[ENG3]#2, E3356._[ENG3]#9, PLC1._[CRW1]#12, PLC2._[CRW1] #12, E3367.*_[ENG3]#13, E3357._[ENG3]#23, E3377._[ENG3]#23, D3341.*_[DOZ2]#23, IOF._[PRV]#38				
SUGG	10/21/2007	12:36:17		
Nearby: AA330._[A/A]#1, AA500._[A/A]#1, T70._[A/T3]#1, T71._[A/T3]#1, C10._[HEL2]#5, C12._[HEL2]#5, E3366._[ENG3]#2, D3346._[DOZ2]#12, E3381._[ENG3]#27, E3374._[ENG3]#34				
SUGG	10/21/2007	12:36:17		
Alternate: E97.*_[ENG1]#2, E6161._[ENG3]#4, E3361._[ENG3]#25, E3378R.*_[ENG3]#27, E3388.*_[ENG3]#32, E3370R.*[ENG3]#34, E3382.*_[ENG3]#36				
FREQA	10/21/2007	12:36:46	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	12:36:46	LCRAIG	MVUCAD02
<none> --> HWY 79 / S2 HWY 2				
INCN	10/21/2007	12:36:49	LCRAIG	MVUCAD02
Fire Number $ONE01544 Created				
INCN	10/21/2007	12:36:49	LCRAIG	MVUCAD02
Site Number $CAMVU010432 Created				
DSP	10/21/2007	12:36:49	LCRAIG	MVUCAD02
B3312 (BAT) T95 (A/T3) E3376R (ENG3) E3356 (ENG3) PLC1 (CRW1) PLC2 (CRW1) E3367 (ENG3) E3357 (ENG3) E3377 (ENG3) D3341 (DOZ2) IOF (PRV) JURISDICTION NUMBER $CAMVU010432				
IUNIT	10/21/2007	12:36:49	LCRAIG	MVUCAD02
B3312				
AIQ	10/21/2007	12:36:52	LCRAIG	MVUCAD02
IOF				
STATUSX	10/21/2007	12:41:51		
Unit B3312 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:51		
Unit D3341 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:51		
Unit E3356 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:52		
Unit E3357 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:52		
Unit E3367 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:52		
Unit E3376R Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:53		
Unit E3377 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:53		
Unit PLC1 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:53		
Unit PLC2 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:54		
Unit T95 Status timer expired after 5 MIN				
ENR	10/21/2007	12:43:18	LCRAIG	MVUCAD02
E3376R				
EQA	10/21/2007	12:43:29	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	12:43:30	LCRAIG	MVUCAD02
B3315 (BAT)				
STATUSX	10/21/2007	12:48:33		

Detail Report-All Segments

JGDEF	10/21/2007	12:48:39		
Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 1 D, Path: G 3 E*USFS				
SUGG	10/21/2007	12:48:39		
Primary: PLC3._[CRW1]#12, PLC4._[CRW1]#12, E3361._[ENG3]#25, E3378R.*_[ENG3]#27, E3388.*_[ENG3]#32, E3370R.*[ENG3]#34, E3382.*_[ENG3]#36, IOF._[PRV]#38				
SUGG	10/21/2007	12:48:39		
Nearby: AA330._[A/A]#1, AA500._[A/A]#1, T70._[A/T3]#1, T71._[A/T3]#1, C10._[HEL2]#5, C12._[HEL2]#5, E3366._[ENG3]#2, D3346._[DOZ2]#12, E3381._[ENG3]#27, E3374._[ENG3]#34				
SUGG	10/21/2007	12:48:39		
Alternate: E97.*_[ENG1]#2, E6161._[ENG3]#4				
ENR	10/21/2007	12:52:22	LCRAIG	MVUCAD02
E3356				
ENR	10/21/2007	12:52:24	LCRAIG	MVUCAD02
E3367				
ENR	10/21/2007	12:52:50	LCRAIG	MVUCAD02
B3315				
ENR	10/21/2007	12:53:58	LCRAIG	MVUCAD02
B3312				
ENR	10/21/2007	12:53:58	LCRAIG	MVUCAD02
D3341				
FREQA	10/21/2007	12:56:40	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	12:56:40	LCRAIG	MVUCAD02
W6 (W/T)				
STATUSX	10/21/2007	13:01:45		
it W6 Status timer expired after 5 MIN				
EQA	10/21/2007	13:02:14	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	13:02:15	LCRAIG	MVUCAD02
PLC5 (CRW1)				
STATUSX	10/21/2007	13:07:15		
Unit PLC5 Status timer expired after 5 MIN				
STATUSX	10/21/2007	13:13:21		
Unit E3376R Status timer expired after 30 MIN				
CIN	10/21/2007	13:16:18	SFOSTER	MVUCAD03
HWY 79 / S2 HWY 2 --> WITCH CREEK 3				
CHNG	10/21/2007	13:18:15	LCRAIG	MVUCAD02
Location: 29500 HWY 79 / 29398 S2 HWY ,HENSHAW ==> 27790 HWY 78 / 27098 DEER CANYON DR ,WITCH_CREEK ;Atom: J32 ==> S10;RespArea: J32 ==> S10;				
ONS	10/21/2007	13:19:35	SFOSTER	MVUCAD03
E3367				
ONS	10/21/2007	13:21:44	SFOSTER	MVUCAD03
E3377				
STATUSX	10/21/2007	13:22:27		
Unit E3356 Status timer expired after 30 MIN				
STATUSX	10/21/2007	13:22:51		
Unit B3315 Status timer expired after 30 MIN				
STATUSX	10/21/2007	13:24:03		
Unit B3312 Status timer expired after 30 MIN				
STATUSX	10/21/2007	13:24:04		
Unit D3341 Status timer expired after 30 MIN				
SC	10/21/2007	13:24:18	SFOSTER	MVUCAD03
0 plus acres 100 on south of 78 requesting 4 type 1 and 4 type 3 st oak bridge shelter in place, may be a threat to ramona (command: M)				
MISC	10/21/2007	13:25:54	SFOSTER	MVUCAD03
not able to use aircraft, too smokey (command: M)				
FREQA	10/21/2007	13:31:44	LCRAIG	MVUCAD02

Detail Report-All Segments

DSP	10/21/2007	13:31:45	LCRAIG	MVUCAD02
E3360 (ENG3) E3361 (ENG3) E3370R (ENG3) E3388 (ENG3) E3378R (ENG3)				
ENR	10/21/2007	13:32:00	LCRAIG	MVUCAD02
W6				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3360				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3361				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3370R				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3388				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3378R				
ENR	10/21/2007	13:32:14	LCRAIG	MVUCAD02
PLC1				
ENR	10/21/2007	13:32:14	LCRAIG	MVUCAD02
PLC2				
ENR	10/21/2007	13:32:16	LCRAIG	MVUCAD02
PLC5				
FREQA	10/21/2007	13:32:26	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	13:32:27	LCRAIG	MVUCAD02
PLC3 (CRW1) PLC4 (CRW1)				
ENR	10/21/2007	13:32:33	LCRAIG	MVUCAD02
C3				
ENR	10/21/2007	13:32:33	LCRAIG	MVUCAD02
PLC4				
MISC	10/21/2007	13:36:01	SFOSTER	MVUCAD03
using ramona high as shelter (command: M)				
MISC	10/21/2007	13:56:43	SFOSTER	MVUCAD03
rancho santa tierra closed, backing up to suthern dam (command: M)				
STATUSX	10/21/2007	14:02:02		
Unit W6 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:08		
Unit E3360 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:09		
Unit E3361 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:09		
Unit E3370R Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:09		
Unit E3378R Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:10		
Unit E3388 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:14		
Unit PLC1 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:15		
Unit PLC2 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:20		
Unit PLC5 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:32		
Unit PLC3 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:33		
Unit PLC4 Status timer expired after 30 MIN				
SUGDEF	10/21/2007	14:08:11		

Detail Report-All Segments

SUGG	10/21/2007 14:08:11			
Primary: SDRBR85._[ENG3]#28, IOF._[PRV]#36, RBW1._[CRW1]#45, RBW2._[CRW1]#45				
SUGG	10/21/2007 14:08:11			
Nearby: AA330._[A/A]#1, AA500._[A/A]#1, T70._[A/T3]#1, T71._[A/T3]#1, C10._[HEL2]#3, C12._[HEL2]#3, E3366._[ENG3]#18, D3346._[DOZ2]#20, E3381._[ENG3]#39, E3374._[ENG3]#42, E3382.*_[ENG3]#43				
SUGG	10/21/2007 14:08:11			
Alternate: E95._[ENG1]#5, E6161._[ENG3]#12, E71._[ENG1]#13, E97.*_[ENG1]#18, E74._[ENG1]#21, W74._[W/T2]#21, E83._[ENG1]#24, E81._[ENG1]#26, W85._[W/T1]#28, PVYE84._[ENG1]#31				
FREQA	10/21/2007 14:09:00		SFOSTER	MVUCAD03
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007 14:09:02		SFOSTER	MVUCAD03
RBW1 (CRW1) RBW2 (CRW1) RBW3 (CRW1) RBW4 (CRW1) RBW5 (CRW1)				
RTQ	10/21/2007 14:09:33		LCRAIG	MVUCAD02
E3370R				
AIQ	10/21/2007 14:09:41		LCRAIG	MVUCAD02
E3370R				
STATUSX	10/21/2007 14:14:03			
Unit RBW1 Status timer expired after 5 MIN				
STATUSX	10/21/2007 14:14:04			
Unit RBW2 Status timer expired after 5 MIN				
STATUSX	10/21/2007 14:14:04			
Unit RBW3 Status timer expired after 5 MIN				
STATUSX	10/21/2007 14:14:04			
Unit RBW4 Status timer expired after 5 MIN				
STATUSX	10/21/2007 14:14:05			
Unit RBW5 Status timer expired after 5 MIN				
ENR	10/21/2007 14:22:29		SFOSTER	MVUCAD03
RBW1				
ENR	10/21/2007 14:22:29		SFOSTER	MVUCAD03
RBW2				
ENR	10/21/2007 14:22:29		SFOSTER	MVUCAD03
RBW3				
ENR	10/21/2007 14:22:29		SFOSTER	MVUCAD03
RBW4				
ENR	10/21/2007 14:22:29		SFOSTER	MVUCAD03
RBW5				
SUGDEF	10/21/2007 14:32:13			
Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 3 E*CDF, Path: G 1 D, Path: G 3 E*USFS				
SUGG	10/21/2007 14:32:13			
Primary: SDRBR85._[ENG3]#28, IOF._[PRV]#36, E3370R.*[ENG3]#42, MCN3._[CRW1]#48, MCN4._F[CRW1]#48				
SUGG	10/21/2007 14:32:13			
Nearby: AA330._[A/A]#1, AA500._[A/A]#1, T70._[A/T3]#1, T71._[A/T3]#1, C10._[HEL2]#3, C12._[HEL2]#3, E3366._[ENG3]#18, D3346._[DOZ2]#20, E3381._[ENG3]#39, E3374._[ENG3]#42, E3382.*_[ENG3]#43				
SUGG	10/21/2007 14:32:13			
Alternate: E95._[ENG1]#5, E6161._[ENG3]#12, E71._[ENG1]#13, E97.*_[ENG1]#18, E74._[ENG1]#21, W74._[W/T2]#21, E83._[ENG1]#24, E81._[ENG1]#26, W85._[W/T1]#28, PVYE84._[ENG1]#31				
FREQA	10/21/2007 14:32:19		SFOSTER	MVUCAD03
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007 14:32:19		SFOSTER	MVUCAD03
E3370R (ENG3)				
ONS	10/21/2007 14:32:44		SFOSTER	MVUCAD03
E3370R				
SC	10/21/2007 14:36:40		SFOSTER	MVUCAD03
sdge so animal control @ scene with IC. (command: M)				
MISC	10/21/2007 14:37:06		SFOSTER	MVUCAD03
Notify SD City, Powy, & Lake Side for possible treat (command: M)				
STATUSX	10/21/2007 14:52:32			

Detail Report-All Segments

STATUSX	10/21/2007	14:52:32		
Unit RBW2 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:52:33		
Unit RBW3 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:52:33		
Unit RBW4 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:52:33		
Unit RBW5 Status timer expired after 30 MIN				
ONS	10/21/2007	15:01:23	SFOSTER	MVUCAD03
E3388				
SUPP	10/21/2007	15:06:20	SFOSTER	MVUCAD03
SUPP	10/21/2007	15:24:28	SFOSTER	MVUCAD03
SUPP	10/21/2007	15:26:58	SFOSTER	MVUCAD03
SUPP	10/21/2007	16:11:43	GWHITE	MVUCAD03
SUPP	10/21/2007	16:12:28	GWHITE	MVUCAD03
SUPP	10/21/2007	16:20:08	GWHITE	MVUCAD03
MISC	10/21/2007	16:43:24	SFOSTER	MVUCAD05
B3312,santa teressa threatened, sending engines (command: M)				
MISC	10/21/2007	16:47:51	SFOSTER	MVUCAD05
312,10,000 acres 3 quarter mile from sutherland dam (command: M)				
MISC	10/21/2007	16:52:04	SFOSTER	MVUCAD05
B3312,requesting 7 cwn's plus a type 3 cwn. (command: M)				
MISC	10/21/2007	16:58:04	SFOSTER	MVUCAD05
B3312,spotting well ahead of its self (command: M)				
MISC	10/21/2007	17:00:57	SFOSTER	MVUCAD05
B3312,call from 25179 hwy 78 need help.. 3378r at residence has elderly couple in home (command: M)				
MISC	10/21/2007	17:11:30	SFOSTER	MVUCAD05
B3312,air attack, negative on fixed wing. too turbulant (command: M)				
MISC	10/21/2007	17:11:49	SFOSTER	MVUCAD05
B3312,air attack can stay over incident until cut off (command: M)				
MISC	10/21/2007	17:16:50	SFOSTER	MVUCAD05
B3312,unable to drop tanker 73 & 82 returening 14 min eta, threat little paige area, and north end of estates north of gower mtn (command: M)				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC1				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC2				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC3				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC4				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC5				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
RBW1				
S	10/21/2007	17:21:38	SFOSTER	MVUCAD05
RBW2				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
RBW3				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05

Attachment L

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

Incident Location

Incident Status: ONS

Location: 27790 HWY 78 / 27098 DEER CANYON DR ,WITCH_CREEK *Apartment:*
Lo Cross: *Hi Cross:*
City: WITCH_CREE *County:* SAN DIEGO *Map Page:* 1154_E2
Loc Com:

Latitude:	33.066564	*Agency:*	CAMVU	*Dispatch Zone:*	2
Longitude:	-116.725912	*Jurisdiction:*	CAMVU	*Battalion:*	6
Legal:	01_T13S_R02E_S	*DPA Agency:*	CAMVU	*Resp. Area:*	S10
UTM:	11 525585 3658700			*Atom:*	S10

LEGAL 01_T13S_R02E_S *0*

Reporting Party Information

Caller Name: *Caller Phone:*
Caller Loc: *Call Source:* 1615

Incident Type/Response Information

Incident Type: FIRE, WILDLAND *Response Plan:* FWL2
Dispatch Level: M *Response Level:* 1

Incident Date/Time Summary

Incident Call Rec.:			
Incident Keystroke:	10/21/2007 12:35:42	*Personnel ID*	*CAD Workstation*
Incident Entry:	10/21/2007 12:36:00	LCRAIG	MVUCAD02
Incident Dispatch:	10/21/2007 12:36:49	DCASTER	MVUCAD02
Incident Closed:			

Fire Information

Status: *Contained:* *Controlled:*

Time Summary:

WAI	DSP	ENR	ONS
12:36.00	12:36.49	12:43.18	13:19.35

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

Unit Status Details

B3312

DSP	ENR	ONS
12:36:47	12:53:58	17:22:03

B3315

DSP	ENR	ONS
12:43:30	12:52:50	17:22:03

BR6460

DSP	ENR	ONS	AIQ
20:14:46	20:14:52	21:58:05	19:11:11

D3341

DSP	ENR	ONS
12:36:49	12:53:58	17:22:03

E27

DSP	AIQ
19:42:02	19:44:45

E273

DSP	ENR	ONS
19:50:48	19:56:12	21:58:05

E280

DSP	ENR	ONS	AIQ
19:43:18	19:49:53	21:58:05	6:54:51

E282

DSP	AIQ	DSP	ONS	AIQ
19:42:02	19:49:35	1:13:35	1:13:35	8:14:52

E3356

DSP	ENR	ONS
12:36:48	12:52:22	17:22:03

E3357

DSP	ONS
12:36:49	17:22:06

E3360

DSP	ENR	ONS
13:31:45	13:32:05	17:22:03

E3361

DSP	ENR	ONS
13:31:45	13:32:05	17:22:03

E3367

DSP	ENR	ONS
12:36:48	12:52:24	13:19:35

E3370R

DSP	ENR	RTQ	AIQ	DSP	ONS
13:31:45	13:32:05	14:09:33	14:09:41	14:32:19	14:32:44

,76R

DSP	ENR	ONS
12:36:48	12:43:18	17:21:43

E3377

Detail Report-All Segments

DSP	ONS	AIQ
12:36:49	13:21:44	3:58:33

E3378R

DSP	ENR	ONS
13:31:45	13:32:05	17:21:43

E3388

DSP	ENR	ONS
13:31:45	13:32:05	15:01:23

E3390C

DSP	ENR	ONS	AIQ
22:53:05	23:00:21	2:17:08	3:58:01

E3391C

DSP	ENR	ONS
23:00:13	23:00:21	2:17:08

E6662

DSP	ENR	ONS
20:14:45	20:14:52	21:58:05

E6711

DSP	ONS	AIQ
3:30:27	3:30:27	21:29:31

E80

DSP	ENR	ONS	AIQ	DSP	ONS	AIQ
19:42:01	19:44:02	21:58:05	4:38:25	4:42:20	4:42:20	4:44:42

E82

DSP	ENR	ONS	AIQ	DSP	ONS	AIQ
19:42:02	19:45:52	21:58:05	1:01:46	1:13:46	1:13:46	1:15:23

DSP	ONS	AIQ
3:35:42	3:35:42	22:38:12

IOF

DSP	AIQ
12:36:49	12:36:52

PLC1

DSP	ENR	ONS
12:36:48	13:32:14	17:21:38

PLC2

DSP	ENR	ONS
12:36:48	13:32:14	17:21:38

PLC3

DSP	ENR	ONS
13:32:26	13:32:33	17:21:38

PLC4

DSP	ENR	ONS
13:32:27	13:32:33	17:21:38

5

DSP	ENR	ONS
13:02:15	13:32:16	17:21:38

RBW1

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

DSP	ENR	ONS
14:09:01	14:22:29	17:21:38

RBW2

DSP	ENR	ONS
14:09:01	14:22:29	17:21:38

RBW3

DSP	ENR	ONS
14:09:01	14:22:29	17:21:38

RBW4

DSP	ENR	ONS
14:09:02	14:22:29	17:21:38

RBW5

DSP	ENR	ONS
14:09:02	14:22:29	17:21:38

SDRE77

DSP	ENR	AIQ
11:36:09	11:36:09	17:15:17

T95

DSP	ONS
12:36:48	17:22:13

W6

DSP	ENR	ONS
12:56:40	13:32:00	17:22:13

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

Incident Remarks:

10/21/2007	15:06:20	icp now at Ramona Station 80	SFOSTER
10/21/2007	15:24:28	27438 Sawday TT ...several families congregating in areaa 20 people several animals...they are trapped with no way out...Ops advised and sending resources now	SFOSTER
10/21/2007	15:26:58	FMAG ....working now w/sdso ne ramona into Black Canyon evacuations and country estates for voluntary evacuation	SFOSTER
10/21/2007	16:11:43	Request rep from Escondido Fire to ICP and notification of PD for planning purposes	GWHITE
10/21/2007	16:12:28	Intermountain station 95 threatened...IC notified	GWHITE
10/21/2007	16:20:08	fire moving N and will soon be in the Sutherland drainage	GWHITE
10/21/2007	19:33:57	REQ FROM B3312 FOR B225 THE TYPE 6 ENGINE FROM VIEJAS FIRE TO RESPOND TO STATION 80 FOR STRUCTURE PROTECTION	DCASTER
10/21/2007	23:45:18	PER IC - AND OPS - FIRE IS NOW IN S.D. RIVER DRAINAGE - SAME AREA AS CEDAR FIRE - IN AREA OF BOULDER PEAK X EAGLE PEAK - TBROS 1155-G4	SFOSTER
10/21/2007	23:50:32	IC NEEDS REP FROM MESA GRANDE TO ICP	SFOSTER
10/22/2007	0:13:15	PER IC - UPDATED EVAC AREAS - ESC HS, MIRA MESA HS, RAMONA HS (FOR RAM RESIDENTS)	SFOSTER
10/22/2007	0:50:50	FIRE IS MAKING A RUN FROM S/W OF HAVERFORD X HWY 78 BACK NORTH TO HWY 78 X WEEKEND VILLA RD	SFOSTER
10/22/2007	1:37:26	NEW START IS 1.5 MI E/O WILD ANIMAL PARK ON SOUTH SIDE OF HWY 78; 'WELL-ESTABLISHED'	SFOSTER
10/22/2007	1:45:28	PERIC - HWY 78 IS IMPASSABLE DUE TO FIRE DIRECTIONAL CHANGE	SFOSTER
10/22/2007	3:09:50	IC ADVISES SDFD HAS ORDERED EVACUATIONS - N/E PORTION OF RANCHO BERNARDO, N/END OF POWAY O/LOOKING LAKE HODGES, RANCHO SAN PASQUAL, AND SIERRA LINDA	SFOSTER
22/2007	3:40:53	PER B3317 THE WITCH FIRE IS AT TB 1150 G3 (15000 BLOCK OF HIGHLAND VALLEY]	DCASTER
10/22/2007	8:34:19	structure loss at 554 cedar st and end of lilac.	SFOSTER
10/22/2007	8:38:57	family trapped 1311 cedar X ellis palm tree down on fire blocking access. branch 2 notified	SFOSTER
10/22/2007	8:42:59	roof on fire 19150 horizon view. notified branch 2.	SFOSTER
10/22/2007	8:51:56	units now in poeay on old coach rd	SFOSTER
10/22/2007	8:57:57	fire picking up intensity on old coach in poway	SFOSTER
10/22/2007	9:05:17	78 @ horizon view, fire is there, might think about evacing elfin forest west of I-15	SFOSTER
10/22/2007	9:19:59	air attack off ramona to evaluate flight safety will advise	SFOSTER
10/22/2007	9:24:45	notified ops of residents resident off crealman and gym trapped 20 residents. also homes on fire 20403 rancho villa	SFOSTER
10/22/2007	9:31:20	air attack no aircraft can fly due to turbulance	SFOSTER
10/22/2007	9:38:55	sdso reports fire in the area of highland and sky valley	SFOSTER
10/22/2007	10:07:29	sdso advises that creelman and gym residence are trying to fight a spot fire. ops has 2 strike teams going to area.	SFOSTER
10/22/2007	10:10:09	reports of structures burning 732 creelman ln cross of ashley and 16344 eagle crest in highland valley. also 1509 elm st.	SFOSTER
10/22/2007	10:19:40	operations says no additional resources available for north comm. only has lima strike team.	SFOSTER
10/22/2007	10:23:12	fire in the north has merged with witch creek incident.	SFOSTER
10/22/2007	10:34:25	diverted 4801 A to del dios. report to del dios hwy @ bing crosby blvd. contact 2602 on white 3	SFOSTER
10/22/2007	10:50:53	fire entering wild animal park. can access from back north east entrance. ops notified.	SFOSTER
'22/2007	11:02:39	structure treatened old wagon and yucca, units enroute. wood meadow & 78 unable to get confirmation on units going to this	SFOSTER
10/22/2007	11:05:34	fire from animal park to hwy 78 in valley center	SFOSTER
10/22/2007	11:15:55	flare up 24890 rancho santa thersa. ops notified.	SFOSTER
10/22/2007	11:23:19	report of structures burning in the area of neighborly and	SFOSTER

California Department of Forestry
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Detail Report-All Segments

10/22/2007	11:55:01	Cloverdale and Rockwood rd closed Mandatory EVAC Escondido	SFOSTER
10/22/2007	12:02:16	structures threatened 20891 viento valle, escondido notified ops	SFOSTER
10/22/2007	12:18:25	called witch operations several times along with ramona structure group no communication. reported flare up pine and washington in ramona	SFOSTER
10/22/2007	12:36:36	structure threatened 1420 cross winds @ halverford	SFOSTER
10/22/2007	12:50:49	direct threat to 25129 hwy 78 and 635 old julian hwy structure groups notified	SFOSTER
10/22/2007	13:14:43	118 harper st ramona structure threatened	SFOSTER
10/22/2007	13:23:29	ramona structure will get some one out to harper as soon as they can	SFOSTER
10/22/2007	13:27:54	engine enroute to harper 15 min eta	SFOSTER
10/22/2007	14:38:17	ramona structure group, e280 out of service @ station 80 need mechanic	SFOSTER
10/22/2007	15:01:55	fire in pitts valley and both sides of el cap. mandatory evac orders for harbison cyn and town of alpine. per air attack 500	SFOSTER
10/22/2007	15:18:06	homes in cedar st and cedar summit in ramona.	SFOSTER
10/22/2007	15:26:52	branch 1 release all 5 rbw crews for night @ 1700 so can be used tomorrow	SFOSTER
10/22/2007	16:30:48	fire making run on eagle peak	SFOSTER
10/22/2007	18:12:28	report of structure threat @ 287 via tiquita, branch has no one available send ramona station units.	SFOSTER
10/22/2007	20:55:51	5150 CALLING FIRE VIA RADIO STATING EMERGENCY TRAFFIC; STATED THERE WAS 6 CIVILIANS BURNED AND WAITING TRANSPORT AT HWY 78 XST ZOO ROAD; SDFD SENT SEVERAL MEDICS AND FOUND 5150 AT 17054 ROCKWOOD ROAD	DCASTER
10/23/2007	7:02:32	in 22 hours ramona will be out of water due to lack of water	SFOSTER
10/23/2007	8:05:46	phone call that development in mt woodson is being threatend. e3361 is enroute	SFOSTER
10/23/2007	9:00:48	e282 requesting assistance @salida del sol	SFOSTER
10/23/2007	10:03:32	air attack reporting significant fire front at base of palomar mtn.	SFOSTER
10/23/2007	10:06:07	air attack reports 3 mile fire front on palomar, should be priority, recommend initate palomar evac plan. have direct fire from ramona to palomar. need ground resources to work section, will put tankers in area to work area. no available ground resources at this rime from operations. This will be branch 5	SFOSTER
10/23/2007	10:09:10	bat 8 reporting west winds in ramona	SFOSTER
10/23/2007	10:16:43	made announcement over radio to advise units of significant wind cahange to the west. had to call and notify comm 27 by phone no radio contact	SFOSTER
10/23/2007	10:20:05	air attack unable to work fire at base of palomar, too turbulant. this also may be a seperate fire?	SFOSTER
10/23/2007	10:32:05	air attack pre treating left side of woodson to anticipate wind shift to west.	SFOSTER
10/23/2007	10:45:06	fire has spotted at del dios and lake hodges, 2 too 3 acres.	SFOSTER
10/23/2007	11:26:43	branch 2 has medical emergency on engine 230. chest pains @ highland valley	SFOSTER
10/23/2007	11:32:07	fire established on west side of lake hodges, is burning homes and threating harmony grove	SFOSTER
10/23/2007	11:40:15	reported persons trapped 16637 highland valley and green valley TT	SFOSTER
10/23/2007	13:14:35	chp reporting structure threat 78 east of magnolia	SFOSTER
10/23/2007	13:50:04	poway EOC called re-energizing electrical on Div G branch 2. branch notified	SFOSTER
10/23/2007	13:50:38	Ramona structure group needing immediate need ST to 1760 weekend villa /78	SFOSTER
10/23/2007	14:06:16	branch 3 needs air assistance for slop over. in Div Y	SFOSTER
10/23/2007	14:24:22	report of flare up starvation mtn and highland valley. bat 8	SFOSTER

Detail Report-All Segments

10/23/2007	14:31:41	10 to 12 homes threatened in willow glen area	SFOSTER
10/23/2007	14:50:43	el cap mountain has flare up	SFOSTER
10/23/2007	14:57:24	flare up on vista ramona	SFOSTER
10/23/2007	15:06:44	confirmed that electrical lines are re energized in poway - high valley	SFOSTER
10/23/2007	15:12:55	structure threat olive and pine	SFOSTER
10/23/2007	16:37:08	sdge requesting to turn on power @ west bernardo dr. & Aguamel. If no responce from us they will energize within 5-20 min. Gave message to sylvia in Witch communications, she is to give to IC and or ops.	SFOSTER
10/23/2007	17:25:32	report of flare up om barona mesa and thunder mtn. E82 @ starvation mtn asking for strike team.	SFOSTER
10/23/2007	17:26:52	SDGE turning power on Bernardino and Aguamel	SFOSTER
10/23/2007	17:35:23	fully involved structure thunder mtn / Barona mesa	SFOSTER
10/23/2007	17:51:46	eagle peak and pine hills are problem areas	SFOSTER
10/23/2007	17:54:18	spot fire in avacado grove in highland valley	SFOSTER
10/23/2007	18:17:32	mt woodson has been boxed in by retardent	SFOSTER
10/23/2007	18:44:03	ts81 on scene what they think is a spot out of esisting lines. 24993 painted rock ln	SFOSTER
10/23/2007	18:44:30	reported structure fire @ mt woodson making run toward repeaters	SFOSTER
10/23/2007	18:56:58	fire in rocks still below repeaters	SFOSTER
10/23/2007	18:57:18	report of flare up vista ramona and old julian hwy	SFOSTER
10/24/2007	7:52:23	SDSO reports fire has burned through fire retardant on mt woodson and could be threating repeaters	SFOSTER
10/24/2007	8:00:53	work heavy helo in el cap today. recon the mt woodson / ramona area today	SFOSTER
10/24/2007	8:09:50	report of flare up 635 old julian, manure pile on fire.	SFOSTER
10/24/2007	8:21:11	fire midslope of el cajon mtn 4 spot fires on east side of el cap resavoir	SFOSTER
10/24/2007	8:37:33	fire creeping on mtn woodson, fire has held at fire retardant per air attack eagle peak looks pretty good.	SFOSTER
10/24/2007	8:38:51	flare up pamo and dump rd and jack and jill ln.	SFOSTER
10/24/2007	8:40:08	per air attack, can geet ground access to base of el cajon mtn.	SFOSTER
10/24/2007	8:45:04	branch 3 significant out break minimal line construction in area. div x & y might be slop over.	SFOSTER
10/24/2007	8:57:32	smoke in in the existing line not a slop over	SFOSTER
10/24/2007	9:07:41	ramona structure group locations, san pasqual, 78, & mt woodson area	SFOSTER
10/24/2007	9:19:34	branch 2 requesting that someone come out and open the gates to El Capitan resivor. Gates are locked and impacting getting resources into the Dam area.	SFOSTER
10/24/2007	9:29:27	div A looking real good mopped up 100 ft in.	SFOSTER
10/24/2007	9:35:18	2 helo in mt woodson, attempting to hold. fire spotted on east side of El Capt resivor. tankers are remaining helos are working on the EL Cap resivor spot.	SFOSTER
10/24/2007	9:46:25	off boulder creek rd, has crossed drainage (eagle Peak) requesting some air support.	SFOSTER
10/24/2007	9:54:11	san diego river drainage, fire is creeping along if coves out could make a run to Julian. If is 3 miles south of Santa Isabel. They will make drops to shold it in check, send in hand crew to start working area.	SFOSTER
10/24/2007	10:09:22	reported structures threatened Ash & Harper in Ramona.	SFOSTER
10/24/2007	10:26:52	ramona structure group reporting steady wind of 16 mph out of east	SFOSTER
10/24/2007	10:31:31	Up date from Air attack, rock mtn long string of fire at base of el cap res east side.	SFOSTER
10/24/2007	10:34:50	Branch 2 ... any reports on 67 wildcat and barona is big ... Outside	SFOSTER

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10/24/2007	10:37:14	city copter 1 is making bucket drops on own with no communication with any branch or ground personnel. need to contact city had have copter switch over to cdf air to ground freq to initate communications with fire personnel.	SFOSTER
10/24/2007	10:42:27	dilian ranch requesting permission to continue fireing ops. affirmative given, go slow and report any problems.	SFOSTER
10/24/2007	11:00:54	from witch comm: flare up bear valley blvd.	SFOSTER
10/24/2007	11:24:38	requesting 2 type 1 strike teams for ramona out of staging	SFOSTER
10/24/2007	11:43:00	passed to ops structure threatened bear valley and gutjito rd, valley center	SFOSTER
10/24/2007	11:47:41	REPORT OF AIRCRAFT DOWN NEAR EL CAP RES. PRIVATE CALLER CHP TRANSFER	DHOWELL
10/24/2007	11:48:44	ADVISED HEARTLAND	DHOWELL
10/24/2007	11:58:11	branch 2 all air resources accounted for.	SFOSTER
10/24/2007	12:16:55	ALL AIRCRAFT ACCOUNTED FOR NO FIRE AIR CRAFT DOWN	DHOWELL
10/24/2007	12:24:02	fire has moved into section 35 on the new map will be a concern tomorrow.	SFOSTER
10/24/2007	12:28:20	structure threat rancho vista / hwy 78.	SFOSTER
10/24/2007	12:40:55	sdge re-energizing area of west bernardo drive that was suppose to be done last night. tb 1169 j1, j2 & tb 1149 j7	SFOSTER
10/24/2007	12:42:51	structure threat old julian hwy @ 3 MM. by CHP.	SFOSTER
10/24/2007	13:10:53	SDGE EOC REP CALLED RE GUARDING WEST BERNARDINO RE-ENERGIZING. THEY DID TURN IT ON LAST NIGHT BUT SOMEONE CALLED TO SAY SHUT IT OFF. HE WOULD LIKE SOMEONE TO CALL HIM. I CALLED WITCH COMM TO GIVE TO IC. CALL ELLIS JONES 858-636-6957	SFOSTER
10/24/2007	13:58:28	Div C requesting a helo for bucket work on Div C	SFOSTER
10/24/2007	14:15:33	2330C reporting structure starting at the end of lake hodges.	SFOSTER
10/24/2007	15:29:00	there are fixed water tanks available to use 1532 weekend & 24654 high country rd.	SFOSTER
10/24/2007	16:11:46	flare up 565 la cama. at rear of the address.	SFOSTER
10/24/2007	16:17:41	Branch 4, Escondido FF has lower leg injury. comm unit starting ambulance. to 3301 Bearvalley.	SFOSTER
10/24/2007	16:22:47	Report of flare up on Old Julian hwy 7 MM.	SFOSTER
10/24/2007	16:36:37	16615 highland valley rd. 40 yrd storage container fire next to a structure. @ 4.5 MM dirt raod turn left. Branch 2 copies	SFOSTER
10/24/2007	16:37:42	Ramona structure group @ 7 MM on Julian hwy. Fire is a large island burning out. It's been flagged.	SFOSTER
10/24/2007	16:50:52	Ramona STR GRP: Old Julian island making a pretty good run.	SFOSTER
10/24/2007	17:37:41	ellis jones called again SDGE EOC; WAITNG FOR IC TO CALL HIM BACK. GAVE MESSAGE TO WITCH COMMUNICATIONS	SFOSTER
10/24/2007	17:51:11	called baack eliss jones fron sdge eoc; advised him that witch communications had delivered the message to the ic to call him.	SFOSTER
10/24/2007	18:46:11	575 rancho trails / Lilac Generator fire	SFOSTER
10/25/2007	8:01:49	Per Witch Communications, All road closures in Ramona have been lifted	SFOSTER
10/25/2007	8:44:41	from ramona structure group; 1.5 acre island burning on old julian @ starlight. not a threat homes at top of hill are gone.	SFOSTER
10/25/2007	10:33:15	per chp: aircraft down sunrise vista / rancho del sol branch notified along with witch communications. this is sdge aircraft, sending ramona response. branch 2 enroute.	SFOSTER
10/25/2007	10:37:55	r80 @ scene; conformed helo down. occupants out uninjured. branch 2 notified he will continue code 2.	SFOSTER
10/25/2007	10:54:10	branch 2 clear of SDGE helo incident @ 10:53	SFOSTER
10/25/2007	11:25:06	CHP reporting possible flare up or new fire, weekend villa and hwy 78, chevron mtn. Branch 2 notified	SFOSTER
10/25/2007	11:51:45	heartland reporting flareup sawday / little page. branch notified	SFOSTER

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10/25/2007	13:26:43	SDGE CALLED, SAID THAT THEY ARE WORKING ON THE LINES IN RAMONA AND DON'T HAVE A TIME FRAME YET FOR RESTORATION. IF ANY QUESTIONS PLEASE CALL 800-411-7343. NAME IS DEBBIE.	SFOSTER
10/25/2007	13:34:52	GETTING CALLES FOR WEEKEND AND LITTLE PAGE. BRANCH 2 STATES THIS IS A ISLAND BURNING AT THSI TIME NO THREAT. THEY ARE TRYING TO GET A CLOSER LOOK.	SFOSTER
10/25/2007	13:41:24	UPDATED LOCATION FOR THE 923 OLD JULIAN. NEW LOCATION HWY 78 AND PASSING LN. PASSED ON TO BRANCH	SFOSTER
10/25/2007	14:14:50	CHP NOTIFIED TREE ON FIRE NEAR RD. 1528 BLACK CYN / PILE BRANCH NOTIFIED	SFOSTER
10/25/2007	14:29:10	Branch 2 stopped by chp of a medical aid. 19860 hwy 78, they started BLS rig. need medic. sent Medic 80 engine is oes 251.. Also notified branch of sopt on 67 and mt woodson. @ mm 60.5	SFOSTER
10/25/2007	14:36:37	branch 2 equipment in area unable to find with reference to 60.5. they are checking the area of 67 and mt woodson.	SFOSTER

Detail Report-All Segments

LOCVER	10/21/2007	12:35:56	LCRAIG	MVUCAD02
ENTRY	10/21/2007	12:36:00	LCRAIG	MVUCAD02
SUGDEF	10/21/2007	12:36:17		
Level 1, Path: A 1 AA, Path: A 1 T, Path: A 2 C, Path: G 3 E*USFS				
SUGG	10/21/2007	12:36:17		
Primary: B3312._, T95.*_[A/T3]#1, E3376R._[ENG3]#2, E3356._[ENG3]#9, PLC1._[CRW1]#12, PLC2._[CRW1] #12, E3367.*_[ENG3]#13, E3357._[ENG3]#23, E3377._[ENG3]#23, D3341.*_[DOZ2]#23, IOF._[PRV]#38				
SUGG	10/21/2007	12:36:17		
Nearby: AA330._[A/A]#1, AA500._[A/A]#1, T70._[A/T3]#1, T71._[A/T3]#1, C10._[HEL2]#5, C12._[HEL2]#5, E3366._[ENG3]#2, D3346._[DOZ2]#12, E3381._[ENG3]#27, E3374._[ENG3]#34				
SUGG	10/21/2007	12:36:17		
Alternate: E97.*_[ENG1]#2, E6161._[ENG3]#4, E3361._[ENG3]#25, E3378R.*_[ENG3]#27, E3388.*_[ENG3]#32, E3370R.*[ENG3]#34, E3382.*_[ENG3]#36				
FREQA	10/21/2007	12:36:46	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	12:36:46	LCRAIG	MVUCAD02
<none> --> HWY 79 / S2 HWY 2				
INCN	10/21/2007	12:36:49	LCRAIG	MVUCAD02
Fire Number $ONE01544 Created				
INCN	10/21/2007	12:36:49	LCRAIG	MVUCAD02
Site Number $CAMVU010432 Created				
DSP	10/21/2007	12:36:49	LCRAIG	MVUCAD02
B3312 (BAT) T95 (A/T3) E3376R (ENG3) E3356 (ENG3) PLC1 (CRW1) PLC2 (CRW1) E3367 (ENG3) E3357 (ENG3) E3377 (ENG3) D3341 (DOZ2) IOF (PRV) JURISDICTION NUMBER $CAMVU010432				
IUNIT	10/21/2007	12:36:49	LCRAIG	MVUCAD02
B3312				
AIQ	10/21/2007	12:36:52	LCRAIG	MVUCAD02
IOF				
STATUSX	10/21/2007	12:41:51		
Unit B3312 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:51		
Unit D3341 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:51		
Unit E3356 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:52		
Unit E3357 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:52		
Unit E3367 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:52		
Unit E3376R Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:53		
Unit E3377 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:53		
Unit PLC1 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:53		
Unit PLC2 Status timer expired after 5 MIN				
STATUSX	10/21/2007	12:41:54		
Unit T95 Status timer expired after 5 MIN				
ENR	10/21/2007	12:43:18	LCRAIG	MVUCAD02
E3376R				
EQA	10/21/2007	12:43:29	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	12:43:30	LCRAIG	MVUCAD02
B3315 (BAT)				
STATUSX	10/21/2007	12:48:33		

Detail Report-All Segments

JGDEF	10/21/2007	12:48:39		
Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 1 D, Path: G 3 E*USFS				
SUGG	10/21/2007	12:48:39		
Primary: PLC3._[CRW1]#12, PLC4._[CRW1]#12, E3361._[ENG3]#25, E3378R.*_[ENG3]#27, E3388.*_[ENG3]#32, E3370R.*[ENG3]#34, E3382.*_[ENG3]#36, IOF._[PRV]#38				
SUGG	10/21/2007	12:48:39		
Nearby: AA330._[A/A]#1, AA500._[A/A]#1, T70._[A/T3]#1, T71._[A/T3]#1, C10._[HEL2]#5, C12._[HEL2]#5, E3366._[ENG3]#2, D3346._[DOZ2]#12, E3381._[ENG3]#27, E3374._[ENG3]#34				
SUGG	10/21/2007	12:48:39		
Alternate: E97.*_[ENG1]#2, E6161._[ENG3]#4				
ENR	10/21/2007	12:52:22	LCRAIG	MVUCAD02
E3356				
ENR	10/21/2007	12:52:24	LCRAIG	MVUCAD02
E3367				
ENR	10/21/2007	12:52:50	LCRAIG	MVUCAD02
B3315				
ENR	10/21/2007	12:53:58	LCRAIG	MVUCAD02
B3312				
ENR	10/21/2007	12:53:58	LCRAIG	MVUCAD02
D3341				
FREQA	10/21/2007	12:56:40	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	12:56:40	LCRAIG	MVUCAD02
W6 (W/T)				
STATUSX	10/21/2007	13:01:45		
it W6 Status timer expired after 5 MIN				
EQA	10/21/2007	13:02:14	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	13:02:15	LCRAIG	MVUCAD02
PLC5 (CRW1)				
STATUSX	10/21/2007	13:07:15		
Unit PLC5 Status timer expired after 5 MIN				
STATUSX	10/21/2007	13:13:21		
Unit E3376R Status timer expired after 30 MIN				
CIN	10/21/2007	13:16:18	SFOSTER	MVUCAD03
HWY 79 / S2 HWY 2 --> WITCH CREEK 3				
CHNG	10/21/2007	13:18:15	LCRAIG	MVUCAD02
Location: 29500 HWY 79 / 29398 S2 HWY ,HENSHAW ==> 27790 HWY 78 / 27098 DEER CANYON DR ,WITCH_CREEK ;Atom: J32 ==> S10;RespArea: J32 ==> S10;				
ONS	10/21/2007	13:19:35	SFOSTER	MVUCAD03
E3367				
ONS	10/21/2007	13:21:44	SFOSTER	MVUCAD03
E3377				
STATUSX	10/21/2007	13:22:27		
Unit E3356 Status timer expired after 30 MIN				
STATUSX	10/21/2007	13:22:51		
Unit B3315 Status timer expired after 30 MIN				
STATUSX	10/21/2007	13:24:03		
Unit B3312 Status timer expired after 30 MIN				
STATUSX	10/21/2007	13:24:04		
Unit D3341 Status timer expired after 30 MIN				
MISC	10/21/2007	13:24:18	SFOSTER	MVUCAD03
00 plus acres 100 on south of 78 requesting 4 type 1 and 4 type 3 st oak bridge shelter in place, may be a threat to ramona (command: M)				
MISC	10/21/2007	13:25:54	SFOSTER	MVUCAD03
not able to use aircraft, too smokey (command: M)				
FREQA	10/21/2007	13:31:44	LCRAIG	MVUCAD02

Detail Report-All Segments

DSP	10/21/2007	13:31:45	LCRAIG	MVUCAD02
E3360 (ENG3) E3361 (ENG3) E3370R (ENG3) E3388 (ENG3) E3378R (ENG3)				
ENR	10/21/2007	13:32:00	LCRAIG	MVUCAD02
W6				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3360				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3361				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3370R				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3388				
ENR	10/21/2007	13:32:05	LCRAIG	MVUCAD02
E3378R				
ENR	10/21/2007	13:32:14	LCRAIG	MVUCAD02
PLC1				
ENR	10/21/2007	13:32:14	LCRAIG	MVUCAD02
PLC2				
ENR	10/21/2007	13:32:16	LCRAIG	MVUCAD02
PLC5				
FREQA	10/21/2007	13:32:26	LCRAIG	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	13:32:27	LCRAIG	MVUCAD02
PLC3 (CRW1) PLC4 (CRW1)				
ENR	10/21/2007	13:32:33	LCRAIG	MVUCAD02
C3				
ENR	10/21/2007	13:32:33	LCRAIG	MVUCAD02
PLC4				
MISC	10/21/2007	13:36:01	SFOSTER	MVUCAD03
using ramona high as shelter (command: M)				
MISC	10/21/2007	13:56:43	SFOSTER	MVUCAD03
rancho santa tierra closed, backing up to suthern dam (command: M)				
STATUSX	10/21/2007	14:02:02		
Unit W6 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:08		
Unit E3360 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:09		
Unit E3361 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:09		
Unit E3370R Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:09		
Unit E3378R Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:10		
Unit E3388 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:14		
Unit PLC1 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:15		
Unit PLC2 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:20		
Unit PLC5 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:32		
Unit PLC3 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:02:33		
Unit PLC4 Status timer expired after 30 MIN				
SUGDEF	10/21/2007	14:08:11		

Detail Report-All Segments

SUGG	10/21/2007	14:08:11		
Primary: SDRBR85._[ENG3]#28, IOF._[PRV]#36, RBW1._[CRW1]#45, RBW2._[CRW1]#45				
SUGG	10/21/2007	14:08:11		
Nearby: AA330._[A/A]#1, AA500._[A/A]#1, T70._[A/T3]#1, T71._[A/T3]#1, C10._[HEL2]#3, C12._[HEL2]#3, E3366._[ENG3]#18, D3346._[DOZ2]#20, E3381._[ENG3]#39, E3374._[ENG3]#42, E3382.*_[ENG3]#43				
SUGG	10/21/2007	14:08:11		
Alternate: E95._[ENG1]#5, E6161._[ENG3]#12, E71._[ENG1]#13, E97.*_[ENG1]#18, E74._[ENG1]#21, W74._[W/T2]#21, E83._[ENG1]#24, E81._[ENG1]#26, W85._[W/T1]#28, PVYE84._[ENG1]#31				
FREQA	10/21/2007	14:09:00	SFOSTER	MVUCAD03
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	14:09:02	SFOSTER	MVUCAD03
RBW1 (CRW1) RBW2 (CRW1) RBW3 (CRW1) RBW4 (CRW1) RBW5 (CRW1)				
RTQ	10/21/2007	14:09:33	LCRAIG	MVUCAD02
E3370R				
AIQ	10/21/2007	14:09:41	LCRAIG	MVUCAD02
E3370R				
STATUSX	10/21/2007	14:14:03		
Unit RBW1 Status timer expired after 5 MIN				
STATUSX	10/21/2007	14:14:04		
Unit RBW2 Status timer expired after 5 MIN				
STATUSX	10/21/2007	14:14:04		
Unit RBW3 Status timer expired after 5 MIN				
STATUSX	10/21/2007	14:14:04		
Unit RBW4 Status timer expired after 5 MIN				
STATUSX	10/21/2007	14:14:05		
Unit RBW5 Status timer expired after 5 MIN				
ENR	10/21/2007	14:22:29	SFOSTER	MVUCAD03
RBW1				
ENR	10/21/2007	14:22:29	SFOSTER	MVUCAD03
RBW2				
ENR	10/21/2007	14:22:29	SFOSTER	MVUCAD03
RBW3				
ENR	10/21/2007	14:22:29	SFOSTER	MVUCAD03
RBW4				
ENR	10/21/2007	14:22:29	SFOSTER	MVUCAD03
RBW5				
SUGDEF	10/21/2007	14:32:13		
Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 3 E*CDF, Path: G 1 D, Path: G 3 E*USFS				
SUGG	10/21/2007	14:32:13		
Primary: SDRBR85._[ENG3]#28, IOF._[PRV]#36, E3370R.*[ENG3]#42, MCN3._[CRW1]#48, MCN4._F[CRW1]#48				
SUGG	10/21/2007	14:32:13		
Nearby: AA330._[A/A]#1, AA500._[A/A]#1, T70._[A/T3]#1, T71._[A/T3]#1, C10._[HEL2]#3, C12._[HEL2]#3, E3366._[ENG3]#18, D3346._[DOZ2]#20, E3381._[ENG3]#39, E3374._[ENG3]#42, E3382.*_[ENG3]#43				
SUGG	10/21/2007	14:32:13		
Alternate: E95._[ENG1]#5, E6161._[ENG3]#12, E71._[ENG1]#13, E97.*_[ENG1]#18, E74._[ENG1]#21, W74._[W/T2]#21, E83._[ENG1]#24, E81._[ENG1]#26, W85._[W/T1]#28, PVYE84._[ENG1]#31				
FREQA	10/21/2007	14:32:19	SFOSTER	MVUCAD03
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	14:32:19	SFOSTER	MVUCAD03
E3370R (ENG3)				
ONS	10/21/2007	14:32:44	SFOSTER	MVUCAD03
E3370R				
SC	10/21/2007	14:36:40	SFOSTER	MVUCAD03
sdge so animal control @ scene with IC. (command: M)				
MISC	10/21/2007	14:37:06	SFOSTER	MVUCAD03
Notify SD City, Powy, & Lake Side for possible treat (command: M)				
STATUSX	10/21/2007	14:52:32		

Detail Report-All Segments

STATUSX	10/21/2007	14:52:32		
Unit RBW2 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:52:33		
Unit RBW3 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:52:33		
Unit RBW4 Status timer expired after 30 MIN				
STATUSX	10/21/2007	14:52:33		
Unit RBW5 Status timer expired after 30 MIN				
ONS	10/21/2007	15:01:23	SFOSTER	MVUCAD03
E3388				
SUPP	10/21/2007	15:06:20	SFOSTER	MVUCAD03
SUPP	10/21/2007	15:24:28	SFOSTER	MVUCAD03
SUPP	10/21/2007	15:26:58	SFOSTER	MVUCAD03
SUPP	10/21/2007	16:11:43	GWHITE	MVUCAD03
SUPP	10/21/2007	16:12:28	GWHITE	MVUCAD03
SUPP	10/21/2007	16:20:08	GWHITE	MVUCAD03
MISC	10/21/2007	16:43:24	SFOSTER	MVUCAD05
B3312,santa teressa threatened, sending engines (command: M)				
MISC	10/21/2007	16:47:51	SFOSTER	MVUCAD05
312,10,000 acres 3 quarter mile from sutherland dam (command: M)				
MISC	10/21/2007	16:52:04	SFOSTER	MVUCAD05
B3312,requesting 7 cwn's plus a type 3 cwn. (command: M)				
MISC	10/21/2007	16:58:04	SFOSTER	MVUCAD05
B3312,spotting well ahead of its self (command: M)				
MISC	10/21/2007	17:00:57	SFOSTER	MVUCAD05
B3312,call from 25179 hwy 78 need help.. 3378r at residence has elderly couple in home (command: M)				
MISC	10/21/2007	17:11:30	SFOSTER	MVUCAD05
B3312,air attack, negative on fixed wing. too turbulant (command: M)				
MISC	10/21/2007	17:11:49	SFOSTER	MVUCAD05
B3312,air attack can stay over incident until cut off (command: M)				
MISC	10/21/2007	17:16:50	SFOSTER	MVUCAD05
B3312,unable to drop tanker 73 & 82 returening 14 min eta, threat little paige area, and north end of estates north of gower mtn (command: M)				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC1				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC2				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC3				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC4				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
PLC5				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
RBW1				
S	10/21/2007	17:21:38	SFOSTER	MVUCAD05
RBW2				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
RBW3				
ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05

Detail Report-All Segments

ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
RBW5				
ONS	10/21/2007	17:21:43	SFOSTER	MVUCAD05
E3376R				
ONS	10/21/2007	17:21:43	SFOSTER	MVUCAD05
E3378R				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
B3312				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
B3315				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
D3341				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
E3356				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
E3360				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
E3361				
ONS	10/21/2007	17:22:06	SFOSTER	MVUCAD05
E3357				
ONS	10/21/2007	17:22:13	SFOSTER	MVUCAD05
T95				
ONS	10/21/2007	17:22:13	SFOSTER	MVUCAD05
W6				
MISC	10/21/2007	17:25:33	SFOSTER	MVUCAD05
312,phone call that fire has reached the pine hills egg ranch (command: M)				
MISC	10/21/2007	17:31:12	SFOSTER	MVUCAD05
B3312,the shelter is located at the ramona highschool. sdso is sending them to ramona not poway. (command: M)				
MISC	10/21/2007	17:39:18	SFOSTER	MVUCAD05
B3312,entering southerland drainage, with these winds may jump sutherland lake (command: M)				
MISC	10/21/2007	17:45:24	SFOSTER	MVUCAD05
B3312,3 to 4 hours until it hits littlepage area (command: M)				
MISC	10/21/2007	18:11:11	SFOSTER	MVUCAD05
B3312,trying to keep it west of 79 (command: M)				
MISC	10/21/2007	18:12:33	SFOSTER	MVUCAD05
B3312,send cen helo's to ramona airbase (command: M)				
MISC	10/21/2007	18:17:06	SFOSTER	MVUCAD05
B3312,requesting 1 als and 1 bls to witch creek station (command: M)				
MISC	10/21/2007	18:18:59	SFOSTER	MVUCAD05
B3312,getting reports of structures on fire near witch creek station (command: M)				
MISC	10/21/2007	18:37:38	SFOSTER	MVUCAD05
B3312,icp moved to ramona fair grounds (command: M)				
MISC	10/21/2007	18:38:46	SFOSTER	MVUCAD05
B3312,person trapped @ 25056 santa rancho theresa will heve engines enroute (command: M)				
MISC	10/21/2007	18:41:30	SFOSTER	MVUCAD05
B3312,person trapped 26464 little paige ln (command: M)				
MISC	10/21/2007	18:53:51	SFOSTER	MVUCAD05
B3312,relayed info of persons trapped 26441 hwy 78 (command: M)				
MISC	10/21/2007	19:14:24	SFOSTER	MVUCAD05
3312,fire making run at goos valley (command: M)				
SC	10/21/2007	19:19:00	SFOSTER	MVUCAD05
B3312,believe fire is 5000 to 6000. (command: M)				
MISC	10/21/2007	19:20:58	SFOSTER	MVUCAD05
B3312,hikers trapped at 3 sisters falls ic will get with sdso and send astria (command: M)				
MISC	10/21/2007	19:23:11	SFOSTER	MVUCAD05

Detail Report-All Segments

ONS	10/21/2007	17:21:38	SFOSTER	MVUCAD05
RBW5				
ONS	10/21/2007	17:21:43	SFOSTER	MVUCAD05
E3376R				
ONS	10/21/2007	17:21:43	SFOSTER	MVUCAD05
E3378R				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
B3312				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
B3315				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
D3341				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
E3356				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
E3360				
ONS	10/21/2007	17:22:03	SFOSTER	MVUCAD05
E3361				
ONS	10/21/2007	17:22:06	SFOSTER	MVUCAD05
E3357				
ONS	10/21/2007	17:22:13	SFOSTER	MVUCAD05
T95				
ONS	10/21/2007	17:22:13	SFOSTER	MVUCAD05
W6				
MISC	10/21/2007	17:25:33	SFOSTER	MVUCAD05
312,phone call that fire has reached the pine hills egg ranch (command: M)				
MISC	10/21/2007	17:31:12	SFOSTER	MVUCAD05
B3312,the shelter is located at the ramona highschool. sdso is sending them to ramona not poway. (command: M)				
MISC	10/21/2007	17:39:18	SFOSTER	MVUCAD05
B3312,entering southerland drainage, with these winds may jump sutherland lake (command: M)				
MISC	10/21/2007	17:45:24	SFOSTER	MVUCAD05
B3312,3 to 4 hours until it hits littlepage area (command: M)				
MISC	10/21/2007	18:11:11	SFOSTER	MVUCAD05
B3312,trying to keep it west of 79 (command: M)				
MISC	10/21/2007	18:12:33	SFOSTER	MVUCAD05
B3312,send cen helo's to ramona airbase (command: M)				
MISC	10/21/2007	18:17:06	SFOSTER	MVUCAD05
B3312,requesting 1 als and 1 bls to witch creek station (command: M)				
MISC	10/21/2007	18:18:59	SFOSTER	MVUCAD05
B3312,getting reports of structures on fire near witch creek station (command: M)				
MISC	10/21/2007	18:37:38	SFOSTER	MVUCAD05
B3312,icp moved to ramona fair grounds (command: M)				
MISC	10/21/2007	18:38:46	SFOSTER	MVUCAD05
B3312,person trapped @ 25056 santa rancho theresa will heve engines enroute (command: M)				
MISC	10/21/2007	18:41:30	SFOSTER	MVUCAD05
B3312,person trapped 26464 little paige ln (command: M)				
MISC	10/21/2007	18:53:51	SFOSTER	MVUCAD05
B3312,relayed info of persons trapped 26441 hwy 78 (command: M)				
MISC	10/21/2007	19:14:24	SFOSTER	MVUCAD05
3312,fire making run at goos valley (command: M)				
SC	10/21/2007	19:19:00	SFOSTER	MVUCAD05
B3312,believe fire is 5000 to 6000. (command: M)				
MISC	10/21/2007	19:20:58	SFOSTER	MVUCAD05
B3312,hikers trapped at 3 sisters falls ic will get with sdso and send astria (command: M)				
MISC	10/21/2007	19:23:11	SFOSTER	MVUCAD05

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

MISC	10/21/2007 19:28:13	SFOSTER	MVUCAD05
B3312,report of person trapped in green tundra @ 18438 little page (command: M)			
MISC	10/21/2007 19:28:57	SFOSTER	MVUCAD05
B3312,fire up to ramona trails (command: M)			
CHNG	10/21/2007 19:33:57	DCASTER	MVUCAD03
Remarks Entered;			
MISC	10/21/2007 19:35:23	SFOSTER	MVUCAD05
B3312,homes on fire at oak mountain and starvale ln (command: M)			
MISC	10/21/2007 19:39:15	SFOSTER	MVUCAD05
B3312,20 people trapped @ A&E ranch 18122 Little Page (command: M)			
FREQA	10/21/2007 19:42:00	SKING	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)			
DSP	10/21/2007 19:42:02	SKING	MVUCAD02
E80 (ENG1) E282 (ENG1) E82 (ENG1) E27 (ENG1)			
FREQA	10/21/2007 19:43:17	SKING	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)			
DSP	10/21/2007 19:43:18	SKING	MVUCAD02
E280 (ENG1)			
ENR	10/21/2007 19:44:02	SKING	MVUCAD02
E80			
MISC	10/21/2007 19:44:06	SFOSTER	MVUCAD05
B3312,aware of immediate structure threat on magnolia and pile (command: M)			
AIQ	10/21/2007 19:44:45	SKING	MVUCAD02
E27			
ENR	10/21/2007 19:45:52	SKING	MVUCAD02
2			
STATUSX	10/21/2007 19:47:01		
Unit E282 Status timer expired after 5 MIN			
STATUSX	10/21/2007 19:48:19		
Unit E280 Status timer expired after 5 MIN			
MISC	10/21/2007 19:48:55	SFOSTER	MVUCAD05
B3312,fire well established gower mountain threat to wildcat canyon barona mesa and the estates advise duty chief (command: M)			
AIQ	10/21/2007 19:49:35	SKING	MVUCAD02
E282			
ENR	10/21/2007 19:49:53	SKING	MVUCAD02
E280			
FREQA	10/21/2007 19:50:47	SKING	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)			
DSP	10/21/2007 19:50:48	SKING	MVUCAD02
E273 (ENG1)			
STATUSX	10/21/2007 19:55:50		
Unit E273 Status timer expired after 5 MIN			
ENR	10/21/2007 19:56:12	SKING	MVUCAD02
E273			
MISC	10/21/2007 19:57:51	SFOSTER	MVUCAD05
B3312,fire moving through santa rancho tierrsa still getting people out (command: M)			
MISC	10/21/2007 20:09:23	SFOSTER	MVUCAD05
B3312,persons trapped off sunset oaks information relayed to operations (command: M)			
MISC	10/21/2007 20:11:43	SFOSTER	MVUCAD05
B3312,relayed person trapped 19750 ramona trails. per ops fire is hitting area hard will try yo get (command: M)			
MISC	10/21/2007 20:13:46	SFOSTER	MVUCAD05
B3312,relyed person trapped 23970 old julian hwy (command: M)			
STATUSX	10/21/2007 20:14:02		
Unit E80 Status timer expired after 30 MIN			

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010432
Incident Name: WITCH
Event Number: 07010784

Detail Report-All Segments

XEQA	10/21/2007 20:14:44	SKING	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)			
DSP	10/21/2007 20:14:46	SKING	MVUCAD02
E6662 (ENG3) BR6460 (ENG3)			
ENR	10/21/2007 20:14:52	SKING	MVUCAD02
BR6460			
ENR	10/21/2007 20:14:52	SKING	MVUCAD02
E6662			
STATUSX	10/21/2007 20:15:56		
Unit E82 Status timer expired after 30 MIN			
STATUSX	10/21/2007 20:19:57		
Unit E280 Status timer expired after 30 MIN			
MISC	10/21/2007 20:24:13	SFOSTER	MVUCAD05
B3312,base camp at fair ground 5th and A st (command: M)			
STATUSX	10/21/2007 20:26:15		
Unit E273 Status timer expired after 30 MIN			
MISC	10/21/2007 20:35:17	SFOSTER	MVUCAD05
B3312,in process of evacuating ramona vista, getting multipal call for smoke inhalation (command: M)			
MISC	10/21/2007 20:43:09	SFOSTER	MVUCAD05
B3312,relay barn on fire 18452 woods hill ln (command: M)			
MISC	10/21/2007 20:43:29	SFOSTER	MVUCAD05
B3312,requesting cal trans rep and county parks rep (command: M)			
MISC	10/21/2007 20:43:54	SFOSTER	MVUCAD05
B3312,correction county road rep (command: M)			
STATUSX	10/21/2007 20:44:53		
it BR6460 Status timer expired after 30 MIN			
STATUSX	10/21/2007 20:44:54		
Unit E6662 Status timer expired after 30 MIN			
MISC	10/21/2007 20:47:30	SFOSTER	MVUCAD05
B3312,relayed persons disabled persons needs assistance 18655 oak ridge ln (command: M)			
MISC	10/21/2007 20:53:02	SFOSTER	MVUCAD05
B3312,person trapped 23970 old julian hwy, trying to gain access now (command: M)			
MISC	10/21/2007 21:00:50	SFOSTER	MVUCAD05
B3312,county roads and cal trans sending reps (command: M)			
MISC	10/21/2007 21:04:43	SFOSTER	MVUCAD05
B3312,vista ramona beign threatened (command: M)			
MISC	10/21/2007 21:07:02	SFOSTER	MVUCAD05
B3312,fire running through ash and elm. reverse 911 on north east of air base (command: M)			
MISC	10/21/2007 21:18:56	SFOSTER	MVUCAD05
B3312,fire on olive behind air base (command: M)			
MISC	10/21/2007 21:25:20	SFOSTER	MVUCAD05
B3312,Barona voluntary evac, notifying casino (command: M)			
MISC	10/21/2007 21:38:59	SFOSTER	MVUCAD05
B3312,3319 trapped with persons elm and hwy 78 may jump halford (command: M)			
MISC	10/21/2007 21:47:24	SFOSTER	MVUCAD05
B3312,fire 2 hours from reaching barona (command: M)			
MISC	10/21/2007 21:51:13	SFOSTER	MVUCAD05
B3312,helos to either ramona or gillespie. also double exsisting resource order (command: M)			
ONS	10/21/2007 21:58:05	SKING	MVUCAD02
E80			
ONS	10/21/2007 21:58:05	SKING	MVUCAD02
2			
ONS	10/21/2007 21:58:05	SKING	MVUCAD02
E280			
ONS	10/21/2007 21:58:05	SKING	MVUCAD02

Detail Report-All Segments

ONS	10/21/2007	21:58:05	SKING	MVUCAD02
BR6460				
ONS	10/21/2007	21:58:05	SKING	MVUCAD02
E6662				
MISC	10/21/2007	22:04:04	SFOSTER	MVUCAD05
B3312,person trapped 25152 old julian hwy, enroute (command: M)				
FREQA	10/21/2007	22:53:05	SKING	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	22:53:05	SKING	MVUCAD02
E3390C (ENG3)				
STATUSX	10/21/2007	22:58:04		
Unit E3390C Status timer expired after 5 MIN				
FREQA	10/21/2007	23:00:12	SKING	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/21/2007	23:00:13	SKING	MVUCAD02
E3391C (ENG3)				
ENR	10/21/2007	23:00:21	SKING	MVUCAD02
E3390C				
ENR	10/21/2007	23:00:21	SKING	MVUCAD02
E3391C				
STATUSX	10/21/2007	23:30:24		
Unit E3390C Status timer expired after 30 MIN				
STATUSX	10/21/2007	23:30:24		
Unit E3391C Status timer expired after 30 MIN				
SUPP	10/21/2007	23:45:18	SFOSTER	MVUCAD05
SUPP	10/21/2007	23:50:32	SFOSTER	MVUCAD05
SUPP	10/22/2007	0:13:15	SFOSTER	MVUCAD05
SUPP	10/22/2007	0:50:50	SFOSTER	MVUCAD05
AIQ	10/22/2007	1:01:46	DCASTER	MVUCAD03
E82				
FREQA	10/22/2007	1:13:35	SKING	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DOS	10/22/2007	1:13:35	SKING	MVUCAD02
E282 (ENG1)				
FREQA	10/22/2007	1:13:46	SKING	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DOS	10/22/2007	1:13:46	SKING	MVUCAD02
E82 (ENG1)				
AIQ	10/22/2007	1:15:23	DCASTER	MVUCAD03
E82				
SUPP	10/22/2007	1:37:26	SFOSTER	MVUCAD05
SUPP	10/22/2007	1:45:28	SFOSTER	MVUCAD05
ONS	10/22/2007	2:17:08	SKING	MVUCAD02
E3390C				
ONS	10/22/2007	2:17:08	SKING	MVUCAD02
E3391C				
SUPP	10/22/2007	3:09:50	SFOSTER	MVUCAD05
CHNG	10/22/2007	3:40:53	DCASTER	MVUCAD03

Detail Report-All Segments

AIQ	10/22/2007	4:38:25	DCASTER	MVUCAD03
E80				
FREQA	10/22/2007	4:42:19	SKING	MVUCAD02
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DOS	10/22/2007	4:42:20	SKING	MVUCAD02
E80 (ENG1)				
AIQ	10/22/2007	4:44:42	SKING	MVUCAD02
E80				
MISC	10/22/2007	7:15:51	SFOSTER	MVUCAD05
B3312,currently 10,000 acres several homes loss in ramona area. old julian and hwy 78 (command: M)				
MISC	10/22/2007	7:16:32	SFOSTER	MVUCAD05
B3312,eastside of fire is back burning up eagle peak and down into the drainage. (command: M)				
MISC	10/22/2007	7:17:17	SFOSTER	MVUCAD05
B3312,when it comes out it will most likely come out at barona station 27, most likely to (command: M)				
MISC	10/22/2007	7:18:01	SFOSTER	MVUCAD05
B3312,to go over el cajon mtn and get to i-8. threat to harbison canyon. (command: M)				
MISC	10/22/2007	7:18:32	SFOSTER	MVUCAD05
B3312,west side of fire moving south in lakeside and rancho bernardo (command: M)				
MISC	10/22/2007	7:43:17	SFOSTER	MVUCAD05
B3312,sdso is requesting 1 engine for assistance @ old julian and vista ramona (command: M)				
MISC	10/22/2007	7:46:03	SFOSTER	MVUCAD05
B3312,setting up road block @ wildcat and willows. fire to bump wildcat within hour (command: M)				
MISC	10/22/2007	8:05:52	SFOSTER	MVUCAD05
B3312,4 persons trapped @ 16103 eagle crest rd, and immediate structure threat at end of montecito y (command: M)				
PP	10/22/2007	8:34:19	SFOSTER	MVUCAD05
SUPP	10/22/2007	8:38:57	SFOSTER	MVUCAD05
SUPP	10/22/2007	8:42:59	SFOSTER	MVUCAD05
SUPP	10/22/2007	8:51:56	SFOSTER	MVUCAD05
SUPP	10/22/2007	8:57:57	SFOSTER	MVUCAD05
SUPP	10/22/2007	9:05:17	SFOSTER	MVUCAD05
SUPP	10/22/2007	9:19:59	SFOSTER	MVUCAD05
SUPP	10/22/2007	9:24:45	SFOSTER	MVUCAD05
SUPP	10/22/2007	9:31:20	SFOSTER	MVUCAD05
SUPP	10/22/2007	9:38:55	SFOSTER	MVUCAD05
SUPP	10/22/2007	10:07:29	SFOSTER	MVUCAD05
SUPP	10/22/2007	10:10:09	SFOSTER	MVUCAD05
SUPP	10/22/2007	10:19:40	SFOSTER	MVUCAD05
SUPP	10/22/2007	10:23:12	SFOSTER	MVUCAD05
SUPP	10/22/2007	10:34:25	SFOSTER	MVUCAD05

Detail Report-All Segments

SUPP	10/22/2007	10:50:53	SFOSTER	MVUCAD05
SUPP	10/22/2007	11:02:39	SFOSTER	MVUCAD05
SUPP	10/22/2007	11:05:34	SFOSTER	MVUCAD05
SUPP	10/22/2007	11:15:55	SFOSTER	MVUCAD05
SUPP	10/22/2007	11:23:19	SFOSTER	MVUCAD05
FREQA	10/22/2007	11:36:09	GWHITE	MVUCAD03
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DE	10/22/2007	11:36:09	GWHITE	MVUCAD03
SDRE77 (ENG1)				
SUPP	10/22/2007	11:55:01	SFOSTER	MVUCAD05
SUPP	10/22/2007	12:02:16	SFOSTER	MVUCAD05
STATUSX	10/22/2007	12:06:09		
Unit SDRE77 Status timer expired after 30 MIN				
SUPP	10/22/2007	12:18:25	SFOSTER	MVUCAD05
SUPP	10/22/2007	12:36:36	SFOSTER	MVUCAD05
SUPP	10/22/2007	12:50:49	SFOSTER	MVUCAD05
SUPP	10/22/2007	13:14:43	SFOSTER	MVUCAD05
SUPP	10/22/2007	13:23:29	SFOSTER	MVUCAD05
SUPP	10/22/2007	13:27:54	SFOSTER	MVUCAD05
SUPP	10/22/2007	14:38:17	SFOSTER	MVUCAD05
SUPP	10/22/2007	15:01:55	SFOSTER	MVUCAD05
SUPP	10/22/2007	15:18:06	SFOSTER	MVUCAD05
SUPP	10/22/2007	15:26:52	SFOSTER	MVUCAD05
SUPP	10/22/2007	16:30:48	SFOSTER	MVUCAD05
AIQ	10/22/2007	17:15:17	GWHITE	MVUCAD03
SDRE77				
SUPP	10/22/2007	18:12:28	SFOSTER	MVUCAD05
CHNG	10/22/2007	20:55:51	DCASTER	MVUCAD02
Remarks Entered;				
CIN	10/22/2007	21:23:09	DCASTER	MVUCAD02
WITCH CREEK 3 --> WITCH				
FREQA	10/23/2007	3:30:27	SKING	MVUCAD03
Command:CMD 2:6 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DOS	10/23/2007	3:30:27	SKING	MVUCAD03
E6711 (ENG1)				
FREQA	10/23/2007	3:35:41	DCASTER	MVUCAD02

Detail Report-All Segments

DOS E82 (ENG1)	10/23/2007	3:35:42	DCASTER	MVUCAD02
AIQ E3390C	10/23/2007	3:58:01	DCASTER	MVUCAD02
AIQ E3377	10/23/2007	3:58:33	DCASTER	MVUCAD02
SUPP	10/23/2007	7:02:32	SFOSTER	MVUCAD05
SUPP	10/23/2007	8:05:46	SFOSTER	MVUCAD05
AIQ E282	10/23/2007	8:14:52	GWHITE	MVUCAD02
SUPP	10/23/2007	9:00:48	SFOSTER	MVUCAD05
SUPP	10/23/2007	10:03:32	SFOSTER	MVUCAD05
SUPP	10/23/2007	10:06:07	SFOSTER	MVUCAD05
SUPP	10/23/2007	10:09:10	SFOSTER	MVUCAD05
SUPP	10/23/2007	10:16:43	SFOSTER	MVUCAD05
SUPP	10/23/2007	10:20:05	SFOSTER	MVUCAD05
SUPP	10/23/2007	10:32:05	SFOSTER	MVUCAD05
SUPP	10/23/2007	10:45:06	SFOSTER	MVUCAD05
SUPP	10/23/2007	11:26:43	SFOSTER	MVUCAD05
SUPP	10/23/2007	11:32:07	SFOSTER	MVUCAD05
SUPP	10/23/2007	11:40:15	SFOSTER	MVUCAD05
SUPP	10/23/2007	13:14:35	SFOSTER	MVUCAD05
SUPP	10/23/2007	13:50:04	SFOSTER	MVUCAD05
SUPP	10/23/2007	13:50:38	SFOSTER	MVUCAD05
SUPP	10/23/2007	14:06:16	SFOSTER	MVUCAD05
SUPP	10/23/2007	14:24:22	SFOSTER	MVUCAD05
SUPP	10/23/2007	14:31:41	SFOSTER	MVUCAD05
SUPP	10/23/2007	14:50:43	SFOSTER	MVUCAD05
SUPP	10/23/2007	14:57:24	SFOSTER	MVUCAD05
SUPP	10/23/2007	15:06:44	SFOSTER	MVUCAD05
SUPP	10/23/2007	15:12:55	SFOSTER	MVUCAD05
SUPP	10/23/2007	16:37:08	SFOSTER	MVUCAD05

Detail Report-All Segments

SUPP	10/23/2007	17:25:32	SFOSTER	MVUCAD05
SUPP	10/23/2007	17:26:52	SFOSTER	MVUCAD05
SUPP	10/23/2007	17:35:23	SFOSTER	MVUCAD05
SUPP	10/23/2007	17:51:46	SFOSTER	MVUCAD05
SUPP	10/23/2007	17:54:18	SFOSTER	MVUCAD05
SUPP	10/23/2007	18:17:32	SFOSTER	MVUCAD05
SUPP	10/23/2007	18:44:03	SFOSTER	MVUCAD05
SUPP	10/23/2007	18:44:30	SFOSTER	MVUCAD05
SUPP	10/23/2007	18:56:58	SFOSTER	MVUCAD05
SUPP	10/23/2007	18:57:18	SFOSTER	MVUCAD05
AIQ BR6460	10/23/2007	19:11:11	SKING	MVUCAD02
AIQ E6711	10/23/2007	21:29:31	SKING	MVUCAD02
AIQ 2	10/23/2007	22:38:12	SKING	MVUCAD02
AIQ E280	10/24/2007	6:54:51	SKING	MVUCAD02
SUPP	10/24/2007	7:52:23	SFOSTER	MVUCAD05
SUPP	10/24/2007	8:00:53	SFOSTER	MVUCAD05
SUPP	10/24/2007	8:09:50	SFOSTER	MVUCAD05
SUPP	10/24/2007	8:21:11	SFOSTER	MVUCAD05
SUPP	10/24/2007	8:37:33	SFOSTER	MVUCAD05
SUPP	10/24/2007	8:38:51	SFOSTER	MVUCAD05
SUPP	10/24/2007	8:40:08	SFOSTER	MVUCAD05
SUPP	10/24/2007	8:45:04	SFOSTER	MVUCAD05
SUPP	10/24/2007	8:57:32	SFOSTER	MVUCAD05
SUPP	10/24/2007	9:07:41	SFOSTER	MVUCAD05
SUPP	10/24/2007	9:19:34	SFOSTER	MVUCAD05
SUPP	10/24/2007	9:29:27	SFOSTER	MVUCAD05
SUPP	10/24/2007	9:35:18	SFOSTER	MVUCAD05
SUPP	10/24/2007	9:46:25	SFOSTER	MVUCAD05

Detail Report-All Segments

SUPP	10/24/2007	9:54:11	SFOSTER	MVUCAD05
SUPP	10/24/2007	10:09:22	SFOSTER	MVUCAD05
TAB	10/24/2007	10:19:44	DHOWELL	MVUCAD01
196248 (command: TAB)				
SUPP	10/24/2007	10:26:52	SFOSTER	MVUCAD05
SUPP	10/24/2007	10:31:31	SFOSTER	MVUCAD05
SUPP	10/24/2007	10:34:50	SFOSTER	MVUCAD05
SUPP	10/24/2007	10:37:14	SFOSTER	MVUCAD05
SUPP	10/24/2007	10:42:27	SFOSTER	MVUCAD05
SUPP	10/24/2007	11:00:54	SFOSTER	MVUCAD05
SUPP	10/24/2007	11:24:38	SFOSTER	MVUCAD05
SUPP	10/24/2007	11:43:00	SFOSTER	MVUCAD05
CHNG	10/24/2007	11:47:41	DHOWELL	MVUCAD01
Remarks Entered;				
CHNG	10/24/2007	11:48:44	DHOWELL	MVUCAD01
marks Entered;				
SUPP	10/24/2007	11:58:11	SFOSTER	MVUCAD05
CHNG	10/24/2007	12:16:55	DHOWELL	MVUCAD01
Remarks Entered;				
SUPP	10/24/2007	12:24:02	SFOSTER	MVUCAD05
SUPP	10/24/2007	12:28:20	SFOSTER	MVUCAD05
SUPP	10/24/2007	12:40:55	SFOSTER	MVUCAD05
SUPP	10/24/2007	12:42:51	SFOSTER	MVUCAD05
SUPP	10/24/2007	13:10:53	SFOSTER	MVUCAD05
SUPP	10/24/2007	13:58:28	SFOSTER	MVUCAD05
SUPP	10/24/2007	14:15:33	SFOSTER	MVUCAD05
SUPP	10/24/2007	15:29:00	SFOSTER	MVUCAD05
SUPP	10/24/2007	16:11:46	SFOSTER	MVUCAD05
SUPP	10/24/2007	16:17:41	SFOSTER	MVUCAD05
SUPP	10/24/2007	16:22:47	SFOSTER	MVUCAD05
SUPP	10/24/2007	16:36:37	SFOSTER	MVUCAD05
SUPP	10/24/2007	16:37:42	SFOSTER	MVUCAD05

Detail Report-All Segments

SUPP	10/24/2007	16:50:52	SFOSTER	MVUCAD05
SUPP	10/24/2007	17:37:41	SFOSTER	MVUCAD05
SUPP	10/24/2007	17:51:11	SFOSTER	MVUCAD05
SUPP	10/24/2007	18:46:11	SFOSTER	MVUCAD05
SUPP	10/25/2007	8:01:49	SFOSTER	MVUCAD05
SUPP	10/25/2007	8:44:41	SFOSTER	MVUCAD05
SUPP	10/25/2007	10:33:15	SFOSTER	MVUCAD05
SUPP	10/25/2007	10:37:55	SFOSTER	MVUCAD05
SUPP	10/25/2007	10:54:10	SFOSTER	MVUCAD05
SUPP	10/25/2007	11:25:06	SFOSTER	MVUCAD05
SUPP	10/25/2007	11:51:45	SFOSTER	MVUCAD05
SUPP	10/25/2007	13:26:43	SFOSTER	MVUCAD05
SUPP	10/25/2007	13:34:52	SFOSTER	MVUCAD05
SUPP	10/25/2007	13:41:24	SFOSTER	MVUCAD05
SUPP	10/25/2007	14:14:50	SFOSTER	MVUCAD05
SUPP	10/25/2007	14:29:10	SFOSTER	MVUCAD05
SUPP	10/25/2007	14:36:37	SFOSTER	MVUCAD05
REC			LCRAIG	MVUCAD02

1 – VIOLATION(S)

2 – SUMMARY

3 – SUBJECT(S)/SUSPECT(S)

4 – VICTIM(S)/WITNESS(ES)

5 – EVIDENCE

6 – CONDITIONS

7 – VEHICLE(S)/EQUIPMENT

8 – PROPERTY

9 – NARRATIVE

10 – ATTACHMENTS

Health & Safety Code Section 13001; Causing a Fire

13001. Every person is guilty of a misdemeanor who, through careless or negligent action, throws or places any lighted cigarette, cigar, ashes, or other flaming or glowing substance, or any substance or thing which may cause a fire, in any place where it may directly or indirectly start a fire, or who uses or operates a welding torch, tar pot or any other device which may cause a fire, who does not clear the inflammable material surrounding the operation or take such other reasonable precautions necessary to insure against the starting and spreading of fire.

General Order 95

Rule 44.1, Table 4

On Monday, October 22, 2007 @ 1:00 AM, CAL FIRE Battalion Chief Suzanne Todd and her Strike Team 9270c witnessed an arcing power line with fire in the San Pasqual Valley while enroute to the Witch Fire. The location of the fire was in Guejito Creek drainage on the south side of State Route 78 and ¼ mile west of Bandy Canyon Rd. N33 5.6224 W116 57.6991. This fire burned an unknown amount of acres and homes because the Guejito Fire and the Witch Fire combined into one fire.

After investigation of the origin area(s) the fire was determined to have started when energized power lines and lashing wire from a Cox Communications cable came in contact with each other.

San Diego Gas & Electric (SDG&E)/SEMPRA
9965 Carroll Canyon Rd. SD1386
San Diego , CA. 92131-1105
858-536-4007
Attn: Dean Le Brecht – Claims

COX Communications
5159 Federal Blvd.
San Diego, CA. 92105
619-266-5357
Attn: Steve Gautereaux

V-1 Unknown at this time

W-1 Gary Eidsmoe — Investigator
CAL FIRE
2249 Jamacha Rd.
El Cajon, CA. 92019
[redacted]

W-2 Suzanne Todd — Battalion Chief
CAL FIRE
Amador-El Dorado Unit
5660 Mother Lode Dr.
Placerville, CA. 95667
[redacted]

See Attachment E for written statement

W-3 Rob Wheatley — Fire Captain
CAL FIRE — E2782
[redacted]

See Attachment F for written statement. I did not interview Wheatley.

W-4 Justin Sanders — Fire Captain
CAL FIRE — E2761
[redacted]

See Attachment G for written statement. I did not interview Sanders.

W-5 Tyson Short Resident
[redacted]

Tyson was in his front yard watching the Witch Fire when he saw a flash from what appeared to be arcing power lines in Guejito Creek then saw the fire start below where the lines were arcing.

W-6 Lynnette Short Resident
[redacted]

Short is Tyson's wife and witnessed fire travel of the Guejito Fire. However she did not see the Guejito fire start.

W-7 Larry Hall Retired
San Diego Gas & Electric
619-820-3535

O-1 Dean Le Brecht Claims Management
San Diego Gas & Electric
9965 Carroll Canyon Rd.
San Diego, CA. 92131-1105
858-536-4007

Le Brecht took photographs for SDG&E

O-2 Randy Lyle Veg. Contract Manager
San Diego Gas & Electric
8315 Century Park Ct.
San Diego, CA. 92123
619-964-7460

Lyle was assisting Hall but was not interviewed.

Collected 872 plus feet of San Diego Gas & Electric power line conductor that was involved in the start of the fire.

Collected 2 pieces of damaged support cable that the COX Communications fiber optics line that was attached to a support cable and pieces of lashing wire recovered from the line and the ground.

Photographs of both cables and the damage.

All evidence collected is being held in the Monte Vista Prevention Evidence Locker.

Very strong East winds were blowing down through the San Pasqual Valley, and the Witch fire was just at the top around Weekend Villa in Ramona and about to burn down through the valley.

SITE INFORMATION

ID: KRNM
NAME: Ramona Airport
LATITUDE: 33.03750
LONGITUDE: -116.91583
ELEVATION: 1391 ft
MNET: NWS/FAA

Observations prior to selected time: October 22, 2007 - 00:00 PDT

Weather Conditions at October 21, 2007 - 23:53 PDT

	23:53	24 Hour Max	24 Hour Min
Temperature	71.1° F	77.0 at 12:53	42.1 at 4:53
Dew Point	-0.0° F	48.9 at 0:53	-0.0 at 23:53
Wet Bulb Temperature	45.7° F	49.5 at 1:53	41.5 at 6:53
Relative Humidity	6%	100 at 2:45	6 at 21:36
Wind Speed	35 mph from ENE	35 at 23:22	0 at 0:15
Wind Gust	44 mph	49 at 22:53	22 at 18:32
Pressure	28.63 in	28.65 at 22:07	28.40 at 2:48
Sea level pressure	30.07 in	30.08 at 22:53	29.84 at 2:53
Altimeter	30.11 in	30.14 at 22:07	29.87 at 2:48
1500 m Pressure	25.13in	25.15 at 22:07	24.93 at 2:48
Weather conditions	smoke	-	-
Visibility	2.50 miles	10.00 at 7:53	0.25 at 0:53
Ceiling	-	3300 at 18:32	100 at 0:36

Observations prior to selected time: October 23, 2007 - 00:00 PDT

Weather Conditions at October 22, 2007 - 23:53 PDT

23:53	24 Hour Max	24 Hour Min
-	75.9 at 11:53	68.0 at 3:53
-	8.6 at 3:11	-0.4 at 8:15
-	48.4 at 11:53	44.6 at 7:16
-	9 at 2:53	6 at 9:18
-	36 at 1:50	22 at 3:53
-	53 at 6:51	31 at 5:21
0.00 in	28.73 at 8:53	28.64 at 0:10
-	30.18 at 8:53	30.08 at 0:53
-	30.22 at 8:53	30.12 at 0:10
0.00in	25.22 at 8:53	25.13 at 0:10

Equipment involved was a 12kv power line conductor and a COX Communications fiber optics lashing wire spanning below the power lines. The distance between the two poles was 872 feet.

Property where the Guejito Fire had started was San Diego County (SRA) then the fire immediately burned onto San Diego City.

On Monday, October 22, 2007 @ 1:00 AM, a vegetation fire was reported by W-2 CAL FIRE Battalion Chief Suzanne TODD. She reported the location in the river bottom of the Guejito Creek just south of the Guejito Creek Bridge which is in the San Pasqual Valley.

W-2 TODD with Strike Team 9270c from Amador-El Dorado witnessed an arcing power line with fire in the Guejito Creek while enroute to the Witch Fire. The location of the fire was in Guejito Creek drainage on the south side of State Route 78 and ¼ mile west of Bandy Canyon Rd.

W-2 TODD reported the fire to the Monte Vista Emergency Command Center (MVUECC) and then had her Strike Team start suppression efforts. They did not attempt to go into the creek bottom due to the already sizable and fast spreading fire and being unfamiliar with the area, so they turned around on Hwy 78 to try to cut the fire off.

As of this report the acreage of the fire and the homes that were damaged or destroyed are unknown, due to the Guejito Fire and the Witch Fire merging at some point.

On Thursday, November 1, 2007, I was requested by Fire Prevention Bureau Chief Jim Garrett to locate and investigate Origin and Cause of the Guejito Fire. I was to determine whether it started in State Responsibility Lands (SRA) or in San Diego City. According to maps the fire started in SRA and immediately burned in a westerly direction onto San Diego City land.

Upon my initial assessment and after talking to W-2 TODD by cell phone, I found where the fire had started in the river bottom. It was possible there were multiple origins.

I asked her if she could return to the scene and point to where she saw the arcing and the fire start.

When W-2 TODD arrived, she told me that while they were traveling east bound on Hwy 78 and just past the San Diego Wild Animal Park, she noticed what she described as a "light show" coming from ahead of them. As the Strike Team got to the Guejito Creek bridge W-2 TODD noticed that the light show was arcing power lines. She also saw that a fire had started in the vegetation below where the lines were arcing. (See attachment E, Suzanne Todd statement.)

W-2 TODD noted the location as on the south side of Hwy 78 at the Guejito Creek Bridge. She said she gave that location to the MVUECC then directed her Strike Team to take action on the fire.

As I was looking at and flagging fire spread indicators I was also examining the power lines overhead to see if there was any indication of arcing. In the same span and below the power lines was a Cox Cable Communications line. I noticed a small gauged lashing wire that was wound around the communication cable for support. I looked at the whole length of the cable and noticed the lashing had come undone in several locations.

In two locations, I noticed that some of the lashing was dangling from the Cox cable line; the ends about 10 – 12 feet from the ground. I also found some of the same type wire lashing lying on the ground in the origin area. There was also some leftover undamaged lashing wire on the ground that appeared to have been left from a previous repair job.

On the ground in the origin area I noticed that there was some lashing wire which had been sooted and burned with beaded ends. It looked as if these pieces had come from the support cable.

I also noticed where it appeared that there had been some electrical contact with the leftover undamaged lashing wire on the ground and where electricity had followed the wire that was buried in the dirt giving it the appearance of dark veins following the wire under the dirt.

Looking at the wire ends that were dangling from the cable, I noticed they were also sooted and beaded. Looking at the power line through binoculars, which I called the south power line, I saw some damage to a strand and also found three spots where the lashing wire from the fiber optics cable was fused to the power line.

I interviewed W-5 Tyson SHORT who lives about 1000 feet east of where the fire had started. He told me he was watching the Witch Fire burning toward his house. During that time he noticed a bright flash behind him. He looked at toward the flash and saw arcing.

W-5 SHORT then said after seeing the arcing the second time he saw the fire start underneath where the arcing was. (See attachment H, Tyson Short statement.)

I also interviewed W-9 Lynnette SHORT, Tyson's wife. She told me shortly after the Guejito fire started she took her baby and they drove out of the area via Bandy Canyon Rd. This road goes from Hwy 78 in San Pasqual Valley to Highland Valley Rd. in Rancho Bernardo. She said at that time the Witch Fire appeared to be on the hill above the San Pasqual Academy just east of them about ½ mile. W-9 SHORT told me she watched the Guejito fire burn toward the west and south toward Bandy Canyon Rd. below her.

The Guejito fire eventually did burn over Bandy Canyon Rd. toward Rancho Bernardo.

While I was investigating, W-7 Larry HALL, O-1 Dean LE BRECHT and O-2 Randy LYLE, who were representing San Diego Gas & Electric (SDG&E/Sempra) arrived. I explained my findings and HALL thought the same as to the cause of the fire.

On Friday, November 2, 2007 I met with HALL, LYLE and LE BRECHT again and HALL told me that a SDG&E crew was coming out to replace the damaged span. Before the wire was put on a spool, the crew lowered the wire enough so we could inspect and photograph it.

After closer inspection, there were two areas on the power line where one strand of the wire had been burned through and three areas where the lashing wire from the COX Cable line had been fused to the power line..

The wire was put on a large spool and I attached a CAL FIRE evidence tag to it before leaving the scene.

Due to the size of the spool I agreed to SDG&E taking it to their facility in Escondido for the night and locked up for security. The next day, the wire was transferred to a smaller spool and taken to the SDG&E facility in El Cajon to be secured. On November 11, 2007, the spool was transferred to our CAL FIRE evidence locker.

On November 3, 2007 I met with Cox Cable representatives at the origin area. I showed them my findings as to what I thought what happened. They brought their service trucks and lowered the support cable to which the fiber optics cable was lashed. On that cable there were two areas where one strand had burned completely through and several areas showing arcing.

The fiber optics cable had some minor marks and some sooting but was not damaged enough to take out of service. The Cox Communications cable was not removed from service.

I cut and took into evidence the two pieces of support cable that were burned through. The rest of the cable was spooled and taken by Cox Communications.

W-10 HALL told me when the arcing occurred SDG&E equipment recorded a slight interruption in that line at 12:59 AM. Other than that there was no interruption in service from either the SDG&E lines or the Cox Communications cable.

OPINIONS AND CONCLUSIONS:

With the witness statements from Suzanne Todd and Tyson Short and finding the lashing wire from the COX Cable fiber optics line fused to the south power line in several areas, and finding some of that wiring on the ground sooted and beaded, it is my opinion that sometime during the wind event the lashing wire securing the fiber optics cable and the power line had come in contact with each other causing an arc and starting the fire. I also eliminated all other possible ignition sources, such as campfire, smoking and vehicles.

Case Disposition

The case remains open and additional information and material items will be requested from San Diego Gas & Electric or COX Communications. Physical evidence in their possession and any additional physical evidence collected will be examined by technical experts for opinions and conclusions.

Fire Cause Determination

Lightning (Detection Method)
No lightning in the area during the whole month of October.

Equipment Use (Exhaust, Brake Shoe, Aircraft, Vehicle Fire, Grinding, Other)
Origin area(s) were about 150 feet from the nearest road.

Smoking (Tobacco, Other)
Even though humidity's were low, nobody was seen in the origin area and no cigarette butts were found.

Campfire (Cooking, Warming, Ceremonial, Other)
No evidence of camping was found at or near the origin.

Debris Burning (Land, Slash, Refuse, Pile, Barrel, Agriculture/Dooryard, Clearance, Screen, Permit, Other)
No evidence of debris burning was found near or in the origin of the fire.

Railroad (Ignition Activities Associated with Railroad Companies)
No railroad in the area

Incendiary (Ignition Component / Material First Ignited)
No evidence of any incendiary type devices were found in the origin area.

Children (Ignition Activities Associated with Children)
No children live at or near the location or were seen in the area prior to the fire.

Miscellaneous (Blasting, Structure, Fireworks, Pest Control, Logging, Power line, Glass, Target Shooting, Spontaneous Combustion, Other)
A Power line and Cox Communications Cable coming into contact with each other due to the high winds was the most probable cause of the fire.

A. CAL FIRE Fire Report

B. Preliminary Fire Investigation (LE-66)

C. Scene Sketch/Topographic map of origin area

D. General Order 95, Rule 37

E. Statement from W-2 Suzanne Todd, CAL FIRE Battalion Chief

F. Statement from W-3 Rob Wheatley, CAL FIRE Captain

G. Statement from W-4 Justin Sanders, CAL FIRE Captain

H. Statement from W-5 Tyson & W-6 Lynnette Short

I. Letter of Demand for Evidence to Cox Cable and to San Diego Gas & Electric/Sempra

J. Photo and Evidence Report, Spooled Wire from SDG&E

K. Perimeter Map

L. Photo and Evidence Report and Scene Photo's

Gary S. Eidsmoe
Investigator
Retired Annuitant

STATE OF CALIFORNIA
DEPARTMENT OF FORESTRY AND FIRE PROTECTION
LE-66 *(Rev. 6/00)*

PRELIMINARY FIRE INVESTIGATION

CONFIDENTIAL

LOSS | SAVE

1.Estimated Start	Reported	2.Location	3.Fire ID
Date: 10/22/07 Time: 0100	Date: 10/22/07 Time: 0100	Address: Hwy 78 & Guejito Cr. Bridge City: Escondido, CA.	Batt: 6 Inc # CA-MVU-010484 Fire #: Fire Name: Guejito

4. What Burned? Vegetation | Acres Burned:

5. Reporting Party: Suzanne Todd, BC Amador/El Dorado | Telephone:

6. Codes: 1. **V**ictim 2. **W**itness 3. **S**uspect/Subject 4. **T**enant/Owner

Code:	Name:	CDL#/ID:	Sex:	Hair:	Eyes:	Hgt:	Wt:	DOB/Age
W-2	Suzanne Todd		F					
Address: 5660 Mother Lode Dr.				City: Placerville, CA. 95667			Telephone: 530-622-3858	
Code:	Name:	CDL#/ID:	Sex:	Hair:	Eyes:	Hgt:	Wt:	DOB/Age
W-3	Tyson Short		M					
Address: 17331 San Pasqual Valley Rd.				City: Escondido, CA.			Telephone: 760-644-3557	
Code:	Name:	CDL#/ID:	Sex:	Hair:	Eyes:	Hgt:	Wt:	DOB/Age
Address:				City:			Telephone:	
Code:	Name:	CDL#/ID:	Sex:	Hair:	Eyes:	Hgt:	Wt:	DOB/Age
Address:				City:			Telephone:	

7. General Remarks (such as statements, observations, license numbers, equipment ID, evidence, etc.):

Both W-2 Todd and W-3 Short saw powerlines arc in the Guejito Creek bottom and the saw the fire start.

8. Wind Speed/Direction	Temp: °	Humidity: %	9. Photo? ☐Yes ☐No Taken by whom? Gary Eidsmoe FCS #52

10. Insured? ☐Yes ☐No Company/Agent:

11. Before fire fighters arrived, what suppression efforts were taken?	
None	By whom?
	What tools?

12. What caused the fire? (State opinions and conclusions)

According to witnesses and evidence at the origin area, the cause of the fire was wire used to attach fiber optics cable to a support cable and unwound and made contact a with powerline conductor, causing an arc.

13. Debris Burning:

Did fire escape control? ☐Yes ☐No	Burning permit? ☐Yes #	☐ No	Permit required? ☐Yes	☐No
☐ Piled debris	Clearance:	Length:	Width:	Height:
☐ Incinerator	Clearance:	Screen: ☐Yes ☐No	Screen mesh size:	

14. Railroad

Train #:	Time Passed:	Direction of Travel:	Mile Post #:

15. Power Line

ID Pole:	☐ +750 volts ☐ -750 volts	Tree Involved? ☐Yes ☐No	Remarks:	Distance of Limbs to Conductor:
Utility Representative: Telephone #:		Conductor/Pole Clearance: ☐Yes ☐ No		

16. Sketch the area where the fire originated

Distance measured by: ☐Tape ☐ Pace ☐ Estimate Sec. Township Range ⇑ N

18. Action

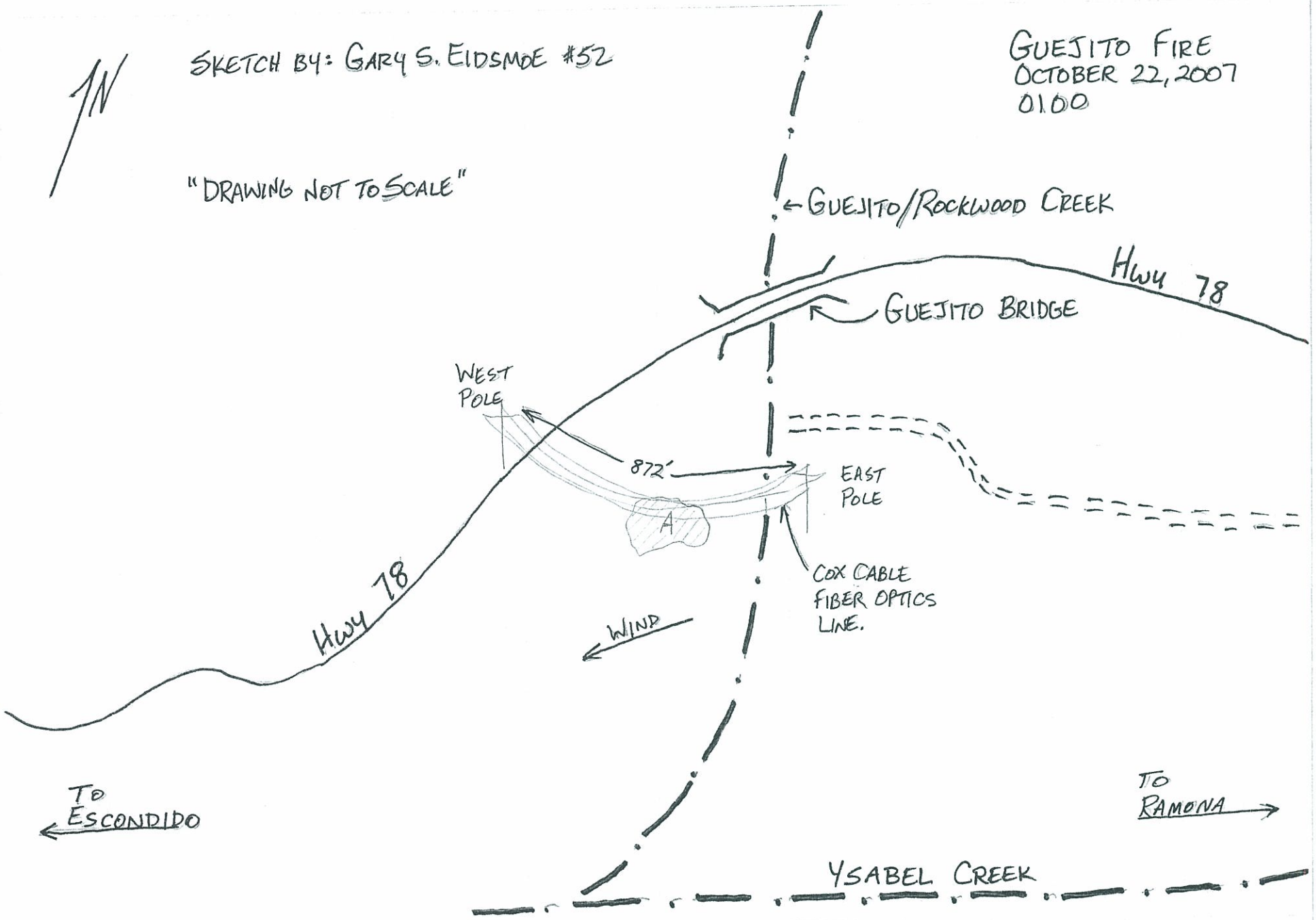
None	Investigation Continued
Criminal	Civil Litigation
Judicial	Administrative

17. Did the fire burn the property of others? ☐Yes ☐No

19. See Supplement? ☐Yes ☐No

20. Signature	Printed Name:	Title:	Badge #:	Date:
	Gary S. Eidsmoe	FCS #52	52	01/17/08
21. Reviewed by:	Title:			Date:

7540-130-0167


SKETCH BY: GARY S. EIDSMOE #52
GUEJITO FIRE
OCTOBER 22, 2007
01.00
1N
"DRAWING NOT TO SCALE"
GUEJITO/ROCKWOOD CREEK
HWY 78
GUEJITO BRIDGE
WEST POLE
872'
EAST POLE
A
COX CABLE FIBER OPTICS LINE.
WIND
HWY 78
TO ESCONDIDO
TO RAMONA
YSABEL CREEK

RULE 2 & 2

4. Mature trees whose trunks and major limbs are located more than six inches, but less than 18 inches, from primary distribution conductors are exempt from the 18-inch minimum clearance requirement under this rule. The trunks and limbs to which this exemption applies shall only be those of sufficient strength and rigidity to prevent the trunk or limb from encroaching upon the six-inch minimum clearance under reasonably foreseeable local wind and weather conditions. The utility shall bear the risk of determining whether this exemption applies, and the Commission shall have final authority to determine whether the exemption applies in any specific instance, and to order that corrective action be taken in accordance with this rule, if it determines that the exemption does not apply.

Note: Added October 22, 1997 by Decision No. 97-10-056.

36 Pole Clearances from Railroad Tracks

Poles or other supporting structures which are set in proximity to railroad tracks shall be so located that the clearance requirements of General Order 26-D are met. The clearance requirements of General Order 26-D, applicable to pole line construction, are contained in Appendix E.

Note: Revised February 1, 1948 by Supplement No. 1 (Decision No. 41134, Case No. 4324).

37 Minimum Clearances of Wires above Railroads, Thoroughfares, Buildings, Etc.

Clearances between overhead conductors, guys, messengers or trolley span wires and tops of rails, surfaces of thoroughfares or other generally accessible areas across, along or above which any of the former pass; also the clearances between conductors, guys, messengers or trolley span wires and buildings, poles, structures, or other objects, shall not be less than those set forth in Table 1, at a temperature of 60_ F. and no wind.

The clearances specified in Table 1, Case 1, Columns A, B, D, E and F, shall in no case be reduced more than 5% below the tabular values because of temperature and loading as specified in Rule 43. The clearances specified in Table 1, Cases 2 to 6 inclusive, shall in no case be reduced more than 10% below the tabular values because of temperature and loading as specified in Rule 43.

The clearance specified in Table 1, Case 1, Column C (22.5 feet), shall in no case be reduced below the tabular value because of temperature and loading as specified in Rule 43.

The clearances specified in Table 1, Cases 11, 12 and 13, shall in no case be reduced below the tabular values because of temperatures and loading as specified in Rule 43.

Where supply conductors are supported by suspension insulators at crossings over railroads which transport freight cars, the initial clearances shall be sufficient to prevent reduction to clearances less than 95% of the clearances specified in Table 1, Case 1, through the breaking of a conductor in either of the adjoining spans.

Rule 37

Where conductors, dead ends, and metal pins are concerned in any clearance specified in these rules, all clearances of less than 5 inches shall be applicable from surface of conductors (not including tie wires), dead ends, and metal pins, except clearances between surface of crossarm and conductors supported on pins and insulators (referred to in Table 1, Case 9) in which case the minimum clearance specified shall apply between center line of conductor and surface of crossarm or other line structure on which the conductor is supported.

All clearances of 5 inches or more shall be applicable from the center lines of conductors concerned.

Note: Modified January 8, 1980 by Decision No. 91186, March 9, 1988 by Resolution E-3076; and November 6, 1992 by Resolution SU-15, September 20, 1996 by Decision 96-09-097 and January 23, 1997 by Decision 97-01-044.

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Table 1: Basic Minimum Allowable Vertical Clearance of Wires above Railroads, Thoroughfares, Ground or Water Surfaces; Also Clearances from Poles, Buildings, Structures or Other Objects (nn) (Letter References Denote Modifications of Minimum Clearances as Referred to in Notes Following This Table)

		Wire or Conductor Concerned

	Clearance between wires, cables and conductors not supported on the same poles, vertically at crossings in spans and radially where colinear or approaching crossings											
1	Span wires, guys and messengers (b)	18 (c)	48 (d, e)	24 (e)	24 (e)	36 (f)	36	72	72	78	78 (gg)	138 (hh)
2	Trolley contact conductors, 0 - 750 volts	48 (d, e)	-	48 (d)	48 (d, h)	48	72	96	96	96	96 (gg)	156 (hh)
3	Communication conductors	24 (e)	48 (d)	24	48 (i)	48 (dd)	72	96	96	96	96 (gg)	156 (hh)
4	Supply conductors, service drops and trolley feeders, 0 - 750 volts (qq)	24 (e)	48 (d, h)	48 (i)	24	48	48	96 (oo)	96	96	96(gg)	156 (hh)
5	Supply conductors, 750 - 7,500 volts (qq)	36 (f)	48	48 (dd)	48	48 (h)	72	96 (oo)	96	96	96(gg)	156 (hh)
6	Supply conductors, 7,500 - 20,000 volts (qq)	36	72	72	48	72	72	96 (oo)	96	96	96 (gg)	156 (hh)
7	Supply conductors, more than 20,000 volts (qq)	72 (g)	96 (g)	96 (g)	96 (g, oo)	96 (g, oo)	96 (g, oo)	96 (g, oo)	96 (g)	96	96 (gg)	156 (hh)
	Vertical separation between conductors and/or cables, on separate crossarms or other supports at different levels (excepting on related line and buck arms) on the same pole and in adjoining midspans											
8	Communication Conductors and Service Drops	-	-	12 (j)	48 (k, l, m, n, pp)	48 (k)	72 (m n)	72 (m)	72	78	87 (gg)	147 (hh)
9	Supply Conductors Service Drops and Trolley Feeders, 0 - 750 Volts	-	-	48 (k, l, m, n, pp)	24 (h, k, m, o)	48 (k, m, p)	48 (k, m, q)	72 (m, nn)	72	78	87 (gg)	147 (hh)

Table 2 (Continued)

Case No.	Nature of Clearance	A Span Wires (Other than Trolley Span Wires) Overhead Guys and Messengers	B Communication Conductors (Including Open Wire, Cables and Service Drops), Supply Service Drops of 0 - 750 Volts	C Trolley Contact, Feeder and Span Wires, 0 - 5,000 Volts	D Supply Conductors of 0 - 750 Volts and Supply Cables Treated as in Rule 57.8	E Supply Conductors and Supply Cables, 750 - 22,500 Volts	F Supply Conductors and Supply Cables, 22.5 - 300 kV	G Supply Conductors and Supply Cables, 300 - 550 kV (mm)
1	Crossing above tracks of railroads which transport or propose to transport freight cars (maximum height 15 feet, 6 inches) where not operated by overhead contact wires. (a) (b) (c) (d)	25 Feet	25 Feet	22.5 Feet	25 Feet	28 Feet	34 Feet	34 Feet (kk)
2	Crossing or paralleling above tracks of railroads operated by overhead trolleys. (b) (c) (d)	26 Feet (e)	26 Feet (e) (f) (g)	19 Feet (h) (i) (eee)	27 Feet (e) (g)	30 Feet (g)	34 Feet (g)	34 Feet (g) (kk)
3	Crossing or along thoroughfares in urban districts or crossing thoroughfares in rural districts. (c) (d)	18 Feet (j) (k) (ii)	18 Feet (j) (l) (m) (ii) (aa)	19 Feet (hh) (eee)	20 Feet (ii)	25 Feet (o) (ii)	30 Feet (o) (ii)	30 Feet (o) (ii) (kk)
4	Above ground along thoroughfares in rural districts or across other areas capable of being traversed by vehicles or agricultural equipment.	15 Feet (k)	15 Feet (m) (n) (p)	19 Feet (eee)	19 Feet	25 Feet (o)	30 Feet (o) (p)	30 Feet (o) (kk)
5	Above ground in areas accessible to pedestrians only	8 Feet	10 Feet (m) (q)	19 Feet (eee)	12 Feet	17 Feet	25 Feet (o)	25 Feet (o) (kk)
	Vertical clearance above walkable surfaces on buildings, (except generating plants or substations) bridges or other structures which do not ordinarily support conductors, whether attached or unattached.	8 Feet (r)	8 Feet (r)	8 Feet	8 Feet	12 Feet	12 Feet	20 Feet (ll)
6a	Vertical clearance above non-walkable surfaces on buildings, (except generating plants or substations) bridges or other structures, which do not ordinarily support conductors, whether attached or unattached	2 Feet	8 Feet (yy)	8 Feet	8 Feet (zz)	8 Feet	8 Feet	20 Feet
7	Horizontal clearance of conductor at rest from buildings (except generating plants and substations), bridges or other structures (upon which men may work) where such conductor is not attached thereto (s) (t)	-	3 Feet (u)	3 Feet	3 Feet (u) (v)	6 Feet (v)	6 Feet (v)	15 Feet (v)
8	Distance of conductor from center line of pole, whether attached or unattached (w) (x) (y)	-	15 inches (s) (aa)	15 inches (aa) (bb) (cc)	15 inches (o) (aa) (dd)	15 or 18 inches (o) (dd) (ee) (jj)	18 inches (dd) (ee)	Not Applicable

(zz) May be reduced to 2 feet for conductors insulated in accordance with 20.8-G

(aaa) Special requirements for communication and supply circuits energized at 0 - 750 volts 35

(bbb) May be reduced for conductor of less than 60,000 volts when protected from abrasion and grounding by contact with tree 35

(ccc) For 22.5 kV to 105 kV, minimum clearance shall be 18 inches.

(ddd) Clearances in this case shall be maintained for normal annual weather variations, rather than at 60 degrees, no wind.

(eee) May be reduced to 18 feet if the voltage does not exceed 1000 volts and the clearance is not reduced to more than 5% below the reduced value of 18 feet because of temperature and loading as specified in Rules 37 and 43.

Note: Revised February 1, 1948 by Supplement No. 1 (Decision No. 41134, Case No. 4324); January 2, 1962 by Resolution E-1109; February 7, 1964 by Decision No. 66707; March 29, 1966 by Decision No. 70489; August 9, 1966 by Decision No. 71094; September 18, 1967 by Decision No. 72984; March 30, 1968 by Decision No. 73813; January 8, 1980 by Decision No. 91186; March 9, 1988 by Resolution E-3076; November 21, 1990 by Resolution SU-6; January 21, 1992 by Resolution SU-10; and November 6, 1992 by Resolution SU-15, September 20, 1996 by Decision 96-09-097, October 9, 1996 by Resolution SU-40 and January 23, 1997 by Decision 97-01-044.

Rule 37, Table 1

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38 Minimum Clearances of Wires from Other Wires

The minimum vertical, horizontal or radial clearances of wires from other wires shall not be less than the values given in Table 2 and are based on a temperature of 60° F. and no wind. Conductors may be deadended at the crossarm or have reduced clearances at points of transposition, and shall not be held in violation of Table 2, Cases 8-15, inclusive.

The clearances in Table 2 shall in no case be reduced more than 10 percent because of temperature and loadi as specified in Rule 43 or because of a difference in size or design of the supporting pins, hardware or insulato All clearances of less than 5 inches shall be applied between surfaces, and clearances of 5 inches or more shall be applied to the center lines of such items.

Note: Revised May 22, 1990 by Resolution No. SU-5.

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Table 2: Basic Minimum Allowable Clearance of Wires from Other Wires at Crossings, in Midspans and at Supports (Letter References Denote Modifications of Minimum Clearances as Referred to in Notes Following This Table) All Clearances are in Inches

		Other Wire, Cable or Conductor Concerned										
					Supply Conductors (Including Supply Cables)							
Case No.	Nature of Clearance and Class and Voltage of Wire, Cable or Conductor Concerned	A Span Wires, Guys and Messengers	B Trolley Contact Conductors 0 - 750 Volts	C Communication Conductors (Including Open Wire, Cables and Service Drops)	D 0 - 750 Volts (Including Service Drops) and Trolley Feeders (a)	E 750 - 7,500 Volts	F 7,500 - 20,000 Volts	G 20,000 - 35,000 Volts	H 35,000 - 75,000 Volts	I 75,000 - 150,000 Volts	J 150,000 - 300,000 Volts	K (kk) 300,000 - 550,000 Volts

9	Distance of conductor from surface of pole crossarm or other overhead line structure upon which it is supported, providing it complies with case 8 above (x)	-	3 inches (aa) (ff)	3 inches (aa) (cc) (gg)	3 inches (aa) (dd) (gg)	3 inches (dd) (gg) (jj)	1/4 Pin Spacing Shown in Table 2 Case 15 (dd)	1/2 Pin Spacing Shown in Table 2 Case 15 (dd)

Table 1 (Continued)

		Wire or Conductor Concerned						
Case No.	Nature of Clearance	A Span Wires (Other than Trolley Span Wires) Overhead Guys and Messengers	B Communication Conductors (Including Open Wire, Cables and Service Drops), Supply Service Drops of 0 - 750 Volts	C Trolley Contact, Feeder and Span Wires, 0 - 5,000 Volts	D Supply Conductors of 0 - 750 Volts and Supply Cables Treated as in Rule 57.8	E Supply Conductors and Supply Cables, 750 - 22,500 Volts	F Supply Conductors and Supply Cables, 22.5 - 300 kV	G Supply Conductors and Supply Cables, 300 - 550 kV (mm)
10	Radial centerline clearance of conductor or cable (unattached) from non-climbable street lighting or traffic signal poles or standards, including mastarms, brackets and lighting fixtures	-	1 Foot (u) (rr) (ss)	15 inches (bb) (cc)	3 Feet (oo)	6 Feet (pp)	10 Feet (qq)	10 Feet (ll)
11	Water areas not suitable for sailboating (tt) (uu) (ww) (xx)	15 Feet	15 Feet	-	15 Feet	17 Feet	25 Feet	25 Feet (kk)
12	Water areas suitable for sailboating, surface area of: (tt) (vv) (ww) (xx)							
	(A) Less than 20 acres	18 Feet	18 Feet	-	18 Feet	20 Feet	27 Feet	27 Feet (kk)
	(B) 20 to 200 acres	26 Feet	26 Feet	-	26 Feet	28 Feet	35 Feet	35 Feet (kk)
	(C) Over 200 to 2,000 acres	32 Feet	32 Feet	-	32 Feet	34 Feet	41 Feet	41 Feet (kk)
	(D) Over 2,000 acres	38 Feet	38 Feet		38 Feet	40 Feet	47 Feet	47 Feet (kk)
13	Radial clearance of bare line conductors from tree branches or foliage (aaa) (ddd)	-	-	18 inches (bbb)	-	18 inches (bbb)	1/4 pin spacing shown in table 2, Case 15 (bbb) (ccc)	1/2 pin spacing shown in table 2, Case 15

References to Rules Modifying Minimum Clearances in Table 1 Rule Rule

(a) Shall not be reduced more than 5% because of temperature or loading 37

1 Supply lines 54.4-B1

2 Communication lines 84.4-B1

(b) Shall be increased for supply conductors on suspension insulators, under certain conditions 37

(c) Special clearances are provided for traffic signal equipment 58.4-C

(d) Special clearances are provided for street lighting equipment 58.5-B

(e) Based on trolley pole throw of 26 feet. may be reduced where suitably protected 56.4-B2

1 Supply guys 56.4-B2

Table 4: Minimum Safety Factors

Element of Line	Grades of Construction			
	Grade "A"	Grade "B"	Grade "C"	Grade "F"
Conductors, splices and conductor fastenings (other than tie wires)	2	2	2	1
Pins	2	2	2	1
Pole line hardware	2	2	2	2
Line Insulators (mechanical)	3	2	2	2
Guy insulators (mechanical)				
Interlocking	2	2	2	2
Noninterlocking wood	3	3	3	-
Noninterlocking glass fiber	3	2 (a)	2 (b)	-
Guys, except in light loading rural districts	2	2	2	1.25
Guys in light loading rural districts	2	1.5	1.5	1.25
Messengers and span wires	2	2	2	2
Foundations against uplift	1.5	1.5	1.5	-
Foundations against depression	3	2	2	-
Poles Towers and Structures				
Wood poles	4	3	2	1
Metallic service and meter poles	-	2	2	-
Structural or tubular metallic poles, towers, structures, crossarms and metallic members of foundations	1.5 (c)	1.25 (c)	1.25 (c)	-
Reinforced concrete poles	4	3	3	-
Prestressed concrete poles, structures and crossarms	1.8	1.5	1.5	-
Other structural materials	1.5	1.25	1.25	-
Crossarms				
Wood	2	2	2	1
Steel	1.5	1.25	1.25	-
Concrete	1.8	1.5	1.5	-
Other structural material	1.5	1.25	1.25	-

(a) Insulators are to be replaced before safety factors have been reduced (due to deterioration or changes in construction, arrangement, or other conditions subsequent to installation) to less than 95 percent of the safety factor specified in Rule 44.1.

(b) Insulators are to be replaced before safety factors have been reduced (due to deterioration or changes in construction, arrangement, or other conditions subsequent to installation) to less than 75 percent of the safety factor specified in Rule 44.1.

On October 22, 2007, at approximately 0100 hours, my Strike Team and I were enroute to the Witch Fire in San Diego County. We were traveling east on Highway 78, east of the San Diego Wild Animal Park.

While driving I saw multiple flashes in general direction of travel; the flashes were similar to lightening in color and intensity.

Approximately two turns in the road ahead of where I noted the flashes of light I came upon a small fire (size of a small vehicle) underneath the power lines on the south side of the roadway (HWY 78) and near the western side of the Guajito Creek bridge. Travel time from flashes to arrival at the fire beneath the power lines was approximately 30 seconds.

I attempted to notify MVU ECC on MVU Local net of the new incident. There was no radio acknowledgement from MVU ECC to my recollection. According to telephone records, I contacted MVU ECC via my cell phone to report the new incident at Hwy 78 at Guejito Creek under the power lines. MVU replied that I was at the Witch fire. I advised that I could see the Witch fire five to six miles distant to the east, and that this was, indeed, a new and incipient stage fire, and requested initial attack dispatch of 2 STEN any type closest, 3 WT any type closest, 4 hand crews, 4 dozers type 2, in addition to my engine Strike Team. I assumed the "78" IC.

I deployed some my Strike Team resources to hold the fire on the south side of Hwy 78, and instructed the remainder of resources to turn around to head west to triage life and property risk potential.

A few minutes later the fire crossed the road to the north side of Hwy 78. Resources at scene were unable to catch the fire due to access (steep cut bank) and rate of spread. At this point there were several miles of headlights in the oncoming west-bound traffic (evacuees). We turned all evacuees around to travel east on Hwy 78, as both sides of Hwy 78 were now on fire, with fire progressing to the west.

I recontacted MVU to inquire about additional resources that were requested. MVU advised we were on our own unless we were able to flag down other resources that may be en route to the Witch fire,; MVU suggested ST3462C, ST 2025C, ST2330C.

I established the Incident Command Post (ICP) at Hwy 78 at a turnout (Witman Ranch?).Two of my Strike Team engines were in the Ranch for structure protection.

Battalion Chief "Gerry" (619) 980-3710, City of San Diego Fire, arrived an unknown amount of time later, and stated this was the "San Pasqual" fire. He confirmed that it was within the SD city limits. I offered to assist as needed, but that this was now his incident. I advised of current sit-stat and resources.
MVU Battalion Chief (O'Leary?) arrived at the incident as SDFD BC (Gerry) and I were setting initial objectives (s/o Hwy 78; w/o Highland Valley Rd.; e/o I-15). Initial priorities were to establish safety zones, structure protection only in the San Diego Wild

Animal Park, protect the City of Escondido, and local archaeological sites in the area. Gerry did not want to assume IC, BC O'Leary advised him that we were there as resources to him, and reiterated that this was San Diego City's responsibility..

Other resources and overhead arrived at the ICP I was not included in the briefing, as I was communicating with and directing initial attack incident resources (ST 9270C). No other local government resources were in communication with me or my resources, reportedly due to non-interoperability of our communications (all of the local resources were on 800Mhz).

I requested a change of tactical frequencies to provide common communication from Gerry, the IC. He stated that he was now the "East" Branch and that I could communicate with him only on White 1. I advised we were following the forward progress of the fire and had assigned my ST resources along the dynamic leading edge for life and property protection. We deployed primarily in the area of the Orfila Winery at 13455 San Paqual Road for structure protection and rescue of a reporter trapped by fire.

Later in the early morning hours (before sunrise) I was recontacted by Gerry who assigned me as Division Z, to report to Tom (Bat 6, Escondido FD) who was now the Escondido Structure Branch. I was advised that this was now the "Guejito" incident, and that Chief Brewster was the Guejito IC on White 1. My assigned resources were: ST 9270C, ST 2330C, ST 2004C, ST 2025C, ST 4800A. During the early morning hours I was also given ST 9374G, ST 9375G. Later that afternoon I was given ST 9210C. My assigned division was from Sierra Linda in the City of Escondido on the west, to San Pasqual Valley Rd. on the north, to Bandy Canyon Rd. on the east, to San Pasqual Rd./Old Milky Way on the south.

We remained assigned to the Escondido Structure Branch until approximately 0400 on October 22 when we were reassigned immediate need to the Poomacha Incident in Valley Center.

Respectfully,

Suzanne Todd
Battalion Chief
CAL FIRE
Amador-El Dorado Unit

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Respectfully,

Suzanne Todd
Battalion Chief
CAL FIRE
Amador-El Dorado Unit

Notes:

The following sequence of events commenced at approximately 0105 hours on October 22, 2007.

- while enroute to the Witch Fire
- traveling east on Highway 78 east of the San Diego Wild Animal Park
- several miles of headlights in oncoming WB traffic (evacuees)
- saw multiple flashes in general direction of travel, flashes similar to lightening
- approximately two turns in road ahead of our location upon first notice of flashes
- travel time from flash to arrival at fire approximately 30 seconds
- came upon a small fire (size of a small vehicle) underneath the power lines
- south side of roadway, west side of Guajito Creek bridge
- Attempted to notify MVU ECC on MVU Local net of new incident. No radio acknowledgement to my recollection.
- Deployed ST resources to hold fire on south side of Hwy 78, remainder of resources to turn around to head west, triage life and property risk potential.
- Made contact with MVU (via cell?) to report new incident at Hwy 78 at Guejito Creek under the power lines. MVU replied that I was at the Witch fire. I advised that I could see the Witch fire five to six miles distant to the east, and that this was, indeed, a new and incipient stage fire, and requested initial attack dispatch of 2 STEN any type closest, 3 WT any type closest, 4 hand crews, 4 dozers type 2, in addition to my engine Strike Team. I assumed the "78" IC.
- Fire crossed to north side of Hwy 78
- Recontact with MVU to inquire about additional resources that were requested. MVU advised we were on our own unless we can flag down other resources that may be en route to the Witch fire,; MVU suggested ST3462C, ST 2025C, ST2330C.
- Turned all evacuees around to travel east on Hwy 78, as both sides of Hwy were now on fire, fire progressing to the west.
- Established ICP at Hwy 78 at a turnout (Witman Ranch?).
- Battalion Chief "Gerry" (619) 980-3710, City of San Diego Fire, arrived unknown time later, stated this was the "San Pasqual" fire. He confirmed that it was within the SD city limits. I offered to assist as needed, but that this was now his incident. I advised of current sit-stat and resources.
- MVU Battalion (O'Leary?) arrived as SDFD BC and I were setting initial objectives (s/o Hwy 78; w/o Highland Valley Rd.; e/o I-15). Initial priorities were to establish safety zones, structure protection only in the San Diego Wild Animal Park, protect the City of Escondido, and local archaeological sites in the area.
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- We remained assigned to the Escondido Structure Branch until approximately 0400 on October 22 when we were reassigned immediate need to the Poomacha Incident in Valley Center.

Roster for ST 9270C
Guajito/San Pasqual/78 Fire
Start date: October 22, 0105 hours

Suzanne Todd	Strike Team Leader	530.919.4511
Justin Sanders	Fire Captain E2761	916.844.8283
Timothy Yee	Firefighter E2761	916.844.8547
Silverio Hererra	Firefighter E2761	916.837.5281
Jose Madrid	FAE E2771	530.417.3215
Erik Fiedler	Firefighter E2771	530.306.8129
Nicole Lozano	Firefighter E2771	916.508.3455
Rob Wheatley	Fire Captain E2782	530.277.8625
Scott Hertzog	Firefighter E2782	209.304.9719
Dustin Benke	Firefighter E2782	916.337.7231
Mark Brooks	Fire Captain E2753	530.417.3421
Tim McNew	Firefighter E2753	unk
Walker Exstrom	Firefighter E2753	530.417.1573
Julie Pyevach	FAE E2784	916.837.5109
Greg Schwegler	Firefighter E2784	530.957.0104
Jason Podesta	Firefighter E2784	209.768.6091

On 10-21-07 I was dispatched to the Witch Fire as part of ST 9270C. I was the operator on E2782 along with my two FF1's, Scott Hertzog and Dustin Benke. We were traveling East on Hwy.78, outside of Escondido and somewhere past the "Wild Animal Park", at approximately 0030-0100. E2782 was the last of five engines being led by B2711. The Hwy. was closed to all but evacuation traffic so there was no other traffic headed East bound, but there was an almost solid line of traffic headed West bound, towards us. The Hwy. at this point, is a two lane road and slightly winding. We could see the Witch Fire coming over the ridge several miles off in the distance. I then saw a flash in the sky similar to lightning. I asked the firefighters if they saw it and they said yes. At this point I commented that it was probably power lines slapping, as the sky was clear, so it was unlikely that it was lightning and the wind was blowing in excess of 45mph. We then saw a whole series of flashes in the sky, approx. 4-5 flashes. It appeared to be just around the corner and over a spur ridge, from our location. As we rounded the corner we saw several large power lines hanging low over the road. The other engines were on the far side of the lines along with our Strike Team Leader. Cars were still driving under the lines and it appeared that the lines might fall further so I pulled my engine diagonal across the lane to block East bound traffic, and then called the lead engine, E2761, and asked him to block West bound traffic. As I was doing this my firefighters said "fire". I looked to my right, and saw a fire approximately 3'X3', under the power lines as they sagged towards the ground. The fire was approximately 150'-200' off the road, on the South side.

The fire was burning in what appeared to be drainage or wash. The fuel was grass, brush and woody debris. I notified the Strike Team Leader and heard her call the fire in, on MVU Local. I told my firefighters to stand by, as we could not attack the fire due to the proximity of the power lines. Within seconds of my first seeing the fire, it was producing flame lengths of 30'-50' and running with the wind. I met face to face with a local Battalion Chief that was assigned to the Witch Fire and was traveling West bound, towards Escondido. Our Strike Team Leader pulled up next to us and I was assigned to take three engines and keep the fire to the South side of Hwy.78. The local BC stated that he was assigned to the Witch Fire, 5-6 miles East of our location, so our Strike Team Leader would have to take I.C. I returned to my engine and took two other engines to try and hold the road.

It had only been 5-10 minutes since we first saw the fire. I estimated the fire to be 15-20 acres, moving West. The fire was exhibiting extreme fire behavior, and spotting several hundred feet in front of itself. By the time we turned engines around and moved down the road, it had already spotted across the road in several places. All three engines attacked the spots and were able to pick them up. Just as we finished picking up the spots, a Strike Team of OES engines from Sacramento pulled up and helped hold the road. The fire had now run into an orchard and a sod farm, which funneled it away from the road and into a narrow wash approximately 300' wide.

We left the OES Strike Team to hold the road and continued back down Hwy. 78, West bound, towards Escondido, in an attempt to get ahead of the fire. We found a dirt road approximately 1/3 of a mile in front of the fires head. The road cut through the wash and tied into a sod farm. I scouted it out and decided that this would be a good place to try a firing operation. I notified the I.C. of our intentions and

after getting approval we fired the road in front of the main fire. When we started firing, the main fire was still several hundred yards away. We fired the road from the sod farm over to the orchard near Hwy 78 without problem. We had 50' of good black when the main fire hit. It never even slowed down. First it spotted everywhere and then the fire front hit and washed right past us. We left one engine to protect a structure as the fire moved by and headed back out to Hwy. 78 to try, once again, to get in front of the fire. We took the rest of the strike team West on 78 towards Escondido. As we passed the fire front again, we saw spot fires on the side of a mountain over half a mile in front of the fire. At this point we realized that our only option now was to start structure protection and evacuation in front of the fire.

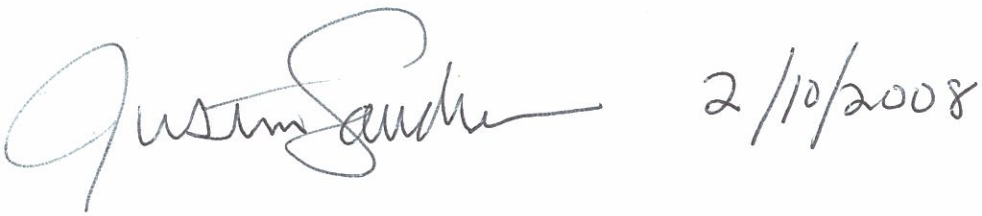
Our next stop was San Pasqual Valley Rd. several miles in front of the fire. The wind continued to blow in excess of 45mph, and the fire behavior became even more extreme with flame lengths over 100'. We spent the next 30 hours in the San Pasqual and East Escondido area before being reassigned to the Poomacha Fire.

Rob Wheatley
Fire Captain

1-26-08

On October 22, 2007 @ approximately 0100 hours while assigned to Strike Team 9270C, on Engine 2761, I (Justin Sanders, Fire Captain) witnessed the following:

While driving E2761 East on Highway 78 towards the “Witch” fire, I saw two bright flashes of light approximately 3 minutes apart in front of me. I thought the bright flashes of light were Arcing Power Lines. I continued to drive towards the “Witch” fire and when I passed the "Wild Animal Park" on Hwy 78, I saw on the opposite side of the road, a small 40' X 40' fire burning under the High Voltage Power Lines. The High Voltage Power Lines were on the ground and they were in the middle of the fire. With the current weather conditions and the dangers of working around live High Voltage Power Lines, the Strike Team of Engines utilized defensive firefighting tactics (Indirect Attack) to try and put out the fire.



2/10/2008

Justin Sanders
Fire Captain
CAL-FIRE
(530)622-3858

Witness detail of Witch & Guejito fires – October 2007

I was at home on the evening of October 21 2007 during a Santa Anna wind event. Earlier that afternoon I witnessed smoke coming from Ramona. The news reported that a fire had started near Witch Creek, east of Ramona. It was named the Witch fire. The Santa Anna winds were carrying the Witch fire smoke in a west – southwest direction, just south of my home.

10:00 p.m.
The winds continued to blow harder, and the smoke was beginning to settle in the San Pasqual valley where my home is. Once darkness fell, the glow of the Witch fire was visible east of our home in the Clevenger Canyon. I heard a report that the fire would eventually crest the hills above San Pasqual, and head toward Highland valley – so I began to prepare the house.

12:45 a.m.
While outside my home I saw a couple of flashes in the direction of our corn field (west of the house). The flashes were in the area of the power lines that run east-west over our property. The wind continued to pick up speed.

1:00 a.m.
While outside my home I witnessed another flash in the direction of our corn field (west of the house). The flash appeared to be an arc from a power line down to the ground. This time the flash resulted in a fire start. The fire grew very rapidly. Once it was established I could see that it had started in the Guejito creek, just west of our property. The fire started down the riverbed, in a southwest direction.

1:30 a.m.
The head of the fire that started in the Guejito creek was almost out of sight. It appeared to have met with the Santa Ysabel creek which bisects the Guejito creek.

2:30 a.m.
The Witch fire was cresting the hills above the San Pasqual Academy – on the south side of the San Pasqual Valley. The fire began to back down the north-facing slopes, and continue west along the ridge.

2:55 a.m.
The Witch fire had backed all the way down the slopes, and met with the San Pasqual Academy. The fire at the top of the ridge was continuing west. Embers were reaching our property from the Witch fire.

5:00 a.m.
Smoke from the Witch fire had become very thick – as a result, not much of the fire was visible anymore. Embers were showering down on our property. The wind continued to pick up speed. A strike team of engines came to our house.

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Smoke from the Witch fire had become very thick – as a result, not much of the fire was visible anymore. Embers were showering down on our property. The wind continued to pick up speed. A strike team of engines came to our house.

6:00 a.m.
The strike team of engines departed from our house. It appeared that part of the Witch fire was still making its way down from Clevenger canyon – east of our property.

7:30 a.m.
We could hear the Witch fire coming from the east. The wind picked up to about 70 mph, embers and debris was blowing in every direction.

7:45 a.m.
The Witch fire came full force down the Santa Ysabel creek. It leaped over the highway 78 bridge (just east of our property) and continued down the riverbed toward the west. The fire was also coming from the cemetery across the highway (east of our property).

8:15 a.m.
The main front of the fire had passed us, and continued to the west. The store across the highway (north of our property) was fully engulfed. My uncle's house just west of our house was fully engulfed. We continued to put out spot fires.

Tyson Short

Tyson Short – landowner
17331 San Pasqual Valley Road
Escondido, CA 92027

October 21 & 22nd 2007

On Sunday, October 21st 2007 I was at my home on 17331 San Pasqual Valley Rd. I was with my daughter, my mother-in-law, and my husband. The Witch fire that started earlier that afternoon was visible to the east once it grew dark. The smoke that had stayed to the south of us all day was now blowing in our direction. Around 9:30 p.m. my husband started to prepare the outside of the house just in case the fire made it to us. I stayed inside with my daughter and mother-in-law.

About 1:05 a.m. on Monday the 22nd my husband came inside to wake me, and tell me that the Guejito creek east of our property was on fire. I looked out the window, and saw the fire well established, and running in a southwest direction. I began to pack a bag, and prepare to leave.

At 2:30a.m. I departed from our home, daughter & mother-in-law in tow. We attempted to go west on Highway 78, but were turned around by fire crews. We then headed east on 78, past our house. That's when I saw the Witch fire to the east cresting on the hills above the San Pasqual Academy, starting do descend down the hills. I turned and headed west on Bandy Canyon Rd.

At 2:45 a.m. we were driving approximately 1 mile east of Fenton Ranch (Bandy Canyon) still on Bandy Canyon Rd. At that time I could see that the fire that started in the Guejito Creek had made it's way into the Santa Ysabel Creek, and traveled west to the point where it was parallel to my location on Bandy Canyon Rd. The fire continued west down the creek, and was breaching the riverbed in a southwest direction through a field, toward Bandy Canyon Rd. in the Highland Valley direction. We crested the top of Bandy Canyon near the intersection of Highland Valley Rd. knowing it would only be a matter of minutes before the fire would travel up the hill in our direction. Smoke and embers were cast ahead of the fire.

At 3:10 a.m. I arrived at my parent's home at 20891 Viento Valle. From there I could see that the fire in the Santa Ysabel Creek had reached the top of Highland Valley, and crossed over Bandy Canyon Rd. like I thought it would. The same fire also continued west down the Santa Ysabel riverbed, heading toward Lake Hodges.

Lynnette T. Short

Lynnette Short
Homeowner
17331 San Pasqual Valley Rd.

January 8, 2008

VIA TELEPHONIC FACSIMILE and CERTIFIED MAIL

Dean Le Brecht
Claims Department
San Diego Gas & Electric
9965 Carroll Canyon Rd., SD1386
San Diego, CA. 92131-1105

Re: Guejito Fire
CDF Case: CA-MVU-010484

Dear Mr. Le Brecht,

The California Department of Forestry and Fire Protection (CAL FIRE) is mandated to investigate all wildland fire incidents to determine both potential criminal liability, if any, as well as any civil liability for potential reimbursement of the cost of wildland fire suppression in the above-referenced fire. CAL FIRE is the law enforcement authority that is investigating the above-referenced fire, and considers the area of the origin of the above-referenced wildland fire to be a potential crime scene containing tangible, relevant evidence. The area of origin of that wildland fire has preliminarily been determined to be in Guejito Creek, south of the Hwy 78 in San Pasqual Valley.

THEREFORE, PLEASE TAKE NOTICE that, as the investigative law enforcement agency, CAL FIRE is asserting its authority to control that crime scene. Please do not attempt to tamper with or alter the area in any manner whatsoever or attempt to obstruct our investigation, including, but not limited to, seizing, replacing, or disposing of any poles, conductors, guys, insulators, or appurtenant equipment.

PLEASE TAKE FURTHER NOTICE that CAL FIRE field personnel have no authority to allow access to the crime scene, and, further, that any such prior permission to enter the crime scene is hereby revoked.

Inasmuch as a number of issues remain to be addressed in CAL FIRE's investigation of the above-referenced fire, CAL FIRE also requests that within 10 days of receipt of this letter that Southern California Edison and/or Edison International, as well as their officers, employees, contractors, agents and/or their assigns, produce the following information, items and documents which are relevant to the completion of said investigation:

1. Any and all witness statements that were taken by representatives of SDG&E/SEMPRA regarding to the Rice Fire.

2. Any and all SDG&E/SEMPRA photos of the fire origin area, and any photos of the area prior to the fire.

3. Any and all aerial photos of the fire scene during 2004, 2005, 2006, and 2007.

4. Any and all fire scene photos, which were taken at or near the area of origin.

5. Circuit map for the circuit adjacent to the point of origin.

6. The construction "Estimate" and "Work Order" for the construction of the circuit and pole the area adjacent to the point of origin.

7. Any construction records regarding the circuit, poles, and equipment in the area adjacent to the point of origin, including any after the fire on October 22, 2007.

8. A copy of SDG&E/SEMPRA's equivalent of SCE's System Operating Bulletin #22 for 2003, 2004, 2005, 2006, and 2007.

9. An admission by SDG&E/SEMPRA that the point of origin was a Bulletin 22-type area?

10. Any and all records of Bulletin 22-type inspections on the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

11. The wind loading tables for the circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

12. The utility's definition of a "heavy loading area."

13. SDG&E/SEMPRA high wind area maps.

14. SDG&E/SEMPRA engineering policies, practices, and standards for all facilities and equipment in high wind areas.

15. An admission by SDG&E/SEMPRA that the pole was located in an area governed by the California Public Resources Code.

16. Any and all records of post-audit inspections of the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

17. Inspection records for 2004, 2005, 2006, and 2007 for the aforementioned circuit.

18. Any maintenance records for 2004, 2005, 2006, and 2007 for the aforementioned circuit.

19. Any and all records of any and all inspections on the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

20. Any and all grid/circuit reports for the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

21. The operation and maintenance policy and procedures manual in effect at the time of the fire.

22. Any and all SDG&E/SEMPRA documents relating to the cause of the fire.

23. Name the jurisdiction in which the circuit, poles, and equipment in the area adjacent to the point of origin of the respective fire are located.

24. Any and all SDG&E/SEMPRA-generated investigation reports for the cause of the subject fire.

25. Who inspected the area at and around the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007?

26. Any and all written reports by the troubleman in relation to the events surrounding the fire at the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

27. Any and all outage reports for the circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

28. The location and number of any Automatic Recloser (AR), if any, on the circuit for the distribution line which caused the fire

29. Any and all "Automatic Recloser" ("AR") records for the circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

30. The Ground and Phase settings for the aforementioned AR.

31. The location and number of any Source Side Device on the distribution line which caused the fire.

32. The location and number or name of the Circuit Breaker that controlled the distribution line which caused the fire.

33. The Ground and Phase setting for the aforementioned Circuit Breaker.

34. Any and all SDG&E/SEMPRA-generated metallurgy reports regarding the subject fire.

35. Any SDG&E/SEMPRA origin and cause investigation report for the subject fire.

36. Any and all records of measurements taken by SDG&E/SEMPRA or its contractors at the area of origin of the fire

37. SDG&E/SEMPRA business and performance reports for 2004, 2005, 2006, and 2007.

38. Any and all SDG&E/SEMPRA reports to shareholders regarding profit/loss due to payment of fire suppression costs, during 2004, 2005, 2006, and 2007.

39. Any and all reports by SDG&E/SEMPRA to the CPUC regarding the subject fire.

40. Any and all press releases by SDG&E/SEMPRA regarding the subject fire.

41. Any and all e-mails, letters, or other communications by SDG&E/SEMPRA to the Governor of the State of California, including, but not limited to his staff, employees or agents; the Attorney General of the State of California, including but not limited to his staff, employees or agents; any member of the United States House of Representatives, including, but not limited to his/her staff, employees or agents; any member of the United States Senate, including, but not limited to his/her staff, employees or agents; any member of the California Legislature, including, but not limited to his/her staff, employees or agents; the San Diego County Board of Supervisors, the Mayor and City Council of the City of San Diego, including, but not limited to his/her staff, employees or agents; or any other elected official, regarding the subject fire.

42. Any and all communications between SDG&E/SEMPRA and the San Diego County fire agencies regarding the subject fire.

43. SDG&E/SEMPRA operations and maintenance policy and procedures manual.

44. Any SDG&E/SEMPRA accident prevention manuals dated November 1997 to present.

45. Any and all SDG&E/SEMPRA fire reporting manuals.

46. SDG&E/SEMPRA Claims Department policy and guidelines for handling fire suppression cost claims and requests for information and documents relating to a fire incident for the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

47. Listing of any and all maintenance-related budget increases allowed by the CPUC during 2004, 2005, 2006, and 2007.

48. Any and all SDG&E/SEMPRA memos or reports during 2004, 2005, 2006, and 2007, regarding SDG&E/SEMPRA's grid, circuit, line, and pole maintenance obligations.

49. Any and all SDG&E/SEMPRA inspection reports for the circuit, poles, and equipment in the area adjacent to the point of origin, during 2004, 2005, 2006, and 2007.

50. Any and all computer generated reports regarding grid, circuit, line, and pole maintenance report schedules and maintenance information for the circuit adjacent to the origin of the subject fire.

51. 2006 maintenance report with supporting documents for the circuit, poles, and equipment in the area adjacent to the point of origin.

52. Daily record of events dated 10/19/07 – 10/31/07, for the circuit, poles, and equipment in the area adjacent to the point of origin.

53. Any and all reports/records of maintenance performed on the circuit, poles, or equipment in the area adjacent to the point of origin, during 2004, 2005, 2006, and 2007.

54. Any and all reports/records from 10/19/07 through 10/31/07 that may reasonably indicate faults on the circuit, poles, and equipment in the area adjacent to the point of origin.

55. Any and all right-of-way/easements, and agreements, current or expired, within one-half mile radius of the circuit, poles, and equipment in the area adjacent to the point of origin.

56. Any and all records of post-audit inspections of the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

57. Any and all SDG&E/SEMPRA inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the aforementioned SDG&E/SEMPRA circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

58. Any and all Cox Cable inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the aforementioned SDG&E/SEMPRA circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

59. Any and all SDG&E/SEMPRA inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the aforementioned Cox Cable TV cable circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

60. Any and all SDG&E/SEMPRA line inspector referrals to SDG&E/SEMPRA maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections on the aforementioned SDG&E/SEMPRA circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

61. Any and all Cox Cable line inspector referrals to SDG&E/SEMPRA maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections

on the aforementioned SDG&E/SEMPRA circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

62. Any and all evidence that is exculpatory.

CAL FIRE greatly appreciates your anticipated assistance and cooperation in providing the foregoing information, items and documents. If there is a problem in providing particular information, items or documents within 10 days of receipt of this letter, CAL FIRE is prepared to be flexible provided that you contact me immediately and establish an acceptable schedule for providing the aforementioned information, items and documents. Any information or materials provided in response to this communication will remain within the context of the investigation unless otherwise required by law.

Please deliver the following requested information, items and documents, together with Southern California Edison's bill for the reasonable cost of reproduction of such documents, to:

Pete J. Marquez, Deputy Chief
CAL FIRE
Southern Region Fire Prevention/Law Enforcement
1234 E. Shaw Ave. Fresno CA 93710
Office: (559) 243-4117
Cell: (559)779-8692
Fax :(559)222-3409

If you have any comments or inquiries, please do not hesitate to contact me at your earliest convenience.

Most cordially,

PETE J. MARQUEZ
Southern Region Fire Prevention/Law Enforcement
California Department of Forestry
and Fire Protection

cc: D. Hillman
T. Hoffman
G. Chandler, Esq.
R. Harrington, Esq.
B. Darrington
bcc: T. Cronin

January 18, 2007

VIA TELEPHONIC FACSIMILE and CERTIFIED MAIL

Don Stryszko
Senior Director of Risk Management
Cox Enterprises, Inc.
6205 Peachtree Dunwoody Rd.
Atlanta, Georgia. 30328

Re: Guejito Fire
CDF Case: CA-MVU-010484

Dear Mr. Stryszko,

The California Department of Forestry and Fire Protection (CAL FIRE) is mandated to investigate all wildland fire incidents to determine both potential criminal liability, if any, as well as any civil liability for potential reimbursement of the cost of wildland fire suppression in the above-referenced fire. CAL FIRE is the law enforcement authority that is investigating the above-referenced fire, and considers the area of the origin of the above-referenced wildland fire to be a potential crime scene containing tangible, relevant evidence. The area of origin of that wildland fire has preliminarily been determined to be in Guejito Creek, south of the Hwy 78 in San Pasqual Valley.

THEREFORE, PLEASE TAKE NOTICE that, as the investigative law enforcement agency, CAL FIRE is asserting its authority to control that crime scene. Please do not attempt to tamper with or alter the area in any manner whatsoever or attempt to obstruct our investigation, including, but not limited to, seizing, replacing, or disposing of any poles, conductors, guys, insulators, or appurtenant equipment.

PLEASE TAKE FURTHER NOTICE that CAL FIRE field personnel have no authority to allow access to the crime scene, and, further, that any such prior permission to enter the crime scene is hereby revoked.

Inasmuch as a number of issues remain to be addressed in CAL FIRE's investigation of the above-referenced fire, CAL FIRE also requests that within 10 days of receipt of this letter that Southern California Edison and/or Edison International, as well as their officers, employees, contractors, agents and/or their assigns, produce the following information, items and documents which are relevant to the completion of said investigation:

1. A copy of the franchise agreement, permits, and business license granted Cox Cable from the City of San Diego and/or the County of San Diego.

2. Any and all witness statements that were taken by representatives of Cox Cable regarding to the Guejito Fire.

3. Any and all Cox Cable photos of the fire origin area, and any photos of the area prior to the fire.

4. Circuit map for the Cox Cable TV cable circuit adjacent to the point of origin.

5. The construction "Estimate" and "Work Order" for the construction of the Cox Cable TV cable circuit adjacent to the point of origin.

6. Any construction records regarding the Cox Cable TV cable circuit, poles, and equipment in the area adjacent to the point of origin, including any after the fire on October 20-21, 2007.

7. A copy, if any, of Cox Cable's equivalent of SCE's System Operating Bulletin #22 for 2003, 2004, 2005, 2006, and 2007.

8. Any and all records of Bulletin 22-type inspections on the Cox Cable TV cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

9. The wind loading tables for the Cox Cable TV cable circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

10. Cox Cable's definition of a "heavy loading area."

11. Cox Cable high wind area maps.

12. Cox Cable engineering policies, practices, and standards for all facilities and equipment in high wind areas.

13. Any and all Cox Cable records of post-audit inspections of the TV cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

14. Inspection records for 2004, 2005, 2006, and 2007 for the aforementioned circuit.

15. Any maintenance records for 2004, 2005, 2006, and 2007 for the aforementioned circuit.

16. Any Troubleman Reports for the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin in 2004, 2005, 2006, and 2007.

17. Any and all line patrol records for the Cox Cable circuit adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

18. Any and all records of any and all inspections on the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

19. Any and all grid/circuit reports for the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

20. The Cox Cable operation and maintenance policy and procedures manual in effect at the time of the fire.

21. Any and all Cox Cable documents relating to the cause of the fire.

22. Name the jurisdiction in which the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin of the respective fire are located.

23. Any and all Cox Cable-generated investigation reports for the cause of the subject fire.

24. Who inspected the area at and around the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007?

25. Any and all written reports by the Cox Cable troubleman in relation to the events surrounding the fire at the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

26. Any and all outage reports for the Cox Cable circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

27. Any and all Cox Cable-generated metallurgy reports regarding the subject fire.

28. Any Cox Cable origin and cause investigation report for the subject fire.

29. Any and all records of measurements taken by Cox Cable or its contractors at the area of origin of the fire

30. Cox Cable business and performance reports for 2004, 2005, 2006, and 2007.

31. Any and all reports by Cox Cable to the CPUC regarding the subject fire.

32. Any and all press releases by Cox Cable regarding the subject fire.

33. Any and all e-mails, letters, or other communications by Cox Cable to the Governor of the State of California, including, but not limited to his staff, employees or agents; the Attorney General of the State of California, including but not limited to his staff, employees or agents; any member of the United States House of Representatives, including, but not limited to his/her staff, employees or agents; any member of the United States Senate, including, but not limited to his/her staff, employees or agents; any member of the California Legislature, including, but not limited to his/her staff, employees or agents; the San Diego County Board of Supervisors, the Mayor and City Council of the City of San Diego, including, but not limited to his/her staff, employees or agents; or any other elected official, regarding the subject fire.

34. Any and all communications between Cox Cable and the San Diego County fire agencies regarding the subject fire.

35. Cox Cable operations and maintenance policy and procedures manual.

36. Any Cox Cable accident prevention manuals dated November 1997 to present.

37. Any Cox Cable hazard reduction guide dated November 1997 to present.

38. Any and all Cox Cable fire reporting manuals.

39. Cox Cable Claims Department policy and guidelines for handling fire suppression cost claims and requests for information and documents relating to a fire incident for the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

40. Listing of any and all maintenance-related budget increases allowed by the CPUC during 2004, 2005, 2006, and 2007.

41. Any and all Cox Cable memos or reports during 2004, 2005, 2006, and 2007, regarding Cox Cable's grid, circuit, line, and pole maintenance obligations.

42. Any and all Cox Cable inspection reports for the circuit, poles, and equipment in the area adjacent to the point of origin of the Guejito Fire, during 2004, 2005, 2006, and 2007.

43. Any and all computer generated reports regarding Cox Cable grid, circuit, line, and pole maintenance report schedules and maintenance information for the circuit adjacent to the origin of the subject fire.

44. Cox Cable's 2006 maintenance report with supporting documents for the circuit, poles, and equipment in the area adjacent to the point of origin.

45. Daily record of events dated 10/19/07 – 10/31/07, for the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin.

46. Any and all reports/records of maintenance performed on the Cox Cable circuit, poles, or equipment in the area adjacent to the point of origin, during 2004, 2005, 2006, and 2007.

47. Any and all reports/records from 10/19/07 through 10/31/07 that may reasonably indicate faults on the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin.

48. Any and all Cox Cable right-of-way/easements, and agreements, current or expired, within one-half mile radius of the circuit, poles, and equipment in the area adjacent to the point of origin.

49. Any and all records of post-audit inspections of the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

50. Any and all Cox Cable inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the aforementioned Cox Cable circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

51. Any and all Cox Cable inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the SDG&E/SEMPRA circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

52. Any and all SDG&E/SEMPRA inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for

the aforementioned Cox Cable circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

53. Any and all Cox Cable line inspector referrals to maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections on the aforementioned Cox Cable circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

54. Any and all Cox Cable line inspector referrals to maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections on the SDG&E/SEMPRA circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

55. Any and all SDG&E/SEMPRA line inspector referrals to Cox Cable maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections on the aforementioned Cox Cable circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

56. Any and all evidence that is exculpatory.

CAL FIRE greatly appreciates your anticipated assistance and cooperation in providing the foregoing information, items and documents. If there is a problem in providing particular information, items or documents within 10 days of receipt of this letter, CAL FIRE is prepared to be flexible provided that you contact me immediately and establish an acceptable schedule for providing the aforementioned information, items and documents. Any information or materials provided in response to this communication will remain within the context of the investigation unless otherwise required by law.

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Pete J. Marquez, Deputy Chief
CAL FIRE
Southern Region Fire Prevention/Law Enforcement
1234 E. Shaw Ave. Fresno CA 93710

Office: (559) 243-4117
Cell: (559)779-8692
Fax :(559)222-3409

If you have any comments or inquiries, please do not hesitate to contact me at your earliest convenience.

Most cordially,

PETE J. MARQUEZ
Southern Region Fire Prevention/Law Enforcement
California Department of Forestry
and Fire Protection

cc: D. Hillman
T. Hoffman
G. Chandler, Esq.
R. Harrington, Esq.
B. Darrington

bcc: T. Cronin

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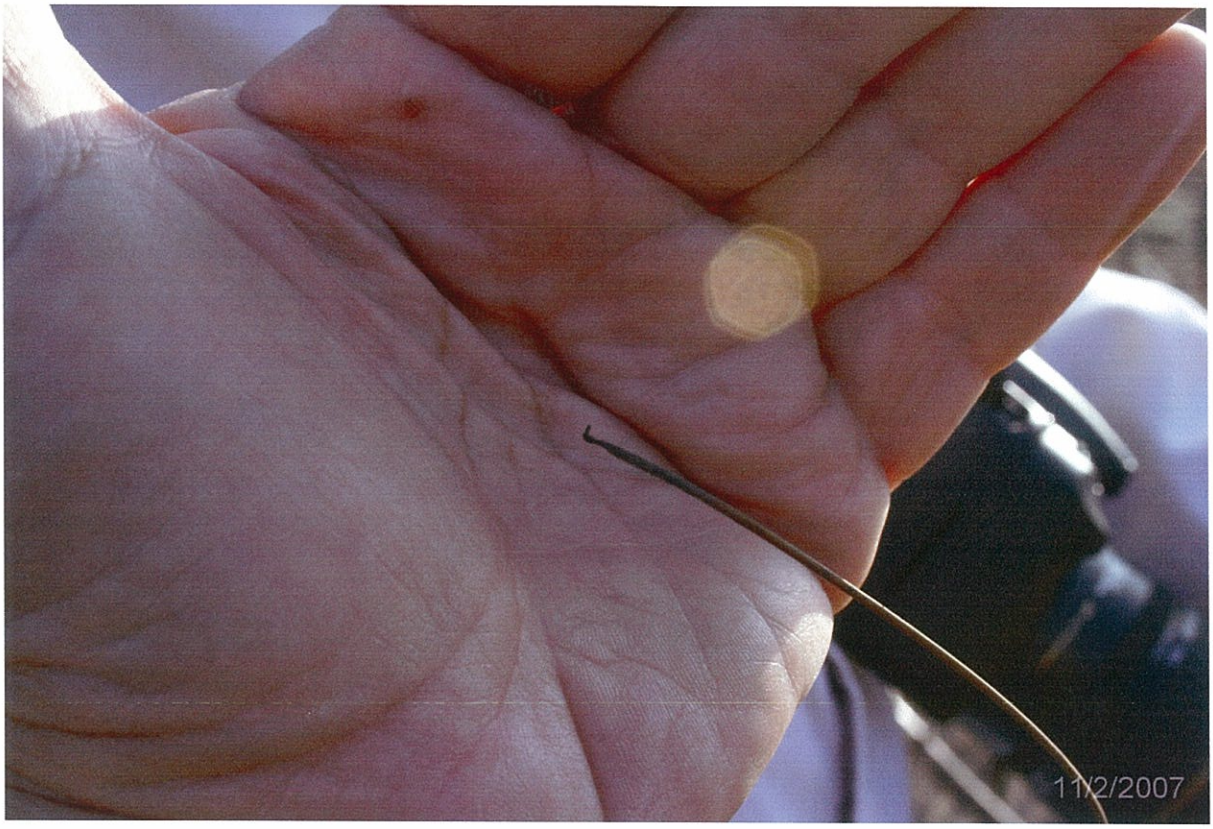

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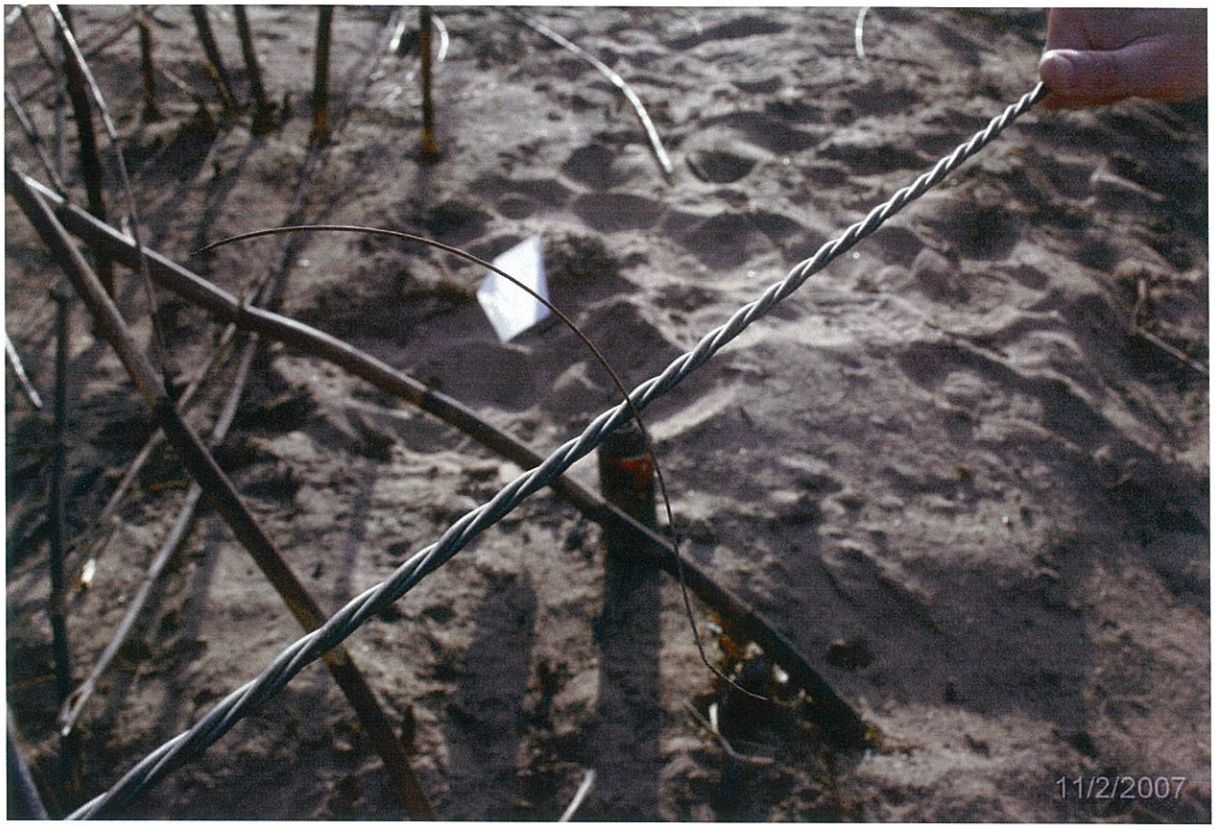

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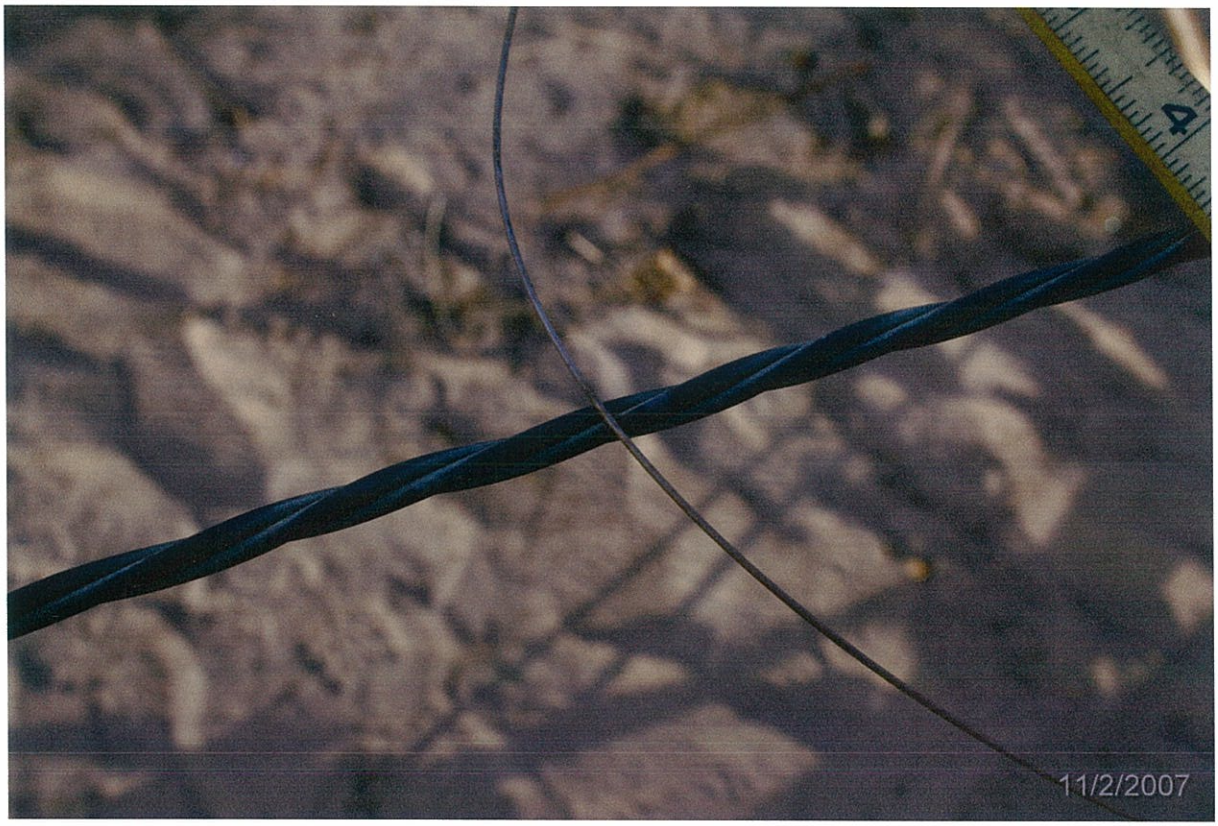

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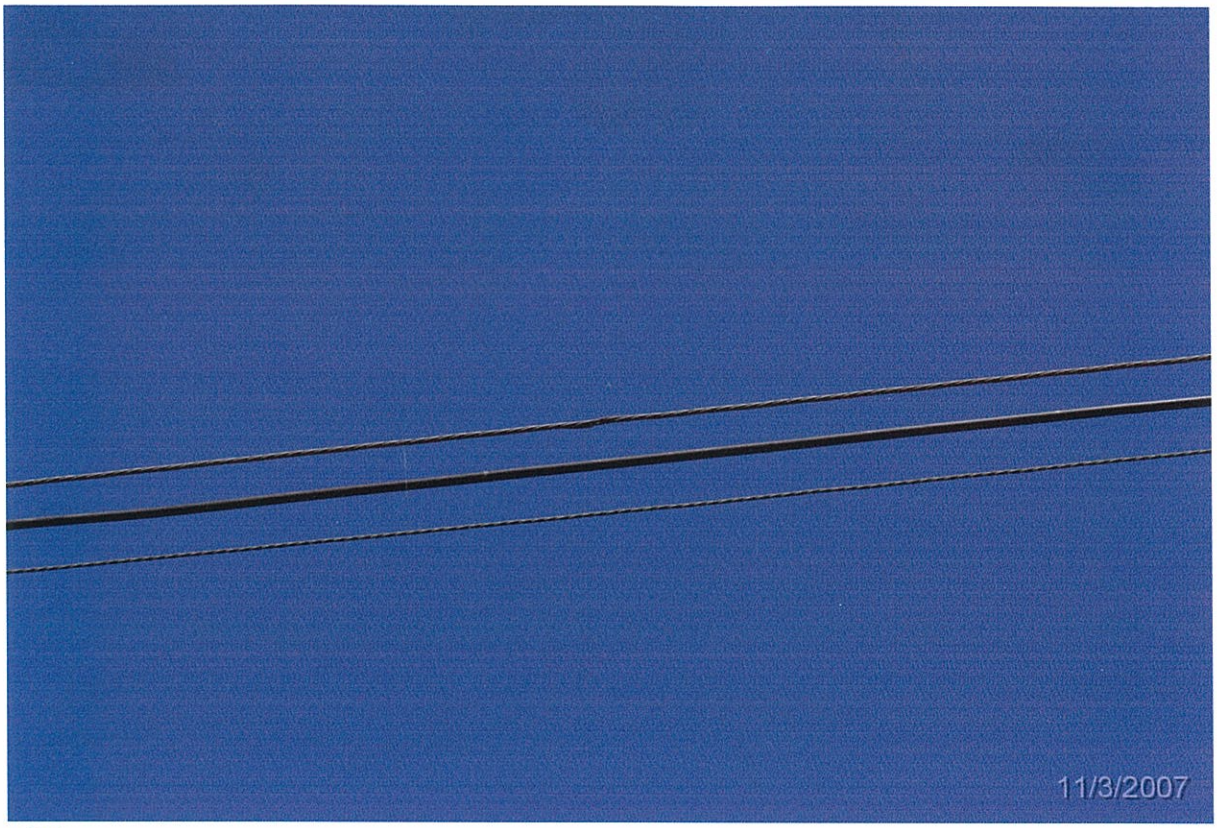

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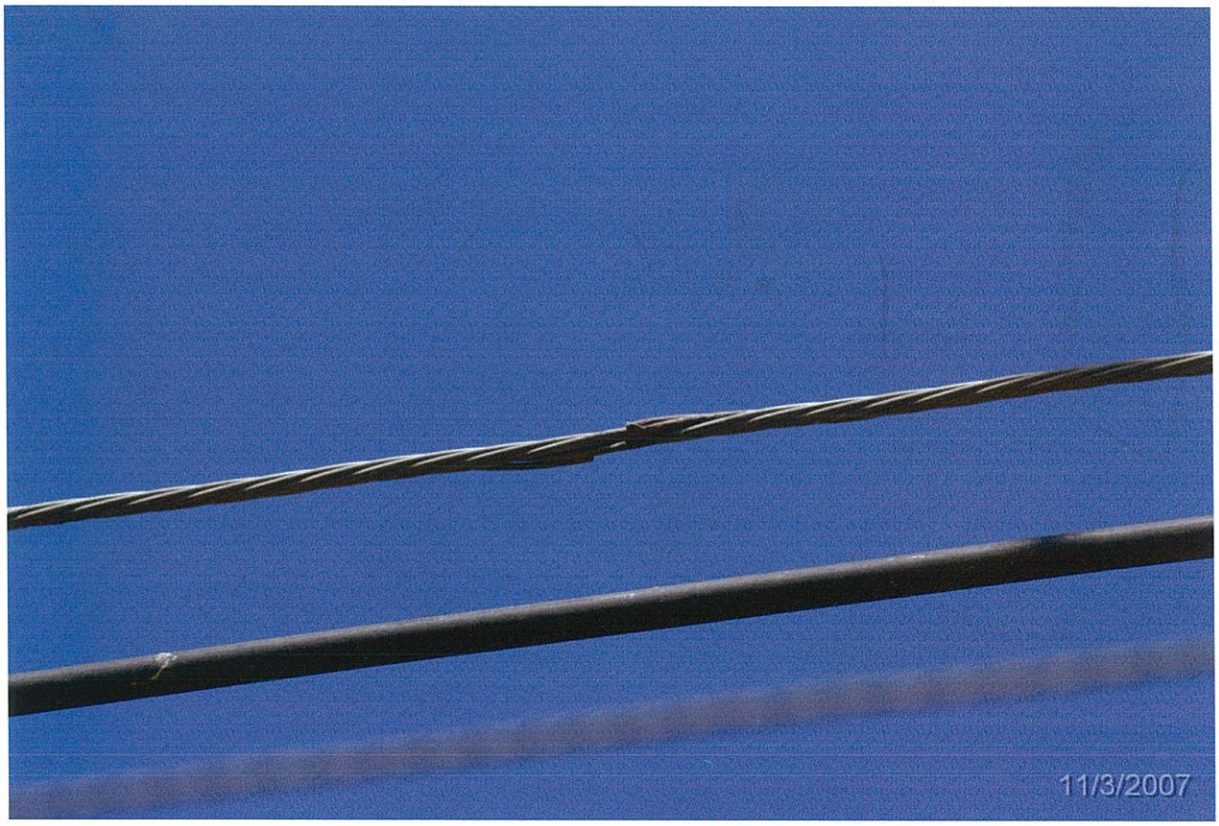

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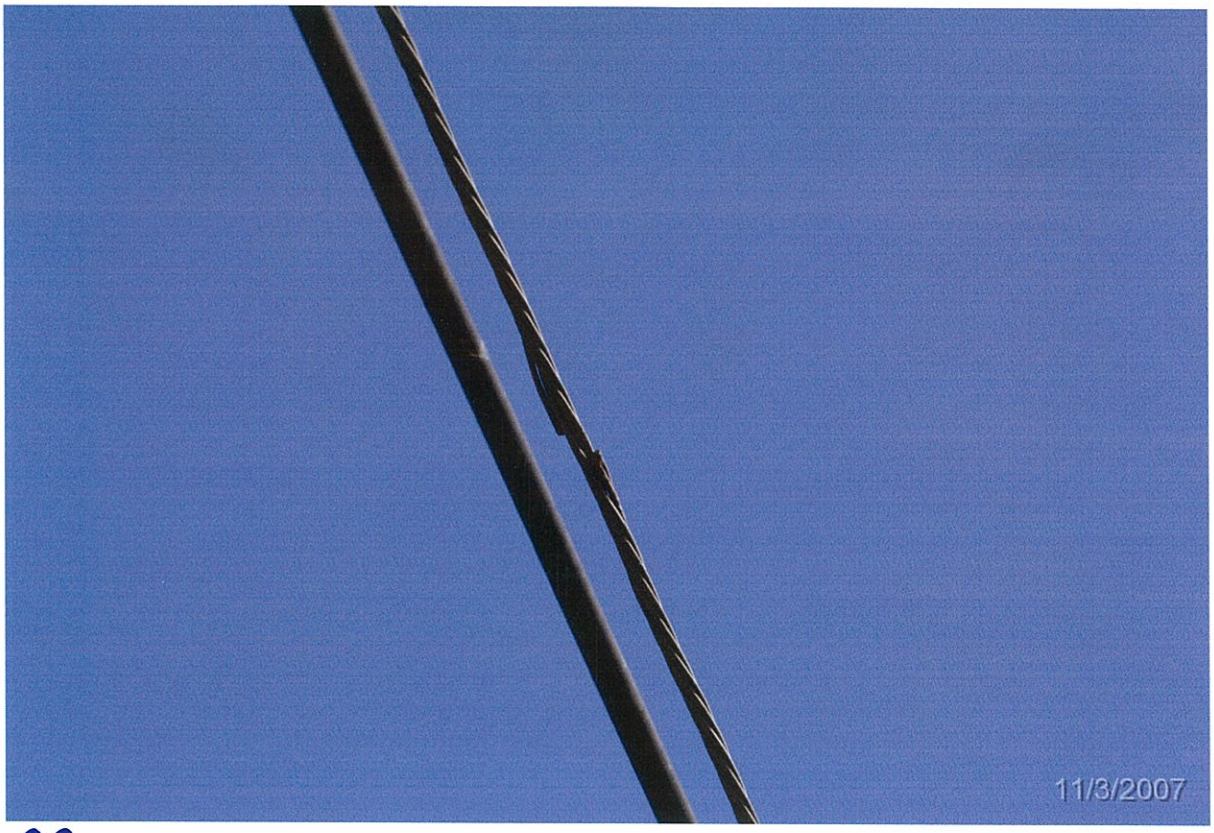

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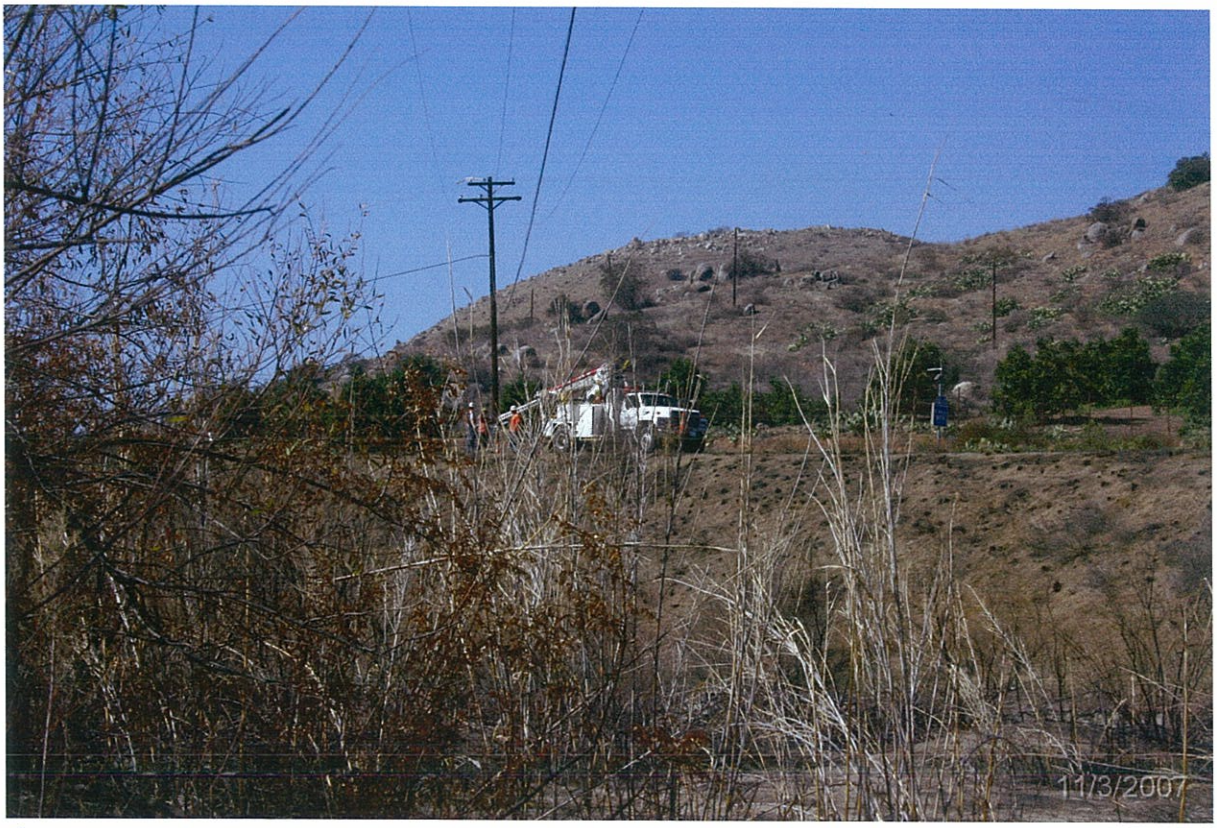

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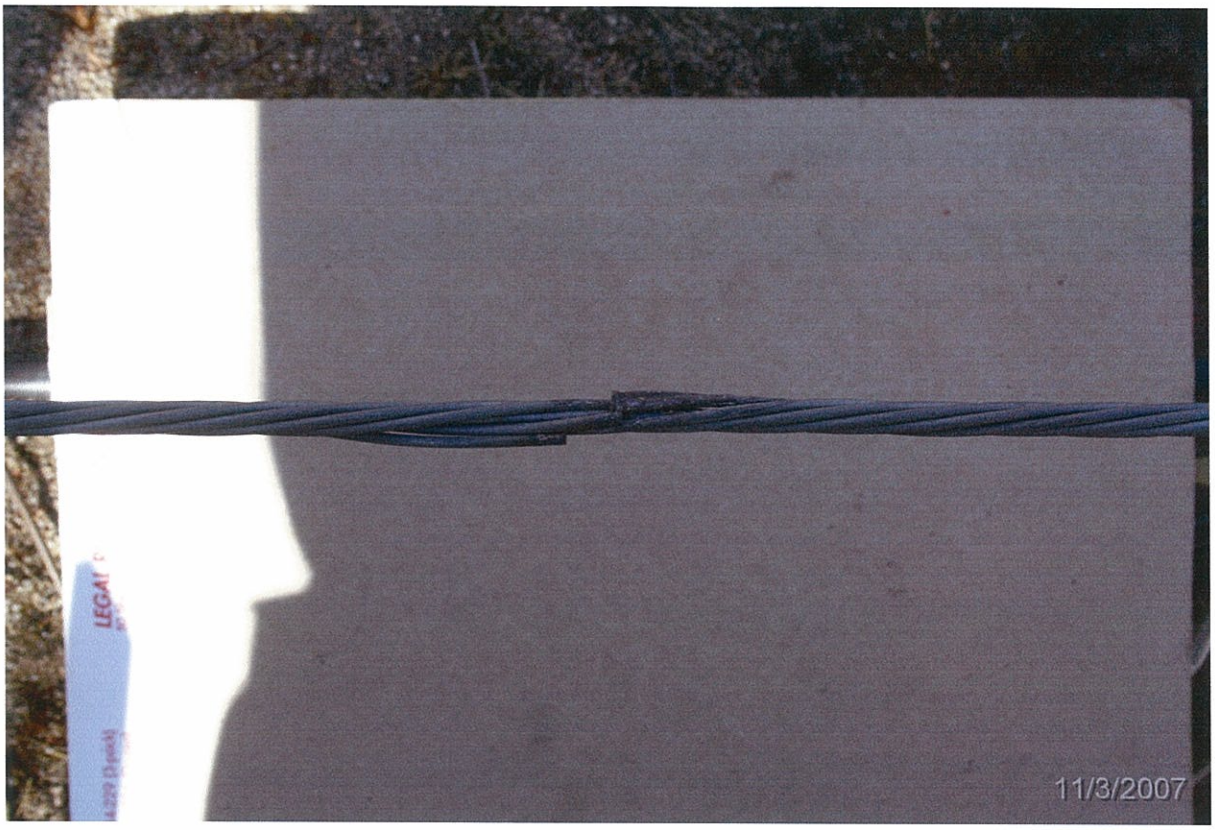

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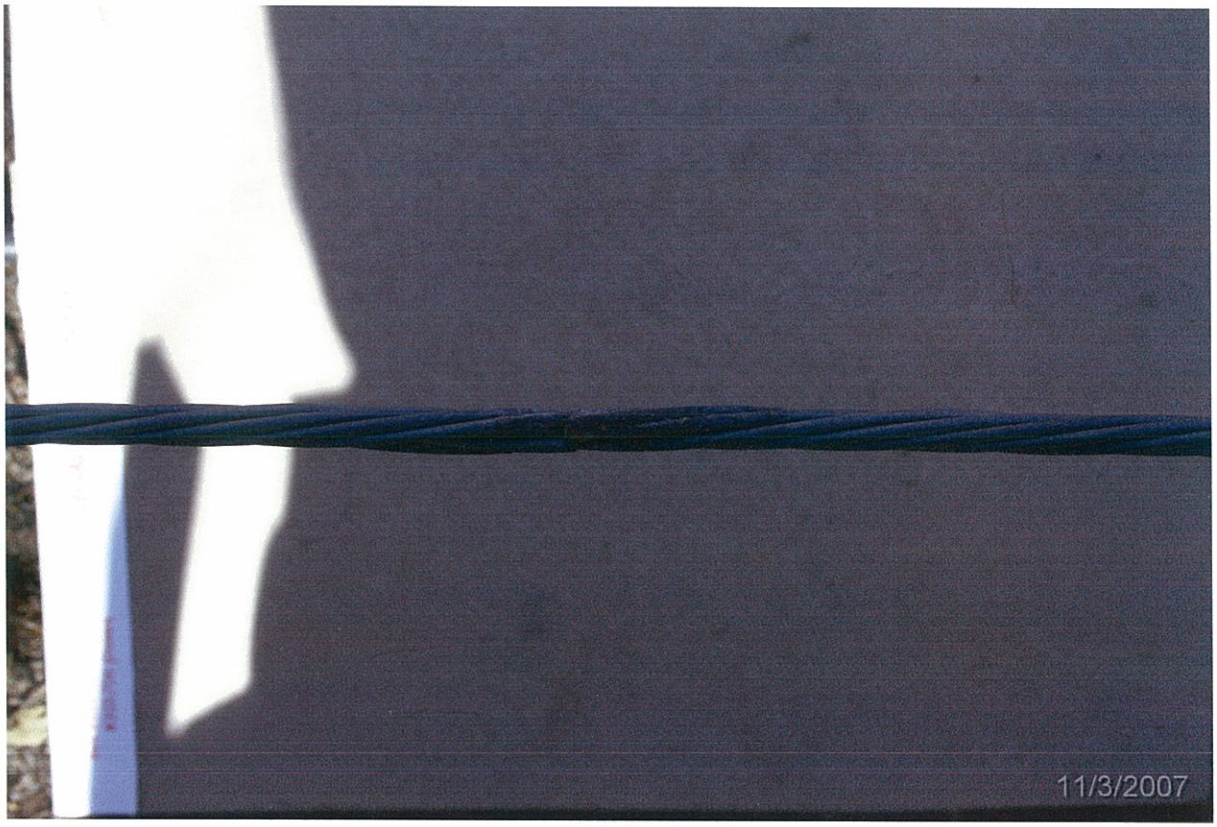

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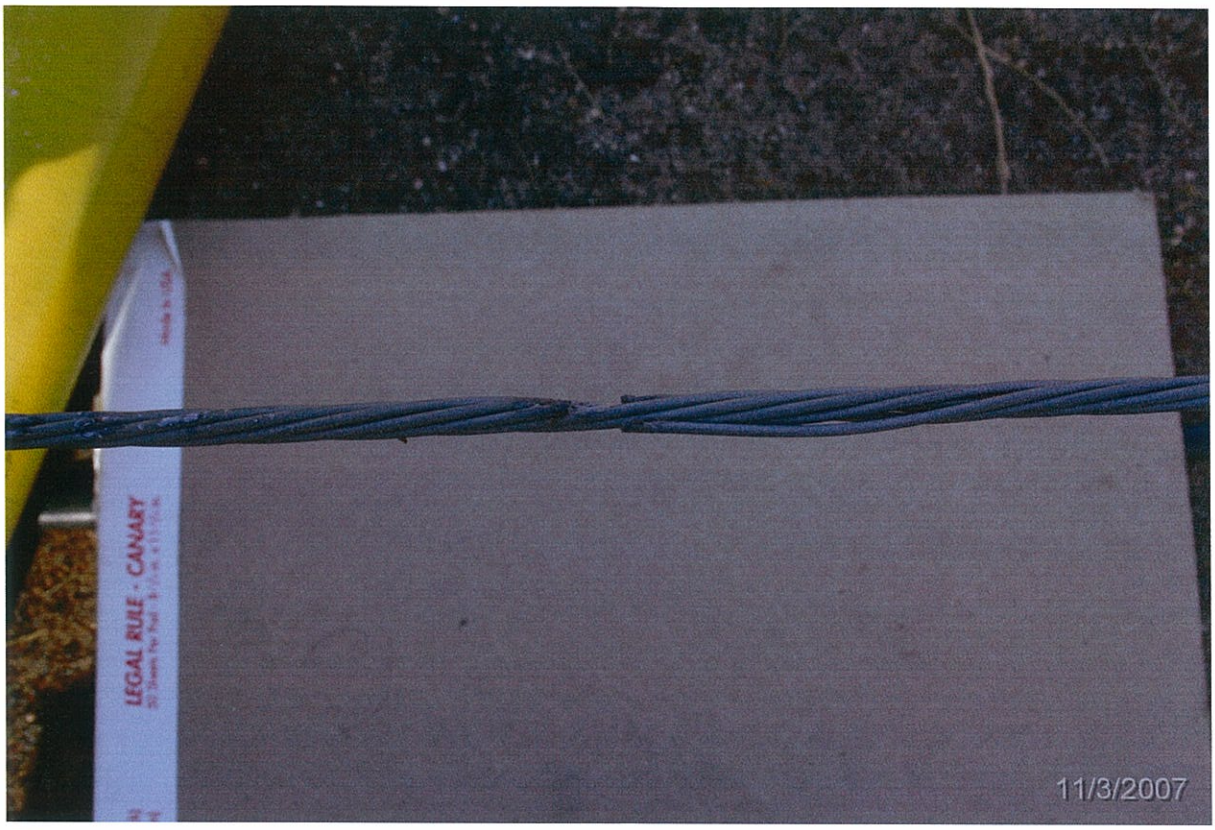

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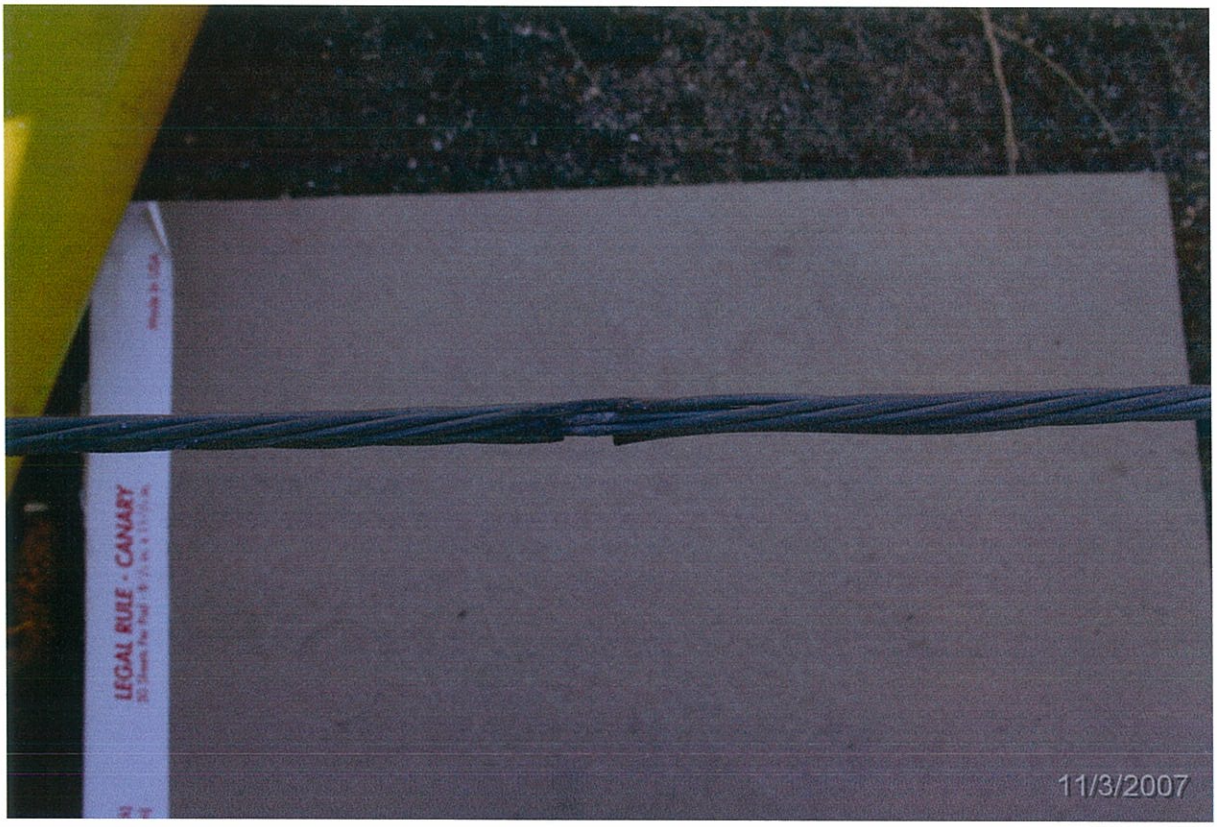

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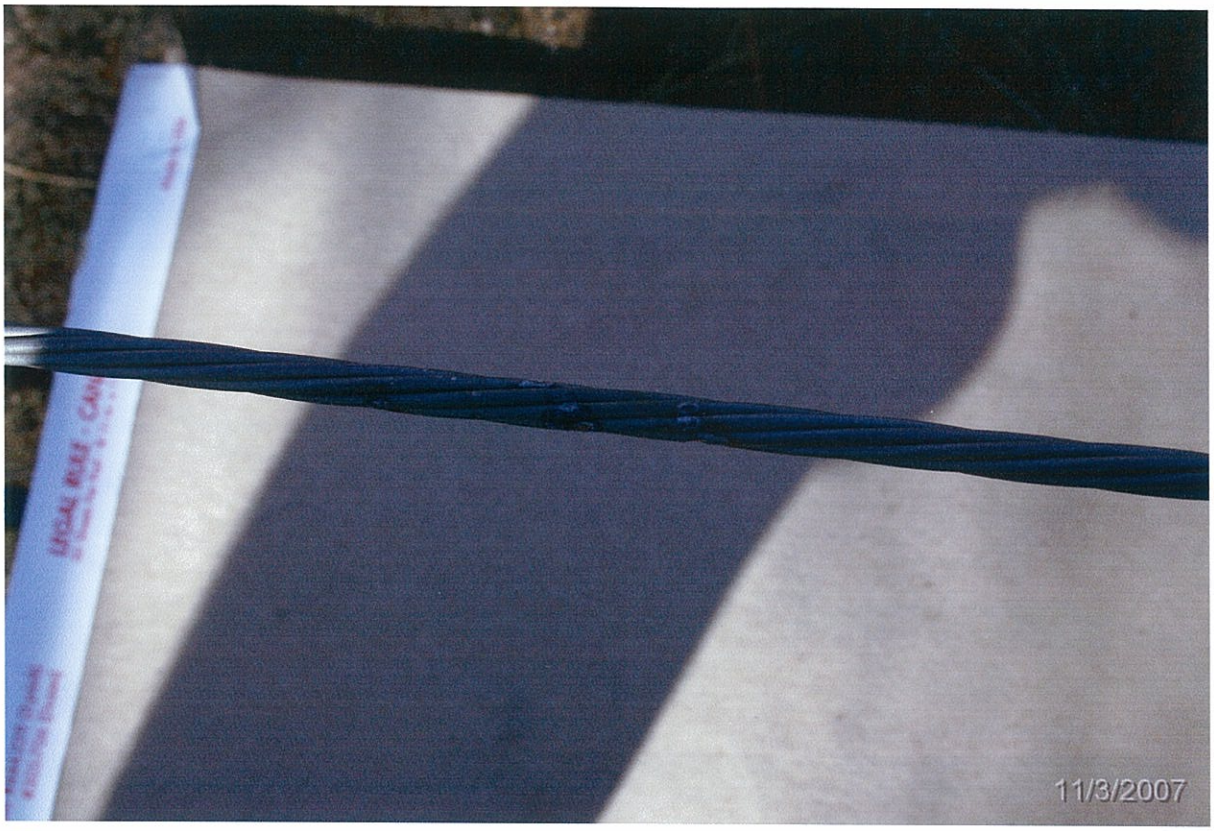

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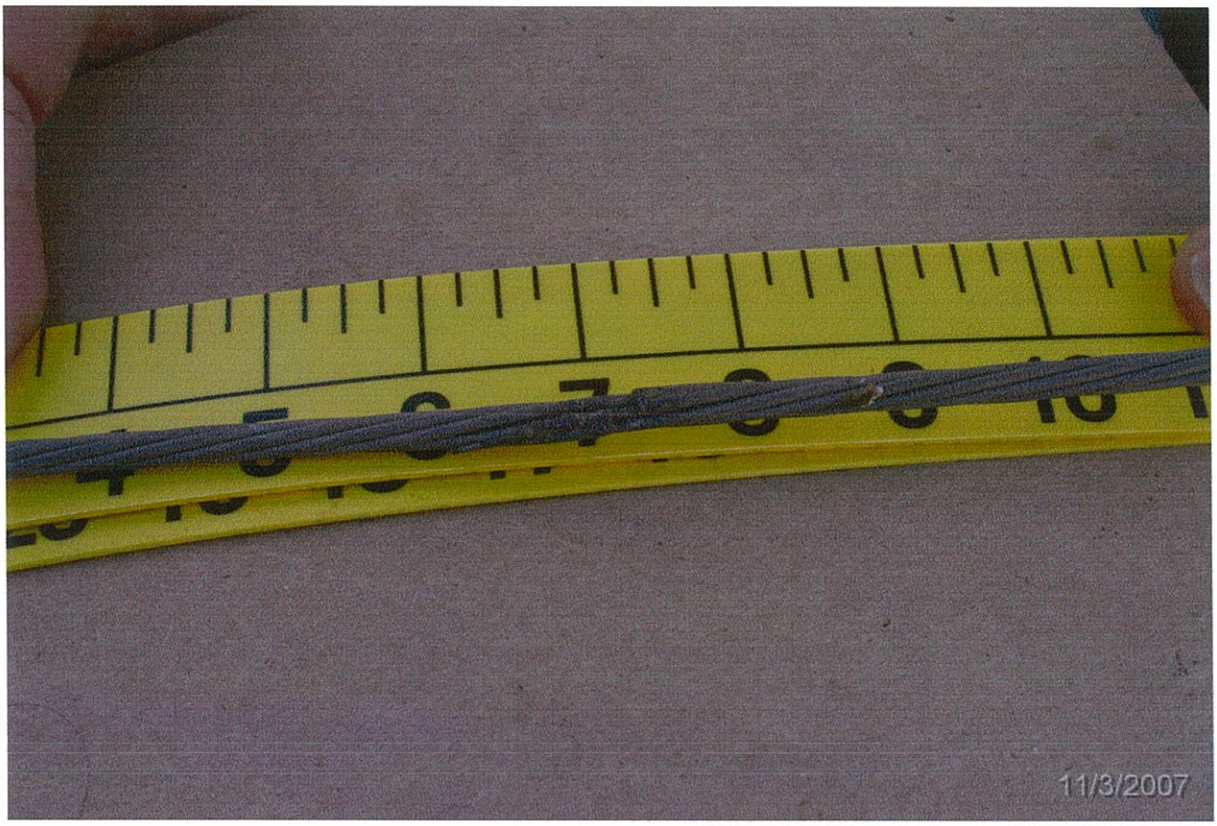

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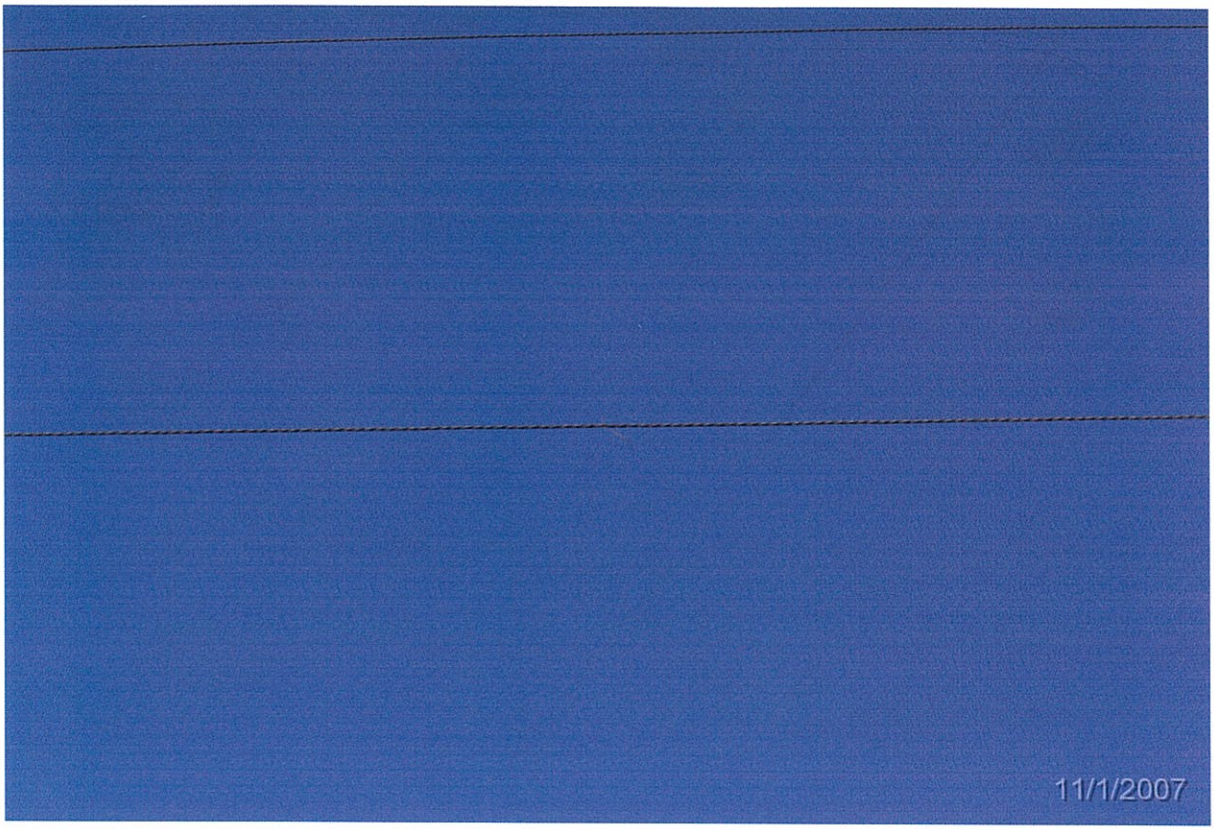

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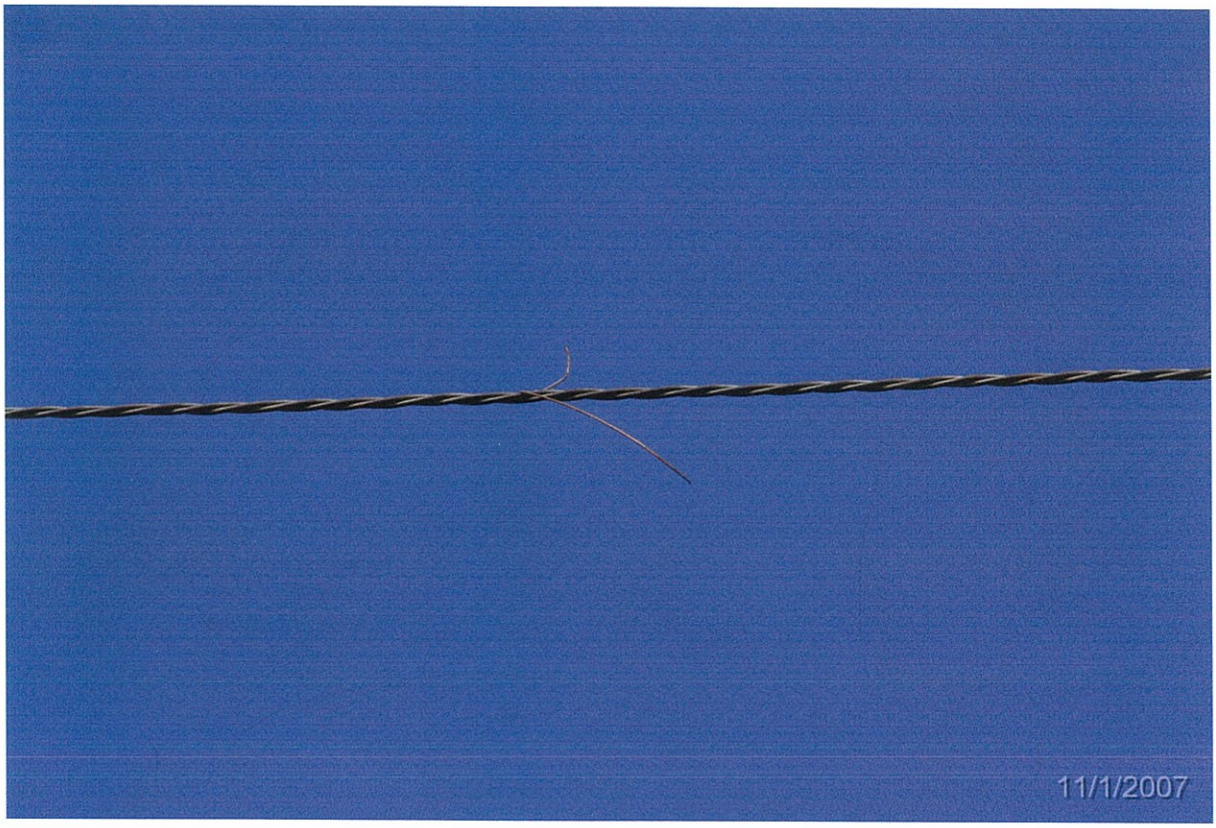

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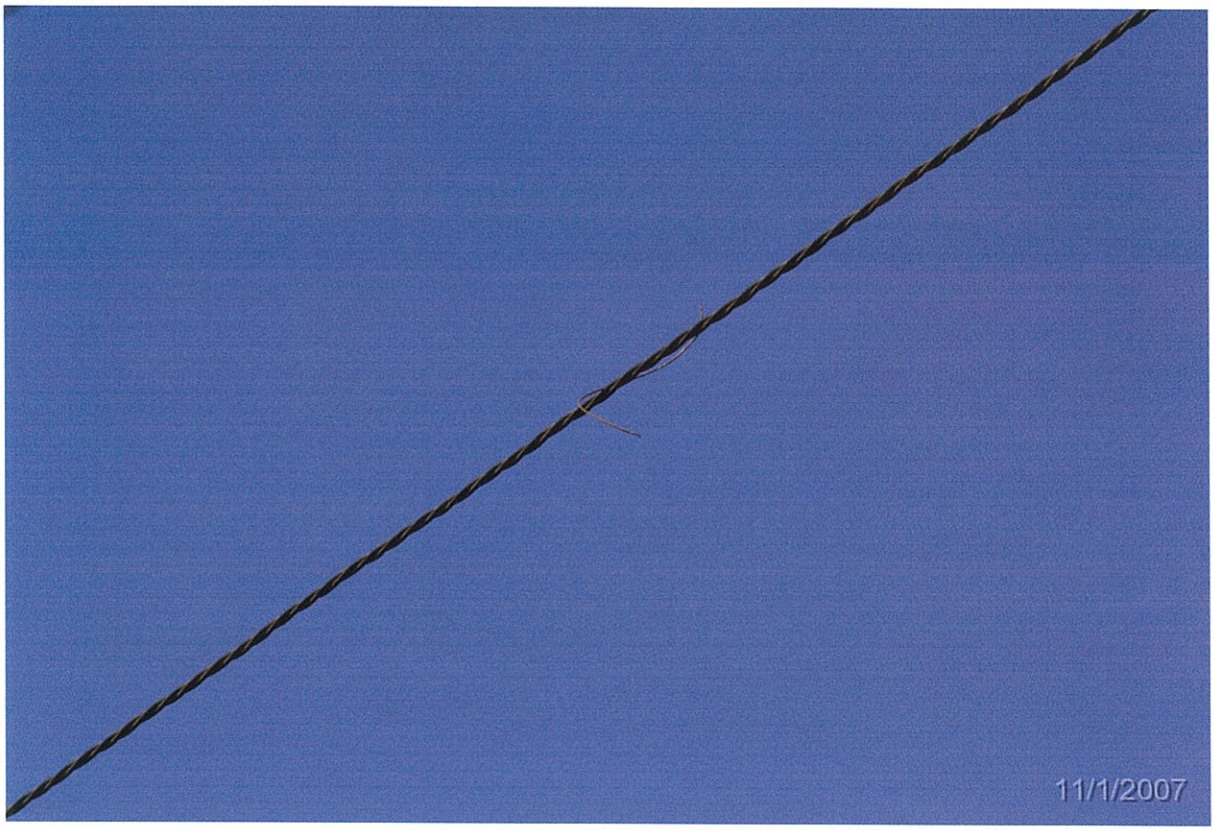

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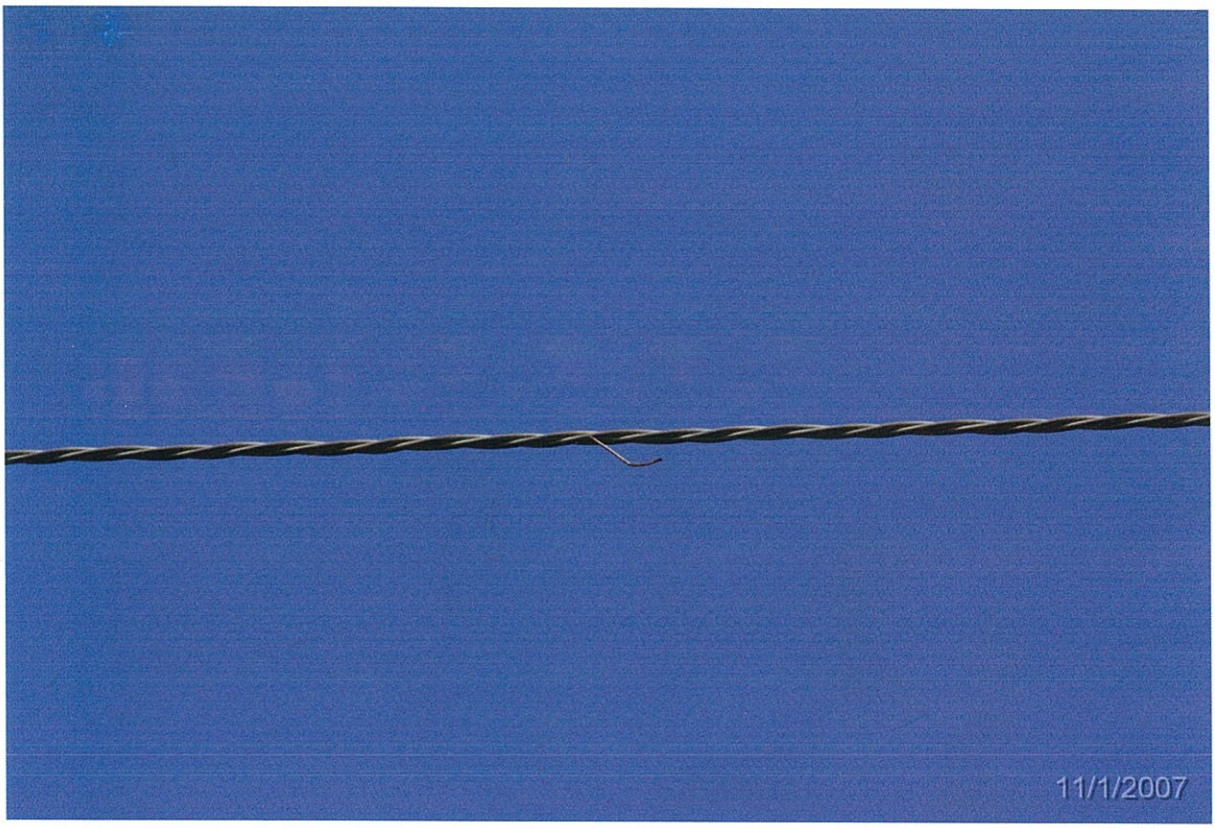

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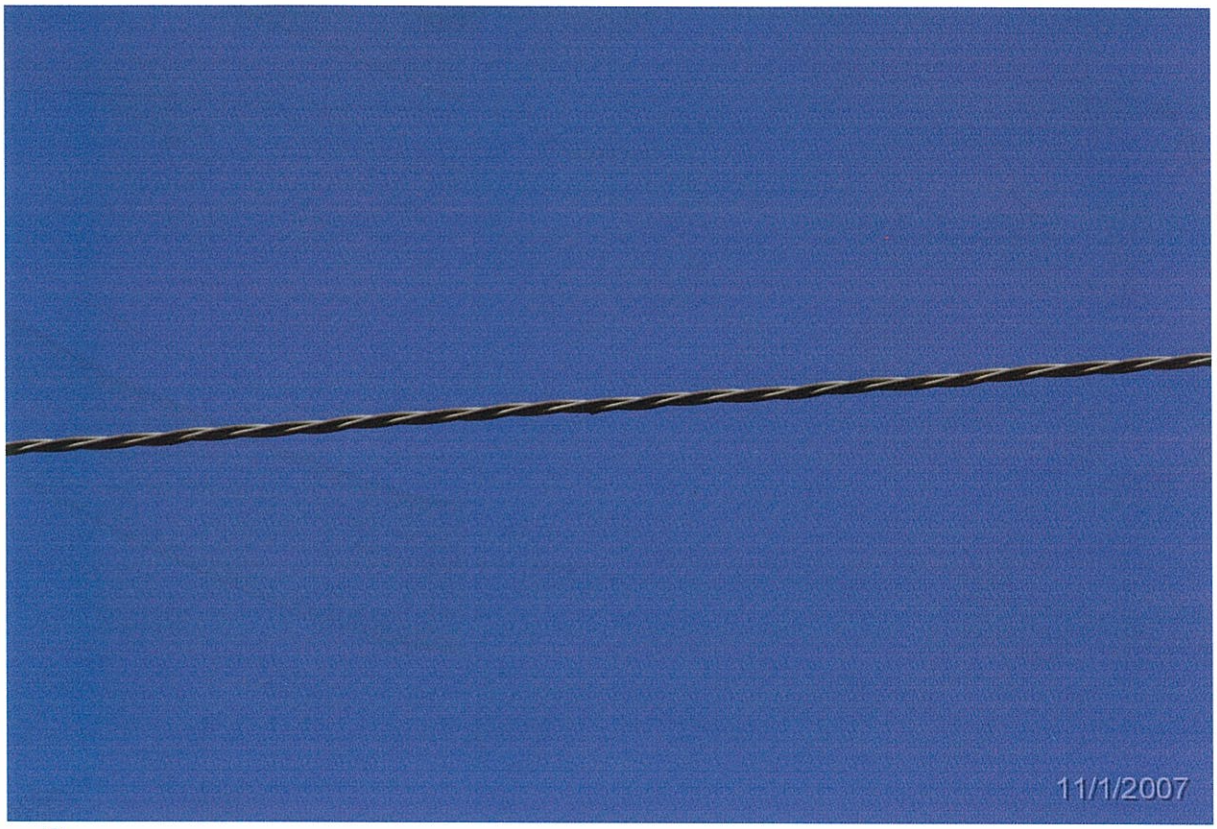

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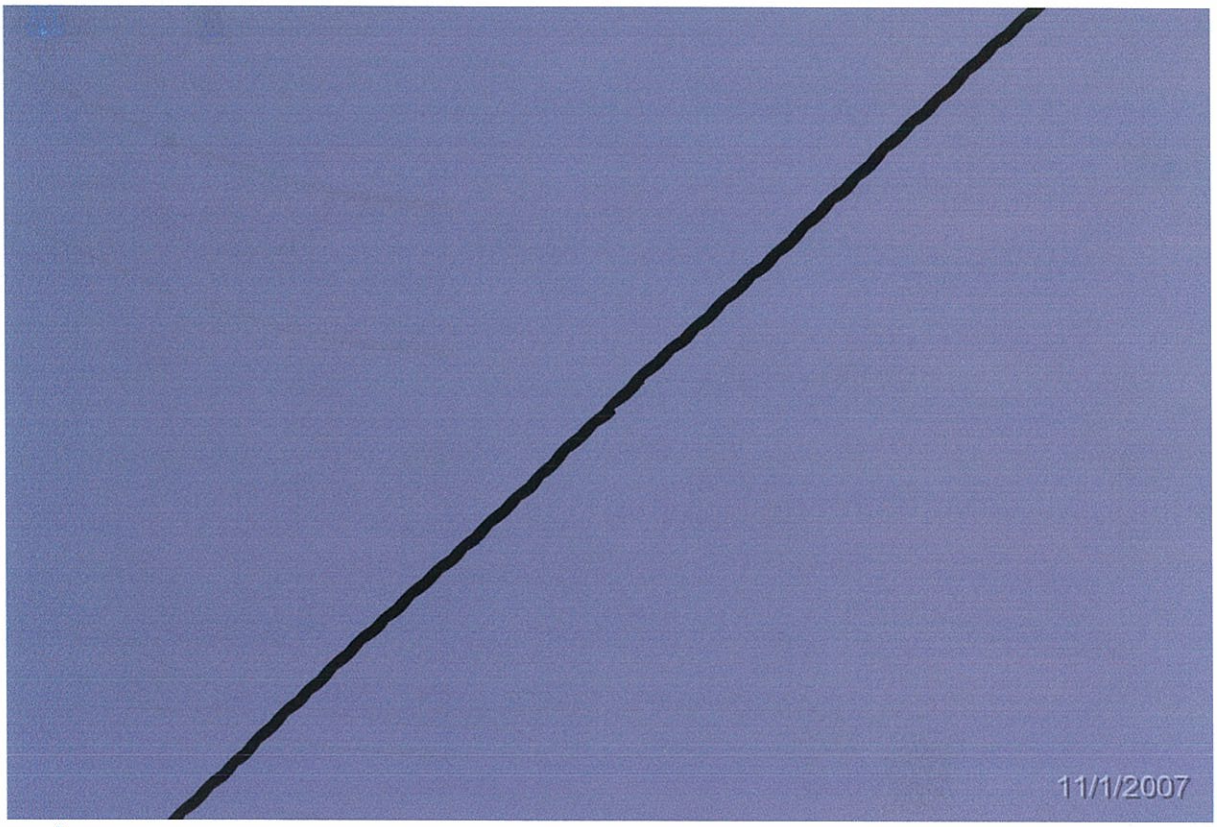

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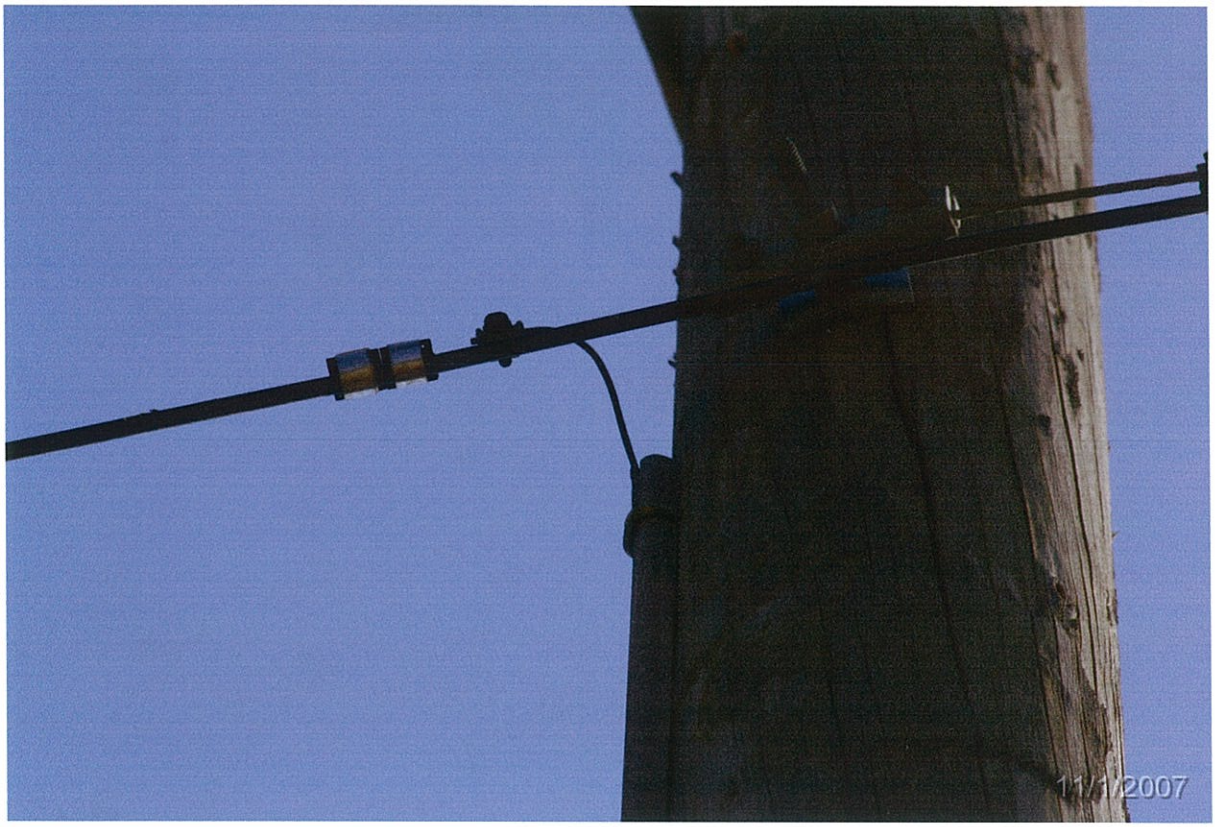

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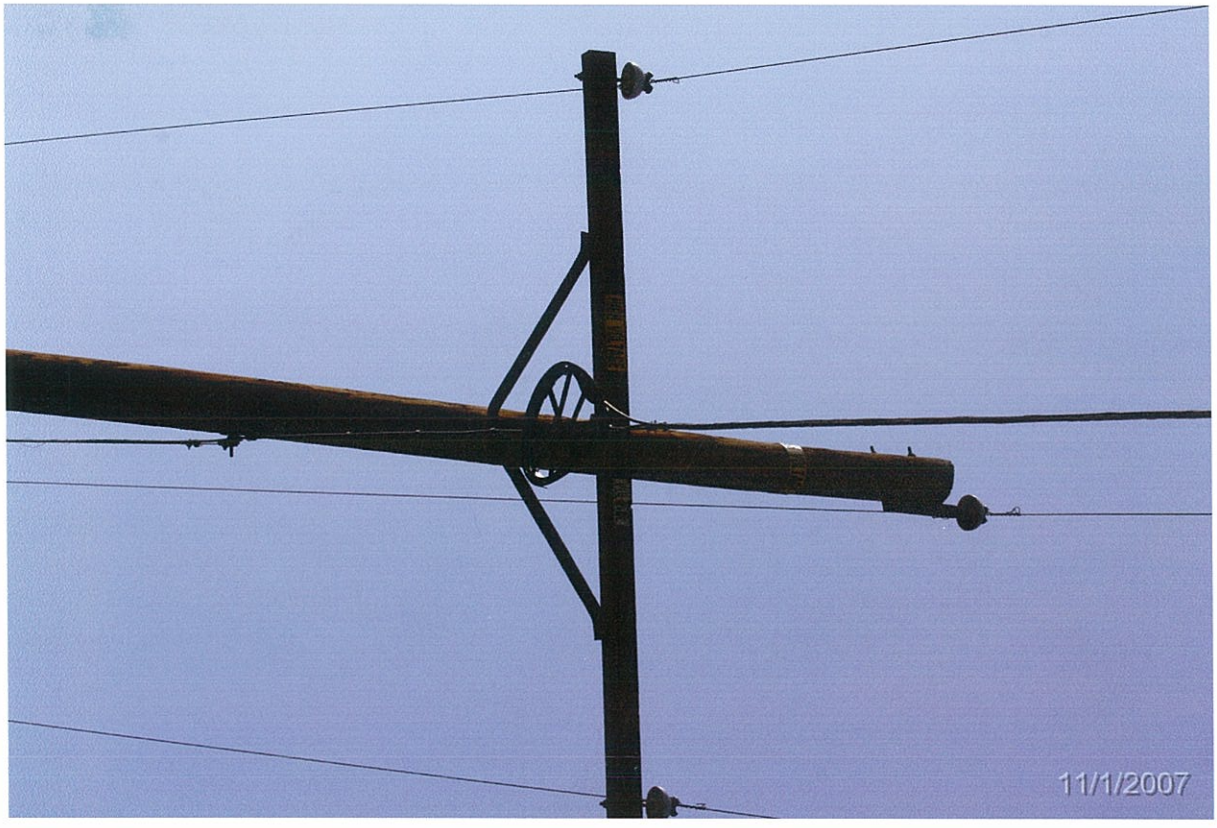

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6:00 a.m.
The strike team of engines departed from our house. It appeared that part of the Witch fire was still making its way down from Clevenger canyon – east of our property.

7:30 a.m.
We could hear the Witch fire coming from the east. The wind picked up to about 70 mph, embers and debris was blowing in every direction.

7:45 a.m.
The Witch fire came full force down the Santa Ysabel creek. It leaped over the highway 78 bridge (just east of our property) and continued down the riverbed toward the west. The fire was also coming from the cemetery across the highway (east of our property).

8:15 a.m.
The main front of the fire had passed us, and continued to the west. The store across the highway (north of our property) was fully engulfed. My uncle's house just west of our house was fully engulfed. We continued to put out spot fires.

Tyson Short

Tyson Short – landowner
17331 San Pasqual Valley Road
Escondido, CA 92027

October 21 & 22nd 2007

On Sunday, October 21st 2007 I was at my home on 17331 San Pasqual Valley Rd. I was with my daughter, my mother-in-law, and my husband. The Witch fire that started earlier that afternoon was visible to the east once it grew dark. The smoke that had stayed to the south of us all day was now blowing in our direction. Around 9:30 p.m. my husband started to prepare the outside of the house just in case the fire made it to us. I stayed inside with my daughter and mother-in-law.

About 1:05 a.m. on Monday the 22nd my husband came inside to wake me, and tell me that the Guejito creek east of our property was on fire. I looked out the window, and saw the fire well established, and running in a southwest direction. I began to pack a bag, and prepare to leave.

At 2:30a.m. I departed from our home, daughter & mother-in-law in tow. We attempted to go west on Highway 78, but were turned around by fire crews. We then headed east on 78, past our house. That's when I saw the Witch fire to the east cresting on the hills above the San Pasqual Academy, starting do descend down the hills. I turned and headed west on Bandy Canyon Rd.

At 2:45 a.m. we were driving approximately 1 mile east of Fenton Ranch (Bandy Canyon) still on Bandy Canyon Rd. At that time I could see that the fire that started in the Guejito Creek had made it's way into the Santa Ysabel Creek, and traveled west to the point where it was parallel to my location on Bandy Canyon Rd. The fire continued west down the creek, and was breaching the riverbed in a southwest direction through a field, toward Bandy Canyon Rd. in the Highland Valley direction. We crested the top of Bandy Canyon near the intersection of Highland Valley Rd. knowing it would only be a matter of minutes before the fire would travel up the hill in our direction. Smoke and embers were cast ahead of the fire.

At 3:10 a.m. I arrived at my parent's home at 20891 Viento Valle. From there I could see that the fire in the Santa Ysabel Creek had reached the top of Highland Valley, and crossed over Bandy Canyon Rd. like I thought it would. The same fire also continued west down the Santa Ysabel riverbed, heading toward Lake Hodges.

Lynnette T. Short

Lynnette Short
Homeowner
17331 San Pasqual Valley Rd.

January 8, 2008

VIA TELEPHONIC FACSIMILE and CERTIFIED MAIL

Dean Le Brecht
Claims Department
San Diego Gas & Electric
9965 Carroll Canyon Rd., SD1386
San Diego, CA. 92131-1105

Re: Guejito Fire
CDF Case: CA-MVU-010484

Dear Mr. Le Brecht,

The California Department of Forestry and Fire Protection (CAL FIRE) is mandated to investigate all wildland fire incidents to determine both potential criminal liability, if any, as well as any civil liability for potential reimbursement of the cost of wildland fire suppression in the above-referenced fire. CAL FIRE is the law enforcement authority that is investigating the above-referenced fire, and considers the area of the origin of the above-referenced wildland fire to be a potential crime scene containing tangible, relevant evidence. The area of origin of that wildland fire has preliminarily been determined to be in Guejito Creek, south of the Hwy 78 in San Pasqual Valley.

THEREFORE, PLEASE TAKE NOTICE that, as the investigative law enforcement agency, CAL FIRE is asserting its authority to control that crime scene. Please do not attempt to tamper with or alter the area in any manner whatsoever or attempt to obstruct our investigation, including, but not limited to, seizing, replacing, or disposing of any poles, conductors, guys, insulators, or appurtenant equipment.

PLEASE TAKE FURTHER NOTICE that CAL FIRE field personnel have no authority to allow access to the crime scene, and, further, that any such prior permission to enter the crime scene is hereby revoked.

Inasmuch as a number of issues remain to be addressed in CAL FIRE's investigation of the above-referenced fire, CAL FIRE also requests that within 10 days of receipt of this letter that Southern California Edison and/or Edison International, as well as their officers, employees, contractors, agents and/or their assigns, produce the following information, items and documents which are relevant to the completion of said investigation:

1. Any and all witness statements that were taken by representatives of SDG&E/SEMPRA regarding to the Rice Fire.

2. Any and all SDG&E/SEMPRA photos of the fire origin area, and any photos of the area prior to the fire.

3. Any and all aerial photos of the fire scene during 2004, 2005, 2006, and 2007.

4. Any and all fire scene photos, which were taken at or near the area of origin.

5. Circuit map for the circuit adjacent to the point of origin.

6. The construction "Estimate" and "Work Order" for the construction of the circuit and pole the area adjacent to the point of origin.

7. Any construction records regarding the circuit, poles, and equipment in the area adjacent to the point of origin, including any after the fire on October 22, 2007.

8. A copy of SDG&E/SEMPRA's equivalent of SCE's System Operating Bulletin #22 for 2003, 2004, 2005, 2006, and 2007.

9. An admission by SDG&E/SEMPRA that the point of origin was a Bulletin 22-type area?

10. Any and all records of Bulletin 22-type inspections on the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

11. The wind loading tables for the circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

12. The utility's definition of a "heavy loading area."

13. SDG&E/SEMPRA high wind area maps.

14. SDG&E/SEMPRA engineering policies, practices, and standards for all facilities and equipment in high wind areas.

15. An admission by SDG&E/SEMPRA that the pole was located in an area governed by the California Public Resources Code.

16. Any and all records of post-audit inspections of the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

17. Inspection records for 2004, 2005, 2006, and 2007 for the aforementioned circuit.

18. Any maintenance records for 2004, 2005, 2006, and 2007 for the aforementioned circuit.

19. Any and all records of any and all inspections on the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

20. Any and all grid/circuit reports for the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

21. The operation and maintenance policy and procedures manual in effect at the time of the fire.

22. Any and all SDG&E/SEMPRA documents relating to the cause of the fire.

23. Name the jurisdiction in which the circuit, poles, and equipment in the area adjacent to the point of origin of the respective fire are located.

24. Any and all SDG&E/SEMPRA-generated investigation reports for the cause of the subject fire.

25. Who inspected the area at and around the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007?

26. Any and all written reports by the troubleman in relation to the events surrounding the fire at the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

27. Any and all outage reports for the circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

28. The location and number of any Automatic Recloser (AR), if any, on the circuit for the distribution line which caused the fire

29. Any and all "Automatic Recloser" ("AR") records for the circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

30. The Ground and Phase settings for the aforementioned AR.

31. The location and number of any Source Side Device on the distribution line which caused the fire.

32. The location and number or name of the Circuit Breaker that controlled the distribution line which caused the fire.

33. The Ground and Phase setting for the aforementioned Circuit Breaker.

34. Any and all SDG&E/SEMPRA-generated metallurgy reports regarding the subject fire.

35. Any SDG&E/SEMPRA origin and cause investigation report for the subject fire.

36. Any and all records of measurements taken by SDG&E/SEMPRA or its contractors at the area of origin of the fire

37. SDG&E/SEMPRA business and performance reports for 2004, 2005, 2006, and 2007.

38. Any and all SDG&E/SEMPRA reports to shareholders regarding profit/loss due to payment of fire suppression costs, during 2004, 2005, 2006, and 2007.

39. Any and all reports by SDG&E/SEMPRA to the CPUC regarding the subject fire.

40. Any and all press releases by SDG&E/SEMPRA regarding the subject fire.

41. Any and all e-mails, letters, or other communications by SDG&E/SEMPRA to the Governor of the State of California, including, but not limited to his staff, employees or agents; the Attorney General of the State of California, including but not limited to his staff, employees or agents; any member of the United States House of Representatives, including, but not limited to his/her staff, employees or agents; any member of the United States Senate, including, but not limited to his/her staff, employees or agents; any member of the California Legislature, including, but not limited to his/her staff, employees or agents; the San Diego County Board of Supervisors, the Mayor and City Council of the City of San Diego, including, but not limited to his/her staff, employees or agents; or any other elected official, regarding the subject fire.

42. Any and all communications between SDG&E/SEMPRA and the San Diego County fire agencies regarding the subject fire.

43. SDG&E/SEMPRA operations and maintenance policy and procedures manual.

44. Any SDG&E/SEMPRA accident prevention manuals dated November 1997 to present.

45. Any and all SDG&E/SEMPRA fire reporting manuals.

46. SDG&E/SEMPRA Claims Department policy and guidelines for handling fire suppression cost claims and requests for information and documents relating to a fire incident for the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

47. Listing of any and all maintenance-related budget increases allowed by the CPUC during 2004, 2005, 2006, and 2007.

48. Any and all SDG&E/SEMPRA memos or reports during 2004, 2005, 2006, and 2007, regarding SDG&E/SEMPRA's grid, circuit, line, and pole maintenance obligations.

49. Any and all SDG&E/SEMPRA inspection reports for the circuit, poles, and equipment in the area adjacent to the point of origin, during 2004, 2005, 2006, and 2007.

50. Any and all computer generated reports regarding grid, circuit, line, and pole maintenance report schedules and maintenance information for the circuit adjacent to the origin of the subject fire.

51. 2006 maintenance report with supporting documents for the circuit, poles, and equipment in the area adjacent to the point of origin.

52. Daily record of events dated 10/19/07 – 10/31/07, for the circuit, poles, and equipment in the area adjacent to the point of origin.

53. Any and all reports/records of maintenance performed on the circuit, poles, or equipment in the area adjacent to the point of origin, during 2004, 2005, 2006, and 2007.

54. Any and all reports/records from 10/19/07 through 10/31/07 that may reasonably indicate faults on the circuit, poles, and equipment in the area adjacent to the point of origin.

55. Any and all right-of-way/easements, and agreements, current or expired, within one-half mile radius of the circuit, poles, and equipment in the area adjacent to the point of origin.

56. Any and all records of post-audit inspections of the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

57. Any and all SDG&E/SEMPRA inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the aforementioned SDG&E/SEMPRA circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

58. Any and all Cox Cable inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the aforementioned SDG&E/SEMPRA circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

59. Any and all SDG&E/SEMPRA inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the aforementioned Cox Cable TV cable circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

60. Any and all SDG&E/SEMPRA line inspector referrals to SDG&E/SEMPRA maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections on the aforementioned SDG&E/SEMPRA circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

61. Any and all Cox Cable line inspector referrals to SDG&E/SEMPRA maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections

on the aforementioned SDG&E/SEMPRA circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

62. Any and all evidence that is exculpatory.

CAL FIRE greatly appreciates your anticipated assistance and cooperation in providing the foregoing information, items and documents. If there is a problem in providing particular information, items or documents within 10 days of receipt of this letter, CAL FIRE is prepared to be flexible provided that you contact me immediately and establish an acceptable schedule for providing the aforementioned information, items and documents. Any information or materials provided in response to this communication will remain within the context of the investigation unless otherwise required by law.

Please deliver the following requested information, items and documents, together with Southern California Edison's bill for the reasonable cost of reproduction of such documents, to:

Pete J. Marquez, Deputy Chief
CAL FIRE
Southern Region Fire Prevention/Law Enforcement
1234 E. Shaw Ave. Fresno CA 93710
Office: (559) 243-4117
Cell: (559)779-8692
Fax :(559)222-3409

If you have any comments or inquiries, please do not hesitate to contact me at your earliest convenience.

Most cordially,

PETE J. MARQUEZ
Southern Region Fire Prevention/Law Enforcement
California Department of Forestry
and Fire Protection

cc: D. Hillman
T. Hoffman
G. Chandler, Esq.
R. Harrington, Esq.
B. Darrington
bcc: T. Cronin

January 18, 2007

VIA TELEPHONIC FACSIMILE and CERTIFIED MAIL

Don Stryszko
Senior Director of Risk Management
Cox Enterprises, Inc.
6205 Peachtree Dunwoody Rd.
Atlanta, Georgia. 30328

Re: Guejito Fire
CDF Case: CA-MVU-010484

Dear Mr. Stryszko,

The California Department of Forestry and Fire Protection (CAL FIRE) is mandated to investigate all wildland fire incidents to determine both potential criminal liability, if any, as well as any civil liability for potential reimbursement of the cost of wildland fire suppression in the above-referenced fire. CAL FIRE is the law enforcement authority that is investigating the above-referenced fire, and considers the area of the origin of the above-referenced wildland fire to be a potential crime scene containing tangible, relevant evidence. The area of origin of that wildland fire has preliminarily been determined to be in Guejito Creek, south of the Hwy 78 in San Pasqual Valley.

THEREFORE, PLEASE TAKE NOTICE that, as the investigative law enforcement agency, CAL FIRE is asserting its authority to control that crime scene. Please do not attempt to tamper with or alter the area in any manner whatsoever or attempt to obstruct our investigation, including, but not limited to, seizing, replacing, or disposing of any poles, conductors, guys, insulators, or appurtenant equipment.

PLEASE TAKE FURTHER NOTICE that CAL FIRE field personnel have no authority to allow access to the crime scene, and, further, that any such prior permission to enter the crime scene is hereby revoked.

Inasmuch as a number of issues remain to be addressed in CAL FIRE's investigation of the above-referenced fire, CAL FIRE also requests that within 10 days of receipt of this letter that Southern California Edison and/or Edison International, as well as their officers, employees, contractors, agents and/or their assigns, produce the following information, items and documents which are relevant to the completion of said investigation:

1. A copy of the franchise agreement, permits, and business license granted Cox Cable from the City of San Diego and/or the County of San Diego.

2. Any and all witness statements that were taken by representatives of Cox Cable regarding to the Guejito Fire.

3. Any and all Cox Cable photos of the fire origin area, and any photos of the area prior to the fire.

4. Circuit map for the Cox Cable TV cable circuit adjacent to the point of origin.

5. The construction "Estimate" and "Work Order" for the construction of the Cox Cable TV cable circuit adjacent to the point of origin.

6. Any construction records regarding the Cox Cable TV cable circuit, poles, and equipment in the area adjacent to the point of origin, including any after the fire on October 20-21, 2007.

7. A copy, if any, of Cox Cable's equivalent of SCE's System Operating Bulletin #22 for 2003, 2004, 2005, 2006, and 2007.

8. Any and all records of Bulletin 22-type inspections on the Cox Cable TV cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

9. The wind loading tables for the Cox Cable TV cable circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

10. Cox Cable's definition of a "heavy loading area."

11. Cox Cable high wind area maps.

12. Cox Cable engineering policies, practices, and standards for all facilities and equipment in high wind areas.

13. Any and all Cox Cable records of post-audit inspections of the TV cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

14. Inspection records for 2004, 2005, 2006, and 2007 for the aforementioned circuit.

15. Any maintenance records for 2004, 2005, 2006, and 2007 for the aforementioned circuit.

16. Any Troubleman Reports for the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin in 2004, 2005, 2006, and 2007.

17. Any and all line patrol records for the Cox Cable circuit adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

18. Any and all records of any and all inspections on the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

19. Any and all grid/circuit reports for the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

20. The Cox Cable operation and maintenance policy and procedures manual in effect at the time of the fire.

21. Any and all Cox Cable documents relating to the cause of the fire.

22. Name the jurisdiction in which the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin of the respective fire are located.

23. Any and all Cox Cable-generated investigation reports for the cause of the subject fire.

24. Who inspected the area at and around the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007?

25. Any and all written reports by the Cox Cable troubleman in relation to the events surrounding the fire at the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

26. Any and all outage reports for the Cox Cable circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

27. Any and all Cox Cable-generated metallurgy reports regarding the subject fire.

28. Any Cox Cable origin and cause investigation report for the subject fire.

29. Any and all records of measurements taken by Cox Cable or its contractors at the area of origin of the fire

30. Cox Cable business and performance reports for 2004, 2005, 2006, and 2007.

31. Any and all reports by Cox Cable to the CPUC regarding the subject fire.

32. Any and all press releases by Cox Cable regarding the subject fire.

33. Any and all e-mails, letters, or other communications by Cox Cable to the Governor of the State of California, including, but not limited to his staff, employees or agents; the Attorney General of the State of California, including but not limited to his staff, employees or agents; any member of the United States House of Representatives, including, but not limited to his/her staff, employees or agents; any member of the United States Senate, including, but not limited to his/her staff, employees or agents; any member of the California Legislature, including, but not limited to his/her staff, employees or agents; the San Diego County Board of Supervisors, the Mayor and City Council of the City of San Diego, including, but not limited to his/her staff, employees or agents; or any other elected official, regarding the subject fire.

34. Any and all communications between Cox Cable and the San Diego County fire agencies regarding the subject fire.

35. Cox Cable operations and maintenance policy and procedures manual.

36. Any Cox Cable accident prevention manuals dated November 1997 to present.

37. Any Cox Cable hazard reduction guide dated November 1997 to present.

38. Any and all Cox Cable fire reporting manuals.

39. Cox Cable Claims Department policy and guidelines for handling fire suppression cost claims and requests for information and documents relating to a fire incident for the circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

40. Listing of any and all maintenance-related budget increases allowed by the CPUC during 2004, 2005, 2006, and 2007.

41. Any and all Cox Cable memos or reports during 2004, 2005, 2006, and 2007, regarding Cox Cable's grid, circuit, line, and pole maintenance obligations.

42. Any and all Cox Cable inspection reports for the circuit, poles, and equipment in the area adjacent to the point of origin of the Guejito Fire, during 2004, 2005, 2006, and 2007.

43. Any and all computer generated reports regarding Cox Cable grid, circuit, line, and pole maintenance report schedules and maintenance information for the circuit adjacent to the origin of the subject fire.

44. Cox Cable's 2006 maintenance report with supporting documents for the circuit, poles, and equipment in the area adjacent to the point of origin.

45. Daily record of events dated 10/19/07 – 10/31/07, for the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin.

46. Any and all reports/records of maintenance performed on the Cox Cable circuit, poles, or equipment in the area adjacent to the point of origin, during 2004, 2005, 2006, and 2007.

47. Any and all reports/records from 10/19/07 through 10/31/07 that may reasonably indicate faults on the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin.

48. Any and all Cox Cable right-of-way/easements, and agreements, current or expired, within one-half mile radius of the circuit, poles, and equipment in the area adjacent to the point of origin.

49. Any and all records of post-audit inspections of the Cox Cable circuit, poles, and equipment in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

50. Any and all Cox Cable inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the aforementioned Cox Cable circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

51. Any and all Cox Cable inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for the SDG&E/SEMPRA circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

52. Any and all SDG&E/SEMPRA inspectors' reports with any follow-up reports identifying any unsatisfactory maintenance issues, or improper construction or engineering techniques for

the aforementioned Cox Cable circuit in the area adjacent to the point of origin during 2004, 2005, 2006, and 2007.

53. Any and all Cox Cable line inspector referrals to maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections on the aforementioned Cox Cable circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

54. Any and all Cox Cable line inspector referrals to maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections on the SDG&E/SEMPRA circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

55. Any and all SDG&E/SEMPRA line inspector referrals to Cox Cable maintenance employees, contractors, or agents for necessary maintenance, construction or engineering corrections on the aforementioned Cox Cable circuit in the area adjacent to the point of origin, for 2004, 2005, 2006, and 2007.

56. Any and all evidence that is exculpatory.

CAL FIRE greatly appreciates your anticipated assistance and cooperation in providing the foregoing information, items and documents. If there is a problem in providing particular information, items or documents within 10 days of receipt of this letter, CAL FIRE is prepared to be flexible provided that you contact me immediately and establish an acceptable schedule for providing the aforementioned information, items and documents. Any information or materials provided in response to this communication will remain within the context of the investigation unless otherwise required by law.

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CAL FIRE
Southern Region Fire Prevention/Law Enforcement
1234 E. Shaw Ave. Fresno CA 93710

Office: (559) 243-4117
Cell: (559)779-8692
Fax :(559)222-3409

If you have any comments or inquiries, please do not hesitate to contact me at your earliest convenience.

Most cordially,

PETE J. MARQUEZ
Southern Region Fire Prevention/Law Enforcement
California Department of Forestry
and Fire Protection

cc: D. Hillman
T. Hoffman
G. Chandler, Esq.
R. Harrington, Esq.
B. Darrington

bcc: T. Cronin

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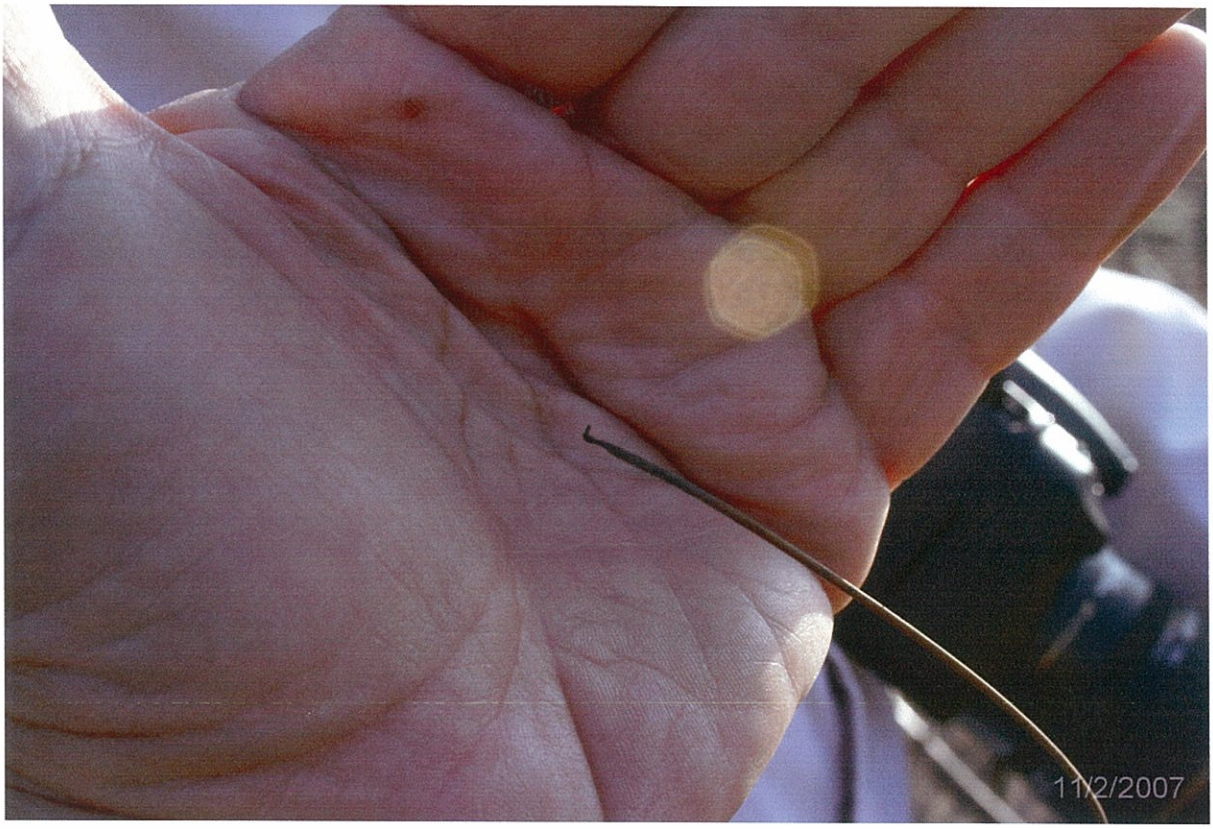

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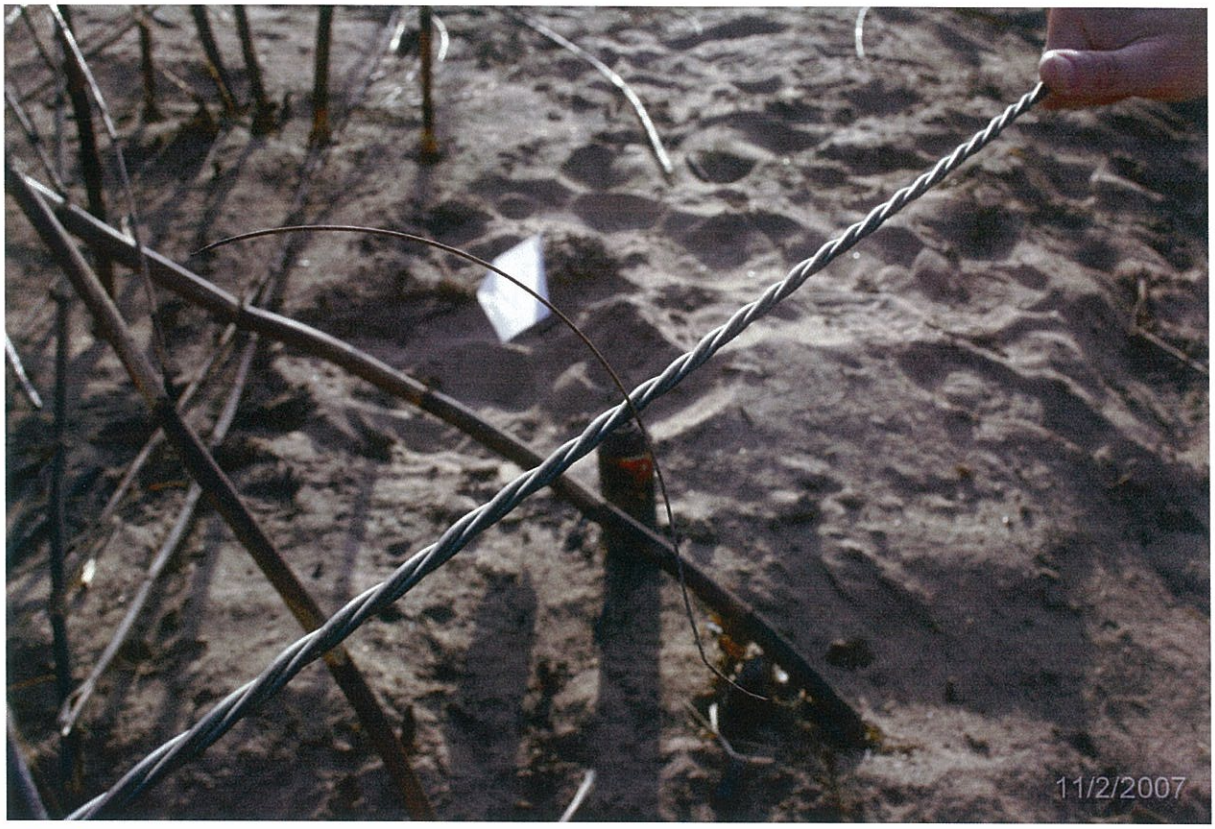

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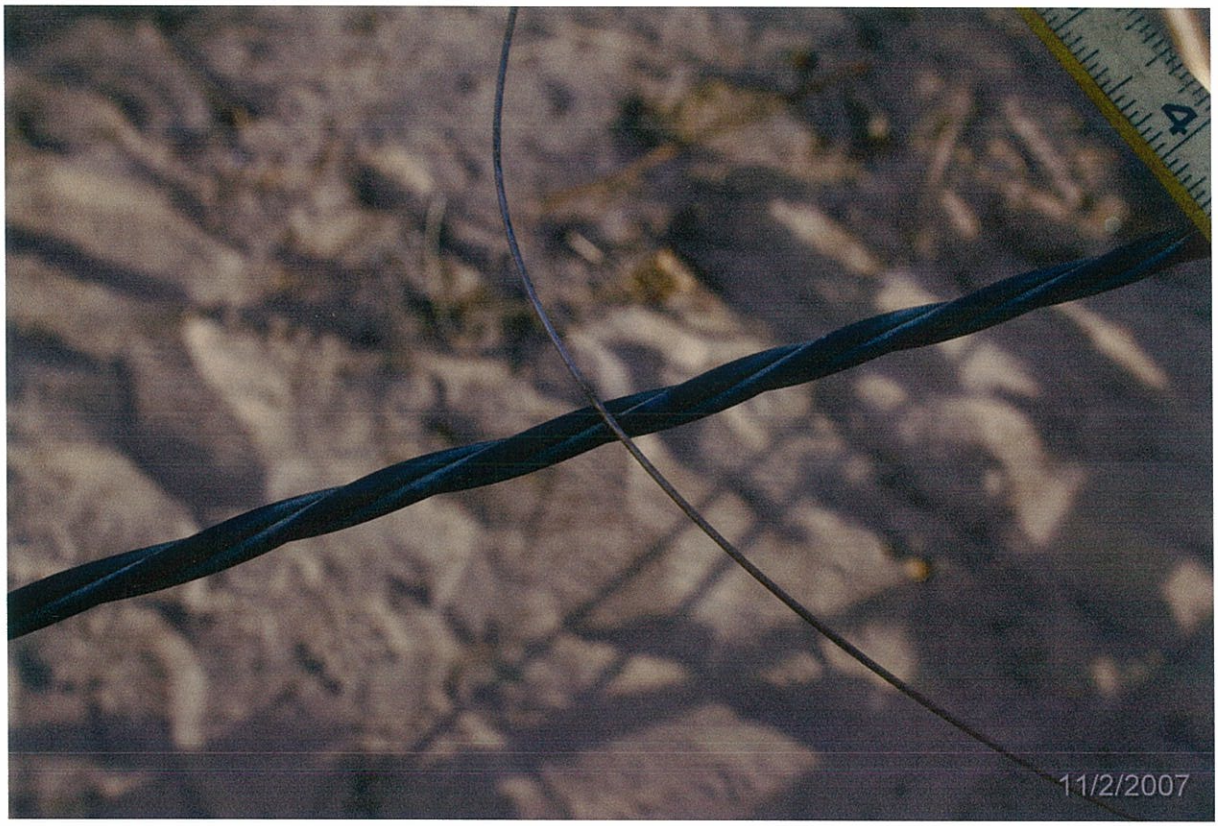

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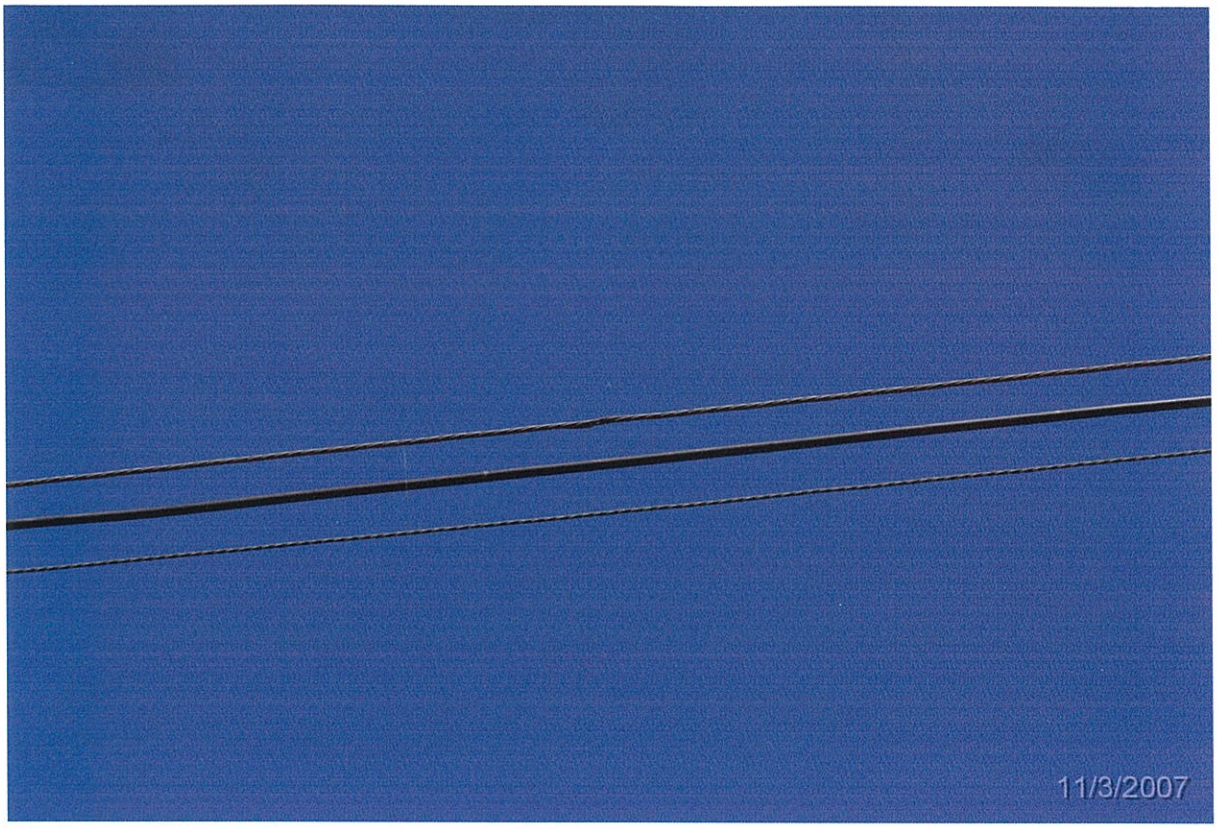

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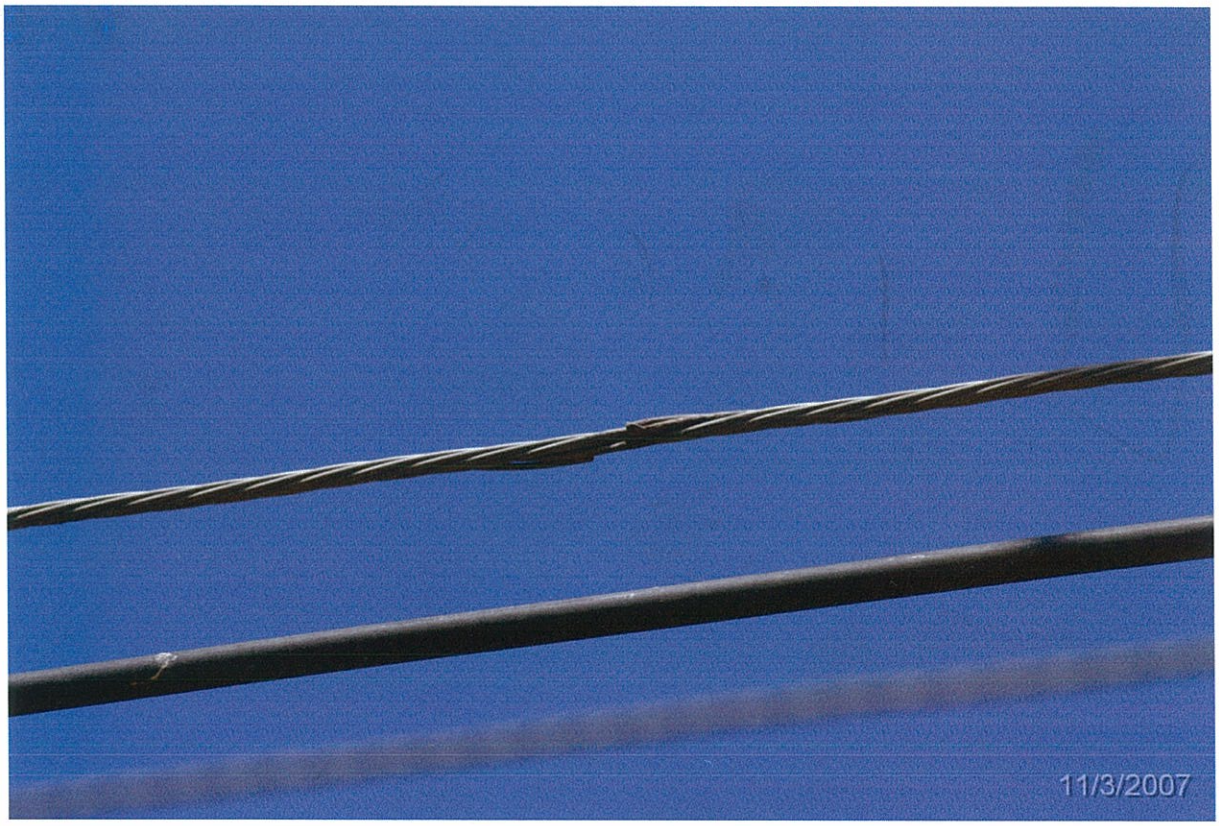

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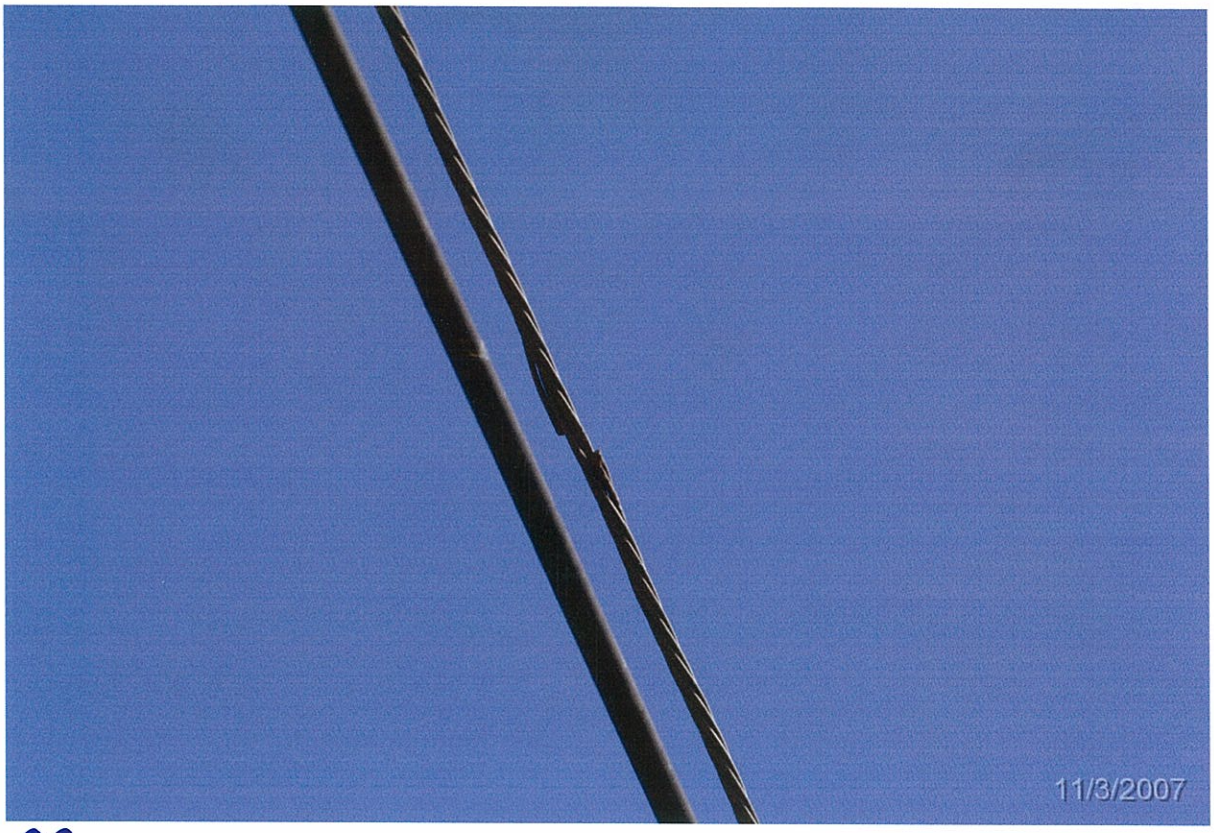

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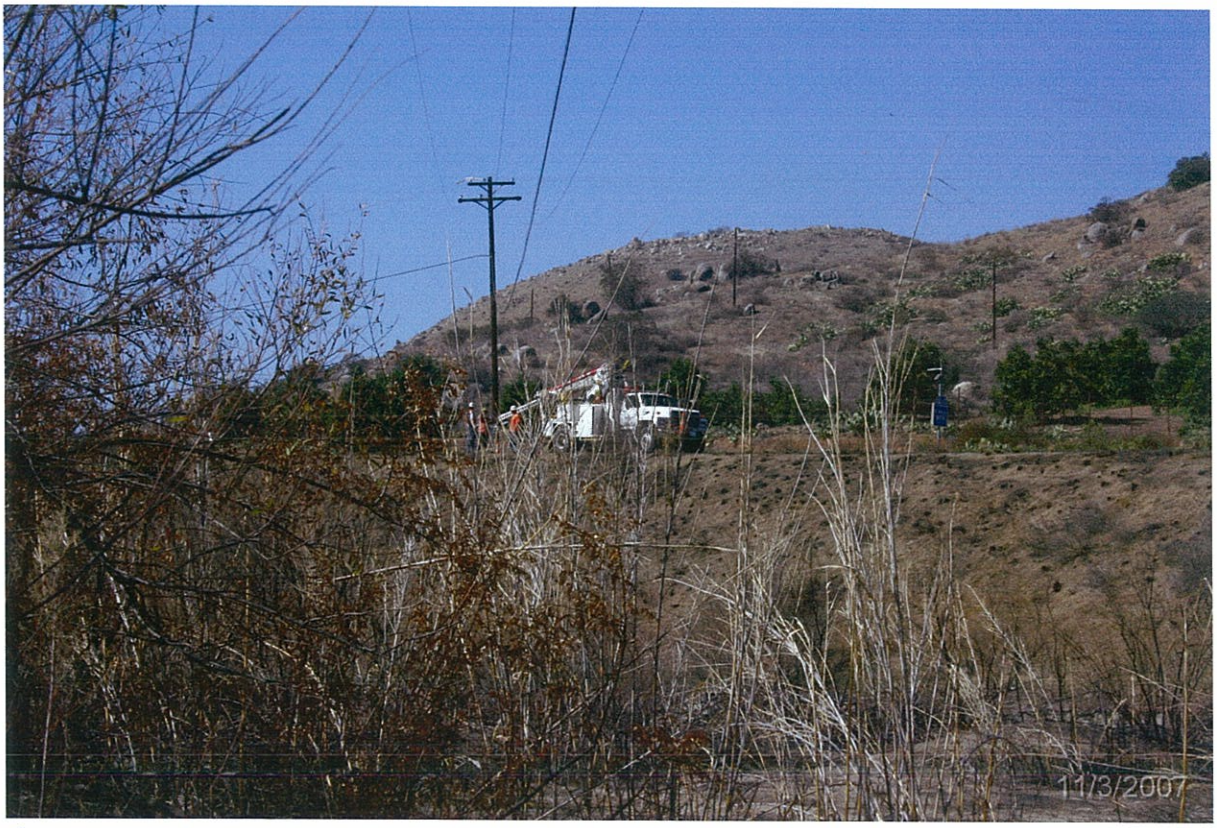

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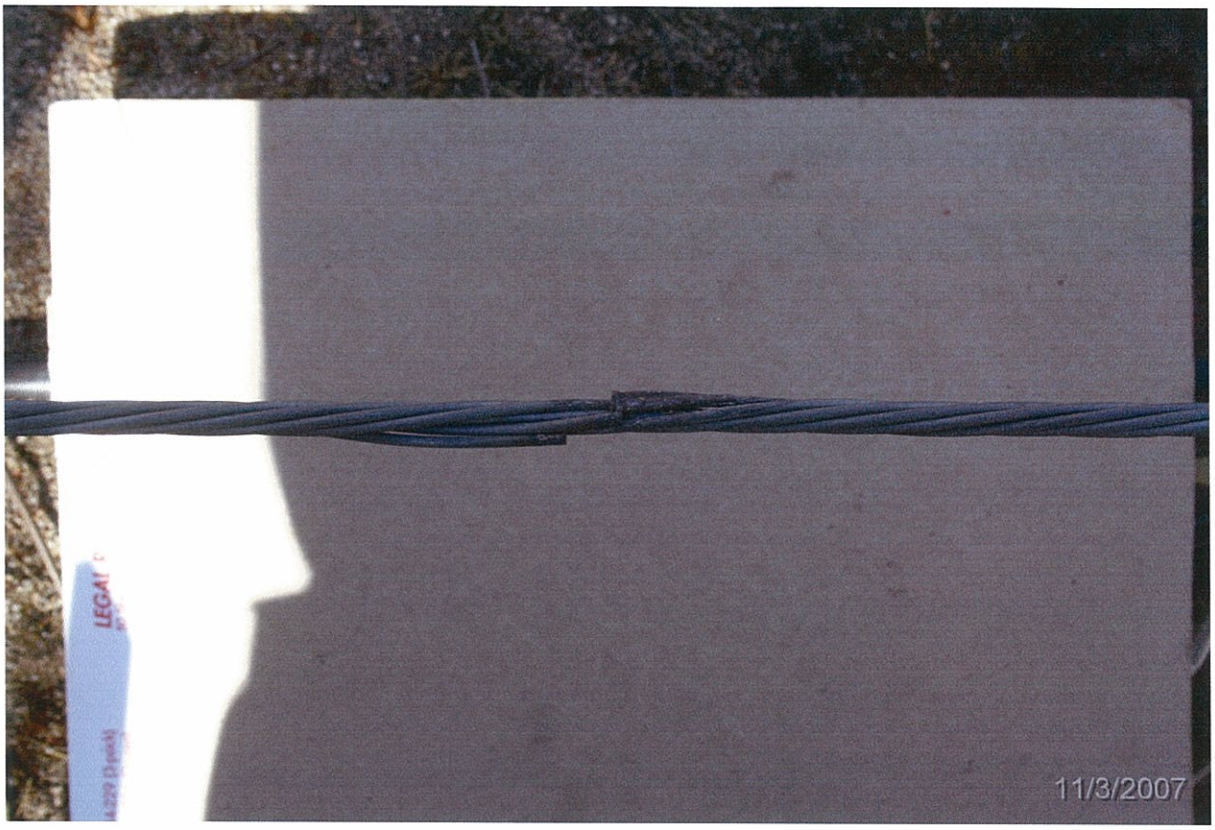

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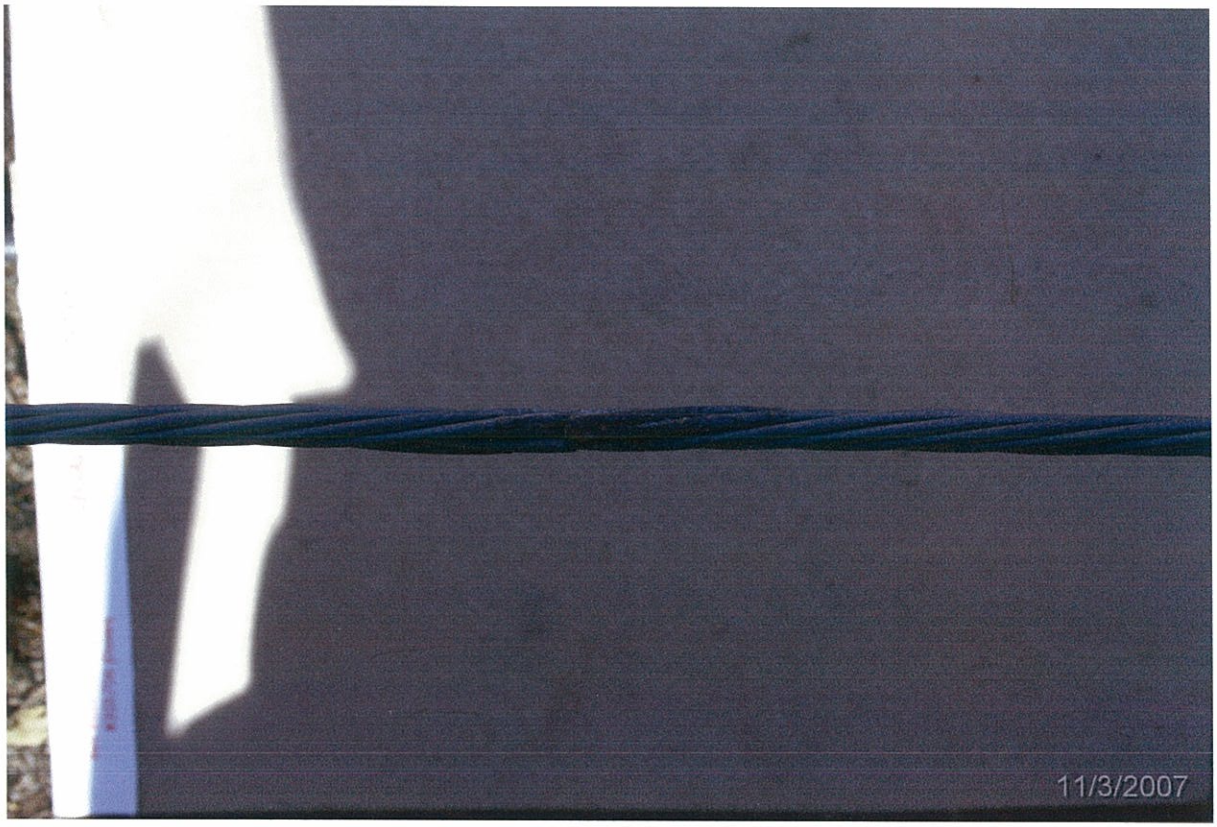

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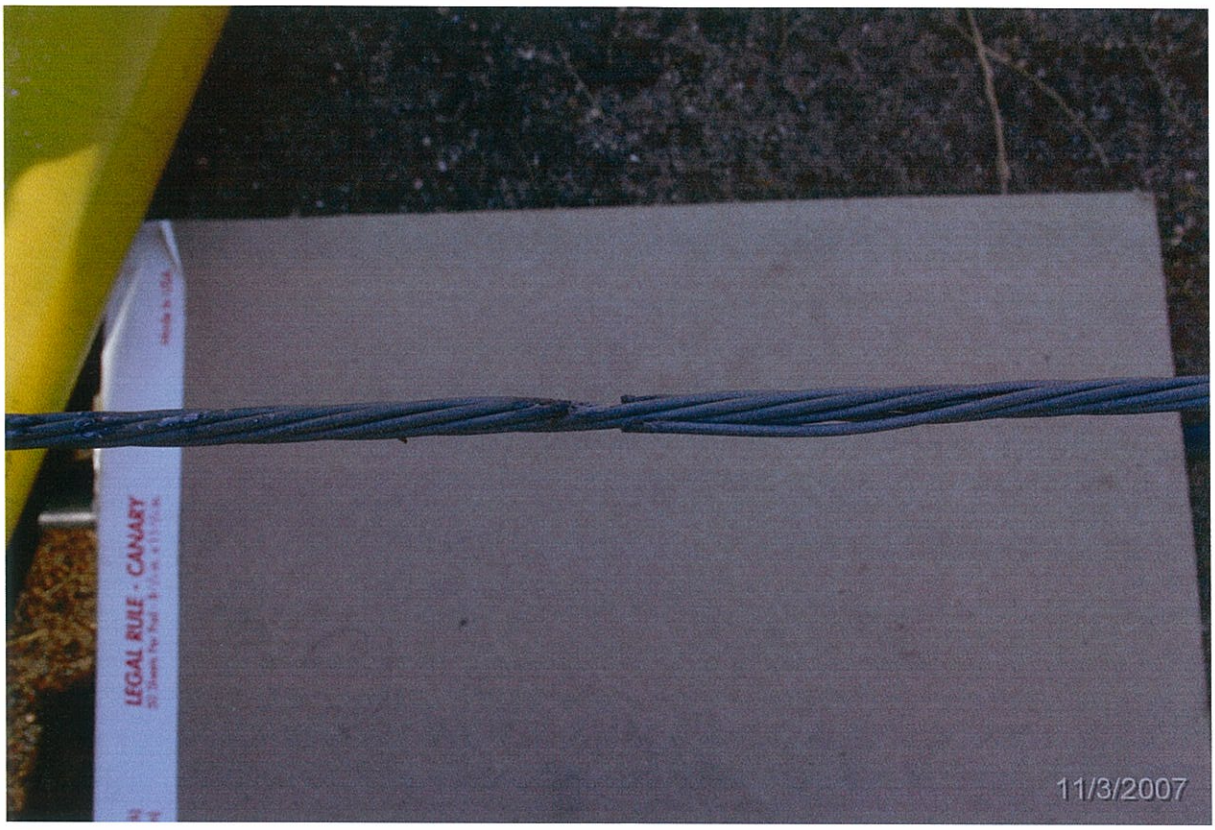

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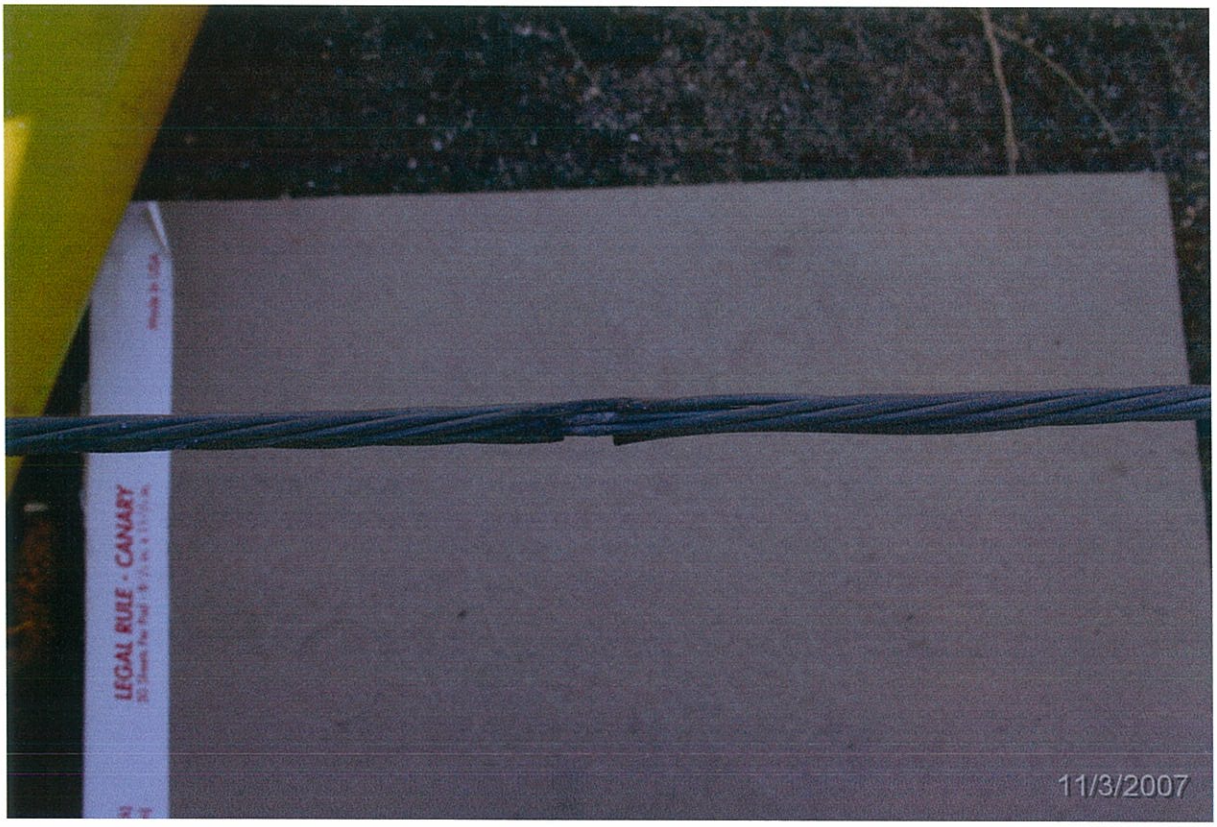

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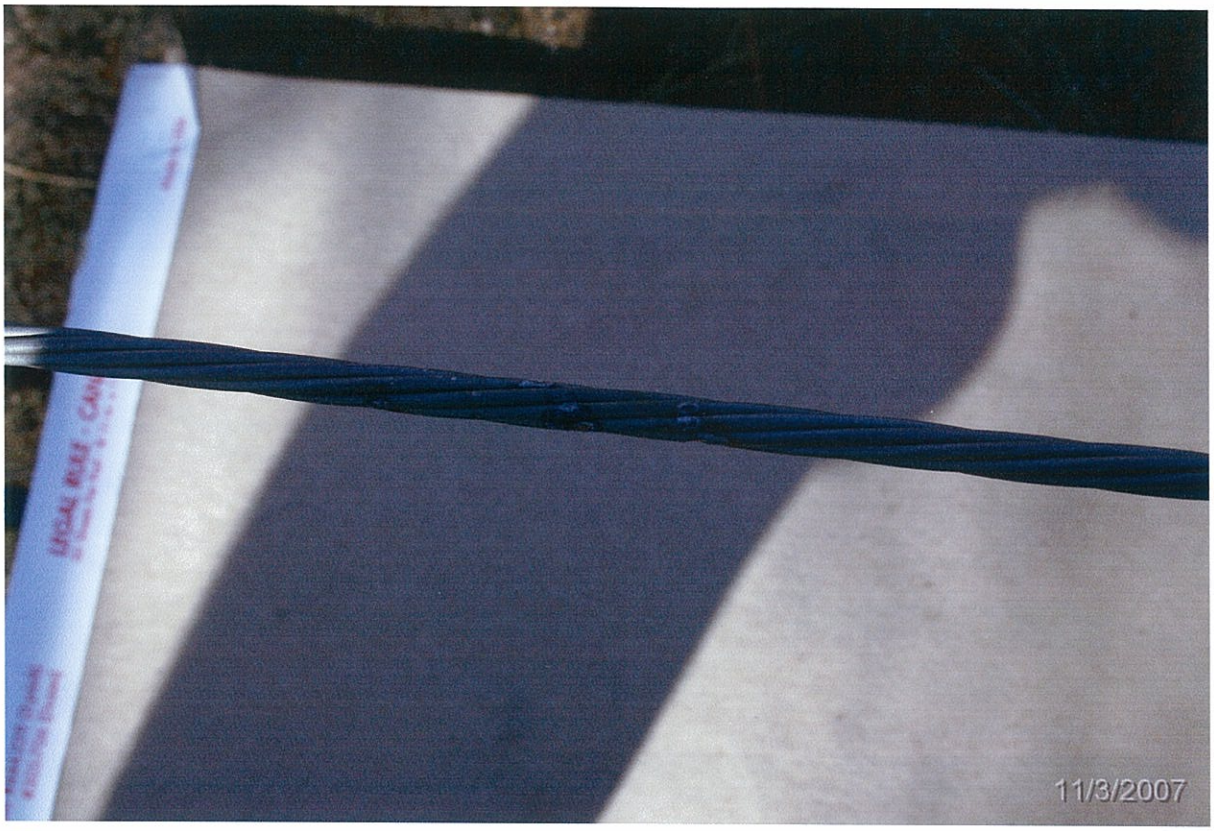

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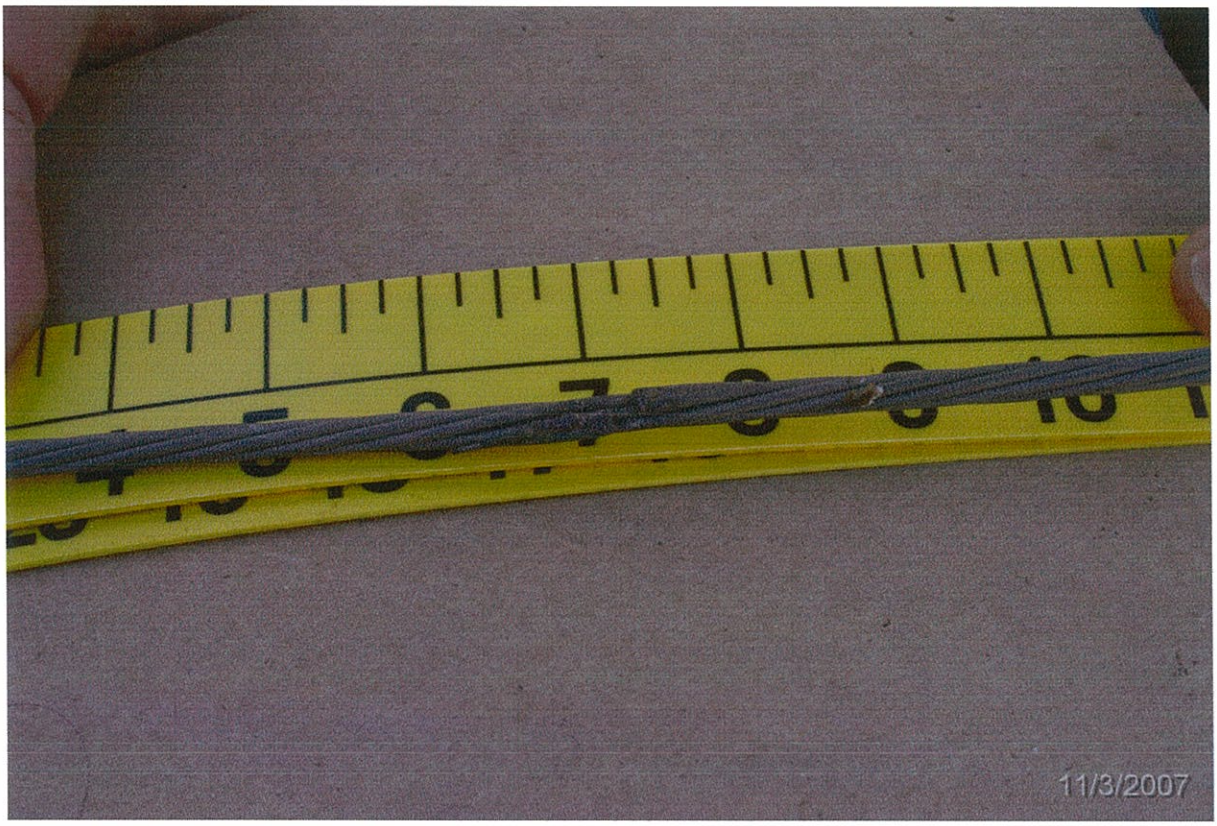

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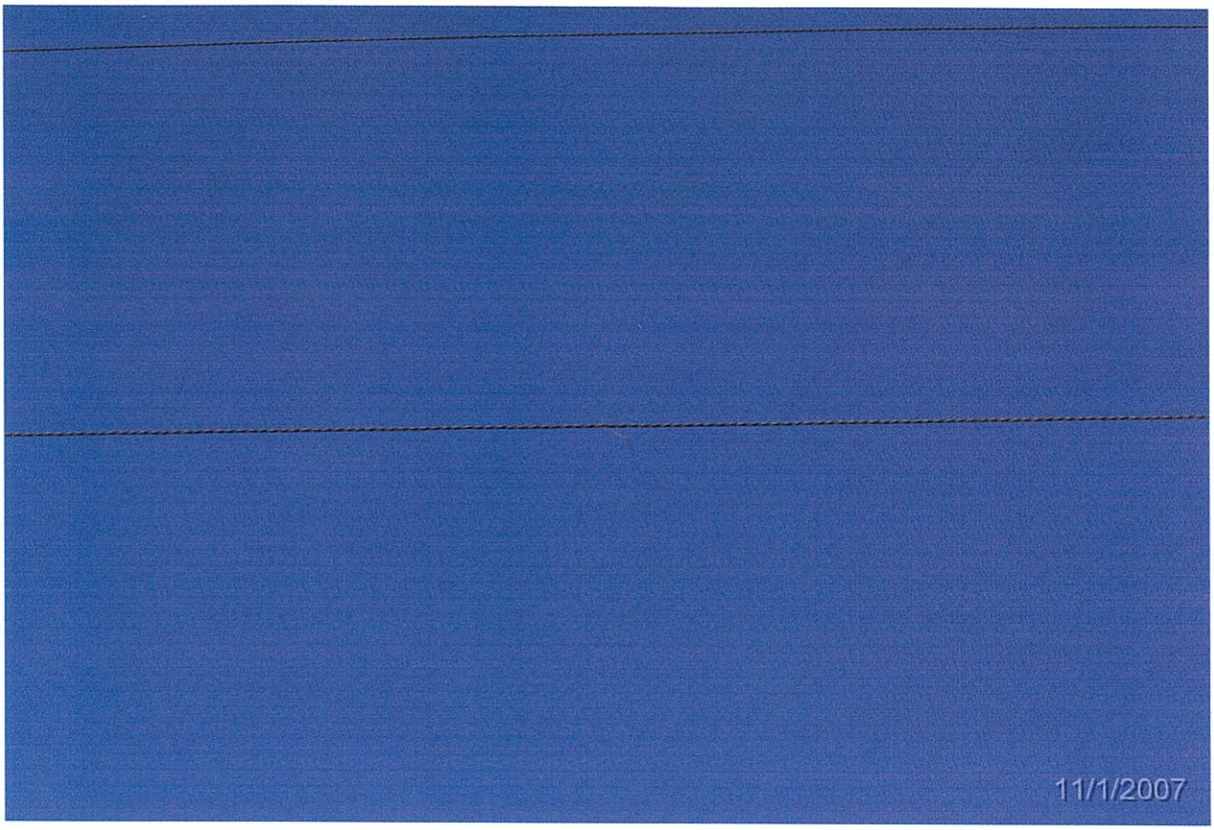

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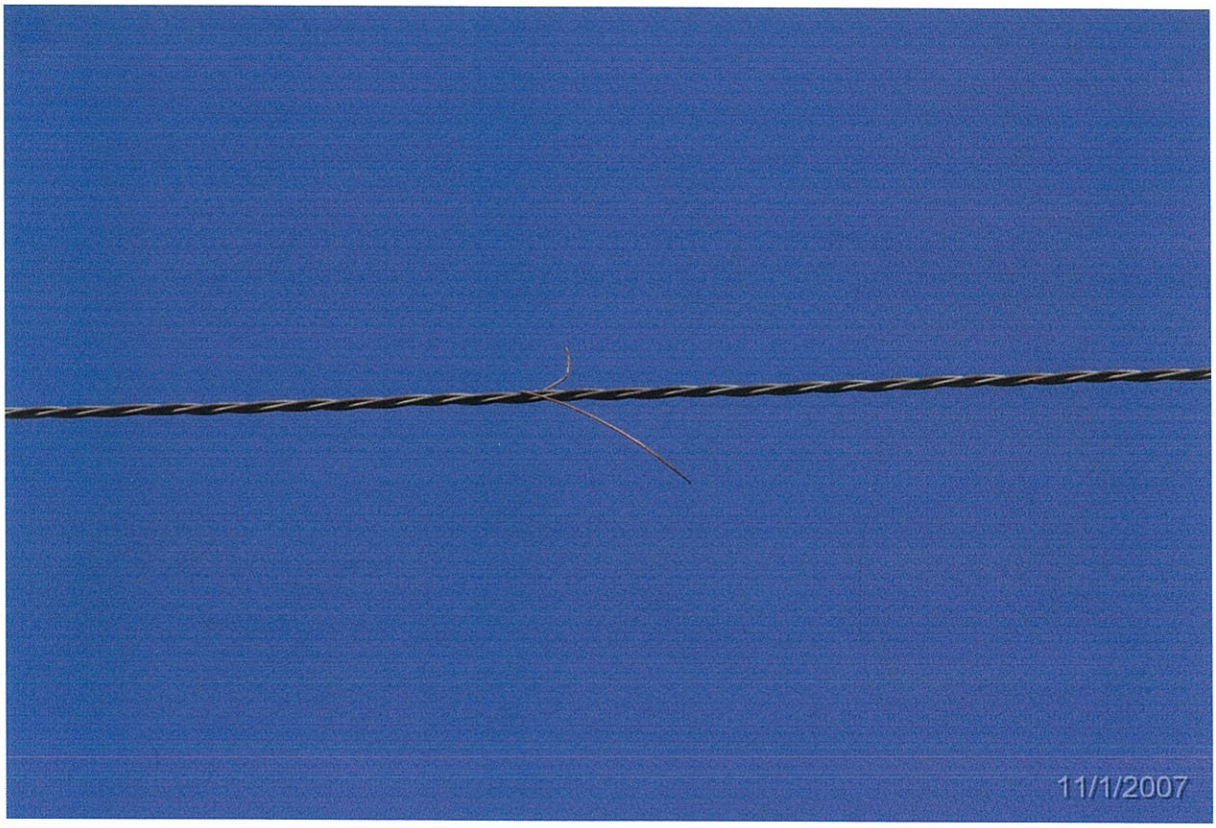

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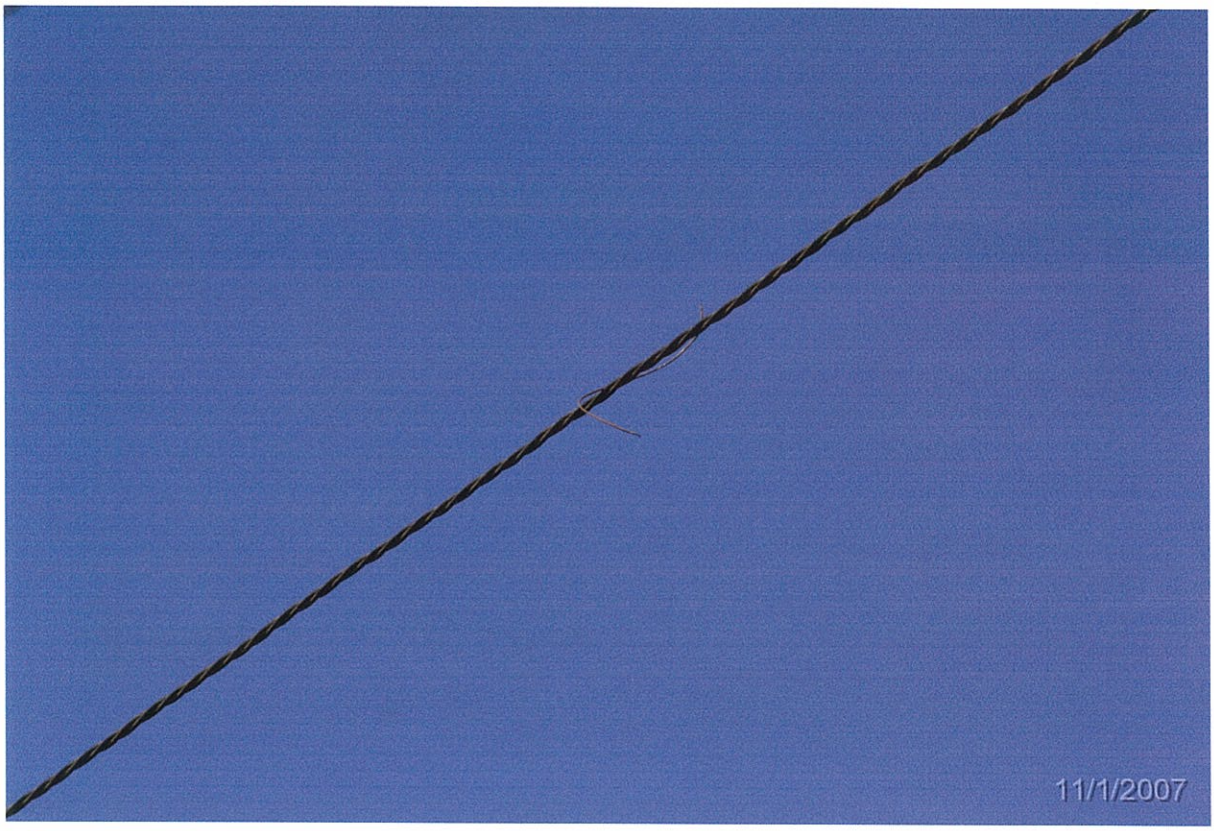

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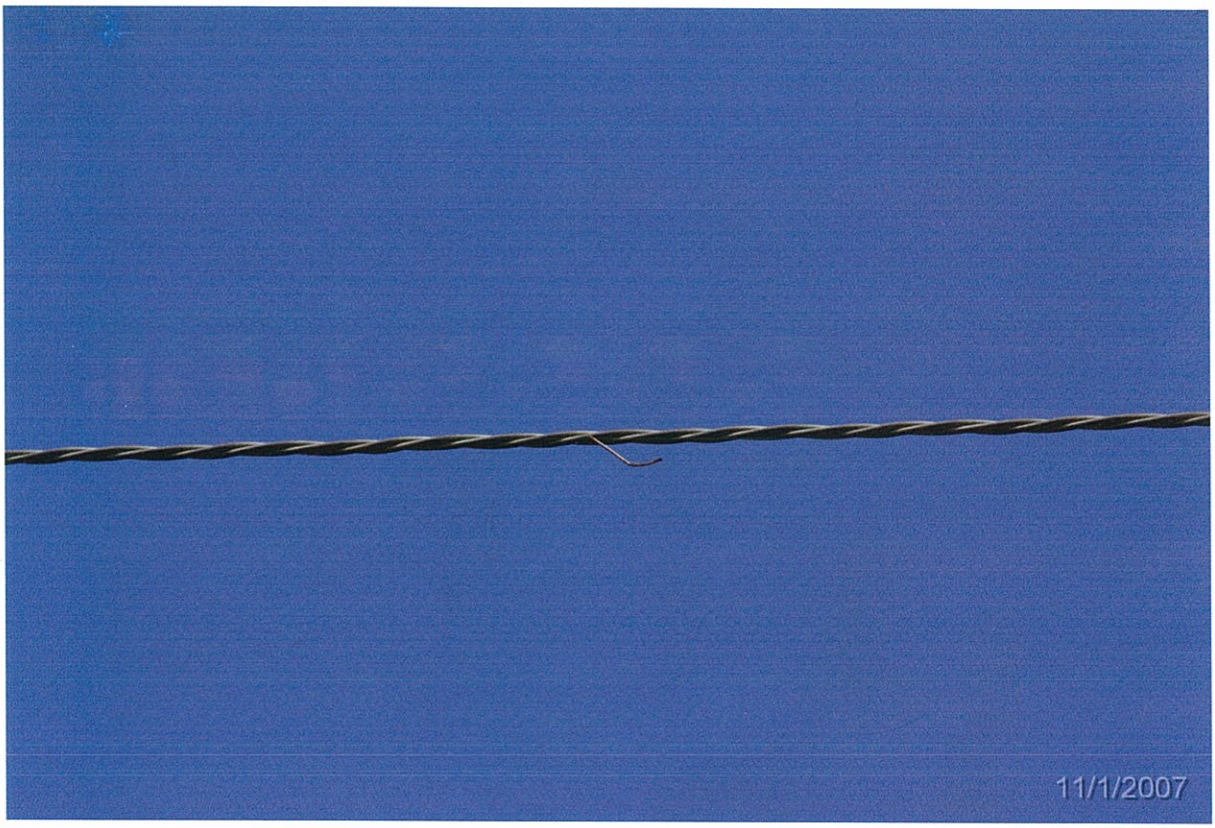

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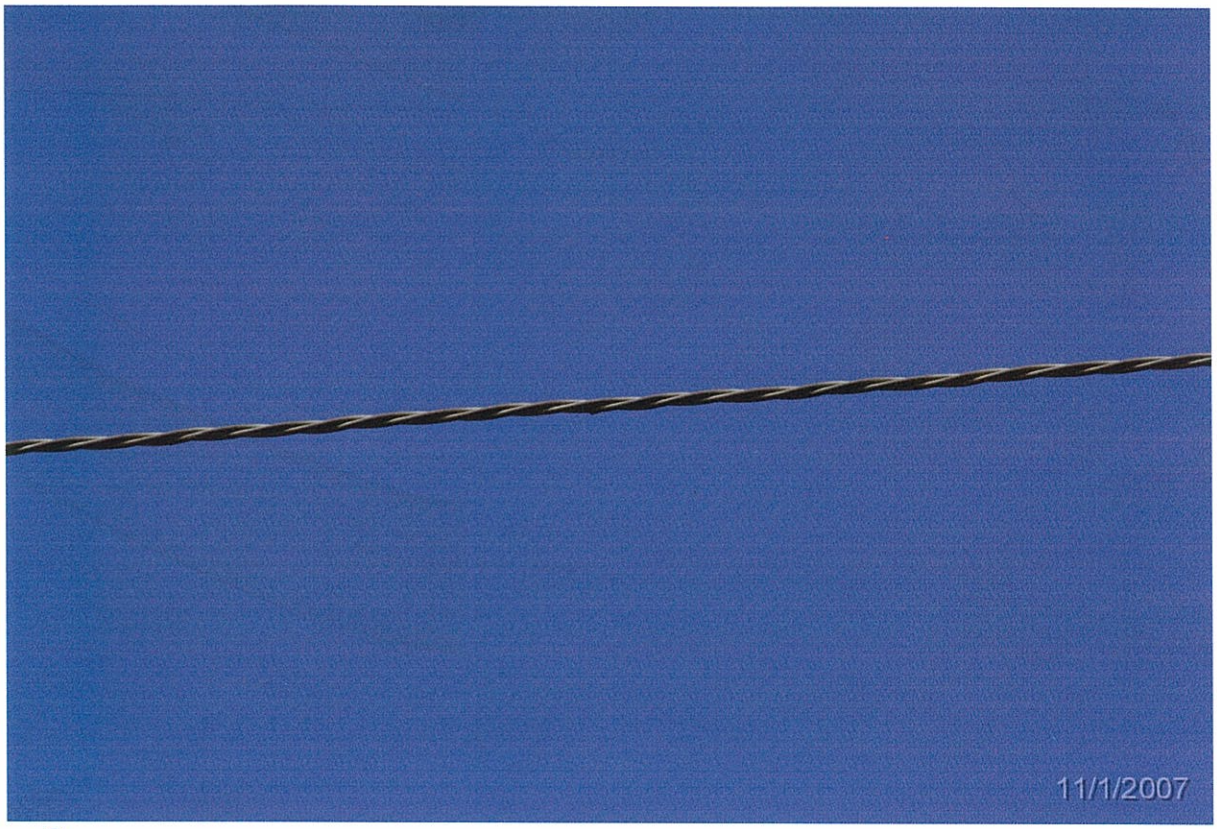

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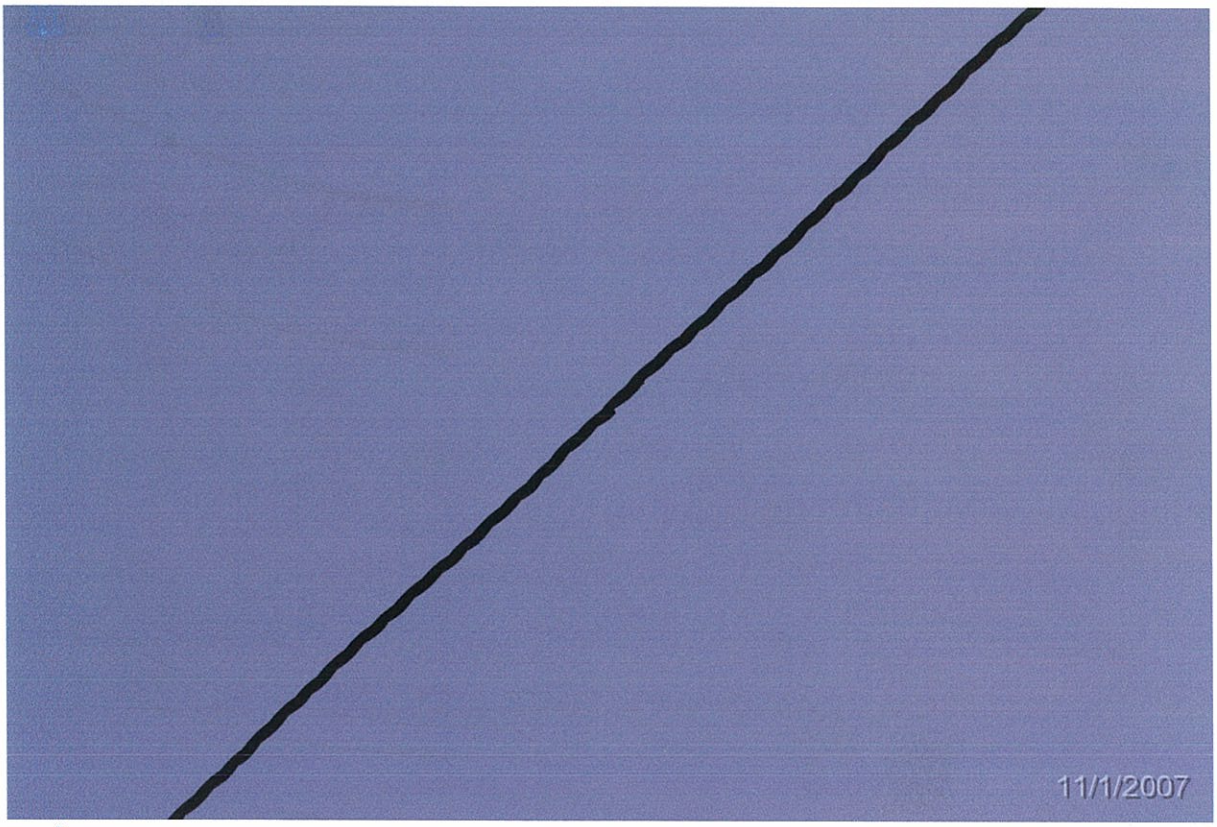

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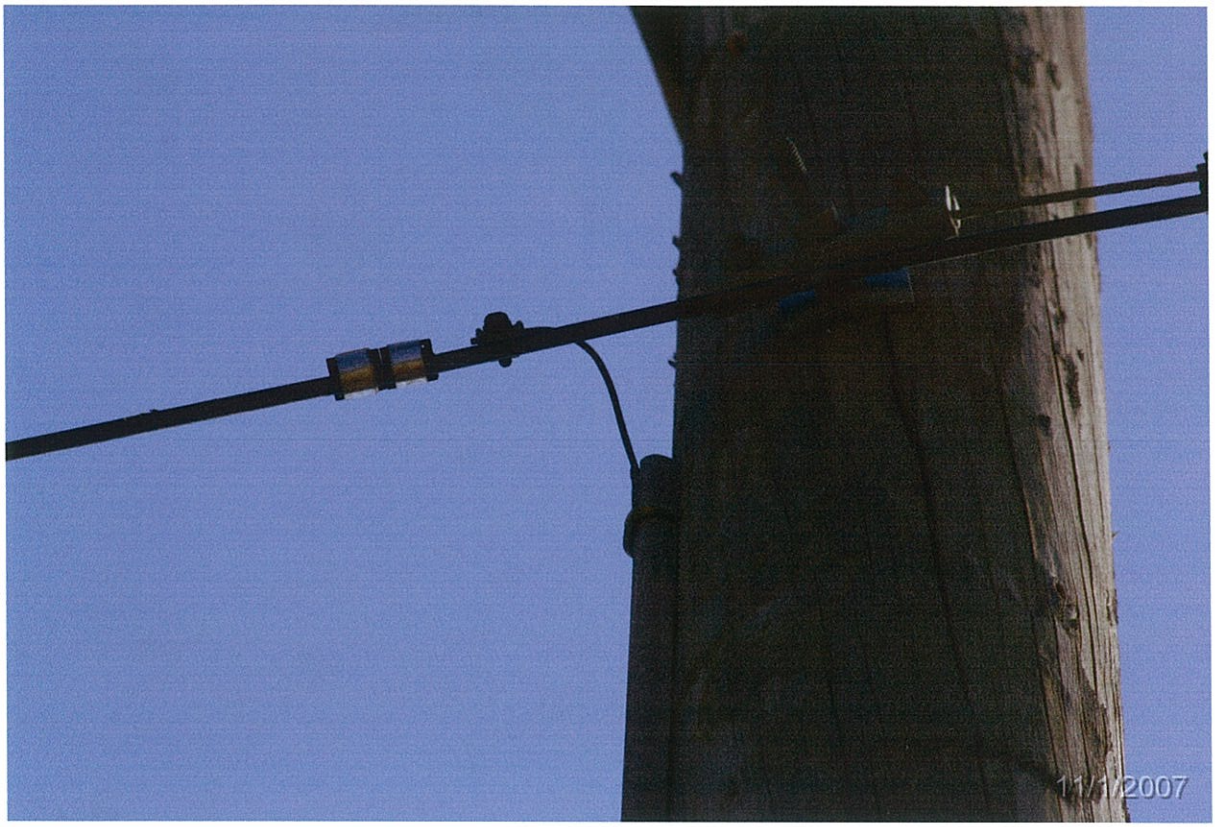

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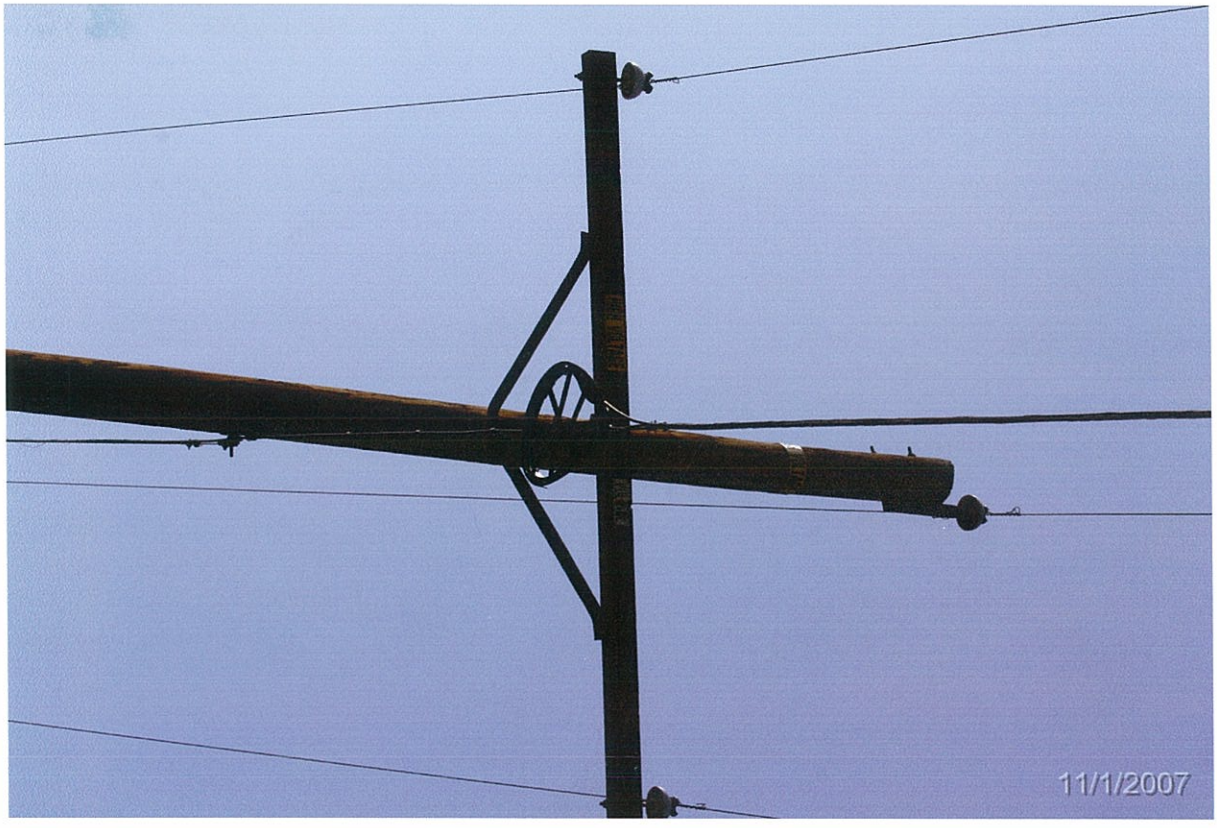

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California Department of Forestry and Fire Protection

INVESTIGATION REPORT

NAME: Rice Fire **CASE NO.** 07-CDF-572

DATE: October 23, 2007 **INCIDENT NO.** 07-CA-MVU-010502

LOCATION: Rice Canyon Road, San Diego County, CA

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1 - VIOLATION:

Public Resources Code Section 4293 - Except as otherwise provided in Sections 4294 to 4296, inclusive, any person that owns, controls, operates, or maintains any electrical transmission or distribution line upon any mountainous land, or in forest-covered land, brush-covered land, or grass-covered land shall, during such times and in such areas as are determined to be necessary by the director or the agency which has primary responsibility for the fire protection of such areas, maintain a clearance of the respective distances which are specified in this section in all directions between all vegetation and all conductors which are carrying electric current:

(a) For any line which is operating at 2,400 or more volts, but less than 72,000 volts, four feet.

(b) For any line which is operating at 72,000 or more volts, but less than 110,000 volts, six feet.

(c) For any line which is operating at 110,000 or more volts, 10 feet.

In every case, such distance shall be sufficiently great to furnish the required clearance at any position of the wire, or conductor when the adjacent air temperature is 120 degrees Fahrenheit, or less. Dead trees, old decadent or rotten trees, trees weakened by decay or disease and trees or portions thereof

that are leaning toward the line which may contact the line from the side or may fall on the line shall be felled, cut, or trimmed so as to remove such hazard. The director or the agency which has primary responsibility for the fire protection of such areas may permit exceptions from the requirements of this section which are based upon the specific circumstances involved.

2 - SUMMARY:

On October 22, 2007 at approximately 4:16 AM Tom DAVIS, a resident of the area, reported a fire in the Rice Canyon area. This fire was identified as the Rice Fire and eventually burned approximately 9,472 acres, damaging approximately 206 homes, two commercial properties and 40 outbuildings.

On October 23, 2007 I was assigned to conduct an origin and cause investigation into the Rice Fire. During the course of my investigation I located two Specific Origin Areas, one on each side of Rice Canyon Road. I located downed power lines in each Specific Origin Area. During my investigation I eliminated all other causes for the Rice Fire, determining it to be a power line caused fire.

3 - SUBJECT:

San Diego Gas and Electric/Sempra Energy
8330 Century Park Court
San Diego, CA 92123
San Diego Gas and Electric operates the line which was determined to be the cause of the Rice Fire.

4 - VICTIMS, WITNESSES & OTHERS:

Victims – During the Rice Fire 206 homes, two commercial properties and 40 outbuildings were destroyed. Reference the Damage Assessment Report for the details of the losses associated with the Rice Fire and victim information.

W-1 Frank DeSILVA

Resident

[redacted]

DeSILVA observed the fire on the west side of Rice Canyon Road.

W-2 Ed JONES

Resident

[redacted]

JONES saw the fire on both side of Rice Canyon Road.

W-3 Tom DAVIS

Resident

[redacted]

DAVIS was the first reporting party for the Rice Fire

O-1 Fire Captain Specialist Preston FOUTS, ID #2654

[redacted]

FOUTS assisted with the origin and cause investigation

O-2 Joseph TORRES
San Diego Gas and Electric
Construction Supervisor – Electric
571 Escondido Street, SD1445
Escondido, CA 92029
TORRES was present when I collected Item #'s 1-4 and was issued a property receipt

O-3 Larry DAVIS
Sempra Energy
Managing Attorney
101 Ash Street
San Diego, CA 92101
(619) 517-9424

O-4 Larry HALL
Electrical Engineer
8575 Renown Drive
San Diego, CA 92119
[redacted]

5 - EVIDENCE:

P-1 MG thru P-102 MG Photographs taken on October 23, 2007

P-1 MG thru P-9 MG Photographs taken on October 24, 2007

Item #1 – Section of power line taken from west side of Rice Canyon Road, adjacent to Specific Origin Area #2.

Item #2 – Section of power line taken from north side of Specific Origin Area #2

Item #3 – Section of power line taken from adjacent of Specific Origin Area #1

Item #4 – Section of power line taken from adjacent to Specific Origin Area #1

A property receipt was issued to O-2 Joseph TORRES for the above items of evidence on October 24, 2007. The above items of evidence were then transferred to the CAL-FIRE evidence locker at Monte Vista Headquarters on October 25, 2007.

6 - CONDITIONS:

Relative Humidity: Palomar @ 3:15 AM – 13%

Temperature: Palomar @3:15 AM - 48° Fahrenheit
Valley Center @ 4:13 AM - 68° Fahrenheit

Wind Direction: Palomar – ESE
Valley Center – ENE

Wind Speed: Palomar 18 MPH, gust to 24 MPH
Valley Center 24 MPH, gust to 47 MPH

Aspect: SOA #1 – North
SOA #2 - Flat

Slope: SOA #1 – Moderate slope
SOA #2 - Flat

The above weather conditions were obtained via the Remote Automated Weater Station (RAWS) located at Valley Center, CA and Palomar, CA. The Palomar Station data was obtained at approximately 3:15 AM, and the Valley Center Station data was obtained at approximately 4:13 AM on October 22, 2007.

Additionally, a red flag warning was in effect for the San Diego County area. Multiple fires were burning throughout Southern California during the time.

7 - EQUIPMENT:

The equipment associated with the cause of the Rice Fire was a 12 KV distribution line operated by San Diego Gas and Electric. The effected span was between Pole #112340 and Pole #213072. Sections of the effected power line were collected as evidence, Items #1-4.

8 - PROPERTY:

The Rice Fire burned approximately 9,472 acres before being contained. During the course of the fire approximately 206 homes, two commercial properties and 40 outbuildings were destroyed. For additional information relating to the damages suffered during the Rice Fire reference the Damage Assessment Report.

9 - NARRATIVE:

On October 22, 2007 at approximately 4:16 AM W-3 Tom DAVIS reported a vegetation fire to the San Diego Unit on Rice Canyon Road near "Deadmans Curve." This fire is identified as the Rice Fire, and eventually burned approximately 9,472 acres before being contained.

On October 23, 2007 I was assigned to conduct an Origin and Cause investigation for the Rice Fire. I met with O-1 Fire Captain Specialist Preston FOUTS on Rice Canyon Road, inside of the fire area. I learned from FOUTS he had spoken with witnesses to the fire start who identified the general area where the fire had originated.

Perimeter Search

During the perimeter search of the fire area, I identified witnesses to be interviewed and located downed power lines in the area, later identified as the two Specific Origin Areas. I also observed indicators which showed the General Origin Area as being located on the east side of the fire, on both sides of Rice Canyon Road.

Origin Determination

I entered the burned area on the east side of Rice Canyon Road and observed indicators which showed an advancing fire. These indicators included angle of char, staining on rocks and areas of protection. I also observed areas of freezing, which indicated wind direction. I determined the General Origin Area included both sides of Rice Canyon Road, near the heel of the fire.

I first entered the area on the east side of Rice Canyon Road and observed indications of an advancing fire. These indicators included angle of char on trunks of trees, angle of char on brush, staining on rocks, and damage differential. I identified the initial run, advancing fire, and marked these indicators with red flags. I continued in a "S" pattern, observing indicators of a lateral moving fire. These indicators included damage differential and comparing areas of protection with

exposed areas. I identified these areas as the flanks of the fire and marked them with yellow colored flags.

I continued to an area where I began to observe indications of a backing fire. These indicators included die-out patterns, areas of protection and staining on rocks. I marked these areas with blue colored flagging. I identified this area where the fire transitioned from advancing to backing and where the two flanks came together as the Specific Origin Area #1.

I then entered the burned area on the west side of Rice Canyon Road to an area where I observed indications of an advancing fire. These indicators included staining on objects with in the burn, areas of protection and angle of char on brush and small trees. I marked these indicators with red colored flags. I followed these indicators back in a "S" pattern, where I also observed indications of a lateral moving fire. These indicators included areas of protection and damage differential. I marked these indicators with yellow colored flags.

I continued to an area where I observed indications of a backing fire. I observed die-out patterns, staining and cupping. I identified this area where the fire transitioned from an advancing fire to a backing fire and where the two flanks came together as the Specific Origin Area #2. Within these two Specific Origin Areas I completed the following cause elimination analysis.

Cause Exclusion

Lightning – The skies were clear and Santa Ana wind conditions were present. There were no thunder heads observed while I was at the scene. Additionally, I did not observe any signs of lightning strikes on the trees adjacent to the Specific Origin Areas located. Based on the above I eliminated a lightning caused fire.

Spontaneous Combustion – During my investigation I did not observe any debris piles, or remnants of debris, in the Specific Origin Areas which could have

contributed to the cause of the fire. There were no piled organic materials typically associated with spontaneous combustion caused fires. Based on the above facts I eliminated spontaneous combustion as a cause for the fire.

Campfire – While examining the Specific Origin Areas of the Rice Fire and during the perimeter search I did not observe any remnants of campfires, or areas where camping occurs. There were no rock rings, piles of firewood or other signs of a campfire caused fire. Based on the above facts I eliminated a campfire as the cause for the fire.

Smoking – During my investigation I did not locate any cigarette butts or other smoking related materials in either Specific Origin Area. Specific Origin Area #1 is located uphill from Rice Canyon Road in an area where it is impossible for a discarded cigarette from the roadway to come to rest. Specific Origin Area #2 is located across a creek from the roadway. There is a gated dirt road which runs north of Specific Origin Area #2, however the road was overgrown and did not support frequent, if any, vehicle traffic. Based upon the above facts I eliminated smoking as a cause for the fire.

Debris Burning – I did not observe any signs of debris burning in the area. I did not observe any burn barrels, piled debris, or other indication of debris burning being conducted in the area. San Diego also currently has a burn ban in effect which prohibits debris burning. Based upon the above facts I eliminated debris burning as a cause for the fire.

Vehicles – Both Specific Origin Areas were located away from Rice Canyon Road. I observed no recent signs of vehicle traffic thru the Specific Origin Areas. Specific Origin Area #1 was in-accessible to vehicle due to the rocky terrain and vegetation. Additionally, I swept both Specific Origin Areas with a magnet and did not recover any carbon particles associated with vehicle caused fires. I did not observe any remnants of catalytic converter components within either Specific Origin Area. Based upon the above facts I eliminated vehicles as a cause for the fire.

Equipment use – I did not observe any signs of equipment use within either Specific

Origin Area. There were signs of recent tree work adjacent to Specific Origin Area #2, however there was burned fuels underneath of the piled logs; and the logs were undamaged by fire, which indicated the work occurred post-fire. I did not observe any signs of strike marks on rocks, any track marks associated with heavy equipment, or any other signs of equipment use. Based upon the above facts I eliminated equipment use as a cause for the fire.

Railroad – There were no railroads in the area where the Rice Fire originated which could have contributed to the cause of the fire. Based on the above facts I eliminated railroads as contributing to the cause of the fire.

Fireworks – During my investigation I did not observe any remnants of fireworks in either Specific Origin Area. I did not observe any signs typically associated with the use of fireworks which would include discolored areas where they were launched from, eyewitness statements or fireworks packaging in the area. Based upon the above facts I eliminated a fireworks caused fire.

Playing with Fire – The Rice Fire was first reported at approximately 4:16 AM, which is a time children are typically at home. I did not observe any forts or play areas in either specific origin area which are typically associated with playing fire caused fires. I did not observe any debris which would indicate the area where the fire occurred is frequented by children. Based upon the above facts I eliminated a playing with fire caused fire.

Power lines – During my investigation of Specific Origin Areas #1 and #2 I located downed power lines. Each line showed areas of spackling and arcing. Witness statements place the fire as being small in size near the areas I identified as the Specific Origin Areas and the power going out between 4:00 and 4:15 AM, which correlates to the estimate provided by SDG&E. During the course of the investigation I eliminated all other causes for the fire, determining the Rice Fire to be a power line caused fire.

Glass refraction – During my investigation I did not observe any pieces of glass or reflective objects in either Specific Origin Area. I observed no pieces of debris, or reflective materials during the perimeter search or during my investigation of

the Specific Origin Areas which could have contributed to the cause of the fire. Additionally, based on the time the fire occurred and on the above facts I eliminated a glass refraction caused fire.

Incendiary – Based upon witness statements, my observations of the downed power lines located in both Specific Origin Areas I eliminated an arson caused fire. I did not locate any incendiary devices in either Specific Origin Area. Both Specific Origin Areas were located a distance from the roadway, in areas where no trails or easy access could be made. There were no indications this was an arson caused fire, and based upon the above facts I eliminated an arson caused fire.

Interviews

I first interviewed W-1 Frank DeSILVA on October 23, 2007. He said he was up at approximately 4:10 AM on October 21, 2007 and saw sparks coming from the area later identified as Specific Origin Area #2, but he didn't know what they were coming from. His friend "Bob" came up to his house to tell him about the fire. When he first saw the fire he estimated it was twenty-feet in size and around the pole with the transformer on the west side of Rice Canyon Road.

On October 23, 2007 I also met with W-2 Ed JONES at his residence. JONES said he woke up on October 22, 2007 at approximately 3:00 AM. He was watching TV and he said the power went out at approximately 4:05 AM. He then went outside of his residence and saw fire below the upper pole and to the right of it by the lower pole. These areas he described lined up with the Specific Origin Areas #1 and #2 I previously identified. I photographed the view from JONES residence, where he described seeing the fires. He described the upper fire as being more intense then than the lower fire.

October 24, 2007

On October 24, 2007 I returned to the Rice Canyon Fire where I met O-2 Joseph

TORRES and SDG&E representative. SDG&E was re-stringing the lines in the Rice Canyon area. I asked TORRES to assist me in identifying damage to the lines in both Specific Origin Areas. TORRES described the spackling I observed on the lines adjacent to Specific Origin Area #2 as indicative of the line coming in contact with vegetation in the area. We also looked at the beading and breaks in the line near Specific Origin Area #1. He described the break in the line as looking like it occurred in an area where the spackling occurred. TORRES also said he believed the power had gone out in the area approximately 4:00 AM on October 22, 2007.

I also interviewed W-3 Tom DAVIS via telephone. DAVIS was the first 911 caller for the Rice Fire. He said he left his house at approximately 4:00 AM on October 22, 2007. When he left his house the power was on. It was between 4:00 AM and 4:15 AM same date when he saw the fire. He described the fire as being twenty to thirty feet off of the road and seven to eight feet in diameter by an oak tree. He described the fire as on the west side of Rice Canyon Road by a big tree. He described fifteen foot high flames on the north side of the tree. He described the flames as looking really hot. The area DAVIS described matches with the area where I located Specific Origin Area #2.

I also spoke with O-4 Larry HALL from SDG&E via telephone. We were working towards obtaining records relating to both the Witch Fire and the Rice Fire. He asked if I had any information on the cause of the Rice Fire, and I said it was a power line caused fire. He replied "I know that."

November 2, 2007

On November 2, 2007 I met with members from SDG&E regarding the Rice Fire and the Witch Fire. HALL stated they are attempting to retrieve the tree information for the effected trees adjacent to the Specific Origin Area #2. I did learn the area surrounding the line which caused the Rice Fire had been inspected in July 2007 for trees which needed to be trimmed. The sycamore tree identified adjacent to

Specific Origin Area #2 was determined to be in compliance with no need for any priority work. Davey Tree also inspected the tree and determined the tree to be healthy and in compliance. On September 1, 2007 Davey Tree received a full package of scheduled work to be completed in the area, and the work was supposed to be completed prior to November 1, 2007.

Opinions & Conclusions

Based on my training, experience, witness statements and observations made at the scene I determined the Rice Fire to be a power line caused fire. I located downed power lines in each Specific Origin Area and each Specific Origin Area was correlated by witness statements and a second investigator. I observed arcing and spackling on the lines near each Specific Origin Area, which is indicative of the lines being energized. Also, SDG&E records indicate the lines were energized when the fire occurred. During the course of my investigation I eliminated all other causes for the fire.

10 - ATTACHMENTS:

a. Photographs P-1 MG thru P-102 MG Photographs taken on October 23, 2007
b. Photographs P-1 MG thru P-9 MG Photographs taken on October 24, 2007
c. Sketch of Specific Origin Areas #1 and #2
d. Crystal Report for 07-CA-MVU-010502

Case Disposition

This case remains open and as additional information and testing is conducted the information will be attached in supplemental reports.

INVESTIGATING OFFICER:

7-1-2008

Signature Date

Matthew Gilbert, ID #22
Fire Captain Specialist
210 W. San Jacinto Avenue
Perris, CA. 92570
(951) 940-6900

Attachment A

P-1 MG Overall view of angle of char showing advancing fire, east side of Rice Canyon

P-2 MG Overall view of indicators showing advancing fire

P-3 MG View of exposed side

P-4 MG View of protected side

P-5 MG View of angle of char showing advancing fire

P-6 MG View of leaf freeze, showing wind direction

P-7 MG Close-up view of leaf freeze

P-8 MG View of end of power line

P-9 MG View of arcing on power line

P-10 MG Close-up view of arcing

P-11 MG Close-up view of arcing

P-12 MG Close-up view of arcing

P-13 MG View of fire area

P-14 MG View of broken power line

P-15 MG View of power line

P-16 MG View of beading on power line

P-17 MG View of angle of char showing advancing fire

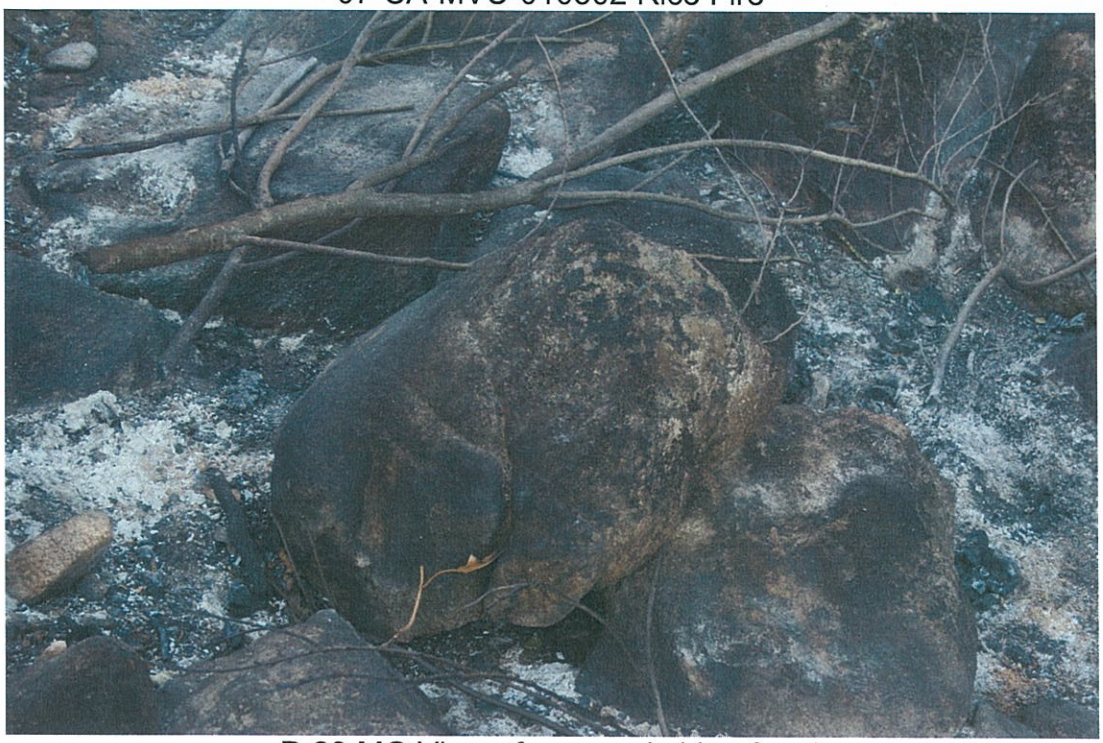
P-18 MG View of angle of char showing advancing fire

P-19 MG View of angle of char showing advancing fire

P-20 MG View of angle of char showing advancing fire

P-21 MG Overall view of rocks used to show advancing fire

P-22 MG View of protected side of rock



P-23 MG View of exposed side of rock

P-24 MG Used to seperate photos

P-25 MG Overall view of Origin #1, with flags

P-26 MG Overall view of advancing indicators

P-27 MG View of angle of char, showing advancing fire

P-28 MG View of white ash, showing advancing fire

P-29 MG Overall view of Specific Origin Area, with flagging

P-30 MG Overall view of Specific Origin Area

P-31 MG View of lateral movement of fire, exposed side

P-32 MG View of protected side

P-33 MG View of lateral fire, exposed side

P-34 MG View of protected side

P-35 MG View of backing fire, exposed side

P-36 MG View of backing fire, protected side

P-37 MG View of backing fire, with power lines marked with white flags

P-38 MG Overall view of backing indicators

P-39 MG View of damage differential, showing backing fire

P-40 MG View of damage differential, showing backing fire

P-41 MG View of damage differential, showing lateral fire

P-42 MG View of advancing fire from SOA, protected side

P-43 MG View of exposed side

P-44 MG Close-up view of exposed side

P-45 MG View of SOA

P-46 MG View of SOA

P-47 MG View of power line

P-48 MG View of power line

P-49 MG View of SOA with power line

P-50 MG Close-up view of power line

P-51 MG View of arcing on power line

P-52 MG View of arcing and damage to power line

P-53 MG View of arcing and damage to power line

P-54 MG View of power line

P-55 MG View of downed power line, south of SOA

P-56 MG View of damage to power line

P-57 MG View of beading on end of power liine

P-58 MG Close-up view of damage to power line

P-59 MG View of beading on end of power line

P-60 MG Close-up view of beading

P-61 MG Close-up view of beading

P-62 MG Overall view of second origin, on west side of Rice Canyon

P-63 MG Overall view of advancing indicators, north of SOA

P-64 MG View of protected side of indicator

P-65 MG View of exposed side of indicator

P-66 MG View of exposed side of indicator, showing advancing fire

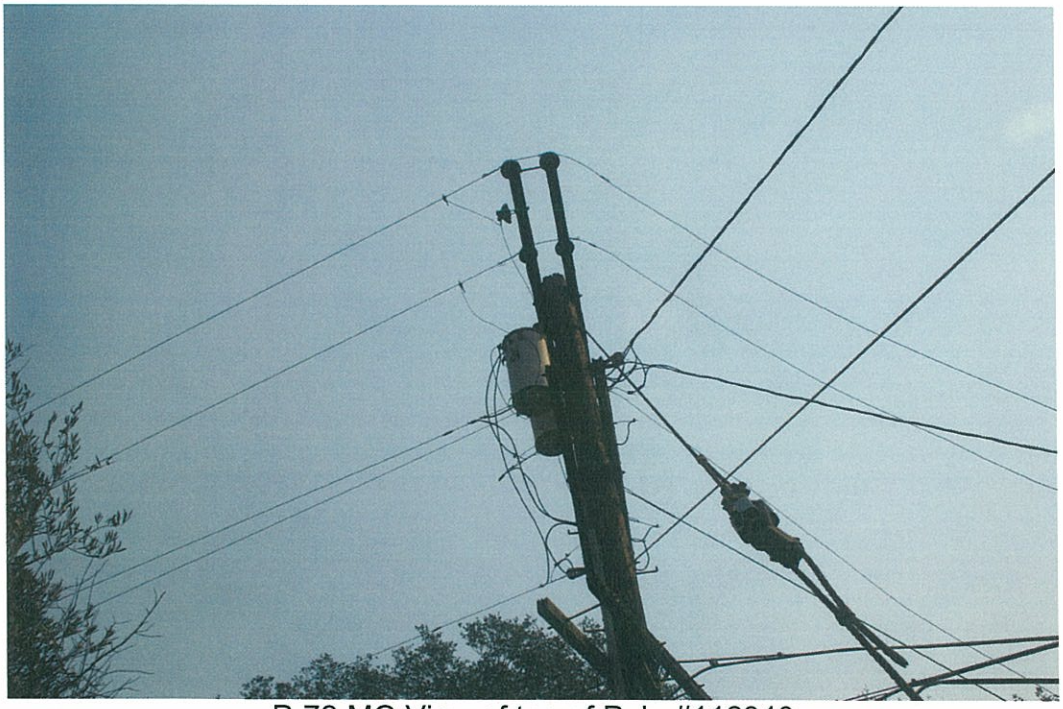
P-67 MG View of protected side of indicator

P-68 MG View of angle of char on ladder

P-69 MG View of angle of char, showing advancing fire

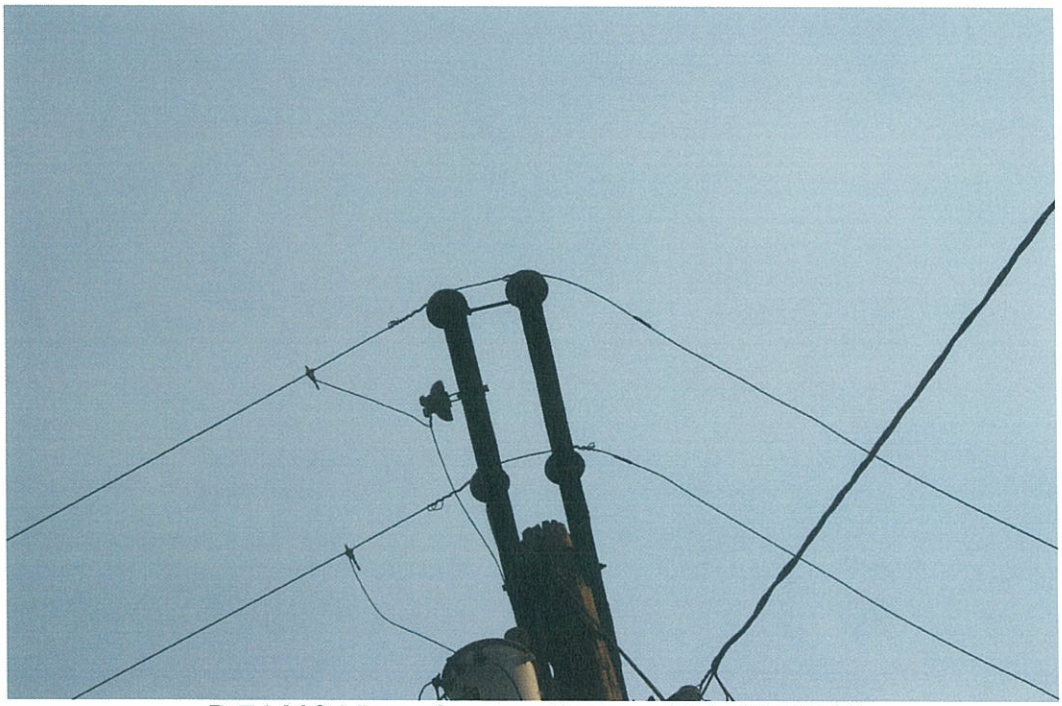
P-70 MG View of Pole #112340

P-71 MG Overall view of Pole #112340



P-72 MG View of top of Pole #112340

P-73 MG View of transformers on Pole #112340



P-74 MG View of connections on Pole #112340

P-75 MG View of connections on Pole #112340

P-76 MG View of lateral movement, SOA in background

P-77 MG View of exposed side of previous indicator

P-78 MG View of melted plastic, showing lateral movement of fire

P-79 MG Close-up view of melted plastic

P-80 MG Overall view of advancing indicator

P-81 MG Close-up view of cupping

P-82 MG Overall view of indicator showing advaning fire

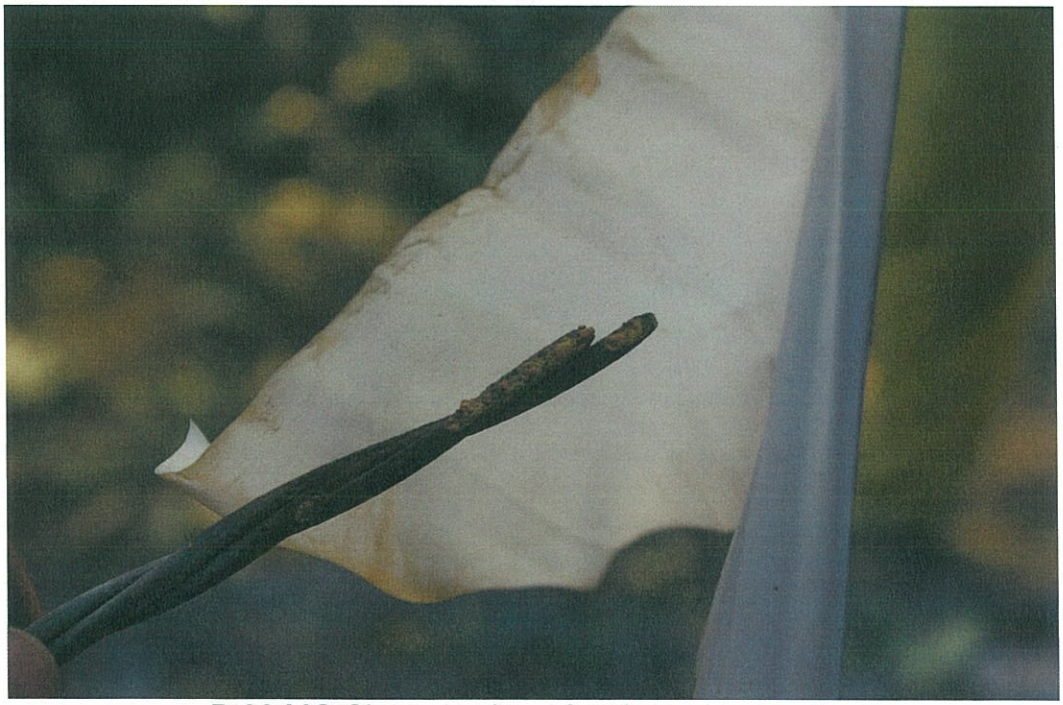
P-83 MG Close-up view of cupping

P-84 MG View of downed power lines

P-85 MG View of downed power line, in SOA

P-86 MG Overall view of downed power line

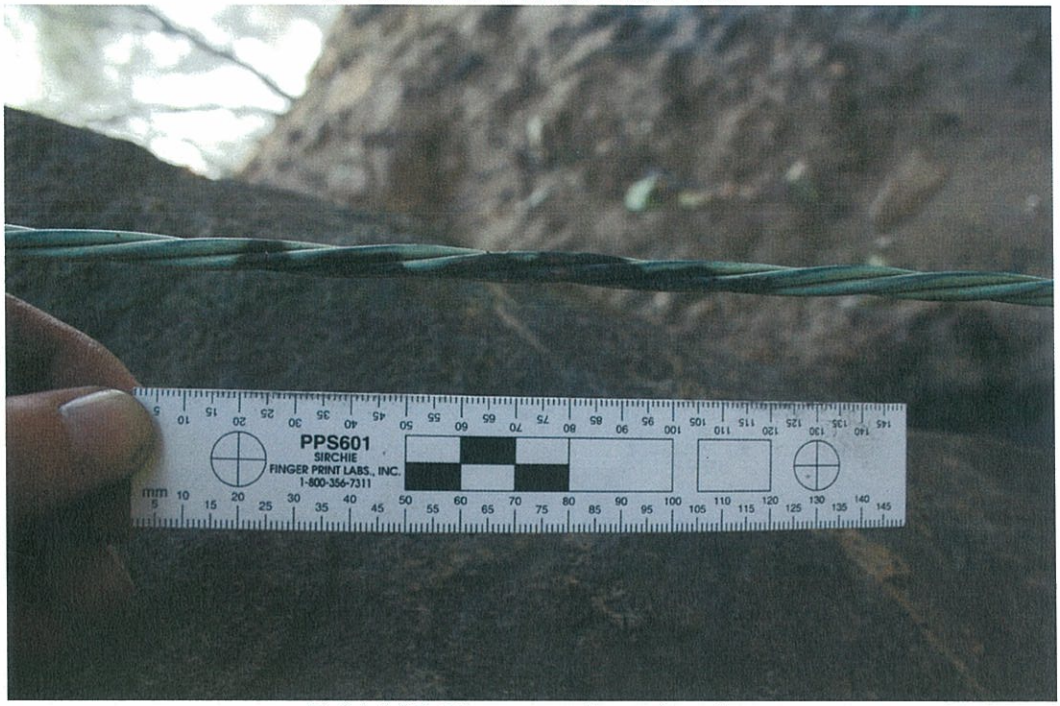
P-87 MG Close-up view of arcing on power line



P-88 MG Close-up view of arcing on power line

P-89 MG View of power line hanging on west side of Rice Canyon Road

P-90 MG Close-up view of arcing on power line



P-91 MG Close-up view of arcing

P-92 MG Overall view of downed power line

P-93 MG Close-up view of damage power line

P-94 MG Close-up view of damaged power line

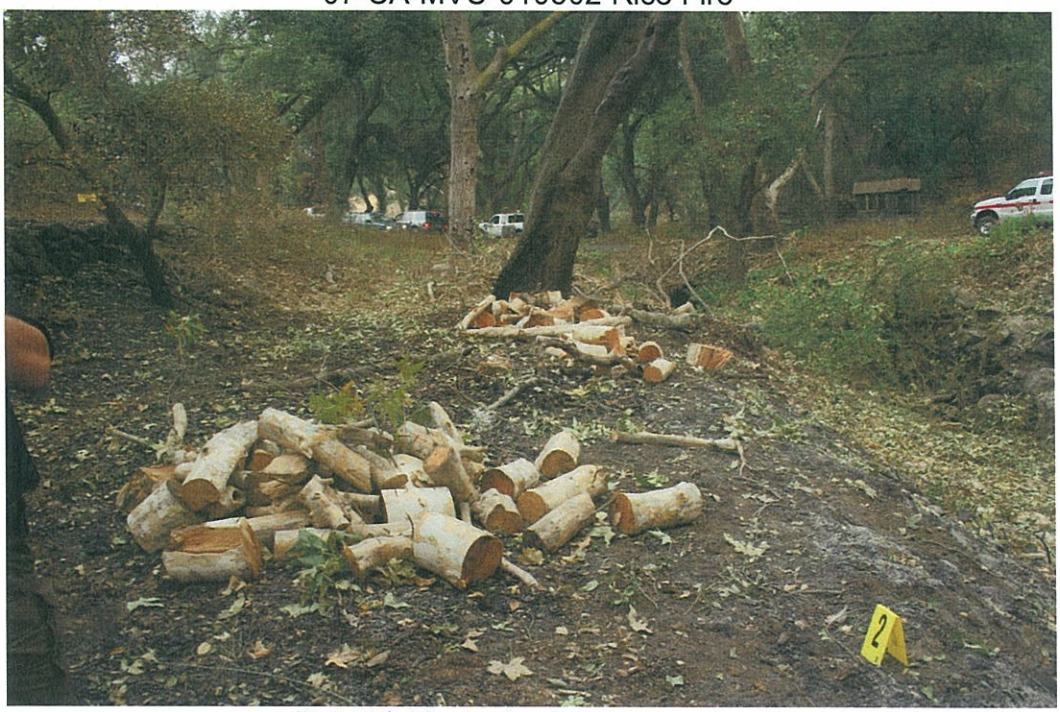
Attachment B

P-1 MG View of Item #1

P-2 MG View of Item #2

P-3 MG View of area where lines traveled through trees

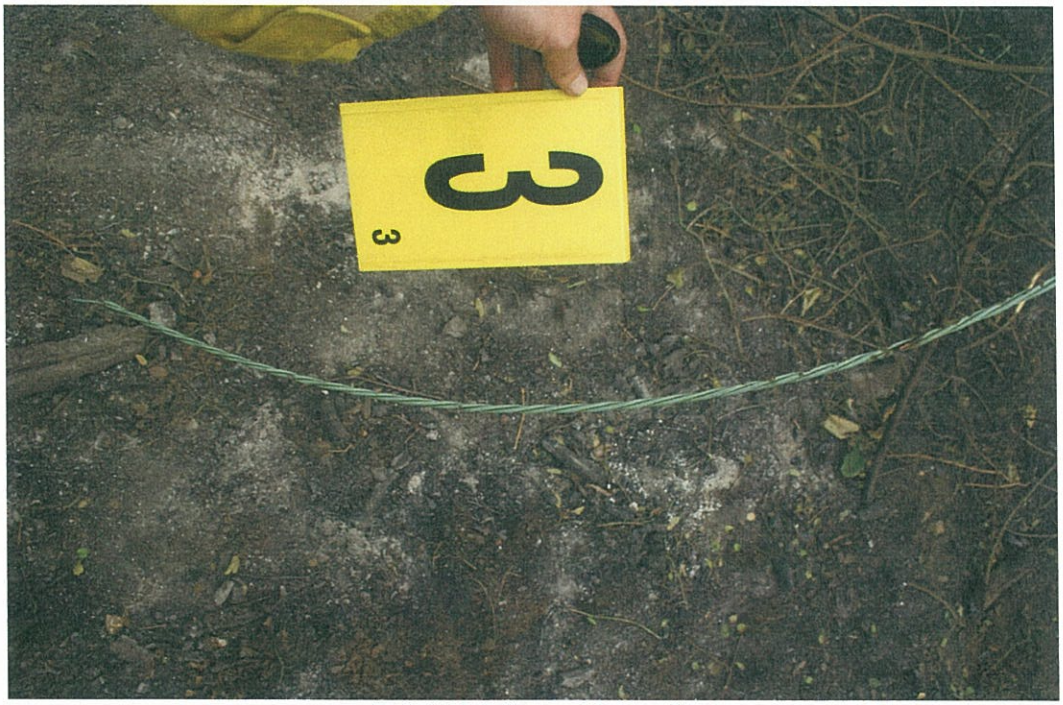
P-4 MG View of work done to sycamore tree



P-5 MG View of cut sycamore logs

P-6 MG View of area where sycamore was cut

P-7 MG View of damaged oak



P-8 MG View of Item #3

P-9 MG View of Item #4

941

2007 10 29

Attachment C

SUPPLEMENTARY INVESTIGATION REPORT

STATE OF CALIFORNIA
DEPARTMENT OF FORESTRY AND
FIRE PROTECTION

ORIGINATORS CASE NUMBER
07-CDF-572
ORDER NUMBER

CASE TITLE	MONTH	DATE	YEAR	COUNTY	REG	RU	INCIDENT #
Rice Fire	Oct	22	2007	San Diego	CSR	MVU	010502

COPIES TO	INVESTIGATION STATUS
RU ☑ REG ☐ HQ ☐ DA ☐ AG ☐ OTHER ☐	CLOSED ☐ CONTINUING ☐ OTHER_____

PRINTED NAME OR REPORTING OFFICER	SIGNATURE OF REPORTING OFFICER	OFFICER'S TITLE	DATE OF REPORT
Matthew Gilbert ID #22	Matthew Gilbert	FCS	5-3-2008

Attachment D

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010502
Incident Name: RICE
Event Number: 07010865

Detail Report-All Segments

Incident Location *Incident Status:* ONS

Location: 1162 RICE CANYON RD ,RAINBOW *Apartment:*
Lo Cross: 8899 BLK CLEARWATER RD *Hi Cross:* 8899 BLK RANCHO TAZA RD
City: RAINBOW *County:* SAN DIEGO *Map Page:* 999_A7
Loc Com: AT DEADMAN'S CURVE

Latitude:	33.392820	*Agency:*	CAMVU	*Dispatch Zone:*	2
Longitude:	-117.142462	*Jurisdiction:*	CAMVU	*Battalion:*	1
Legal:	13_T09S_R03W_S	*DPA Agency:*	CAMVU	*Resp. Area:*	H5
UTM:	11 486751 3694845			*Atom:*	H5

LEGAL 13_T09S_R03W_S *0*

Reporting Party Information

Caller Name: TOM DAVIS *Caller Phone:* 909-648-7331
Caller Loc: *Call Source:* 1615

Incident Type/Response Information

Incident Type: FIRE, WILDLAND *Response Plan:* FWL2
Dispatch Level: M *Response Level:* 1

Incident Date/Time Summary

			Personnel ID	*CAD Workstation*
Incident Call Rec.:				
Incident Keystroke:	10/22/2007	4:16:52		
Incident Entry:	10/22/2007	4:17:34	DCASTER	MVUCAD03
Incident Dispatch:	10/22/2007	5:00:36	SFOSTER	MVUCAD01
Incident Closed:	10/22/2007	4:32:16		

Fire Information

Status: *Contained:* *Controlled:*

Time Summary:

WAI	CLS	WAI	GEN	DSP	ENR	ONS
4:17.34	4:32.16	4:55.26	5:00.36	5:17.20	5:17.33	6:01.27

AAC	DSP	ONS
20:33.07	17:11.39	17:31.41

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010502
Incident Name: RICE
Event Number: 07010865

Detail Report-All Segments

Unit Status Details

B3310

DSP	ONS
17:11:39	17:31:41

B3317

DSP	ENR	ONS	AV
5:17:20	5:17:33	6:01:27	6:17:09

BR6761

DSP	ONS	RTQ	AIQ
7:31:11	7:31:29	15:43:03	15:43:05

E3354C

DSP	ENR	ONS	RTQ	ONS	AIQ
22:35:24	22:35:37	23:16:46	23:44:15	23:48:07	1:10:07

E6611

DSP	AIQ
5:44:05	5:45:36

ME6611

DSP	ENR	ONS	RTQ	ONS	AIQ
5:45:43	5:55:46	6:42:24	5:02:23	5:23:47	20:33:07

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010502
Incident Name: RICE
Event Number: 07010865

Detail Report-All Segments

Incident Remarks:

10/22/2007	5:21:12	NORTH COMMAND 5	SKING
10/22/2007	5:59:32	WELL ESTABLISHED FIRE ON BOTH SIDES OF RICE CANYON PRIORITY IS TO PUT FIRE OUT ON EAST SIDE OF RICE CANYON RD EVACUATIONS TO I-15 AND HWY 76	DCASTER
10/22/2007	10:47:03	1865 responding\	GWHITE
10/22/2007	10:55:27	e1868 en route	GWHITE
10/22/2007	17:21:47	REQUESTING AIRCRAFT FROM HARRIS FIRE ,REQUEST DENIED DUE TO HARRIS BEING A HIGHER PRIORITY	DHOWELL
10/22/2007	17:23:10	TYPE 2 HELICOPTER (212 AH) SEN TO RICE FIRE	DHOWELL
10/22/2007	17:44:16	MADE CALLS TO NORTH COMM TO ADVISE FIRE COULD ENCROUCH INTO THEIR AREA	DHOWELL
10/22/2007	17:47:19	NOTIFICATIONS: NORTH COMM- SPOKE WITH LESLIE(ADMINISTRATOR0 AND ADVISED THAT THE FIRE MIGHT POSSIBLY HEAD INTO VISTA SOMETIME TONIGHT. CONTACT NUMBER 858-756-3006- ASK FOR LESLIE OR AN ADMINISTRATOR. SAN DIEGO SHERIFF: SPOKE WITH CURRAN AT THE EMERGENCY SERVICES CENTER. WITH NOTIFICATION FOR VISTA AREA AND POSSIBLE FIRE MOVEMENT INTO THE AREA. CONTACT NUMBER 858-565-3462 OCEANSIDE PD- SPOKE WITH LAUARA- OPERATOR 1134 AND ADVISED THAT FIRE HAS POTENTIAL TO MOVE INTO OCEANSIDE THIS EVENING.	DHOWELL
/22/2007	18:23:04	12 S/T TYPE ONE ENGINES PLACED UP TO SOPS , SHOULD BE FILLED BY RIVERSIDE	DHOWELL
10/22/2007	18:26:18	CONTACTED POLICE CHIEF ROB DUNNAM TO TIE HIM HIM WITH I/C OF RICE FIRE	DHOWELL
10/22/2007	18:31:21	3316 NOW RICE IC B1711NOW RICE PLANS	DHOWELL
10/23/2007	9:02:44	north Cmm called, structure threatned los olisis X camino Olisos, 2460 Hobbet ln, Spot fire live oak @ gum tree, Tierra Roja Dr. @ E. Mission	SFOSTER
10/23/2007	10:50:32	rainbow valley loosing water pressure per water department	SFOSTER
10/23/2007	11:36:33	rice cn road flare up mm 2.2 per chp.	SFOSTER
10/23/2007	16:15:18	spot fire behind paula temecula	SFOSTER
10/24/2007	9:13:43	div x is the priority for the day	SFOSTER
10/24/2007	9:42:33	coloum showing over by macadema sending untis to check it out	SFOSTER
10/24/2007	9:43:43	north flank west side of san margurita drainage priority for air craft today.	SFOSTER
10/24/2007	9:57:28	activate mandatory evacuation plan for rainbow glen to riverside county line, includes deluz & Sandy creek.	SFOSTER
10/24/2007	10:14:33	notify riverside co that the fire is almost to the the county line.	SFOSTER
10/24/2007	11:06:04	Air attack update: north edge of fire: Helo's holding the fire in check at this time no threat to power lines to north. Was only able to do limited work with tanker 90. Got smoked in very quickly.	SFOSTER
10/24/2007	13:44:13	on shore flow is affecting the south end of the fire.	SFOSTER
10/24/2007	14:00:14	Confirm with SDGE that firn and citrus are de-energized. wires are down on firn.	SFOSTER
10/24/2007	14:12:53	so reporting power pole fire dos dios and wilks	SFOSTER
)/24/2007	14:44:15	re-energizing powerline north of live oak.	SFOSTER
10/24/2007	15:13:49	air attack reportig spot fire (unknown location)Helo tack crew working way into it.	SFOSTER
10/24/2007	15:24:12	rice communications on air	SFOSTER

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010502
Incident Name: RICE
Event Number: 07010865

Detail Report-All Segments

10/24/2007	16:57:58	Air attack: winds are out of 270 degrees @ 7mph at ramona	SFOSTER
10/24/2007	17:54:26	aircraft off the rice incident for the evening.	SFOSTER
10/25/2007	8:46:56	del rio & vista glen per branch working flare up	SFOSTER
10/25/2007	9:10:40	from air attack; went around all three branches, everything looks cold don't see any targets for helo. will be returning to ramona aab standing by	SFOSTER
10/25/2007	9:56:43	from Branch: Live oak area to be re-energized by SDGE	SFOSTER
10/25/2007	14:09:45	ZULU ASKING FOR AIR SUPPORT FOR ON DIV.	SFOSTER
10/25/2007	14:39:50	rice comm reporting flare up on mission /rose. units enroute to div W	SFOSTER
10/27/2007	9:33:26	RED MTN RPTR HAS BROKEN PART RUNNING ON MOBILE REPEATER AND PROPANE 1/3 REMAINING B3309 NOTIFIED	DHOWELL

Detail Report-All Segments

LOCVER	10/22/2007	4:16:59	DCASTER	MVUCAD03
ENTRY	10/22/2007	4:17:34	DCASTER	MVUCAD03
SUGDEF	10/22/2007	4:17:46		
1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 4 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS				
SUGG	10/22/2007	4:17:46		
Primary: E1062.*_[ENG3]#7, IOF._[PRV]#25				
SUGG	10/22/2007	4:17:46		
Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34				
SUGG	10/22/2007	4:17:46		
Alternate: W6665._[W/T1]#11				
SUGDEF	10/22/2007	4:19:49		
1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS				
SUGG	10/22/2007	4:19:49		
Primary: IOF._[PRV]#25				
SUGG	10/22/2007	4:19:49		
Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E1062.*_[ENG3]#7, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34				
SUGDEF	10/22/2007	4:20:06		
1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS				
SUGG	10/22/2007	4:20:06		
Primary: IOF._[PRV]#25				
SUGG	10/22/2007	4:20:06		
Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E1062.*_[ENG3]#7, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34				
SUGDEF	10/22/2007	4:21:05		
1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS				
SUGG	10/22/2007	4:21:05		
Primary: IOF._[PRV]#25				
SUGG	10/22/2007	4:21:05		
Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E1062.*_[ENG3]#7, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34				
EXPIRE	10/22/2007	4:22:36		
Pending event expired after 5 MIN				
CLOSE	10/22/2007	4:32:16	SKING	MVUCAD02
ROPEN	10/22/2007	4:55:26	SKING	MVUCAD02
SUGDEF	10/22/2007	4:57:54		
1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS				
SUGG	10/22/2007	4:57:55		
Primary: IOF._[PRV]#25				
SUGG	10/22/2007	4:57:55		
Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34				
EXPIRE	10/22/2007	5:00:27		
Pending event expired after 5 MIN				
SUGDEF	10/22/2007	5:00:34		

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010502
Incident Name: RICE
Event Number: 07010865

Detail Report-All Segments

1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS

SUGG	10/22/2007	5:00:34		
Primary: IOF._[PRV]#25				
SUGG	10/22/2007	5:00:34		
Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34				
INCN	10/22/2007	5:00:36	DCASTER	MVUCAD03
Site Number $CAMVU010502 Created				
INCN	10/22/2007	5:00:36	DCASTER	MVUCAD03
Fire Number $ONE01572 Created				
FREQA	10/22/2007	5:00:36	DCASTER	MVUCAD03
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
GEN	10/22/2007	5:00:36	DCASTER	MVUCAD03
<none> --> RICE CANYON RD RAINBO 17				
FREQA	10/22/2007	5:17:19	DCASTER	MVUCAD03
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/22/2007	5:17:20	DCASTER	MVUCAD03
B3317 (BAT)				
ENR	10/22/2007	5:17:33	DCASTER	MVUCAD03
B3317				
CHNG	10/22/2007	5:21:12	SKING	MVUCAD02
Remarks Entered;				
FREQA	10/22/2007	5:44:04	DCASTER	MVUCAD03
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/22/2007	5:44:05	DCASTER	MVUCAD03
E6611 (ENG1)				
AIQ	10/22/2007	5:45:36	SKING	MVUCAD02
E6611				
FREQA	10/22/2007	5:45:43	SKING	MVUCAD02
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/22/2007	5:45:43	SKING	MVUCAD02
ME6611 (ENG1)				
STATUSX	10/22/2007	5:47:34		
Unit B3317 Status timer expired after 30 MIN				
STATUSX	10/22/2007	5:50:46		
Unit ME6611 Status timer expired after 5 MIN				
ENR	10/22/2007	5:55:46	SKING	MVUCAD02
ME6611				
CHNG	10/22/2007	5:59:32	DCASTER	MVUCAD03
Remarks Entered;				
ONS	10/22/2007	6:01:27	DCASTER	MVUCAD03
B3317				
PREMP	10/22/2007	6:17:09	SKING	MVUCAD02
B3317				
STATUSX	10/22/2007	6:25:47		
Unit ME6611 Status timer expired after 30 MIN				
ONS	10/22/2007	6:42:24	DCASTER	MVUCAD03
ME6611				
FREQA	10/22/2007	7:31:11	LCRAIG	MVUCAD02
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/22/2007	7:31:11	LCRAIG	MVUCAD02
BR6761 (ENG3)				
ONS	10/22/2007	7:31:29	LCRAIG	MVUCAD02
BR6761				

Detail Report-All Segments

SUPP	10/22/2007	10:47:03	GWHITE	MVUCAD03
SUPP	10/22/2007	10:55:27	GWHITE	MVUCAD03
CHNG	10/22/2007	17:21:47	DHOWELL	MVUCAD01
Remarks Entered;				
CHNG	10/22/2007	17:23:10	DHOWELL	MVUCAD01
Remarks Entered;				
CHNG	10/22/2007	17:44:16	DHOWELL	MVUCAD01
Remarks Entered;				
CHNG	10/22/2007	17:47:19	DHOWELL	MVUCAD01
Remarks Entered;				
CHNG	10/22/2007	18:23:04	DHOWELL	MVUCAD01
Remarks Entered;				
CHNG	10/22/2007	18:26:18	DHOWELL	MVUCAD01
Remarks Entered;				
CHNG	10/22/2007	18:31:21	DHOWELL	MVUCAD01
Remarks Entered;				
FRPNAME	10/22/2007	18:55:01	GWHITE	MVUCAD03
<none> --> RED MTN				
CIN	10/22/2007	21:38:21	DCASTER	MVUCAD02
RICE CANYON RD RAINBO 17 --> RICE				
FREQA	10/22/2007	22:35:24	DCASTER	MVUCAD02
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
)SP	10/22/2007	22:35:24	DCASTER	MVUCAD02
E3354C (ENG3)				
ENR	10/22/2007	22:35:37	DCASTER	MVUCAD02
E3354C				
STATUSX	10/22/2007	23:05:42		
Unit E3354C Status timer expired after 30 MIN				
ONS	10/22/2007	23:16:46	DCASTER	MVUCAD02
E3354C				
RTQ	10/22/2007	23:44:15	DCASTER	MVUCAD02
E3354C				
ONS	10/22/2007	23:48:07	DCASTER	MVUCAD02
E3354C				
AIQ	10/23/2007	1:10:07	SKING	MVUCAD03
E3354C				
RTQ	10/23/2007	5:02:23	DCASTER	MVUCAD02
ME6611				
ONS	10/23/2007	5:23:47	DCASTER	MVUCAD02
ME6611				
SUPP	10/23/2007	9:02:44	SFOSTER	MVUCAD05
SUPP	10/23/2007	10:50:32	SFOSTER	MVUCAD05
SUPP	10/23/2007	11:36:33	SFOSTER	MVUCAD05
SUPP	10/23/2007	16:15:18	SFOSTER	MVUCAD05
SUPP	10/24/2007	9:13:43	SFOSTER	MVUCAD05
SUPP	10/24/2007	9:42:33	SFOSTER	MVUCAD05
SUPP	10/24/2007	9:43:43	SFOSTER	MVUCAD05

Detail Report-All Segments

SUPP	10/24/2007	9:57:28	SFOSTER	MVUCAD05
SUPP	10/24/2007	10:14:33	SFOSTER	MVUCAD05
SUPP	10/24/2007	11:06:04	SFOSTER	MVUCAD05
SUPP	10/24/2007	13:44:13	SFOSTER	MVUCAD05
SUPP	10/24/2007	14:00:14	SFOSTER	MVUCAD05
SUPP	10/24/2007	14:12:53	SFOSTER	MVUCAD05
SUPP	10/24/2007	14:44:15	SFOSTER	MVUCAD05
SUPP	10/24/2007	15:13:49	SFOSTER	MVUCAD05
SUPP	10/24/2007	15:24:12	SFOSTER	MVUCAD05
SUPP	10/24/2007	16:57:58	SFOSTER	MVUCAD05
SUPP	10/24/2007	17:54:26	SFOSTER	MVUCAD05
SUPP	10/25/2007	8:46:56	SFOSTER	MVUCAD05
SUPP	10/25/2007	9:10:40	SFOSTER	MVUCAD05
SUPP	10/25/2007	9:56:43	SFOSTER	MVUCAD05
SUPP	10/25/2007	14:09:45	SFOSTER	MVUCAD05
SUPP	10/25/2007	14:39:50	SFOSTER	MVUCAD05
RTQ	10/25/2007	15:43:03	GWHITE	MVUCAD02
BR6761				
AIQ	10/25/2007	15:43:05	GWHITE	MVUCAD02
BR6761				
CHNG	10/27/2007	9:33:26	DHOWELL	MVUCAD01
Remarks Entered;				
AIQ	10/27/2007	20:33:07	PWILSON	MVUCAD02
ME6611				
AAC	10/27/2007	20:33:07	PWILSON	MVUCAD02
SUGDEF	10/28/2007	17:11:14		
1 CoverBC - BAT6, Level 1, Path: A 1 AA, Path: A 1 T, Path: A 2 C, Path: G 4 E*CDF, Path: G 2 HC, Path G 1 D, Path: G 3 E*USFS				
SUGG	10/28/2007	17:11:14		
Primary: T95.*_[A/T3]#3, IOF._[PRV]#25, E3369C.*_[ENG3]#27				
SUGG	10/28/2007	17:11:14		
Nearby: AA330._[A/A]#3, E3361.*_[ENG3]#6, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3384._[ENG3]#32				
SUGG	10/28/2007	17:11:14		
Alternate: E1022.*_[ENG1]#7, SDRE79.*_[ENG1]#14, E65.*_[ENG1]#34, SDRE80.*_[ENG1]#34				
FREQA	10/28/2007	17:11:38	SFOSTER	MVUCAD01
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/28/2007	17:11:39	SFOSTER	MVUCAD01
B3310 (BAT)				

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

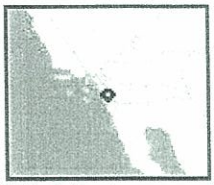
Incident Number: 07-CAMVU 010502
Incident Name: RICE
Event Number: 07010865

Detail Report-All Segments

STATUSX	10/28/2007	17:16:42		
Unit B3310 Status timer expired after 5 MIN				
ONS	10/28/2007	17:31:41	LCRAIG	MVUCAD02
B3310				
REC			DCASTER	MVUCAD03

SITE INFORMATION

ID: VLCC1
NAME: VALLEY CENTER
LATITUDE: 33.2394
LONGITUDE: -117.0142
ELEVATION: 1370 ft
MNET: RAWS



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SITE LINKS

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California Dept of Water Resources

Past Weather Conditions for VLCC1

Observations prior to selected time: October 22, 2007 - 05:00 PDT

Weather Conditions at October 22, 2007 - 4:13 PDT

	4:13	24 Hour Max	24 Hour Min
Temperature	68.0° F	79.0 at 13:13	49.0 at 5:13
Dew Point	-	49.0 at 5:13	-29.4 at 13:13
Relative Humidity	0%	100 at 5:13	0 at 14:13
Wind Speed	24 mph from ENE	25 at 3:13	2 at 5:13
Wind Gust	47 mph	50 at 21:13	4 at 6:13
Solar Radiation	0.0 W/m*m	831.0 at 13:13	0.0 at 5:13
Fuel Temperature	68.0° F	87.0 at 12:13	47.0 at 5:13
10 hr Fuel Moisture	6 gm	33 at 6:13	6 at 23:13
Battery voltage	12.50 volt	13.80 at 8:13	12.40 at 5:13

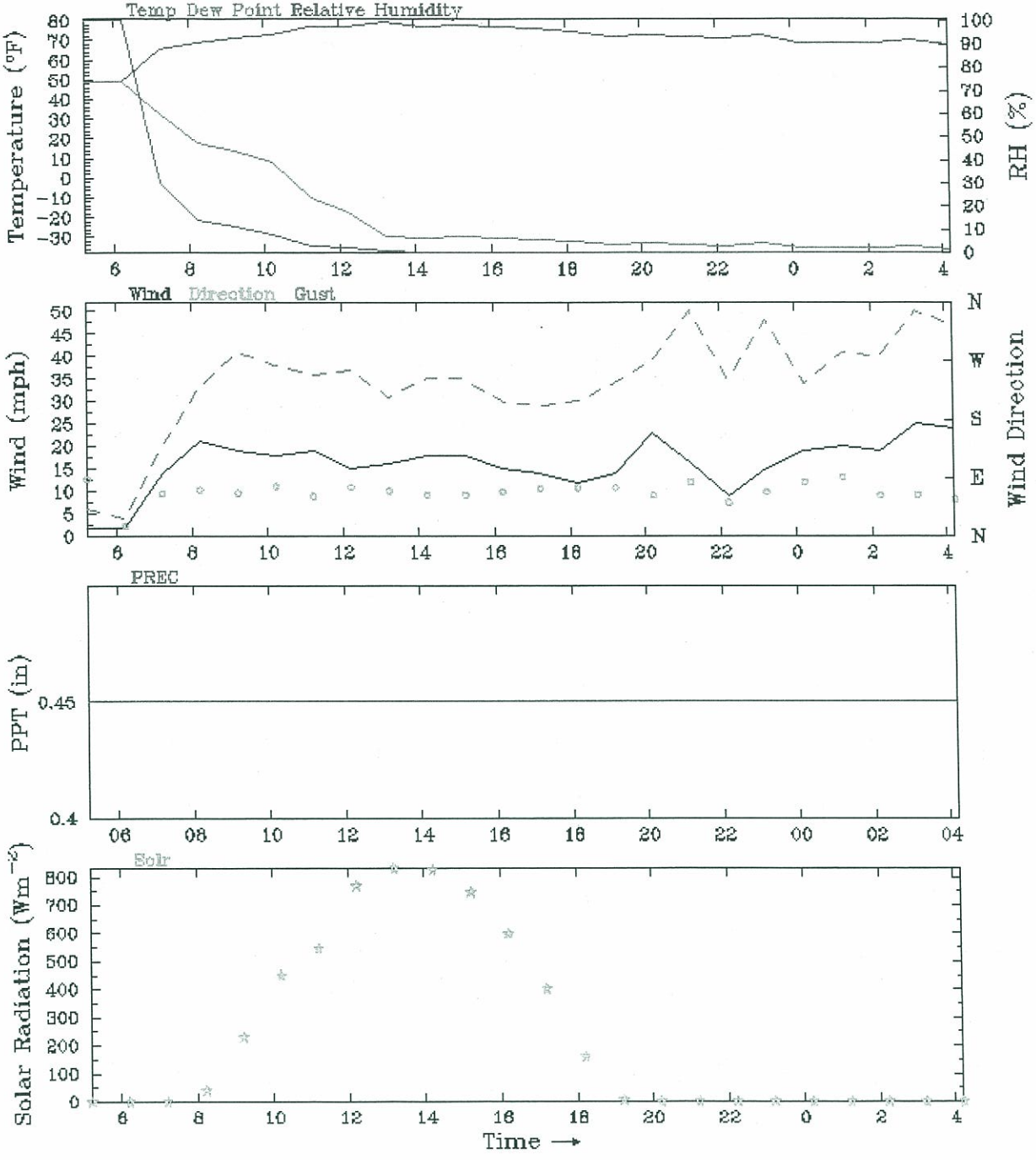
Precipitation accumulated since midnight: 0.00", in 24 hours: 0.00"

Tabular Listing: October 21, 2007 - 4:00 through October 22, 2007 - 05:00 PDT

Time(PDT)	Temperature	Dew Point	Relative Humidity	Wind Speed	Wind Gust	Wind Direction	Quality check	Solar Radiation	Precipitation accumulated	Fuel Temperature	10 hr Fuel Moisture	Battery voltage
	° F	° F	%	mph	mph			W/m*m	in	° F	gm	volt
4:13	68.0		0	24	47	ENE	OK	0.0	0.45	68.0	6	12.50
3:13	70.0		0	25	50	ENE	OK	0.0	0.45	68.0	6	12.50
2:13	69.0		0	19	40	ENE	OK	0.0	0.45	67.0	6	12.60
1:13	69.0		0	20	41	E	OK	0.0	0.45	67.0	6	12.60
0:13	69.0		0	19	34	E	OK	0.0	0.45	67.0	6	12.60
23:13	73.0		0	15	48	ENE	OK	0.0	0.45	69.0	6	12.60
22:13	71.0		0	9	35	NE	OK	0.0	0.45	70.0	7	12.60
21:13	72.0		0	16	50	E	OK	0.0	0.45	70.0	7	12.60
20:13	73.0		0	23	39	ENE	OK	0.0	0.45	70.0	7	12.70
19:13	72.0		0	14	34	ENE	Caution	5.0	0.45	70.0	7	12.70
18:13	74.0		0	12	30	ENE	Caution	160.0	0.45	72.0	7	12.70
17:13	76.0		0	14	29	ENE	Caution	400.0	0.45	75.0	7	13.00
16:13	77.0		0	15	30	ENE	Caution	597.0	0.45	81.0	8	13.70
15:13	78.0		0	18	35	ENE	Caution	745.0	0.45	84.0	8	13.70
14:13	77.0		0	18	35	ENE	Caution	824.0	0.45	86.0	8	13.70
13:13	79.0	-29.4	1	16	31	ENE	OK	831.0	0.45	86.0	9	13.70
12:13	77.0	-17.7	2	15	37	ENE	OK	767.0	0.45	87.0	10	13.70
11:13	77.0	-9.7	3	19	36	ENE	OK	545.0	0.45	82.0	10	13.70
10:13	73.0	8.2	8	18	38	ENE	OK	450.0	0.45	78.0	11	13.70
9:13	71.0	13.9	11	19	41	ENE	OK	228.0	0.45	76.0	12	13.80
8:13	69.0	17.8	14	21	33	ENE	OK	39.0	0.45	70.0	14	13.80
7:13	65.0	32.8	30	14	20	ENE	OK	0.0	0.45	63.0	16	12.40
6:13	49.0	49.0	100	2	4	NNE	OK	0.0	0.45	47.0	33	12.40
5:13	49.0	49.0	100	2	6	E	OK	0.0	0.45	47.0	32	12.40
4:13	50.0	50.0	100	2	5	E	OK	0.0	0.45	47.0	28	12.50

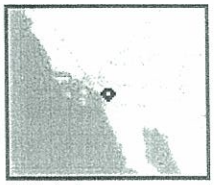
Select Previous Periods: 12 Hours 24 Hours 2 Days 5 Days 7 Days 10 Days 30 Days
Hodograph

VALLEY CENTER
Start 10/21/07 05:13 (PDT) – End 10/22/07 04:13 (PDT)



SITE INFORMATION

ID: PAMC1
NAME: PALOMAR
LATITUDE: 33.3517
LONGITUDE: -116.8617
ELEVATION: 5530 ft
MNET: RAWS



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USDA Forest Service

Past Weather Conditions for PAMC1

Observations prior to selected time: October 22, 2007 - 05:00 PDT

Weather Conditions at October 22, 2007 - 3:15 PDT

	3:15	24 Hour Max	24 Hour Min
Temperature	48.0° F	61.0 at 13:15	46.0 at 2:15
Dew Point	-0.5° F	7.5 at 11:15	-10.5 at 0:15
Relative Humidity	13%	15 at 10:15	8 at 14:15
Wind Speed	18 mph from ESE	19 at 20:15	7 at 18:15
Wind Gust	24 mph	36 at 21:15	0 at 9:15
Solar Radiation	0.0 W/m*m	779.0 at 13:15	0.0 at 9:15
Fuel Temperature	46.0° F	71.0 at 13:15	45.0 at 23:15
10 hr Fuel Moisture	7 gm	9 at 9:15	7 at 1:15
Battery voltage	12.50 volt	13.90 at 10:15	12.50 at 3:15

Precipitation accumulated since midnight: 0.00", in 24 hours: -

Tabular Listing: October 21, 2007 - 4:00 through October 22, 2007 - 05:00 PDT

Time(PDT)	Temperature	Dew Point	Relative Humidity	Wind Speed	Wind Gust	Wind Direction	Quality check	Solar Radiation	Precipitation accumulated	Fuel Temperature	10 hr Fuel Moisture	Battery voltage
	° F	° F	%	mph	mph			W/m*m	in	° F	gm	volt
3:15	48.0	-0.5	13	18	24	ESE	OK	0.0	2.96	46.0	7	12.50
2:15	46.0	-3.7	12	9	31	ESE	OK	0.0	2.96	45.0	7	12.60
1:15	49.0	-5.2	10	9	23	ESE	OK	0.0	2.96	46.0	7	12.60
0:15	48.0	-10.5	8	9	29	ESE	OK	0.0	2.96	45.0	7	12.60
23:15	48.0	-5.9	10	10	36	ESE	OK	0.0	2.96	45.0	7	12.70
22:15	50.0	-2.4	11	13	34	ESE	OK	0.0	2.96	48.0	7	12.70
21:15	49.0	-1.4	12	14	36	ESE	OK	0.0	2.96	48.0	7	12.70
20:15	51.0	-1.6	11	19	26	E	OK	0.0	2.96	49.0	7	12.70
19:15	50.0	1.1	13	10	26	ESE	OK	1.0	2.96	46.0	7	12.70
18:15	49.0	0.3	13	7	29	SE	OK	23.0	2.96	48.0	7	12.80
17:15	53.0	-2.1	10	12	29	ESE	OK	293.0	2.96	55.0	7	13.30
16:15	58.0	-0.5	9	13	25	ESE	OK	521.0	2.96	64.0	8	13.90
15:15	58.0	-0.5	9	12	25	ESE	OK	666.0	2.96	69.0	8	13.90
14:15	59.0	-2.2	8	11	24	ESE	OK	754.0	2.96	71.0	8	13.90
13:15	61.0	4.1	10	12	23	ESE	OK	779.0	2.96	71.0	8	13.90
12:15	60.0	5.4	11	13	27	ESE	OK	737.0	2.96	69.0	8	13.90
11:15	58.0	7.5	13	12	27	ESE	OK	561.0	2.96	66.0	8	13.90
10:15	54.0	7.4	15	13	0	ESE	Suspect	477.0	2.96	61.0	8	13.90
9:15	53.0	1.8	12	12	0	ESE	Suspect	0.0	2.96	59.0	9	13.80

University of Utah Mountain Meteorology Group

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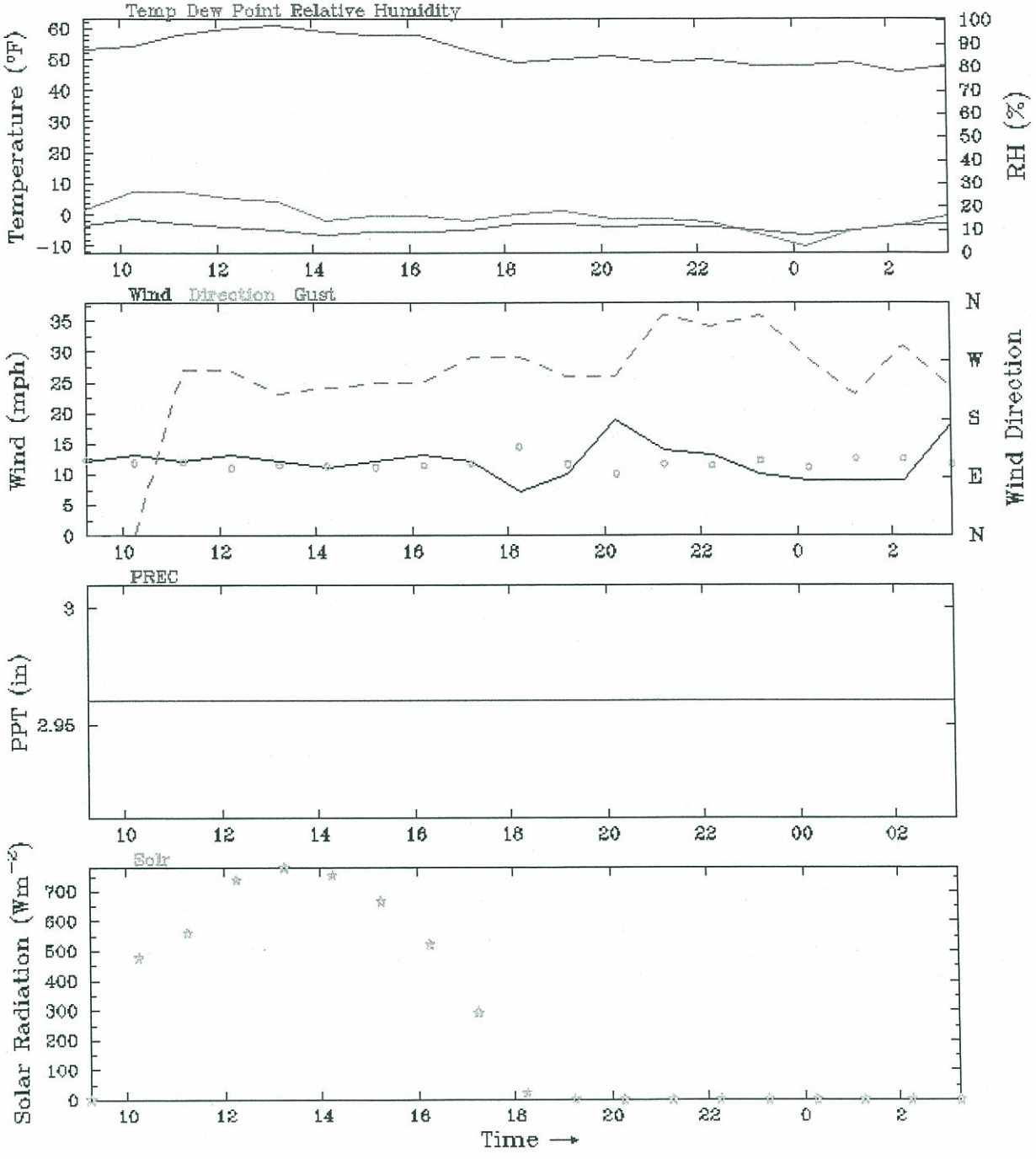
Select Previous Periods: 12 Hours 24 Hours 2 Days 5 Days 7 Days 10 Days 30 Days
Hodograph

PALOMAR
Start 10/21/07 09:15 (PDT) – End 10/22/07 03:15 (PDT)



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California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010502
Incident Name: RICE
Event Number: 07010865

Detail Report-All Segments

Incident Location

Incident Status: ONS

Location: 1162 RICE CANYON RD ,RAINBOW
Apartment:
Lo Cross: 8899 BLK CLEARWATER RD
Hi Cross: 8899 BLK RANCHO TAZA RD
City: RAINBOW *County:* SAN DIEGO *Map Page:* 999_A7
Loc Com: AT DEADMAN'S CURVE

Latitude:	33.392820	*Agency:*	CAMVU	*Dispatch Zone:*	2
Longitude:	-117.142462	*Jurisdiction:*	CAMVU	*Battalion:*	1
Legal:	13_T09S_R03W_S	*DPA Agency:*	CAMVU	*Resp. Area:*	H5
UTM:	11 486751 3694845			*Atom:*	H5

LEGAL 13_T09S_R03W_S *0*

Reporting Party Information

Caller Name: TOM DAVIS
Caller Phone: 909-648-7331
Caller Loc:
Call Source: 1615

Incident Type/Response Information

Incident Type: FIRE, WILDLAND
Response Plan: FWL2
Dispatch Level: M
Response Level: 1

Incident Date/Time Summary

Incident Call Rec.:				
Incident Keystroke:	10/22/2007	4:16:52	*Personnel ID*	*CAD Workstation*
Incident Entry:	10/22/2007	4:17:34	DCASTER	MVUCAD03
Incident Dispatch:	10/22/2007	5:00:36	DCASTER	MVUCAD02
Incident Closed:	10/22/2007	4:32:16		

Fire Information

Status: *Contained:* *Controlled:*

Time Summary:

WAI	CLS	WAI	GEN	DSP	ENR	ONS
4:17.34	4:32.16	4:55.26	5:00.36	5:17.20	5:17.33	6:01.27

Unit Status Details

B3317

DSP	ENR	ONS	AV
5:17:20	5:17:33	6:01:27	6:17:09

BR6761

DSP	ONS	RTQ	AIQ
7:31:11	7:31:29	15:43:03	15:43:05

E3354C

DSP	ENR	ONS	RTQ	ONS	AIQ
22:35:24	22:35:37	23:16:46	23:44:15	23:48:07	1:10:07

E6611

DSP	AIQ
5:44:05	5:45:36

ME6611

DSP	ENR	ONS	RTQ	ONS
5:45:43	5:55:46	6:42:24	5:02:23	5:23:47

California Department of Forestry
and Fire Protection
Interagency Report of Incident and Dispatch Action

Incident Number: 07-CAMVU 010502
Incident Name: RICE
Event Number: 07010865

Detail Report-All Segments

Incident Remarks:

10/22/2007	5:21:12	NORTH COMMAND 5	SKING
10/22/2007	5:59:32	WELL ESTABLISHED FIRE ON BOTH SIDES OF RICE CANYON PRIORITY IS TO PUT FIRE OUT ON EAST SIDE OF RICE CANYON RD EVACUATIONS TO I-15 AND HWY 76	DCASTER
10/22/2007	10:47:03	1865 responding\	GWHITE
10/22/2007	10:55:27	e1868 en route	GWHITE
10/22/2007	17:21:47	REQUESTING AIRCRAFT FROM HARRIS FIRE ,REQUEST DENIED DUE TO HARRIS BEING A HIGHER PRIORITY	DHOWELL
10/22/2007	17:23:10	TYPE 2 HELICOPTER (212 AH) SEN TO RICE FIRE	DHOWELL
10/22/2007	17:44:16	MADE CALLS TO NORTH COMM TO ADVISE FIRE COULD ENCROUCH INTO THEIR AREA	DHOWELL
10/22/2007	17:47:19	NOTIFICATIONS: NORTH COMM- SPOKE WITH LESLIE(ADMINISTRATOR0 AND ADVISED THAT THE FIRE MIGHT POSSIBLY HEAD INTO VISTA SOMETIME TONIGHT. CONTACT NUMBER 858-756-3006- ASK FOR LESLIE OR AN ADMINISTRATOR. SAN DIEGO SHERIFF: SPOKE WITH CURRAN AT THE EMERGENCY SERVICES CENTER. WITH NOTIFICATION FOR VISTA AREA AND POSSIBLE FIRE MOVEMENT INTO THE AREA. CONTACT NUMBER 858-565-3462 OCEANSIDE PD- SPOKE WITH LAUARA- OPERATOR 1134 AND ADVISED THAT FIRE HAS POTENTIAL TO MOVE INTO OCEANSIDE THIS EVENING.	DHOWELL
10/22/2007	18:23:04	12 S/T TYPE ONE ENGINES PLACED UP TO SOPS , SHOULD BE FILLED BY RIVERSIDE	DHOWELL
10/22/2007	18:26:18	CONTACTED POLICE CHIEF ROB DUNNAM TO TIE HIM HIM WITH I/C OF RICE FIRE	DHOWELL
22/2007	18:31:21	3316 NOW RICE IC B1711NOW RICE PLANS	DHOWELL
10/23/2007	9:02:44	north Cmm called, structure threatned los olisis X camino Olisos, 2460 Hobbet ln, Spot fire live oak @ gum tree, Tierra Roja Dr. @ E. Mission	SFOSTER
10/23/2007	10:50:32	rainbow valley loosing water pressure per water department	SFOSTER
10/23/2007	11:36:33	rice cn road flare up mm 2.2 per chp.	SFOSTER
10/23/2007	16:15:18	spot fire behind paula temecula	SFOSTER
10/24/2007	9:13:43	div x is the priority for the day	SFOSTER
10/24/2007	9:42:33	coloum showing over by macadema sending untis to check it out	SFOSTER
10/24/2007	9:43:43	north flank west side of san margurita drainage priority for air craft today.	SFOSTER
10/24/2007	9:57:28	activate mandatory evacuation plan for rainbow glen to riverside county line, includes deluz & Sandy creek.	SFOSTER
10/24/2007	10:14:33	notify riverside co that the fire is almost to the the county line.	SFOSTER
10/24/2007	11:06:04	Air attack update: north edge of fire: Helo's holding the fire in check at this time no threat to power lines to north. Was only able to do limited work with tanker 90. Got smoked in very quickly.	SFOSTER
10/24/2007	13:44:13	on shore flow is affecting the south end of the fire.	SFOSTER
10/24/2007	14:00:14	Confirm with SDGE that firn and citrus are de-energized. wires are down on firn.	SFOSTER
10/24/2007	14:12:53	so reporting power pole fire dos dios and wilks	SFOSTER
10/24/2007	14:44:15	re-energizing powerline north of live oak.	SFOSTER
10/24/2007	15:13:49	air attack reportig spot fire (unknown location) Helo tack crew working way into it.	SFOSTER
24/2007	15:24:12	rice communications on air	SFOSTER
10/24/2007	16:57:58	Air attack: winds are out of 270 degrees @ 7mph at ramona	SFOSTER
10/24/2007	17:54:26	aircraft off the rice incident for the evening.	SFOSTER
10/25/2007	8:46:56	del rio & vista glen per branch working flare up	SFOSTER

Detail Report-All Segments

10/25/2007	9:10:40	from air attack; went around all three branches, everything looks cold don't see any targets for helo. will be returning to ramona aab standing by	SFOSTER
10/25/2007	9:56:43	from Branch: Live oak area to be re-energized by SDGE	SFOSTER
10/25/2007	14:09:45	ZULU ASKING FOR AIR SUPPORT FOR ON DIV.	SFOSTER
10/25/2007	14:39:50	rice comm reporting flare up on mission /rose. units enroute to div W	SFOSTER

Detail Report-All Segments

COVER	10/22/2007	4:16:59	DCASTER	MVUCAD03
ENTRY	10/22/2007	4:17:34	DCASTER	MVUCAD03
SUGDEF	10/22/2007	4:17:46		

1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 4 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS

SUGG	10/22/2007	4:17:46		

Primary: E1062.*_[ENG3]#7, IOF._[PRV]#25

SUGG	10/22/2007	4:17:46		

Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34

SUGG	10/22/2007	4:17:46		

Alternate: W6665._[W/T1]#11

SUGDEF	10/22/2007	4:19:49		

1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS

SUGG	10/22/2007	4:19:49		

Primary: IOF._[PRV]#25

SUGG	10/22/2007	4:19:49		

Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E1062.*_[ENG3]#7, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34

SUGDEF	10/22/2007	4:20:06		

1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS

SUGG	10/22/2007	4:20:06		

imary: IOF._[PRV]#25

GG	10/22/2007	4:20:06		

Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E1062.*_[ENG3]#7, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34

SUGDEF	10/22/2007	4:21:05		

1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS

SUGG	10/22/2007	4:21:05		

Primary: IOF._[PRV]#25

SUGG	10/22/2007	4:21:05		

Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E1062.*_[ENG3]#7, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34

EXPIRE	10/22/2007	4:22:36		

Pending event expired after 5 MIN

CLOSE	10/22/2007	4:32:16	SKING	MVUCAD02
ROPEN	10/22/2007	4:55:26	SKING	MVUCAD02
SUGDEF	10/22/2007	4:57:54		

1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS

SUGG	10/22/2007	4:57:55		

Primary: IOF._[PRV]#25

SUGG	10/22/2007	4:57:55		

Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34

EXPIRE	10/22/2007	5:00:27		

nding event expired after 5 MIN

GDEF	10/22/2007	5:00:34		

1 CoverBC - B3317, Level 1, Path: A 1 AA, Path: A 2 T, Path: A 2 C, Path: G 5 E*CDF, Path: G 2 HC, Path: G 1 D, Path: G 3 E*USFS

SUGG	10/22/2007	5:00:34		

Primary: IOF._[PRV]#25

Detail Report-All Segments

JGG	10/22/2007	5:00:34		
Nearby: AA330._[A/A]#3, AA500._[A/A]#3, T70._[A/T3]#3, T71._[A/T3]#3, C10._[HEL2]#4, C12._[HEL2]#4, E3381._[ENG3]#7, D3346._[DOZ2]#20, E3374._[ENG3]#34				
INCN	10/22/2007	5:00:36	DCASTER	MVUCAD03
Site Number $CAMVU010502 Created				
INCN	10/22/2007	5:00:36	DCASTER	MVUCAD03
Fire Number $ONE01572 Created				
FREQA	10/22/2007	5:00:36	DCASTER	MVUCAD03
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
GEN	10/22/2007	5:00:36	DCASTER	MVUCAD03
<none> --> RICE CANYON RD RAINBO 17				
FREQA	10/22/2007	5:17:19	DCASTER	MVUCAD03
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/22/2007	5:17:20	DCASTER	MVUCAD03
B3317 (BAT)				
ENR	10/22/2007	5:17:33	DCASTER	MVUCAD03
B3317				
CHNG	10/22/2007	5:21:12	SKING	MVUCAD02
Remarks Entered;				
FREQA	10/22/2007	5:44:04	DCASTER	MVUCAD03
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/22/2007	5:44:05	DCASTER	MVUCAD03
E6611 (ENG1)				
AIQ	10/22/2007	5:45:36	SKING	MVUCAD02
E6611				
EQA	10/22/2007	5:45:43	SKING	MVUCAD02
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/22/2007	5:45:43	SKING	MVUCAD02
ME6611 (ENG1)				
STATUSX	10/22/2007	5:47:34		
Unit B3317 Status timer expired after 30 MIN				
STATUSX	10/22/2007	5:50:46		
Unit ME6611 Status timer expired after 5 MIN				
ENR	10/22/2007	5:55:46	SKING	MVUCAD02
ME6611				
CHNG	10/22/2007	5:59:32	DCASTER	MVUCAD03
Remarks Entered;				
ONS	10/22/2007	6:01:27	DCASTER	MVUCAD03
B3317				
PREMP	10/22/2007	6:17:09	SKING	MVUCAD02
B3317				
STATUSX	10/22/2007	6:25:47		
Unit ME6611 Status timer expired after 30 MIN				
ONS	10/22/2007	6:42:24	DCASTER	MVUCAD03
ME6611				
FREQA	10/22/2007	7:31:11	LCRAIG	MVUCAD02
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)				
DSP	10/22/2007	7:31:11	LCRAIG	MVUCAD02
BR6761 (ENG3)				
ONS	10/22/2007	7:31:29	LCRAIG	MVUCAD02
BR6761				
PP	10/22/2007	10:47:03	GWHITE	MVUCAD03
SUPP	10/22/2007	10:55:27	GWHITE	MVUCAD03
CHNG	10/22/2007	17:21:47	DHOWELL	MVUCAD01

Detail Report-All Segments

CHNG	10/22/2007 17:23:10	DHOWELL	MVUCAD01
Remarks Entered;			
CHNG	10/22/2007 17:44:16	DHOWELL	MVUCAD01
Remarks Entered;			
CHNG	10/22/2007 17:47:19	DHOWELL	MVUCAD01
Remarks Entered;			
CHNG	10/22/2007 18:23:04	DHOWELL	MVUCAD01
Remarks Entered;			
CHNG	10/22/2007 18:26:18	DHOWELL	MVUCAD01
Remarks Entered;			
CHNG	10/22/2007 18:31:21	DHOWELL	MVUCAD01
Remarks Entered;			
FRPNAME	10/22/2007 18:55:01	GWHITE	MVUCAD03
<none> --> RED MTN			
CIN	10/22/2007 21:38:21	DCASTER	MVUCAD02
RICE CANYON RD RAINBO 17 --> RICE			
FREQA	10/22/2007 22:35:24	DCASTER	MVUCAD02
Command:CMD 3:9 Primary Tactical:TAC 5 Alternate Tactical:(none)			
DSP	10/22/2007 22:35:24	DCASTER	MVUCAD02
E3354C (ENG3)			
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E3354C			
STATUSX	10/22/2007 23:05:42		
Unit E3354C Status timer expired after 30 MIN			
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354C			
RTQ	10/22/2007 23:44:15	DCASTER	MVUCAD02
E3354C			
ONS	10/22/2007 23:48:07	DCASTER	MVUCAD02
E3354C			
AIQ	10/23/2007 1:10:07	SKING	MVUCAD03
E3354C			
RTQ	10/23/2007 5:02:23	DCASTER	MVUCAD02
ME6611			
ONS	10/23/2007 5:23:47	DCASTER	MVUCAD02
ME6611			
SUPP	10/23/2007 9:02:44	SFOSTER	MVUCAD05
SUPP	10/23/2007 10:50:32	SFOSTER	MVUCAD05
SUPP	10/23/2007 11:36:33	SFOSTER	MVUCAD05
SUPP	10/23/2007 16:15:18	SFOSTER	MVUCAD05
SUPP	10/24/2007 9:13:43	SFOSTER	MVUCAD05
SUPP	10/24/2007 9:42:33	SFOSTER	MVUCAD05
SUPP	10/24/2007 9:43:43	SFOSTER	MVUCAD05
SUPP	10/24/2007 9:57:28	SFOSTER	MVUCAD05
SUPP	10/24/2007 10:14:33	SFOSTER	MVUCAD05
SUPP	10/24/2007 11:06:04	SFOSTER	MVUCAD05

Detail Report-All Segments

SUPP	10/24/2007	13:44:13	SFOSTER	MVUCAD05
SUPP	10/24/2007	14:00:14	SFOSTER	MVUCAD05
SUPP	10/24/2007	14:12:53	SFOSTER	MVUCAD05
SUPP	10/24/2007	14:44:15	SFOSTER	MVUCAD05
SUPP	10/24/2007	15:13:49	SFOSTER	MVUCAD05
SUPP	10/24/2007	15:24:12	SFOSTER	MVUCAD05
SUPP	10/24/2007	16:57:58	SFOSTER	MVUCAD05
SUPP	10/24/2007	17:54:26	SFOSTER	MVUCAD05
SUPP	10/25/2007	8:46:56	SFOSTER	MVUCAD05
SUPP	10/25/2007	9:10:40	SFOSTER	MVUCAD05
SUPP	10/25/2007	9:56:43	SFOSTER	MVUCAD05
SUPP	10/25/2007	14:09:45	SFOSTER	MVUCAD05
SUPP	10/25/2007	14:39:50	SFOSTER	MVUCAD05
RTQ BR6761	10/25/2007	15:43:03	GWHITE	MVUCAD02
AIQ BR6761	10/25/2007	15:43:05	GWHITE	MVUCAD02
REC			DCASTER	MVUCAD03

CALIFORNIA FIRE SIEGE 2007

AN OVERVIEW

Cover photos from top clockwise:

The Santiago Fire threatens a development on October 23, 2007.

(Photo credit: Scott Vickers, istockphoto)

Image of Harris Fire taken from Ikhana unmanned aircraft on October 24, 2007.
(Photo credit: NASA/U.S. Forest Service)

A firefighter tries in vain to cool the flames of a wind-whipped blaze.

(Photo credit: Dan Elliot)

The American Red Cross acted quickly to establish evacuation centers during the siege.
(Photo credit: American Red Cross)

Opposite Page:

Painting of Harris Fire by Kate Dore, based on photo by Wes Schultz.

Introductory Statement

In October of 2007, a series of large wildfires ignited and burned hundreds of thousands of acres in Southern California. The fires displaced nearly one million residents, destroyed thousands of homes, and sadly took the lives of 10 people.

Shortly after the fire siege began, a team was commissioned by CAL FIRE, the U.S. Forest Service and OES to gather data and measure the response from the numerous fire agencies involved. This report is the result of the team's efforts and is based upon the best available information and all known facts that have been accumulated.

In addition to outlining the fire conditions leading up to the 2007 siege, this report presents statistics—including availability of firefighting resources, acreage engaged, and weather conditions—alongside the strategies that were employed by fire commanders to create a complete day-by-day account of the firefighting effort.

The ability to protect the lives, property, and natural resources of the residents of California is contingent upon the strength of cooperation and coordination among federal, state and local firefighting agencies. By utilizing the information contained within this report, fire managers will create lessons learned that will be utilized continually to improve the response to wildfires.

RUBEN GRIJALVA
Director
California Department
Forestry and Fire Protection
(CAL FIRE)

RANDY MOORE
Regional Forester
Pacific Southwest Region
U.S. Forest Service

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Director
Office of Emergency Services
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Introduction

In late October 2007, Southern California experienced an unusually severe fire weather event characterized by intense, dry, gusty Santa Ana winds. This weather event drove a series of destructive wildfires that took a devastating toll on people, property, natural resources, and infrastructure. Although some fires burned into early November, the heaviest damage occurred during the first three days of the siege while the winds were the strongest.

During this siege, 17 people lost their lives, 10 were killed by the fires outright, three were killed while evacuating, four died from other fire siege related causes, and 140 firefighters and an unknown number of civilians were injured. A total of 3,069 homes and other buildings were destroyed, and hundreds more were damaged. Hundreds of thousands of people were evacuated at the height of the siege. The fires burned over half a million acres, including populated areas, wildlife habitat and watershed. Portions of the electrical power distribution network, telecommunications systems, and even some community water sources were destroyed. Transportation was disrupted over a large area for several days, including numerous road closures. Both the Governor of California and the President of the United States personally toured the ongoing fires. Governor Schwarzenegger proclaimed a state of emergency in seven counties before the end of the first day. President Bush quickly declared a major disaster. While the total impact of the 2007 fire siege was less than the disastrous fires of 2003, it was unquestionably one of the most devastating wildfire events in the history of California.

Kevin Key

An untouched home in the background stands in contrast to the destruction of neighboring properties.

Purpose

This report provides a broad, factual overview of the fire siege, documenting key events, providing summary statistics and serving as a reference for other reviews, investigations, studies and reports.

While firefighters gained control of the fires, a team of state and federal fire specialists gathered information to develop this factual report to recount the collective response of various organizations to the siege. The team has attempted to present the complexities of managing a large fire siege, and has included a broad array of information. The report provides detailed information about the day-to-day tactical firefighting effort, as well as the numerous social and political considerations that influenced strategic decisions.

This report is not an in-depth analysis and assessment of specific fire events, as these issues will be addressed in other efforts that will continue for several years.

The Contents

Fire Events and Policy includes a synopsis of significant large and damaging wildfires in California since 1923. It describes some key public policy actions establishing the multi-agency firefighting organization in place during this siege. It places a special emphasis on relevant activities and events that took place from 2004 through 2006.

The Prelude to the Siege describes events that took place during the year prior to the fire siege. It emphasizes major fires and the development of conditions that increased the magnitude of the October wildfires beyond what normally would have been expected.

Meteorological Events Timeline and Preparation recounts the six days leading up to the siege detailing the developing fire weather conditions, and actions taken by state and federal wildland fire agencies and local fire departments to prepare for the possibility of a major fire event.

The Fires provides a daily chronology written from the perspective of a fire chief working at a regional scale. Each day is a snapshot of the complex and rapidly changing fire environment, including weather, fire location and size, firefighting resource commitments, and public safety and evacuation impacts, that influence regional strategic decisions. The daily chronology follows specific fire activity, detailing the efforts of firefighters suppressing major fires while continuously responding to new outbreaks. It also describes the human and environmental impacts of the fires, including evacuations, structures damaged and destroyed, and damage to critical watershed and natural resources.

The Epilogue describes the continuation of the 2007 fire season into late November, placing it into the fire season as a whole, making the important point that the fire season did not end when the siege was over.

Fire Siege Coordination highlights examples of strategic regional coordination of several management systems and technologies.

The Aftermath summarizes the October fire siege, placing it into the context of both the 2007 fire season, and wildfire history.

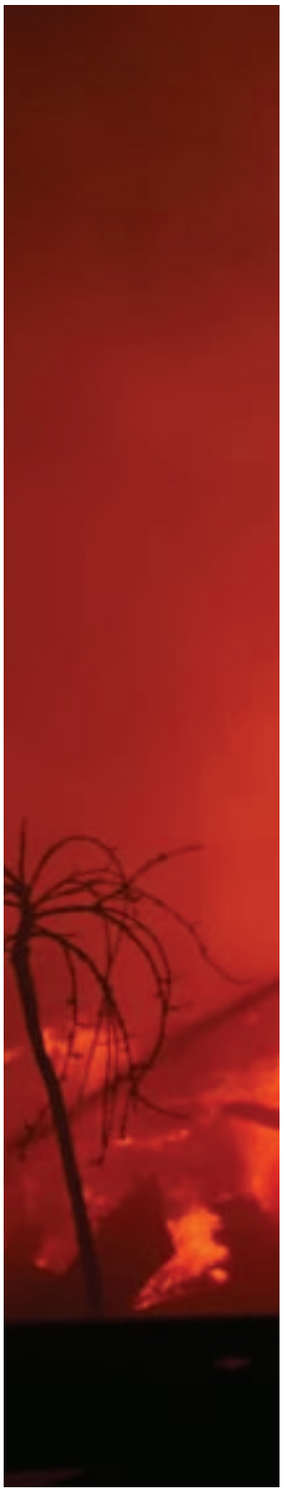
The Appendices include summary statistics for the siege, maps and descriptions of the fires by incident, a brief description of evacuations, a list of some after-action reports, copies of key advisories, proclamations, and declarations.

Glossary of Terms, and ***Acknowledgements*** of those responsible for producing the report.

Fire Events and Policy

Years 1923–2006

California has a long history of catastrophic Wildland Urban Interface fires. The following timeline discusses some of those fires and highlights key policies.



1923
Berkeley Fire destroyed 584 structures. Embers falling on wood shingles accelerated the spread of the fire.

1932
The Economy Act was passed by the U.S. Congress, enabling use of military resources in peacetime events. The intent of Congress was to encourage civilian employment prior to committing military resources.

1933
The Griffith Park Fire in Los Angeles started on October 3, 1933. This 47-acre fire killed 29 firefighters and injured 150 others.

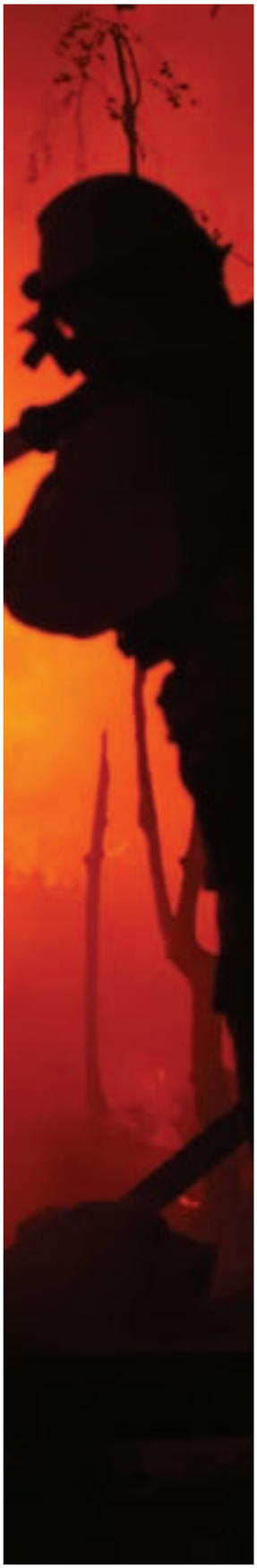
1943
The Hansen Creek Fire started on October 2, 1943 on the Cleveland National Forest. Ten marines and one army firefighter are killed. Seventy-three other military personnel are injured on this 13,145-acre fire.

1946
The California State Board of Forestry declared the San Bernardino Mountains around Crestline and Lake Arrowhead as a "Zone of Infestation" for forest insects.

1947
Helicopters are used to assist during wildland fires for the first time in Southern California and the usefulness for moving firefighters around the fire was quickly recognized.

1950
The State of California, all 58 counties and nearly all city governments signed a "Master Mutual Aid Agreement."

1960
California Public Resource Code 4291 was adopted. This code requires a minimum of 30 feet clearance of flammable vegetation around structures in State Responsibility Areas.



1961

Santa Ana winds fanned a wildland fire in the Bel Air community of Los Angeles County destroying 484 homes, many owned by Hollywood stars. Researchers studying the fire's impacts identified a demand for regulations limiting expansion in the wildlands and improving structure survivability.

1971

After the devastating fire season of 1970, the California fire services were severely criticized for failure to provide leadership in solving the issues of cooperation, command and control, communications and training. In response, state and federal legislative action authorized funding for a five-year research program coordinated by the Governor's Office of Emergency Services (OES) called FIRESCOPE (Firefighting Resources of Southern California Organized for Potential Emergencies). The FIRESCOPE research team identified a new fire management system containing the following elements:

- Incident Command System
- Multi-Agency Coordination System
- Information Management System
- Technological Support
- Common Communications

President Nixon created the "National Commission on Fire Prevention and Control." The commission completed a report in May 1973, titled "America Burning." The report covered structural and wildland fires and stated, "Fire is a major national problem."

1972

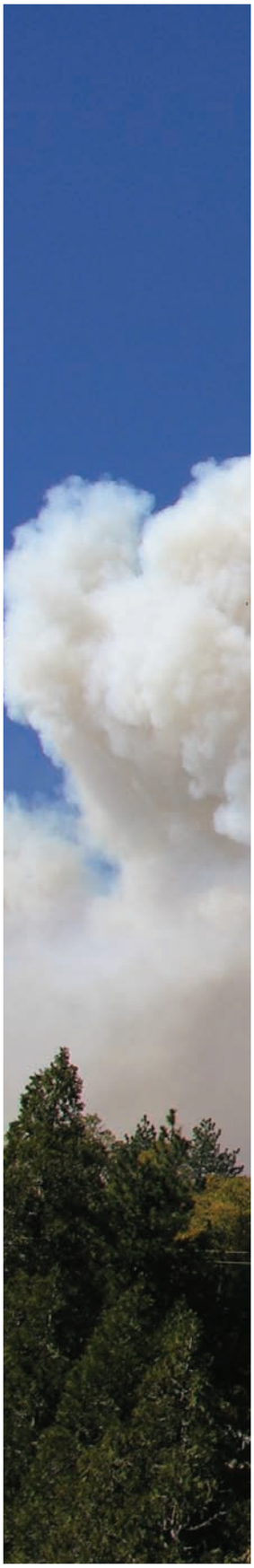
The Southern California Geographic Area Coordination Center (OSCC) was established to provide coordinated multi-agency logistical support and intelligence for wildfires in Southern California. Components of the center include the Intelligence Section, Logistical Support Center, Southern Operations Emergency Command Center and the South Zone Training Unit.

1980

Major Santa Ana wind-driven wildfires occurred in Southern California. At least 325 homes were burned in San Bernardino. The fires prompted Federal, State and Local officials to study the problem of fires coming from the wildland into developed communities. The California legislature established the Vegetation Management Program (VMP) to reduce hazardous fuel conditions.

1987

Pebble Beach Fire in Monterey County destroyed 31 structures. Roof type, window type and vegetation clearance were determining factors of structural survival.



1989

The California Legislature added the FIRESCOPE program to the California Health and Safety Code and authorized OES, in cooperation with CAL FIRE and the State Fire Marshal, to carry out the program.

1990

The Paint Fire in Santa Barbara County killed one resident and destroyed 479 homes and other major buildings. Researchers from the University of California, Berkeley, conducted a study of the causal factors that led to structure damage. The study found that 86% of the buildings survived when they had both 30 feet of vegetation clearance and an ignition resistant roof. Researchers also found that approximately 90% of buildings are completely destroyed once they catch fire.

1991

In October 1991 the Oakland Hills fire burned 1,600 acres, killed 25 people and destroyed 2,900 homes. The fire was almost completely within the city limits of Oakland and Berkeley and was considered an urban conflagration rather than a wildland or urban intermix. Six acres of SRA wildland burned on the perimeter of the fire. Combustible roofing material was implicated in the spread of fire. The high density of structures contributed to extreme radiant heat that spread fire to adjacent structures.

1993

The Laguna Beach fire alone destroyed 441 homes. The October 1993 fire siege in Southern California resulted in four fatalities and 1,200 structures destroyed. After the fire, residents formed the Laguna Coast FIRESAFE Council to help protect the region from future disasters.

The California Legislature passed the Standardized Emergency Management System (SEMS) Act for California. SEMS required state agencies responding to emergencies to use a standardized management system. Incident Command System (ICS) is a component of SEMS.

1994

Thirty-four wildland firefighters were killed while fighting fires in the United States, prompting the five federal wildland fire agencies to review federal fire management policy and programs.

1995

A new federal fire management policy was adopted. The policy concluded:

- The first priority in wildland fire management is the protection of human life.
- The second priority is the protection of natural resources, cultural resources, and property.
- Wildland fire, as a critical natural process, must be reintroduced into the ecosystem.

1996

CAL FIRE and the Office of the State Fire Marshal publish "California's I Zone," a nationally recognized in-depth study of past and projected problems of wildland/urban intermix fires.

The California Department of Forestry and Fire Protection developed the "California Fire Plan," a framework for reducing costs and losses from wildfire. The Fire Plan emphasized that residents need to be involved in planning for fire safety. Fire Safe Councils were established. State and federal funding was made available for civilian-supported fuel reduction projects. The U.S. Forest Service (USFS) amended the program to include training for local fire service personnel in firefighting tactics in the Wildland Urban Interface (WUI).

2000

In August 2000, President Clinton directed the Secretaries of Agriculture and the Interior to develop a plan to respond to severe wildland fires in order to reduce their impacts on rural communities, and to assure sufficient firefighting capacity in the future. The Secretaries developed the National Fire Plan (NFP) to increase firefighting capabilities to better protect natural resources, to reduce the threat to communities adjacent to federal lands, and to reduce the cost of fighting large fires.

2001

The U.S. Forest Service began implementing key points of the National Fire Plan by building up fire preparedness and suppression resources beyond historic levels. NFP assigned the highest priority for hazardous fuel reduction treatments to communities at risk, and other important local features, where conditions favor uncharacteristically intense wildfires. California Wildfire Coordinating Group (CWCG) identified communities at risk from wildfire and recorded them in the Federal Register.

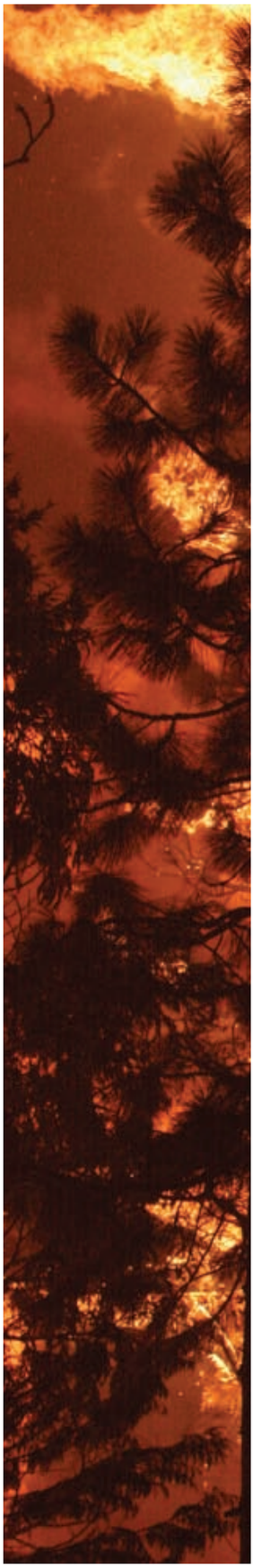
2002

The Mountain Area Safety Taskforce (MAST) was organized to address public safety and forest health issues on both public and private land in San Bernardino and Riverside counties. This was one of the most extensive, pre-event planning efforts to ever take place. The three part strategy deals with: 1) emergency preparedness response, 2) fuel reduction around communities and key evacuation routes, and 3) long-term planning and treatments to restore forest health.

In San Diego County, new county fire code required 100-foot clearance around structures, and the Forest Area Safety Taskforce (FAST) was formed.

2003

Local, state and federal agencies focus on identifying priority WUI areas in California to establish better protection strategies that will result in meaningful changes in fire behavior and mitigate the severity of fire effects at a watershed scale. These strategies are consistent with the interagency report: "A Collaborative Approach for Reducing Wildland Fire Risks to Communities



and the Environment, Western Governor's 10-Year Comprehensive Strategy Implementation Plan and the Memorandum of Understanding for the Development of a Collaborative Fuels Treatment Program."

A multi-agency Joint Information Center (JIC) operating plan was developed in conjunction with the MAST plan to coordinate information release to the community and the media.

All national forests in Southern California began environmental analyses to increase the scale and intensity of vegetation treatments to protect communities from wildland fire.

October 21, 2003 marked the beginning of one of the most devastating periods in Southern California fire history, the Fire Siege of 2003. During the ensuing 15 days, 14 major fires burned more than 750,000 acres and destroyed more than 3,700 homes. Twenty-four people are killed, including one firefighter. Before the last fire was contained, an interagency team was assembled to chronicle the siege resulting in "The Story – California Fire Siege 2003."

In November 2003, Governor Gray Davis and Governor-elect Arnold Schwarzenegger created the Governor's Blue Ribbon Fire Commission to review the effort to fight the California's 2003 wildfires, and provide recommendations to limit destruction from future fires.

2004

In April the Govenor's Blue Ribbon Fire Commission released its final report which included 33 findings and 48 recommendations in five categories: 1) Jurisdictional and Operational Barriers; 2) Training; 3) Interstate/ Regional Mutual Aid System; 4) Local Building, Planning and Land Use Regulations/ Brush Clearance and Fuel Modification; and 5) Communications Interoperability, Information Technology, and Public Outreach.

Congress began funding hazardous fuel reduction projects. By 2006 more than $181 million in federal, state, and local treated more than 96,000 acres in California.

The USFS Pacific Southwest Region developed and implemented the "FIREWATCH" program, utilizing excess military Cobra helicopters to provide state-of-art command and control, infrared capable remote sensing, and downlink capability.

The USFS Pacific Southwest Region developed an aviation training simulator for agency and interagency cooperator pilots and international governmental aviation personnel.

Beginning in 2004, Governor Schwarzenegger issued annual Executive Orders to minimize the impacts of large and damaging wildfires.

The California legislature amended the Public Resources Code and Government Code to require 100 feet of clearance around structures in the State Responsibility Area and Very High Fire Hazard Severity Zones in Local Responsibility Areas. The law took effect January 1, 2005.

Many local governments adopt or strengthen ordinances requiring clearance and removal of flammable vegetation and other materials.

CAL FIRE San Diego established an operation plan with the U.S. Navy Helicopter Squadron from North Island allowing the San Diego unit to access assests during major incidents. This included annual training.

2005

CAL FIRE units intensify hazardous brush treatment by cutting and piling brush as part of a shaded fuel break for wildland interface protection.

CAL FIRE begins year-round staffing of department stations.

The Topanga Fire, starting in Los Angeles County and moving into Ventura County, burned 24,175 acres. Of the nearly 1,000 residences threatened, three homes were destroyed and one damaged. Defensible space, fire safe design and ignition resistant construction is credited with reducing the impact of this fire is populated WUI.

2006

The USFS Pacific Southwest Region established an agreement with United States Marine Corps CH-53 Squadron at the Marine Corps Air Station Miramar in San Diego. The agreement outlines the annual pre-fire season training and experience requirements for pilots in command.

NASA's Dryden Flight Research Center and the USFS Pacific Southwest Region agree to test aerospace technologies to aid wildfire imaging and mapping through use of a remotely piloted unmanned aircraft.

Governor Schwarzenegger authorized contracting for a 12,000 gallon DC-10 air tanker during the peak fire season. This air tanker provides a large-load backup capability to supplement CAL FIRE's regular fleet of 23 Grumman S2T air tankers.

On October 26, 2006, five USFS firefighters were entrapped while engaged in structure protection operations on the Esperanza Fire in Riverside County, California. Three of the firefighters were killed at the scene, one died en-route to the hospital and the fifth died on October 31.

Prelude to the Siege 2007

Rainfall totals for the winter of 2006-2007 were far below average, leaving Southern California far drier than normal at the beginning of the 2007 fire season. Conditions were particularly dry at higher elevations, prompting concern for potentially severe fires. Early "green-up" of vegetation at mid-and-higher elevations produced lower than normal peak Live Fuel Moisture (LFM). The annual drying cycle began in May, and by June, moisture levels in live and dead vegetation were declining one-to-two months ahead of normal. LFM's fell below the critical level of 60% by July. By early September they had fallen to the mid-50-to upper-40 percentiles.

January 11, 2007

An Arctic cold front swept through the state, killing native and ornamental vegetation, creating an above-average volume of dead fuels in the Wildland Urban Interface.

January 29, 2007

The Building Standards Commission adopted the updated California Building and Fire Codes. This new code requires ignition-resistant construction for new building in State Responsibility Area (SRA) and Very High Fire Hazard Severity Zones in Local Responsibility Area (LRA).

Insect damage and drought stress combined to produce visible mortality in upland forests. Lower elevation coastal areas trended closer to normal in terms of moisture due to marine influences. Heavy frost in January 2007, caused considerable die-back of vegetation in Ventura, Orange, and San Diego counties.

March 11, 2007

The 241 Fire was reported along State Route 241 near the Wind Ridge Toll Plaza in Orange County. Influenced by high winds, high temperatures, and low humidity, this unusually early fire event burned 2,036 acres in less than three hours. One residence was damaged and two outbuildings were destroyed.

May 8, 2007

The Griffith Park Fire burned 817 acres in Los Angeles City. High power transmission lines were destroyed causing a loss of power to local neighborhoods. Over 400 structures and the Observatory were threatened. Fire caused the evacuation of over 1,000 people from the Los Angeles Zoo, Golf Course, Gene Autry Museum, Zoo Magnet School, and Griffith Park Boys Camp.

May 9, 2007

Governor Schwarzenegger issued an executive order directing CAL FIRE to mobilize additional resources and to work closely with federal, state, and local government agencies to maximize fire fighting and prevention capabilities within California.

May 10, 2007

The Island Fire started on Santa Catalina Island, 26 miles off the coast of Los Angeles. Extreme fire behavior was reported with spotting 1/4 to 1/2 mile in advance of the head of the fire due to low relative humidity, high erratic winds and low fuel moistures. More than 3,800 people were evacuated from the island via the Catalina Island Express to the city of Long Beach. While 4,750 acres were burned, threatening more than 900 structures, only one residence and five outbuildings were destroyed; four outbuildings were damaged.

June 20, 2007

USFS issued a Fuels and Fire Behavior Advisory for low fuel moisture and potentially severe fire behavior.

June 24, 2007

An unattended campfire in the area southwest of South Lake Tahoe set off the destructive Angora Fire. Driven by strong erratic winds in heavy timber with a large dead and down component, the burn exhibited extreme fire behavior causing the evacuations of several subdivisions within the first burning period. The fire was contained on July 2 at 3,100 acres, after destroying 242 residences and 67 outbuildings.

July 4, 2007

The Zaca Fire started in the rugged, inaccessible area 15 miles northeast of Buellton, in Santa Barbara County. High temperatures and low relative humidity combined with steep terrain hampered control efforts. Fuel moisture levels were at levels typically seen in late August or September. The Zaca Fire, the second largest fire in California history. was contained at 240,207 acres two months after it started.

July 25, 2007

Following the Angora Fire, California Governor Arnold Schwarzenegger and Nevada Governor Jim Gibbons signed a joint memorandum of understanding which established the California-Nevada Tahoe Basin Fire Commission. The joint fire commission was charged to conduct a comprehensive overview of forest management in the Lake Tahoe Basin, including effective fuels management, to help prevent fires from starting or escalating.

July 30, 2007

CAL FIRE issued a Fire Behavior Alert discussing the potential for extreme fire behavior this season, based on low fuel moisture conditions.

Summer weather was seasonably dry with very little precipitation. By October, Southern California remained dry, with much of San Diego and desert regions near the border with Baja California extremely dry. All these factors increased the potential for severe fires in the fall.

Meteorological Events Timeline and Preparations

October 15–20, 2007

Predictive Services at the Southern California Geographic Area Coordination Center (OSCC) continued to forecast an extreme fire weather event of strong, hot, dry, winds. Regional Chief Officers, representing CAL FIRE, USFS, and OES at OSCC, monitored developing conditions and initiated actions within their specific agencies to preposition wildland firefighting resources.

Monday October 15–Wednesday, 17

Daily and 7-day forecasts discussed strong offshore flow conditions predicted for Sunday,

October 21, and Monday, October 22.

Thursday, October 18

"High Risk Days" were added to the 7-day forecast for Sunday, October 21, and Monday, October 22, highlighting the prediction that this anticipated offshore event would be strong and widespread, and accompanied by very warm and very dry conditions.

Predictive Services and the National Weather Service participated in daily conference calls to coordinate weather information. Predictive Services invited local fire agencies to join in wildland fire agency briefings regarding the upcoming Santa Ana wind event.

Regional Chief Officers issued a regional special staffing pattern to go into effect Sunday, October 21:

- Staff all CAL FIRE fire crews in the Southern California Conservation Camps
- Staff all CAL FIRE bulldozers in Southern California 24 hours per day
- Staff three CAL FIRE fire crews per camp in Central California CAL FIRE Conservation Camps
- Pre-position a CAL FIRE Strike Team of Type 3 engines (five engines and a leader) from Central California into Ventura and Los Angeles Counties on October 20
- Request that Riverside County Fire Department staff five reserve Type 3 Engines

Friday, October 19

Predictive Services forecasters added Tuesday, October 23, as a High Risk Day in the 7-day report. Daily conference calls with the National Weather Service and fire agencies continued.

Regional Chief Officers placed the following requests for Sunday, October 21:

Orange County Fire Authority to staff one additional Engine Strike Team, one additional bulldozer and one additional fire crew.

- Santa Barbara County Fire Department to staff one additional task force consisting of three engines and one water tender.
- Increase Chief Officer and Emergency Command Center staffing in the Southern California Units, and place two CAL FIRE Incident Command Teams on standby.
- Reposition three Northern Region air tankers to Paso Robles, Hemet, and Ramona air attack bases.
- Activate the DC-10 Supertanker.

- Authorize extended staffing for federal initial attack engine modules (increasing initial attack capabilities by 30%) and federal Hotshot Crews.
- Authorize the four Southern California Forests to extend staffing to 24 hours per day.

Saturday, October 20

Predictive Services continued to forecast a strong widespread offshore wind event, Sunday through Tuesday. Saturday started with an onshore wind, but by late that night and into early Sunday morning, the winds in Southern California gradually shifted, blowing from the north and northeast.

Regional Fire Officers pre-positioned federal firefighting resources including:

Four Type 1 Incident Management Teams

- Five Type 2 Incident Management Teams
- Seven heavy helitankers
- Seven Type 2 helicopters
- Eight heavy air tankers
- Local federal fire officers on the Cleveland National Forest implemented 24 hour staffing.
- Local federal fire officers on the remaining three southern forests, San Bernardino, Los Padres, and Angeles National Forests implemented 24-hour staffing effective the following day.

Sunday, October 21

The anticipated Santa Ana wind event was under way.

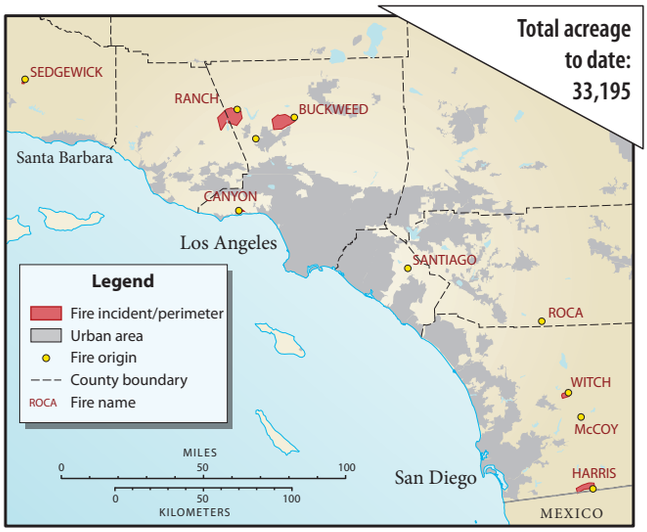
Energy Release Component

The Energy Release Component (ERC) is an NFDRS (National Fire Danger Rating System) index relating to how hot a fire can burn. It is directly related to the 24-hour, potential worst case, total available energy (BTUs) per unit area (in square feet) within the flaming front at the head of a fire.

The ERC can serve as a good characterization of fire season as it tracks seasonal fire danger trends. The ERC is a function of the fuel model and live and dead fuel moistures. Fuel loading, woody fuel moistures, and larger fuel moistures all have an influence on the ERC, while the lighter fuels have less influence and wind speed has none. ERC has low variability, and is the best fire danger component for indicating the effects of intermediate to long-term drying on fire behavior (if it is a significant factor) although it is not intended for use as a drought index. Throughout most of the Southern region, ERCs had hovered around the 90 to 100% level from July onward. By late September all but one of the seven Predictive Service Areas (PSAs) were displaying ERCs at 95 to 100%—at or above the recorded maximum values. Fuels and slope-driven fires were burning with remarkable intensity and moved upslope as if they were driven by the wind.

The Fires: Day 1

Sunday, October 21, 2007



Predictive Services Morning Report:

A strong ridge of high pressure will build into California from the Pacific Ocean bringing a warming trend and very low humidity to the region through Wednesday. There will be widespread strong and gusty north to east winds over Southern California through Wednesday morning. Winds will be 20-to-40 miles per hour with much higher gusts over the mountains and below the canyons and passes of Southern California.

Today's Events:

The anticipated Santa Ana wind event is under way. Southern California is experiencing widespread sustained wind speeds of 20-to-40 miles per hour, with gusts of 70-to-80 miles per hour in more wind-prone areas. These winds persist throughout the day, diminishing somewhat by late afternoon. Humidity values tumble into the single digits and teens.

The **Ranch Fire** is reported Saturday night, October 20, at 9:42 p.m., along Interstate-5 six miles north of Castaic in Los Angeles County. The fire is driven by 25-to-30 mile per hour winds with gusts up to 40 miles per hour. Extreme wind conditions and heavy brush contribute to erratic fire behavior creating control problems. Spotting is noted 1/2 mile ahead of the fire. The communities of Fillmore, Piru, Ventura, and Ojai are threatened. The Condor Reserve and Sespe Wilderness areas are identified for protection. Reconnaissance

Daily Snapshot

Incident Name	MACS Priority* a.m. / p.m.	Crews	Engines	Dozers	Overhead	Acres**	Contained %
Buckweed	na / 5	10	26	2	65	10,000	0
Canyon	na / 1	14	247	2	92	2,200	10
Harris	na / 2	6	37	2	13	2,000	0
Ranch	na / 4	15	56	5	22	12,000	10
Roca	na / 8	7	37	3	14	250	40
Santiago	na / 9	2	69	2	29	4,000	5
Sedgewick	na / 7	0	0	0	0	710	50
Witch	na / 3	12	20	1	8	2,000	1
Contained Fires***		10	39	3	0	35	100
Totals		**76**	**531**	**20**	**243**	**33,195**	

** Multi-Agency Coordination System (MACS) priority setting for resource allocation is based on the following criteria: Life Threatening Situations, Real Property Threatened, High Damage Potential, Incident Complexity, Potential for Timely Containment.*
*** Figures for acreage are cumulative for the incident throughout the siege.*
**** When a fire is 100% contained, the fire name is deleted but the acreage burned and additional resources (used in mop-up) is added to the "Contained Fires" section.*
Data used above was extracted from the Incident Status Summary (ICS-209).

On October 21, 2007, resources commence battling eight fires starting within hours of one another. Dry winds gusting up to 70 miles an hour in some areas, threaten thousands of structures. Of over 2,000 structures threatened, destroyed structures total 53 on day one of the siege.

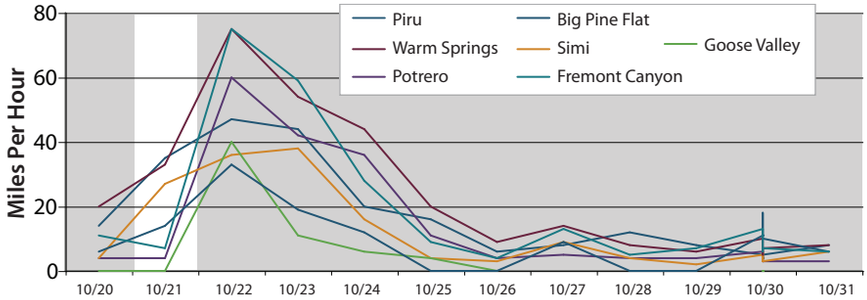
flights by lead plane pilots determine winds and turbulence are too great for air tanker operations, so only helicopter operations are planned. By afternoon, the Ranch Fire reports "extremely hellacious & erratic fire behavior," driving the number of acres burned to 6,000, with 300 structures threatened.

The **Canyon Fire** is reported at 4:55 a.m. in Malibu Canyon, Los Angeles County. The fire threatens 300 structures and evacuations in progress create severe traffic congestion along the narrow, winding roads. The Malibu coastline is without power. Fifty mile-per-hour winds drive the fire through dense six-foot tall chaparral. Both fixed-wing aircraft and helicopters are used all day with great effect. Two of the heavy air tankers do not fly because lead planes are acommitted to other fires.

Due to the unusually dry fuel condition, spotting occurs 1/2 mile ahead of the main fire. With a rapid rate of spread of two miles per hour, the fire has the potential to grow to 3,000 acres within 24 hours. The fire is spreading in a south-southwest direction into homes, businesses and historical sites including Serra Retreat House and Pepperdine University.

Peak Wind Speeds: October 20–31, 2007

October 21 highlighted



Govenor Schwarzenegger declared a state of emergency in seven counties: Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, and Ventura, due to the damages caused by wildfires and continued fire threat.

- The Governor's Office Of Emergency Services requested four California National Guard helicopters to support firefighting efforts.

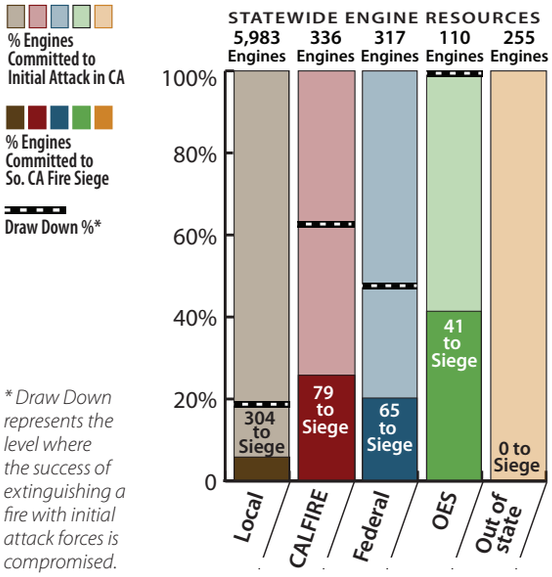
At 6:00 a.m., slightly over an hour after the Canyon Fire is reported, the **Sedgewick Fire** begins, possibly started by arcing power lines igniting dry grass. Burning near Sedgewick Ranch and Figueroa Mountain In Santa Barbara County, the fire spreads quickly. The Woodstock area receives an evacuation warning. The initial aircraft order of four air tankers and four helicopters is increased by four additional heavy air tankers, a lead plane and one additional helicopter. By day's end, the fire is held with retardant at approximately 710 acres.

Farther to the south the **Harris Fire** is reported at 9:30 a.m. along Highway 94 near the U.S.-Mexico border town of Potrero in San Diego County. Strong winds hamper suppression efforts as the fire spreads rapidly in dry brush and grass. A second small fire in the area diverts resources briefly. By 11:00 a.m., the fire is burning around the CAL FIRE Potrero fire station with one engine on scene protecting the structure. Approximately 250 residences are threatened in the community of Potrero. By day's end, there are reports of possible fatalities and numerous injuries, including the burnover of an engine. Air tankers are held out of the area and a helicopter is sent to search for the injured personnel. In spite of high winds and poor visibility, the injured parties are found and transported to the Potrero Forest Fire Station. Two other medivacs use five Emergency Medical System (EMS) helicopters to transport ten public burn cases to the University of California San Diego Burn Center.

Air tanker operations are unable to continue due to the deteriorating conditions caused by blowing smoke and dust, turbulence and 70 mile per hour winds. Four Type 2 helicopters and two helitankers work the fire until cutoff. Multiple structures are destroyed. The communities of Dulzura and Tecate are threatened as well as the transmission power line serving a large portion of San Diego County. In a little more than 12 hours, the Harris Fire burns more than 16,000 acres.

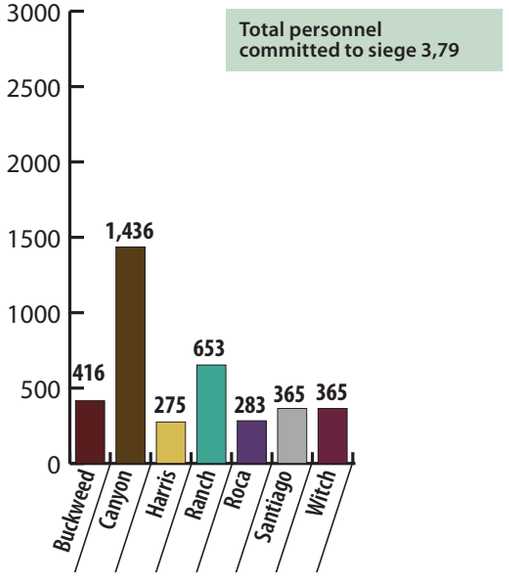
Just 40 miles north of the Harris Fire, the **Witch Fire** is reported at 12:35 p.m. in the rural area of Witch Creek, east of Ramona in San Diego County. Aircraft diverted from the Harris Fire take immediate action due to imminent structure threat and rapid rate of spread toward Ramona. Air tanker drops are ineffective due to the winds, and air attack is cancelled.

Resources Committed: Engines, October 21, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

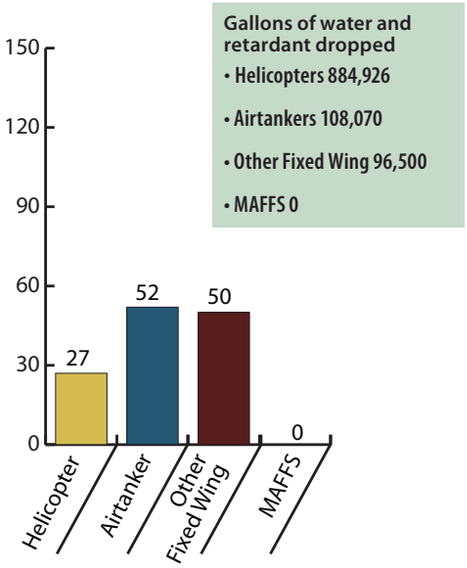
Resources Committed: Personnel, October 21, 2007



The fire spreads rapidly toward the communities of Northeast Ramona, San Diego Country Estates, and Barona Mesa in roughly the same area that was burned by the Cedar Fire in 2003. Over 175 structures are threatened. With multiple fires already burning in Southern California, competition for resources is anticipated. By evening, the western edge of the fire jumps Interstate-15 and establishes itself in the river drainage. An estimated 10,000 acres burn. Multiple structures are destroyed in Rancho Bernardo and Poway. The communities of Ramona, San Diego Country Estates, Barona Mesa, Barona Indian Reservation, Poway and San Pasqual are all threatened.

Just before 1:00 p.m., less than 30 minutes after the inception of the Witch Fire, the **Buckweed Fire** is reported along Mint Canyon Road directly east of Six Flags Magic Mountain in Los Angeles County. Within hours, the wind-driven fire threatens 200 residences and evacuations are initiated. By evening the fire consumes an estimated 10,000 acres, threatening the communities of Santa Clarita, Castaic, Leona Valley,

Resources Committed: Aircraft, Flight Hours, October 21, 2007



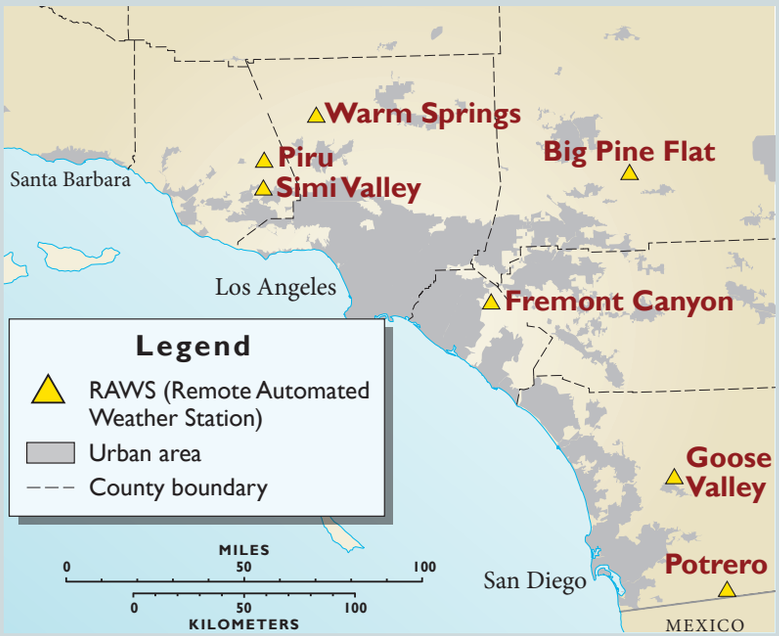
Remote Automated Weather Stations

Remote Automated Weather Stations (RAWS) are solar-powered weather stations strategically positioned throughout the United States, often in isolated areas. These units collect, store, and transmit important weather information on an hourly basis. RAWS sensors monitor:

- Wind speed and direction
- Wind gusts
- Precipitation
- Air temperature
- Solar radiation
- Relative humidity
- Fuel moisture
- Soil moisture and temperature

In addition to fire weather, data collected from the more than 1,800 stations are used in numerous applications, including climatology, resource management, flood warning, noxious weed control, all-risk management, and air quality management.

The map below shows the location of the seven RAWS stations used for wind gusts data in developing the daily peak wind speed graph for this report.



Green Valley, Acton, Agua Dulce and Mint Canyon. There are unconfirmed reports of several civilian burn victims and two destroyed residences. More than 3,800 structures are threatened. Large-scale evacuations are ordered for Bouquet Canyon and San Francisquito areas. Additional threats to infrastructure include water distribution systems along Interstate-5, Bouquet Canyon and San Francisquito Canyon, as well as power lines in Bouquet Canyon and along the State Route-14 corridor. The smoke column has risen to approximately 15,000 feet and the winds are gusting on the surface up to 70 miles-per-hour.

Two scoopers (air tankers that "scoop" water from water bodies while in flight) pick up water from Castaic Reservoir. Even though their water drops are made from extremely low altitudes, the wind dissipates the water to the extent that the drops are deemed ineffective. The extreme fire behavior is exceeding on-scene firefighting resource capabilities.

At 3:52 p.m. a strike team of CAL FIRE Type 3 engines on the way to fires in San Diego reports the **Roca Fire,** east of Temecula in Riverside County. High winds drive the fire down canyon at dangerous rates of spread toward the Cleveland National Forest, threatening the Agua Tibea Wilderness and the Palomar Mountain State Park.

- A FEMA Fire Management Assistance Grant (FMAG) was authorized for the Canyon Fire in Los Angeles County.

The Roca Fire has the potential to burn up to 10,000 acres. The Jojoba Hills Resort and Rancho California RV Park receive mandatory evacuation orders for 700 residences. An evacuation center is set up at Temecula Community Center.

Seven major fires, exacerbated by relentless winds, are now blazing in Southern California. With resources already stretched, the **Santiago Fire** begins shortly before 6:00 p.m. in the foothills north of Irvine and east of the city of Orange in Orange County. This fire reportedly started in two separate spots, along Santiago Canyon Road, and west of Silverado Canyon Road. Wind speeds are reported at 50 miles-per-hour causing large runs and major spotting. More than 2,000 residences and 50 commercial properties are threatened near Irvine. As the eighth major fire start in 20 hours, suppression efforts on the Santiago Fire are greatly limited by a lack of additional available resources.

"The flames are about 1,000 yards from the prison."
Jim Amormino
Orange County Sheriffs' Department Spokesman

While fire commanders had their hands full with the increasing number of fires and the stretching of resources, local law enforcement confronted unprecedented evacuation issues.

The James A. Musick Branch Jail in Irvine stood in the path of the Santiago fire. With the smoke growing thicker and the flames within 1,000 yards of the buildings, law enforcement was able to empty the prison and move all prisoners with no injury or incident.

Other facilities cooperated by making temporary space for the displaced prisoners. Within 36 hours the jail was repopulated with inmates.

Within a matter of days, 17 lives would be lost and up to 900,000 residents would be displaced. However, thousands of lives, homes and commercial properties were saved in spite of Santa Ana winds and drought conditions.

Dan Elliot

The ninth large fire of the day for Southern California, the **McCoy Fire**, is reported at 11:37 p.m. in the Boulder Creek area of San Diego County. The McCoy Fire burns in the area near the 2003 Cedar Fire in light fuels of grass and chamise regrowth. High winds drive the fire in all directions. No resources are available for initial attack.

Regional Chief Officers at OSCC respond to the escalating fire situation by initiating a series of strategic resource movements. They order all CAL FIRE fireline personnel in the Sierra Units and Northern Region to remain on duty. They also move three federal Incident Management Teams to Southern California and activate the Master Mutual Aid System to request OES and local government resources from Northern California. Northern Region Chiefs begin moving engines, crews, bulldozers, and Incident Command Teams to Southern California.

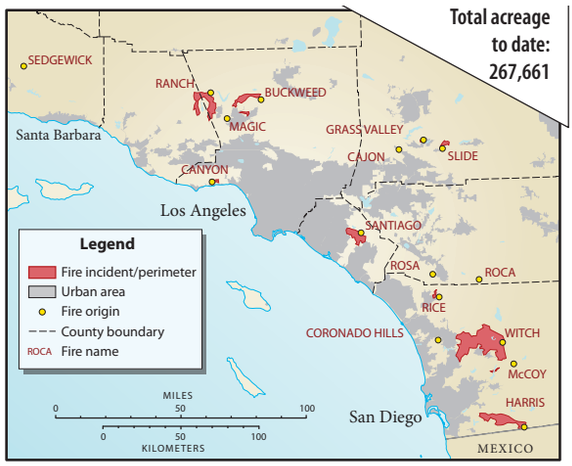
Regional Chief Officers also initiate movement of aerial resources to Southern California by activating California National Guard and active duty military helicopters, the Martin Mars air tanker from Canada, and all available "off contract" CAL FIRE air tankers. They also request two Oregon State DC-7 air tankers, reposition three Northern California helicopters, and bring two out-of-state federal heavy air tankers into the area.

- Southern California Regional Emergency Operations Center activated.

By day's end on October 21, fire managers are administering multiple incidents with extreme wind-driven fire behavior and limited resource availability. The Santa Ana winds are expected to continue through the night. The Southern California Wildland Fire Siege of 2007 is well under way.

The Fires: Day 2

Monday, October 22, 2007



12 American Red Cross (ARC) shelters open.

Predictive Services Morning Report:

With the strong ridge of high pressure over California temperatures will be 10 to 20 degrees above normal. There will be widespread strong and gusty north-to-east winds over Southern California through Wednesday morning. Winds will be 20-to-40 miles per hour, with much higher gusts over the mountains and below the canyons and passes of Southern California through Tuesday morning.

Today's Events:

Southern California awakens to the news that the Fire Siege of 2007 has grown. By dawn, four new large fires have been reported: Coronado Hills, Guajito, Rice, and Grass Valley.

The **Coronado Hills Fire** is reported at 1:46 a.m., south of California State University, San Marcos, in San Diego County. The fire is racing through dense chaparral fanned by winds up to 40 miles per hour. Multiple structures are destroyed and evacuations begin. Fire threatens the communities of Discovery Hills, Coronado Hills, San Elijo Hills, Elfin Forest and Harmony Grove.

Daily Snapshot

Incident Name	MACS Priority* a.m. / p.m.	Crews	Engines	Dozers	Overhead	Acres**	Contained %
Buckweed	1 / 4	21	129	9	72	35,547	20
Canyon	4 / 5	24	210	6	94	3,800	8
Coronado Hills	– / –	0	23	0	3	300	0
Grass Valley	– / 1	5	56	0	119	75	0
Harris	3 / 3	6	37	2	13	22,000	50
Magic	– / –	4	60	1	5	1,200	0
McCoy	– / –	0	5	0	3	300	50
Ranch	5 / 6	20	66	7	89	41,000	10
Rice	– / 8	0	5	0	5	1,500	0
Rosa	– / –	7	34	4	12	350	70
Santiago	6 / 7	2	94	2	37	15,225	30
Slide	– / 1	4	20	0	0	150	0
Witch	2 / 2	9	87	10	31	145,000	0
Contained Fires***		41	83	16	64	1,214	100
Totals		**143**	**909**	**57**	**547**	**267,661**	

* *Multi-Agency Coordination System (MACS) priority setting for resource allocation is based on the following criteria: Life Threatening Situations, Real Property Threatened, High Damage Potential, Incident Complexity, Potential for Timely Containment.*
** *Figures for acreage are cumulative for the incident throughout the siege.*
*** *When a fire is 100% contained, the fire name is deleted but the acreage burned and additional resources (used in mop-up) is added to the "Contained Fires" section.*
Data used above was extracted from the Incident Status Summary (ICS-209).

High winds prevented the water drop above from ever reaching it's target.

Wes Schultz

At approximately 4:00 am, a new fire is reported south of the San Diego Wild Animal Park, burning in the San Pasqual River drainage. Within 30 minutes this new fire, the **Guajito Fire**, burns west to Interstate- 15. The California Highway Patrol closes this major highway in both directions, disrupting the evacuation of communities threatened by the Witch Fire. The Guajito Fire burns under a bridge along Interstate-15 racing toward Rancho Bernardo. Later in the day, the Guajito and the Witch Fires merge.

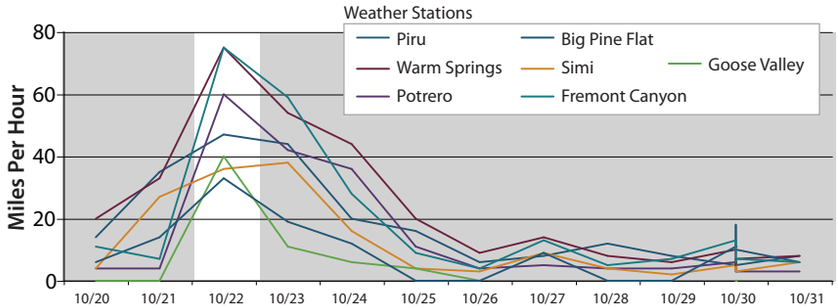
The **Rice Fire** is reported at 4:16 a.m. in Rice Canyon, north San Diego County burning in grass and brush with rapid fire spread and spotting. One structure burns and 250 structures are threatened. No mandatory evacuations are in place.

- U.S. Department of Defense announced that six Modular Airborne Fire Fighting Systems (MAFFS) equipped aircraft have been directed to assist in Southern California.

At 5:08 am, less than one hour after the Rice Fire is reported, the **Grass Valley Fire**, also known as the **Valley Fire**, is reported. This new fire is in the Deer Lodge Park area near Lake Arrowhead in San Bernardino County. Burning in timber with heavy winds, the fire poses an immediate threat to 100 structures. Evacuations commence immediately for Deer Lodge Park. As the fire progresses, it poses a threat

Peak Wind Speeds: October 20–31, 2007

October 22 highlighted



- President Bush issued a declaration of emergency in California for the seven counties struck by wildfires (direct federal assistance, debris removal, emergency protective measures).

to thousands of residents in and around the town of Lake Arrowhead as well as endangering a nearby power plant. Fierce competition for resources hinders suppression efforts and all local resources are depleted. Due to winds over 30 miles per hour, aircraft are unable to effectively drop retardant.

- The Governor directed California National Guard to make 1,500 guardsmen available at the direction of the OES to support the firefighting efforts in Southern California.

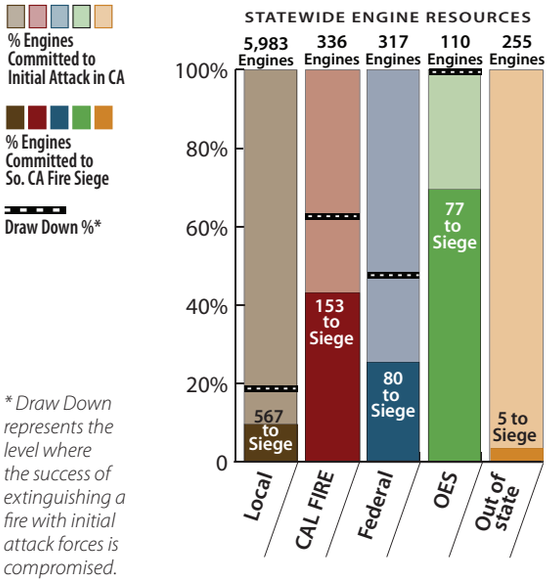
By 8:00 am the Multi-Agency Coordination (MAC) Group convenes at the Southern California Geographic Area Coordination Center (OSCC) to prioritize the incidents based on the most current information and coordinate the allocation of firefighting resources supporting the siege as a whole. In addition to the MAC Group member agency representatives, a representative for the San Diego County fires is included. Morning reports from ongoing fires describe erratic fire behavior associated with extreme weather conditions. Thousands of homes are threatened and massive evacuations are underway.

Roaring through chaparral, mixed brush and grass, the **Buckweed Fire** continues to exceed the capabilities of on-scene resources. Helicopters and two CL215s (Canadian water scooping air tankers) are working effectively. On the eastern flank, no structures are in danger. There are insufficient ground forces to assign fire fighters to the eastern portion of the fire. Without the support of ground forces, and with strong winds blowing, no air drops occur on the eastern side of the Buckweed.

The winds increase through the canyons. Officials receive unconfirmed reports of three civilian burn victims. The Texas Canyon USFS Ranger Station district office, the Bouquet Canyon/Vasquez Canyon Bridge and the Sierra Highway/Vasquez Canyon Bridge are destroyed. Major transmission lines are threatened as the fire burns toward the Magic Mountain theme park. By noon, more than 50,000 structures are threatened, and 25 have been destroyed. An estimated 15,000 residents are under mandatory evacuation.

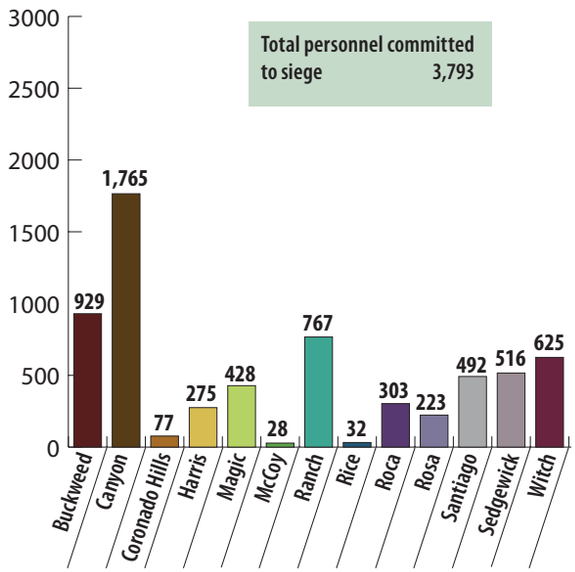
The **Witch Fire** continues to threaten many communities in the San Diego area and jumps Interstate-15 as it heads west. The fire is well established in the river drainage burning downhill, down canyon. Driven by 31 miles-per-hour winds, with gusts up to 47 miles-per-hour, spotting occurs up to 1/2 mile. The area between the Paradise Fire (2003) and the Cedar Fire (2003) has not burned for at least 25 years. Fire reaches the community of Ramona and evacuations take place. Highway 78 from Ramona to Santa Ysabel, Wildcat Canyon and Highway 67 from Poway Road to Ramona are closed. The fire continues to move west and

Resources Committed: Engines, October 22, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed: Personnel, October 22, 2007



southwest. Widespread spotting and numerous new starts occur in the surrounding areas due to electrical wires falling as a result of the high winds.

High winds in excess of 40 miles per hour ground aircraft and hamper suppression efforts on the **Harris Fire**. Covering over 20,000 acres, the fire burns in the areas of Deer Horn, Mother Grundy, and east of Otay Lake. San Diego County Sheriff officers and U.S. Border Patrol agents are busy handling immigrant issues including the rescue, medical treatment, and identification of individuals. There are reports of an additional fatality. Multiple structures are destroyed in Dulzura. Mandatory evacuations are ordered for Coyote Holler, Round Potrero and Deer Horn Valley. An evacuation center is established at Steel Canyon High School. Several roads are closed. Winds reaching 70 miles per hour with moderate to severe turbulence are reported. Ground visibility is extremely poor due to blowing dust and ash. Due to the poor visibility, fixed-wing aircraft are unable to fly safely until afternoon. The San Diego Gas & Electric southwest major transmission line remains inoperable. All firefighting efforts are focused on protecting life and property.

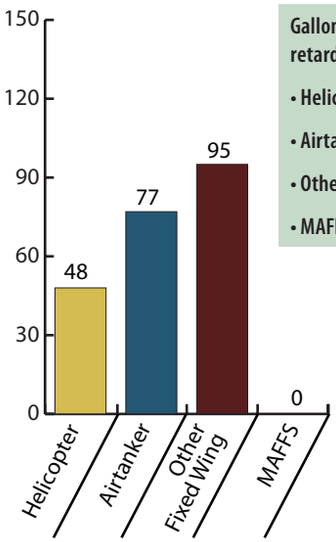
- Governor Schwarzenegger directed inmate firefighters and staff from the California Department of Corrections and Rehabilitation (CDCR) to deploy firefighting resources to work with state and local firefighters.

Burning through heavy brush, grass, and oak, the **Ranch Fire** remains very active overnight with large wind-driven runs, long distance spotting, fire whirls, and flame sheeting. The fire spreads further west and south with the east and north flanks holding. Highway 126 is closed. Evacuations continue in the Hasley Canyon, Oak Springs, Val Verde and Piru areas. Firefighters successfully contain a new fire in Hopper Canyon.

At 8:02 a.m., another fire, the **Slide Fire**, is reported in the San Bernardino Mountains between Green Valley Lake and Running Springs. Located in a dense residential area with bug-killed timber, the fire burns at an extreme rate of spread with numerous structures threatened. Mandatory evacuations are ordered in Green Valley Lake and Arrow Bear. The fire also poses a significant threat to timber, watershed and recreation areas.

With resources already stretched thin, the **Cajon Fire** is reported at 11:38 a.m. along Interstate-15 in Devore, also in San Bernardino County. The combination of dense chaparral and high winds present control problems, causing active fire behavior including long-range spotting and high rates of spread. The fire threatens Interstate-15, a natural gas line, railway, and power lines.

Resources Committed: Aircraft, Flight Hours, October 22, 2007



Gallons of water and retardant dropped	
• Helicopters	884,926
• Airtankers	108,070
• Other Fixed Wing	96,500
• MAFFS	0

At 2:17 p.m., the **Magic Fire** is reported west of Interstate-5 near the Old Road and Magic Mountain Parkway. Driven by Santa Ana winds, the fire shows critical fire spread with numerous spot fires. The potential for large-scale loss is great as the fire moves through heavy fuels impacted by severe weather conditions. The new fire start causes some electrical outages in the area. Numerous residential properties are at risk. Two water-scooping air tankers and several county helicopters work the area along with federal air attack. Four air tankers are used until the winds and intensity of the fire limit the retardant's effectiveness. The incident commander's ability to control this fire in the early stages is limited by the fierce competition for available resources.

By evening, a decision is made to manage the **Grass Valley** and **Slide** fires as one incident. This incident is designated the number one priority by the Southern California Geographic Area Multi-Agency Coordination (MAC) Group. Burning

A border crossing is engulfed by flames.

at extreme rates of spread in high density residential property intermixed with standing dead timber, the fire very quickly destroys multiple structures in Lake Arrowhead and Grass Valley. Thousands of structures are threatened and evacuations begin in Arrow Bear, Lake Arrowhead, Running Springs, Green Valley Lake, and Twin Peaks. Between the two fires, over 200 homes are damaged or destroyed. All roads to mountain communities are closed. Competition for firefighting resources continues to pose major problems. Aircraft are not able to drop retardant on either fire due to the wind and turbulence. The two Type 1 helicopters ordered can't fly due to strong winds and turbulence. Anticipating a break in the winds, orders are placed for two additional Type 1 helicopters, a DC 10 heavy air tanker, and any other available heavy air tankers.

The second and third priority fires, the Witch and Harris fires, are the two largest fires burning in San Diego County.

The **Witch Fire** is reported at over 145,000 acres. No containment progress has been made due to rapid fire spread and limited on-scene resources. The fire exhibits extreme behavior with long-range spotting in excess of 1/4 mile and rapid spread rates over 2.5 miles-per-hour eventually merging with the **Guajito Fire**. The high winds with high temperature and low humidity are expected to continue through Wednesday, October 24. The fire continues to move west and southwest, threatening the communities of San Diego, Poway, Ramona, Escondido, Lakeside, Valley Center, San Marcos and Rancho Santa Fe. The fire burned with exceptional speed, driven by blowing embers in the strong winds. Islands of unburned fuel are left behind, creating an additional hazard of reburn when the winds shift. Mandatory evacuations are placed for Scripps Ranch, Rancho Bernardo, Poway, Valley Center, San Marcos and Rancho Santa Fe. By the end of the day, an estimated 500 homes have been destroyed and 250 damaged; 100 commercial buildings have been destroyed and 75 damaged. More than 5,000 homes and 1,500 commercial buildings remain threatened. There are reports of civilian injuries.

- FEMA Fire Management Assistance Grants (FMAGs) authorized for the Santiago Fire, the Ranch Fire, the Witch Fire, the Buckweed Fire, the Harris Fire, the Grass Valley Fire and the Rice Fire.

The **Harris Fire** reports extreme fire behavior due to weather conditions. Driven by 40-to-60 mile per hour winds, the fire spreads west toward Otay Lake, and north to Lyon's Valley. Smoke and weather conditions make air operations difficult. More than 600 structures and multiple heritage sites are threatened. Evacuations progress in the threatened communities of Potrero, Barrett Junction, Barrett Lake, Lawson Valley, Jamul, Lyons Valley and Otay Mountain. Some civilians refuse to evacuate and create rescue problems. Three additional civilians suffer burns and are transported to local hospitals. One civilian has died and 17 have been injured by this fire. The San Diego Gas & Electric Southwest major transmission line remains shut down. Most resource orders remain unfilled due

to competing incidents in the area. All firefighting efforts focus on protection of life and property, and on firefighter safety. Incident base is moved to Gillespie Field.

Extreme fire behavior is also reported from the Buckweed Fire. Influenced by strong north-northeast Santa Ana wind conditions and critically low fuel moisture levels, the fire is spotting up to 1/2 mile ahead of the main fire, and burning toward Magic Mountain theme park. On the positive side, the west flank is holding in San Francisquito Canyon. Progress is also made on the north end. The south flank is slowed significantly as it runs into a subdivision with a greenbelt established around it. At 5:45 p.m., evacuations are lifted and residents are allowed to return.

- Governor Schwarzenegger and San Diego City Mayor Sanders visit the evacuation center at Qualcomm Stadium.

The **Ranch Fire** reports control problems due to extreme wind conditions and steep terrain. Threats to infrastructure, including Interstate-5 and state highways 126, 150 and 33, multiple power line and pipelines systems, create additional challenges. Strong winds and low relative humidity cause intense fire behavior with rapid wind-driven runs and short-range spotting. Fine and patchy fuels within the Piru Fire (2003) area limit the fire spread to the southwest. The fire is moving further west, and burns through Hasley Canyon. By afternoon, Highway 126 is closed. The Ranch, Buckweed, and Magic fires are expected to burn together within 24 to 48 hours.

With strong Santa Ana conditions, the **Canyon Fire** spots 1/2-mile ahead of the fire front and flame heights reach 30 to 50 feet. Two-miles-per-hour rates of spread are observed. Mandatory evacuations and voluntary evacuations are implemented in many areas. Numerous road closures take effect. Competition for fire resources and ongoing Santa Ana winds continue to impact operations. Offshore winds in the area make helicopter and air tanker drops ineffective with excessive amounts of drift. Severe downdrafts are reported by the air tankers' lead plane pilots. The terrain is steep and the drops have little effect.

Homes in numerous communities along the Santa Ana Canyon corridor continue to be threatened by the **Santiago Fire**. Continued Red Flag weather conditions produce extreme and erratic fire behavior with high rates of spread and long-range spotting. Precautionary shelter deployments occur in the unincorporated area of Silverado as the fire makes several runs into the WUI. Crews undertake aggressive structure protection within the communities of Lake Forest and Foothill Ranch, with evacuations under way in Foothill Ranch. Open resource orders due to the extraordinary regional fire activity hampers containment efforts. Air tankers are unable to fly due to dangerous wind conditions.

Driven by 40-to-50 mile per hour winds, the **Rice Fire** crosses Interstate-15 and Highway 395, posing an imminent threat to 500 to 1,000 homes in the Fallbrook area within the next 24 hours. Approximately 100 homes have already been destroyed. The entire town of Fallbrook, with a population of 29,000, is evacuated. Five air tankers help support structure protection efforts of ground forces on both sides of Interstate-15. Firefighting efforts are hampered by extreme fire behavior.

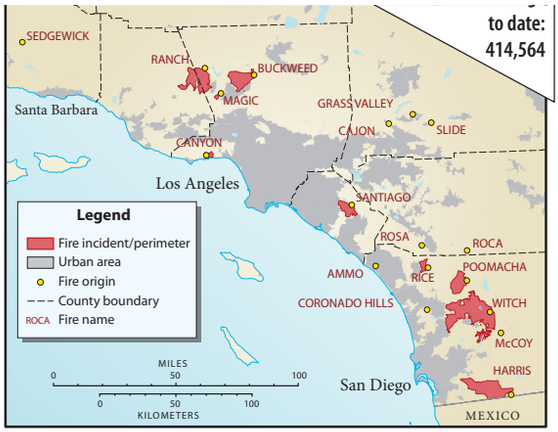
- FMAG requested for the Rosa Fire in Riverside County.

In spite of the winds, good progress is made on three of the fires. The **Sedgewick Fire** reaches 100% containment at 710 acres, and the Coronado Hills Fire is 100% contained at 250 acres. It is recognized that immediate engagement and aggressive initial attack contributed to the Roca Fire being contained at only 270 acres.

Progress toward containment on a few of the fires gives overworked firefighters on other incidents hope that more resources will become available. However another fire, the **Rosa Fire**, is reported at 11:10 p.m. near Temecula in Riverside, County. Suppression efforts are hampered by strong winds, difficult access, and poor water supply in the area. More than 100 structures are threatened and evacuations are ordered for Deluz, Tenaja, Temecula and the Santa Margarita Ecological Reserve.

The Fires: Day 3

Tuesday, October 23, 2007



President Bush signs Emergency Declaration FEMA-3279-EM-CA for seven California counties.

Predictive Services Morning Report:

Gusty Santa Ana winds will continue over portions of the region with sustained speeds between 15 and 25 miles per hour, gusting from the 30s-to-mid-40s. Gusty conditions will continue to be problematic, especially over San Diego County.

Today's Events:

With Santa Ana wind conditions expected to continue, existing firefighting resources are not sufficient to fill all resource requests from the siege fires. Southern California has eleven fires burning in seven counties: Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura.

Day three of the siege begins with reports of a new start; the **Poomacha Fire**, reported at 3:13 a.m. on the La Jolla Indian Reservation, in San Diego County. Starting in a structure, the fire quickly burns into six-foot-tall

Daily Snapshot

Incident Name	MACS Priority* a.m. / p.m.	Crews	Engines	Dozers	Overhead	Acres**	Contained %
Ammo†	– / 11	0	5	0	0	350	0
Buckweed	8 / 8	28	144	13	130	37,812	80
Canyon	9 / 10	17	90	3	99	4,500	75
Grass Valley	3 / 1	16	58	2	160	1,000	0
Harris	6 / 6	16	93	2	116	72,000	10
Magic	10 / 0	0	21	0	5	2,000	80
McCoy	– / –	1	5	0	4	300	95
Poomacha	5 / 3	8	20	4	145	20,000	0
Ranch	7 / 7	26	145	12	99	47,240	10
Rice	4 / 4	14	101	6	68	7,500	10
Rosa	11 / 9	7	34	4	12	411	70
Santiago	2 / 5	5	109	2	43	19,191	30
Slide	3 / 1	3	83	0	97	4,000	0
Witch	1 / 2	39	230	22	142	196,420	10
Contained Fires***		23	57	7	74	1,840	100
Totals		**203**	**1,195**	**77**	**1,194**	**414,564**	

* *Multi-Agency Coordination System (MACS) priority setting for resource allocation is based on the following criteria: Life Threatening Situations, Real Property Threatened, High Damage Potential, Incident Complexity, Potential for Timely Containment.*
** *Figures for acreage are cumulative for the incident throughout the siege.*
*** *When a fire is 100% contained, the fire name is deleted but the acreage burned and additional resources (used in mop-up) is added to the "Contained Fires" section.*
† *Resource data for Ammo Fire does not include military personnel. Fire was on a Military Reservation.*
Data used above was extracted from the Incident Status Summary (ICS-209).

A game of cards helps keep fears at bay for displaced children in one of the many evacuation centers. Volunteers and employees of the American Red Cross provided support and supplies for thousands of fire victims.

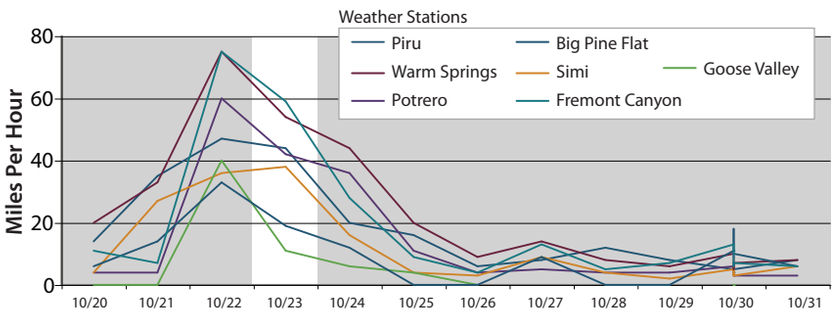
American Red Cross

chaparral. Driven by 50 mile per hour winds, the fire consumes 1,000 acres and threatens 2,000 residences in the Yellowbrick Road area of Valley Center. Reverse 911 evacuations are conducted for the entire Highway 76 corridor. Firefighters are unable to engage in direct fire suppression or formulate an effective strategy due to extreme fire behavior and limited resources at hand. Eight injuries are reported.

The Poomacha Fire increases substantially throughout the day. At one point the fire grows in size from 3,000 acres to 23,000 acres in an hour and a half. By afternoon, 50 residences have been destroyed. The fire threatens the communities of Valley Center, Rincon, and Deer Springs. Although some resources begin to arrive at the incident, no significant perimeter control has been initiated due to structure protection priorities as the fire burns toward Palomar Mountain.

The largest of the fires, the **Witch Fire,** continues to spread west and southwest passing through many communities. Multiple evacuations are ordered. In the early morning hours, there is a dramatic increase in wind and fire activity. The fire behavior is extreme with long-range spotting in excess of 1/4 mile and rapid rates of spread in excess of 2.5 miles-per-hour. Fire continues to burn through some areas very rapidly,

Peak Wind Speeds: October 20–31, 2007
October 23 highlighted



- California Department of Food and Agriculture (CDFA) opened fairgrounds and other facilities to provide urgent shelter for displaced residents as well as horses and other animals threatened by the wildfires.

leaving behind unburned fuels and creating a dangerous re-burn potential.

Mandatory evacuations take effect for Scripps Ranch, Rancho Bernardo, Poway, Valley Center, San Marcos, and Rancho Santa Fe. By dawn, 500 homes have been destroyed and 250 are damaged; 100 commercial buildings have been destroyed, and 75 damaged. More than 5,000 homes and 1,500 commercial buildings are still threatened. Hopes for containment are tempered due to competition for resources combined with predictions for more winds. By early afternoon, the Witch Fire destroys an additional 100 homes over a three-hour period.

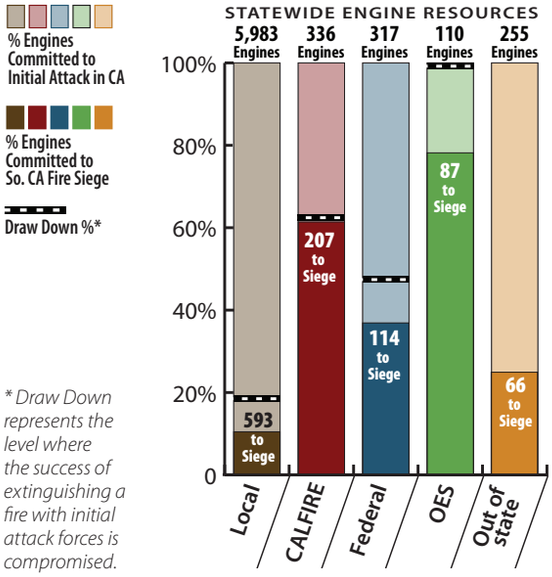
Firefighters take quick action to suppress a spot fire on thhe roof of a structure.

The **Santiago Fire** morning report shows current acreage at 18,000 acres with 30% containment. While good progress is made along the north and west portions of the fire, red flag conditions produce extreme and erratic fire behavior. Numerous communities along the Santa Ana Canyon corridor remain threatened. While damage assessment is ongoing, early reports show 13 structures destroyed and 20 structures damaged. About 4,500 structures remain threatened. By noon, erratic winds push the fire in Modjeska Canyon, and threaten an additional 750 homes in the eastern foothill communities of Modjeska, Silverado and Santiago Canyons. Ground level winds are 20-to-30 miles per hour. Turbulence is moderate to severe for aircraft operating in the area. Air tankers are being used for limited structure protection and to put retardent imbs the lower ridges above Modjeska Canyon. Smoke creates visibility problems throughout the day as the winds shift from offshore to on-shore. The ongoing competition for resources continues to hamper containment efforts.

- California Department of Corrections and Rehabilitation (CDCR) mobilized more than 2,300 inmates and more than 170 custody staff to fight wildfires in Southern California.

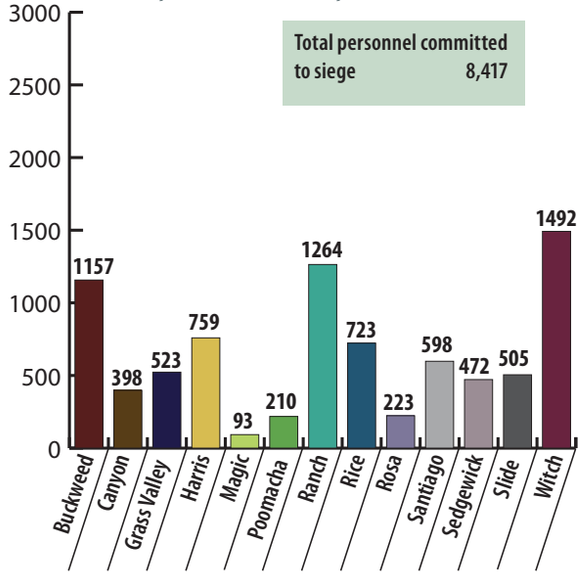
By evening, some requested resources begin to arrive, and some progress is made. Extreme fire behavior

Resources Committed: Engines, October 23, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed: Personnel, October 23, 2007



continues with the wind-driven head of the fire running into the urban interface areas of the eastern Orange County foothills. The fire moves into the heavier fuels of the Cleveland National Forest and makes runs into the community of Modjeska Canyon. Six homes have been destroyed, and several more damaged. Structure protection proceeds in several eastern foothill canyon areas. Mandatory evacuations are ordered for Silverado, Modjeska, Williams, Ladd, Trabuco, Holy Jim and Live Oak Canyons.

- California Emergency Services Authority activate Disaster Medical Assistance Teams (DMATs) from New Mexico and Washington.

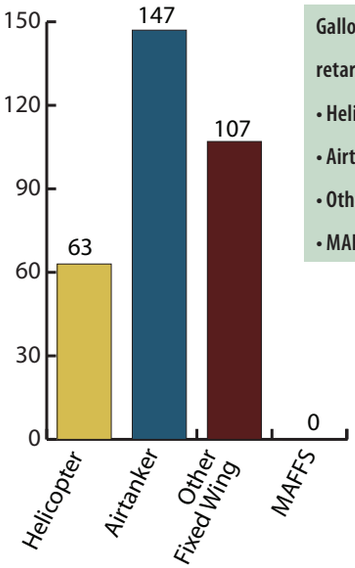
With the fires burning at extreme rates of spread, the **Slide/Grass Valley** fires still threaten hundreds of structures. Mandatory evacuations are ordered for Arrow Bear, Lake Arrowhead, Running Springs, Green Valley Lake, and Twin Peaks. All roads into the mountain communities are closed. The command teams from the Slide and Grass Valley incidents are now sharing meetings and resources. Extreme, wind-driven fire behavior, including group torching, crown runs and spotting, results in the Grass Valley fire making significant runs through structures. Aerial resources provide structure protection and cool the advancing flames so that ground resources can successfully engage. In several cases, ground crews have been unable to work on the fire's edge, and aerial resources are successfully used for structure protection.

Mandatory evacuations are in place from Crestline east to Snow Valley Ski Area. Voluntary evacuations are in effect west of Crestline, including Valley of the Enchanted and Cedar Pines Park. Evacuations to the south include North Highlands. The Mountains Community Hospital in Lake Arrowhead is evacuating patients.

Mountain Area Safety Taskforce (MAST) Plans are reviewed and implementation begins with available resources. Over 2,000 people are sheltered at evacuation centers. Closure of the San Bernardino National Forest is in effect, with limited open access. Early estimates state that between the Grass Valley and Slide Fire, nearly 300 structures have been damaged or consumed by the fire. The damage assessment team has limited access to confirm initial reports of damage. More than 10,000 structures remain threatened. Firefighter fatigue becomes a serious issue.

The entire community of Green Valley is evacuated as the Slide Fire surrounds the area. Firefighters were forced to withdraw from the area yesterday due to extreme fire behavior. The fire perimeter is currently within the community of Running Springs, with some loss of structures. The fire threatens several

Resources Committed: Aircraft, Flight Hours, October 23, 2007



Gallons of water and retardant dropped	
• Helicopters	770,295
• Airtankers	418,692
• Other Fixed Wing	26,800
• MAFFS	0

DAN ELLIOT

Wind pushers fire and embers into structure

Govenor Schwarzenegger, U.S. Department of Homeland Security Secretary Michael Chertoff, Federal Emergency Management Agency Administrator David Paulison and San Diego Mayor Jerry Sanders toured the emergency evacuation center at Qualcomm Stadium.

The "Devil Winds"

Santa Ana winds are a California firefighter's nightmare. These blustery, dry, and often hot winds blow out of the desert and race through canyons and mountain passes on their way toward the coast. The air is hot not because it is bringing heat from the desert, but because it is flowing downslope from higher elevations. As summer ends and fall progresses, cold air begins to sink into the Great Basin deserts to the east of California. As the air piles up in the desert basins, high pressure builds and the air begins to flow downslope toward the coast. When winds blow downslope, the air is compressed, causing it to warm and dry out. In fact, the air can warm at a rate of 10 degrees Celsius per kilometer of descent (29 degrees Fahrenheit per mile). Canyons and passes funnel the winds, which increases their speed. Not only do the winds spread the fire, but they also dry out vegetation, making it even more flammable.

Courtesy NASA

communities in the Running Springs and Arrowbear, as well as Calvary Chapel Camp, National Children's Forest and Visitors Center and Snow Valley and Nordic Rim ski areas.

Driven by 50 mile per hour winds, the Rice Fire makes major runs toward the town of Fallbrook and is positioned to burn into Santa Margarita and Sandia Creek Drainages. It is anticipated this fire will combine with the Rosa Fire. Reports indicate that as many as 500 residences may have been destroyed, and up to 30 damaged. Over 2,500 residences are currently threatened. Smoky conditions preclude the use of air tankers and only a limited number of helicopters are able to fly.

Evening provides no relief, and the Rice Fire continues to experience erratic and extreme fire behavior, with active burning in the Rainbow Glen area and the Santa Margarita drainage. Evacuation of the Deluz Canyon area is in progress. Red flag warnings will remain in effect until 3:00 p.m. tomorrow. Approximately 1,500 residences are threatened in Fallbrook. An estimated 20,000 avocado trees have been incinerated.

The Harris Fire reports extreme fire behavior due to weather conditions. The fire threatens to establish in the Otay River drainage and burn through Chula Vista. Most resource orders remain unfilled due to extraordinary resource competition. The fire burns over 100 homes in Deerhorn Valley and Honey Springs. Residents are sheltered at Fire Station 66. Fire moves rapidly to the west-southwest toward Chula Vista and Otay Lake, and north toward the south end of Barrett Lake. A critical power sub-station and a water treatment plant are endangered and firefighters are actively engaged in protection. An additional 200 to 500 homes have been destroyed or damaged, and more than 2,000 are still threatened. Almost 5,000 people are being evacuated, with more evacuations being ordered.

Smoke and weather conditions make air operations difficult and dangerous. However, aircraft is used to protect ground troops. By evening, the Harris Fire reports that a wind change aids in successful structure protection in Chula Vista and San Diego City toward Otay. The returning onshore flow moves the fire to the northeast and threatens structures along Highway 94 from Jamul to the east, and Jamacha to the west. The Evacuation Center at Steele Canyon is threatened where 200 people are sheltered in place. Structures are destroyed in the communities of: Lyons Valley, Lawson Valley, Rancho San Diego, Millar

Ranch, Indian Springs and Jamul. Two critical communications sites are threatened in San Miguel and Monte Vista.

One additional civilian suffers burns and is treated and transported to a local hospital. To date, one civilian has been killed by this fire and 21 civilians have been injured.

The Ranch Fire poses a threat to the communities of Fillmore, Piru, Ventura, and Ojai. Evacuations continue. The fire also threatens the Condor Sanctuary, Sespe Wilderness Area and Hopper Canyon National Wildlife Refuge. Major transmission lines are also threatened. Fire control problems continue due to extreme wind conditions, steep terrain and infrastructure challenges. Infrared Imagery indicate the areas embodying the most heat are on the north flank in Turtle Canyon and Sharps Canyon near the Day Fire (2006) burn, and to the west of Hopper Canyon. The Buckweed, Ranch and Magic fires are anticipated to burn together within 24-to-48 hours. The Magic and Ranch fires are now on opposite sides of Highway 126 at the Los Angeles/Ventura County line, about two miles apart.

By evening, the Ranch Fire experiences cautious optimism. The fire moves into Ventura County with some active backing fire in Violin Canyon near Interstate-5 and Castaic. Wind-driven runs advance toward Oat Mountain and Oak Flat. The fire begins to spread by rollout into Little Sespe Creek. The prediction of the Ranch, Buckweed, and Magic fires merging is no longer a concern.

- A toll-free phone line was set up for businesses to use for the efficient collection and distribution of large quantity donations to evacution centers.

Reports from the Buckweed Fire show moderate fire behavior. The fire continues to threaten a large number of residential and commercial structures in the communities of Santa Clarita, Castaic and Mint Canyon. By evening, major progress on line construction is made with little to no spread expected. Evacuations are lifted for all areas except Bouquet Canyon. The fire stands at 80% contained.

The Magic Fire is caught quickly and full containment is expected on October 24.

With decreased winds, firefighters on the Canyon Fire continue to make effective progress. The fire reports 75% containment and the demobilization of resources begins.

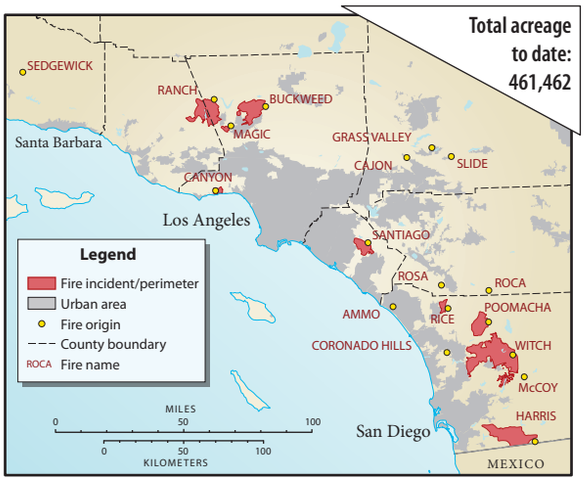
On the Rosa Fire, poor water supply and limited road access leads to competition between fire equipment and evacuees. However, good progress is made overnight with direct fire line construction. By evening, evacuation and road closure restrictions are lifted.

As progress is being made on some incidents, a new start is reported. At 9:20 a.m., the Ammo Fire starts at the Camp Pendleton Marine Corp Base, in San Diego County. Erratic fire behavior was observed as the fire burned into dense chaparral over steep terrain. Some mandatory evacuations occur within the camp. By evening, the Ammo Fire reports 50% containment at 3,000 acres, with full containment expected on October 25.

Meanwhile, good progress is made on the **Cajon Fire,** which reports 90% containment at 250 acres.

The Fires: Day 4

Wednesday, October 24, 2007



- President Bush declared major disaster, for seven counties for Individual Assistance, Public Assistance Categories A and B, and Hazard Mitigation Grant Program statewide.

Predictive Services Morning Report:

With the strong ridge of high pressure over California, temperatures will remain 10-to-20 degrees above normal and minimum humidity will remain in the single digits and teens today. Northeast–to-east winds will be locally 10-to-20 miles per hour with gusts up to 30 miles per hour over the mountains and below the canyons and passes of Southern California this morning. Winds will become light this afternoon over Southern California, with onshore winds over the coastal areas and upslope winds over most foothill and mountain locations.

Today's Events:

As the Santa Ana wind event begins to subside, many of the large fires report moderate fire behavior. However, the anticipated change in wind direction to a more normal onshore flow raises the potential for a new set of dangers. The intense wind speeds caused some fuels to be passed over by rapidly moving fires. This unburned fuel is now vulnerable to re-burn with the reversing winds.

More progress is made on the **Grass Valley Fire** due to a decrease in winds combined with increased relative humidity and effective perimeter control. Fire behavior is limited to creeping and backing fire with short uphill runs. Even with the decrease in erratic fire behavior,

Daily Snapshot

Incident Name	MACS Priority* a.m. / p.m.	Crews	Engines	Dozers	Overhead	Acres**	Contained %
Ammo†	10 / 8	3	15	0	10	10,000	0
Canyon	11 / 0	17	50	3	99	4,500	85
Grass Valley	1 / 1	16	109	3	1,015	1,100	30
Harris	6 / 6	33	149	4	169	75,000	10
Poomacha	3 / 3	24	73	10	67	35,000	10
Ranch	7 / 7	27	60	16	99	54,716	70
Rice	4 / 4	19	112	11	181	9,000	20
Santiago	5 / 5	11	276	4	67	22,000	30
Slide	1 / 1	12	92	2	87	10,800	0
Witch	2 / 2	45	293	22	190	196,240	20
Contained Fires***		41	59	5	168	43,106	100
Totals		**248**	**1,288**	**80**	**2,152**	**461,462**	

** Multi-Agency Coordination System (MACS) priority setting for resource allocation is based on the following criteria: Life Threatening Situations, Real Property Threatened, High Damage Potential, Incident Complexity, Potential for Timely Containment.*
*** Figures for acreage are cumulative for the incident throughout the siege.*
**** When a fire is 100% contained, the fire name is deleted but the acreage burned and additional resources (used in mop-up) is added to the "Contained Fires" section.*
† Resource data for Ammo Fire does not include military personnel. Fire was on a Military Reservation.
Data used above was extracted from the Incident Status Summary (ICS-209).

Firefighters work shoulder to shoulder as they advance on the blaze that threatens to consume a home in the Wildland Urban Interface.

large-scale evacuations and road closures remain in effect for the surrounding fire area. Damage assessment teams enter the fire area.

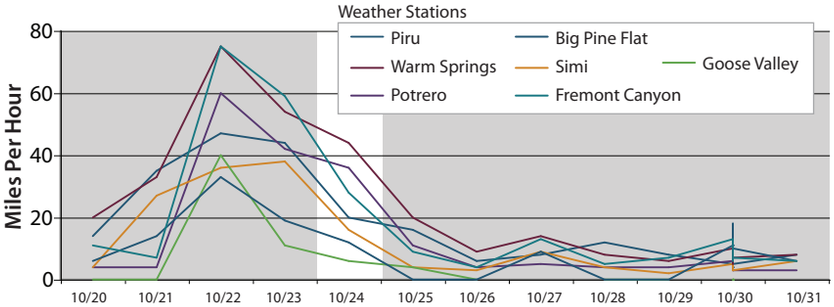
The **Slide Fire** reports moderate intensity fire behavior with three-to-six-foot flame lengths; the fire mainly spreading by spotting, group torching and short crown runs. Additional structures are destroyed in Running Springs and Fredalba. A damage assessment team arrives on scene. At 4:30 p.m., the winds shift to the west-northwest and the fire once again threatens the evacuated communities between Running Springs, Snow Valley and Nordic Rim Ski Resort.

Acreage for the **Witch Fire** remains at 196,420 acres with an estimated 20% containment. Fire progression slows to the west, southwest, and northwest due to improvement in weather and additional resources being assigned to the fire. Winds in the fire area remain variable with coastal influence returning to the valleys. Warm, dry and unstable conditions exist at the higher elevations and the eastern areas of the fire. Fire continues to burn within and around structures with moderate to high intensity. Perimeter growth persists on the eastern side of the fire in mature, heavy brush and brush that resprouted after the 2003 fire siege.

The Poomacha Fire continues to burn close to the north flank of the Witch Incident. Favorable progress on containment is made on the eastern flank. Conditions improve sufficiently to evaluate the return of residents to the communities of Poway, Escondido, Rancho Santa Fe and Rancho Bernardo.

A shift in the wind drives the **Poomacha Fire** in a northeasterly direction resulting in an increase in fire

Peak Wind Speeds: October 20–31, 2007
October 24 highlighted



The Slide Fire experiences group torching and short crown runs today.

- Governor Schwarzenegger announced a $50,000 reward for information leading to the arrest and conviction in a California court of the person or persons responsible for setting the Santiago Fire.

acreage to 35,000. Thirty mile-per-hour winds, long-range spotting and extreme rates of spread occur. Perimeter control is initiated with the arrival of some requested resources. Structure protection remains in place. Visibility to the west is extremely poor, and MAFFS aircraft are able to make only one drop each before sunset.

Valley Center, Rincon, Deer Springs, Pauma Valley, Escondido, Vista, Mt. Palomar Community, Palomar Observatory, and communications towers continue to be threatened. An estimated 50 structures have been destroyed.

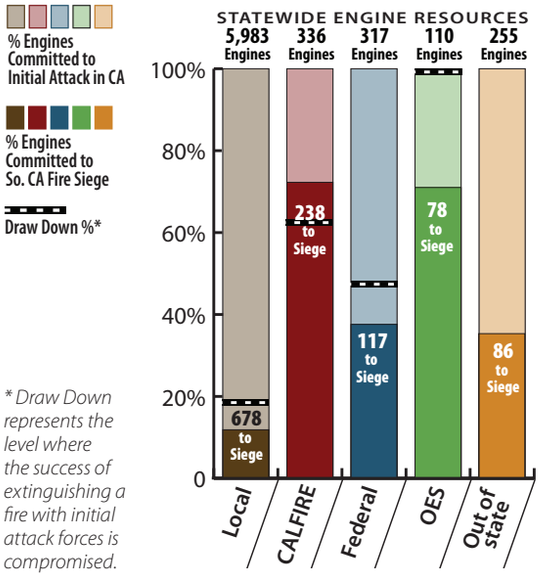
Strong, gusty winds overnight produce rapid rates of spread and frequent spotting on the **Rice Fire,** allowing the fire to become established in the Santa Margarita drainage. However, fire spread slows, experiencing only isolated runs due to a decrease in afternoon winds. Progress is made with perimeter control and structure protection. Evacuation orders remain in effect for Fallbrook and outlying areas with over 45,000 evacuees from the Fallbrook and Deluz area.

On the **Santiago Fire,** changing wind patterns and critical fire weather conditions persist, maintaining severe fire behavior with rapid rates of spread. The fire is very active overnight and additional structures are destroyed in Modjeska Canyon. Significant effort is made to effectively and safely protect assets in the vicinities of Williams Canyon, Modjeska Canyon, and Harding Truck Road. The fire progresses to the northeast. Due to difficult terrain and fire activity, control opportunities in the immediate fire location on the eastern flank are extremely limited. Evacuations are in effect in canyons along Santiago Canyon Road and the communities of Silverado, Modjeska, Trabuco, Live Oak, Williams, Holy Jim and the Cleveland National Forest. The San Onofre/Chino power transmission grid is threatened. The lack of available resources continues to be a concern.

- Amendment No. 1 to FEMA-3279-EM-CA designates the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura for Individual Assistance.

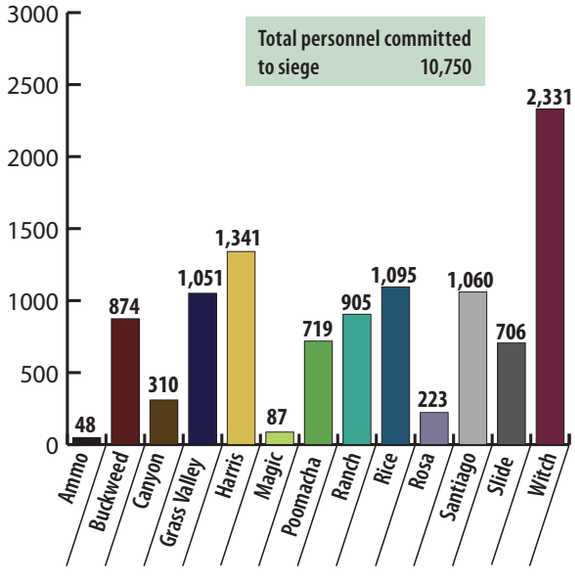
Erratic fire behavior due to changing weather conditions continues to be the norm on the Harris Fire. While east-northeast winds remain active on the eastern portion of the fire, the normal onshore flow begins to influence the western portion. This returning onshore flow moves the fire to the northeast, threatening structures along

Resources Committed: Engines, October 24, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed: Personnel, October 24, 2007



Dry fuels and changing winds threaten new areas of the Harris (at left) and other fires.

- Federal Incident Response Team (FIRST) Atlanta and Task Force San Diego activated to provide situational awareness and support to mission requirements at QualComm Stadium.

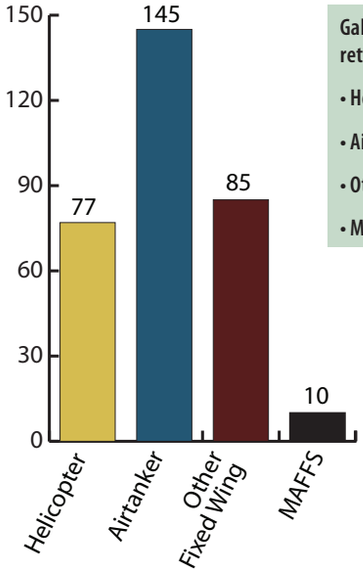
Highway 94 from Jamul to the east and Jamacha to the west. Lyons Peak burns when the fire jumps perimeter control lines, damaging the regional communications equipment and destroying the back-up generator. Crews quickly install a portable repeater to support fire communications. The fire burns north in the Barrett Lake area, consuming old, heavy fuels. With a detailed damage assessment about 55% complete, it is estimated that 1,500 homes have been threatened with 200 of those destroyed or damaged.

Most initial attack resources have been engaged continuously since the beginning of the fire; crew fatigue has become a serious problem. Most resource orders remain unfilled as the demand from incidents in the southern part of the state continues and available resources from out fo the region have been drained down. Knowing this, incident commanders make adjustments to mitigate resource shortages

The **Ranch Fire** reports considerably slowing fire spread, with no significant new fire activity. Light winds and extremely dry fuels result in small isolated slope-driven runs in the southwest portion of the fire. The north flank runs into the Day Fire (2006) burn. Good progress is made on the west flank.

Evacuations are lifted in all areas and all roads reopen. A red flag fire weather warning for the Ranch Fire is cancelled at 3:30 p.m. The NASA Ikahana Unmanned Aerial System flight provides thermal intelligence regarding the fire, including perimeter information. Containment is estimated at 70%. Demobilized resources are reassigned to assist other Southern California incidents.

Resources Committed: Aircraft, Flight Hours, October 24, 2007



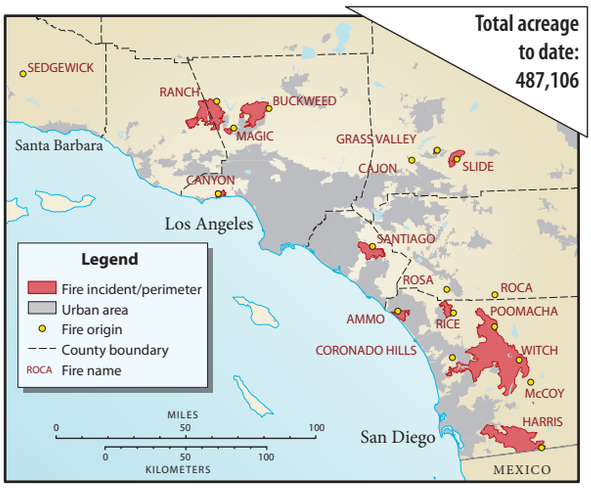
Gallons of water and retardant dropped	
• Helicopters	1,235,666
• Airtankers	335,878
• Other Fixed Wing	2,000
• MAFFS	13,500

Early morning reports for the **Ammo Fire** show good progress and optimistic predictions. Acreage burned stands at 7,500, with 50% containment. Later in the day, however, the fire escapes containment on the south flank, spreading southeast and parallel to Interstate-5. Because visibility is estimated at only one mile, the MAFFS are diverted to the Poomacha Fire. By evening, the Ammo Fire has grown to 10,000 acres, and is only 10% contained. Interstate-5 southbound is closed at Basilone and northbound at Las Pulgas due to smoke and downed power lines. The Metro Link Rail line is shut down from milepost 212.3 to milepost 225.3. Fire spots across Interstate-5 into San Onofre State Park although there is no threat to the nearby nuclear power plant. Camp Pendleton experiences sporadic power outages. Both the Buckweed and Magic fires are contained.

- FEMA Joint Field Office (JFO) established in Pasadena.

The Fires: Day 5

Thursday, October 25, 2007



- Small Business Disaster Assistance Loan Guarantee Program was activated.
- Special load permits issued for trucks carrying disaster relief supplies.

Predictive Services Morning Report:

The ridge of high pressure over the southwestern states will weaken. However, temperatures will remain above normal, and humidity will remain low through Friday. For the most part, there will be typical diurnal winds over the region through early next week. Winds will be light offshore or downslope nights and mornings, and light onshore or upslope in the afternoons.

Today's Events:

The wind pattern returns to a more normal diurnal flow, and acts favorably on many of the ongoing fires. However, fire personnel remain cautious as changes in wind direction can cause sudden, erratic fire behavior.

The **Grass Valley Fire** reports little perimeter growth during the night. During the day, isolated interior tree torching with some backing, creeping, and smoldering fire behavior is observed. Evacuation and road closure orders remain in effect for a large area surrounding the Grass Valley and **Slide Fires**. Progress is made on line construction and burning out in Miller Canyon. Damage assessment teams continue their work. The fire team works with cooperating agencies and utilities to plan for residents' re-entry into the mandatory evacuation area.

Daily Snapshot

Incident Name	MACS Priority* a.m. / p.m.	Crews	Engines	Dozers	Overhead	Acres**	Contained %
Ammo†	6 / 6	3	28	0	31	15,000	50
Grass Valley	8 / 8	20	72	3	215	1,100	70
Harris	2 / 2	33	149	4	169	84,000	20
Poomacha	3 / 3	34	147	18	164	38,500	30
Ranch	– / 9	11	45	8	99	56,235	81
Rice	7 / 7	19	111	12	174	9,000	40
Santiago	4 / 4	28	216	11	130	26,000	30
Slide	1 / 1	25	213	6	55	11,675	15
Witch	5 / 5	53	365	22	228	197,990	30
Contained Fires***		21	10	5	150	47,606	100
Totals		**247**	**1,356**	**89**	**1,415**	**487,106**	

* *Multi-Agency Coordination System (MACS) priority setting for resource allocation is based on the following criteria: Life Threatening Situations, Real Property Threatened, High Damage Potential, Incident Complexity, Potential for Timely Containment.*
** *Figures for acreage are cumulative for the incident throughout the siege.*
*** *When a fire is 100% contained, the fire name is deleted but the acreage burned and additional resources (used in mop-up) is added to the "Contained Fires" section.*
Data used above was extracted from the Incident Status Summary (ICS-209).

The **Slide Fire** reports moderate fire behavior with some backing, occasional torching, and short range spotting. A fire line is successfully established in some areas. Continued success with a perimeter control strategy is anticipated as critical resources begin to arrive. Plans for re-entry into the mandatory evacuation area are made.

Wes Schultz

Operation strategies are evaluated and revised as winds slow.

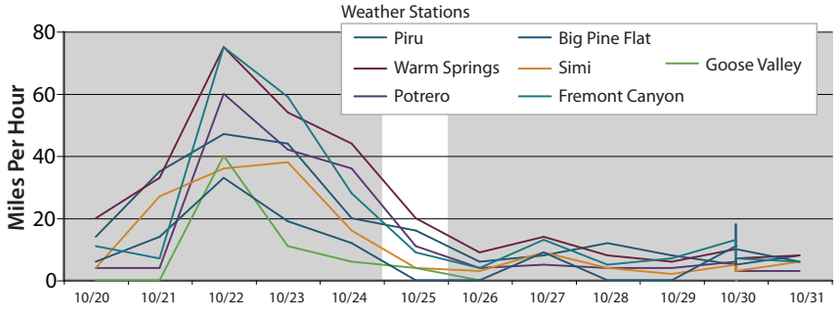
Fire progression for the **Witch Fire** slows to the west, southwest, and northwest due to improvement in weather and additional resources assigned to the fire. Coastal influence and westerly winds return to low-lying areas and coastal valleys. Progress on containment is favorable on the west side, allowing the return of residents into Poway, Escondido, Rancho Santa Fe, San Diego and Rancho Bernardo. Warm, dry and unstable conditions still exist at the higher elevations and in the eastern areas of the fire where the perimeter continues to grow. The fire is burning in mature heavy brush and resprouted brush from the 2003 fire siege. The Poomacha Fire merges with the Witch Fire. San Diego Gas & Electric (SDG&E) begins to re-establish utility service in some affected areas. President Bush, Governor Schwarzenegger and Senator Feinstein survey the fire area and visit Incident Base in the morning. Damage assessments report 239 destroyed vehicles.

- U.S. Department of Labor approved a $50 million grant to hire workers in disaster assistance jobs.

Ongoing firing operations and line construction continue throughout the day on the **Poomacha Fire**. The control line, which is tied into the Witch Fire, is holding although some spotting across the line occurs. Mop-up and patrolling is underway in the flats, but there is still fire actively burning in the Pauma Reservation and Palomar Mountain areas. The fire enters the Aqua Tibia Wilderness where control operations remain difficult due to steep terrain, inaccessibility, and lack of handcrew. Active structure protection is ongoing in the Mt. Palomar area where 450 structures are threatened. Re-entry plans are being developed for displaced residents.

Peak Wind Speeds: October 20–31, 2007

October 25 highlighted



Wes Schultz

- President Bush, Senator Feinstein, Congressman Bilbray, and Govenor Schwarzenegger meet with firefighters at incident base camps, meet homeowners at Rancho Bernardo Community Center, tour a Rancho Bernardo neighborhood destroyed by fires, and take an aerial tour of the burned areas of Rancho Bernardo, Poway, and Escondido in Marine One.

Good progress is made on the **Rice Fire**. Crews construct and improve portions of the line, anticipating a dangerous change in wind direction with the potential to push the fire into Riverside County toward Temecula and endanger fire fighters. Fire activity is generally limited to localized flare-ups. Although structure protection is still in place, portions of Fallbrook are reopened to residents. Plans are made for a gradual lifting of additional evacuations over the next several days.

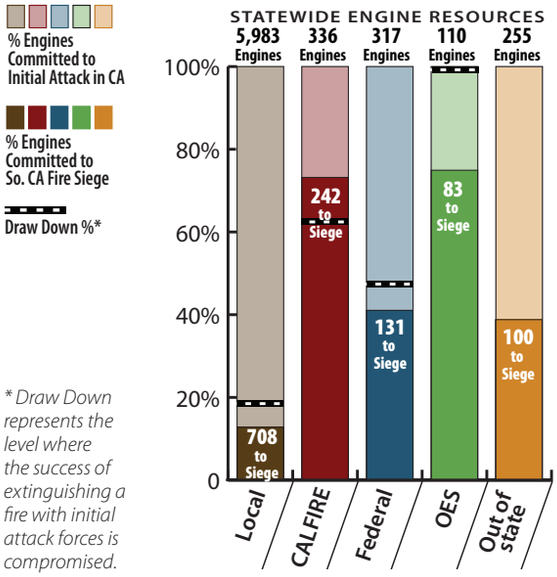
Changing wind patterns and critical fire weather, combined with problematic fuel and topographic conditions, produce very active fire behavior with rapid rates of spread on the **Santiago Fire**. The fire burns east to within one mile of Modjeska Peak. A contingency group is formed to triage extremely critical telecommunication sites along the main divide. In the meantime, good progress is made in burning around and securing structures in the Modjeska Canyon area. Resource shortages continue to be a challenge in meeting incident control objectives.

- Denver Mobile Emergency Response Support/Mobile Emergency Operations Vehicle (MERS/MEOV) activated and deployed.

Riverside County develops a comprehensive strategic contingency plan in the event that the Rice, Poomacha, or Santiago fires cross into the county.

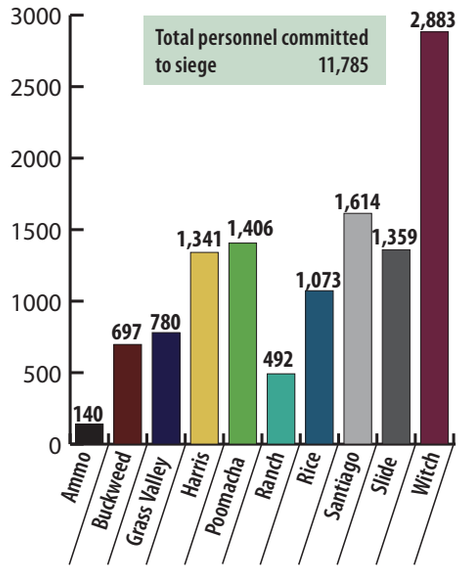
The **Harris Fire** remains active in old and extremely dry fuels with active burning on the northern and eastern portions of the fire. The heavy fuels and steep terrain on the northern edge of the fire present few control opportunities. Active structure protection continues in Lyons Valley. The fire spots across the southwest arm of Barrett Lake and approximately 500 more homes are evacuated. Evaluation of re-entry of civilians to other evacuated areas continues today. Residents in the Thousand Trails, Potrero and Tecate neighborhoods are allowed to return. The cities of Chula Vista and San Diego are no longer threatened. Four additional fatalities are discovered inside the fire perimeter. A total of five civilians have been killed

Resources Committed: Engines, October 25, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed: Personnel, October 25, 2007



and 21 injured by this fire. Personnel are exhausted. Some additional resources begin trickling in, however, many resource orders remain unfilled as demand exceeds the immediately available supply.

- 54 shelters are open with a total population of approximately 19,440.

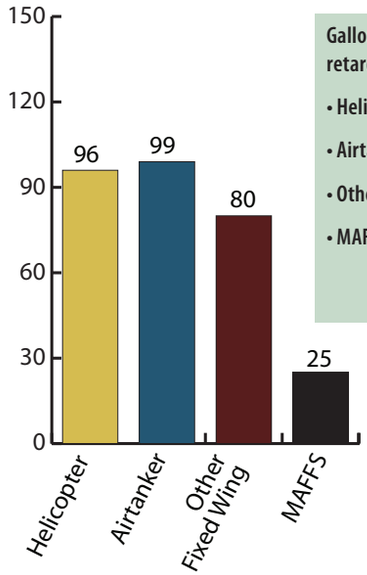
Successful suppression efforts limit fire spread in most locations of the **Ranch Fire.** Dry fuel conditions and up-canyon winds stimulate runs on the north side of the fire that spread into the Day Fire burn (2006). Fire crews rappel on the west end of the fire and construct a direct line in the Hopper Mountain, Oat Mountain, and Little Sespe Creek areas. Good progress is made in mopping up contained areas. Estimated control date is extended by five days to allow for mopping up in difficult-to-access areas where the threat of fire is low.

By 6:00 p.m. the **Ammo Fire** reports burned acreage of 15,000 with 50% containment. The fire still poses a threat to base facilities.

The **Ammo** Incident Team (Team 5) and the **Rice** Incident Team (Team 3) form a unified command to share incident base facilities with the North County Fire Protection District, including supplies and services.

Evacuees in Qualcomm Stadium in San Diego find ways to pass the time.

Resources Committed: Aircraft, Flight Hours, October 25, 2007



Gallons of water and retardant dropped

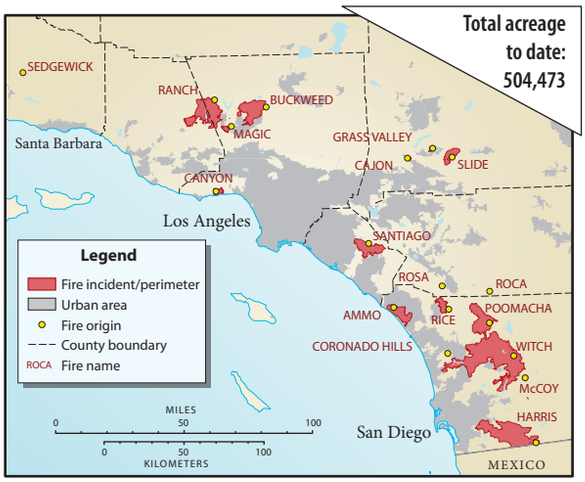
• Helicopters	1,196,531
• Airtankers	261,245
• Other Fixed Wing	0
• MAFFS	0

DAN ELLIOT

A member of an engine crew is silhouetted by brilliant flames as he works the fire line at night.

The Fires: Day 6

Friday, October 26, 2007



State and Consumer Services Agency sets up a toll-free number to take reports of scams, fraud, and abuse and to provide information on contractors, loan officers and other licensed professionals to assist victims of the fires.

Predictive Services Morning Report:

A trough over Northern California will enhance the marine layer along the central and Southern California coast, bringing cooler temperatures, higher humidity, and a little stronger onshore flow to the entire region today and Saturday. In the fire areas, temperatures will mainly be in the 70s and 80s, and humidity values in the 15 to 25% range both today and Saturday. Winds will turn southwest-to-west by this afternoon, at five-to- 15 miles per hour.

Today's Events:

As the Santa Ana wind event subsides and the normal onshore flow returns to the area, most of the nine remaining large fires report minimal fire spread and estimate full containment within the next five days.

The **Harris Fire** remains active in old, extremely dry fuels and steep terrain, in particular, along the northern edge of the fire. Active structure protection continues in Lyons Valley. The team continues to develop contingency plans to protect communities to the north toward Interstate-8, and to the east along Buckman Springs Road. Residents of Thousand Trails, Potrero, Tecate and western Jamul areas are allowed re-entry. The estimated containment date is October 31.

Daily Snapshot

Incident Name	MACS Priority* a.m. / p.m.	Crews	Engines	Dozers	Overhead	Acres**	Contained %
Ammo†	6 / 7	0	49	0	33	21,004	90
Grass Valley	8 / 8	16	79	2	152	1,140	75
Harris	2 / 1	41	219	25	313	85,000	35
Poomacha	3 / 3	48	164	29	150	42,000	35
Ranch	9 / 0	7	27	6	89	58,401	94
Rice	7 / 6	19	103	2	173	9,000	60
Santiago	4 / 4	37	212	18	186	27,600	35
Slide	1 / 2	27	321	35	107	13,700	20
Witch	5 / 5	64	352	22	235	197,990	45
Contained Fires***		3	16	0	19	48,558	100
Totals		**262**	**1,542**	**139**	**1,457**	**504,473**	

* *Multi-Agency Coordination System (MACS) priority setting for resource allocation is based on the following criteria: Life Threatening Situations, Real Property Threatened, High Damage Potential, Incident Complexity, Potential for Timely Containment.*
** *Figures for acreage are cumulative for the incident throughout the siege.*
*** *When a fire is 100% contained, the fire name is deleted but the acreage burned and additional resources (used in mop-up) is added to the "Contained Fires" section.*
† *Resource data for Ammo Fire does not include military personnel. Fire was on a Military Reservation.*
Data used above was extracted from the Incident Status Summary (ICS-209).

Flames and smoke billow through the dense brush on a hillside. The winds begin to subside today allowing firefighters to make substantial progress on most fires.

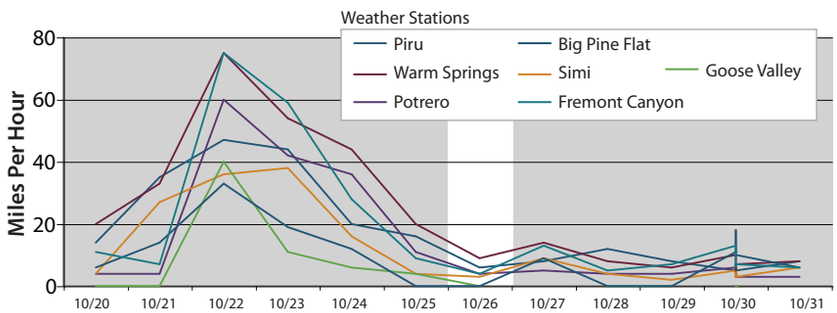
The **Slide Fire** reports moderate intensity, active surface and backing fire with short runs, torching, and short-range spotting. Structure protection remains in place for Lake Arrowhead Scout Camps. An additional structure is destroyed this morning in Running Springs. Contingency plans for fire movement toward Lake Arrowhead are developed. Damage assessment continues.

The **Poomacha Fire** reports active fire behavior as the fire continues to burn in the Aqua Tibia Wilderness. Re-entry of residents begins in some areas. Extensive assessment progresses and 78 structures are reported destroyed.

The **Santiago Fire** has burned to Modjeska Peak and poses a threat to the San Onofre/Chino power grid and telecommunications facilities. A secondary line is planned along the Orange/Riverside County border.

The **Witch Fire** reports containment progress on the west flank of the fire. However, onshore winds continue to affect control lines with warm, dry, and unstable conditions at high elevations and on eastern areas of the fire. The Poomacha and Witch fires merge. Protecting the San Diego Wild Animal Park and a local Indian reservation remain a concern. Re-entry of residents continues in Poway, Escondido, Rancho Santa Fe, San Diego and Rancho Bernardo, as well as in Julian, Wynola, Cuyamaca, Del Dios and Lake Hodges. Ramona evacuations are lifted. The estimated containment date is October 31.

Peak Wind Speeds: October 20–31, 2007
October 26 highlighted



Governor Schwarzenegger issued Executive Order S-13-07 directing state agencies to take numerous actions:

- suspend the one-week waiting period for unemployment insurance
- waive fees in the replacement of certain vital documents
- expedite cleanup and debris removal

With the change in wind direction, the **Rice Fire** reports significant progress on fire line construction, although portions of the fire perimeter are still in need of line construction. Deluz and areas north of Mission Road continue to be threatened. Meanwhile, re-entry continues for portions of Fallbrook. The estimated containment date is set at October 28.

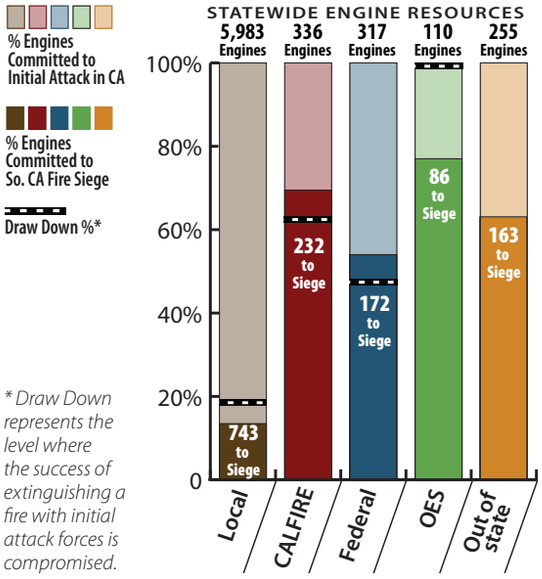
The **Ammo Fire** commanders predict no fire spread for the next operational period. Acreage burned to date is 21,084 acres, with 90% containment.

The **Grass Valley Fire** reports good progress in the Miller Canyon drainage with no perimeter growth anticipated in this operational period. Mandatory evacuation orders for the Crestline community are reduced to voluntary status. All other evacuation and road closures remain in effect. Current acreage burned stands at 1,140 acres with 75 % containment. The estimated containment date is set for October 28.

The **Ranch Fire** reports complete line construction on the west perimeter of the fire with good progress made overall. The team sets an expected containment date of October 30.

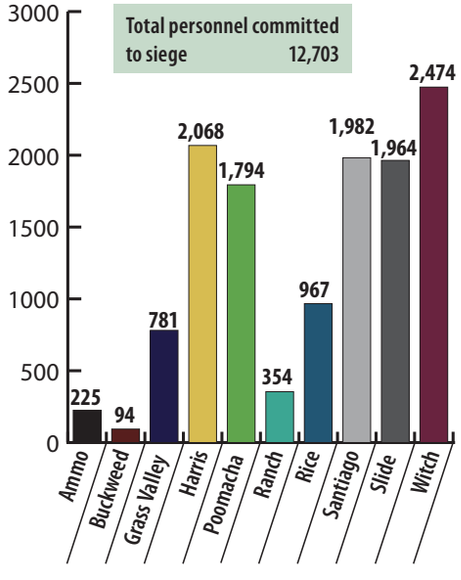
Firefighters feel a cautious optimism as the Santa Ana Winds begin to slow.

Resources Committed: Engines, October 26, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed: Personnel, October 26, 2007

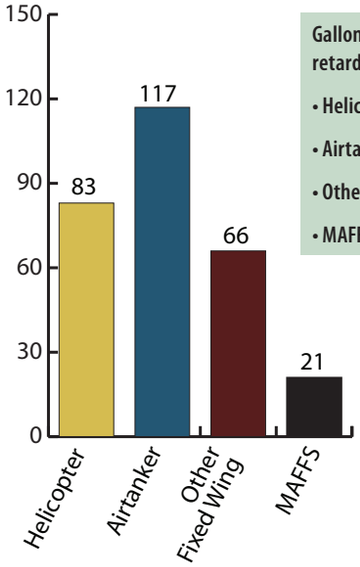


President George W. Bush shakes hands with firefighters during his tour of the siege.

- ESF-4 resources arrive in California and are dispersed to incidents.

- Evacuation center at QualComm Stadium closed.

Resources Committed: Aircraft, Flight Hours, October 26, 2007



Gallons of water and retardant dropped	
• Helicopters	987,262
• Airtankers	307,047
• Other Fixed Wing	0
• MAFFS	41,170

KEVIN LABIANCO

A resident surveys the damage done by the Santiago fire.

The Fires: Day 7

Saturday, October 27, 2007

Predictive Services Morning Report:

A trough off the California coast will combine with some subtropical moisture to produce widespread cloudiness today across region, along with a few light showers or sprinkles. Temperatures will be seasonable and the humidity will rise a little over most of the fires with the mid-level moisture overhead. In the fire areas, temperatures will mainly be in the 70s-to-low-80,s and humidity values should rise to the 15-to-30% range. East-to-southeast winds this morning will switch to the southwest and west at 8-to-18 miles per hour this afternoon.

Today's Events:

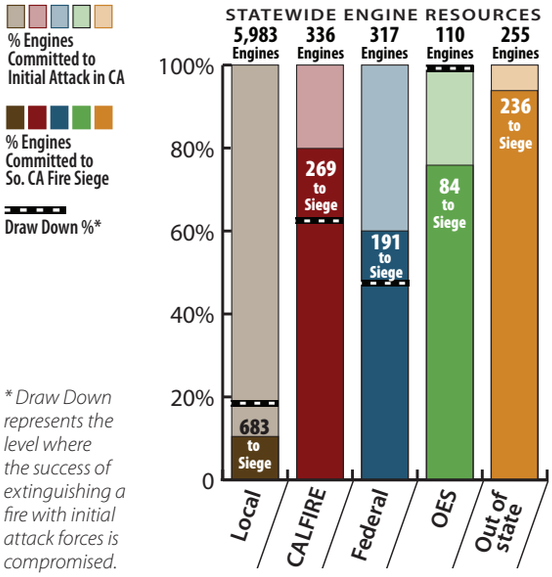
Fire activity on the **Harris Fire** decreases dramatically as humidity increases. Evacuation orders are lifted for all areas. Firing operations are successful along Wilson Creek. Direct line construction continues in Hauser Canyon near Barrett Lake. Alternate control lines are constructed to support the Lawson Valley contingency plan. Air tanker operations on the fire are concluded. Helicopter operations continue to support ground troops.

- Govenor Schwarzenegger holds a press conference to reinforce the state and law enforcement's commitment to capture and prosecute arsonists and to discuss further actions to protect fire victims against price gouging and insurance scams.

Various aerial infrared platforms fly the fire to identify hot spots and help refine the fire perimeter map. Search and rescue operations continue. Damage inspection of burned structures is ongoing. Assessments of areas for fire suppression rehabilitation needs are under way.

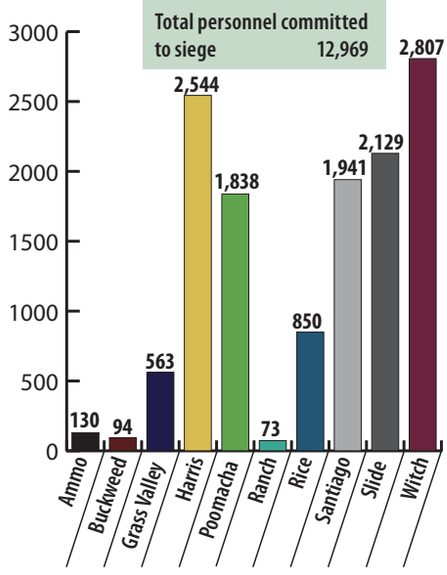
Good progress is made in containing fire spread on all flanks of the **Slide Fire**. The estimated number of residences threatened in the communities of Crab Flats, Running Springs, Smiley Park and Arrowbear decreases from 10,000 to 5,500. However, closure orders remain in effect. Utility companies work hard to support re-entry of evacuated residents. Very light precipitation occurs over some areas of fire.

Resources Committed:
Engines, October 27, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed:
Personnel, October 27, 2007



The **Poomacha Fire** experiences moderate fire behavior with short runs upslope to ridge tops. The estimated number of residences threatened decreases from 2,000 to 500. The reported number of residences destroyed increases from 78 to 136. There is a short period of light rain on the fire, but it has little effect.

- ESF-2 demobilized.

Cooler weather and cloud cover slow down fire behavior on the **Santiago Fire**. However, a potential change in the weather bringing warmer and drier conditions is forecast for tomorrow. Current and future threats to property and structures still exist as the fire slowly backs down Silverado Canyon. Bulldozers continue to work to tie in control lines above Silverado Canyon and North Main Divide.

- California Department of Social Services to administer cash grants of up to $10,000 to help individuals who have suffered losses in the fires.

The **Witch Fire** experiences no significant fire spread overnight, and good progress on containment occurs on all branches. Open line in the San Diego river drainage and the Poomacha Fire interface area is an ongoing concern. Warm, dry and unstable conditions still exist at the higher elevations. Re-entry begins to the Del Dios, Alpine and Peutz Valley areas. San Diego Gas and Electric starts restoring utility service to some affected areas. Meanwhile, firefighters continue to implement strategies to minimize the impacts to the Agua Tibia Wilderness.

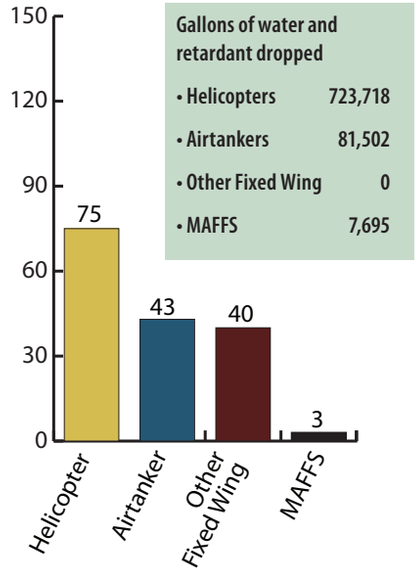
Line construction on fire perimeter and mop-up around structures is almost complete for the **Rice Fire**. Full containment of the fire is expected tomorrow as light precipitation aids mop-up operations. All portions of Fallbrook are opened to residents. Demobilization of excess resources continues.

The fire line is completed for the **Grass Valley Fire**, with effective mop-up of the perimeter progressing.

The **Slide Fire** reports progress containing the fire spread on the south and southwest flanks. Area closure orders remain in effect for a large area surrounding the Grass Valley and Slide Fires. Power, gas, and water companies work in fire areas to restore services. Coordinated efforts with cooperating agencies and utility companies for re-entry into the mandatory evacuation area continue.

At the **Ammo Fire**, evacuation orders are lifted for the camp and power is restored. Demobilization is planned for the next day.

Resources Committed: Aircraft, Flight Hours, October 27, 2007



Gallons of water and retardant dropped	
• Helicopters	723,718
• Airtankers	81,502
• Other Fixed Wing	0
• MAFFS	7,695

A pair of trees frame a smoky sunset during the October siege.

Wes Schultz

The Fires: Day 8

Firefighters survey fire damage

Sunday, October 28, 2007

Predictive Services Morning Report:

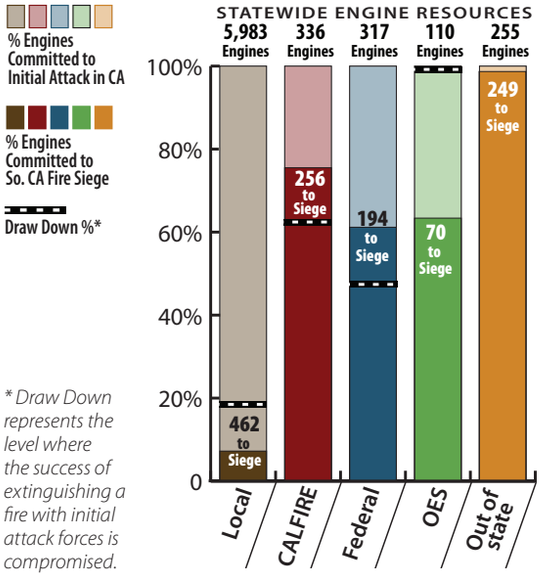
A ridge of high pressure over California will bring warmer temperatures and lower humidity to the region today. Temperatures will be around 10 degrees above normal, and humidity will be mainly between 15% and 30%. Winds will continue to be very light today.

Today's Events:

Direct line construction on the fire perimeter is nearly completed for the **Santiago Fire**, but threats to property and structures continue. Continued aircraft support is deemed critical. Fire behavior is moderate with creeping and some short runs when the fire aligns with fuels and topography. Structure protection remains in place in Silverado & Trabuco Canyons. A burn plan is approved for Silverado Canyon and remains an option for future use.

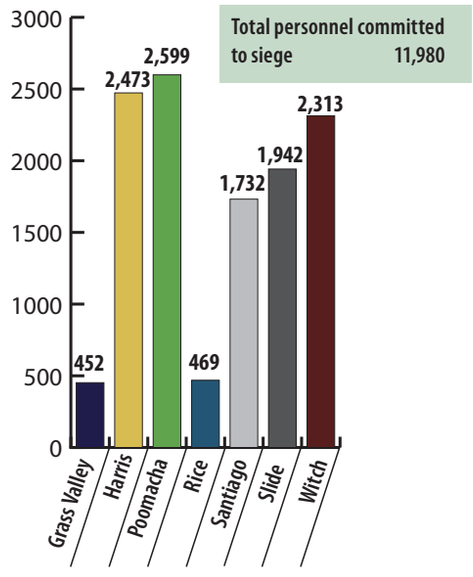
The **Poomacha Fire** experiences active backing fire north of Palomar divide, and moderate runs upslope in the interior of the burn. The DC-10, Martin Mars, six C-130 (MAFFS), and six heavy air tankers are working together to contain the spread of the fire. The estimated containment date is pushed back two days to October 31. Firefighters continue structure protection and perimeter control. Crews

Resources Committed:
Engines, October 28, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed:
Personnel, October 28, 2007



experience difficulties in mop-up in the Agua Tibia Wilderness. A complete re-entry of residents is expected by this evening.

There is minimal fire activity with no significant fire spread on the **Harris Fire**. To prevent future escape, significant mop-up is required in steep terrain with heavy fuels. Residents re-enter the fire area. Navy Seabees work contingency lines and assist in demobilization. The fire team reports excellent production by out-of-state crews.

- Tribal Task Force established to provide liaison and address concerns with impacted tribes in San Diego County.

With the **Witch Fire** 95% contained, the cities of San Diego, Poway and Escondido along with the Rancho Santa Fe Fire Protection District transition out of Unified Command and serve as Agency Representatives. All communities are repopulated and San Diego Gas and Electric continues to restore utility services. Damage assessment and fire line suppression repair continues. Significant demobilization is under way.

- Governor Schwarzenegger toured the local assistance center at Cuyamaca College.

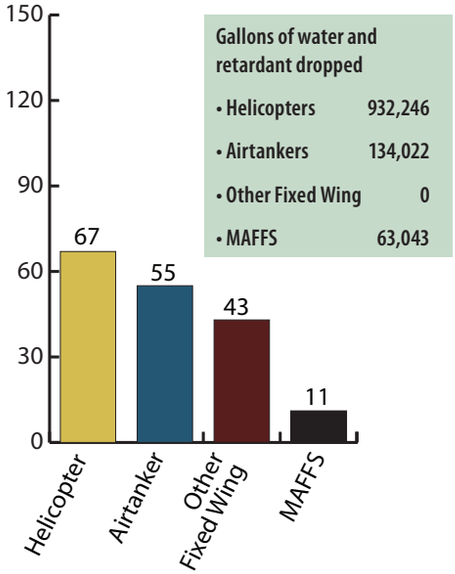
Evacuation and closure orders remain in effect for the **Grass Valley** and **Slide** fire areas. However, mandatory evacuations are lifted east of Heaps Peak. Re-entry for Lake Arrowhead area is expected shortly. Power, gas, and water companies work in the fire area to restore services. Meanwhile, crews continue to mop-up and patrol residential areas with helicopter infrared (IR) to identify hot spots and prioritize mop-up.

The **Ammo Fire** is contained at 21,004 acres.

- Subject Matter Specialists from Planning, Logistics, Community Relations, Public Assistance and External Affairs deployed from the FEMA Joint Field Office in Pasadena to San Diego.

The California National Guard (CNG) has 2,388 personnel committed to supporting the siege. Since October 22, CNG has mobilized a total of 10 helicopters, helped deploy 6 C-130 aircraft with Modular Airborne Fire-fighting System (MAFFS), and coordinated airborne tactical reconnaissance aircraft. While two Air Guards were placed on standby for Search-and-Rescue, additional CNG resources provided security at evacuation centers at Del Mar Raceway and Qualcomm Park.

Resources Committed: Aircraft, Flight Hours, October 28, 2007



Gallons of water and retardant dropped	
• Helicopters	932,246
• Airtankers	134,022
• Other Fixed Wing	0
• MAFFS	63,043

Flames subsided but smoky skies remained the norm throughout the week.

The Fires: Day 9

Monday, October 29, 2007

Predictive Services Morning Report:

A couple of weak low-pressure areas will move through Central California bringing much cooler temperatures and much higher humidity to the region through Wednesday. These weak low-pressure areas will also bring scattered showers mainly to Central California this afternoon through Wednesday. There will also be scattered thunderstorms over Central California this afternoon. Most Central California locations will receive less than a quarter-inch of rainfall, and locations over Southern California will receive little or no measurable rainfall through Wednesday. There will be gusty south-to-west winds over the mountains and deserts this afternoon.

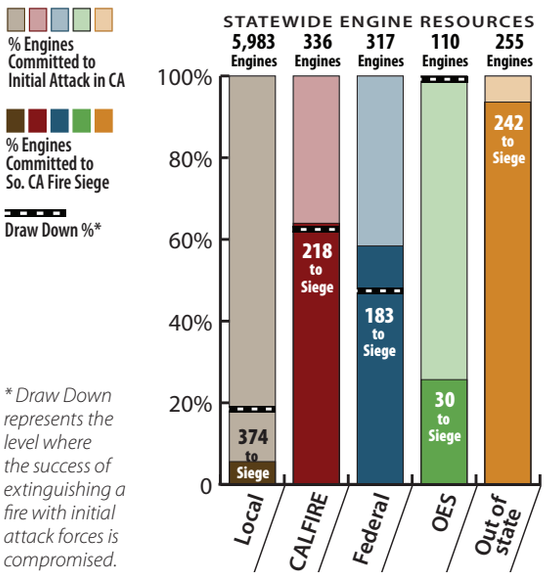
Many communities built with fire safe building practices passed the ultimate test by surviving the siege.

Today's Events:

The **Santiago Fire** continues to threaten structures and private property within the Silverado area. Direct line construction is chosen over burning out to limit the potential for long-term effects, in particular flooding and rock fall. Changing wind patterns and problematic fuel and topographic conditions have produced severe fire behavior during past several burning periods. Although fire behavior has moderated, a mild-to-moderate offshore wind event is forecast for the coming weekend. Continued aircraft support is considered critical.

Resources Committed:

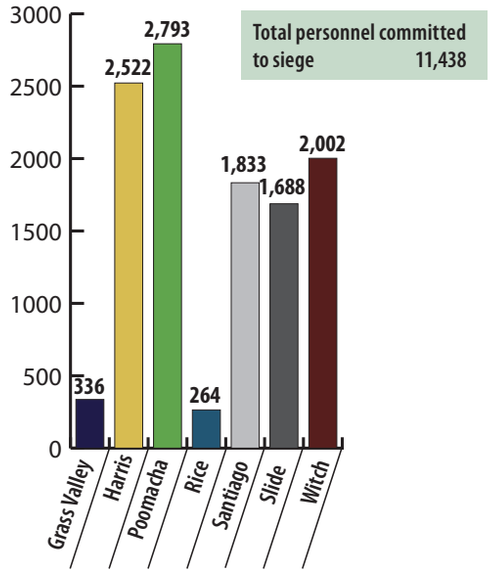
Engines, October 29, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed:

Personnel, October 29, 2007



- State Superintendent of Public Instruction announced assistance and fiscal relief for schools affected by the wildfires.

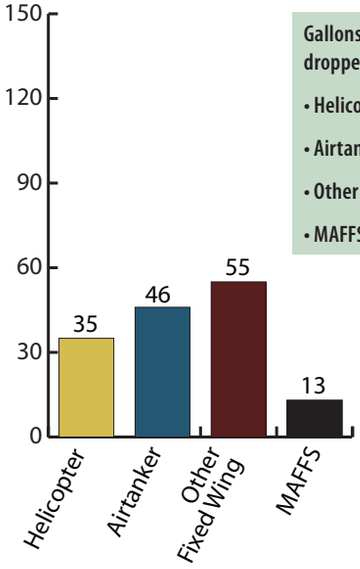
The wind hampers efforts for a firing operation planned for the steep terrain in the north/northeast areas of the **Poomacha Fire**. Fire activity consists of a slow backing fire north of Palomar, divided with moderate runs upslope within the interior of the burn. Although bulldozer and hand line are complete around slop-overs, these areas are still of concern. Evacuation orders for Palomar Community and the La Jolla Indian reservation areas are evaluated.

Line construction and improvements are nearly complete in all branches of the **Witch Fire**. San Diego Gas and Electric continues to restore utility service to affected areas. Damage assessment and fire line suppression repair are ongoing. Personnel from the cities of San Diego, Poway, Escondido, the Rancho Santa Fe Fire Protection District and Heartland Fire Zone transition out of unified command to serve as Agency Representatives. Arrival of additional resources allows initial attack resources in San Diego County to return to their respective jurisdictions. Heavy demobilization occurs.

Crews on the **Slide Fire** continue to make good progress in closing the open fire line perimeter in the south/southeast areas of the fire. With 100% containment expected at the end of this operational period, the **Grass Valley Fire** prepares to transfer command to the Slide Fire incident management team. Demobilization of excess local resources continues.

Crews continue secondary searches, improvement of control lines, mop-up and patrol on the **Harris Fire**. Interpretation of infrared imagery continues to be used to identify hot spots and focus mop-up efforts. Inspection of affected structures and fire suppression rehabilitation needs continues. Excess resources are demobilized.

Resources Committed: Aircraft, Flight Hours, October 29, 2007



Gallons of water and retardant dropped	
• Helicopters	320,934
• Airtankers	115,063
• Other Fixed Wing	0
• MAFFS	26,754

The Fires: Day 10

Tuesday, October 30, 2007

Predictive Services Morning Report:

A weak Pacific trough will bring cooler temperatures and higher humidity to the region today. A ridge of high pressure will build into California from the Pacific Ocean bringing warmer temperatures and lower humidity Friday and Saturday.

Today's Events:

Good progress continues on the **Santiago Fire** with the completion of the remaining open fire line. The fire remains a threat to structures within the Silverado area, and evacuation orders are still in effect for Silverado Canyon. Meanwhile, residents are allowed to return to the communities of Williams, Modjeska, and Santiago Canyons. Containment is at 90%.

Again, conditions are not favorable to firing operations on the **Poomacha Fire**. There is minimal fire activity north of the Palomar Divide although slop-over potential still concerns firefighters. With aerial support, crews continue direct hand line construction on the north side of the fire to minimize impact to Aqua Tibia Wilderness and Palomar Mountain.

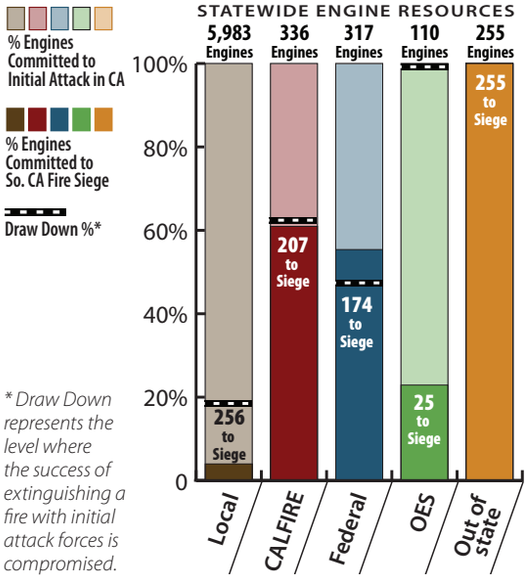
The **Witch Fire** reports progress on closing the last portions of open line. All residents have returned to evacuated communities.

Full containment of the **Slide Fire** is predicted for evening.

The **Grass Valley Fire** is fully contained. Fire areas are opened to the public for residential site visits throughout the day. Plans are made to reopen Grass Valley area to residents on October 31.

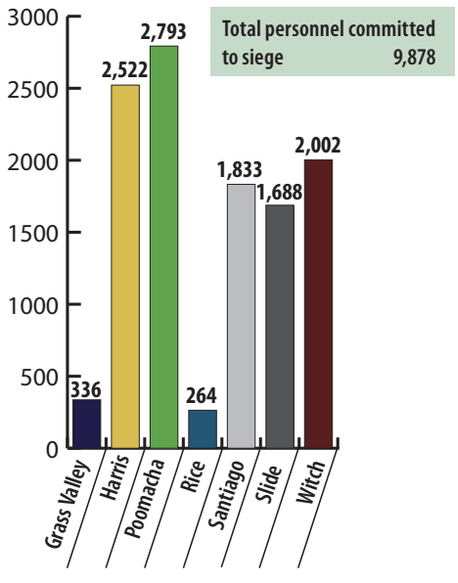
- Govenor Schwarzenegger meets San Diego County local officials and discusses the state's ongoing response to the wildfires and actions needed for recovery.

Resources Committed:
Engines, October 30, 2007



** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed:
Personnel, October 30, 2007



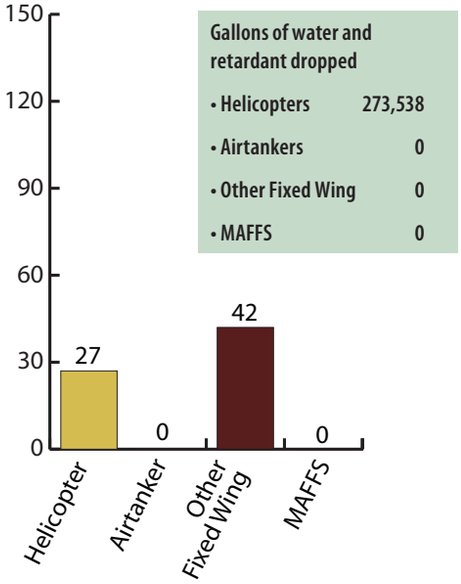
PR Gibbs

A billboard welcoming people to San Pasqual Agricultural Preserve stands scorched by the roadside after fire. Inset shows the same billboard before the fire.

Voluntary re-entry into Lake Arrowhead is ongoing. The opening of roads and communities causes some traffic congestion in the area.

Although mop-up is still needed around some interior islands and the northwestern portion of the fire line, the **Harris Fire** reports 90% containment. Heavy fuels near the line still hold significant heat. Infrared interpretation continues to be used to identify hot spots and focus mop-up efforts. Fire suppression rehabilitation continues.

Resources Committed: Aircraft, Flight Hours, October 30, 2007



Gallons of water and retardant dropped	
• Helicopters	273,538
• Airtankers	0
• Other Fixed Wing	0
• MAFFS	0

As the winds slow and fires are contained, resources are demobilized.

The Fires: Day 11

Wednesday, October 31, 2007

Predictive Services Morning Report:

The back side (trailing edge) of a Pacific trough will bring near normal temperatures and humidity through Thursday. A strong ridge of high pressure will build into California from the Pacific Ocean bringing above normal temperatures and very low humidity to most of the region Friday through the middle of next week. There will be locally strong and gusty northeast-to-east winds over the mountains and below the canyons and passes of Southern California Saturday morning. Winds will be light Sunday through the middle of next week.

- The Governor directed the California National Guard, CAL FIRE and Office of Emergency Services to proactively prepare for the forecasted return of Santa Ana winds.

Today's Events:

The **Santiago Fir**e continues to threaten structures within the Silverado area. Residents are allowed to return to the communities of Williams, Modjeska, and Santiago Canyons. The evacuation order for Silverado Canyon remains in effect.

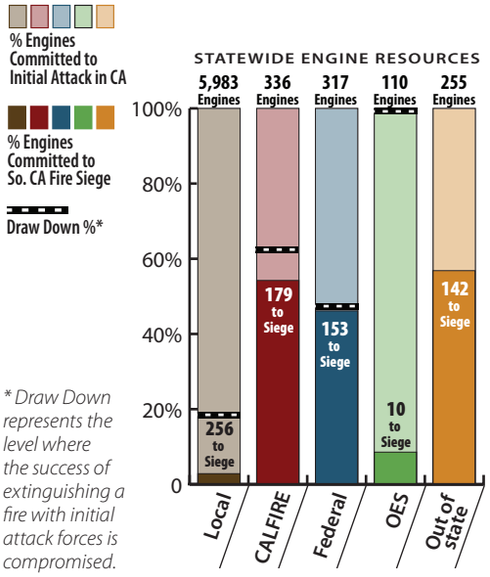
Crews on the **Poomacha Fire** continue construction of a direct hand line within the north part of the fire while mop-up and patrol progress in other areas. Highway 76 reopens. Operations and burn area rehabilitation are expected to continue into November with the transition of incident management from a state team to a federal team set for November 5.

Good progress continues on the **Witch Fire** with full containment expected by evening.

Full containment of the **Slide Fire** is expected by evening.

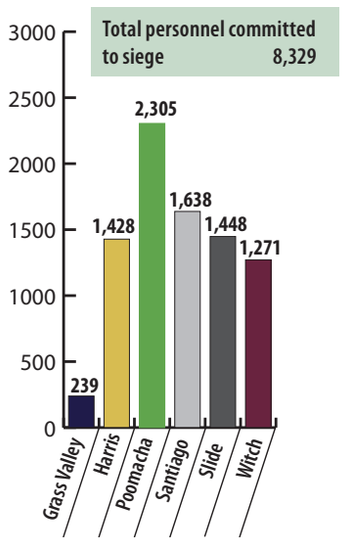
The **Harris Fire** reports 100% containment. Extensive demobilization of excess resources occurs. Fire suppression rehabilitation continues.

Resources Committed: Engines, October 31, 2007

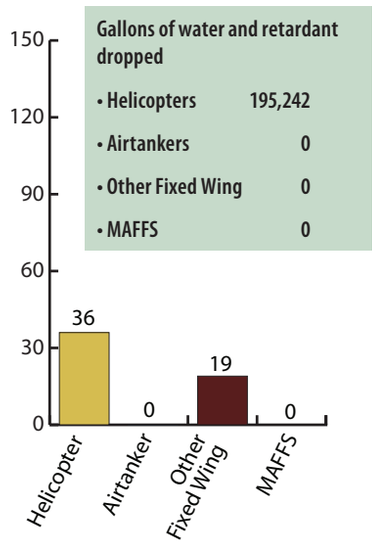


** Draw Down represents the level where the success of extinguishing a fire with initial attack forces is compromised.*

Resources Committed: Personnel, October 31, 2007



Resources Committed: Aircraft, Flight Hours, October 31, 2007



Aftermath

The fire siege of October 2007 will be known for the speed of its evolution.

On October 21, the first day of the siege, the Harris Fire in the southern part of San Diego County killed one resident, severely burned another and burned over a fire engine, requiring the crew to be airlifted to safety.

That same morning, 40 miles north of the Harris Fire, the Witch Fire began in the Witch Creek area. By noon it had charred 8,000 acres and was advancing into the same area that had been devastated by the Cedar Fire in 2003. Meanwhile, the Harris Fire had already burned 20,000 acres and was still growing.

A homeowner is rewarded for pre-fire preparation. While some neighboring homes were destroyed, the defensible space around this home aided in its survival.

From the very beginning, these fires were propelled by Santa Ana winds, clocked as high as 90 miles per hour. One gust on Laguna Peak north of Los Angeles was clocked at 112 miles per hour. Air tankers and helicopters were ineffective in the heavy winds, and at times were unable to fly in these extraordinarily adverse conditions.

By dawn of October 22, barely one day into the siege, new fires had ignited in Fallbrook, San Marcos and near the San Diego Wild Animal Park. Twenty thousand homes were without power. Qualcomm Stadium had opened as an evacuation center, and officials there were preparing for as many as 100,000 evacuees. By noon, October 22, the Witch Fire had jumped Interstate-15 and was burning in Poway. San Diego businesses, government offices, and schools began closing.

Soon, 17 significant fires and dozens of smaller ones were burning from Santa Barbara to the Mexican border. Major highways and surface streets were closed to traffic as residents began what would become the largest evacuation in California history. Officials believe as many as 900,000 people were displaced at the height of the emergency.

If the rapid advancement of the fires was the news headline, then evacuation was the common theme. Hundreds of thousands of people moved out of the fire areas into hotels and evacuation centers. Many slept in their cars on the side of the road. Hundreds of people brought their pets with them.

These fires occurred in horse country, and many evacuees were moving livestock. People loaded up their horse trailers and headed to nearby fairgrounds hoping to find safe, empty stalls.

Governor Schwarzenegger visited several areas the evening of the second day, promising help to the displaced residents and calling for military support for the firefighters. California declared a state of emergency, and in Washington, D.C., President Bush declared a national disaster area.

The smoky haze from the fires was visible from space and health officials expressed concern about respiratory problems. State and local public health officials visited the evacuation centers and offered free flu shots. Mental health officials began to monitor the toll that stress was having on the emotional health of the evacuees, especially children who weren't able to go to school. Information on coping with disasters was widely distributed.

Some of the most emotional moments seemed to come when residents were allowed back into their neighborhoods only to see their homes in ruins.

Given the scope of the siege, investigation, damage assessment and rehabilitation of wildlands will continue for years.

Seventeen people lost their lives as a result of the siege. Ten were killed by the fires outright, three were killed while evacuating, and four died from other fire siege related causes. Though none were killed, more than 100 firefighters were injured. Of these, four were very seriously injured and two will require lengthy rehabilitation.

Although the fires of October 2003 were the worst fire siege in California's history, the effective response to the Fire Siege of 2007 set the record for the number of people who were safely evacuated and cared for by emergency responders and volunteers.

Considering the destruction of the fires, the disruption of people's lives, the damage to health and the loss of business and tourism, ultimately millions of people were impacted by these fires, directly or indirectly. Those impacts will be felt for years to come.

Epilogue

As the siege fires were put out and resources were demobilized, fire managers kept an eye on weather forecasts for the remainder of the season. In mid-November, the National Weather Service and Predictive Services began issuing forecasts for another Santa Ana wind event. The 2007 fire season was not over.

The **Corral Fire** in Malibu started on Saturday, November 24 from an illegal campfire near the mouth of Corral Canyon Cave. Winds up to 60 miles per hour and low relative humidity quickly spread the fire. In spite of pre-positioning and planning, the fire burned 4,901 acres, destroyed 53 homes and damaged another 35. Most of the damage occurred during the early hours of the fire in Latigo Canyon and the neighborhoods along Newell Road and Sea Breeze Drive. There were no civilian injuries reported, but seven firefighters were injured.

By late November, a major shift in the overall upper air pattern took place. Rain came to Southern California in December.

When the siege was over, the destruction to wildlands and personal property stood in smoldering contrast to the spectacular sunsets created by the smoky skies.

Fire Siege Coordination

Coordinating the firefighting efforts during a Southern California fire siege presents a challenge that is distinctly different from coordinating individual fires. These sieges are characterized by strong Santa Ana winds with many ignitions, including multiple large fires burning simultaneously in extremely dry, heavy fuels over steep terrain. New starts spread very quickly, shortening the time that firefighters can effectively contain the fires with initial attack forces. The large number of expanding fires quickly create multiple, immediate demands for available firefighting resources. Southern California fire sieges are also distinctive in the significant regional impact on people, property and natural resources in the extensive Wildland-Urban Interface.

This section describes the regional coordination of several management systems and technologies that were used during the 2007 siege, some for the first time, to support the multiple-agency response.

Pre-positioning and pre-fire attack planning took place due to wind predictions and drought conditions. Firefighters and other emergency service providers gather at a staging area.

Wes Schultz

Remote Sensing

During the 2007 Southern California Fire Siege, regional chief officers augmented the established MAC intelligence function by activating a Situation Status Cell (Sit Stat Cell) at the Southern California Geographic Area Coordination Center level.

The Sit Stat Cell integrated remote sensing capabilities and geospatial operations across the geographic area, regardless of source, to provide direct support for on-the-ground incident response needs from Incident Command Teams, the GACC, and the State Operations Center (SOC) recovery missions. The Sit Stat Cell executed this function using a team of remote sensing specialists deployed to the Southern California GACC and a strategic analysis staff located at the SOC. The GACC team coordinated remote sensing aircraft mission tasking. The SOC team compiled, and analyzed the data to produce map based reports. These reports assisted in the orientation of crews and staff, and provided information on the operating area in support of firefighter and public safety. This coordinated effort resulted in one of the largest deployments of remote sensing and geospatial technologies for wildland firefighting.

The table at the right provides a description of the broad array of remote sensing systems that were used in support of the 2007 Fire Siege.

SYSTEM	SOURCE	CAPABILITY
RC-26 Full Motion Video	California National Guard (with assistance from Texas National Guard)	Night and day fire perimeter spotting in direct support of incident command teams
P-3 Full Motion Video	United States Navy (coordinated through United States Northern Command)	Night and day fire perimeter spotting in direct support of incident command teams
Civil Air Patrol	United States Air Force (coordinated through United States Northern Command)	Digital imagery of burn areas for critical infrastructure assessment and fire behavior analysis
Ikhana Unmanned Aerial Vehicle	NASA and the National Interagency Fire Center	Night and day multispectral and thermal mapping of fire and damage areas
U-2	United States Air Force (coordinated through United States Northern Command)	High resolution imagery of operations area (Southern California)
Global Hawk Unmanned Aerial Vehicle	United States Air Force (coordinated through United States Northern Command)	Night and day digital infrared imagery of fire perimeters and threatened land/structures
National Infrared Operations Support (Cessna Citation)	National Interagency Fire Center	Night and day thermal mapping of fire areas
Fire Mapper	USFS Pacific Southwest Research Station	Night and day multi-spectral and thermal mapping of fire areas
Commercial Satellite Imagery	Coordinated by Federal Emergency Management Agency (FEMA) and the National Geospatial-Intelligence Agency. Data delivered by Nevada National Guard (Eagle Vision) and Army Strategic Command (coordinated through United States Northern Command)	Broad-area high resolution and color imagery of operations area

Decision Science

Federal fire analysts located at the U.S. Forest Service Pacific Southwest Regional Office provided regional chief officers and incident commanders with a decision support product known as the Wildland Fire Decision Support System (WFDSS). They produced map products for ten of the siege fires: the Ammo, Buckweed, Grass Valley, Harris, Poomacha, Ranch, Santiago, Sedgewick, Slide, and Witch.

WFDSS is a web-based application that utilizes fire behavior modeling, economic principles, and information technology to develop probabilities of potential fire spread and impacts. The two main components are Fire Spread Probability (FSPro) and the Rapid Assessment of Values at Risk (RAVAR). FSPro calculates and maps the probability of fire spread within a specific time, based on fuel, topography and weather conditions. RAVAR then uses that spread probability information to estimate the impact of the fire on primary-resource values in the path of a fire.

Fire-Cause Investigations

The wildland firefighting agencies conduct a cause-and-origin investigation for every wildland fire. Fire prevention bureau chiefs use this information to develop programs to prevent future ignitions, and as supporting documentation for legal actions against those who intentionally or negligently cause a fire. Fire-cause investigators must conduct their investigations quickly before firefighting actions or other activities destroys evidence at the origin of the fire.

The number of new fires during the siege quickly exceeded the investigation capacity of the various firefighting agencies. In response to the growing workload, regional law enforcement coordinators established a regional cause and origin investigation group to support investigation efforts on all fires on State Responsibility Area (SRA) in the Southern California counties. Investigators from throughout California assembled at OSCC. USFS and CAL FIRE investigation leaders coordinated efforts and assigned

investigation responsibilities for fires that burned across federal and state direct protection area. Investigators worked as a team during the investigation of these multi-jurisdiction incidents.

FEMA enacted Homeland Security Presidential Directive Five (HSPD5) ESF#13 (Public Safety and Security) because investigators determined that one of the fires was caused by arson. Alcohol Tobacco and Firearms (ATF) and Federal Bureau of Investigation (FBI) agents were then assigned to investigative support. CAL FIRE and the Orange County Sheriff's Department provided additional investigators and technical support.

CAL FIRE's chief law enforcement officer joined the team at the OSCC to establish communication links between the incident investigators and the CAL FIRE director, approve information releases to the media, and establish consultation link with the Deputy Attorney General assigned to cases that would go to trial.

Surge Capacity

With predictions of severe fire weather, regional fire chiefs anticipated a need to build firefighting resource depth in Southern California. Local, state, and federal authorities have been established and systems designed to facilitate the movement of resources. Regional fire chiefs moved firefighters to Southern California before the siege began. This movement of resources continued and expanded during the early stages of the siege. Eventually the siege became a national mobilization and assistance was also provided by Mexico, sending bomberos (firefighters) from Tijuana and Tecate.

The Federal Department of Homeland Security's National Response Plan uses Emergency Support Functions (ESF) as the primary mechanism to organize and provide assistance to local and state governments and tribal agencies. The purpose of the ESF is to provide the greatest possible access to the capabilities of the federal government, regardless of agency. The Stafford Act authorizes FEMA, a function of the Department of Homeland Security, to coordinate support from across the federal agencies and certain non-government organizations. FEMA invokes one or more of the 15 ESFs to funnel resources to disasters and emergencies. During an ESF-4 declaration, the US Forest Service is the lead agency, and is tasked with coordinating the federally activated resources.

On October 22, Governor Schwarzenegger requested a federal emergency declaration for the Southern California fire siege and FEMA activated ESF-4. On October 24, President Bush signed Disaster

Wes Schultz

In addition to the use of numerous out-of-state resources, the October Siege utilized the Bomberos from Tijuana, Mexico.

Declaration 1731-DR-CA and the Governor's Office of Emergency Services requested that FEMA provide 125 strike teams of engines, 300 overhead personnel, and other resources. FEMA processed the request and the resources were on scene by October 27.

The Emergency Managers Assistance Compact (EMAC) is a congressionally ratified organization that gives form and substance to mutual aid between member states. EMAC has resolved issues of liability and reimbursement so that a state suffering a disaster can request and receive assistance from other member states quickly and efficiently. Through standard operating procedures and reimbursement guidelines, states can request and receive needed resources in a timely manner.

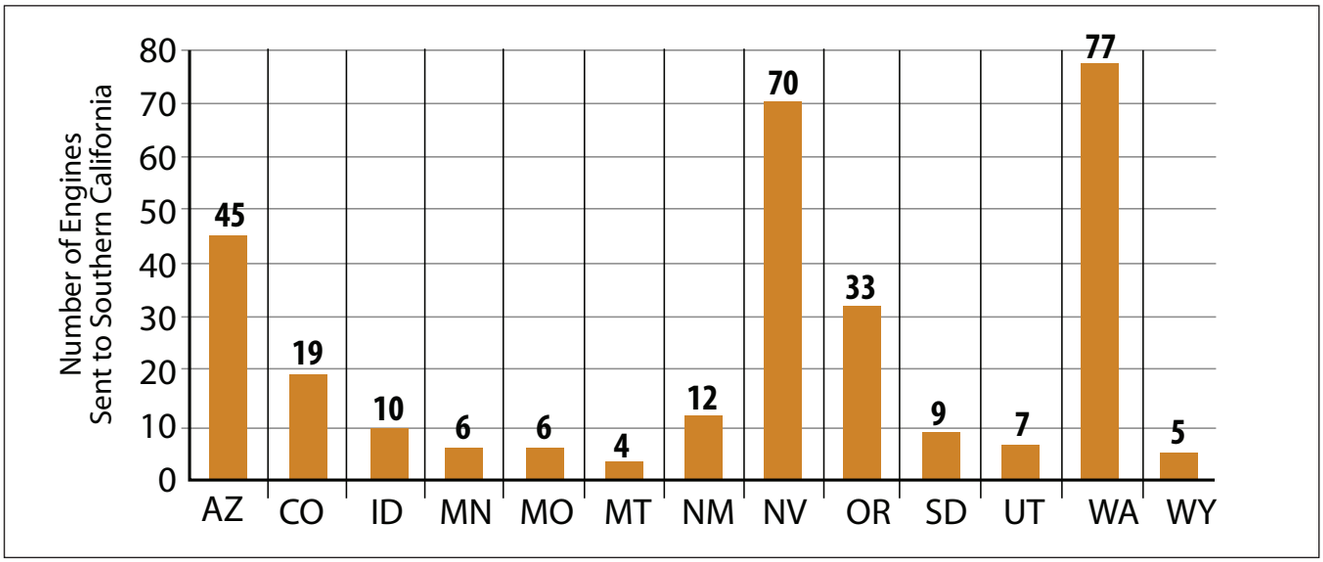
Out-of-state engines played a vital role in assisting the local, state and federal firefighters already engaged on the Southern California fire siege. This siege saw the first activation of resources through the EMAC compact. On October 23, the Office of Emergency Services activated the Emergency Managers Assistance Compact (EMAC) and requested 50 strike teams of engines from EMAC member states. Out-of-state resources were able to integrate easily with forces already engaged in the firefight. Engine crews assisted not only on the fireline, but also staffed empty stations whose local crews were working on siege fires.

On October 26, a federal management team was assigned to the newly established FEMA Mobilization Center at the Chino Airport. Resources arrived at the Mobilization Center through several dispatching channels and funding sources, including FEMA, EMAC, California's master mutual aid system, and other state and federal resource ordering processes. Although the original assignment was to establish a Mobilization Center to provide support for incoming FEMA resources as they were being moved to incidents, the mission grew to encompass a full-range mobilization-and-staging area. Within hours, there were over 700 firefighting resources at the center, and the numbers continued to increase the following day.

The following chart shows the number of out-of-state engines, by state. The chart includes resources arriving prior to October 26 that went directly to incidents, as well as those arriving from October 26 to 31 that were assigned to incidents through the FEMA Mobilization.

Out-of-state Resources

Engines sent to siege by state



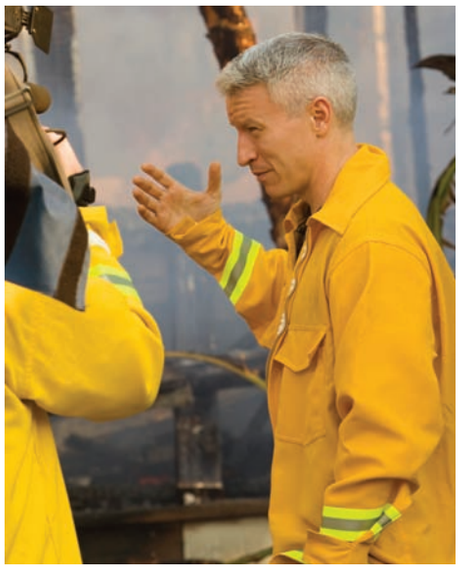
Information and the Media

Managing the tremendous flow of information during a major siege can be a daunting task. Firefighting agencies had quickly realized that a well coordinated, multi-agency, large-fire strategy would be required to address the large number of rapidly developing region-wide disasters impacting millions of Californians. Based on the area-wide magnitude of this developing disaster, news media coverage was immediately intense. Local, regional, and national print, broadcast, and electronic media became engaged in twenty-four hour disaster news coverage. One vital element of this strategy included the agencies' ability to deliver clear, accurate, and timely information to the public and news media. Incident commanders immediately assign information officer responsibilities as fires grow to major proportions.

On October 23, regional fire chiefs organized a joint information center (JIC) to provide consistent emergency information from the incident management teams to the various government agencies and the media. Operational and sensitive issues were discussed with executive leadership. The JIC Information Officer's task was to support incident information functions and ensure that accurate and timely incident information was distributed to the affected public, agency administrators, and elected officials, while serving as a Southern California regional point of contact for the state and national Joint Information Centers. The Southern Region JIC unified and coordinated information flow on the large and developing incidents

Wes Schultz

Wes Schultz



Wes Schultz

The siege was covered lin the news at local, national and international levels. From left, clockwise; Katie Couric, CBS Evening News; Geraldo Rivera, Fox News; and Anderson Cooper, CNN.

An untouched home in the background stands in contrast to the destruction of neighboring properties.

Kevin Key

to support Area Command information needs. The JIC monitored news media coverage of the disaster to ensure accuracy of disseminated information and consistency of key messages at all levels and across all involved agencies.

The JIC ensured that disseminated information was accurate, timely, and met the needs of the member agencies and the public, as well as the print, broadcast and electronic news media. The JIC handled more than 400 local, regional, national, and international print, television, and radio news media contacts during the period of operation from October 23 to November 11. International news contacts included media from several countries including England, Japan, Budapest, Argentina, and Belgium.

The JIC developed and observed several operational protocols to provide for consistent information management during the siege. Federal and state agencies agreed to use a standard methodology and source (209 snapshot) to ensure consistency for daily operational period update, daily situational status and resources (2003 Blue Ribbon Commission recommendation). Working with the Intelligence Unit, the JIC reconciled and disseminated the 209 snapshot and incident summary to federal and state agencies and each incident command team twice daily at 0700 and 1900 hours.

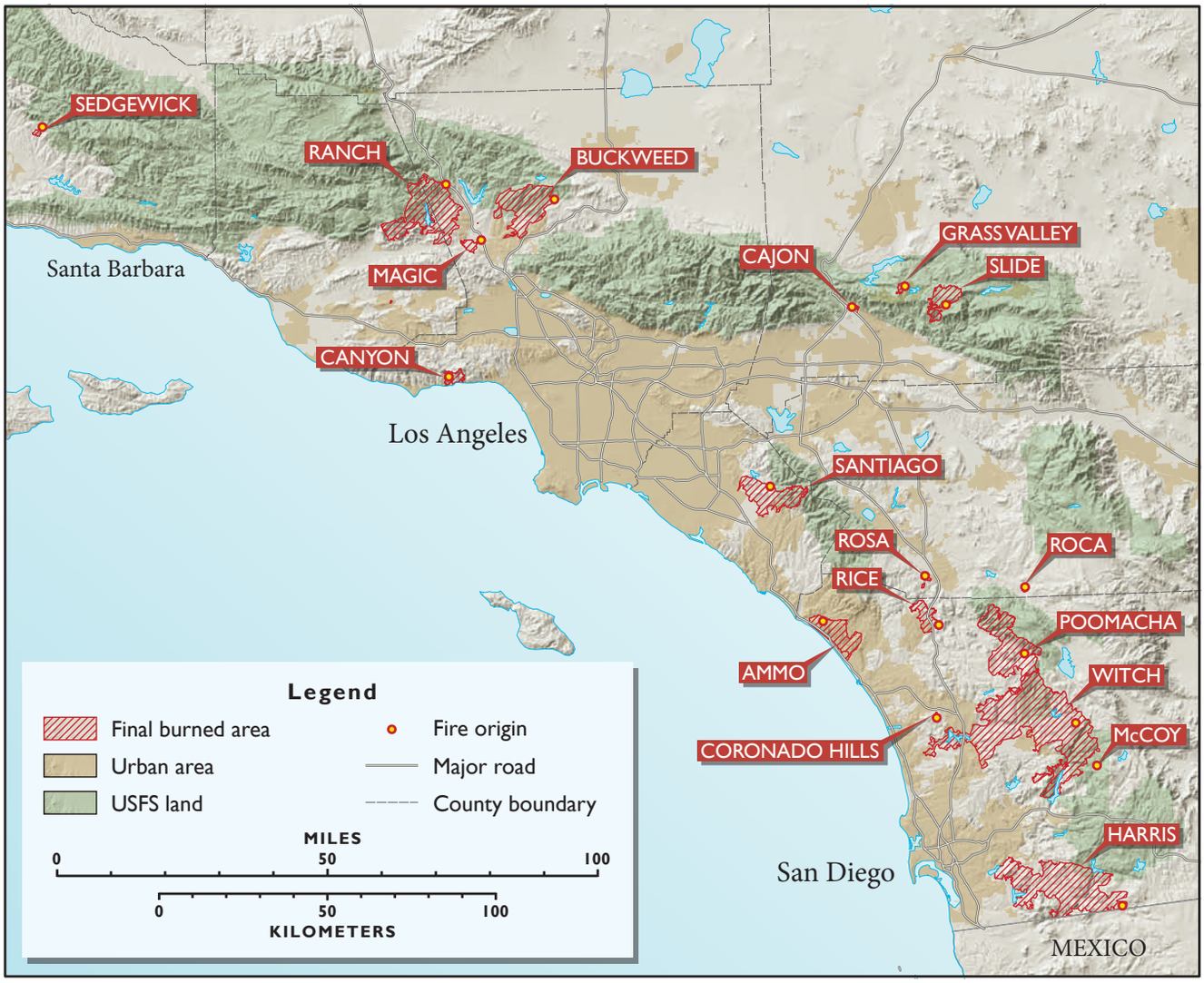
Daily conference calls were utilized to effectively communicate issues and processes with Area Command, San Diego County JIC, State Operations Center-JIC (SOC-JIC), National Interagency Fire Center (NIFC), Federal Emergency Management Agency-Joint Field Office (FEMA-JFO), National Interagency Coordination Center (NICC), and National Emergency Management Organization (NEMO).

OES supplied Governor's talking points to the JIC. This information was disseminated to personnel and agencies participating in the distribution of incident related information. JIC personnel fielded media inquiries related to incident/resource status, aircraft utilization, pre-deployment of assets, MAC operations, command and control function at South Ops, defensible space, building construction materials and standards, and state and federal emergency management practices, emerging technologies, real-time digital imaging, and advanced mapping technologies.

The JIC provided support for dignitary visits to South Ops, including research and preparation of briefing packages, researched background material and responded to requests for information related to 2003 fire siege and Blue Ribbon Commission findings and recommendations. JIC PIOs conducted television, radio, and print interviews at South Ops, and in the field, and facilitated media requests for "feature" stories.

The JIC developed proactive, strategic messages for dissemination through news releases and/or use at agency executive levels and/or internal briefings for lead agencies and the Governor's office. The JIC established and maintained daily contact with PIOs on twenty-two incidents, ensuring coordination, consistency, and continuity of message dissemination, and provided support for each incident's information operation.

Appendix I: Statistical Information



A NASA satellite captured this image of the siege in progress on October 22. The strong off-shore progress of the smoke plumes illustrate the strong winds that hampered suppression efforts. Areas indicated in red have been digitally added to show fire perimeters.

Incident Starts and Duration

Containment Percentages: Start | 0–39% | 40–59% | 60–79% | 80–99% | 100%

Incident	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31
Ranch	START	0–39%	0–39%	0–39%	40–59%	80–99%	80–99%	80–99%	80–99%	80–99%	100%	
Canyon		START	0–39%	80–99%	80–99%	100%						
Sedgewick		START	80–99%	100%								
Buckweed		START	0–39%	60–79%	100%							
Harris		START	0–39%	0–39%	0–39%	0–39%	0–39%	60–79%	60–79%	80–99%	80–99%	100%
Witch		START	40–59%	40–59%	40–59%	40–59%	40–59%	60–79%	80–99%	80–99%	80–99%	100%
Santiago		START	0–39%	0–39%	0–39%	0–39%	0–39%	40–59%	60–79%	60–79%	80–99%	80–99%
Roca		START	100%									
Coronado Hills			START 100%									
Magic			START	0–39%	100%							
Rice			START	0–39%	0–39%	40–59%	60–79%	80–99%	100%			
Rosa			START	60–79%	100%							
Grass Valley				START	0–39%	0–39%	60–79%	60–79%	80–99%	80–99%	100%	
Slide				START	0–39%	0–39%	0–39%	60–79%	80–99%	80–99%	80–99%	100%
Ammo				START	0–39%	40–59%	80–99%	80–99%	100%			
Poomacha				START	0–39%	0–39%	0–39%	40–59%	40–59%	60–79%	60–79%	80–99%

Daily Resource & Acreage Summary

Date	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31
Engines		531	909	1,195	1,288	1,333	1,542	1,458	1,169	1,028	732	589
Personnel		3,793	6,460	8,417	11,750	11,785	12,703	12,969	11,980	11,438	9,878	8,329
Acreage		31,195	267,661	414,564	461,462	487,106	504,473	507,677	516,938	517,367	517,421	517,937

Southern California Fire Siege Summary, 2007

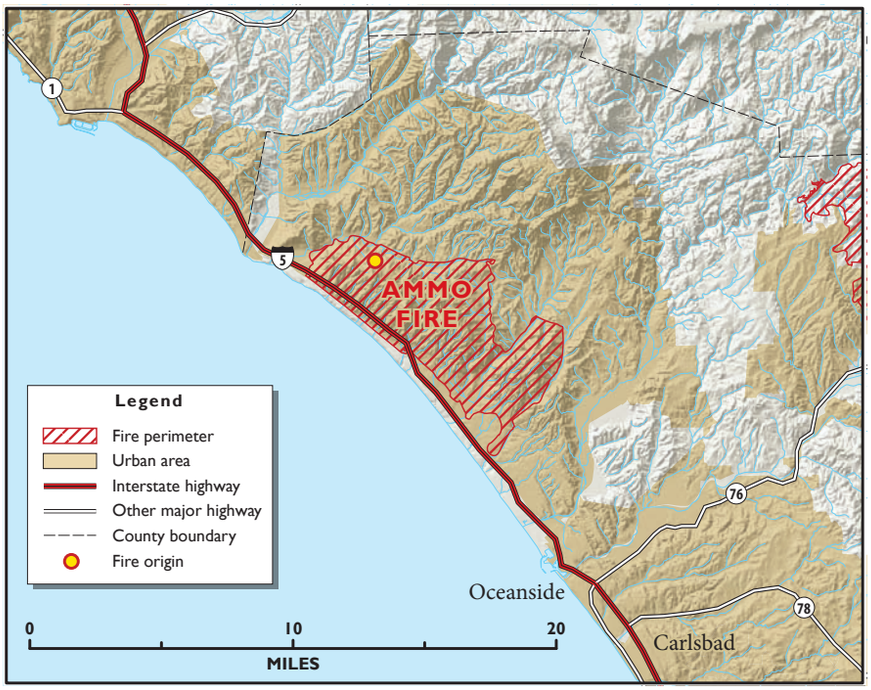
Incident	*Acreage*	*Engines*	*Helicopters*	*Water/Retardant Gallons Dropped*	*Structures Destroyed*	*Structures Damaged*	*Fatalities*	*Firefighter Injuries*	*USFS Preliminary Costs**	*CAL FIRE Est. Costs**
Ammo	21,004	49	8	104,740	0	0	0	6	$35,500	$708,047
Buckweed	38,356	144	5	409,100	63	30	0	1	$5,810,000	$2,135,148
Canyon	4,521	247	13	925,826	8	14	0	3	$109,400	$5,846,256
Coronado Hills	250	23	0	0	2	0	0	0	$16,500	---
Grass Valley	1,247	109	3	207,256	178	22	0	1	$4,900,000	$767,330
Harris	90,440	219	26	2,427,947	373	259	8	40	$5,030,000	$21,157,453
Magic	2,824	60	5	147,514	0	0	0	0	$125,000	$900,196
Poomacha	49,410	164	13	1,581,726	217	12	0	13	$6,842,500	$19,368,014
Ranch	58,401	145	6	86,214	10	2	0	8	$9,945,000	$3,031,397
Rice	9,472	112	9	457,509	248	0	0	6	---	$6,757,077
Roca	270	37	0	3,200	1	1	0	1	---	$358,267
Rosa	411	34	0	0	2	0	0	0	$59,850	$670,486
Santiago	28,400	276	15	1,986,789	26	20	0	13	$10,325,000	$10,509,353
Sedgewick	710	26	5	207,191	0	0	0	0	$3,465	$1,053,945
Slide	12,759	321	13	1,305,527	315	0	0	8	$13,545,000	$1,771,997
Witch	197,990	365	18	787,705	1,624	103	2	40	$5,393,500	$17,792,887
TOTALS					**3,069**	**463**	**10**	**140**	**$62,124,215**	**$92,827,853**

** Estimated firefighting costs only. This figure does not include other emergency related costs such as evacuations, shelters, law enforcement, etc.*

Appendix II: Incident Fire Summaries

Ammo Fire

- **Incident#:** MCP-001111
- **County:** San Diego
- **Agencies in Command:** Camp Pendleton Marine Corps, CAL FIRE
- **Start Report Date:** October 23, 2007
- **Containment Date:** October 28, 2007
- **Total Acres:** 21,004
- **Direct Fire Suppression Cost:***
  US Forest Service $35,500
  CAL FIRE $708,047
- **Firefighters Assigned at Peak:** 225
- **Structures Destroyed:** 0
- **Structures Damaged:** 0
- **Firefighters Injured:** 6
- **Fatalities:** 0
- **Fuels:** Chaparral
- **Cause:** Undetermined



The Ammo Fire was reported October 23, 2007 on Camp Pendleton Marine Corps Base.

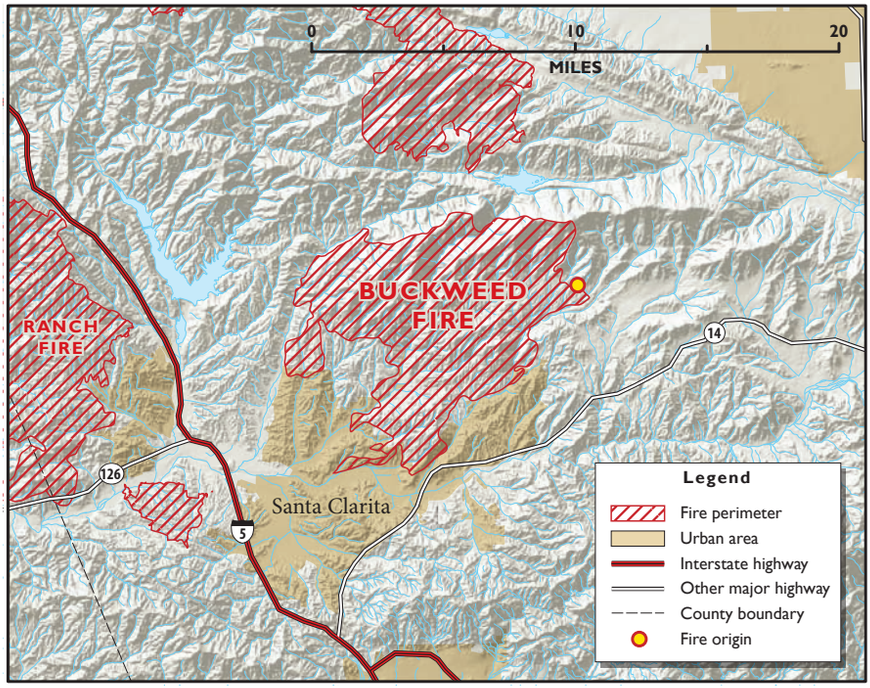
Military barracks, high voltage power grid lines originating from San Onofre Power Plant, and a communications site (repeater) for several agencies housed on San Onofre Peak, were threatened. The wind blown fire burned in heavy fuels over steep terrain. During the morning of October 24, 7,500 acres had burned, and the fire was 50% contained. Interstate-5 southbound was closed at Basilone, and northbound at Las Pulgas due to smoke and downed power lines. The fire escaped containment on the south flank, spreading southwest and parallel to Interstate-5. By afternoon the fire spotted across Interstate-5. While there was no threat to the nearby San Onofre Nuclear Power Plant, there were sporadic power outages in Camp Pendleton, and the Metro Link Rail line was temporarily shut down. The fire grew to 15,000 acres on October 25, and to over 21,000 acres by October 26. On October 27, the fire was 90% contained, evacuation orders were lifted, and power was restored to all affected areas of the camp.

The Ammo Fire was 100% contained on October 28, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Buckweed

- **Incident#:** LAC-07232185
- **County:** Los Angeles
- **Agencies in Unified Command:** Los Angeles County Fire Department, USFS
- **Start Report Date:** October 21, 2007
- **Containment Date:** October 24, 2007
- **Total Acres:** 38,356
- **Direct Fire Suppression Cost:***
  US Forest Service $5,810,000
  CAL FIRE $2,135,148
- **Firefighters Assigned at Peak:** 1,157
- **Structures Destroyed:** 63
- **Structures Damaged:** 30
- **Firefighters Injured:** 1
- **Fatalities:** 0
- **Fuels:** Chaparral, mixed brush and grass
- **Cause:** Undetermined



The Buckweed Fire was reported near Mint Canyon Road and Sierra Highway at 12:55 p.m. on October 21, 2007.

It was rapidly spread by strong, gusty Santa Ana winds. By 4:30 p.m., about 2,000 acres had burned, Sierra Highway and many other roads were closed, and the fire was moving toward the city of Santa Clarita. At 5:43 p.m. the fire was reported to be about 10,000 acres, numerous structures had been destroyed, and another 200 were threatened. Evacuations were in progress for upper Bouquet Canyon, San Francisquito Canyon, and Green Valley areas. Evacuation centers were established at Hart High School, Saugus High School, Crown Valley Middle School, and Meadowlark School.

As of 8:25 a.m., on October 22, the Santa Ana winds continued. The area had burned nearly 30,000 acres, and at least 25 structures had destroyed. As the fire burned toward the Magic Mountain area of Santa Clarita, evacuations continued and now included Vasquez Canyon, Copperhill, and areas up to Spunky Canyon. A total of 3,800 residences as well as major electrical transmission lines were threatened. The L.A. County Sheriff, and Animal Control coordinated animal evacuations. Only residents were allowed into the evacuation areas. Both the Saugus Union School District and the Castaic School District cancelled classes. The incident exceeded capabilities of available firefighting resources.

By 2:00 p.m. the burn area exceeded 35,000 acres. It was estimated that 15,000 people were evacuated from 5,500 homes. The south flank slowed significantly when it ran into a sub-division surrounded by a greenbelt. The west flank held in San Francisquito Canyon. As winds eased later that afternoon, the fire spread slowed, containment lines held, containment increased and the threat to the communities diminished. It was noted that there were impacts to archeological sites along the service road to Drinkwater Reservoir and along Del Sur Ridge, and also that fires threatened the endangered the Red Legged frog, Arroyo toad and Stickleback fish. At 5:45 pm, conditions had improved, evacuations were lifted and residents were allowed return.

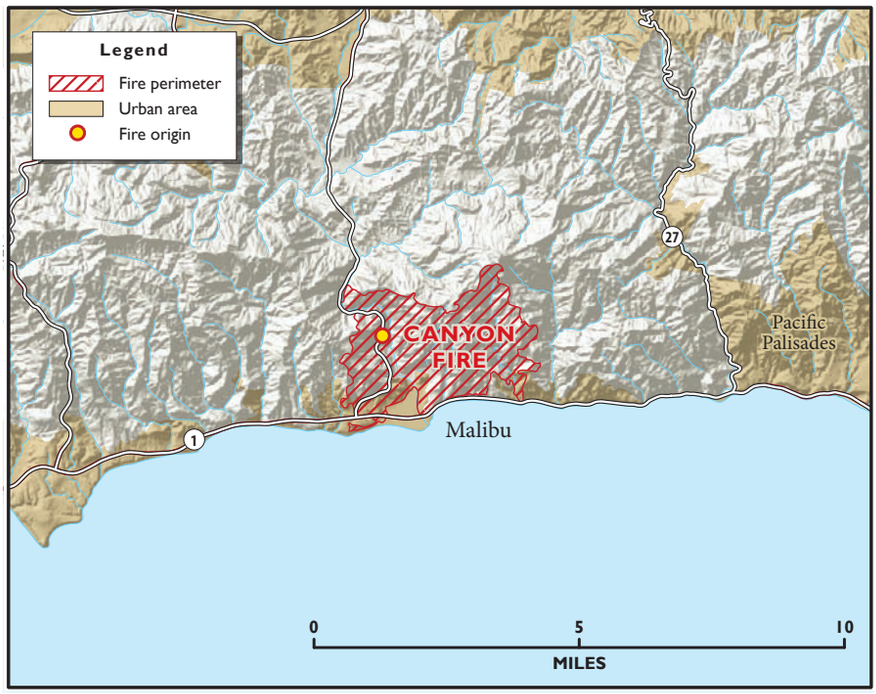
By 6:00 p.m. on October 23, containment was at 80%, and mop-up, patrol, and containment line improvement were the main focuses.

Both the Buckweed and nearby Magic Fires were 100% contained on October 24, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Canyon

- **Incident#:** LAC-07231849
- **County:** Los Angeles
- **Agency in Command:** Los Angeles County Fire Department
- **Start Report Date:** October 21, 2007
- **Containment Date:** October 25, 2007
- **Total Acres:** 4,521
- **Direct Fire Suppression Cost:***
  US Forest Service $109,400
  CAL FIRE $5,846,256
- **Firefighters Assigned at Peak:** 1,765
- **Structures Destroyed:** 8
- **Structures Damaged:** 14
- **Firefighters Injured:** 3
- **Fatalities:** 0
- **Fuels:** Chaparral
- **Cause:** Power line



The Canyon Fire was reported at 4:55 a.m. on October 21, 2007, north of the Pacific Coast Highway near the community of Malibu, in Los Angeles County.

The wind-driven fire rapidly spread toward houses. By 6:30 a.m. the fire reached 500 acres following its historical footprint, burning east up Malibu Canyon, and west down-canyon into Malibu. By 9:30 a.m. the communities of Pepperdine & Piuma Canyon were evacuated, and over 200 homes were threatened. Three homes, one church, and two commercial buildings were destroyed and, one home was reported damaged.

By the end of the day 1,150 personnel were assigned to the fire, which had reached 2,200 acres, and was only 10% contained. There was a loss of electrical infrastructure over a large area of the Malibu coast. The Pacific Coast Highway was closed between Topanga Canyon and Kanan-Dune Rd; Malibu Canyon Road was closed between the Pacific Coast Highway and Piuma Rd. Evacuation centers were established at Agoura and Palisades High Schools. School closures were issued for October 22 at Malibu High School, Webster, Point Dume, Cabrillo, and Topanga Elementary Schools. The fire was considered to have a strong potential to move through high value residential and commercial properties, and historical sites. By the end of the first day, fire lines were holding, but there was concern over predictions of increased winds.

During the morning of October 22, winds were driving the fire toward Carbon Mesa and Sweetwater Mesa. Mandatory evacuations were in effect, and there were massive structure protection efforts in the Palm Canyon and Cross Creek areas. The fire headed northeast toward the Rambler Pacifica area. By 10:00 p.m., 3,800 acres were burning, 900 structures were threatened, and six residences and two commercial buildings had been destroyed. Nine other residences and five commercial buildings were damaged and containment was down to 8%. Winds and topography caused channeling down the Malibu canyons, and electrical power was lost over a large area of the Malibu coast.

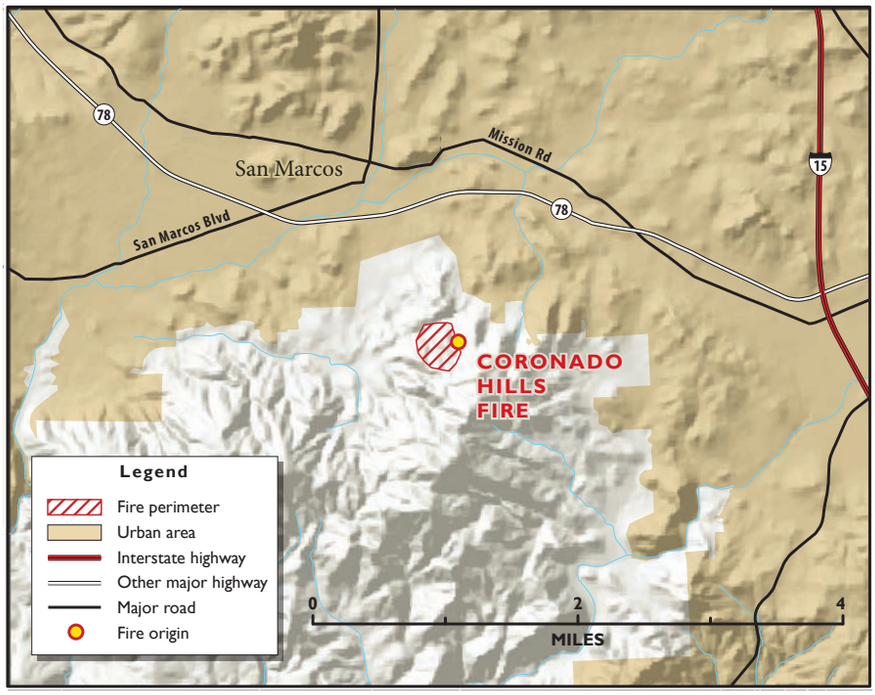
By the morning of October 23, the area burned had reached 4,400 acres. Although the winds decreased and firefighting efforts through the night were effective, containment stood at only 15% and several hundred structures were still considered threatened. Favorable weather conditions that evening enabled firefighters to hold the fire at Las Flores Ridge. Containment was at 75% and operations moved to extensive mop up. Demobilization of significant number of resources began.

The Canyon fire was 100% contained at 11:00 a.m. on October 25, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Coronado Hills

- **Incident#:** 20070005532
- **County:** San Diego County
- **Agency in Command:** San Marcos Fire Department
- **Start Report Date:** October 22, 2007
- **Containment Date:** October 22, 2007
- **Total Acres:** 250
- **Direct Fire Suppression Cost:***
  US Forest Service -
  CAL FIRE -
- **Firefighters Assigned at Peak:** 77
- **Structures Destroyed:** 2
- **Structures Damaged:** 0
- **Firefighters Injured:** 0
- **Fatalities:** 0
- **Fuels:** Chaparral
- **Cause:** Undetermined



The Coronado Hills Fire was reported at 1:46 a.m. on October 22, off of Atterbury Drive, south of the campus of California State University, San Marcos.

This fast moving fire grew to 300 acres, driven by Santa Ana winds gusting to 40 miles per hour. By 9:30 a.m., multiple structures had been destroyed. Fire was threatening the communities of Discovery Hills, Coronado Hills, and San Elijo Hills, Elfin Forest and Harmony Grove, and evacuations were in progress. Resources committed included 23 engines, a water tender, and three chief officers, for a total of 77 personnel.

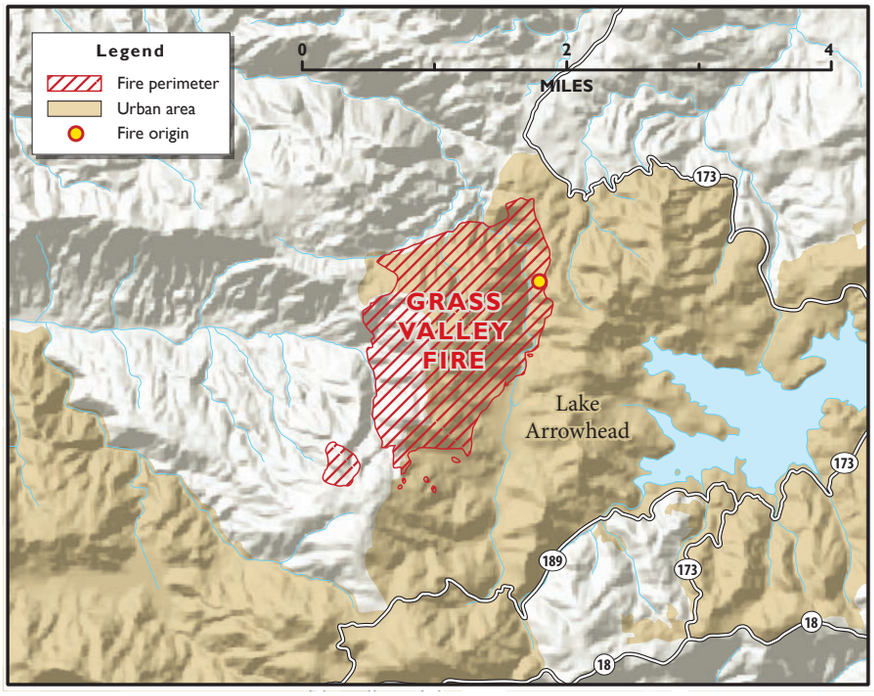
By 12:40 p.m. containment was still at 0%, multiple structures had been destroyed in Discover Hills and San Marcos and the flames were heading toward Elfin Forest and Harmony Grove, pushed by 40 mile per hour winds.

The aggressive initial attack paid off, and the Coronado Hills Fire was 100% contained at 3:25 p.m. on the same day it started.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

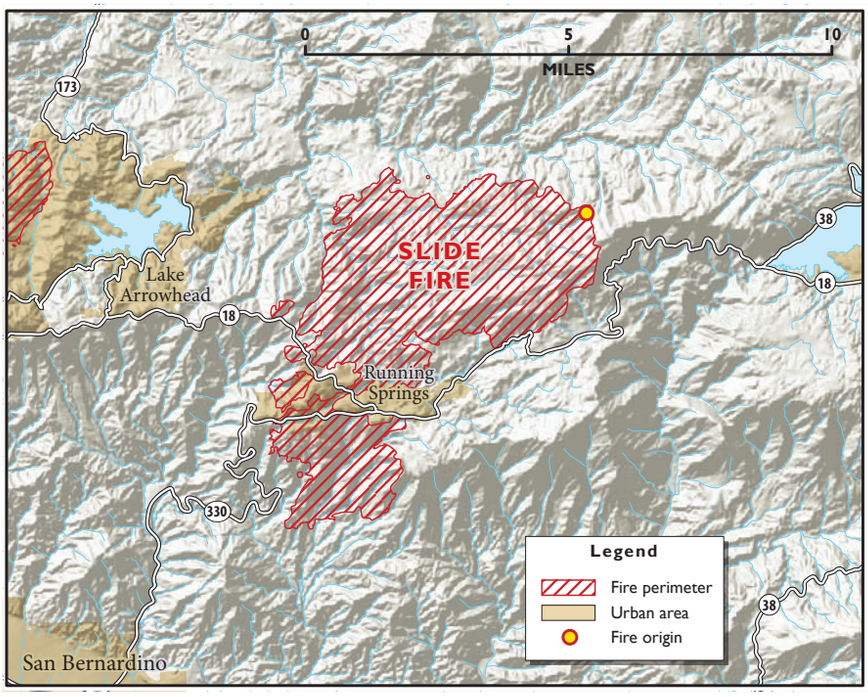
Grass Valley

- **Incident#:** BDF-10566
- **County:** San Bernardino
- **Agencies in Command:** USFS, San Bernardino County Fire, San Bernardino County Sherrifft
- **Start Report Date:** October 22, 2007
- **Containment Date:** October 29, 2007
- **Total Acres:** 1,247
- **Direct Fire Suppression Cost:***
  US Forest Service $4,900,000
  CAL FIRE $767,330
- **Firefighters Assigned at Peak:** 1,051
- **Structures Destroyed:** 178
- **Structures Damaged:** 22
- **Firefighters Injured:** 1
- **Fatalities:** 0
- **Fuels:** Timber
- **Cause:** Power lines



Slide

- **Incident#:** BDF-10570
- **County:** San Bernardino
- **Agencies in Command:** USFS, San Bernardino County Fire, San Bernardino County Sherriff, Running Springs Fire Department
- **Start Report Date:** October 22, 2007
- **Containment Date:** October 31, 2007
- **Total Acres:** 12,759
- **Direct Fire Suppression Cost:***
  US Forest Service $13,545,000
  CAL FIRE $1,771,997
- **Firefighters Assigned at Peak:** 2,129
- **Structures Destroyed:** 315
- **Structures Damaged:** 0
- **Firefighters Injured:** 8
- **Fatalities:** 0
- **Fuels:** Equipment use
- **Cause:** Under Investigation



*Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.

The Grass Valley Fire was reported at 5:08 a.m. on October 22, 2007, west of Lake Arrowhead in San Bernardino County. The Slide Fire started a little farther to the east at 8:02 p.m. that same day, close to Green Valley Lake near Running Springs in San Bernardino County.

Both fires were driven by extremely strong, gusty Santa Ana winds. Burning at an extreme rate of spread through timber, they posed an immediate threat to communities, timber, watershed and recreation areas. Several structures were threatened and mandatory evacuations were issued for Green Valley Lake and Arrow Bear.

By 1:30 p.m., it was estimated that 115 structures had been destroyed on the Slide Fire, and thousands of others were threatened. Evacuations were extended to include Arrowhead, Running Springs, and Twin Peaks. All roads into the mountain communities were closed. By nightfall the Slide Fire had grown to 1,500 acres and the Grass Valley fire to 500 acres. The large number of fires burning in Southern California made the lack of firefighting resources a major problem.

The fire burned fiercely through the night, and on morning of October 23 was still burning at an extreme rate of spread and new evacuations were issued for Lake Arrowhead and Deer Park Lodge. By 6:41 p.m., the Slide Fire had burned over 4,000 acres and 200 structures. The Grass Valley Fire reached 1,000 acres and destroyed 100 structures. The community of Running Springs also had structures destroyed. Green Valley, surrounded by fire, was evacuated. Firefighters were forced to disengage due to extreme fire behavior. Accurate damage reports were impossible to establish because the damage assessment teams were unable to gain access to the area. Evacuations are extended to Crestline, east to Snow Valley Ski Area. Mountains Community Hospital in Lake Arrowhead was evacuated of patients. Firefighters had been engaged for 36 hours without rest.

On October 24, CA-IMT #1 assumed command of the Slide Fire at 6:00 a.m. NorCal Team II remained in command of the Grass Valley Fire. Both incidents were unified in planning and resource allocation. The Slide Fire had burned over 5,000 acres and destroyed 200 structures. Damage assessment access remained a problem. The lack of firefighting resources, staffing, and rest have become larger issues. High-density residential properties, intermixed with bug-killed timber in areas with limited access, and continued adverse weather are all major factors working against suppression efforts. By afternoon, the wind direction shifts to the west-northwest, driving the fire in a new direction. The fires are now threatening Green Valley, Running Springs, Live Oak, Fredalba, Smiley Park, Calvary Chapel Camp, National Children's Forest and Visitors Center, Arrowbear Lake, Snow Valley, and Nordic Rim Ski Resort. All are evacuated.

By the morning of October 25, containment is still at 0% and the area burned in the Slide Fire is more than 11,000 acres. The Grass Valley Fire is now about 1,100 acres. As other fires in Southern California are coming under control, more firefighting resources become available, allowing progress in perimeter control. Progress is made over the next few days as more resources become available and the weather cooperates. The focus of firefighting efforts gradually shifts to mop-up and patrol in residential areas.

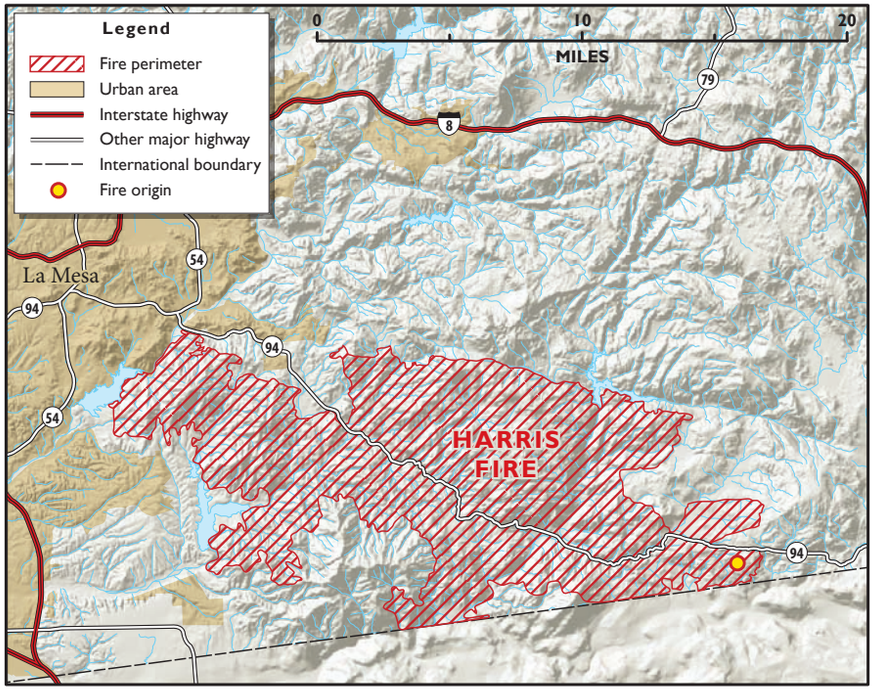
On October 28, the Grass Valley Fire is 95% contained, and Slide Fire is 85% contained. Threats to communities are diminished. Significant demobilization of firefighting resources is under way. By October 30, residents are allowed to return for site visits throughout the day. Highway 18 is completely re-opened on October 29.

The Grass Valley Fire was 100% contained on October 29, 2007.

The Slide fire was 100% contained on October 31, 2007.

Harris

- **Incident#:** MVU-010427
- **County:** San Diego
- **Agencies in Command:** CAL FIRE, USFS, San Diego City, Chula Vista, San Miguel
- **Start Report Date:** October 21, 2007
- **Containment Date:** October 31, 2007
- **Total Acres:** 90,440
- **Direct Fire Suppression Cost:***
  US Forest Service $5,030,000
  CAL FIRE $21,157,453
- **Firefighters Assigned at Peak:** 2,544
- **Structures Destroyed:** 373
- **Structures Damaged:** 259
- **Firefighters Injured:** 40
- **Fatalities:** 8
- **Fuels:** Brush and grass
- **Cause:** Undetermined



The Harris Fire was reported at 9:30 a.m., October 21, 2007, in a thickly vegetated draw east of the small community of Potrero.

The fire quickly spread through grass and tinder-dry brush and across the flats of Potrero Valley into the steep hills to the west. Evacuations were immediately ordered and ground forces concentrated their efforts on life and structure protection. Fixed-and-rotary-wing aircraft working under the most difficult conditions were pressed into action to support and protect ground forces engaged in firefights to save homes and lives. During this time the firefighters on CAL FIRE Engine 3387 were caught in a fire-storm trying to evacuate a home, resulting in one civilian death, one civilian burn victim, and four seriously burned firefighters. The engine was destroyed. In order to rescue the firefighters, the pilot of a US Forest Service contract helicopter made a heroic approach and landing to get to the firefighters and civilian who were injured.

The fire burned fiercely through the day and night, and by Monday evening had burned through several small communities and had charred 22,000 acres. Many structures were destroyed, multiple roads were closed, and the fire was still listed at only 5% containment. Aircraft remained grounded due to high winds. The San Diego General Electric Southwest major transmission line was shut off. Hundreds of structures remained threatened. Extreme fire was spreading to the west-southwest towards Otay Lake, and north into Lyon's Valley and Honey Springs Road. Threat extended to the communities of Potrero, Barrett Junction, Barrett Lake Lawson Valley, Jamul, Lyons Valley and Otay Mountain. Base Camp was moved to Gillespie Field.

Protecting lives and structures became the order of the day during the first three days of the fire. Despite evacuation orders, some citizens refused to evacuate, forcing firefighters to make rescues and plead with unwilling residents to leave, using valuable time that could have been used to protect other homes. In one case a CAL FIRE/Riverside County Type 1 strike team, ST RVC 6003A, used three engines and the Strike Team Leader to heroically rescue a disabled man from the garage of a home surrounded by fire.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

The winds continued unabated through Tuesday, October 23, pushing the 70,000-acre fire to the Chula Vista City limits and destroying an additional 100 homes in Deerhorn. The winds calmed but changed direction, pushing the fire to the north and east, toward Deerhorn and Lyons Valley, and prompting the evacuations of Lawson Valley and Carve Acre. By evening, 5,400 people had been evacuated, with additional evacuations ordered. Hundreds of structures had burned and thousands more threatened. Fire threatens the communication site on San Miguel Mountain, and the water treatment plant. The lack of firefighting resources due to the large number of fires in Southern California continues to hinder suppression efforts. Unified Command for the fire includes the U.S. Forest Service, CAL FIRE, San Diego City, Chula Vista and San Miguel.

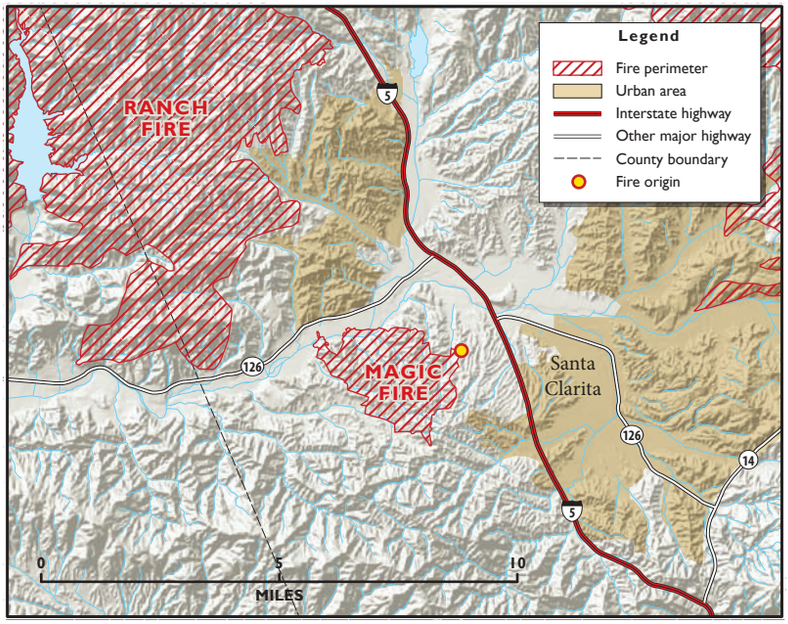
On October 24, the onshore flow moves the fire to the northeast. The fire was held at the edge of Chula Vista and San Miguel. Evacuations have been lifted for the 1000 Trails RV Park. During the next few days, fire behavior remains active on the north side with evacuations for the Lake Morena, Lawson Valley and Carve Acres areas ongoing. Structures are threatened along Highway 94 from Jamul on the east, to Jamacha on the west. Fire is a threat to the north side of the Cleveland National Forest, and is also moving east towards Lyons Valley, and burning Lyons Peak. On October 25 the fire exceeds 84,000 acres in size, but grows more slowly over the next several days as the weather become favorable for firefighters.

Residents are allowed to re-enter the Thousand Trails, Potrero, Tecate and western Jamul areas on October 26th. On October 27th evacuation orders are lifted for all areas. All residents are allowed to re-enter all fire areas on October 28.

The Harris Fire was 100% contained on October 31, 2007.

Magic

- **Incident#:** LAC-07233077
- **County:** Los Angeles
- **Agency in Command:** Los Angeles County Fire Department
- **Start Report Date:** October 22, 2007
- **Containment Date:** October 24, 2007
- **Total Acres:** 2,824
- **Direct Fire Suppression Cost:***
  US Forest Service $125,000
  CAL FIRE $900,196
- **Firefighters Assigned at Peak:** 428
- **Structures Destroyed:** 0
- **Structures Damaged:** 0
- **Firefighters Injured:** 0
- **Fatalities:** 0
- **Fuels:** Chaparral
- **Cause:** Undetermined



The Magic Fire started shortly after 2:00 p.m., October 22, near the Six Flags Magic Mountain amusement park on the western side of Santa Clarita.

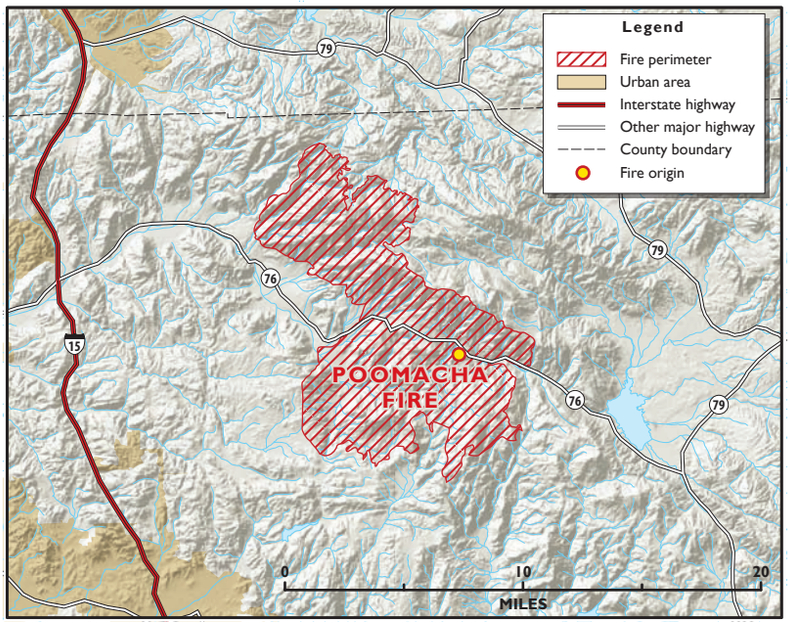
By October 23 the fire had grown to 1,200 acres. Only 20% contained, it was considered a threat to Simi Valley if the winds continued. However, weather conditions improved, and by evening there was little fire spread, and control lines were holding. Efforts shifted to mop-up and patrol.

The Magic Fire was 100% contained on October 24, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Poomacha

- **Incident#:** MVU-010643
- **County:** San Diego
- **Agency in Command:** CAL FIRE, USFS
- **Start Report Date:** October 23, 2007
- **Containment Date:** November 13, 2007
- **Total Acres:** 49,410
- **Direct Fire Suppression Cost:***
  US Forest Service $6,842,500
  CAL FIRE $19,368,014
- **Firefighters Assigned at Peak:** 2,793
- **Structures Destroyed:** 217
- **Structures Damaged:** 12
- **Firefighters Injured:** 13
- **Fatalities:** 0
- **Fuels:** Chaparral
- **Cause:** Structure fire



The Poomacha Fire was reported on October 23, at 3:13 a.m., as a structure fire on the La Jolla Indian Reservation, and rapidly spread to the adjacent vegetation.

Reverse 911 was used to contact residents in an effort to evacuate the entire Highway 76 corridor on the first day of the fire. The combined lack of resources and extreme fire weather were so serious on the first day that firefighters could not take action on the fire. It grew from 3,000 acres to 23,000 acres in an hour-and-a-half on day one. Eight injuries were reported.

By the morning of October 24 the area burned had grown to 25,000 acres, and 50 structures had been destroyed. Structure protection remained a priority as several communities, the Palomar Observatory, and a communication tower were threatened.

On October 25, the fire merged with the south side of the Witch Fire.

On October 26, the perimeter control lines of the Poomacha Fire were tied to those for the Witch Fire. The burn area burned reached 42,000 acres, and containment was at 35%. Extensive damage assessment confirmed 78 structures destroyed. Fire has entered the Aqua Tibia Wilderness and strategies were implemented to reduce impacts. Work in the wilderness is slow due to steep terrain. Residents are allowed to re-enter some areas.

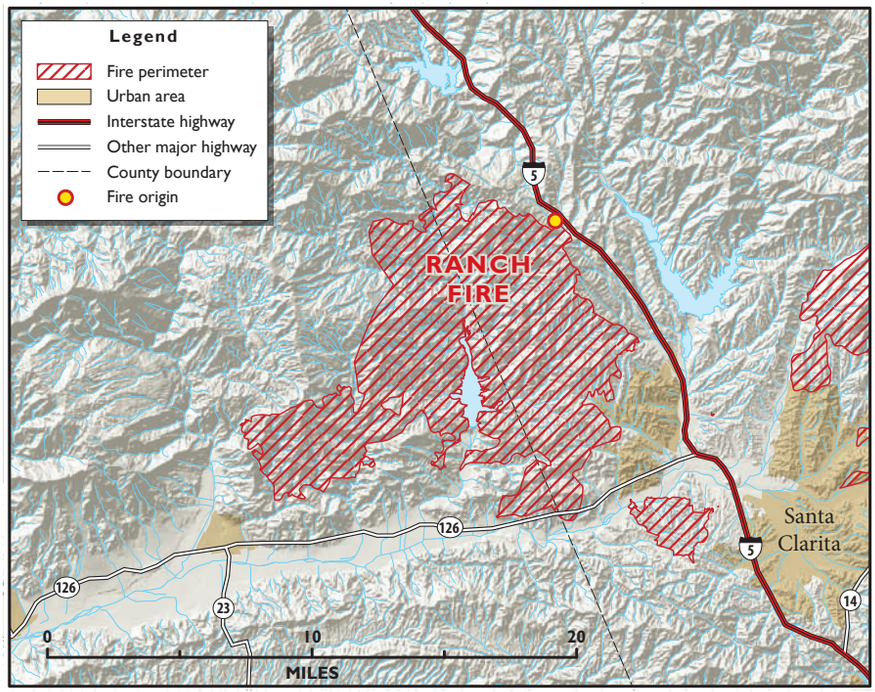
On October 27 the fire progressed to 45,000 acres and was 45% contained. The number of structures destroyed rose to 136, and the number of structures threatened declined from 2,000 to 500. On October 28, the fire perimeter encompasses 49,140 acres. Efforts for the rest of the incident shift toward securing the perimeter, mopping up, and addressing hot spots within the perimeter. Fourteen planes flew the fire on October 28, to contain the spread. It was the first day planes were able to fly in this area. Complete re-entry of residents is expected by evening. By November 1, infrared flights show very little heat left inside the fire perimeter.

The Poomacha Fire was 100% contained on November 13, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Ranch

- **Incident#:** ANF-4306
- **County:** Los Angeles
- **Agencies in Command:** Los Angeles County Fire Department, USFS
- **Start Report Date:** October 20, 2007
- **Containment Date:** October 30, 2007
- **Total Acres:** 58,401
- **Direct Fire Suppression Cost:***
  US Forest Service $9,945,000
  CAL FIRE $3,031,397
- **Firefighters Assigned at Peak:** 1,264
- **Structures Destroyed:** 10
- **Structures Damaged:** 2
- **Firefighters Injured:** 8
- **Fatalities:** 0
- **Fuels:** Chaparral
- **Cause:** Equipment use



The Ranch Fire started at 9:42 p.m., October 20, 2007, on the west side of Interstate-5, approximately seven miles northwest of the community of Castaic, in Los Angeles County, and was burning to the southwest toward Ventura County.

Santa Ana winds were blowing 25-to-30 miles per hour, and gusting to 40 miles per hour. The fire was spotting up to 1/2 mile, and by 6:00 a.m. October 21, it had burned 500 acres but was slowing down. The winds had calmed to 10 miles per hour, with gusts to 20 miles per hour, and the relative humidity rose to 45%. Additional resources arrived and there was no eminent threat to structures unless the winds picked up again. Three hours later at 9:00 a.m., the fire was still holding at 500 acres. However, the winds picked up again and spread the fire from a rural area without threat to structures, to 6,000 acres. By the end of the day, it threatened the communities of Fillmore, Piru, Ventura, Ojai, and the Condor Reserve and Sespe Wilderness areas.

Winds continued to drive the fire, and by the morning of October 23, the area burned exceeded 50,000 acres, and the fire became well established in Ventura County. If the winds continued, the Buckweed, Magic, and Ranch fires were expected to burn together in 24-to-48 hours.

By October 23, seven structures were reported destroyed, and Highway 126 was closed. An evacuation center was established at the Fillmore Veterans Memorial Building. Large animals were evacuated to the Ventura County Fairgrounds and small animals were moved to the Camarillo Animal Shelter. Evacuations occurred in Chiquito Canyon, Halsey Canyon, Val Verde, Hopper Canyon and toward Fillmore. Structure protection was provided for Hasley, Piru, Sespe, Fillmore, and structures along Highway 126.

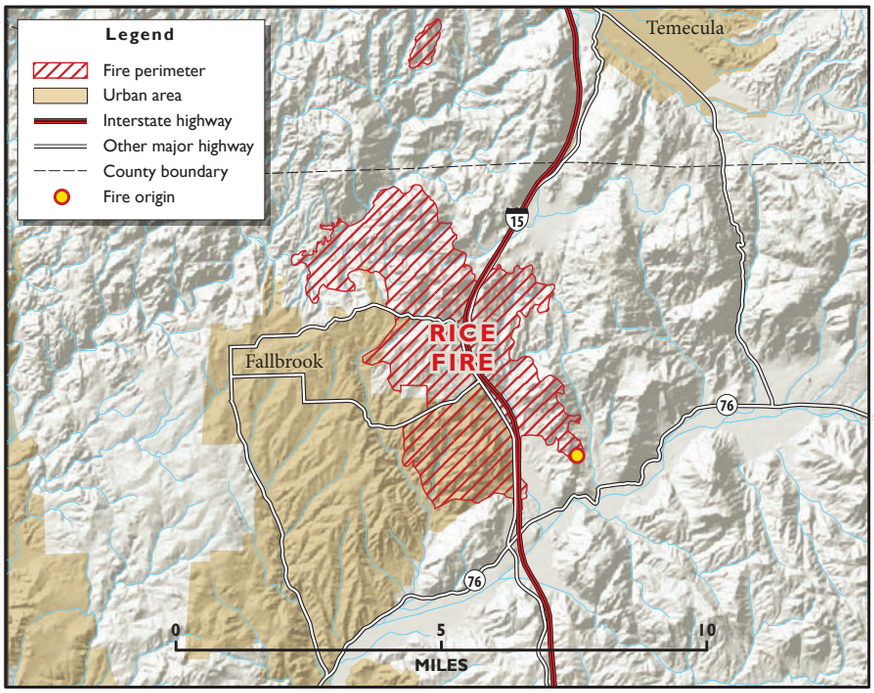
By the morning of October 24, the winds had calmed and fire activity was minimal with some topography-driven short distance runs; flames were visible from Interstate-5. Evacuations were lifted and efforts refocused on securing the perimeter and mopping up. Line construction was completed on the west perimeter of the fire on October 26; the fire was 97% contained by October 27.

The Ranch Fire was 100% contained on October 30, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Rice

- **Incident#:** MVU-010502
- **County:** San Diego
- **Agencies in Command:** CAL FIRE, North County Fire Protection District
- **Start Report Date:** October 22, 2007
- **Containment Date:** October 28, 2007
- **Total Acres:** 9,472
- **Direct Fire Suppression Cost:*** US Forest Service — CAL FIRE $6,757,077
- **Firefighters Assigned at Peak:** 1,073
- **Structures Destroyed:** 248
- **Structures Damaged:** 0
- **Firefighters Injured:** 6
- **Fatalities:** 0
- **Fuels:** Grass and brush
- **Cause:** Human/Electrical



The Rice Fire was reported at 4:16 a.m. on October 22, burning into an agricultural area of Rice Canyon and initially threatening 250 structures.

Wind gusts of 40-to-50 miles per hour hampered early suppression efforts intended to keep fire within a perimeter defined by Rice Canyon to east, Interstate-15 to the west, Rainbow Height to north, and Highway 76 to south. Before 12:30 p.m. the fire had crossed Interstate-15 and Highway 395. By 3:30 p.m. on the first day, about 1,000 acres had burned, destroying 100 structures in Fallbrook and threatening up to a thousand others. The entire town of Fallbrook, as well as Fallbrook Hospital, was evacuated.

By the morning of October 23, the fire had burned 6,100 acres, numerous structures were destroyed or damaged, thousands more were threatened, and 20,000 avocado trees had been incinerated. As fire spread toward Santa Margarita and the Sandia Creek drainage, and it was feared that the Rice Fire would merge with the Rosa fire. By the end of the day, over 200 structures had burned, and the fire covered 7,500 acres. It was only 10% contained.

On day three, additional evacuations were ordered In the DeLuz area, north of Fallbrook. The fire covered 9,000 acres, and was moving toward Santa Margarita. The San Onofre main electrical transmission line was threatened.

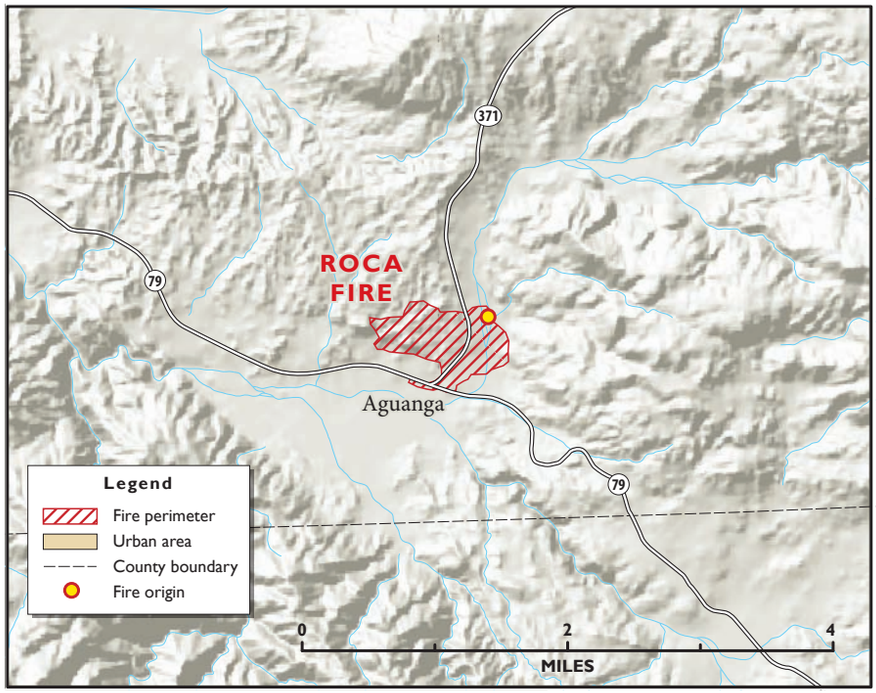
On the morning of October 25, fire spread slowed due to decreasing winds, and some residents were allowed to return home. Over the next two days, significant progress was made on fire line construction, increasing containment. Evacuation orders for all of Fallbrook lifted on October 27.

The Rice Fire was 100% contained on October 28, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Roca

- **Incident#:** RRU-91948
- **County:** Riverside
- **Agency in Command:** CAL FIRE
- **Start Report Date:** October 21, 2007
- **Containment Date:** October 22, 2007
- **Total Acres:** 270
- **Direct Fire Suppression Cost:***
  US Forest Service –
  CAL FIRE $353,267
- **Firefighters Assigned at Peak:** 303
- **Structures Destroyed:** 1
- **Structures Damaged:** 1
- **Firefighters Injured:** 1
- **Fatalities:** 0
- **Fuels:** Chaparral
- **Cause:** Undetermined



The Roca Fire started at 3:52 p.m. on October 21, 2007, driven by gusty Santa Ana winds blowing from the northeast at 40 miles per hour.

The rapidly spreading and spotting fire was burning on both sides of Highway 371 within 90 minutes of the start. Numerous structures were threatened and evacuations were quickly undertaken in the South Lake Riverside and Iguana areas. By 11:00 p.m. additional structures were threatened in Cottonwood, and evacuations were ordered at the Jojoba RV Resort. The fire threatened the Cleveland National Forest as it headed toward Temecula Creek and the Riverside-San Diego County Line, south of Highway 79.

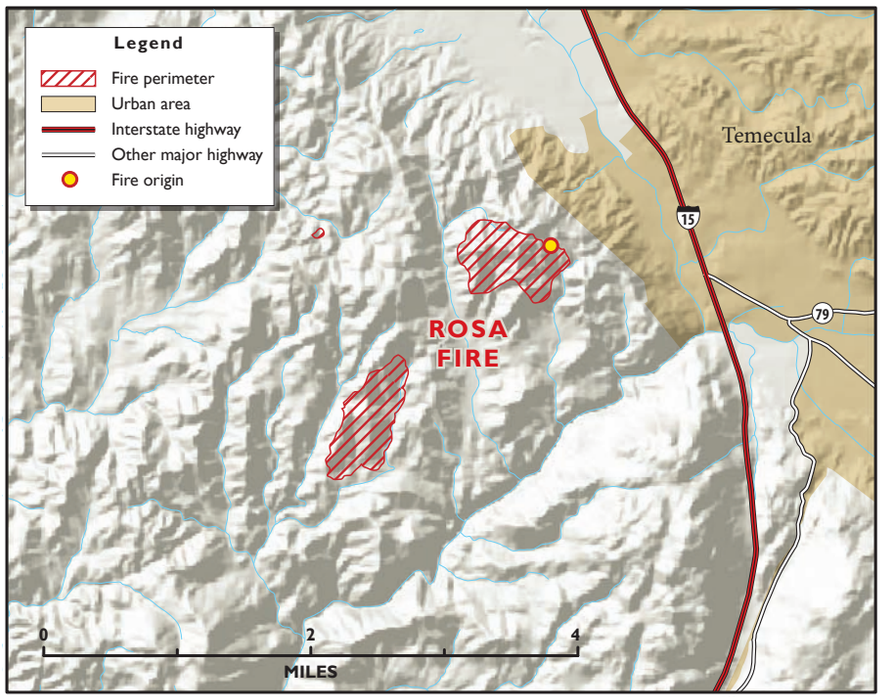
By the next morning, the fire's rate of spread had slowed.

The Roca Fire was contained by 8:00 a.m. on October 22, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Rosa

- **Incident#:** RRU-93126, RRU-92560
- **County:** Riverside
- **Agency in Command:** CAL FIRE
- **Start Report Date:** October 22, 2007
- **Containment Date:** October 24, 2007
- **Total Acres:** 411
- **Direct Fire Suppression Cost:***
  US Forest Service $59,850
  CAL FIRE $670,486
- **Firefighters Assigned at Peak:** 192
- **Structures Destroyed:** 2
- **Structures Damaged:** 0
- **Firefighters Injured:** 0
- **Fatalities:** 0
- **Fuels:** Chaparral
- **Cause:** Arson



The Rosa Fire started as three separate fires at 11:10 p.m. on October 22, 2007, near Temecula.

Initial suppression efforts were hampered by wind gusts over 20 miles per hour, as well as difficult access to the fire, and poor water supply for firefighting. The Santa Rosa Plateau Ecological Reserve and the 33 KV transmission lines supplying power to Orange County were threatened. Evacuations occurred in De Luz, and an evacuation enter was established at the Temecula Community Center for the evacuees.

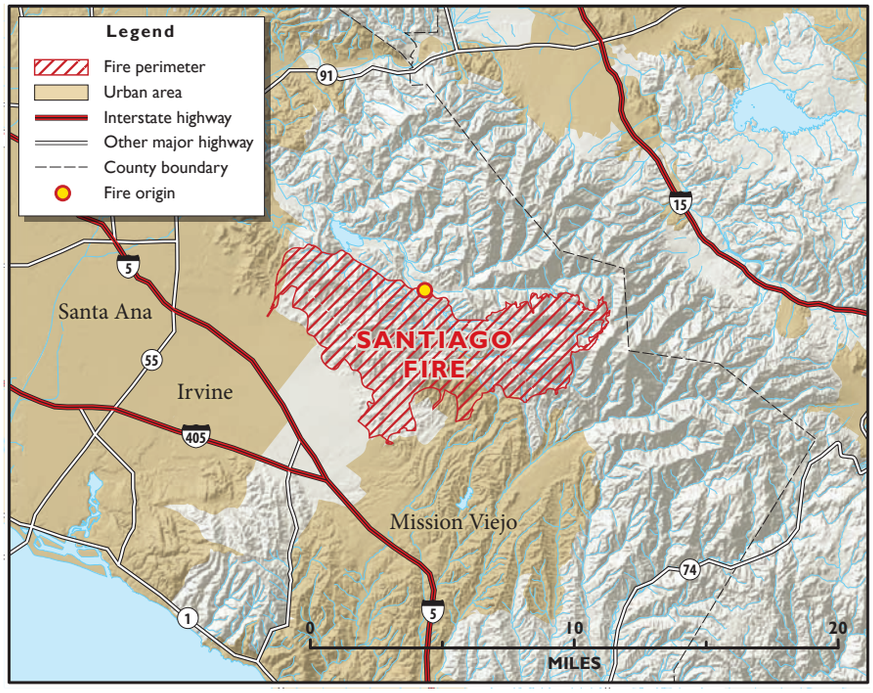
The fire was 70% contained by 6:45 a.m. the following morning, less than eight hours after it started. Evacuation and road closure restrictions were lifted at 5:00 p.m. on October 23.

The Rosa Fire was contained on October 24, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Santiago

- **Incident#:** ORC-68555
- **County:** Orange
- **Agencies in Command:** Orange County Fire Authority, Orange County Sherriff, USFS, CAL FIRE
- **Start Report Date:** October 21, 2007
- **Containment Date:** November 8, 2007
- **Total Acres:** 28,400
- **Direct Fire Suppression Cost:***
  US Forest Service $10,325,000
  CAL FIRE $10,509,353
- **Firefighters Assigned at Peak:** 1,982
- **Structures Destroyed:** 26
- **Structures Damaged:**20
- **Firefighters Injured:** 13
- **Fatalities:** 0
- **Fuels:** Chaparral
- **Cause:** Arson



The Santiago fire started at 5:55 p.m. on October 21, near Irvine in Orange County. The fire was making large runs with major spotting. Numerous structures were threatened to the south and west of the fire, and evacuations were ordered immediately. A Unified Command is established with Orange County Fire Authority, U.S. Forest Service and Orange County Sheriff's Department.

As of 6:35 a.m. October 22, gusty winds continued to spread the fire, which had grown to 8,800 acres, destroying one structure and damaging two others. Residences were threatened in the communities of Portola Hills, Silverado Canyon, and Foothill Ranch. During the day the wind blew 30-to-40 miles per hour, with gusts up to 60 miles per hour. The fire posed a major threat to over 2,000 homes in Foothill Ranch, and 700 structures in Silverado Canyon. The fire crossed into Silverado Canyon, spreading toward Modjeska, covering over 16,000 acres by nightfall. Throughout the first few days of the incident, the lack of available firefighting resources due to the large number of ongoing fires hampered suppression efforts.

On the morning of October 23, the fire threatened numerous communities along the Santa Ana Canyon corridor, and also along the San Onofre power grid. Structure protection was in place for the Portola Hills, Foothill Ranch, Modjeska and Santiago Canyon areas. Newly arriving firefighting resources helped meet some of the containment objectives. By afternoon 18,000 acres had burned, destroying 10 structures and two outbuildings, and threatening several thousand additional structures. Containment remained at 30%. Winds shifting from an offshore to an onshore flow complicated the firefighting effort. Mandatory evacuations were in place for Harris Grade, Live Oak Canyon, Trabuco Canyon, Silverado, Modjeska and Ladd Canyons. There were also threats to the Chino Edison power lines.

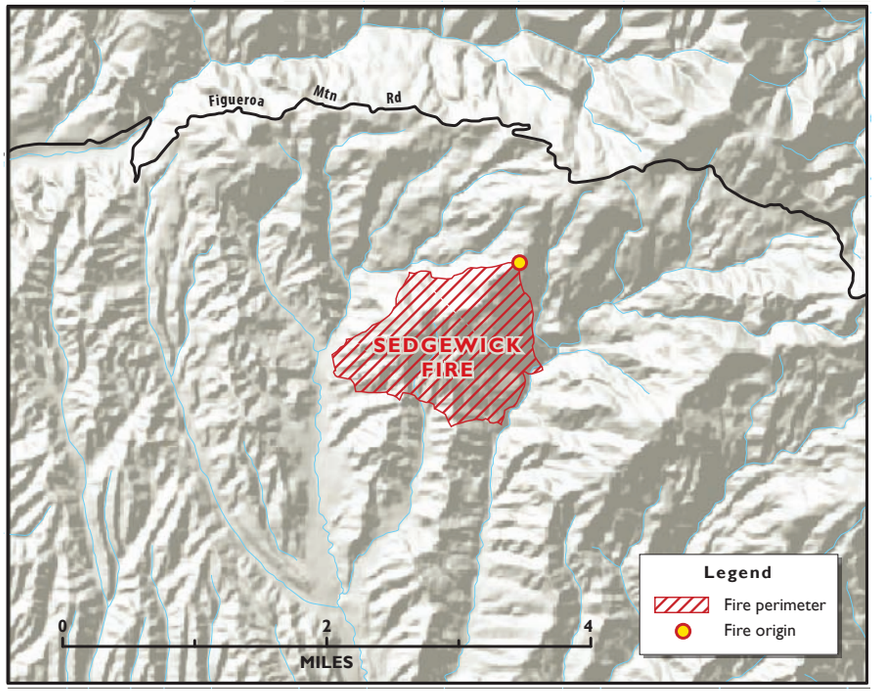
By the afternoon of October 24, the fire had spread to the northeast and the south. Good progress was made overnight in the Modjeska Canyon area. On October 25, the fire progressed to Modjeska Peak, has burned 27,000 acres, and continues to burn north toward Riverside County. For the next several days the fire expands more slowly as weather conditions become more favorable. Containment lines are established and shored up. The focus shifts to mop-up and containing flare-ups that occur in unburned islands within the fire perimeter. All evacuation orders are lifted by November 1.

The Santiago Fire was 100% contained on November 8, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Sedgewick

- **Incident#:** LPF-1783
- **County:** Santa Barbara
- **Agencies in Command:** USFS, Santa Barbara County Fire Departmentt
- **Start Report Date:** October 21, 2007
- **Containment Date:** October 23, 2007
- **Total Acres:** 710
- **Direct Fire Suppression Cost:***
  US Forest Service $3,465
  CAL FIRE $1,053,945
- **Firefighters Assigned at Peak:** 516
- **Structures Destroyed:** 0
- **Structures Damaged:** 0
- **Firefighters Injured:** 0
- **Fatalities:** 0
- **Fuels:** Grass
- **Cause:** Power lines



The Sedgewick fire was reported at 6:00 a.m., October 21, south of Figueroa Mountain in Santa Barbara County.

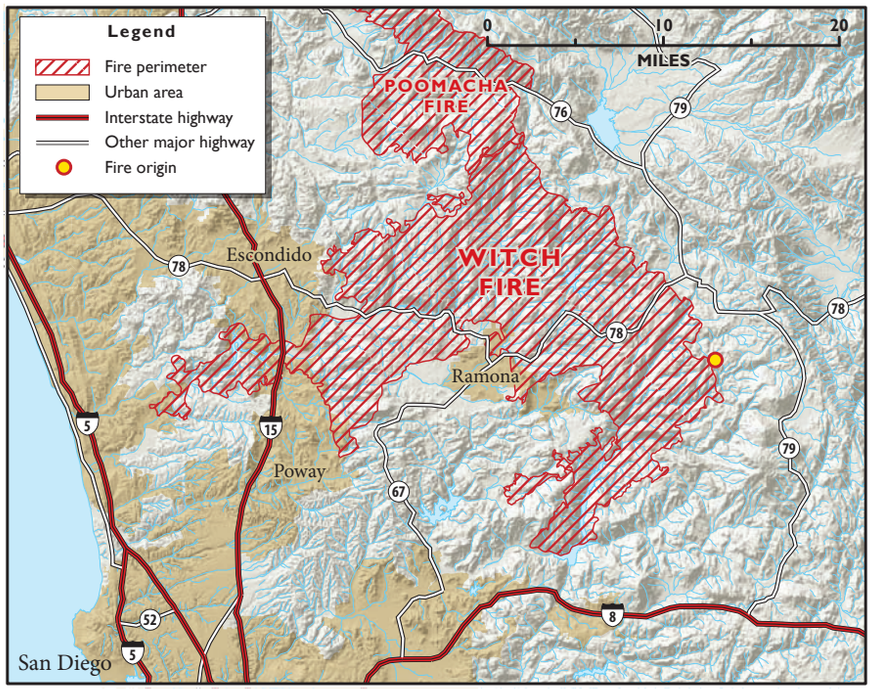
About 450 homes were threatened. Evacuation warnings were posted for the Woodstock area. By the afternoon of October 22, the fire was 75% contained, and resources were released to help the efforts on other ongoing fires. Arcing from electrical power lines is suspected to be the cause of the fire.

The Sedgewick Fire was contained at 6:00 a.m., October 23, 2007.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

Witch

- **Incident#:** MVU-010432
- **County:** San Diego
- **Agencies in Command:** CAL FIRE, USFS, Heartland Fire Zone, Rancho Santa Fe FPD, San Diego County FS, Poway, Escondido
- **Start Report Date:** October 21, 2007
- **Containment Date:** October 31, 2007
- **Total Acres:** 197,990
- **Direct Fire Suppression Cost:***
  US Forest Service $5,393,500
  CAL FIRE $17,792,887
- **Firefighters Assigned at Peak:** 2,883
- **Structures Destroyed:** 1,624
- **Structures Damaged:** 103
- **Firefighters Injured:** 40
- **Fatalities:** 2
- **Fuels:** Chapparal
- **Cause:** Power lines



The Witch Fire was reported at about 12:35 p.m. on October 21, 2007, east of Ramona in San Diego County.

By the end of the first day, the fire was well established in the Witch Creek drainage, had jumped Interstate-15 and burned multiple structures in Ramona, Rancho Bernardo and Poway, and grown to near 10,000 acres in size. Communities threatened included Ramona, San Diego Country Estates, Barona Mesa, Barona Indian Reservation, Poway and San Pasqual. Widespread evacuations were in progress.

At approximately 4:00 a.m., October 22, the Guajito Fire was reported south of the San Diego Wild Animal Park, burning in the San Pasqual River drainage. Within 30 minutes it had burned west to I-15, causing the CHP to close the highway in both directions and disrupting the evacuation of communities threatened by the Witch Fire.The Guajito Fire burned under I-15 toward Rancho Bernardo, and later in the day merged with the Witch Fire.

By the evening of October 22, the fire had blown up to 145,000 acres, with an estimated 500 structures destroyed and another 250 damaged. The fire, pushed by the strong Santa Ana winds, was burning rapidly and produced long range spotting up to 1/4 mile in front of the fire. Thousands of structures were threatened. Much of the fire was burning between the 2003 Paradise and Cedar fire burns in 25-year-old fuel.

On the morning of October 23, at 8:30 a.m., the fire had already burned 165,000 acres but was only 1% contained. The wind pushed the fire to the west-and-southwest at a rapid rate, with long range spotting. Thousands of structures remained threatened. At 1:50 p.m., it is reported that the fire has grown to 200,000 acres and still only 1% contained. In the last three hours, 100 homes have burned in the communities of Rancho Santa Fe, Harmony Grove, Valley Center, Escondido and Valley Center. By 5:50 p.m., the perimeter growth had slowed and the area burned remained the same. Structures were destroyed in the additional communities of Rancho San Diego, Millar Ranch, Indian Springs and Jamul; all had all been evacuated. Evacuation centers were set up.

**Figures shown reflect direct suppression cost estimates by stated agency. Other federal, state and local agency costs are not included. Additional expenses not related to direct suppression (rehabilitation, agency overhead, etc.) are not included.*

By October 24, the Santa Ana winds had ended and the winds shifted onshore. Fire spread was greatly reduced. Damage estimates now tallied 805 structures destroyed, and 375 damaged. Communities threatened now include the additional communities of Julian, Pine Hills, Rincon, and Rancho Bernardo.

The Poomacha Fire merges with the Witch Fire on October 25. The Structure Assessment Team confirms that 69 homes were destroyed in Escondido, 85 in Poway, 480 in San Diego City, and more than 600 in San Diego County. Residents begin to return to some areas of Poway, Escondido, Rancho Santa Fe, San Diego City, Ramona, and Rancho Bernardo. There is increased fire activity in the El Capitan area and south of Lake Henshaw, but this occurs with no significant fire spread.

As fire behavior moderates from October 26 to October 31, suppression efforts shift to completion of the fire line perimeter, rehabilitation, and damage assessment. Evacuations are lifted, people return to their communities and demobilization of firefighting resources occurs.

The Witch Fire was 100% contained at 197,990 acres on October 31, 2007.

Appendix III: Evacuations

"The fires…forced the evacuation of more than 350,000 houses, most of them in San Diego County. With the area's average household size of 2.6 people, that means the evacuation could encompass nearly 910,000 people."

MSNBC, October 23, 2007

A volunteer sorts donations made to evacuees. Businesses, individuals and agencies were generous in their support of those who were displaced by the siege.

The 2007 fire siege in Southern California forced hundreds of thousands of residents to evacuate, triggered numerous road closures, and prompted school officials to cancel classes throughout the region.

Evacuees quickly filled all available hotel rooms, poured into shelters, pitched tents in parking lots, or slept in their cars. Many were able to stay with nearby friends or relatives.

Four days into the siege, the number of citizens displaced was estimated at nearly a million. Many major roads were closed, including Interstate-15 on October 22, and Interstate-5 on October 24. In San Diego County alone, the residents of at least 11 nursing homes were evacuated, and in Orange County, a jail housing 900 inmates required evacuation.

Overall, local agencies and residents conducted themselves in a safe, orderly manner, following the instructions of firefighters and law enforcement officials. Operating under "unified command," most firefighting teams included local law enforcement personnel, giving them a crucial strategic perspective in addition to the tactical perspective of the fire commanders. The broader view gained through unified command, along with improved communication technologies, helped the massive evacuation process to run smoothly.

A vital component in any evacuation or emergency situation is communication. During the October fire siege, the Reverse 911 system was employed on a large scale, and was key to reaching thousands of citizens. Previous evacuation communications, such as those employed in the 2003 fire siege, depended on residents watching the news, listening to radio broadcasts or waiting for a personal visit from law enforcement officials giving evacuation orders. The Reverse 911 system contacted nearly 200,000 citizens with recorded phone messages relevant to their communities.

Appendix IV: After Action Reports

After Action Reports

Major fire sieges fully test the various management systems that are designed for emergency response and coordination. Agency executives take a hard look at all aspects of the operation and make adjustments as necessary. The management team responsible for each of the major fires prepares an incident-specific post-incident activity summary with findings and recommendations. In addition, there are several completed and on-going major after-action reports from various levels of government discussing operations during the California Fire Siege 2007. This list describes some of these reports, and is not intended to be all-inclusive.

Blue Ribbon Commission Task Force

In November 2007, Governor Schwarzenegger asked the Govenor's Blue Ribbon Fire Commission formed after the 2003 fire siege, to reconvene and assess what happened during the 2007 fires and recommend improvements in California's fire and emergency response system. On January 18, 2008 the 18-member independent panel of fire service professionals issued an interim report. This report titled "Blue Ribbon Commission Task Force Report" detailed more than a dozen critical recommendations to increase permanent state and local emergency services, build additional surge capacity, improve tactical capabilities, establish better coordination among governmental agencies, and promote fire-safe construction and land-use planning. Some high-priority recommendations, such as staffing, equipment and training, were incorporated into the governor's proposed 2008-2009 budget.

Lessons Learned Center

The Wildland Fire Lessons Learned Center actively promotes a learning culture to enhance and sustain safe and effective work practices in the wildland fire community. The Center provides opportunities and resources to foster collaboration among all fire professionals, facilitates their networks, provides access to state-of-the-art learning tools, and links learning to training.

The Lessons Learned Center conducted a study of actions taken during the October fire siege and issued a report entitled "Initial Impressions Report Southern California Fires 2007: What we learned, how we worked".

Interviewees for this report noted several areas that should receive focused attention until, either through policy, training, or equipment upgrades, these problems areas are resolved. This report does not relate a complete history of the events or decisions made during Southern California's 2007 fires. It codifies the observations of a broad sampling of representatives from as many agencies and organizations as possible, who were working in a variety of roles, in several functions, on different fires. The report then highlights the themes that rose as common concerns among all of these respondents.

Smokey conditions spread throughout Southern California

Hemet Ryan AAB on the morning of November 3, 2007 just minutes prior to the start of morning operations.

Aviation Response

The aviation management teams of CAL FIRE and the U.S. Forest Service, Region 5, conducted a study of the aviation response during the siege. Their findings are documented in the report "Collection of Aviation Related Written Accounts", compiled from submitted accounts written by Air Tactical Group Supervisors, Lead Plane Pilots, Bravo units, and Air Tanker Bases Southern California Fires October 2007. This report collected information from aviation management officers that will prove valuable for future management reviews of operational procedures.

National Response Plan

The federal Office of Homeland Security and the Federal Emergency Management Agency have made significant changes to the National Response Plan since the terrorist attacks of September 11, 2001, and the Katrina Hurricane disaster. These plans were put into action during this fire siege, and were fully tested. FEMA is preparing numerous after-action studies and reports to evaluate the effectiveness of the updates. These studies will be published and distributed by FEMA.

Appendix V: Proclamations and Declarations

10/26/2007

EXECUTIVE ORDER S-13-07

WHEREAS on October 21, 2007, I proclaimed a State of Emergency to exist in the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura as a result of major wildfires fanned by extremely high winds; and

WHEREAS at least 13 out of more than 20 fires continue to burn in Southern California, which have already killed one person and injured dozens of others, including firefighters; and

WHEREAS the fires have displaced hundreds of thousands of persons in the largest evacuation in California history, including those taking refuge in more than 50 shelters, which have housed more than 20,000 people; and

WHEREAS these fires have burned over 450,000 acres of land and more than 1,600 structures, and caused the loss of valuable personal and business records; and

WHEREAS more than 10,000 firefighters are fighting the fires; and

WHEREAS the President of the United States declared that the conditions in the affected counties constitute a major disaster; and

WHEREAS the State Employment Development Department and my Office of Emergency Services estimate that thousands of workers are, or will be, unemployed as a result of the wildfire disaster and are in need of immediate financial assistance; and

WHEREAS the suspension of the statutory one-week waiting period for unemployment insurance applicants who are unemployed due to the wildfire disaster would provide these unemployed workers with immediate financial assistance; and

WHEREAS hospitals, mobile hospitals, temporary hospital annexes, mass care centers, first-aid stations, or other similar temporary facilities established by public entities in the affected areas to care for persons displaced by the fires may be subject to licensing requirements that may prevent, hinder or delay the establishment of those facilities or their ability to provide health care services; and

WHEREAS existing state law does not permit former health care professionals who retired in good standing, or inactive health care professionals in good standing, to practice their professions, even though these persons can play a helpful role in providing emergency health care services where insufficient licensed personnel are available; and

WHEREAS other statutes, regulations, rules or orders governing the delivery of medical care may prevent, hinder or delay the delivery of health care services to persons displaced by the fires; and

WHEREAS those who have lost family members, and those who have lost or sustained damage to their homes, property, businesses or places of employment, may need to obtain or replace important government records such as certificates of birth, death, fetal death, or marriage, as well as marriage dissolution records, driver's licenses, identification cards, vehicle registration certificates, and certificates of title, to obtain assistance from federal, state and local governmental agencies, make claims for and collect insurance, find new employment, and for other purposes related to losses suffered in the fire; and

WHEREAS those who need to obtain or replace important government records to mitigate their losses and rebuild their lives as a consequence of the wildfire disaster require immediate assistance from state and local governmental agencies to replace those records; and

WHEREAS existing law requires the Office of Vital Records of the Department of Public Health, along with local registrars, county recorders and county clerks, to impose fees upon persons requesting copies of certificates of birth, death, fetal death, and marriage, and marriage dissolution records, and existing law requires the State Department of Motor Vehicles to impose fees upon persons requesting replacement driver's licenses, identification cards, vehicle registration certificates, and certificates of title; and

WHEREAS existing law requires the State Department of Motor Vehicles to impose late fees on persons who are late in renewing their vehicle registration or late in transferring ownership of a vehicle; and

WHEREAS existing law requires the State Department of Housing and Community Development to impose fees on persons who are late in renewing their manufactured home registration or late in transferring ownership of a manufactured home; and

WHEREAS the suspension of statutory requirements for imposition of fees would assist fire victims; and

WHEREAS my Office of Emergency Services has successfully used Local Assistance Centers during previous emergencies to coordinate and expedite disaster assistance by providing "one-stop" centers where those affected by an emergency may obtain all services provided by governmental and community organizations; and

WHEREAS the California Military Department, through the California National Guard, has the capability to protect the lives and property of the people of the state during periods of natural disaster and civil disturbances, and to perform other functions required by the California Military Department or as directed by the Governor.

NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, in accordance with the authority vested in me by the Constitution and statutes of the State of California, including the Emergency Services Act and in particular Government Code sections 8567 and 8571, do hereby issue the following orders to become effective immediately:

IT IS ORDERED THAT:

1. The California National Guard shall mobilize under California Military and Veterans Code section 146 (mobilization in case of catastrophic fires) to support disaster response and relief efforts and coordinate with all relevant state agencies, including my Office of Emergency Services, and all relevant state and local emergency responders and law enforcement within the impacted areas. Sections 147 and 188 of the Military and Veterans Code are applicable during the period of participation in this mission, exempting the California Military Department from applicable procurement rules for specified emergency purchases, and those rules are hereby suspended.

2. The provisions of Unemployment Insurance Code section 1253 imposing a one-week waiting period for unemployment insurance applicants are suspended as to all applicants who are unemployed as a result of the wildfire disaster in the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura, who apply for unemployment insurance benefits during the time period beginning October 21, 2007 and ending on the close of business on April 21, 2008, and who are otherwise eligible for unemployment insurance benefits in California.

3. Any hospital, mobile hospital, temporary hospital annex, mass care center, first-aid station, or other similar facility

established in the affected area for disaster response shall be exempt from the requirements set forth in Health and Safety Code sections 1200 through 1799.207 (licensing provisions) and sections 127125 through 130070 (health policy planning, health professions development, health care demonstration projects, health data, facilities loan insurance and financing, facilities design review and construction). Such facilities shall be established and operated in accordance with the State Emergency Plan and local emergency plans. The Licensing and Certification Division of the State Department of Public Health shall, to the extent reasonably possible, advise public entities on reasonable and appropriate measures under the circumstances to protect the health and safety of persons in the facility.

4. Business & Professions Code sections 702 (inactive healing arts license) and 2439 (retired license) are suspended and without effect in the counties subject to the proclamation of emergency, provided that, at the time the practitioner retired or became inactive, his or her license was in good standing.

5. The provisions of Health and Safety Code sections 103525.5 and 103625, and the provisions of Penal Code section 14251, requiring the imposition of fees, are hereby suspended with regard to any request for copies of certificates of birth, death, fetal death, and marriage, or marriage dissolution records by any resident of the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara or Ventura who suffered a loss of a family member, or who suffered loss or damage to property, business, or employment, due to the wildfire disaster. Copies of certificates of birth, death, fetal death, and marriage, and marriage dissolution records, shall be provided to such persons without charge.

6. Health and Safety Code section 18114, requiring the imposition of fees, is hereby suspended with regard to any late renewal of registration certificate or certificate of title for a manufactured home by any registered owner who lost these documents as a result of the wildfire disaster. Those documents shall be replaced without charge.

7. The provisions of Vehicle Code sections 9265(a), 9867, 14901, 14902 and 15255.2, requiring the imposition of fees, are hereby suspended with regard to any request for replacement of a driver's license, identification card, vehicle registration certificate or certificate of title by any resident of the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura who suffered a loss of such documents in the wildfire disaster. A replacement driver's license, identification card, vehicle registration certificate, or certificate of title shall be provided to such persons without charge.

8. The provisions of Vehicle Code sections 4602 and 5902, requiring the timely registration or transfer of title, are hereby suspended with regard to any registration or transfer of title by any resident of the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura who suffered a loss of such registration or title documents in the wildfire disaster. The time covered by this suspension shall not be included in calculating any late penalty pursuant to Vehicle Code section 9554.

9. My Office of Emergency Services shall immediately establish and support Local Assistance Centers where needed to provide "one-stop" emergency assistance services to those affected by the wildfires in the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura.

10. My Office of Emergency Services shall coordinate assistance programs offered by all relevant federal, state and local agencies and departments, including, but not limited to, the Federal Emergency Management Agency, the California Conservation Corps, the Department of Public Health, the Department of Health Care Services, the Department of Mental Health, the Department of Social Services, the Department of Consumer Affairs, the Employment Development Department, the Department of the Highway Patrol, the Department of Forestry and Fire Protection, the Department of Veterans Affairs, the Department of Aging, the Department of

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Transportation, the Department of Insurance, and the Franchise Tax Board.

11. All State agencies with responsibility, regulatory authority or expertise related to recovery efforts in connection with these fires shall cooperate fully and act expeditiously in coordination with the California Resources Agency and the California Environmental Protection Agency, to facilitate the mitigation of the effects of the fires and the environmental restoration of the affected areas.
12. State agencies shall expeditiously enter into contracts and arrange for the procurement of materials, goods, and services necessary to quickly remove dangerous debris, repair damaged resources, and restore and protect the impacted watershed. Because strict compliance with the provisions of the Government Code and the Public Contract Code applicable to state contracts would prevent, hinder, or delay these efforts, applicable provisions of those statutes, including, but not limited to, advertising and competitive bidding requirements, are suspended to the extent necessary to address the effects of this emergency.
13. Statutes, rules, regulations and requirements are hereby suspended to the extent they apply to the following activities: (a) removal, storage, transportation and disposal of hazardous and non-hazardous debris resulting from the disaster, (b) necessary restoration, and (c) related activities. Such statutes, rules, regulations and requirements are suspended only to the extent necessary for expediting the removal and cleanup of debris from the disaster, and for implementing any restoration plan. The Secretary for the California Environmental Protection Agency, and the Secretary for the California Resources Agency, shall use sound discretion in applying this suspension to ensure that the suspension serves the purpose of accelerating cleanup and recovery, while at the same time protecting public health and the environment. The Secretaries shall maintain a public list of all statutes, rules, regulations and requirements that are suspended, and shall post the list prominently on their websites. This order shall apply to, but is not necessarily limited to, solid waste facility permits, and waste discharge requirements for storage, disposal, emergency timber harvesting, stream environment zones, emergency construction activities, along with waste discharge requirements and/or Water Quality Certification for discharges of fill material or pollutants. To the extent it is within their administrative authority and discretion, the boards, departments and offices within the California Environmental Protection Agency shall expedite the granting of other authorizations, waivers or permits necessary for the removal, storage, transportation and disposal of hazardous and non-hazardous debris resulting from the fires, and for other actions necessary for the protection of public health and the environment.
14. My Office of Emergency Services and all affected State agencies and departments shall provide assistance to the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura. Support provided by the State for implementation of the California Disaster Assistance Act shall include, but shall not necessarily be limited to, the use of state personnel and state contractors to support recovery operations.
15. State agencies and departments shall work with local officials to put into place and implement a comprehensive structural debris removal plan that will treat the removal of structural debris as a single organized project.
16. The Department of Forestry and Fire Protection, the California Department of Corrections and Rehabilitation, and the California Conservation Corps, shall use inmate and ward labor, where appropriate, to protect public health, safety, and water quality on public lands or where otherwise requested by private property owners.
17. Standby order numbers one and three are invoked to allow sufficient state personnel to address disaster response and recovery, clean-up and restoration efforts. Standby order number one provides: "It is hereby ordered that the period of employment for State Personnel Board emergency appointments, as provided in Section 19120 of the Government Code and State Personnel Board Rules 301-303, be waived for positions required

for involvement in emergency and/or recovery operations. The requirements and period of employment for such appointments will be determined by the Director, California Office of Emergency Services, but shall not extend beyond the termination date of said State of Emergency." Standby order number three provides: "It is hereby ordered that during the proclaimed State of Emergency appropriate parts of Sections 18020-18026 of the Government Code and State Personnel Board Rules 130-139 be waived to permit cash compensation to personnel whose work is designated by the Director, California Office of Emergency Services, as essential to expedite emergency and recovery operations for all time worked over the employee's regular workweek, at a rate of 1-1/2 times the regular rate of pay. The Director, Office of Emergency Services, will also designate the beginning and ending dates for such overtime for each individual involved. This waiver shall not extend beyond the termination date of said State of Emergency."

IT IS FURTHER REQUESTED THAT:

1. The Public Utilities Commission direct utility companies with transmission lines in the affected area to ensure that all dead and dying trees and vegetation are completely cleared from their utility right-of-ways to mitigate the potential threat to human health and safety and public property.
2. The Franchise Tax Board and the Board of Equalization consider using their administrative powers where appropriate to provide those individuals and/or businesses impacted by the wildfires extensions for filing, audits, billing, notices, assessments and relief from subsequent penalties.

This Executive Order is not intended to, and does not, create any rights or benefits, substantive or procedural, enforceable at law or in equity, against the State of California, its agencies, departments, entities, officers, employees, or any other person.

I FURTHER DIRECT THAT, as soon as hereafter possible, this Order be filed in the Office of the Secretary of State and that widespread publicity and notice be given to this order.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 25th day of October 2007.

ARNOLD SCHWARZENEGGER

Governor of California

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DEPARTMENT OF HOMELAND SECURITY

Federal Emergency Management Agency

[FEMA-1731-DR]

California; Major Disaster and Related Determinations

AGENCY: Federal Emergency Management Agency, DHS.

ACTION: Notice.

SUMMARY: This is a notice of the Presidential declaration of a major disaster for the State of California (FEMA-1731-DR), dated October 24, 2007, and related determinations.

EFFECTIVE DATE: October 24, 2007.

FOR FURTHER INFORMATION CONTACT: Peggy Miller, Disaster Assistance Directorate, Federal Emergency Management Agency, Washington, DC 20472, (202) 646-2705.

SUPPLEMENTARY INFORMATION: Notice is hereby given that, in a letter dated October 24, 2007, the President declared a major disaster under the authority of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. 5121-5206 (the Stafford Act), as follows:

I have determined that the damage in certain areas of the State of California resulting from wildfires beginning on October 21, 2007, and continuing, is of sufficient severity and magnitude to warrant a major disaster declaration under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 U.S.C. §§ 5121-5206 (the Stafford Act). Therefore, I declare that such a major disaster exists in the State of California.

In order to provide Federal assistance, you are hereby authorized to allocate from funds available for these purposes such amounts as you find necessary for Federal disaster assistance and administrative expenses.

You are authorized to provide Individual Assistance, assistance for debris removal and emergency protective measures (Categories A and B) under the Public Assistance program in the designated areas, Hazard Mitigation throughout the State, and any other forms of assistance under the Stafford Act that you deem appropriate subject to completion of Preliminary Damage Assessments (PDAs), unless you determine that the incident is of such unusual severity and magnitude that PDAs are not required to determine the need for supplemental Federal assistance pursuant to 44 C.F.R. § 206.33(d).

Consistent with the requirement that Federal assistance be supplemental, any Federal funds provided under the Stafford Act for Public Assistance, Hazard Mitigation, and Other Needs Assistance will be limited to 75 percent of the total eligible costs. Federal funds provided under the Stafford Act for Public Assistance also will be limited to 75 percent of the total eligible costs, except for any particular projects that are eligible for a higher Federal cost-sharing percentage under the FEMA Public Assistance Pilot Program instituted pursuant to 6 U.S.C. § 777.

Further, you are authorized to make changes to this declaration to the extent allowable under the Stafford Act.

The time period prescribed for the implementation of section 310(a), Priority to Certain Applications for Public Facility and Public Housing Assistance, 42 U.S.C. 5153, shall be for a period not to exceed six months after the date of this declaration.

The Federal Emergency Management Agency (FEMA) hereby gives notice that pursuant to the authority vested in the Administrator, Department of Homeland Security, under Executive Order 12148, as amended, Michael J. Hall, of FEMA is appointed to act as the Federal Coordinating Officer for this declared disaster.

I do hereby determine the following areas of the State of California to have been affected adversely by this declared major disaster:

Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, and Ventura Counties for Individual Assistance and debris removal and emergency protective measures (Categories A and B) under the Public Assistance program.

All counties within the State of California are eligible to apply for assistance under the Hazard Mitigation Grant Program.

(The following Catalog of Federal Domestic Assistance Numbers (CFDA) are to be used for reporting and drawing funds: 97.030, Community Disaster Loans; 97.031, Cora Brown Fund Program; 97.032, Crisis Counseling; 97.033, Disaster Legal Services Program; 97.034, Disaster Unemployment Assistance (DUA); 97.046, Fire Management Assistance; 97.048, Individual and Household Housing; 97.049, Individual and Household Disaster Housing Operations; 97.050 Individual and Household Program-Other Needs, 97.036, Public Assistance Grants; 97.039, Hazard Mitigation Grant Program.)

R. David Paulison,

Administrator,

Federal Emergency Management Agency.

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PROCLAMATION

by the Governor of the State of California

WHEREAS on October 21, 2007, there are more than eleven major wildfires burning in Southern California; and

WHEREAS the wildfires are being driven by dry conditions and high winds, and these conditions are expected to continue for several days; and

WHEREAS more than 20,000 acres have already burned, and more areas are threatened; and

WHEREAS the wildfires have already caused the loss of human life and serious injuries; and

WHEREAS homes, businesses and other structures have burned; and

WHEREAS residents have been evacuated in many communities and several highways and local roads have been closed; and

WHEREAS the wildfires have disrupted a major electrical transmission line and caused power outages; and

WHEREAS on October 21, 2007, my Office of Emergency Services requested federal Fire Management Assistance Grants for many of the fires to ensure that adequate financial resources are available to rapidly attack the fires and reimburse critical emergency response costs; and

WHEREAS some counties have already issued local proclamations of emergency regarding the wildfires, requesting that I issue a state proclamation of emergency, and more local proclamations of emergency are anticipated; and

WHEREAS these wildfires, by reason of their magnitude, are beyond the control of the services, personnel, equipment and facilities of any single county, city and county, or city and require the combined forces of a mutual aid region or regions to combat; and

WHEREAS under the provisions of section 8558(b) of the California Government Code, I find that, because of the wildfires, conditions of extreme peril to the safety of persons and property exist in the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, and Ventura.

NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, in accordance with the authority vested in me by the State Constitution and the California Emergency Services Act, and in particular, section 8625 of the California Government Code, HEREBY PROCLAIM A STATE OF EMERGENCY to exist within the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara and Ventura.

IT IS HEREBY ORDERED that all agencies of the state government utilize and employ state personnel, equipment and facilities for the performance of any and all activities consistent with the direction of my Office of Emergency Services (OES) and the State Emergency Plan, and that OES provide local government assistance under the authority of the California Disaster Assistance Act.

I FURTHER DIRECT that as soon as hereafter possible, this proclamation be filed in the Office of the Secretary of State and that widespread publicity and notice be given of this proclamation.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 21st Day of October 2007.

ARNOLD SCHWARZENEGGER, Governor of California

05/09/2007

EXECUTIVE ORDER S-07-07

WHEREAS the threat of wildfires in California present extreme peril to the people, property and environment; and

WHEREAS this emergency situation of imminent fire danger is caused by the extraordinary number of dead, dying and diseased trees resulting from prolonged drought, overstocked forests and infestation by bark beetles and other decay organisms; and

WHEREAS the number of dead and dying trees continues to increase, providing a readily available fuel load which could result in catastrophic fires; and

WHEREAS an Arctic Cold Front resulting in extreme low temperatures and freezing conditions swept through California, beginning on January 11, 2007, and continuing for a period of time thereafter, contributed to the increased mortality of wildland vegetation therefore fire danger; and

WHEREAS below normal precipitation, higher than season normal temperatures, strong winds and low relative humidity in the majority of the State during this past winter have contributed to early drying of brush and other wildland vegetation; and

WHEREAS reduction in other-agency resources, including aviation assets, limits their initial attack capabilities; and

WHEREAS coordinated fire prevention, aggressive fuels reduction programs and strong initial attack resources remain critical; and

WHEREAS increased risk of catastrophic wildfires throughout California threatens the lives, property and economic well-being of the people of the State; and

WHEREAS the increased risk of catastrophic wildfires throughout California may result in unplanned releases of air pollutants that adversely affect air and water quality, soil stability, populations of sensitive and endangered fish and wildlife species, and their habitat; and

WHEREAS the increased risk of catastrophic wildfires could significantly impact state efforts to reduce greenhouse gases by large uncontrolled emissions of carbon dioxide and other greenhouse gases caused by wildfire; and

WHEREAS the United States Forest Service and Federal Emergency Management Agency have directed funding to assist in fuel removal and forest health improvement.

NOW, THEREFORE, I, ARNOLD SCHHWARZENEGGER, Governor of the State of California, by virtue of the power and authority vested in me by the Constitution and statutes of the State of California, do hereby issue this order to become effectively immediately:

IT IS ORDERED that the California Department of Forestry and Fire Protection (CAL FIRE) shall secure and deploy additional resources necessary, as determined by the Director, to protect the safety of persons and property from wildfires during periods of elevated fire risk as follows:

- Staff additional fire crews, fire engines, fire bulldozers, and aviation resources as warranted based on fire threat conditions.
- Assign a crew of four firefighters to selected CAL FIRE fire engines as warranted based on fire threat conditions.
- Assign a Helitack Crew to the San Diego County Sheriff's Department helicopter.
- Provide for immediate availability and utilization of the Supertanker aircraft.
- Assign additional resources in the CAL FIRE contract counties as warranted based on fire threat conditions.

- Coordinate with the military for those resources that may be available for assistance during emergencies in California.
- Assign additional fire safety inspectors where and when beneficial to reduce fire risk.
- Assign fire lookouts during peak fire conditions as part of CAL FIRE staffing patterns.
- Increase staffing for command and control functions at CAL FIRE Unit Emergency Command Centers, Northern and Southern Operations centers and the CAL FIRE Sacramento Coordination Center when necessary to respond to significant fire events.

IT IS FURTHER ORDERED that CAL FIRE obtain additional staffing as necessary to support a heightened level of fire prevention public awareness and education utilizing CAL FIRE Volunteers in Prevention, Fire Safe Councils, and the Office of the State Fire Marshal.

IT IS FURTHER ORDERED that CAL FIRE continue to expedite the processing of contracts and grants of federal funds to the communities as quickly as possible and support all local and regional responses to the bark beetle affected tree eradication and community emergency planning efforts.

IT IS FURTHER ORDERED that the Office of Emergency Services (OES), in consultation and coordination with CAL FIRE, as fire threat conditions warrant, deploy OES fire engine strike teams to ensure a substantial response capability to any wildland fire situation in California, and that the costs of the deployment shall be reimbursed consistent with the California Fire Service and Rescue Emergency Mutual Aid Plan and the California Fire Assistance Agreement.

IT IS FURTHER ORDERED that the California National Guard prepare its aviation assets, and pre-position ground support equipment as appropriate for immediate response to major wildfires and report to OES weekly on the status of all aircraft.

IT IS FURTHER ORDERED that the California Department of Corrections and Rehabilitation, including the Division of Juvenile Justice, place the highest priority for assignment of level-one inmates and wards to staff Conservation Camp Fire Crews.

IT IS FURTHER ORDERED that the California Conservation Corps report to CAL FIRE daily on the status of all its support crews for response to wildfires.

IT IS FURTHER ORDERED that OES review appropriate state departments to assure preparedness for response to wildfires.

IT IS FURTHER ORDERED that CAL FIRE and OES work closely with federal, state and local government agencies, bordering states, and the government of Mexico to maximize California's fire prevention and fighting capabilities and to provide appropriate reciprocal assistance when requested.

This Order is not intended to, and does not create any right or benefit, substantive or procedural, enforceable in law or equity, against the State of California, its departments, agencies or other entities, its officers or employees, or any other person.

IT IS FURTHER ORDERED that as soon as hereafter possible, this order be filed in the Office of the Secretary of State and that widespread publicity and notice be given to this order.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 9th day of May 2007.

ARNOLD SCHWARZENEGGER, Governor of California

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June 22, 2006

EXECUTIVE ORDER S-10-06

WHEREAS the threat of wildfires in California present extreme peril to the people, property and environment, and

WHEREAS this emergency situation of imminent fire danger is caused by the extraordinary number of dead, dying and diseased trees resulting from prolonged drought, overstocked forests and infestation by bark beetles and other decay organisms; and

WHEREAS an above normal level of precipitation throughout the state during this past winter has led to increased growth of grass and brush, and

WHEREAS the amount of dead and dying trees continues to increase, providing a readily available fuel load which could result in catastrophic fires; and

WHEREAS coordinated fire prevention, aggressive fuels reduction programs and strong initial attack resources remain critical; and

WHEREAS the increased risk of catastrophic wildfires throughout California threatens the lives, property and economic well-being of the people of the state; and

WHEREAS the increased risk of catastrophic wildfires throughout California may result in unplanned releases of air pollutants that adversely affect air and water quality, soil stability, populations of sensitive and endangered fish and wildlife species, and their habitat; and

WHEREAS the increased risk of catastrophic wildfires could significantly impact state efforts to reduce greenhouse gases by large uncontrolled emissions of carbon dioxide and other greenhouse gases caused by wildfire; and

WHEREAS the United States Forest Service and Federal Emergency Management Agency have directed funding to assist in fuel removal and forest health improvement; and

WHEREAS augmentation of fire suppression resources during the previous five years in response to the extraordinary fire conditions has resulted in an overall reduction in the average acres burned (excluding the destructive Southern California Fire Siege in October 2003, which was exacerbated by Santa Ana wind conditions).

NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, by virtue of the power and authority vested in me by the Constitution and statutes of the State of California, do hereby issue this order to become effectively immediately:

1. The California Department of Forestry and Fire Protection (CDF) shall secure and deploy additional resources necessary, as determined by the Director, to protect the safety of persons and property from wildfires during the 2006 periods of elevated fire risk as follows:
   - Assign a minimum crew of four firefighters to selected CDF engines as warranted based on fire threat conditions.
   - Assign additional resources in the CDF Contract Counties as warranted based on fire threat conditions.
   - Staff two additional CDF Conservation Camp Fire Crews as warranted based on fire threat conditions.
   - Coordinate with the military for those resources that may be available for assistance during emergencies in California.
   - Assign additional fire safe inspectors where and when beneficial to reduce fire risk.
   - Assign fire lookouts during peak fire conditions as part of CDF staffing patterns.

- Increase dispatch and command functions at CDF Northern and Southern Operations centers and the CDF Sacramento Command Center when necessary to respond to significant fire events.

2. CDF shall accelerate fire safe clearance inspections by utilizing every second fire engine for inspections when not engaged in firefighting operations.
3. CDF shall obtain additional staffing as necessary to support a heightened level of fire prevention public awareness and education utilizing CDF Volunteers in Prevention, FireSafe Councils, and the Office of the State Fire Marshal.
4. CDF shall continue to expedite the processing of contracts and grants of federal funds to the communities as quickly as possible and support all local and regional responses to the bark beetle affected tree eradication and community emergency planning efforts.
5. The Office of Emergency Services (OES), in consultation and coordination with CDF, as fire threat conditions warrant, shall deploy OES fire engine strike teams to ensure a substantial response capability to any wildland fire situation in California, and that the costs of the deployment shall be reimbursed consistent with the California Fire Service and Rescue Emergency Mutual Aid Plan and the California Fire Assistance Agreement.
6. The California National Guard shall prepare its fixed-wing aircraft and helicopters, and pre-position ground support equipment as appropriate for immediate response to major wildfires and report to OES weekly on the status of all aircraft.
7. The California Department of Corrections and Rehabilitation, including the Division of Juvenile Justice, shall place the highest priority for assignment of level one inmates and wards to staff Conservation Camp Fire Crews.
8. The California Conservation Corps shall report to CDF daily on the status of all its support crews for response to wildfires.
9. OES shall review appropriate state departments to assure preparedness for response to wildfires.
10. CDF and OES shall work closely with federal, state and local government agencies, bordering states, and the government of Mexico to maximize California's fire prevention and fighting capabilities and to provide appropriate reciprocal assistance when requested.

This Order is not intended to, and does not create any right or benefit, substantive or procedural, enforceable in law or equity, against the State of California, its departments, agencies or other entities, its officers or employees, or any other person.

IT IS FURTHER ORDERED that as soon as hereafter possible, this order be filed in the Office of the Secretary of State and that widespread publicity and notice be given to this order.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 22nd day of June 2006.

ARNOLD SCHWARZENEGGER, Governor of California

BRUCE McPHERSON, Secretary of State

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EXECUTIVE ORDER S-6-05

WHEREAS, on March 7, 2003, a State of Emergency was proclaimed to address the extreme peril to the people, property and environment within the Counties of Riverside, San Bernardino and San Diego. This emergency situation of imminent fire danger is caused by the extraordinary number of dead, dying and diseased trees resulting from prolonged drought, overstocked forests and infestation by bark beetles and other decay organisms; and

WHEREAS, the amount of dead and dying trees continues to increase, more than 150,000 additional trees died in 2004, bringing the total acres affected up to 247,000, a 36 percent increase over 2003. This represents a significant increase in the readily available fuel load which could result in catastrophic fires; and

WHEREAS, aggressive fuels reduction programs and strong initial attack resources remain critical; and

WHEREAS, the increased risk of catastrophic wildfires throughout Southern California threatens the lives, property and economic well-being of the people of the state; and

WHEREAS, the United States Forest Service and Federal Emergency Management Agency have directed funding to assist in fuel removal and forest health improvement; and

WHEREAS, the California Department of Forestry and Fire Protection (CDF), the Governor's Office of Emergency Services (OES) and the Counties of Riverside, San Bernardino and San Diego have already taken significant actions to improve routes for the evacuation of people and facilitate emergency response; and

WHEREAS, augmentation of fire suppression resources during the previous four years in response to the extraordinary fire conditions has resulted in an overall reduction in the average acres burned (excluding the destructive Southern California Fire Siege in October 2003, which was exacerbated by Santa Ana wind conditions).

NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, by virtue of the power and authority vested in me by the Constitution and statutes of the State of California, do hereby issue this order to become effectively immediately:

IT IS ORDERED that CDF shall secure and deploy additional resources as needed to protect the safety of persons and property from wildfires during the 2005 periods of elevated fire risk as follows:

- Assign a minimum crew of four firefighters to 53 CDF engines in the Counties of Riverside, San Bernardino and San Diego.
  - Assign additional resources in the CDF Contract Counties of Los Angeles, Ventura and Orange as warranted based on established criteria of fire threat conditions.
  - Staff four additional CDF Conservation Camp Fire Crews in the Southern portion of the state.
  - Lease, staff and deploy a helicopter to be based in San Diego County.

  IT IS FURTHER ORDERED that CDF accelerate Fire Safe Clearance Inspections by utilizing every second fire engine for inspections when not engaged in firefighting operations.

IT IS FURTHER ORDERED that CDF obtain additional staffing as necessary to support a heightened level of fire prevention public awareness and education delivery utilizing CDF Volunteers in Prevention.

IT IS FURTHER ORDERED that CDF continue to expedite the processing of contracts and grants of federal funds to the communities as quickly as possible and support all local and regional responses to the bark beetle affected tree eradication and community emergency planning efforts.

IT IS FURTHER ORDERED that OES, in consultation and coordination with CDF, as fire threat conditions warrant, deploy

OES fire engine strike teams to ensure a substantial response capability to any wildland fire situation in California, and that the costs of the deployment shall be reimbursed consistent with the California Fire Service and Rescue Emergency Mutual Aid Plan and the California Fire Assistance Agreement.

IT IS FURTHER ORDERED that the California National Guard prepare its fixed-wing aircraft and helicopters, and pre-position ground support equipment as appropriate for immediate response to major wildfires and report to OES weekly on the status of all aircraft.

IT IS FURTHER ORDERED that the California Department of Corrections and the California Youth Authority place the highest priority for assignment of level one inmates and wards to staff Conservation Camp Fire Crews.

IT IS FURTHER ORDERED that the California Conservation Corps report to CDF daily on the status of all its support crews for response to wildfires.

IT IS FURTHER ORDERED that OES review appropriate state departments to assure preparedness for response to wildfires.

IT IS FURTHER ORDERED that CDF and OES work closely with federal, state and local government agencies, bordering states, and the government of Mexico to maximize California's fire prevention and fighting capabilities and to provide appropriate reciprocal assistance when requested.

This Order is not intended to, and does not create any right or benefit, substantive or procedural, enforceable in law or equity, against the State of California, its departments, agencies or other entities, its officers or employees, or any other person.

IT IS FURTHER ORDERED that as soon as hereafter possible, this order be filed in the Office of the Secretary of State and that widespread publicity and notice be given to this order.

IN WITNESS WHEREOF I have here unto set my hand and caused the Great Seal of the State of California to be affixed this the twentieth day of July 2005.

Arnold Schwarzenegger

Governor of California

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May 7, 2004

EXECUTIVE ORDER S-9-04

WHEREAS, on March 7, 2003, a State of Emergency was proclaimed to address the extreme peril to the people, property and environment within the Counties of Riverside, San Bernardino and San Diego. This emergency situation of imminent fire danger is caused by the extraordinary number of dead, dying and diseased trees resulting from prolonged drought, overstocked forests and infestation by bark beetles and other decay organisms; and

WHEREAS, the amount of dead and dying trees continues to increases, more than 100,000 trees in a six-month period in 2003. In some areas 100% of existing conifer species have died including one-third of the trees in the San Bernardino National Forest and 181,128 acres of non-federal forestland; and

WHEREAS, the increased risk of catastrophic wildfires throughout Southern California threatens the lives, property and economic well-being of the people of the state; and

WHEREAS, the United States Forest Service and Federal Emergency Management Agency have directed funding to assist in fuel removal and forest health improvement; and

WHEREAS, the California Department of Forestry and Fire Protection (CDF), the Governor's Office of Emergency Services (OES) and the Counties of Riverside, San Bernardino and San Diego have already taken significant actions to improve routes for the evacuation of people and facilitate emergency response; and

WHEREAS, augmentation of fire suppression resources during the past three years in response to the extraordinary fire conditions has resulted in an overall 70% fewer acres burned in 2001, 2002 and 2003 (excluding the destructive Southern California Fire Siege in October 2003, which was exacerbated by Santa Ana wind conditions).

NOW, THEREFORE, I, ARNOLD SCHWARZENEGGER, Governor of the State of California, by virtue of the power and authority vested in me by the Constitution and statutes of the State of California, do hereby issue this order to become effectively immediately:

IT IS ORDERED that CDF shall secure and deploy additional resources as needed to protect the safety of persons and property from wildfires during the 2004 fire season as follows:

- Assign a minimum crew of four firefighters to 53 CDF engines in the Counties of Riverside, San Bernardino and San Diego;
- Assign additional resources in the CDF Contract Counties of Los Angeles, Ventura and Orange as warranted based on established criteria of fire threat conditions;
- Place back into service ten refurbished fire engines to be staffed with a minimum crew of four firefighters to increase CDF fire engine resources to assist with wildfire suppression in the Counties of Riverside, San Bernardino and San Diego;
- Staff four additional CDF Conservation Camp Fire Crews in the Southern portion of the state;
- Lease, staff and deploy a helicopter to be based in San Diego County.

IT IS FURTHER ORDERED that CDF accelerate Fire Safe Clearance Inspections by utilizing every second fire engine for inspections when not engaged in firefighting operations.

IT IS FURTHER ORDERED that CDF obtain additional staffing as necessary to support a heightened level of fire prevention public awareness and education delivery utilizing CDF Volunteers in Prevention.

IT IS FURTHER ORDERED that CDF continue to expedite the processing of contracts and grants of federal funds to the communities as quickly as possible and support all local and regional responses to the bark beetle affected tree eradication and community emergency planning efforts;

IT IS FURTHER ORDERED that OES, in consultation with CDF, implement a program to predeploy, as fire threat conditions warrant, OES fire engine strike teams to ensure a substantial response capability to any wildland fire situation in Southern California, and that the costs of the deployment shall be reimbursed consistent with the California Fire Service and Rescue Emergency Mutual Aid Plan and the California Fire Assistance Agreement.

IT IS FURTHER ORDERED that the California National Guard prepare its fixed-wing aircraft and helicopters, and preposition ground support equipment as appropriate for immediate response to major wildfires and report to OES weekly on the status of all aircraft.

IT IS FURTHER ORDERED that the California Department of Corrections and the California Youth Authority place the highest priority for assignment of level one inmates and wards to staff Conservation Camp Fire Crews.

IT IS FURTHER ORDERED that the California Conservation Corps report to CDF daily on the status of all its support crews for response to wildfires.

IT IS FURTHER ORDERED that OES review appropriate state departments to assure preparedness for response to wildfires.

IT IS FURTHER ORDERED that CDF and OES work closely with federal, state and local government agencies, bordering states, and the government of Mexico to maximize California's fire prevention and fighting capabilities.

This Order is not intended to, and does not create any right or benefit, substantive or procedural, enforceable in law or equity, against the State of California, its departments, agencies or other entities, its officers or employees, or any other person.

IT IS FURTHER ORDERED that as soon as hereafter possible, this order be filed in the Office of the Secretary of State and that widespread publicity and notice be given to this order.

IN WITNESS WHEREOF I have here unto set my hand and caused the Great Seal of the State of California to be affixed this the seventh day of May 2004.

Arnold Schwarzenegger

Governor of California

2/2

Glossary

ANCHOR POINT – An advantageous location, usually a barrier to fire spread, from which to start constructing a fireline.

AREA COMMAND – An organization established to: 1) oversee the management of multiple incidents that are each being handled by an incident management team (IMT) organization; or 2) to oversee the management of a very large incident that has multiple IMTs assigned to it. Area command has the responsibility to set overall strategy and priorities, allocate critical resources based on priorities, ensure that incidents are properly managed, and that objectives are met and strategies followed.

AVERAGE BAD DAY – Fire conditions experienced during typical mid-fire-season day. Used as a benchmark to gauge fire situations.

BACKFIRE – A fire suppression tactic. Any intentionally set fire used to consume the fuel in the path of a free burning wildfire.

BIA – Bureau of Indian Affairs

BLM – Bureau of Land Management

BRITISH THERMAL UNIT (BTU) – Amount of heat required to raise 1 pound of water 1 degree Fahrenheit (from 59.50 to 60.50 F), measured at standard atmospheric pressure.

CAL FIRE – California Department of Forestry and Fire Protection

CALMAC – California Multi-Agency Command. The information coordination center established in Sacramento. Tasked to gather timely information from regions, cooperating agencies, the media, the director, interested government leaders and the public.

CDF – California Department of Forestry and Fire Protection

CHAINS PER HOUR – A unit of measure commonly used to indicate the speed of the leading edge of fire as it moves across the landscape. One chain equals 66 feet. One chain per hour equals 66 feet per hour or approximately 1 foot per minute. A "chain" is a unit of distance measurement used in the public land survey system of the United States.

CHIEF OFFICERS – Agency Administrators, Fire Chiefs and other strategic level staff overseeing Incident Commanders.

CONTAINMENT – A fire is contained when it is surrounded on all sides by some kind of boundary but is still burning and has the potential to jump a boundary line.

CONTROLLED – A fire is controlled when there is no further threat of it jumping a containment line. While crews continue to do mop-up work within the fire lines, the firefight is over.

CONVECTION COLUMN – The rising column of gasses, smoke, fly ash, particulates and other debris produced by a fire.

COOPERATING AGENCY – An agency supplying assistance including but not limited to direct tactical or support functions or resources to the incident control effort.

CROWN FIRE – A fire that advances from top to top of trees or shrubs, more or less independently of the surface fire.

DEFENSIBLE SPACE – Creating a fire safe landscape for at least 30 feet around homes (and out to 100 feet or more in some areas), to reduce the chance of a wildfire spreading and burning through the structures. This is the basis for creating a "defensible space" - an area that will help protect your home and provide a safety zone for the firefighters who are battling the flames. It is required by California law.

DIRECT ATTACK – A method of fire suppression in which suppression activity takes place on or near the fire perimeter.

DIRECT PROTECTION AREA (DPA) – That area for which a particular fire protection organization has the primary responsibility for attacking an uncontrolled fire and for directing the suppression action.

DRAW DOWN LEVEL – The level where the success of extinguishing a fire with initial attack forces is compromised.

ENERGY RELEASE COMPONENT (ERC) – The computed total heat release per unit area (British thermal units per square foot) within the flaming front at the head of a moving fire.

ESF4 – Emergency Support Function 4. A component of the National Response Framework developed for FEMA.

ESRI – Environmental Systems Research Institute. A software company that produces software that is widely used to produce Geographic Information Systems maps on emergencies for analysis and display.

EXTREME FIRE BEHAVIOR – "Extreme" implies a level of fire behavior characteristics that ordinarily precludes methods of direct control action. One or more of the following is usually involved: high rate of spread, prolific crowning and/or spotting, presence of fire whirls, strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically, sometime dangerously.

FEDERAL NATIONAL TEAM – A Type 1 National Incident Management Team coordinated by the National Wildfire Coordinating Group (NWCG). Team members may be from various agencies. The California Wildfire Coordinating Group (CWCG) sponsors five of the 16 national teams.

FEDERAL REGIONAL TEAM – A Type 2 Incident Management Team maintained by the U.S. Forest Service in the Pacific Southwest Region (Region 5, California and the Pacific Islands). Team members may be from various agencies.

FEDERAL RESPONSIBILITY AREA (FRA) – the primary financial responsibility for preventing and suppressing fires is that of the Federal Government. These lands are generally protected by the Department of Agriculture, Forest Service, the Department of Interior, Bureau of Land Management, National Parks Service, US Fish and Wildlife Service, and Bureau of Indian Affairs.

FEMA – Federal Emergency Management Agency

FIRE DANGER RATING – A management system that integrates the effects of selected fire danger factors into one or more qualitative or numerical indices of current protection needs.

FIRE LINE – A strip of area where the vegetation has been removed to deny the fire fuel, or a river, a freeway or some other barrier which is expected to stop the fire. Hose lines from fire engines may also contribute to a fire being surrounded and contained.

FIRE PERIMETER – The entire outer edge or boundary of a fire.

FIRE REPORT – An official record of a fire, generally including information on cause, location, action taken, damage, costs, etc., from start of the fire until completion of suppression action. These reports vary in form and detail from agency to agency.

FIRE WEATHER – Weather conditions which influence fire ignition, behavior, and suppression.

FIRESCOPE – Firefighting Resources of California Organized for Potential Emergencies. A multi-agency coordination system designed to improve the capabilities of California's wildland fire protection agencies. Its purpose is to provide more efficient resource allocation and utilization, particularly in multiple or large fire situations during critical burning conditions.

FLANKS OF A FIRE – The parts of a fire's perimeter that are roughly parallel to the main direction of spread.

FMAG – Fire Management Assistance Grant. A federal assistance program managed by FEMA through the state Office of Emergency Services (OES). This program is designed to help state and/or local jurisdictions impacted by high cost, high damage wildland fires.

FUELS – Combustible material.

GACC – Geographical Area Coordination Center, see South Ops

GIS – Geographic Information System

HOTSHOT CREW – Intensively trained fire crew used primarily in hand line construction (Type-1).

INCIDENT COMMANDER – This ICS position is responsible for overall management of the incident and reports to the Agency Administrator for the agency having incident jurisdiction.

INCIDENT COMMAND SYSTEM (ICS) – A standardized on-scene emergency management concept specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.

INCIDENT COMMAND TEAM (ICT) – see Incident Management Team

INCIDENT MANAGEMENT TEAM (IMT) – The incident commander and appropriate general and command staff personnel assigned to an incident. Also known as an Incident Command Team.

INDIRECT ATTACK – A method of fire suppression in which suppression activities takes place some distances from the fire perimeter, and often advantage of fire barriers.

INFRARED (IR) – A heat detection system used for fire protection, mapping, and hotspot identification.

INITIAL ATTACK (IA) – An aggressive suppression action taken by first arriving resources consistent with firefighter and public safety and values to be protected.

INTERFACE ZONE – It is the area where the wildlands come together with the urban areas. Also referred to as the I-Zone.

INTERMIX ZONE – It is areas where homes are interspersed among the wildlands. Also referred to as the I-Zone.

JOINT INFORMATION CENTER (JIC) – An interagency information center responsible for researching, coordinating and disseminating information to the public and media. Formed through the MAST.

LIVE FUEL MOISTURE CONTENT -Ratio of the amount of water to the amount of dry plant material in living plants.

LRA – Local Responsibility Area

MACS – (Multi-Agency Coordination System) Is a combination of facilities, equipment, personnel, procedures, and communications integrated into a common system with responsibility for coordination of assisting agency resources and support to agency emergency operations.

MAFFS – Modular Airborne Firefighting System (Refers to the Military aircraft, C-130s, which are used as Air Tankers)

MAST – Mountain Area Safety Taskforce.

MODIS – (Moderate Resolution Imaging Spectroradiometer) – is a key instrument aboard the Terra and Aqua satellites. This instrument provided important intelligence for fire managers regarding fire perimeters and fire growth throughout the fire siege.

MOP-UP – Extinguishing or removing burning material near control lines, felling snags, and trenching logs to prevent rolling after an area has burned, to make a fire safe, or to reduce residual smoke.

MUTUAL THREAT ZONE (MTZ) – A geographical area between two or more jurisdictions into which those agencies would respond on initial attack. Also called mutual response zone or initial action zone.

NATIONAL FIRE DANGER RATING SYSTEM (NFDRS)- A uniform fire danger rating system that focuses on the environmental factors that control the moisture content of fuels.

NIFC – National Interagency Fire Center located in Boise, Idaho.

NPS – National Park Service

OES – The California Governor's Office of the Emergency Services.

OSC – (Operations Section Chief) The ICS position responsible for supervising the Operations Section. Reports to the Incident Commander. The OSC directs the preparation of unit operational plans, requests and releases resources, makes expedient changes to the Incident Action Plan as necessary and reports such to the Incident Commander.

PREDICTIVE SERVICES – Those Geographic Area and National-level fire weather or fire danger services and products produced by wildland fire agency meteorologists and intelligence staffs in support of resource allocation and prioritization.

PREPAREDNESS LEVELS – A national system of preparedness for incidents. The levels are 1 through 5. They are:

Preparedness Level 1 – Few or no active fires under 100 acres. Minimal or no commitment of fire resources. Low to moderate fire danger. Agencies above draw down levels.

Preparedness Level 2 – Numerous fires under 100 acres. Local commitment of resources for initial attack. Moderate fire danger. Agencies above drawdown levels and requests for resources outside local area are minimal.

Preparedness Level 3 – High potential for fires 100 acres & above to occur, with several 0-99 acre fires active. Fire danger moderate to very high. Mobilization of resources within the region and minimal requests outside of region. Agencies above or having difficulty maintaining draw down levels.

Preparedness Level 4 – Fires over 100 acres are common. Fire danger is high to very high. Resource mobilization is coming from outside the region. Agencies at minimum draw down levels.

Preparedness Level 5 – CALMAC is fully activated. Multiple large fires are common in the north and or the south. Fire danger is very high to extreme. Resources are being mobilized through the National Coordination Center. Activation of National Guard or military done or under consideration.

RED FLAG WARNING – Term used by fire weather forecasters to alert users to an ongoing or imminent critical fire weather pattern.

REHABILITATION – The activities necessary to repair damage or disturbance caused by wildfire or the wildfire suppression activity.

REOC - Regional Emergency Operations Center. A geographical coordination center consisting of staff, facilities and systems that administers or coordinates mutual aid. A region is an area made up of two or more counties.

ROSS - Resource Order and Status System: A national computer database system used by wildand fire agency dispatchers to track the current status of committed and available firefighting resources and to exchange mission-critical incident information between dispatch offices.

SANTA ANA WINDS – Is a type of Foehn wind. A Foehn wind is a warm, dry and strong general wind that flows down into the valleys when stable, high pressure air is forced across and then down the lee side slopes of a mountain range. The descending air is warmed and dried due to adiabatic compression producing critical fire weather conditions. Locally called by various names such as Santa Ana winds.

SOUTH OPS – The multi-agency geographic area coordinating center for Southern California. Located in Riverside, it is staffed by CDF, State OES and Federal fire agencies.

STRIKE TEAM - An engine strike team consists of five fire engines of the same type and a lead vehicle. The strike team leader is usually a captain or a battalion chief. Strike Teams can also be made up of bulldozers and handcrews.

SPOT FIRE OR SPOTTING – A small fire that is ahead of the main fire that is caused from hot embers being carried to a receptive fuel bed. Spotting indicates extreme fire conditions.

STATE RESPONSIBILITY AREA (SRA) - The California Board of Forestry and Fire Protection classifies areas in which the primary financial responsibility for preventing and suppressing fires is that of the state. CDF has SRA responsibility for the protection of over 31 million acres of California's privately-owned wildlands.

SLOP-OVER – A fire edge that crosses a control line or natural barrier intended to confine the fire. Also called breakover.

UNIFIED COMMAND – In ICS, unified command is a unified team effort which allows all agencies with jurisdictional responsibility for the incident, either geographical or functional, to manage an incident by establishing a common set of incident objectives and strategies.

WFSA – Wildland Fire Situation Analysis

WILDLAND/URBAN INTERFACE – The line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.

Acknowledgements: Project Team

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Photos in this document are provided from agency sources unless otherwise indicated.

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Red Flag Warnings & Fire Weather Watches

The National Weather Service issues Red Flag Warnings & Fire Weather Watches to alert fire departments of the onset, or possible onset, of critical weather and dry conditions that could lead to rapid or dramatic increases in wildfire activity.

A Red Flag Warning is issued for weather events which may result in extreme fire behavior that will occur within 24 hours. A Fire Weather Watch is issued when weather conditions could exist in the next 12-72 hours. A Red Flag Warning is the highest alert. During these times extreme caution is urged by all residents, because a simple spark can cause a major wildfire. A Fire Weather Watch is one level below a warning, but fire danger is still high.

The type of weather patterns that can cause a watch or warning include low relative humidity, strong winds, dry fuels, the possibility of dry lightning strikes, or any combination of the above.

During heightened fire danger, CAL FIRE will place additional firefighters on duty, staff more fire engines and keep more equipment on 24 hours a day to be able to respond to any new fires. CAL FIRE urges Californians to be extremely cautious, especially during periods of high fire danger. It's important all residents and vistors take steps to prevent wildfires. One less spark could mean one less wildfire. See below for tips on preventing wildfires.

California Fire Weather Map

Click on Map for Watches/Warnings Information

Red Flag News Releases

April 2015
- Strong Winds Prompt CAL FIRE to Increase Staffing

JANUARY 2014
- CAL FIRE Increases Staffing in Preparation for Strong Winds - Southern California Experiencing High Fire Danger

DECEMBER 2013
- CAL FIRE Prepares For Forecasted Winds & Increased Fire Threat

OCTOBER 2013
- CAL FIRE Increases Staffing in Preparation for Strong Winds

MAY 2013
- Record High Temperatures Lead to Heightened Fire Danger - Red Flag Warning Prompts CAL FIRE to Increase Staffing
- Strong Winds Prompt CAL FIRE to Increase Staffing Red Flag Warning Issued; Public Urged to be Cautious

OCTOBER 2012
- Strong Winds Prompt CAL FIRE to Increase Staffing

AUGUST 2012
- Dry Lightning Raises Northern California Fire Danger
- CAL FIRE Urges Extra Safety over Labor Day Weekend

JULY 2012
- CAL FIRE Issues Statewide Burn Ban - Dry Conditions and Increased Fire Activity Lead to Burning Suspensions

JANUARY 2012
- Dry Winter has CAL FIRE on Alert

2011
- CAL FIRE Steps Up Precautions Due to Forecasted Winds
- Dry Lightning Predicted for Central Coast and Southern California - CAL FIRE Increases Staffing
- Predicted Dry Lightning Raises Northern California Fire Danger - CAL FIRE Increases Staffing
- CAL FIRE Staffs Up as Fire Danger Increases - Homeowners asked to prepare for Wildfires

Communications Links

- News Releases
- Fire Safety Education
- Fact Sheets
- Communiqué Magazine Archives
- Multimedia
- Volunteers in Preventions (VIP)
- Teachers Tools
- Just For Kids
- Reports and Publications Library

Red Flag Warnings More Info

- Weather Service Fire Weather Page
- Defensible Space
- Equipment Use Fact Sheet (187k PDF)
- Campfire Tips (108k PDF)
- Camping Safety Fact Sheet (147k PDF)
- Homeowner's Checklist (191k PDF)

One Less Spark - One Less Wildfire: A few helpful reminders and safety tips include:

1. Equipment Use Safety

- Never mow or trim dry grass on a Red Flag Warning Day. (Mow before 10 a.m. on a day when its not hot and windy).
- Never use lawn mowers in dry vegetation.
- Spark arresters are required in wildland areas on all portable gasoline powered equipment.

2. Campfire Safety

- Before starting a campfire, make sure you have a campfire permit and that they are permitted on the land you are visiting.
- Afterwards, ensure that your campfire is properly extinguished.

3. Defensible Space

- Residents should make sure they have 100 feet of defensible space around structures.
- Clear dead weeds and vegetation.
- Remove leaves and needles from gutters.
- Trim branches 6 feet from the ground.

4. Vehicle

- Never pull over in dry grass.
- Ensure trailer chains don't drag on the ground.
- Make sure your vehicle is properly maintained.
- Have proper tire pressure to avoid driving on wheel rim.
- Never let your brake pads wear too thin.

5. Other

- Make sure cigarette butts are properly extinguished.
- Never burn landscape debris like leaves or branches on NO Burn Days or when it's windy or areas where not allowed.
- Target shoot only in approved areas, use lead ammunition only, and never at metal targets.
- Report any suspicious activities to prevent arson.

For more fire prevention tips visit a www.PreventWildfireCA.org.

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5.4 Downslope Windstorms of San Diego County: Sensitivity to Resolution and Model Physics*

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1. Introduction

The "Santa Ana" is a dry, sometimes hot, offshore wind directed from the Great Basin and Mojave Desert over the mountains and through the passes of Southern California (cf. Sommers 1978; Small 1995). Its season extends from September to April (Raphael 2003), and the winds evince terrain amplification of the mountain gap and downslope varieties (Huang et al. 2009; Hughes and Hall 2010). Fast winds combine with low relative humidities to produce substantial fire danger especially in the autumn season before the winter rains have begun (Sommers 1978; Westerling et al. 2004). Chang and Schoenberg (2011) showed that while fires occur through the year in Los Angeles, large fires cluster in the September-November time frame (see their Fig. 2). Although some attention has been paid to the phenomenon (e.g., Conil and Hall 2006; Jones et al. 2010), it remains the literature on the subject is surprisingly thin given the meteorological and economic importance of the winds.

On 21 October 2007, at or before 1930 UTC (1230 PDT), the Witch Creek fire started at 33.083083°N, 116.694139°W[1], one of 27 Southern California blazes driven by an especially strong Santa Ana wind event. Ignition was apparently caused by sparking power lines located roughly 20 m above ground level (AGL). The fire spread rapidly and merged with other blazes, becoming one of the largest in California history. This study emerged from a need to estimate ignition time and event maximum wind speeds at Witch, a location for which no meteorological data were available, but this report will focus narrowly on the peak event winds and sensitivity of Weather Research and Forecasting (WRF) model's Advanced Research WRF (ARW) core wind speed estimates to resolution and model physics.

*13th WRF Users Workshop, June 2012

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[1]This location was confirmed with San Diego Gas and Electric. The California Department of Forestry and Fire Protection report lists two different origins, one clearly erroneous and the other on Hwy 78 near Witch Creek mountain, a few km from the actual ignition site.

2. Wind gust estimates

Central to this effort is the estimation of wind gusts from model output, as these short period bursts are the most likely cause of the kind of property damage that caused the Witch fire. However, models of the present type cannot capture the small-scale turbulent motions involved in gust production. Thus, model reconstructions should be compared to observed sustained winds, and gusts have to be parameterized in some fashion. Three different strategies for computing wind gusts are pursued, representing empirical, theoretical and practical approaches.

The simplest procedure is to multiply the resolved-scale wind V by a gust factor (GF) empirically determined from available observations. A typical GF for well-exposed locations in relatively smooth terrain is about 1.4, although this will depend on the gust sampling interval (3 sec is typical), the averaging period applied to the sustained wind (2 min for Automated Surface Observing System, or ASOS, stations), and possibly other factors. Wieringa's (1973) formula for a 3 sec gust

$$G \approx V + 3\sigma_u$$

presumes a normal distribution of wind fluctuations with a standard deviation σ_u that can be sampled in the field or derived from theory. It is sometimes taken as $\sigma_u \approx 2.5u^*$ (Burton and Coauthors 2011), where the friction velocity u^* is a measure of the vertical shearing stress expressed in units of wind speed (e.g., Lumley and Panofsky 1964).

The friction velocity itself depends on the speed of the sustained wind at the lowest model level V_a, the surface roughness length z_0, and the stability, and becomes relatively large on lee slopes during Santa Ana events owing to high winds and relatively low stability very near the ground. Models also use the friction velocity to estimate the wind ($F10$) at standard anemometer height (10 m) based on V_a. Since u^* and $F10$ are not completely independent, this leaves the gust factor basically a function of surface roughness and stability. Over relatively smooth terrain with $z_0 \approx 0.01$ m, $F10 \approx 16u^*$, which implies a GF of about 1.5 in neutrally stable conditions. The European Center for Medium-range Weather Fore-

casts uses the following friction velocity-based formula for nonconvective situations[2]:

$$G = \mathrm{F10} + 7.71u^*.$$

This "EC gust" again yields a GF of 1.5 over smoother surfaces.

Our practical gust estimate is termed WSMAX (for wind speed maximum), and represents the fastest resolved scale wind within the lowest six model levels above the ground (about 600 m at Witch), based on the idea that turbulence can transport high momentum air downwards. This is a simpler version of an idea advanced by Brasseur (2001). WSMAX will overestimate the gust in stable conditions, or whenever a sufficiently effective vertical transport mechanism is lacking. It may underestimate gusts in other situations, as it presumes no further acceleration by subgrid topography or other factors. The vertical distance was determined via inspection of model output, and is tailored for downslope conditions at Witch. In this situation, the fastest wind is always located very close to the surface above Witch, usually in the lowest four levels.

3. Wind corridors, wind shadows, and available surface observations

Figure 1 presents the event maximum estimated EC gust from a WRF simulation employing three domains telescoping down to 6 km horizontal grid spacing over Southern California. The simulation was initialized with the North American Regional Reanalysis (NARR; Mesinger et al. 2006) and used the YSU PBL and RUC surface parameterizations. At this resolution, the topography is fairly smooth. Note the prominent wind corridors and the equally striking wind shadows occupying much of the urban areas of Los Angeles and San Diego. Note further that the fire ignition sites are found in the wind corridors, most of which are associated with terrain gaps including the Soledad, Cajon and San Gorgonio Passes.

The terrain near the Witch Fire, however, has no pronounced gaps but this is where the simulation's strongest gusts appeared, with values exceeding 40 m/s (90 mph). Yet, the maximum wind gusts *observed* in the vicinity (Fig. 2) topped out at only 26 m/s (59 mph). We will show that the flow across the Witch and nearby Guejito fire sites had many characteristics of a classic downslope windstorm (cf. Klemp and Lilly 1975; Durran 1986) and the terrain-accelerated flow was strongest in the immediate vicinity of the Witch ignition site. Furthermore, there are reasons to be skeptical of the representativeness of the observed winds, especially at the Remote Automated Weather Station (RAWS) sites.

First, RAWS stations measure the wind at a height of only 6.1 m (20 ft) AGL, and report ten-minute average winds once per hour, which leaves over 80% of the hour unsampled for the sustained wind. Other factors being equal, RAWS winds should be slower than those from ASOS stations, most of which report 10 m (33 ft) winds each minute, averaged over a two-minute period. In validation exercises, adjustments dependent on vertical stability and surface roughness have to be made to the model's standard 10 m wind diagnostic to avoid a false conclusion of overprediction. Also keep in mind the relevant height for Witch is 20 m, so the winds should be even stronger than at 10 m anyway.

Additionally, even a cursory examination of RAWS site photos hosted by the Desert Research Institute (DRI)[3] reveals numerous stations shielded by buildings and/or trees, among other siting issues. The most important RAWS station for the Witch event is Goose Valley (GOSC1), as it is located immediately downwind and downslope from the ignition location. At this writing, there are no photos for GOSC1 on the DRI website, but Google Earth reveals the station is partly shielded by tall trees when the winds have an easterly component (Fig. 3), as occurs during Santa Ana events.

These trees appear to significantly slow the sustained wind during Santa Ana episodes. Subsequent to October 2007, the San Diego Gas and Electric (SDGE) company deployed numerous stations at wind-prone areas in the county, including several in the immediate vicinity of Witch. These stations adhere to the RAWS wind standard (10 min averages taken at 6.1 m height) but report every 10 min. One such station, GOSSD, is presently located 0.7 km down Black Canyon Road from GOSC1, but is better exposed to the winds[4]. During a moderately strong Santa Ana wind event in December 2011, GOSSD's winds were about 80% faster than those at the nearby RAWS station (Fig. 4), based on the arguable assumption that they would report calm winds simultaneously, and its gusts were 40% stronger (not shown).

In August 2010, station WCKSD was installed near Witch Creek mountain, 4.2 km southwest and 244 m downslope from the Witch ignition site. This station was in place for a moderately strong Santa Ana wind event that occurred in early February 2011. At 26.8 m/s (60 mph), WCKSD reported the fastest gust in

[2]http://www.ecmwf.int/research/ifsdocs/CY37r2

[3]http://www.raws.dri.edu/

[4]Before November 2011, GOSSD was sited even closer to GOSC1, in a less well-exposed area intended to mimic the RAWS installation (S. Vanderburg, pers. comm.).

the entire region (Fig. 5). Note that this value was 30% stronger than for the Goose Valley RAWS and 81% larger than the fastest gust recorded at Ramona airport. However, note further that the wind speeds reported at the ASOS and RAWS are considerably below those recorded during October 2007 (33 vs. 56 mph, or 14.8 vs. 35 m/s, for Ramona, for example). This was a significantly less intense event.

4. Sensitivity to resolution

Terrain gap and downslope flows are significantly modulated by the shape of the topography, which is in turn dependent on the resolution of the model grid and the topographic database. Resolution sensitivity is demonstrated using four simulations, employing grid spacings of 667 m, and 2, 6 and 10 km. The finest grid, shown in Fig. 6a (also seen in Figs. 2 and 5), employs a very high resolution (≈10 m) terrain database that is available from USGS. This dataset sharpens up some of the topographic features, and overall it compares very well with the terrain as rendered within Google Maps (not shown).

In particular, note the presence of a narrow northeast-southwest oriented canyon immediately east of Witch, and an even narrower north-south canyon very close to the Guejito site. It is conceivable that these terrain features are important to the winds at the ignition sites, in which case they should be resolved. These features are notably absent in the 2 km topography (Fig. 6b), which utilized the 30 sec USGS terrain database, but otherwise the rendition appears acceptable. Note, however, that further resolution degradation profoundly changes the slope of the terrain west of the ridge (Figs. 6c, d). At 6 km, Ramona's small valley has been smoothed away (Fig. 6c). The coarsest grid flattens the ridge into a mesa, and pushes Witch up onto it (Fig. 6d).

Figure 7 presents hourly time series of near-surface winds from simulations employing the topographic representations shown in Fig. 6. The simulations were made using WRF version 3.2 with the YSU PBL and thermal diffusion (TD) surface scheme, initialized with the NARR. For Witch, the model-diagnosed 10 m wind is shown, although we already mentioned the relevant height for this site is 20 m. For Ramona, the winds were reduced to 7.9 m using the logarithmic wind profile with a surface roughness length $z_0 = 0.01$ m, which the TD scheme uses in late October for the USGS land use category applicable to the site (category 9, shrubland/grassland). (A small urban area, category 1, resides immediately east of the airport.) In neutral conditions, which is valid for most of the event, this represents a downward adjustment of 3%.

At 10 km resolution (Fig. 7a), the model suggests winds peaked at about 26.8 m/s (60 mph) for Ramona airport. These are raw model outputs, and so should be compared to the *sustained winds* at the site, as the model cannot resolve the small-scale turbulence that drives wind gusts. Yet, the 10 km reconstruction greatly exceeds the fastest sustained wind observed, which was only 17.4 m/s (39 mph). It also exceeds the fastest observed gust, which was 24.6 m/s (55 mph). Even more importantly, the 10 km simulation is suggesting the winds were stronger at Ramona than at the Witch ignition site. This immediately seems quite unreasonable, especially given recent observations provided by the SDGE mesonet.

The 6 km simulation (Fig. 7b) predicts roughly equal winds at Ramona and Witch, although the model's sustained winds still compare better to the observed gusts at the airport. With a 2 km grid spacing, in contrast, the model suggests Witch's sustained winds were 50% stronger than at Ramona. Note the model reconstruction at the airport no longer systematically exceeds the event maximum value, and the sustained winds at Witch are comparable to Ramona's strongest *gusts*. The ignition site was well-exposed to winds from the east and northeast, so the gusts at Witch could be expected to be about 40% larger than the sustained wind, representing a gust factor of about 1.4, which yields an event maximum gust of about 37.6 m/s (84 mph). This gust factor is supported by observations at SDGE station WCKSD during the moderately strong 1-3 February 2011 Santa Ana wind event (Fig. 8).

Finally, we see intermittently stronger winds appear in the 667 m simulation (Fig. 7d), but the overall magnitude and evolution of the event resembles the 2 km result far better than the latter compared with the 6 and 10 km reconstructions. The sustained winds at Ramona do not exceed the maximum observed values, and a peak gust at Witch of about 42 m/s (94 mph) might be anticipated from a gust factor of 1.4. We will soon see the reason why the winds increased at Witch in this simulation is that we began resolving relatively high frequency wave activity that can act to amplify the resolved-scale winds, and thus the unresolvable gusts as well.

Vertical cross-sections, taken west-east across Witch, demonstrate why the coarser resolution simulations overpredict the winds at Ramona, and underpredict them farther upslope (Fig. 9). Shown is the horizontal wind field at 1900 UTC 21 October, shortly before the Witch fire onset. For the 667 m simulation (Fig. 9a), the fastest wind speed in the plane at this time is 27 m/s (60 mph), located immediately above Witch. The red shaded area depicts where Richardson number is less than 0.25. It is conceivable that small scale eddies, unresolvable even at

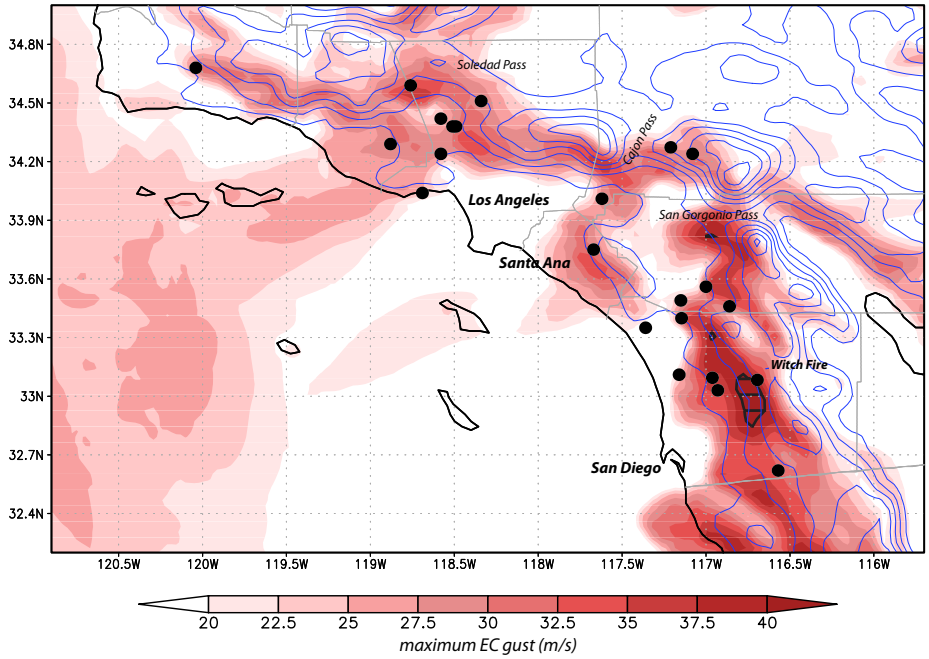

Fig. 1: Event maximum EC wind gusts (colored) for the October 2007 Santa Ana wind event from a 6 km WRF-ARW simulation. Values exceeding 40 m/s (90 mph) are hatched. Topography shown in blue (300 m contours). Black dots indicate locations of most ignition sites; Witch fire site is labeled. Only part of the 6 km domain shown.

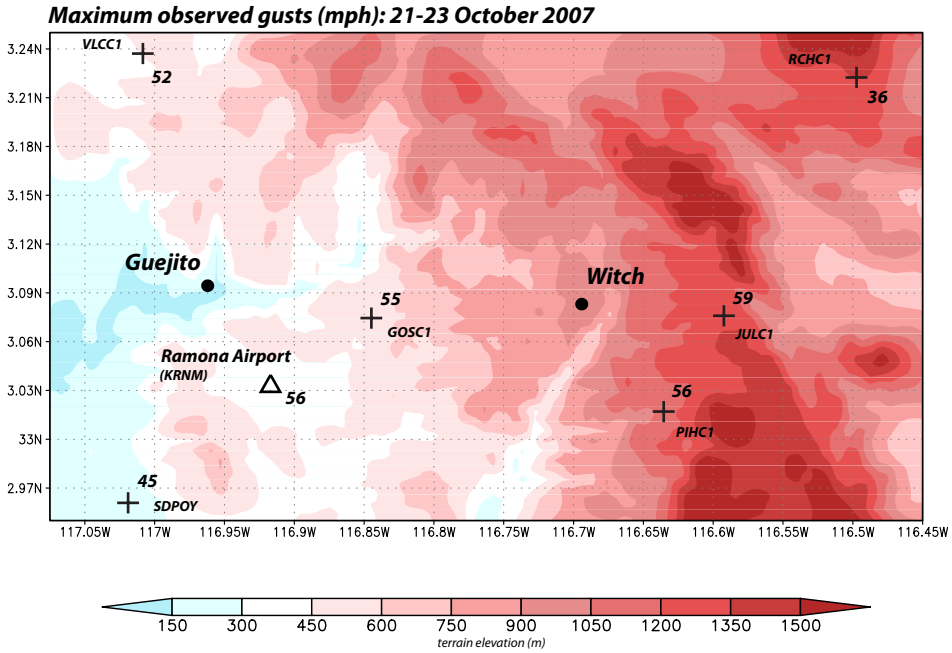

Fig. 2: Maximum observed gusts (mph) for the 21-23 October 2007 period, superposed on topography for 667 m Domain 5. Stations with names ending with "C1" are RAWS sites. Locations of the Witch and Guejito fires are indicated.

Fig. 3: Satellite imagery of the Goose Valley RAWS (GOSC1) immediate area. From Google Earth.

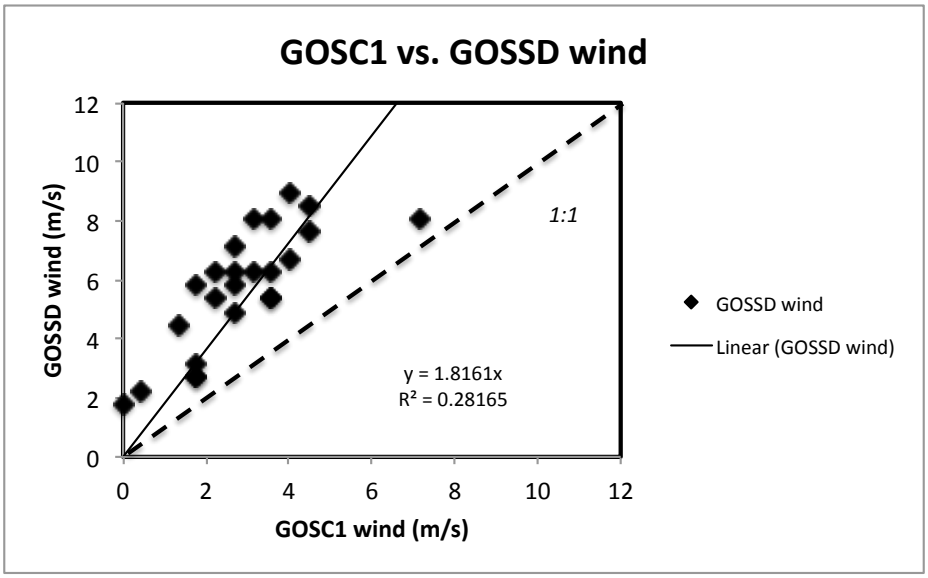

Fig. 4: Scatterplot of hourly sustained winds measured at the Goose Valley RAWS (GOSC1) and SDGE (GOSSD) sites for the period between 00 UTC 6 December to 00 UTC 7 December 2011, with zero-intercept least squares and 1:1 correspondence lines. If the single strongest hourly observation at GOSC1 is removed, the slope of the no-intercept least squares line becomes 2.00 with an R^2 of 0.6, and the fit with intercept is 4.0+1.44*GOSC1, with $R^2 = 0.7$.

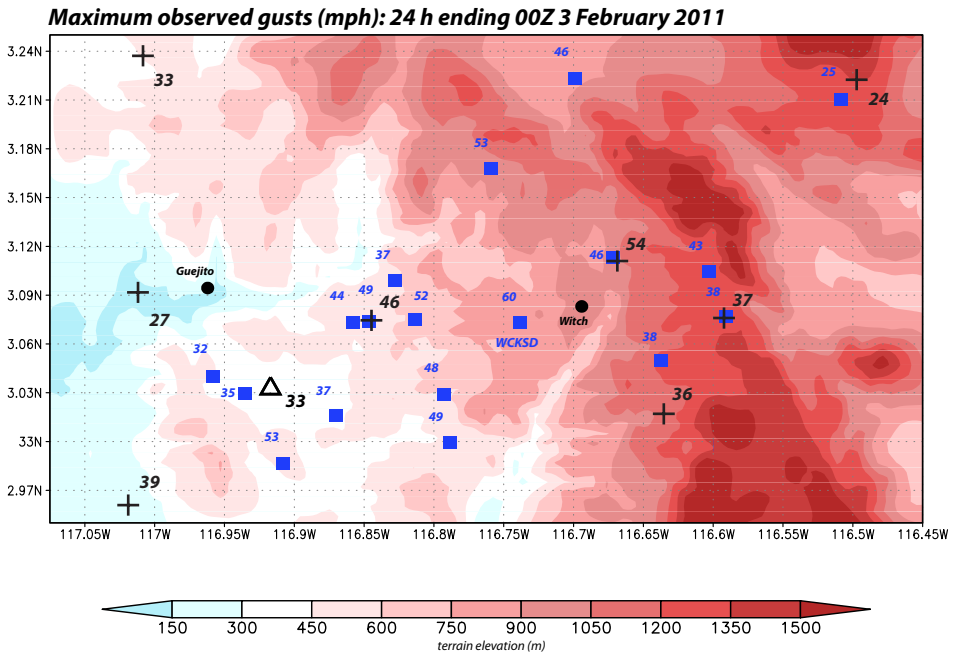

Fig. 5: As in Fig. 2, but for the 2 February 2011 Santa Ana wind event. Blue markers indicate SDGE stations; WCKSD is labeled. GOSSD, near GOSC1 (see Fig. 2), was not in its present location during this event.

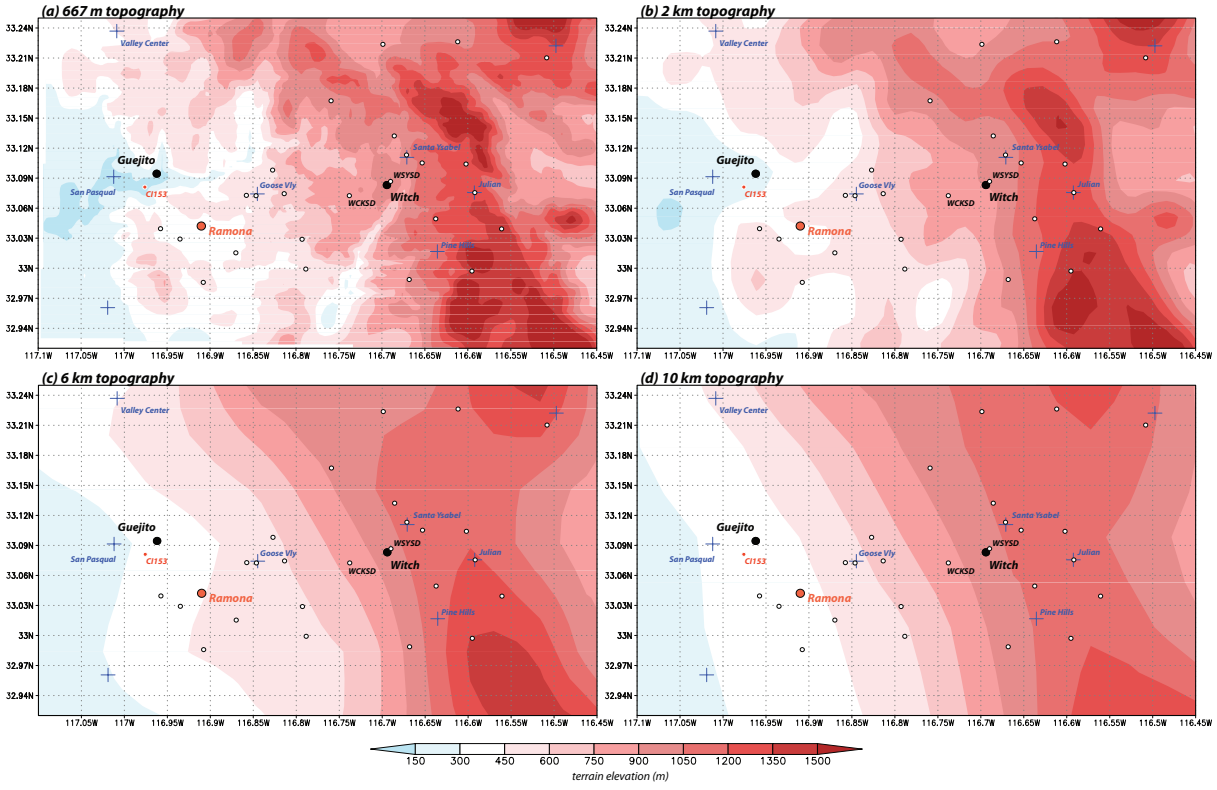

Fig. 6: Topography of the Witch area as rendered in model simulations with maximum resolution of: (1) 667 m; (b) 2 km; (c) 6 km; and (d) 10 km. Small black and white circles indicate some SDGE stations; WCKSD and WSYSD are labeled. WSYSD is located 0.6 km from the ignition site, at the same elevation, but was not installed until August 2011.

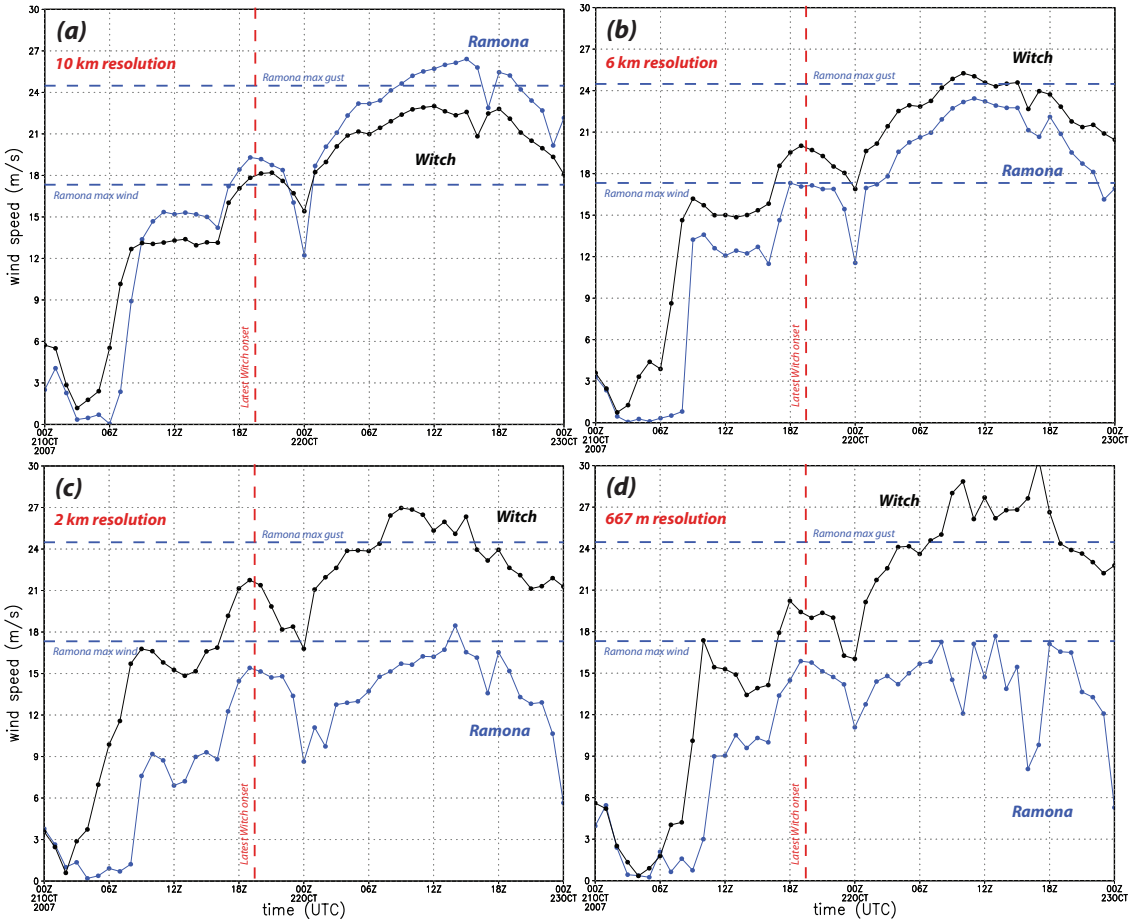

Fig. 7: Time series of hourly simulated at 7.9 m for Ramona and 10 m for Witch, for four simulations differing by the finest grid spacing over the Witch region. At Ramona, the diagnosed 10 m wind was adjusted via the standard logarithmic wind profile. Observed maximum gust and sustained wind at Ramona indicated.

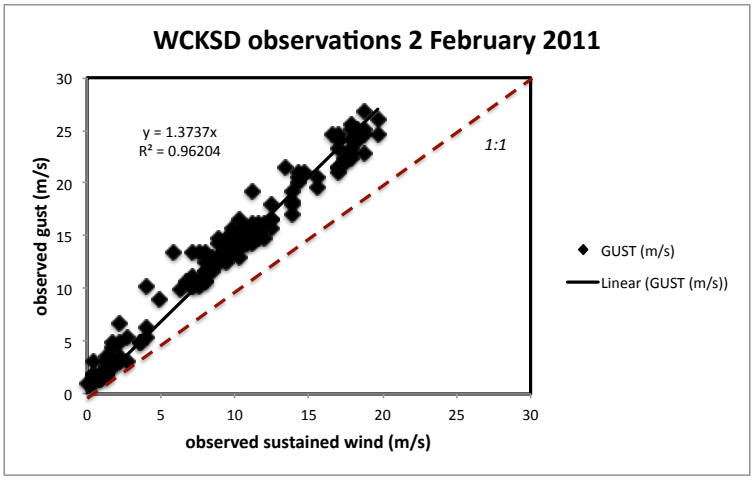

Fig. 8: Observed winds vs. gusts (m/s) at WCKSD for 2 February 2011, based on 10 min sustained winds and 5 sec maximum gusts, both reported every 10 min, with zero-intercept least squares and 1:1 correspondence lines.

this grid spacing, could become established at the top of the high-wind layer and cause the downward transport (if not further amplification) of momentum, enhancing the already fast winds above the ignition site.

Comparing this result with the other panels of Fig. 9, we see that as the grid spacing becomes coarser, the terrain-accelerated flow becomes substantially larger in horizontal extent (although not stronger), and the fastest wind speeds are found farther down the lee slope. In the 10 km simulation, we see why the winds are stronger above Ramona than Witch. As suggested in Fig. 6d, Witch is located on the broadened ridge. If one's goal is to assess wind speeds at a particular time and place, accurately resolving the terrain shape is of paramount importance. Based on these results, it is concluded that grid spacing wider than 2 km cannot reliably place the fastest winds at the most likely correct locations.

5. Sensitivity to model physics

Hundreds of simulations were made for this study, which has included variations in the initialization data source (including NARR, NNRP, FNL, NAM analyses and forecasts, RUC, CFSR, ERA-INTERIM datasets), WRF-ARW model version (3.2 through 3.4), model start time, grid and topographic resolution, and the size, configuration and placement of the model nests. The physics sensitivity simulations in this section were made with WRF version 3.4 using five domains telescoping to 667 m grid spacing in the Witch-Guejito vicinity, and initialized with NARR at 0000 UTC 21 October 2007. The finest resolution domain is slightly larger than shown in Figs. 2 and 6a.

Observations recorded every minute at the Ramona ASOS station are shown in Fig. 10 (grey curve), up until the station ceased reporting at 1931 UTC on the 22nd[5]. There are two peaks, nearly corresponding with the Witch and Guejito fire ignitions, and the maximum value of 17.4 m/s (39 mph) occurs during the second surge. A WRF reconstruction using the YSU PBL and RUC surface schemes is superimposed (black curve), derived from approximately one-minute outputs. This is one of 16 members of a physics ensemble that varied the PBL (also including MYJ, QNSE, and ACM2) and surface (also comprising TD, Pleim-Xiu or PX, and Noah) parameterizations, and was selected as the benchmark run on the basis of this figure.

The event appears to start several hours early in the simulation, but congruence with the observations is acceptable after about 1500 UTC on the 21st, at which time the surface layer becomes (and remains) neutrally stable. The simulation has little high-frequency temporal variation, at least at first. The higher-frequency episode that commences around 0800 UTC on October 22nd is the subject of Sec. 7.

[5]Although these are one-minute data, the sustained winds plotted represent two-minute averages.

Table 1: Roughness lengths employed by the surface schemes for USGS land use category 9 in the late October simulations in YSU, ACM2 runs.

Surface scheme	Roughness length (m) in October
TD	0.01
Noah	0.024
RUC	0.11
PX	0.20

Figure 11 incorporates the remaining ensemble members from this experiment. It is clear that the ensemble spread is very large. All of the members start the event too early, and several consistently overpredict the winds through the period shown while others indicate speeds that are much too low during the core of the event. This could be very discouraging, but two things need to be noted: (1) the ensemble spread is smaller and less important at Witch; and (2) the variation of the winds at Ramona is largely a function of how the surface scheme handles the roughness of the lee slope.

The first point is illustrated in Fig. 12, which presents the WSMAX gust estimates at Witch, for comparison with the sustained winds at Ramona. The ensemble spread is relatively small, as all members produce a downslope windstorm with winds peaking above or near Witch. The vertical cross-sections in Fig. 13 are valid at 0900 UTC 22 October, which is near the event peak. In addition to the YSU/RUC benchmark (Fig. 13b), the other two members selected include YSU/Noah (Fig. 13a) and ACM2/PX (Fig. 13c), which produce the strongest and weakest winds at Ramona, respectively (see next section). As far as Ramona is concerned, the principal difference among these simulations is how far downslope the strong winds remain relatively close to the surface. The variation closer to Witch is comparatively minor.

The largest contributor to the variation of simulated sustained winds at Ramona is the roughness length specified by the surface scheme (Table 1). The local landscape is dominated by USGS land use category 9 (scrubland/grassland). As mentioned earlier, the TD scheme uses the wintertime z_0 value listed in LANDUSE.TBL of 0.01 m, which seems small. The Noah scheme reads data from VEGPARM.TBL and applies a somewhat larger value for this landuse type. The RUC and PX schemes treat scrubland

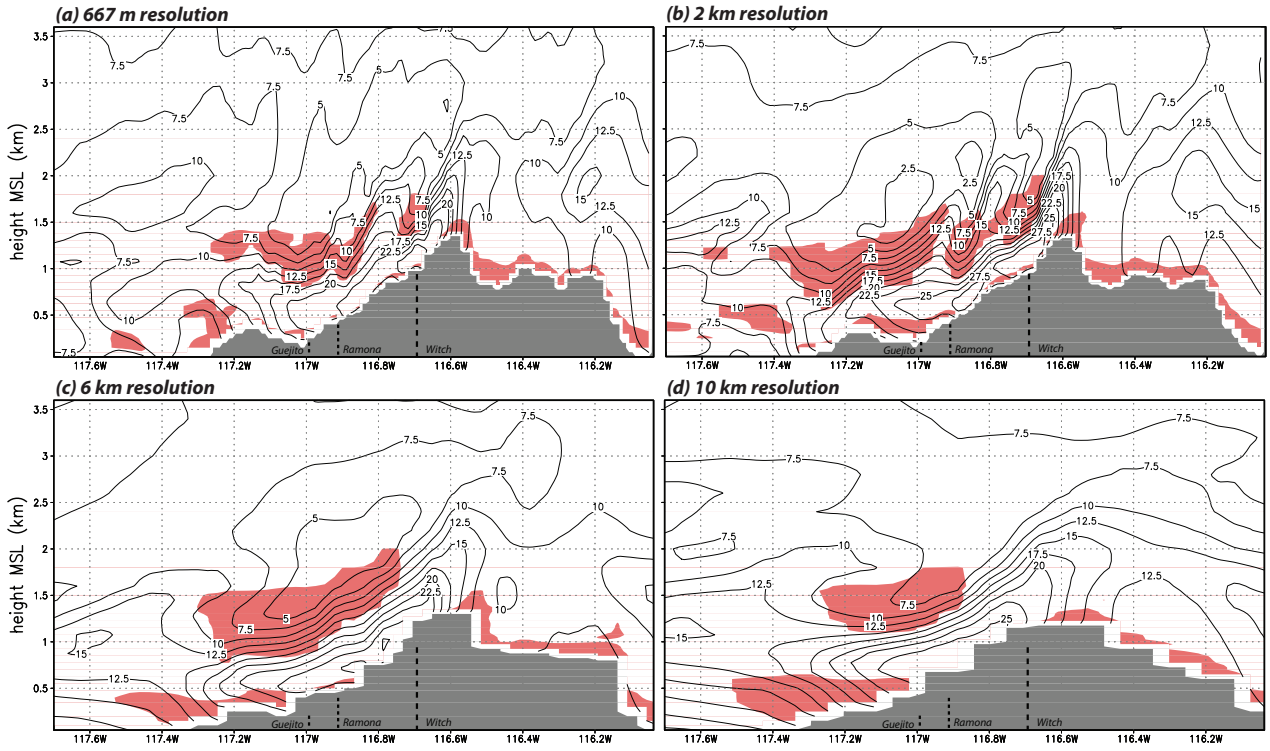

Fig. 9: Vertical cross-sections of horizontal wind speed (2.5 m/s contours) for 1900 UTC 21 October 2007, taken west-east across Witch for the simulations shown in Fig. 7. Red shaded field indicates where Richardson number Ri < 0.25; grey shaded area depicts topography. Approximate locations of Witch, Ramona and Guejito are shown. Guejito and Ramona reside 1.3 km north and 5.1 km south, respectively, of the plane shown. The 667 m simulation shown in panel (a) is taken from the 2 km parent domain, for conformity with the other panels.

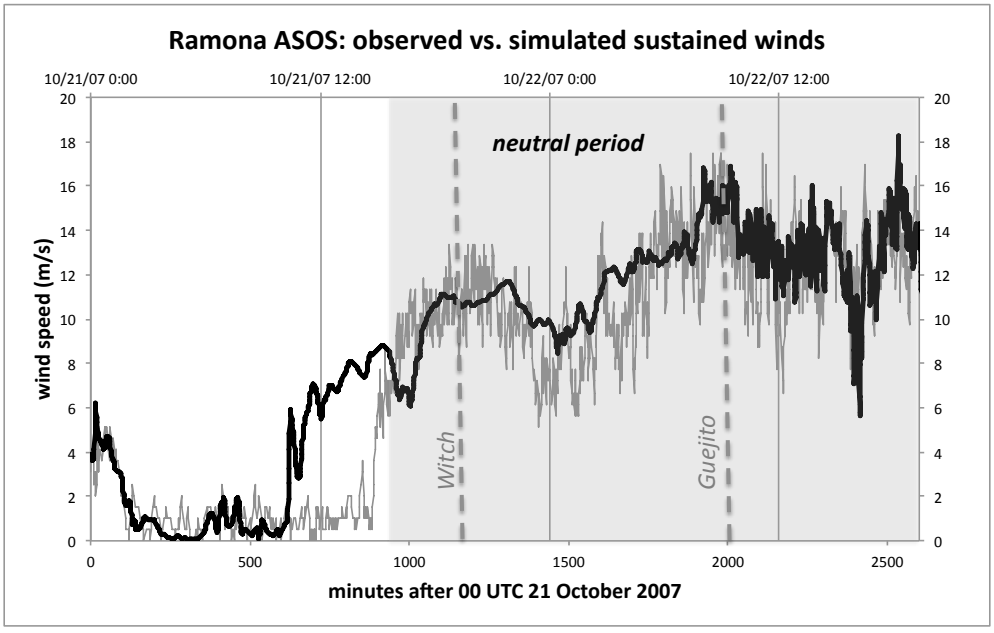

Fig. 10: Time series of observed (grey) and simulated (black) winds at Ramona airport, commencing at 0000 UTC 21 October 2007. The observed winds are two-minute average sustained winds measured at 7.9 m AGL, reported every minute. The model winds are instantaneous 10 m values, adjusted for the anemometer height, and plotted approximately every minute (59 s), from a NARR-initialized (benchmark) simulation using the YSU PBL and RUC surface schemes. The grey-shaded area represents the time period for which the surface layer possesses neutral stability in the simulation. Ramona stopped reporting at 1931 UTC 22 October, the time at which this plot ends. Witch and Guejito fire onset times marked.

and grassland as 11 and 20 times rougher than TD, and yield the slowest winds at Ramona[6].

The Noah scheme results in the largest winds at Ramona in part because it gives a smaller roughness to the urban area (Ramona city) immediately upwind of the ASOS station. A test was carried out in which a YSU/TD simulation was repeated with a LANDUSE.TBL modified to use the RUC scheme's z_0 values for all categories. This simulation resulted in much slower winds at Ramona than observed through the peak of the event, although winds at Witch were little affected (not shown). Although validation is important, there may be less value in the effort than usually presumed, and it is possible incautiously trusting the observations leads one to some erroneous conclusions.

6. Maximum gust estimates for Witch

Table 2 presents maximum event gust estimates for Witch from the 667 m ensemble. The GF gust was created by applying a gust factor of 1.4 to the 20 m wind V_{20}, which was derived from V_a via the logarithmic wind profile

$$V_{20} = V_a \frac{\ln(20/z_0) - \psi_{20}}{\ln(Z_a/z_0) - \psi_a}.$$

In the above, $Z_a \approx 26$ m is the height of the lowest model level and ψ_x are stability functions. The EC gust may be less applicable at other altitudes, and by its nature, WSMAX is height-independent.

The estimated maximum gust range listed on Table 2 is 38-49 m/s (85-110 mph). Among the three estimates, WSMAX is the only one that *directly* incorporates information above the lowest model level and, apart from the PX scheme members, produces the smallest gusts. The WSMAX range, at 41-45 m/s (93-100 mph), is also relatively small. Although the Witch fire started hours before the event peak, our interest here is in the maximum, and a reasonable estimate for the fastest gust at the Witch site is about 43 m/s or 96 mph.

7. High-frequency episode near the event peak

All of the 667 m ensemble members possess a high-frequency episode that commences around 1000 UTC 22 October, around the event peak, and lasts for hours (cf. Fig. 10). West-east vertical cross-sections past Witch over a 6 minute period from the benchmark run reveal the temporal variation is associated with a wave-like feature forming over, and then passing downwind, of Witch with a phase speed of roughly 12 m/s and a period of about 8 min. These

[6]MYJ and QNSE recompute $F10$ with an "effective z_0" which increases the diagnosed wind speed. The effect appears to be proportional to z_0 but is cosmetic.

Table 2: Estimated maximum event gusts at Witch (m/s). (MYJ, QNSE values based on pre-adjusted z_0.)

Surface	PBL	WSMAX	EC gust	GF gust
TD	YSU	43	46	49
TD	ACM2	43	45	47
TD	MYJ	44	41	46
TD	QNSE	44	43	46
NOAH	YSU	42	46	48
NOAH	ACM2	44	45	47
NOAH	MYJ	44	42	45
NOAH	QNSE	44	44	47
RUC	YSU	41	45	43
RUC	ACM2	44	47	45
RUC	MYJ	43	42	43
RUC	QNSE	44	43	44
PX	YSU	45	46	39
PX	ACM2	42	46	40
PX	MYJ	44	44	41
PX	QNSE	43	42	38

appear to be gravity waves, mechanically forced by a shear instability (note region of Ri < 0.25) immediately above the high wind layer that are trapped within the downsloping flow, and are very well resolved both spatially and temporally. Thus, this phenomenon is ostensibly similar to the high frequency disturbances discussed in Scinocca and Peltier (1989) and Smith (1991).

The waves did not form in the 2 km simulations, although some (lower frequency) oscillations did appear (not shown). Therefore, higher resolution appears necessary to capture this feature, These waves deserve further study as it is clear that they represent locally concentrated zones of horizontal velocity that could be transported vertically the surface turbulence, further amplifying near-surface gusts.

8. Concluding discussion

From close inspection of WRF model simulations, we have seen that the infamous Santa Ana wind event of October 2007 possessed many characteristics of downslope windstorms in the Laguna mountains of San Diego county. The terrain-amplified flow was largest in the immediate vicinity of the ignition site of the Witch Creek fire, as long as the regional topography is adequately rendered. Model horizontal grid spacings wider than 2 km were determined insufficient to properly capture the terrain shape. The simulations were sensitive to model physics, mainly due to variations in the surface roughness that determines how far downslope the accelerated flow can remain close to the ground. High resolution simulations reveal the event peak was also marked by relatively high-frequency, well-resolved gravity waves apparently provoked by shear instability immediately above the downsloping flow. This feature is likely relevant to gustiness and deserves further study.

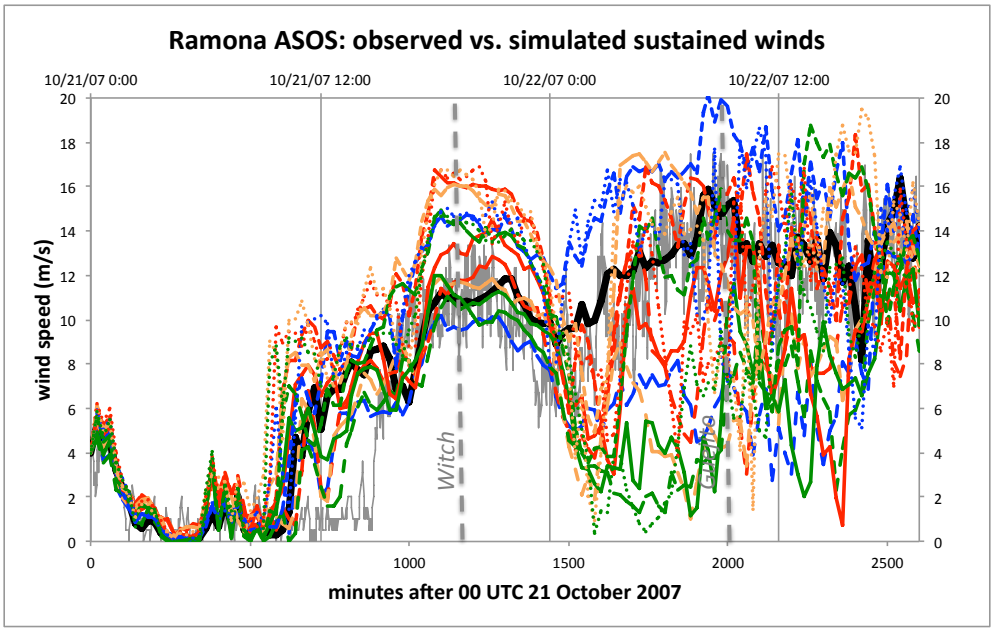

Fig. 11: As in Fig. 10, but including the remaining ensemble members. Simulated winds are based on 20 min outputs. Benchmark run highlighted.

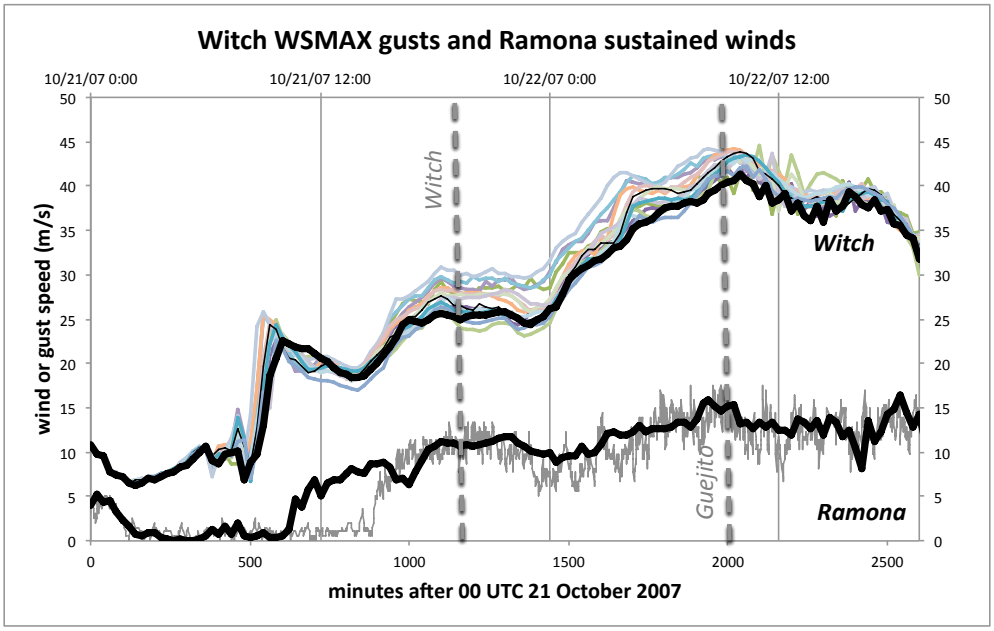

Fig. 12: As in Fig. 11, but for the WSMAX gust estimates at Witch. The benchmark run is highlighted. Sustained winds observed and simulated in the benchmark run for Ramona included for comparison. Based on 20 min outputs. By its nature, WSMAX partially masks the high-frequency episodes.

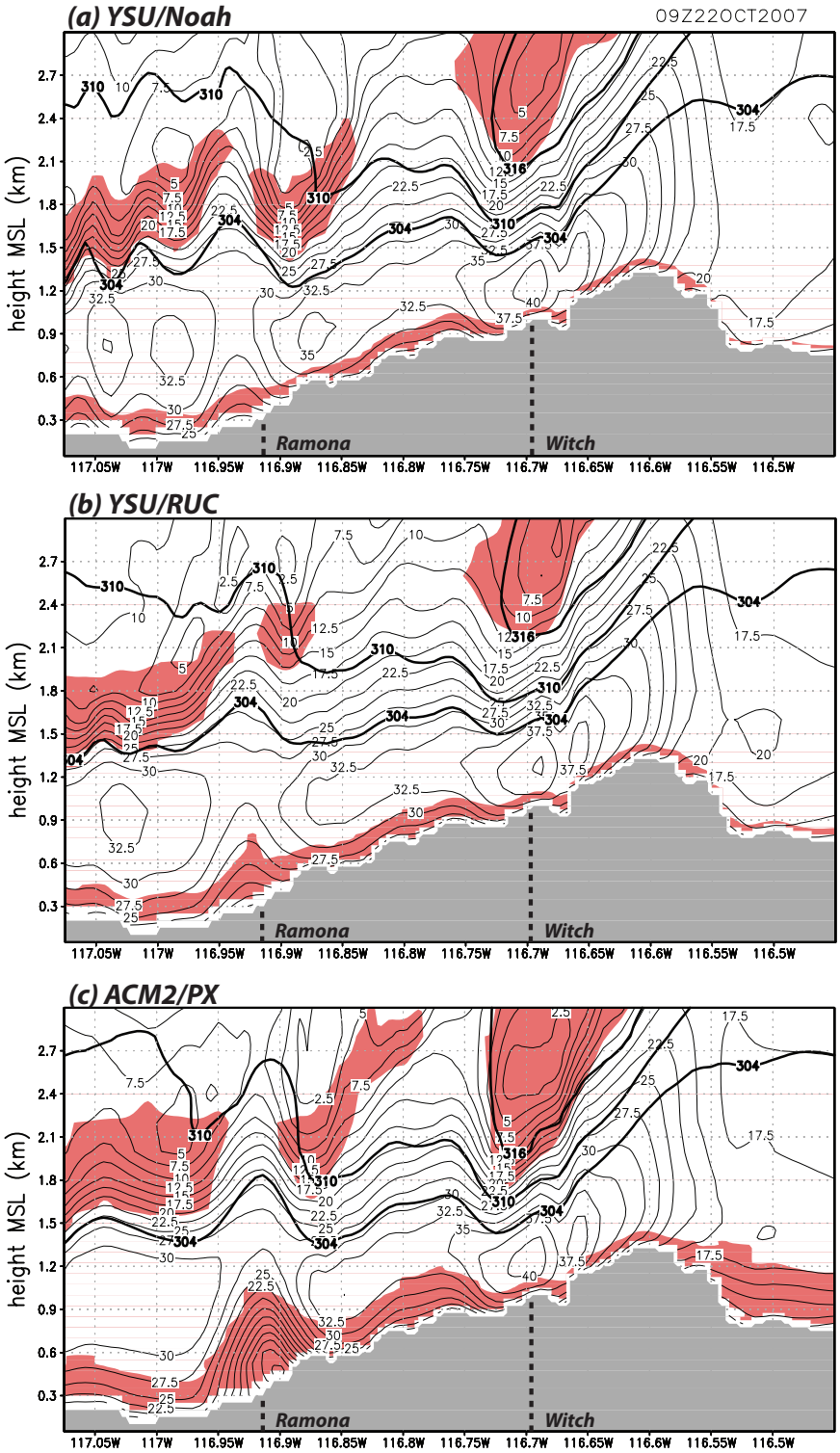

Fig. 13: Similar to Fig. 9, but horizontal velocity (2.5 m/s contours) for three members of the 667 m ensemble, at 0900 UTC 22 October 2007. Thick black contours are the 304, 310 and 316 K isentropes. The shaded field shows where Richardson number < 0.25. Members are: (a) YSU/Noah; (b) YSU/RUC (benchmark); and (c) ACM2/PX.

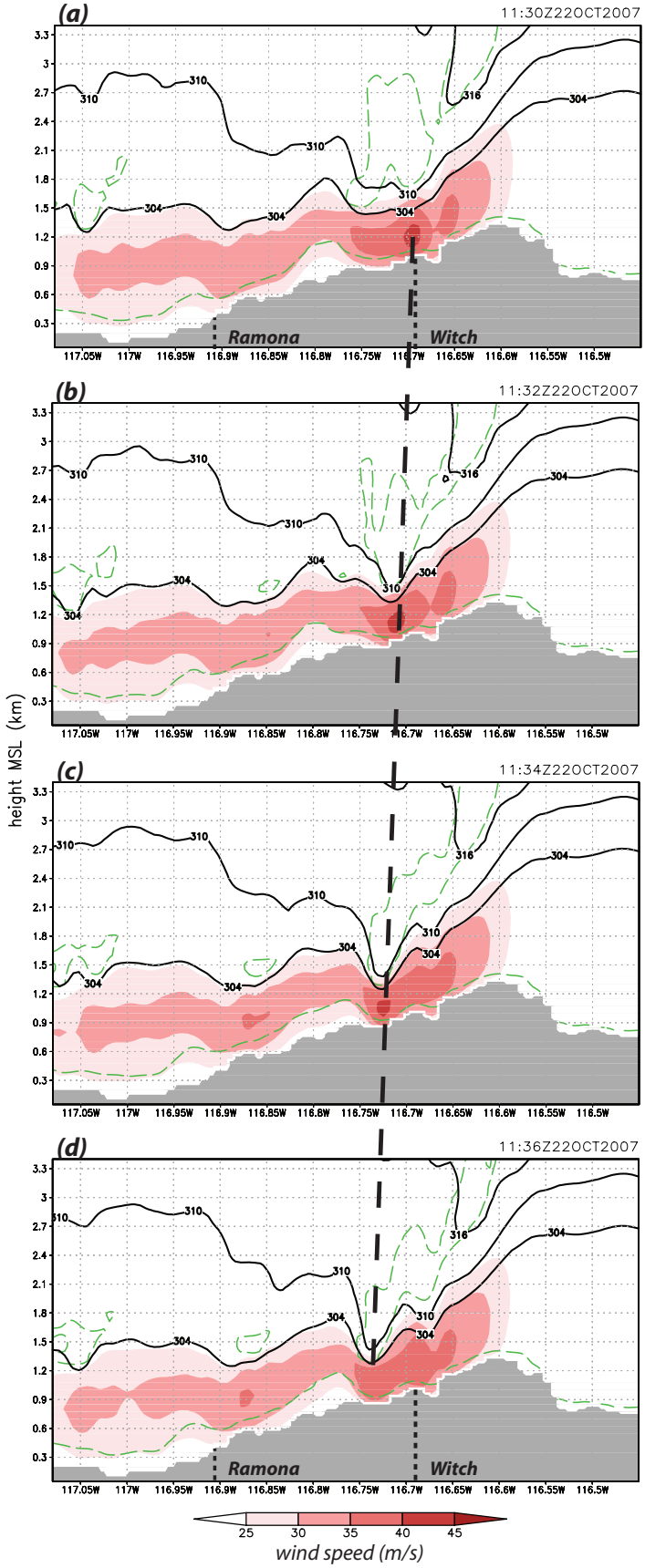

Fig. 14: Similar to Fig. 13, but for 667 m benchmark run (YSU/RUC), at four times during the high-frequency episode. Shaded field is horizontal wind speed (m/s). Thick black contours are the 304, 310 and 316 K isentropes. The green contour encloses are with Richardson number < 0.25.

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Lessons from the October 2003 Wildfires in Southern California

Jon E. Keeley, C.J. Fotheringham, and Max A. Moritz

ABSTRACT

The Southern California fires of late Oct. 2003 burned 742,000 ac and destroyed 3,361 homes and 26 lives. Factors leading up to this event were very different between forests, which comprised about 5% of the area burned, and shrublands. Three lessons are (1) although these fires were massive, they were not unprecedented, and future fires of this magnitude are to be expected; (2) the current fire management policy is not effective at preventing these massive fires; and (3) future developments need to plan for these natural fire events much the same way we currently incorporate engineering solutions to earthquakes and other natural catastrophes.

Keywords: firestorm; fuel mosaics; historical fires; Santa Ana winds; policy

The southern California fires of late Oct. 2003 were, cumulatively, the single largest event in California's recent history. Over 742,000 ac (300,000 ha) burned during one week, and in many cases fires burned right up to the edge of heavily urbanized areas, or worse right through neighborhoods at the wildland-urban interface. A total of 3,361 homes and 26 lives were lost in this event. It is without a doubt the costliest disaster to befall California, exceeding previous fires, earthquakes, and other natural disasters. Understanding the factors leading up to this event and the appropriate human response necessary to reduce the chances of a repeat of these catastrophic impacts is the focus of this article.

Separating Forest Fires from Shrubland Burning

These southern California fires burned through diverse plant communities. The proportion of different vegetation types was not proportional to the media coverage and thus there is widespread belief that these were forest fires. However, coniferous forests comprised only about 5% of the total acreage burned (frap.cdf.ca.gov). Media focus on these forest fires was undoubtedly due to the fact that they burned in unnaturally intense and spectacular crown fires in forests with important recreational value and relatively high-density housing.

Factors leading up to these forest fires are quite different from those responsible for the bulk of the 742,000

ac burned that week. Prior to settlement of the region, the mixed conifer forests in southern California, like similar forest types throughout the Southwest, apparently experienced a natural fire regime of frequent mostly low-intensity surface fires (Allen et al. 2002). Fire suppression policy has been very effective at excluding fires from these forests for three reasons: the montane climate results in a shorter fire season, ignitions are commonly from lightning, under weather conditions not usually conducive to rapid fire spread, and surface fuels produce lower flame lengths. These characteristics have led to a highly successful fire suppression campaign that can be equated with fire exclusion. As a consequence, there has been an unnatural accumulation of surface fuels, coupled with increased density of young shade-tolerant trees (Minnich et al. 1995). Increased density of young trees is perhaps the most serious problem because these saplings act as ladder fuels that change fire behavior from surface fires to crown fires. As with most of our Western Forests, southern California conifer forests have been logged one or more times (Dodge 1975, Minnich 1988), and this may have had a greater impact on creation of ladder fuels than fire exclusion, although no one has clearly sorted out the relative contributions. Ladder fuels were certainly a critical factor in determining property damage from these recent forest fires (Figure 1).

Figure 1. **Remains of cabin in southern California San Bernardino Mountains burned by the Old Fire in Oct. 2003 (photo by J. Keeley).**

Other factors contributed to the fire hazard in southern California coniferous forests. In the past few years, there has been an extraordinarily severe drought that has resulted in major mortality, particularly in pines. This regionwide drought and subsequent pine mortality was a factor in the severity of the 2002 Rodeo-Chedeski Fire in Arizona as well. Estimates for some parts of the southern California San Bernardino Forest are that three-fourths of the pines were killed by a combination of drought followed by subsequent bark beetle infestation. Conventional wisdom suggests that this massive mortality was also a byproduct of fire suppression because the increased density of saplings intensified competition for water. The presumption is that if these forests had retained their natural fire regime, the lower tree density would have resulted in much greater survival during the recent drought. This is consistent with our understanding of tree ecophysiology; however, it should be noted that observations do not indicate there to be a strong correlation between percentage prefire mortality and tree density (John Regglebrugge, USDA Forest Service, Dec. 2003), which would be expected if fire suppression had caused unnaturally intense competition for water. However, the lack of correlation could also indicate that even the lowest density forests were stressed due to over-stocking of young trees.

Shrubland Burning

Chaparral and related shrublands dominated most of the landscape burned during the Oct. 2003 fires. There is ongoing debate over whether such massive fires are natural but infrequent events in the chaparral ecosystem or are the result of modern fire suppression, as appears to be the case with conifer forests. The 2003 firestorm is relevant to this debate, providing an important case study that we can learn from and use to guide rebuilding efforts and future management activities.

The dominant paradigm governing

fire management in southern California shrublands has long been the model that presumes fire suppression has successfully excluded fire and caused an unnatural accumulation of fuels (Minnich 1983, Minnich and Chou 1997). This model assumes that the age and spatial pattern of vegetation are strong constraints on fire spread, even during periods of extreme fire weather. These authors propose that large chaparral wildfires are modern artifacts of fire suppression and they can be eliminated by landscape-scale rotational burning (Minnich and Dezzani 1991, Minnich 1998). Fire management plans for USDA Forest Service national forests in southern California all have incorporated aspects of this model (Conard and Weise 1998).

The primary support for this model is a demonstration of larger fires north of the US border than observed on similar landscapes in Baja California. This model has been questioned on a variety of grounds. Foremost is the observation that despite heroic efforts by firefighters during the 20th century, fire suppression policy has failed to reduce the natural fire frequency and, as a consequence, fuels are not unnaturally old and fire rotation intervals are between 30 and 40 years (Conard and Weise 1998, Keeley et al. 1999, Keeley and Fotheringham 2001, Moritz 2003). An emerging view is that large fires under extreme fire weather conditions are only minimally constrained by the age and spatial patterns of fuels, and this appears to hold over broad regions of central and southern California (Moritz et al. 2004).

Southern California shrublands are an anomaly because, unlike many western US forests, fire suppression policy cannot be equated with fire exclusion. The primary reason is because this region has what fire climatologists have labeled as the worst fire climate in the country (Schroeder et al. 1964). While it is generally true that massive fires anywhere in the West are accompanied by severe fire weather, in southern California these fires typically occur during the autumn Santa Ana winds. These foehn winds reach speeds of 50–60 miles per hour and occur every autumn at the end of a 6-month drought. Under these conditions, firefighters are forced into defensive actions and can do very little to stop these firestorms.

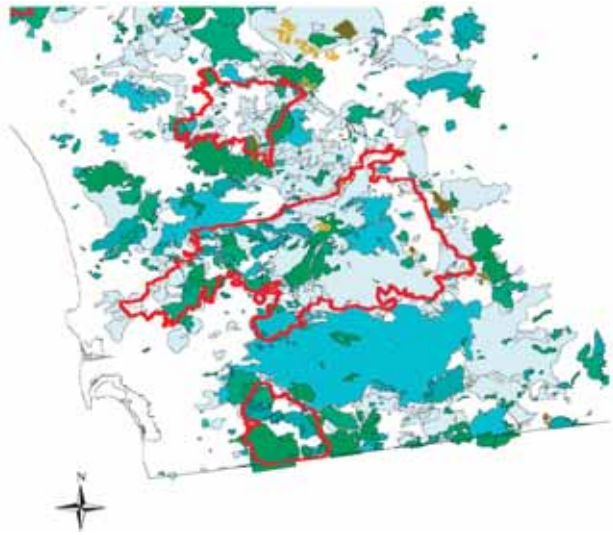

Figure 2. **Fuel mosaics within the perimeters of the 2003 fires in San Diego County, California, which demonstrate that the 2003 fires burned through a variety of fuel ages. Three fire perimeters shown are, from north to south: the Paradise, Cedar, and Otay Fires (data from frap.cdf.ca.gov).**

Lessons Learned

Three lessons can be extracted from the 2003 fire event: 1) Although these fires were massive, their size was not unprecedented, and thus we can expect similar fire events in the future, 2) The current fire management policy is not effective at preventing these massive fires, and 3) Future developments need to plan for these natural fire events much the same way we currently incorporate engineering solutions to earthquakes and other natural catastrophes.

Lesson 1. The firestorm during the last week of Oct. 2003 was a natural event that has been repeated on these landscapes for eons (Mensing et al. 1999, Keeley and Fotheringham 2003). While the recent 273,230-ac Cedar Fire (Figure 2) was the largest in California since official fire records have been kept, there are historical accounts of even larger fire events. For example, during the last week of Sept. 1889, a Santa Ana wind-driven fire east of Santa Ana in Orange County, California reportedly burned 100 miles north and south and 10-18 miles in width (Los Angeles Times, Sept. 27, 1889). This event would have been three times larger than the recent Cedar Fire. Collectively, Sept. 1889 would have exceeded all of the Oct. 2003 burning because there was another fire that ignited that week near Escondido in San Diego County and in 2 days the same Santa Ana winds blew it all the way to downtown San Diego (Barrett 1935), a distance roughly equal to the long axis of the recent Cedar Fire (Figure 2). The primary difference between these fires is that California's population has grown about 30-fold during this period (www.census.gov) and urban sprawl has placed huge populations adjacent to watersheds of dangerous fuels (Figure 3). Because over 95% of all fires on these landscapes are started by people, there has been a concomitant increase in fire frequency and increased chance of ignitions during Santa Ana wind events (Keeley and Fotheringham 2003).

The important lesson here is that massive fires have occurred at periodic intervals in the past and likely will occur again in the future. It may be more useful from a planning and management perspective to see these events as we currently view 100 year flood events or other such cyclical disasters.

Lesson 2. Currently fire management is based on a philosophy that fuel management practices can control the ultimate size of these massive fire events. This philosophy characterizes the response to catastrophic fires on the California landscape for the past half century, and despite this policy there has been an ever increasing loss of prop-

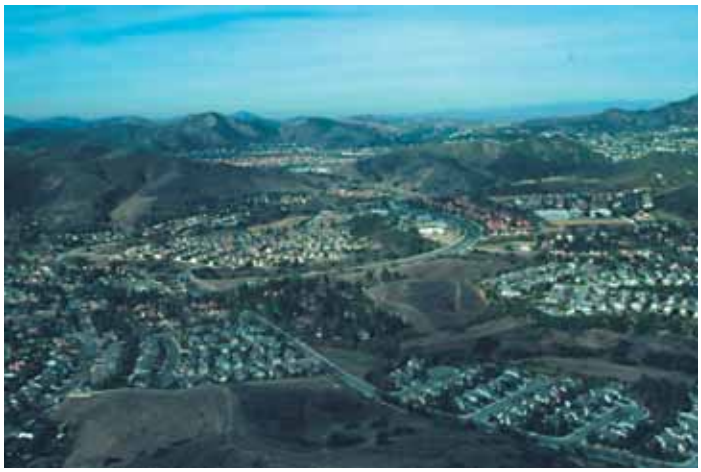

Figure 3. **Typical wildland-urban interface mix in southern California (NPS photo).**

erty and lives due to wildfires. The preferred treatment is prescription burning, applied on a rotational basis across the landscape. Theoretically, fuel reduction treatments are expected to prevent large wildfires by creating fuel mosaics that include patches of young fuel, which theoretically are expected to act as barriers to fire spread. The extent to which landscape level fuel treatments are effective is a function of weather conditions during the fire event. Under extreme weather conditions, there is overwhelming evidence that young fuels, or even fuel breaks (e.g., Figure 4), will not act as a barrier to fire spread. This is quite evident for the recent fires. Crossing nearly the entire width from north to south of the east-west burning Cedar Fire were substantial swaths of vegetation that were less than 10 years of age, not just in one but two parts of that fire (Figure 2). The Otay Fire exhibited the same phenomenon (Figure 2); the fire burned through thousands of acres that were only 7 years of age. The primary reason young fuels cannot act as a barrier to fire spread under these severe weather conditions is that if the high winds do not push the fire through the young age classes, they will spread the fire around them, or jump over them from fire brands that can spread up to a mile or more.

This does not mean there is no role for fuel manipulations in the southern California fire management arsenal, but their application needs to be carefully considered if they are to be effective and provide benefits equal to or exceeding their cost. For example, some fires burning under calm wind conditions have been documented to burn out when the fire encounters young fuels, and the lack of wind limits the likelihood of fire brands jumping these young fuels. These fires, however, seldom present major problems for firefighting crews, and do not pose a major threat to the loss of property and lives. Thus, serious attention needs to be paid to whether or not fuel treatments are cost-effective for these fires.

The key to effective use of prefire fuel manipulations in crown-fire eco-systems such as chaparral is their strategic placement. Under severe weather, lower fuel loads will not stop the spread of fire, but they do reduce fire intensity and thus provide defensible space for fire suppression crews. Thus, the key benefit is to enhance firefighter safety and therefore strategic placement is critical to their success. Much of the southern California shrubland landscape is far too steep to provide defensible space regardless of fuel structure, and thus fuel manipulations in these areas are unlikely to provide economically viable benefits. Fuel manipulations will be most cost-effective when focused on the wildland-urban interface. This is increasingly the case as the interface increases in extent and complexity, diverting fire fighting resources away from direct attack on these configurations. Often times during severe fire weather homes are lost because firefighters refuse to enter areas that lack a sufficient buffer zone of reduced fuel to provide defensible space. In terms of management goals, the metric for fuels treatments on these shrubland landscapes needs to change from simply measuring "acres treated" to consideration of their strategic placement, and this change in management philosophy is being recommended by the largest National Park Service unit in southern California (Marti Witter, Santa Monica Mountains National Recreation Area, Oct. 2003).

Fuel manipulations, in particular rotational prescription burning, may have some beneficial impacts on postfire events because younger fuels are associated with reduced fire severity, and this may affect both vegetation recovery and sediment losses. Extensive studies of postfire recovery following the 1993 fires in southern California found that the impact of high-severity fires was variable, with both positive and negative impacts on postfire recovery (Keeley 1998). Thus, it would be premature at this point to conduct expensive fuel treatments with the expectation of producing major changes in postfire recovery. Recent comparisons of sediment loss from chaparral watersheds have provided evidence that rotational burning at 5-year intervals has the potential for greatly decreasing the immediate postfire sediment loss (Loomis et al. 2003). However, in the long run this may not be cost-effective for several reasons. One critical determinant of sediment loss is the first winter precipitation, high rainfall years being particularly damaging. Prescription burning at 5-year intervals greatly increases the chances of fires being followed by an El Niño year of high rainfall, relative to fires at the normal return interval of 35 years. In addition, the cumulative sediment loss over the long term would be much greater for 5-year burning intervals because there would be multiple peak discharges over the normal 35-year interval. Perhaps most importantly, burning at 5-year intervals will almost certainly effect type conversion to alien grasslands, which in addition to having negative resource impacts would greatly increase the chances of slope failure in many of these very steep watersheds.

Lesson 3. Californians need to embrace a different model of how to view fires on these landscapes. Our response needs to be tempered by the realization

Figure 4. **Prefire fuel breaks that failed to act as barriers to fire spread during the Cedar Fire. These were adjacent to Scripps Ranch where hundreds of homes were destroyed (photo by J. Keeley).**

that these are natural events that cannot be eliminated from the southern California landscape. In this respect, we can learn much from the science of earthquake or other natural disaster management. No one pretends they can stop them, rather they engineer infrastructure to minimize impacts.

Fire management needs to do more to convey to the public their limitations in stopping massive Santa Ana wind-driven fires. For much of the past half century we have had a false belief that how or where we allowed new developments was irrelevant to fire safety because fire managers could prevent fires from burning across the wildland-urban interface. Undoubtedly there has been substantial pressure on fire managers to convey an overly confident image and not to highlight their limitations. These recent fires should be recognized as a wake up call to the fact that there are inherent limitations to containment of Santa Ana wind-driven fires.

Some newspaper accounts have suggested that the conservation planning efforts in southern California contributed by allowing the close juxtaposition of developments and natural habitats. While there may have been isolated instances where this was the case, there is evidence that effective preserve design assisted in reducing the loss of human life and structures. The overriding goal of habitat management planning is to create significant size areas that provide contiguous habitat and are not infringed on by development. This goal is very consistent with increasing fire safety for the public. The best example of where this planning process worked well is the Otay Fire (Figure 2), which burned a substantial portion of a contiguous habitat management area and no expensive homes or lives were lost. Allowing development on an island within this preserve would have meant setting structures within indefensible boundaries.

Conclusions

In summary, fire science tells us there will be other massive wildfires on the southern California landscape. Fire management activities cannot prevent these large fires; however, through a combination of buffer zones and better planning, we may be able to engineer an environment that minimizes their impact on property and lives.

There are two important realities to fuel management at the wildland-urban interface that will potentially cause problems in the future. One is the increasing complexity of landownership and different management goals of neighbors. Fuel clearances necessary to ensure structure survival may not always be possible because of alternative management goals by neighbors. Perhaps a bigger problem is the skyrocketing cost of fuel manipulation treatments, illustrated by the recognition that fuel treatments in many western US forests may need to remove larger commercially valuable timber to pay for treatments. However, extraction of commercial products is not an option for chaparral shrublands, and thus some creative thinking will be required to pay for the necessary buffer system needed to protect urban developments. An important area for future research is the use of normal features of develop-

ment infrastructure as buffers. For example, in southern California many new developments are built around golf courses or recreational parks. However, placing these on the periphery could act as an important barrier to fire spread. Making these designs part of the developers responsibility would have value added in that it would encourage less fingering of developments into dangerous wildland fuels because such configurations would increase the costs of buffer zone construction.

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A Brief History of the Santa Ana Winds

Nathan Masters October 25, 2012

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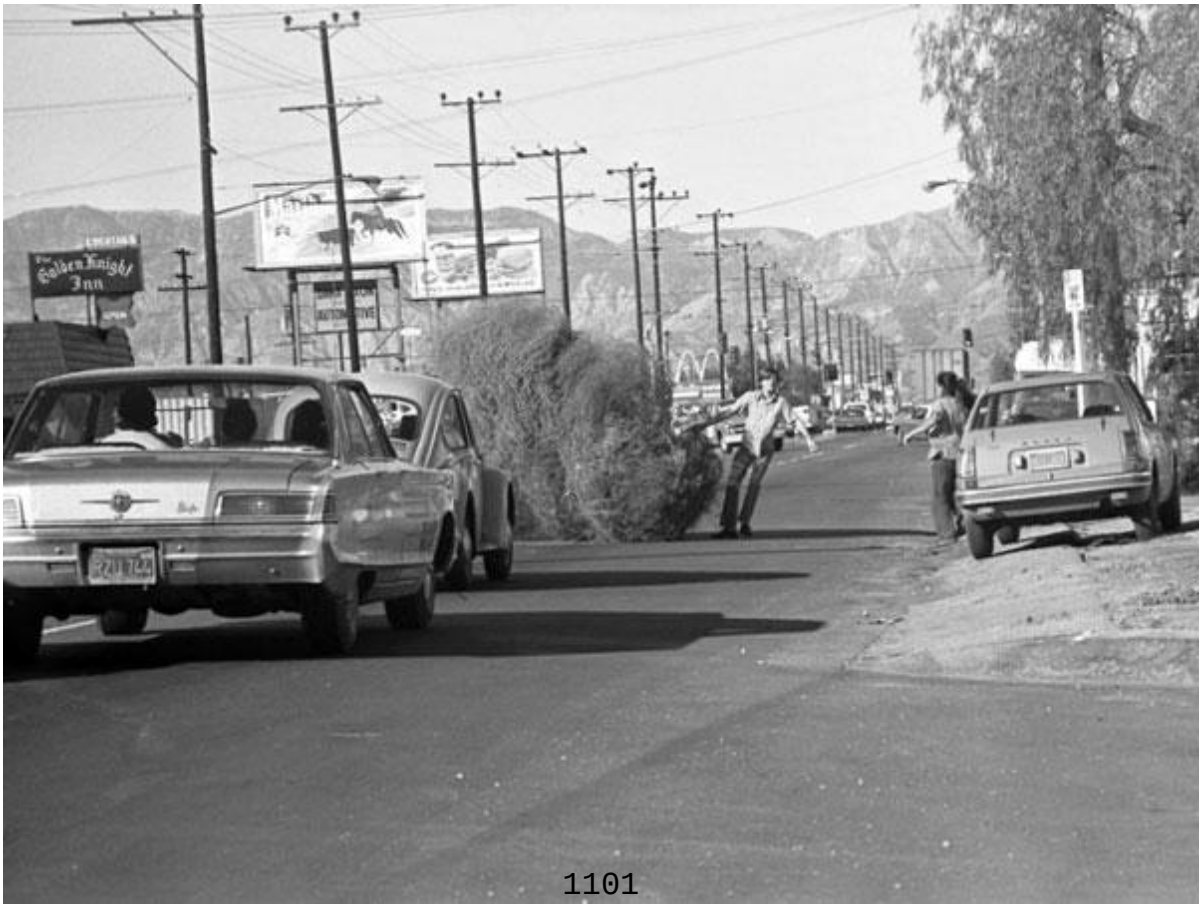


A giant tumbleweed blocks traffic on Lankershim Blvd. in North Hollywood on Jan. 23, 1974. Courtesy of the Los Angeles Times Photographic Archive, Department of Special Collections, Charles E. Young Research Library, UCLA. Used under a Creative Commons license.

Triggering allergies, fraying nerves, and alarming fire-prone communities, the Santa Ana winds have long been a fact of life in Southern California -- the unadvertised price residents pay for the region's otherwise idyllic weather. And though the winds -- which arrive in the fall, peak in December, and depart in the spring -- are invisible to photographers' lenses, cameras have recorded the destruction this recurrent weather phenomenon has wrought throughout the region's history.

Southern California usually sits in a delicate climatic balance. On one side, the chilly waters of the Pacific, transported from Alaska via the California Current, stabilize air temperatures and provide a ready source of moisture. On the other, a palisade of mountains blocks the extremes of the desert from coastal communities.

The Santa Anas upset that balance, ushering in hot, dry, desert-like conditions. But while the Santa Anas are often called desert winds, the term is misleading; the winds are not simply blowing desert air over Southern California's coastal plain. Instead, Santa Anas result from a cool, dry air mass that hovers over the continental interior of the American West. When that air descends from the higher-elevation basins to sea level, it warms and becomes even drier. (A similar phenomenon, termed a föhn wind, warms Central Europe.) Funneled through the Cajon and San Gorgonio passes, the moving air gains speed and destructive power.

Local lore offers several competing explanations for how the winds got their name.

One holds that the name finds its provenance in an Indian word for wind, which Spanish missionaries, detecting an evil presence in the winds, liked for its homonymy with "Satan." Another claims a saintly rather than devilish origin of the name: while camping in present-day Orange County in 1769, the Portola expedition supposedly encountered a fierce windstorm on Saint Ann's Day. Yet another suggests Mexican dictator Antonio López de Santa Anna as the winds' eponym.

Scholars who have looked into the name's origins generally agree that it derives from Santa Ana Canyon, the

name's origins generally agree that it derives from Santa Ana Canyon, the portal where the Santa Ana River -- as well as a congested Riverside (CA-91) Freeway -- leaves Riverside County and enters Orange County. When the Santa Anas blow, winds can reach exceptional speeds in this narrow gap between the Puente Hills and Santa Ana Mountains.

Winds were ferocious in Santa Ana Canyon on the night of January 6, 1847, when U.S. forces under Commodore Robert Stockton camped near the canyon during their conquest of Los Angeles. Stockton's diary describes their ordeal:

> *Taking advantage of a deep ditch for one face of the camp, it was laid off in a very defensible position between the town and the river, expecting the men would have an undisturbed night's rest...In this hope we were mistaken. The wind blew a hurricane (something unusual in this part of California), and the atmosphere was filled with particles of fine dust, so*

> *atmosphere was filled with particles of fine dust, so that one could not see and but with difficulty breathe.*

If the windstorm Stockton and his troops endured was the source of the name, little evidence exists in the historical record. Subsequent written descriptions lacked the winds' distinctive name, referring to them simply as "northeasters." It was not until 1880 -- nearly 37 years after Stockton jotted down his observations -- that the earliest known written use of the name "Santa Ana" appeared in an article in the Los Angeles Evening Express.

A car wrecked by a 75-foot cypress tree, felled by strong winds in Palms in 1955. Courtesy of the Herald-Exa

Strong winds uprooted this 75-foot black acacia in Santa Monica on March 20, 1952. Courtesy of the Los Ang

Children play on a downed tree at Converse and Gage in South Los Angeles on March 1, 1952. Courtesy of t

Passersby stop to look at shattered windows at Broadway and 9th in downtown Los Angeles on March 1, 19

Whatever the origins of their name, the winds have made memorable appearances in the region's literature.

In "Two Years Before the Mast," Richard Henry Dana recounts a "violent northeaster" in 1836 that forced his ship, the Pilgrim, to leave its anchorage in San Pedro and seek refuge in the leeside of Santa Catalina Island.

In his memoir, "Sixty Years in Southern

leeside of Santa Catalina Island.

In his memoir, "Sixty Years in Southern California," the Jewish-German Angeleno Harris Newmark recalls an 1865 windstorm that "struck Los Angeles amidships, unroofing many houses and blowing down orchards."

Agriculture dominated the Southern California landscape for much of its history, and
the prospect of Santa Ana winds haunted farmers and orange growers. When the winds came, they destroyed crops and suffocated urbanized areas with dust -- a phenomenon that fed the growing misconception of Los Angeles as a desert.

In John Fante's "Ask the Dust," Arturo Bandini looks out the window of his Bunker Hill apartment and observes a palm tree, "its crusted trunk choked with dust and sand that blew in from the Mojave and Santa Ana deserts."

By the time Raymond Chandler captured the winds in his 1938 story "Red Wind," they menaced not only crops but civil order, as well:

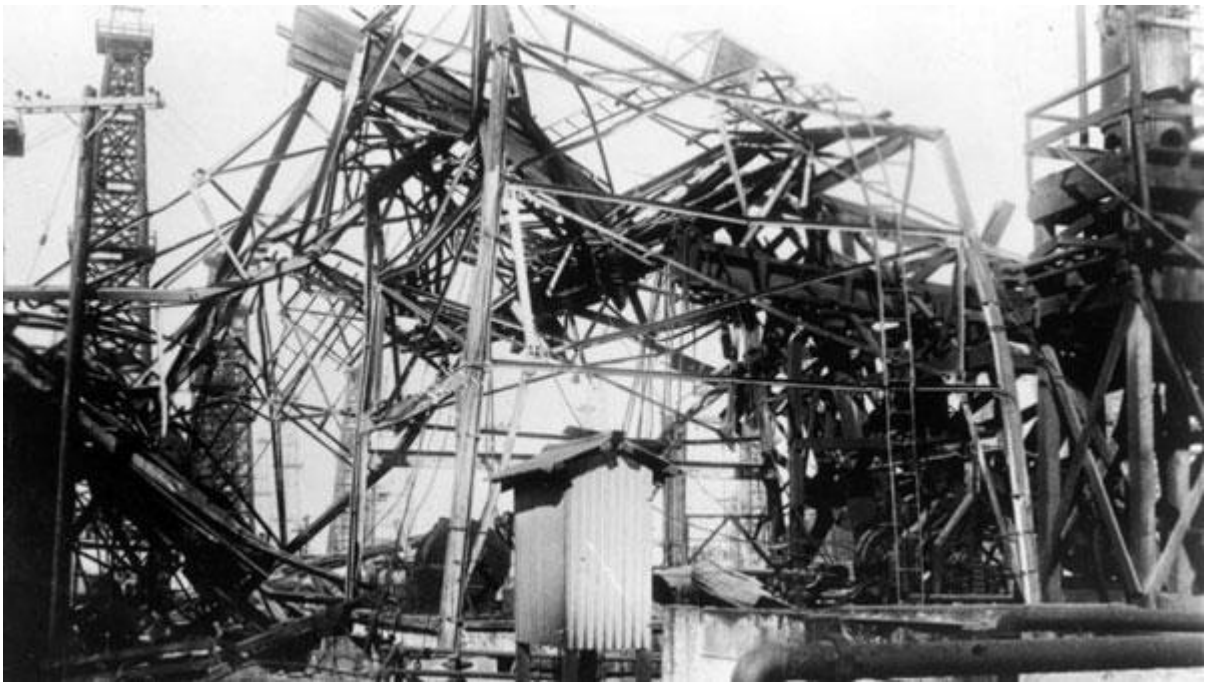
> *There was a desert wind blowing that night. It was one of those hot dry Santa Anas that come down through the mountain passes and curl your hair and make your nerves jump and*

> *and make your nerves jump and your skin itch. On nights like that, every booze party ends in a fight. Meek little wives feel the edge of the carving knife and study their husband's necks. Anything can happen.*

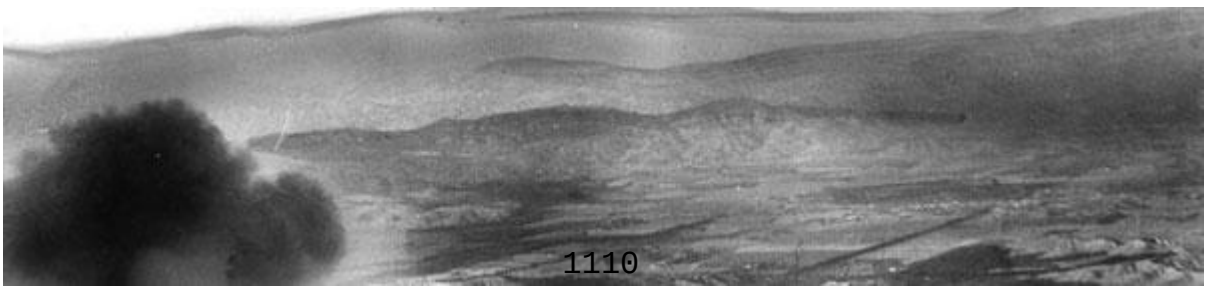
Joan Didion picked up where Chandler left off in 1965. Her "Los Angeles Notebook," later collected in "Slouching Towards Bethlehem," is perhaps the classic literary treatment of the Santa Ana winds:

> *The baby frets. The maid sulks. I rekindle a waning argument with the telephone company, then cut my losses and lie down, given over to whatever is in the air. To live with the Santa Ana is to accept, consciously or unconsciously, a deeply mechanistic view of human behavior. ...[T]he violence and the unpredictability of*

> *violence and the unpredictability of the Santa Ana affect the entire quality of life in Los Angeles, accentuate its impermanence, its unreliability. The wind shows us how close to the edge we are.*



An oil derrick in Santa Ana, damaged by gusty winds. Courtesy of the Santa Ana History Room Photograph C



A brush fire, fueled by Santa Ana winds, sweeps through Topanga Canyon on Nov. 4, 1948, eventually claimi

Fire fighters rush to confront a wildfire on Mt. Washington on May 13, 1961. Courtesy of the Los Angeles Time

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Fire fighters rush to confront a wildfire on Mt. Washington on May 13, 1961. Courtesy of the Los Angeles Time
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Fire officials observe destruction caused by a wildfire near Lake Arrowhead in 1953. Courtesy of the Los Ang

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Red Flag Warning

A term used by fire-weather forecasters to call attention to limited weather conditions of particular importance that may result in extreme burning conditions. It is issued when it is an on-going event or the fire weather forecaster has a high degree of confidence that Red Flag criteria will occur within 24 hours of issuance. Red Flag criteria occurs whenever a geographical area has been in a dry spell for a week or two, or for a shorter period , if before spring green-up or after fall color, and the National Fire Danger Rating System (NFDRS) is high to extreme and the following forecast weather parameters are forecasted to be met:
1) a sustained wind average 15 mph or greater
2) relative humidity less than or equal to 25 percent and
3) a temperature of greater than 75 degrees F.
In some states, dry lightning and unstable air are criteria. A Fire Weather Watch may be issued prior to the Red Flag Warning.

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CLIMATE OF SAN DIEGO, CALIFORNIA

Revised by:
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I. INTRODUCTION

The city of San Diego, California has a moderated Mediterranean climate with some surprising and unique features. The National Weather Service has not issued a climatology of San Diego, but in 1913 the San Diego Chamber of Commerce, in cooperation with the National Weather Service (at that time known as the United States Weather Bureau), published a book entitled "The Climate and Weather of San Diego, California." The climatological stations used in the 1913 San Diego climatology and in this study were based on the official weather stations in the downtown area. Many agencies had responsibility for taking and recording observations for San Diego. These agencies included the National Weather Service (U.S. Weather Bureau), Medical Corps of the Army and the Army Signal Corps (Signal Service). There have been many changes in the location and monitoring practices of the observations, but each one was, and still is, considered official.

Today, several departments maintain weather observing equipment within, and just outside of, the city. These agencies include the National Weather Service, Federal Aviation Administration, U.S. Forest Service, State of California Department of Water Resources, San Diego Flood Control District, City of San Diego Water Utilities Department, U.S. Geological Survey, Caltrans, International Boundary Commission, San Diego Air Pollution Control District and the Department of Defense.

This paper represents an effort to assemble the latest relevant climatological data for the city of San Diego. Within this paper, long-term temperature records are analyzed, precipitation trends are fully discussed and research into many other significant weather factors which affect the city are outlined, including hurricanes, Santa Ana winds and thunderstorms. Many tables are included as well to help understand the climate of San Diego. The result is designed to be an overview of the local climate of the downtown area, including Lindbergh Field, for the city of San Diego. Included in some sections are proverbs and folklore.

The city of San Diego has a fairly long- term official weather record dating back to the middle of the last century. It has been said that San Diego has the shortest thermometer in the United States. This may be true, but the weather, at times, is not as serene as this statement makes one believe.

What is it moulds the life of man?
The weather.

What makes some black and others tan?
The weather.
What makes the Zulu live in trees?
And Congo natives dress in leaves?
While others go in furs and freeze?
The weather.

II. THE CITY OF SAN DIEGO

In the southwest corner of southern California on the San Diego Bay lies the city of San Diego. The prevailing winds and weather are moderated by the Pacific Ocean, resulting in cool summers and warm winters in comparison with other places along the same general latitude. Temperatures of freezing or below have rarely occurred at the station since the record began in 1871, but hot weather, 90 degrees or above, is more frequent.

Dry easterly winds sometimes blow in the vicinity for several days at a time, allowing temperatures to reach into the 90s and occasionally above 100, especially in the eastern sections of the city and the outlying suburbs. As these hot winds are predominant in the fall, most of the highest temperatures occur in the months of September and October. June is the only other month in which the 100 degree mark has been surpassed. These high temperatures are almost invariably accompanied by very low relative humidities, which often drop below 20 percent and occasionally below 10 percent.

A marked feature of the climate is the wide variation in temperature within short distances. In nearby valleys the daytimes are much warmer in the summer and the nights are noticeably cooler in the winter. Also, freezing occurs much more frequently than in the city. Although records show unusually small daily temperature ranges in the city, only about 15 degrees between the highest and lowest readings, a few miles inland these ranges increase to 30 degrees or more.

Strong winds and gales associated with Pacific or tropical storms are infrequent due to the latitude. The predominant winds during the day are from the west-northwest, with light southeasterly winds generally occurring at night. Occasionally, south to southwest winds will develop during the day due to a coastal eddy formation. When an eddy is present the low clouds that normally dissipate in the morning become widespread and can remain over the area throughout the day.

The seasonal rainfall is about 10 inches in the city, but increases with elevation and distance from the coast. In the mountains to the north and east the average is between 20 and 40 inches, depending on slope and elevation. Most of the precipitation falls in winter, with the mountains also having an occasional thunderstorm in the summer. Eighty-five percent of the rainfall occurs from November through March, but wide variations take place in monthly and seasonal totals. Infrequent amounts of hail occur in San Diego and snow is practically unknown at the official downtown weather station. In each occurrence of snowfall only a trace was recorded officially, but in some locations amounts of one half inch or slightly more fell, and remained on the ground for an hour or more.

As on the rest of the Pacific Coast, a dominant characteristic of spring and summer is the nighttime and early morning cloudiness. Low clouds form regularly, and frequently extend inland over the coastal valleys and foothills, but they usually dissipate during the morning leaving the afternoons clear.

Considerable fog occurs along the coast, with the fall and winter months usually the foggiest. Visibilities are good as a rule with only 23 days, on average, when dense fog (visibility of 1/4 mile or less) occurs, generally in the early mornings. The sunshine is plentiful for a marine location, with a marked increase as one travels towards the interior. As for thunderstorms, they are rare, averaging about three a year in the city.

III. HISTORY

As Captain Juan Rodriguez Cabrillo entered San Diego Bay in September, 1542, he recorded in his ship's log:

> *A very great gale blew from the southwest; the port being good, we felt nothing.*

This is the first record of a meteorological observation in San Diego's history. However, official United States Government records of weather have only been available in San Diego since July 1, 1849. At that time, the observations were taken and recorded under the supervision of the Medical Corps of the Army at the San Diego Mission de Alcala, which was located on Presidio Hill in Presidio Park. It was the responsibility of the Post Surgeon to record the temperature and overall weather conditions. While under the care of the Medical Corps the observing location was moved twice. In 1850 the new site became Old Fort Stockton, south of the mission, but still in Presidio Park, and in 1860 the second move was onto the new U.S. Military Post at the H Street (currently called Market Street) barracks. This agreement continued until instruments and records were transferred to the Signal Service in 1871.

On November 1, 1871, the United States Congress assigned responsibility for forecasting storms on lakes and seacoasts to the War Department. The Army Signal Corps (Signal Service) was given these new duties. Since the Army Signal Corps took charge of weather services in San Diego, observations were again moved and taken in Horton Square on D Street (currently called Broadway) between 3rd and 4th Avenues. Through the next 6 decades, until January, 1930, the observing site changed several more times, but remained in the downtown area. Each of the downtown sites were located within a 1000 foot radius of the present day Horton Plaza.

By the year 1890, the Weather Bureau was founded and its office/observing site was located on 5th Avenue between E and F Streets. The Weather Bureau moved to its final downtown location on April 1, 1914, where observations continued through January, 1940. On January 15, 1930, another Weather Bureau Office was established at the Lindbergh Municipal Airport, 1½ miles northwest of the city office. Observations were taken but did not become official until February 1, 1940.

The final move of the observation equipment, to its present location, was made on August 13, 1969, to the Port of San Diego General Aviation Building at Lindbergh Field, San Diego's International Airport. To finish out the official observing sites of San Diego, the Automated Surface Observation System (ASOS) that was commissioned on August 1, 1996 must be mentioned. This study does not include information from the ASOS since the data compiled only includes the interval from July 1, 1849, through June 30, 1996.

IV. TEMPERATURES

The temperatures in San Diego are highly dependent on the direction of the low level flow and the associated airmass upwind. For example, a southwest wind will increase the marine layer depth, thus mild temperatures will result. For the most part, the surface wind has a westerly component. This allows the marine layer to develop in the evenings and dissipate in the mornings. The morning burn-off time of the low clouds determines the amount of heating the surface receives and, therefore, how hot the afternoon will get. Likewise, the time the velo cloud (early name for the marine layer) develops at night will determine the rate of cooling and affect the morning's low temperature. With this in mind, the strength of the onshore low level flow will help to determine both the dissipating time in the morning and the redevelopment time in the evening. Again, this is the normal situation.

When an offshore low level flow develops, the winds may become easterly and not allow the marine layer to develop at all. This is when the area can receive its hottest days (mainly in the summer) and its coldest nights (mainly in the winter).

The average annual temperature in the downtown area, based on the data from 1971-2000, is 64.4. The average daily maximum temperature is 70.8 and the average daily low is 58.1. Average daily maximum temperatures peak in late August and early September at 78, dropping to 65 in late December and early January. The average daily minimum temperatures peak at 68 in August and drop to 48 in mid-late December.

Although moderate temperatures are the routine due to the marine influence, temperature extremes do occur. The highest temperature recorded occurred during a Santa Ana wind event on September 26, 1963. The lowest temperature took place on the morning of January 7, 1913, during a cold downslope, offshore wind event. A description of these episodes follows.

If the barometer and the thermometer
Both rise together,
It is a very sure sign
Of coming fine weather.

Temperature Extremes

As one can see from the following examples, the temperature extremes almost always occur during offshore flow. During the Summer and early Fall the airmass to the east of the area has the potential of becoming quite hot. During the Winter and early Spring the airmass to the east of the area has the potential of becoming quite cold. Both of these air masses are generally dry and generate under surface high pressure.

Hot weather is not always associated with offshore flow. Sometimes, high temperatures occur with light winds while strong high pressure resides overhead. In this situation, temperatures can reach 85 to 95 degrees in the Summer. San Diego has only been at or above 100 degrees 24 times in its 121 years of records. The highest temperature recorded downtown was 111, on September 26, 1963.

As with the high temperatures, lower temperatures are not always associated with offshore flow. Sometimes chilly conditions occur when the synoptic patterns advect cold air from the north to the area. Generally, this cold air originates over Canada. San Diego has only been at or below freezing 11

times. The lowest temperature was 25, recorded on January 7, 1913.

Cold is the night,
When the stars shine bright.

The Hottest Day in History

THURSDAY, SEPTEMBER 26, 1963:

A SCORCHING HEAT WAVE SPREAD OVER ALL OF SOUTHERN CALIFORNIA AS SEVERE SANTA ANA CONDITIONS DEVELOPED WITH EXTREMELY HIGH TEMPERATURES, LOW HUMIDITIES, AND STRONG, GUSTY, EASTERLY WINDS.

A MASSIVE HIGH PRESSURE AREA OVER NEVADA AND UTAH PUSHED WINDS UP TO 50 MILES PER HOUR THROUGH THE MOUNTAINS. TREES WERE DOWNED AND FLYING DEBRIS BROKE OR SHORTED MANY POWER LINES. WINDS WERE UP TO 30 MILES PER HOUR IN MANY PARTS OF THE CITY. LINDBERGH FIELD HAD A PREVAILING WIND FOR THE DAY FROM THE EAST-NORTHEAST AND THE AVERAGE SPEED WAS 6.9 MILES PER HOUR. THE STRONGEST GUST WAS 18 MPH FROM THE EAST.

SAN DIEGO SIZZLED AS THE TEMPERATURE SOARED TO A RECORD HIGH OF 111 DEGREES, SURPASSING THE PREVIOUS RECORD OF 110 DEGREES SET 50 YEARS EARLIER ON SEPTEMBER 17, 1913. THIS WAS A NEW HIGH FOR THE DAY, FOR THE MONTH, AND FOR THE YEAR. THIS WAS THE WORST HEAT WAVE IN HISTORY, DUE NOT ONLY TO THE EXTREMELY HIGH TEMPERATURES BUT ALSO THE DURATION OF THOSE EXTREMES. IT WAS UNUSUAL IN THAT IT STARTED OUT WARM, WITH A LOW OF 73 AFTER THE PREVIOUS DAY'S HIGH OF 96, WARMED UP VERY QUICKLY, AND THEN STAYED HOT THE REMAINDER OF THE DAY. THIS REMAINS THE ONLY DAY THE TEMPERATURE WAS 95 DEGREES AT 8 IN THE MORNING. THERE WERE 11 HOURS OF 90 DEGREES AND HIGHER, 7 HOURS OVER 100, AND 6 HOURS OF 105 AND WARMER, WITH A TEMPERATURE OF 111 DEGREES HOLDING FOR MORE THAN ONE HOUR. RELATIVE HUMIDITY WAS AS LOW AS 6 PERCENT AT LINDBERGH FIELD AND 12 PERCENT AT EL CAJON.

TEMPERATURES OVER THE ENTIRE COUNTY WERE UP INTO TRIPLE DIGITS WITH ONLY ONE MAJOR EXCEPTION, AND THAT BEING THE MOUNTAINS. SKYLINE LODGE ON PALOMAR MOUNTAIN REPORTED A 78 AND WARNER SPRINGS A 91. EVEN THE BEACHES WERE HOT, WITH WINDS BLOWING FROM THE LAND OUT OVER THE OCEAN. CARLSBAD AND OCEANSIDE BOTH REPORTED A 108, IMPERIAL BEACH HAD A 109, BUT CORONADO ONLY HAD A 96. THOUSANDS OF BEACH GOERS PEERING OUT AT THE OCEAN AT MISSION BEACH HAD WINDS AT THEIR BACKS AND A TEMPERATURE OF 100 DEGREES JUST A FEW FEET FROM THE SURF. THE SURF-LINE WATER TEMPERATURE HAD DROPPED FROM 70 DEGREES THE DAY BEFORE DOWN TO 64 BECAUSE OF UPWELLING PROBABLY ASSOCIATED WITH THE SANTA ANA AND THE PREVAILING EASTERLY WINDS. SAN DIEGO STATE UNIVERSITY HAD A 107 ALONG WITH LEMON GROVE, LA MESA, AND ESCONDIDO. GILLESPIE FIELD REPORTED A 108 ALONG WITH CHULA VISTA, BUT THE CITY OF EL CAJON HAD A 112. NATIONAL CITY, VISTA, AND FALLBROOK ALL HAD READINGS OF 106.

UNOFFICIAL REPORTS HAD BOTH LA JOLLA AND PACIFIC BEACH AT 113, LOGAN HEIGHTS AT 122, 118 IN NORTH PARK AND 115 AT MIRAMAR.

THIS HEAT WAVE WAS THE WORST IN HISTORY. IT DAMAGED CROPS AND KILLED 30,000 CHICKENS AND 200,000 RABBITS. THREE PEOPLE WERE TREATED FOR HEAT PROSTRATION. ICE CREAM AND SOFT DRINK SALES SOARED. AIR CONDITIONED THEATERS AND MOTELS FILLED RAPIDLY. CARS WERE STALLED BY VAPOR LOCK AND BOILING

RADIATORS. COMPUTERS WERE TURNED OFF AT THE NAVAL SUPPLY CENTER WHEN THEY BECAME TOO HOT. THE CITY AUTHORIZED ALL FEMALE EMPLOYEES TO LEAVE EARLY BECAUSE OF ADVERSE WORKING CONDITIONS. POLICEMEN LEFT THEIR TIES OFF AND ROLLED UP THEIR SLEEVES.

STIFLING HEAT TURNED MANY CITY AND COUNTY CLASSROOMS INTO OVENS ON THE 26TH, AND SEVERAL SCHOOL DISTRICTS, INCLUDING SAN DIEGO, DECLARED ABBREVIATED SESSIONS FOR THE 27TH. CITY JUNIOR COLLEGES REMAINED ON THEIR REGULAR SCHEDULE. IT WAS THE FIRST TIME SINCE SEPTEMBER, 1939 THAT CITY SCHOOLS HAVE BEEN DISMISSED BECAUSE OF HIGH TEMPERATURES.

BACK COUNTRY FIRE DANGER INCREASED BECAUSE OF EXTREME DRYNESS AND GUSTY WINDS BUT NO SERIOUS FIRES WERE REPORTED.

DESERTS WERE ALSO HOT, WITH BLYTHE AND EL CENTRO AT 107, THERMAL AT 108, AND BORREGO SPRINGS AT 104. FARTHER NORTH HAD LITTLE CHANGE WITH BURBANK AT 105, LONG BEACH AT 110, LOS ANGELES AT 109, AND SANTA BARBARA AT 103. THE MARINE CORPS AIR STATION AT EL TORO WAS OFFICIALLY THE HOTTEST SPOT IN THE UNITED STATES WITH 113, AND SAN DIEGO WAS SECOND WITH 111.

DESPITE THE HEAT IN SOUTHERN CALIFORNIA, AND ESPECIALLY SAN DIEGO, THE OFFICIAL CITY TEMPERATURE WAS NOT QUITE AS HIGH AS THAT AT 4TH AVENUE AND B STREET. THE TEMPERATURE SIGN THERE FLASHED 134.

The Coldest Day in History

TUESDAY, JANUARY 7, 1913:

PROPHETS AND SEERS, FOR EITHER OCCULT REASONS OR SUPERSTITIONS, HAD FILLED THE PUBLIC WITH PROMISES OF CALAMITIES IN A YEAR, ENDING IN 13, DEVOID OF LUCK.

WITH SOME MORNING LOW CLOUDS, NORTHEAST WINDS, A LOW OF 48 AND HIGH OF 61, JANUARY 1, 1913, WAS A NEAR NORMAL DAY. IT THEN STARTED TO WARM UP AS NORTH TO NORTHEAST WINDS AND 100 PERCENT SUNSHINE CONTINUED. A HIGH OF 73 ON THE 2ND WAS FOLLOWED BY 78 ON THE 3RD, WHICH WAS 16 DEGREES ABOVE NORMAL. WINDS BECAME EASTERLY ON THE 4TH AND THE MAXIMUM TEMPERATURE WAS 20 DEGREES LOWER THAN THE DAY BEFORE. IT CONTINUED TO GET COLDER WITH STRONGER NORTHEAST WINDS AND SKIES REMAINING MOSTLY CLEAR. A LOW OF 36 AND A HIGH OF ONLY 47 WERE RECORDED ON THE 5TH. THE MINIMUM TEMPERATURE ON THE MORNING OF THE 6TH WAS 28.4 UNDER CLEAR SKIES AND A 5 KNOT NORTHEAST WIND. THE THERMOMETER CLIMBED VERY SLOWLY AND ONLY REACHED 45 BY NOON, THE LOWEST MAXIMUM EVER RECORDED, AND STILL NOT A CLOUD IN THE SKY.

SAN DIEGANS WERE BEGINNING TO BUNDLE UP AND GATHER AT THE WEATHER KIOSK IN THE PLAZA TO WATCH THE THERMOMETERS. WITH FROSTED BREATH THEY PRESSED THEIR NOSES AGAINST THE PROTECTIVE GLASS TO SEE THE CURRENT TEMPERATURE. NATIVES WERE BEWILDERED, AS THEY HAD NEVER EXPERIENCED COLD WEATHER LIKE THIS. TEMPERATURES AT THE KIOSK WERE ABOUT 6 DEGREES LOWER THAN AT THE WEATHER BUREAU AT 5TH AND F, SO THE HIGH TEMPERATURE IN THE PLAZA COULD HAVE BEEN AS LOW AS 40.

TEMPERATURES BEGAN TO DROP THAT AFTERNOON, BUT PEOPLE REMAINED IN THE PLAZA WITH OVERCOATS ON AND HANDS IN

POCKETS. THE TEMPERATURE DROPPED TO 32 AT 9 PM AND 29 AT MIDNIGHT. PEOPLE WERE STILL HUDDLING AGAINST THE COLD AND OCCASIONALLY STRUCK MATCHES TO SEE HOW LOW THE TEMPERATURE WAS. AT 1 AM IT WAS DOWN TO 24, AND THE LAST READING AT 2 AM WAS 22. THE WEATHER BUREAU LOW, WHICH WAS RECORDED AT 6 AM, WAS 24.9 DEGREES. AT MIDNIGHT, THE KIOSK TEMPERATURE WAS 4 DEGREES LOWER THAN THE WEATHER BUREAU'S, SO THE PLAZA MINIMUM WOULD HAVE BEEN LOWER THAN 24.9, AND POSSIBLY AS LOW AS 21. SKIES WERE CLEAR WITH LIGHT NORTHEAST WINDS AS THE SUN ROSE ON THE COLDEST MORNING IN SAN DIEGO HISTORY.

LOS ANGELES ONLY HAD A 34 THAT MORNING, AS THE COLD AIR HAD SWEPT ACROSS BRITISH COLUMBIA, SLIDING SOUTHWARD ON THE EAST SIDE OF THE SIERRAS, DOWN OVER NEVADA, AND ACROSS EXTREME SOUTHERN CALIFORNIA.

OTHER LOW TEMPERATURES THAT BITTERLY COLD MORNING WERE CAMPO 4, CUYAMACA 9, ALPINE 13, JULIAN AND LAKESIDE 15, EL CAJON 20, LEMON GROVE 22, LA MESA 24, AND CHULA VISTA 26. THERE WAS A KILLING FREEZE ALL OVER THE COUNTY.

FRUIT GROWERS WERE UNPREPARED AND NO ARRANGEMENTS HAD BEEN MADE. SOME HASTILY ATTEMPTED TO BUILD SMUDGE FIRES, BUT SOON LEARNED THERE WAS NO FUEL ON HAND TO BURN, WHILE OTHERS PASSED THE NIGHT PICKING AS MUCH AS POSSIBLE.

IT WAS NOT MUCH BETTER IN OTHER PARTS OF SOUTHERN CALIFORNIA, AS SMUDGE POTS BY THE THOUSANDS WERE FIRED UP IN A FIGHT TO SAVE A CITRUS CROP VALUED AT $50,000,000. DENSE CLOUDS OF BLACK PUNGENT SMOKE FROM THE BURNING OF CRUDE OIL HOVERED OVER ORANGE AND LEMON LADEN TREES. BLAZING DISTILLATE BURNERS DOTTED HILLSIDES AND VALLEYS, ILLUMINATING SMOKE CLOUDS OVERHEAD.

SOME WATER PIPES FROZE AND A FEW BURST. SUBURBAN TROLLEY LINES WERE DISRUPTED BY FREEZING OF AIR BRAKE LINES. FLOWERS WERE DESTROYED. THE COLD PREVENTED SAN DIEGO FISHERMEN FROM MAKING THEIR DAILY TRIPS AS NETS WERE FROZEN TO THE REELS AND

IT WAS IMPOSSIBLE TO THAW THEM SUFFICIENTLY TO BE USED.

MANY YOUNGSTERS WENT TO THE PLAZA FOUNTAIN TO SEE MOTHER NATURE'S ICE FOR THE FIRST TIME, AND CLIMBED OVER THE RIM AND STOOD ON THE 3/4 INCH THICK ICE. ONE BOY FROM THE NORTHERN PART OF THE COUNTRY, WHO BROUGHT ICE SKATES WITH HIM, SKATED IN THE FOUNTAIN AND WAS THE ENVY OF THE LOCAL BOYS. HE WAS OFFERED A POCKET KNIFE, AND EVEN UP TO 10 CENTS IN ACTUAL MONEY, BUT REFUSED TO PART WITH THE SKATES FOR EVEN A SHORT TIME. THEN THE BOYS POOLED THEIR MONEY AND HUNTED EVERY HARDWARE STORE IN TOWN. THEY THOUGHT THEY COULD GET A PAIR FOR ABOUT A DOLLAR BUT FOUND THAT NONE HAD BEEN STOCKED. THERE WERE A FEW PEOPLE WHO BROKE UP THE ICE, WRAPPED IT UP IN PAPER, AND TOOK IT HOME FOR SOUVENIRS.

OFFICIAL TEMPERATURES WERE BELOW 32 FOR 7 HOURS, BUT AT THE KIOSK, APPROXIMATELY 12 HOURS. NEVER BEFORE IN HISTORY, OR SINCE, HAS SAN DIEGO EXPERIENCED SUCH BITTER COLD.

WEATHER BUREAU FORECASTER E. HERBERT NIMMO EXPLAINED IT THIS WAY:

"THE WEATHER REPORTS FROM THE GULF AND ATLANTIC STATES BEING MISSING, WE ARE FORCED TO REPORT SOMEWHAT TO SPECULATION IN ACCOUNTING FOR CONDITIONS

HERE. BUT I FEEL PRACTICALLY CERTAIN THAT THE EXTENSIVE HIGH BAROMETER AREA IN THE NORTHWEST HAS BEEN RETARDED IN ITS EASTWARD MOVEMENT BY EXCEPTIONAL CONDITIONS IN THE EAST. A LOW BAROMETER AREA HAS ALSO MADE ITS APPEARANCE OVER NORTHERN ALBERTA MONDAY AND IS MUCH STRONGER THIS MORNING. THIS, OF COURSE, TENDS TO FORCE THE HIGH, COLD AREA SOUTH."

THIS METEOROLOGICAL CONDITION OF OFFSHORE FLOW NOW HAS A NAME; IT'S CALLED A SANTA ANA.

V. PRECIPITATION

Since rainfall in the San Diego area is generally a late Fall through early Spring phenomenon (occurring from the end of October through April) statistics are normally presented on a "water year" basis, as opposed to a calendar year format. The water year displays a more coherent picture of rainfall data. The National Weather Service computes the water year from July 1st through June 30th.

The annual average precipitation downtown, based on a continuous and homogeneous 146-year record from July 1850 through June 1996, is 10.02 inches. The current and official 30-year average (1971-2000) is 10.77 inches. This long term precipitation record has an unusual statistic included in it. All of the measurable amount of precipitation at the official station location has fallen in the form of rain. This means that snow, ice pellets and hail have never accounted for more than 0.005 inch of the water equivalent.

Most of the rain falls during the months of November through March with January, on average, receiving the maximum rainfall at 2.28 inches. Only 10 percent of the total seasonal rainfall normally occurs from May through October and only 2 percent occurs during the three-month period from June through August.

Heaviest rains are associated with storms approaching California from the west, which frequently tap into a moisture supply from the subtropics. Heavy rains, up to 3.23 inches in a calendar day, have been recorded in the downtown area. The probable maximum precipitation at San Diego, based on statistical analysis, is plotted in a table on page 71.

Thunderstorms

Thunderstorms are rare for San Diego, but when they happen it is generally during the winter. Sometimes they produce small hail and gusty winds. The number of thunderstorms the area receives varies greatly throughout the year, but the average is 3.0. Some years will produce no thunderstorms at all but, on the other hand, during the year of 1936 there were 11. Most thunderstorms have just 1 or 2 claps of thunder and are short lived, although there has been almost constant rumbling for several hours. The longest thunderstorms lasted for almost 8 hours on two different dates: May 20, 1920 and December 8, 1926.

About every other summer, a thunderstorm will work its way off of the mountains and quickly move through the downtown area. This type of occurrence is associated with the monsoonal, or easterly, flow aloft that develops almost yearly, during the summer season. The airmass is generally not unstable enough to sustain a thunderstorm for more than the normal length of a pulse-type thunderstorm (approximately 1 hour) to

allow it to move past the valleys and into the coastal areas of San Diego county.

When the clouds appear
Like rocks and towers,
The earth's refreshed
By frequent showers.

Snowfall History for San Diego

Many years ago there was a small village, where only several hundred people lived in adobe houses, located on a sand flat at the foot of a hill. This was San Diego in December, 1847, which is the area we now call Old Town. Light snow had fallen over the nearby hills but heavier amounts of snow had fallen to the east and near the mountains. There was even a possibility that a few flakes fell in town but details of this storm lived only in the memories of early settlers.

Weather observations were started in July, 1849, followed by a newspaper, which greatly helped documentation and reporting of the next storm which was "The Great Storm of January, 1882."

This storm was accompanied by a blustery surge of very cold air and moved into San Diego County on the 12th and, even though officially documented, has no entries for snow. From the Daily Journal for January 12, 1882: "At a few minutes before 7 am light rain began falling accompanied by sleet for a few moments at 7:20 am." And from a U. S. Signal Service report: "On the morning of the 14th snow flakes were observed melting as fast as they fell, a phenomenon never before noted at this station." Sleet also fell at 8 am at the residence of Mr. G. W. Barnes.

It snowed quite heavily outside of town, and by noon there were 3 inches in the El Cajon Valley, 4 inches on Poway Grade, and 1 inch in the valley. Measurable snow fell in Del Mar and it was reported that roofs of houses in the San Pasqual Valley caved in from the weight of the snow. Snow varying in depth from 2 to 5 inches was reported in other areas within 15 to 25 miles of the station and Julian had 15 inches. It was the coldest storm on record and magnificent white robed hills awed those early residents. The snow line had never before come so near the bay, according to residents, some of whom had lived in the area for 40 years.

The biggest story, however, was the severe unabated storm in the mountains. It started snowing in Campo at 7 am on the 12th, and by 3 pm there was a foot on the ground and the telegraph lines were down. Snow measured 20 inches on the 13th, and brisk easterly winds prevailed causing severe drifting. Snow was up to 2 feet deep on the 14th, and finally ended at 1:40 pm on the 15th. After nearly 4 days there were 3 feet of snow on the ground, many drifts 8 feet deep, hundreds of birds killed, and stock suffering severely. The roads were still impassable on the 18th due to the deep drifts. Snow softened and melted very slowly but heavy rains on the 24th and 25th began to wash away the snow rapidly. Not until then were officials able to repair the telegraph lines and open the roads. Campo was isolated no longer.

Actual snow flurries fell at Lindbergh Field from 4:10 to 5:30 am on January 21, 1937, and were reported by a Weather Bureau Observer on duty. This was the only time that snow in flake form had fallen at the airport but it was not even given dignity by

being entered in the record books because it did not happen at the official station.

Residents in the eastern and northern parts of the city awakened to find those delicate snowflakes gently floating down outside their windows. Some graupel was also reported. Snow was on the roofs for as long as an hour and in some areas there was enough for small snowballs. Meanwhile, back at the Federal Building at Union and F Streets where the official weather observer was on duty, the phone began to ring with inquiries from the newspaper and residents. It was reported that, "he craned his neck and scanned the horizon, but not a snowflake was in sight." That was official and that is what was recorded. At that time, the U. S. Weather Bureau staffed 2 offices in San Diego but only the City Office observations were entered in the record books.

The weakest storm occurred on February 11, 1946, as early morning showers were followed by icy winds (up to 72 mph in the mountains) and cold rain. A few brief snow flurries were reported in several parts of the city. Lindbergh Field had no snow and only 7 hundredths of an inch of precipitation.

"Blizzard Lashes San Diego County," headlined the Tribune-Sun on January 10, 1949, as winter arrived in Southern California with a vengeance, bringing wind, snow, hail, sleet, rain and blocked highways; a severe gas shortage resulted.

Snowfall was the heaviest in history with 3 feet at Mount Laguna, 18 inches at Cuyamaca, 12 inches at Julian and 4 to 8 inches as low as 1000 feet. There was a light covering at Escondido, Spring Valley, and other points surrounding the city, which was enough for snowballs. A few patches were visible in the early morning hours within the city limits at Camp Miramar, Rose Canyon, Mt. Helix, East San Diego, North Park, La Jolla, Point Loma and El Cajon. Traffic was snarled in many areas.

Howling winds accompanied the snowfall and drifting snow closed major highways and secondary roads in the mountain areas. Wind speeds reached 75 miles per hour at the Airways Communication Station. Power failures were scattered throughout the city during the night as winds gusted up to 40 mph. A party of 8 Girl Scouts and 5 adults was marooned at their Cuyamaca camp. A plane crash took 5 lives and injured one as it smashed into a mountain near Julian.

San Diego Gas and Electric announced a gas emergency for the second time in a week and asked for cooperation in conserving gas by using it only for cooking and water heating. They later eased the request by asking that heating be restricted to one room in each house but warned that users might be asked to eliminate all use of gas for heating to avoid a complete shutdown of gas service in some sections.

This was the only time in history that snow had fallen in the city on successive days. Lindbergh Field reported snow pellets from 6:55 to 8:20 on the evening of the 10th, with heavy snow pellets from 4:45 to 5:00 the morning of the 11th.

January, 1949, besides having the raging blizzard and snow in the city, was and still is the coldest month on record. Days and nights were both cold, with the lowest temperature dipping to 29 degrees.

Palomar Airport, near Carlsbad, at 10 am had a temperature of 33 degrees with 2 inches of snow on the ground. This was on December 13, 1967, as the second major

storm of the century, and within 18 years of the first, brought winter to southern California.

Snow was preceded by numerous thunderstorms, hail and lightning, icy winds, and rain. Marble size hail fell at Palomar Mountain State Park with smaller hail reported in other areas. Snow to a depth of 2 feet fell at Palomar Mountain, 12 to 18 inches at higher elevations, and 6 inches at Temecula.

Strong gusty winds accompanied the storm, and all the schools closed in Fallbrook Union, Julian Union, and Mountain Empire Unified School Districts. Chains were required on most mountain highways, but none was completely blocked. The County Engineer put 65 units, including all snowplows and graders, in the field in an effort to keep county roads open. Borrego Springs had 3 inches of snow, Anza Borrego State Park had 4 ½, and a few flurries mixed with hail and cold rain fell at El Centro.

Snow covered most areas including Del Mar, Encinitas, Vista and La Jolla. Up to 5 inches fell in Fallbrook. Winds were calm that night as big snowflakes floated down over North Park, East San Diego, Clairemont, University City and along Interstate 8, above Mission Valley. San Diego Police Sgt. John E. Mansfield said from his Traffic Control Helicopter, "The whole city of San Diego was white." Students at Kearny High School left classrooms to go outside and throw snowballs. Snow in pellet form fell at Lindbergh Field from 7:50 to 8:50 am.

There were so many minor traffic accidents that law enforcement officials were forced to tell people to move on and file reports later. High winds created numerous brief power outages. Telephone switchboards were jammed at both the Evening Tribune and the Weather Bureau by excited people calling in to report snow in their areas.

San Diego almost had a white Christmas as a cold winter storm entered the region on December 24, 1987. Snow fell in the Laguna Mountains and chains were required on all vehicles. Snow flurries or flakes were reported during the late afternoon from many areas, including some within the city limits. Residents of Descanso and Jamul played in a winter wonderland with snow covering the ground and snowballs filling the air. Lindbergh Field did not even report a sprinkle.

A Winter Storm Warning was in effect on January 17, 1990 as a cold and windy storm reached Southern California, causing rapidly dropping snow levels. Mt. Laguna reported 14 inches of snow on the ground, which covered most of the mountain roads. Snow flakes or flurries were reported within the city limits, including several coastal communities, but once again Lindbergh Field did not report snow.

Genuine snow, whether it be in the form of sleet, ice pellets, snow pellets, graupel, or flakes, has fallen in the city on at least 10 days, with only 3 of them considered official.

Tropical Cyclones

The tropical cyclone, by definition, is a rotating storm that originates over the tropical oceans. The tropical cyclone season in the Pacific Ocean is from the end of May through November, but can start as early as May first and last into December. It is rare for downtown San Diego to experience the direct effects of a tropical cyclone; there are only 16 documented cases in which the city

has had a firsthand account of this type of atmospheric phenomenon. The effects of tropical cyclones on the city of San Diego are normally minor since most cyclones move in a westerly direction and dissipate without incident in the Pacific Ocean. The moisture left over from these storms can be collected by mid latitude troughs and advected over southern California, thus producing the few and far between significant summer rain events of downtown San Diego. For the mountains, on the other hand, the tropical moisture will increase the chance for thunderstorms which can cause heavy warm rains and flash flooding.

Although tropical cyclones defined as hurricanes have never moved within 150 nautical miles (278 kilometers) of San Diego, a few tropical storms and depressions have brought copious rain to southern California. One in particular, tropical cyclone Kathleen, hit the area at tropical storm strength (winds of 34 to 63 knots) on the ninth through the twelfth of September, 1976. Kathleen caused flooding mainly in the deserts of southern California and set daily rainfall records. At San Diego's International Airport (Lindbergh Field) the new records for September ninth and tenth were 0.09 inch and 0.87 inch respectively.

Evening red and morning gray
Help the traveller on his way;
Evening gray and morning red
Bring down rain upon his head.

VI. WIND

Reliable wind observations date back to the mid 1880s and have varied in elevation from the current of 20 feet to a high of 102 feet. Due to the Pacific Ocean to the west of the city, a sea breeze is commonplace in the late mornings through evenings. The mechanism that drives this wind is the differential heating between the ocean surface and the land. In the afternoon a westerly flow at an average speed of 10 miles per hour (mph) results. The overall yearly average is 7 mph from the west-northwest. The greatest peak gust of 64 mph from the west last occurred in January of 1988.

Santa Ana Winds

Santa Ana winds are generally defined as warm, dry winds that blow from the east or northeast (offshore). These winds occur below the coastal mountain ranges of Southern California and are strongest through and below the passes and canyons. Santa Ana winds often blow with exceptional speed in the Santa Ana Canyon (the canyon from which the wind derives its name). Forecasters usually reserve the use of "Santa Ana" for winds greater than 25 knots.

The complex topography of Southern California combined with various atmospheric conditions create numerous scenarios that may cause widespread or isolated Santa Ana Wind events. Commonly, Santa Ana winds develop when a region of high pressure builds over the Great Basin (the high plateau east of the Sierra Mountains and west of the Rocky Mountains, including most of Nevada and Utah). Clockwise circulation around the center of this high pressure area forces air down the mountain slopes from the high plateau. The air warms as it descends toward the California coast, at the rate of 5 degrees Fahrenheit per 1000 feet, due to compressional heating. Thus, compressional heating provides the primary source of warming. The air is normally dry since it originates in the desert, and continues to dry

even more as it is forced down the mountains and heated.

Santa Ana winds commonly occur between October and February with December having the highest frequency of events. Summer events are rare. Winds are typically between north and east at a speed of 35 knots through and below passes and canyons with gusts to 50 knots. Stronger Santa Ana Winds can have gusts greater than 60 knots over widespread areas, and gusts greater than 100 knots in favored areas, such as the Santa Ana Canyon. Frequently, the strongest winds in the basin occur during the night and morning hours due to the absence of a sea breeze. The sea breeze, which typically blows onshore daily, can moderate the Santa Ana winds during the late morning and afternoon hours.

VII. PRESSURE

The mercurial barometer at Lindbergh Field, which was removed when the ASOS was commissioned, had its ivory point at an elevation of 28 feet above sea level. The average station pressure is 1014.3 millibars. The twice daily symmetrical swing of the atmospheric pressure (page 52) is rather striking, with maxima occurring at about 10 am and 10 pm and minima at about 4 am and 4 pm. These can be described, in a general fashion, as daily "pressure tides." As the tides are repeated at the same solar time day after day, it is beyond doubt that they are caused in some way by the sun. The low pressure tide at about 4 pm results from air aloft being heated and rarified. The reasons for the other tides are not well understood, but most likely depend on delayed heating and cooling as well as ionization at upper levels.

The highest sea level pressure ever recorded in the downtown area is 30.53 inches of mercury on February 17, 1883. The lowest is 29.37 on March 3, 1983.

When the glass falls low,
Prepare for a blow;
When it rises high,
Let all your kites fly.
When the hollow winds begin to blow,
The clouds look black, the glass is low.

VIII. RELATIVE HUMIDITY

Humidity is an indicator of the amount of water vapor in the air. Relative humidity is the ratio between the amount of water vapor actually in the air at a certain temperature and the theoretical amount of water vapor present when the air is saturated at that same temperature. This is usually expressed as a percentage.

Relative humidity averages 69 percent at San Diego on an annual basis. The average daily maximum relative humidity is 82 percent, generally occurring in the early morning hours around sunrise. The average daily minimum is 54 percent, usually occurring around noon.
Humidities are higher than the annual average, by 10 to 20 percent, May through October. During the months of November through February the relative humidities are generally lower than the average by 10 to 20 percent. Moist conditions are commonplace in San Diego. Near 100 percent relative humidity is typical for the late nights and early mornings of the marine layer seasons of Spring and Summer.

Very low relative humidity is rare in San Diego but, when it happens, a Santa Ana wind condition is normally to blame. With strong offshore flow and downslope winds, the air dries rapidly as the land breeze

develops. Relative humidities of less than 5 percent have been recorded in the city with this type of situation.

IX. AIR QUALITY

Air pollution existed even before life appeared on the planet. This contamination was caused by volcanic eruptions, forest and brush fires, wind storms, dust, pollen and miscellaneous gases. Stone age men were probably driven from unventilated caves by smoking fires.

The name "SMOG" originated in 1905 and was used to describe a combination of smoke and fog. More recently it has been applied to a mixture of pollutants from automobiles and industrial wastes, and their reaction products that have accumulated in the atmosphere. Rapid growth and increasing population, as well as the widespread use of automobiles after World War II, started an escalation of smoggy days. Geography, topography, climate, population and a high concentration of vehicular traffic are key elements to the distribution and development of pollutants.

Precursor emissions, mainly oxides of nitrogen and hydrocarbons, are generated in the populated coastal plain and drift inland with the daily sea breeze and primarily affect inland sections. On some occasions precursors, or even ozone, are generated in the heavily populated Los Angeles area, carried out over the ocean during a mild Santa Ana Wind condition, and then picked up by the sea breeze which brings them back onshore and into San Diego. It has been estimated that about 60 percent of these precursors is being generated by cars and trucks. For San Diego, ozone remains the major air pollution problem. It results from complex reactions that occur in the presence of sunlight. Ozone is the primary component of photochemical smog.
In addition to pollution being advected over San Diego, it is common for a layer of warm dry air to lie above a moist cool marine layer which creates a temperature inversion. The temperature inversion prevents polluted air from rising and mixing with the air above, thus causing hazy conditions.

Due to the drastic increase in pollution, monitoring began in 1955 followed by air pollution programs, which are regulated on both state and federal levels. All air quality reports in the United States are based on the Pollutant Standards Index. For ground level ozone, values greater than 75 on the index exceed the State Standard for clean air and values greater than 100 exceed Federal Standards. At a value of 138 a Health Advisory will be issued. When this level is reached the air is considered unhealthy, with 15 parts of ozone per hundred million parts of air. At 200, a Stage 1 Alert is declared and a Stage 2 Alert is proclaimed at 275. These stages are considered very unhealthy.

Air quality was the worst in the 1960s and 1970s prior to passage of the Clean Air Act. In San Diego Stage 2 Alerts were reached once in 1978 and three times in 1979. Stage 1 alerts were also frequent, with 11 in both 1978 and 1979. San Diego has not had a Stage 2 episode since 1979 or a Stage 1 since 1991.

The Federal Standards were violated on 90 days in 1978 and 87 days in 1980. From there the trend continued downward resulting in only 2 days above Federal Standards in 1996. State standards were violated 151 days in 1978 but a record 192 days in 1981. Again, after 1981 the general trend was downward indicating improving

air quality. This was especially realized in 2002, in which only 15 days violated the State Standard; the cleanest year on record.

Pollutants play a very important part in our daily weather by not only causing hazy conditions but also being the nuclei for the formation of fog. Because of the improving air quality throughout the last few decades, the yearly number of days with either fog or haze reported has also decreased dramatically. So not only is our air becoming cleaner, it is becoming clearer.

X. SKY COVER, CLOUDS, FOG AND HAZE

San Diego is a mostly sunny place with an average of 146 clear days per year. A clear day represents less than 4 tenths of the sky covered in clouds during the hours from sunrise to sunset. Approximately 117 days are considered partly cloudy (4 tenths to 7 tenths sky coverage), and 102 days on average have cloudy skies. Most of these partly cloudy and cloudy days are due to the marine layer or "velo" cloud, as it was called many centuries ago.

Fog that produces very low visibilities, ¼ mile or less, on average occurs 23 days a year. This dense fog is usually caused by airmass advection of a shallow marine layer. The peak time during the year for dense fog is from October through February. Lower visibilities in fog, not considered dense, also occur during the winter season (December, January and February) and are mainly associated with rain.

When visibilities are below 7 miles an observer is required to report a restriction to visibility. If the restriction is not associated with water vapor and is not obvious, such as smoke or rain, haze is generally reported.

Haze is fine dust or salt particles dispersed through a portion of the atmosphere. The particles are so small that they cannot be felt or individually seen with the naked eye, but they diminish horizontal visibility. On average, San Diego has 146 days of haze. This is normally associated with a dissipating marine layer where the low clouds have retreated but the particles in the air have not allowed the visibility to increase to 7 miles.

A summer fog for fair,
A winter fog for rain;
A fact most everywhere,
In valley and on plain.

XI. COASTAL EDDY

During the spring and summer months, Southern California coastal areas and valleys experience many days with low clouds and fog in the early morning and late evening. At times, usually on the coast and less often in the valleys, there are days when the low clouds and fog persist into the afternoon and occasionally all day. A coastal eddy is often the cause when low clouds and fog last into the afternoon. In Southern California, coastal eddies are often generically referred to as Catalina Eddies (for the island that the coastal eddy forms about).

A Catalina Eddy forms when upper level large-scale flow off Point Conception interacts with the complex topography of the Southern California coastline. As a result, a counter-clockwise circulating low pressure area forms with its center in the vicinity of Catalina Island. Catalina Eddy formation is accompanied by a southerly shift in coastal winds, a rapid increase in the depth of the marine layer, and a thickening of the coastal stratus. Catalina Eddies occur predominantly during the "stratus season"

which is between April and September with a peak occurrence in June.

The effects of the Catalina Eddy on the weather over Southern California can be quite dramatic from one day to the next. Usually, the increased thickness of the stratus clouds inhibits the typical morning/early afternoon dissipation. Coastal temperatures will be several degrees cooler than the day before since cloud cover reduces the amount of surface heating from the sun. Air quality may be improved since the Catalina Eddy disrupts the ever present inversion over the coast and allows pollutants to be mixed through a greater depth of the atmosphere. Also, increased cloudiness reduces photochemical reactions. On the downside, air travel may be affected due to reduced visibilities at airports.

A typical Catalina Eddy will allow coastal low clouds and fog to persist into the afternoon. At other times, when the circulation of a Catalina Eddy is stronger, there is a deeper layer of low clouds that may reach as far inland as the intermediate valley of Riverside and San Bernardino Counties. When the Catalina Eddy is at its strongest, the depth of the low clouds may extend to 6000 feet and these clouds will move through the inland valleys and reach into the high deserts.

XII. OUR CHANGING CLIMATE

"The American public is familiar on all sides with elaborate and detailed statements on the weather at a thousand and one resorts. If we may believe all we read in such reports, the temperature never reaches the eighties, the sky is flecked with just enough clouds to perfect the landscape, the breezes are always balmy, and the nights ever cool. There is possibly one place in the United States where such conditions obtain: a bit of country about forty miles square, at the extreme southwestern part of the United States, in which San Diego, California is located."

This quotation from General A. W. Greely, a former resident of San Diego and head of the United States Weather Service as Chief Signal Officer of the Army, was first published in the Climate of the United States in 1888. This was an accurate description of San Diego weather at that time, but slow and gradual changes have been taking place in the climate over the past several decades. Indications of these changes are most evident to those who follow the record high and low temperatures. This is where the most noticeable changes have occurred.

Since the records began in 1874, most of the daily record low temperatures were recorded before 1900 and record highs in the past few decades. Out of a possible 365 days, 366 during leap year, 196 record lows have been set, and still not broken, in the first 26 years of record. This computes to 54 percent, leaving 46 percent, or 169 days, of record lows set in the last 96 years. The frequency of new records declined drastically after the 1940s with only 7 records established in the last 25 years. Disregarding irregularities from one year to another, the general trend has been for diminishing amounts. Maximum temperature record trends are almost the reverse. The majority of daily record high temperatures have occurred recently, with 126 days, or 35 percent, happening within the past 25 years. Only 45 days, or 12 percent, happened before the turn of the century. The remaining 53 percent of the daily record high temperatures are scattered throughout the century. Again, disregarding the irregularities, the general

overall trend has been for increasing record high temperatures as time progresses.

Throughout the period of record, the city of San Diego has also been in transition. It started out with wood buildings, dirt streets and considerable open space. Then, in what seems to be a not so gradual development of the city, San Diego expanded with ribbons of concrete criss-crossing the city: streets of black asphalt, sidewalks made of cement, huge paved parking lots, and steel, brick and concrete buildings, leaving very little open space. What has developed over the many years of growth is a "Heat Island," also known as "Urban Thermal Pollution," and described as a large bubble of hot air that overlies the metropolitan area. The temperature of a densely constructed business district can be as much as 20 degrees higher than the lowest observed suburban temperature on a calm clear night, but normally the difference is near 7 degrees. This is most evident at night because solar radiation is more readily absorbed in the city by the buildings and paving materials that possess large heat storage and retain this heat through the afternoon. As night falls, these materials begin to release their heat slowly. By morning, this heat has still not entirely dissipated and the next day begins with a thermal edge. As the city grows, the heat advantage continues to get stronger with accumulative effects. This will continue in the years to come with only major global climate changes affecting these results.

XIII. ACKNOWLEDGMENTS

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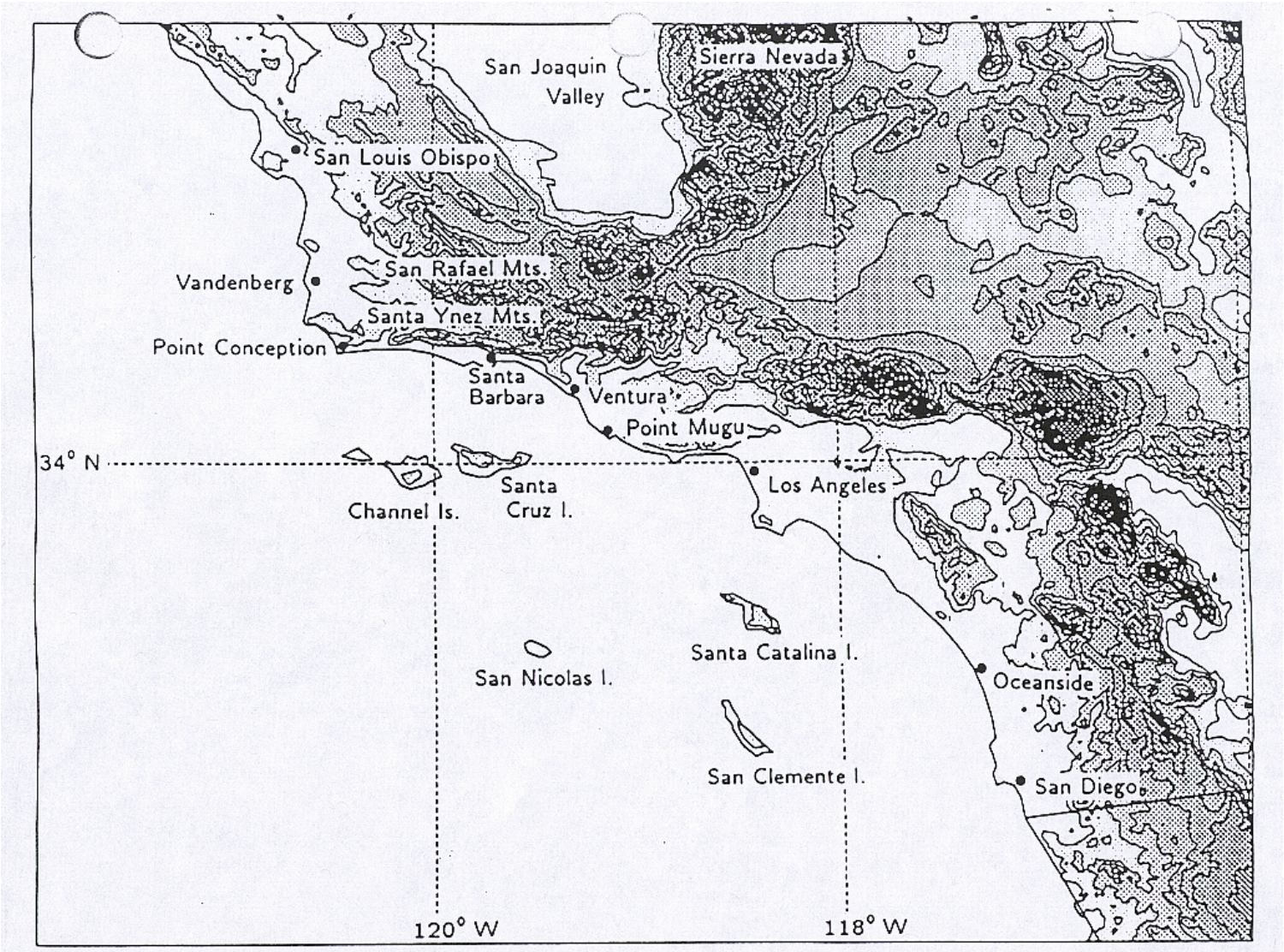
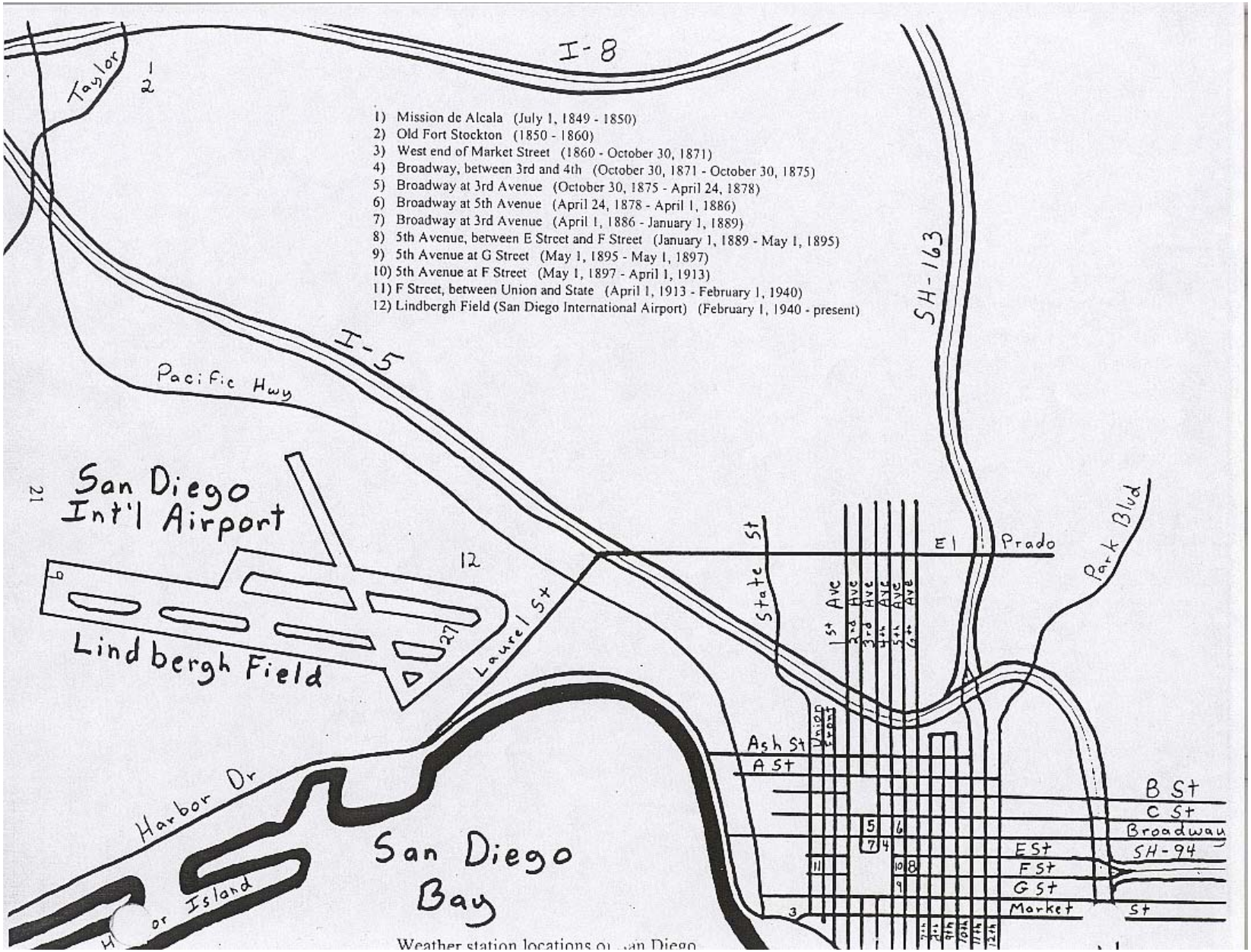


Topography and geographical locations of southern California, redrafted from Ueyoshi and Roads, 1993. Terrain contours every 250 meters.


1) Mission de Alcala (July 1, 1849 - 1850)
2) Old Fort Stockton (1850 - 1860)
3) West end of Market Street (1860 - October 30, 1871)
4) Broadway, between 3rd and 4th (October 30, 1871 - October 30, 1875)
5) Broadway at 3rd Avenue (October 30, 1875 - April 24, 1878)
6) Broadway at 5th Avenue (April 24, 1878 - April 1, 1886)
7) Broadway at 3rd Avenue (April 1, 1886 - January 1, 1889)
8) 5th Avenue, between E Street and F Street (January 1, 1889 - May 1, 1895)
9) 5th Avenue at G Street (May 1, 1895 - May 1, 1897)
10) 5th Avenue at F Street (May 1, 1897 - April 1, 1913)
11) F Street, between Union and State (April 1, 1913 - February 1, 1940)
12) Lindbergh Field (San Diego International Airport) (February 1, 1940 - present)
I-8
Taylor
I-5
Pacific Hwy
SH-163
San Diego Int'l Airport
Lindbergh Field
Laurel St
State St
El Prado
Park Blvd
1st Ave
2nd Ave
3rd Ave
4th Ave
5th Ave
6th Ave
Ash St
A St
Union
B St
C St
Broadway
SH-94
E St
F St
G St
Market St
Harbor Dr
San Diego Bay
Weather station locations o

MISCELLANEOUS MEANS[1] AND EXTREMES
San Diego, California

Latitude: 43° 44' 05" North, Longitude: 117° 10' 07" West, Elevation: 13 feet.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Percent of Possible Sunshine	72	71	70	68	59	58	68	70	69	68	75	73	68
Mean Sky Cover (oktas)													
Sunrise to Sunset	4.1	4.2	4.2	4.2	4.6	4.4	3.6	3.2	3.2	3.5	3.3	3.7	3.9
Midnight to Midnight	3.9	4.4	4.5	4.1	5.1	5.0	4.3	4.0	4.0	3.8	3.4	3.5	4.2
Mean Number of Days:													
Sunrise to Sunset													
-Clear	12.3	10.2	10.8	10.3	8.5	9.3	12.7	15.1	15.0	13.7	14.7	13.6	146.2
-Partly Cloudy	7.6	7.6	9.5	10.0	11.3	11.8	12.8	11.5	9.5	9.7	8.0	7.7	117.0
-Cloudy	11.2	10.5	10.8	9.8	11.2	9.1	5.1	4.4	5.5	7.6	7.3	9.6	102.1
Precipitation													
-.01 inch or more	6.3	5.3	6.6	4.3	2.2	1.1	0.5	0.6	1.5	2.3	5.0	5.5	41.2
-1.00 inch or more	0.3	0.2	0.3	0.1	*	0.0	0.0	*	0.0	0.0	0.3	0.3	1.5
Snow, Ice Pellets, Hail													
-1.0 inch or more	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thunderstorms	0.2	0.3	0.4	0.2	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.4	3.1
Dense Fog-Visibility (1/4 mile or less)	3.0	2.5	1.5	1.1	0.6	0.6	0.7	0.6	2.2	3.2	3.5	3.9	23.4
Temperature in Fahrenheit													
-Maximum													
90° and above	0.0	0.0	0.1	0.2	0.1	0.5	0.3	0.2	1.4	0.9	0.2	0.0	3.9
32° and below	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-Minimum													
32° and below	*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*
Mean Sea-level Pressure (in.)	30.06	30.05	30.02	29.97	29.95	29.92	29.93	29.92	29.90	29.95	30.03	30.06	29.98
Relative Humidity (%)													
-Mean	63	66	67	67	71	74	75	74	73	69	66	64	69
-Hour 04 PST	70	73	75	75	77	81	82	81	80	76	73	70	76
-Hour 10 PST	55	58	60	60	65	69	69	68	66	61	56	54	62
-Hour 16 PST	56	58	59	59	64	66	66	66	65	63	61	58	62
-Hour 22 PST	70	72	72	72	75	78	80	79	78	75	73	71	75
Wind:													
Mean Speed (mph)	6.0	6.6	7.5	7.8	8.1	7.8	7.5	7.3	7.0	6.5	5.8	5.6	7.0
Prevailing Direction (ref: true north)	NW	WNW	WNW	WNW	WNW	SSW	WNW	WNW	NW	WNW	NE	NE	WNW
Peak Gust													
-Direction (ref: true north)	W	SW	S	SW	NW	W	SW	SW	W	NW	SW	NW	W
-Speed (mph)	64	46	44	40	40	35	30	29	35	32	37	44	64
-Date	1988	1993	1995	1988	1988	1996	1985	1991	1994	1991	1985	1991	Jan 1988

[1] - means are reference to the 30 year period from 1961-1990
* - indicates the value is between 0.0 and 0.05

DAILY NORMALS OF TEMPERATURE, HEATING AND COOLING DEGREE DAYS AND PRECIPITATION 1971-2000

December

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	68	50	59	6	0	0.04
2	67	50	59	6	0	0.04
3	67	50	59	6	0	0.04
4	67	50	59	6	0	0.04
5	67	50	59	6	0	0.04
6	67	50	58	7	0	0.03
7	67	50	58	7	0	0.03
8	67	50	58	7	0	0.04
9	67	50	58	7	0	0.04
10	67	50	58	7	0	0.04
11	66	49	58	7	0	0.04
12	66	49	58	7	0	0.04
13	66	49	58	7	0	0.04
14	66	49	58	7	0	0.04
15	66	48	57	8	0	0.04
16	66	48	57	8	0	0.04
17	66	48	57	8	0	0.04
18	66	48	57	8	0	0.04
19	66	48	57	8	0	0.04
20	66	48	57	8	0	0.04
21	66	48	57	8	0	0.04
22	66	48	57	8	0	0.04
23	66	48	57	8	0	0.04
24	66	48	57	8	0	0.05
25	66	48	57	8	0	0.05
26	66	48	57	8	0	0.05
27	66	48	57	8	0	0.05
28	66	48	57	8	0	0.05
29	65	49	57	8	0	0.05
30	65	49	57	8	0	0.05
31	65	49	57	8	0	0.06
Monthly	66.3	48.9	57.6	7.4	0	10.77
Annual	70.8	58.1	64.4	0.6	0	10.77

January

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	65	49	57	8	0	0.06
2	65	49	57	8	0	0.06
3	65	49	57	8	0	0.06
4	65	49	57	8	0	0.06
5	65	49	57	8	0	0.06
6	65	49	57	8	0	0.07
7	65	49	57	8	0	0.07
8	66	49	58	7	0	0.07
9	66	49	58	7	0	0.07
10	66	49	58	7	0	0.07
11	66	49	58	7	0	0.07
12	66	49	58	7	0	0.07
13	66	50	58	7	0	0.07
14	66	50	58	7	0	0.07
15	66	50	58	7	0	0.08
16	66	50	58	7	0	0.08
17	66	50	58	7	0	0.08
18	66	50	58	7	0	0.08
19	66	50	58	7	0	0.08
20	66	50	58	7	0	0.08
21	66	50	58	7	0	0.08
22	66	50	58	7	0	0.08
23	66	50	58	7	0	0.08
24	66	50	58	7	0	0.08
25	66	50	58	7	0	0.08
26	66	50	58	7	0	0.08
27	66	50	58	7	0	0.08
28	66	50	58	7	0	0.08
29	66	50	58	7	0	0.08
30	66	51	59	6	0	0.08
31	66	51	59	6	0	0.07
Monthly	65.8	49.7	57.8	7.2	0	2.28

February

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	66	51	58	7	0	0.08
2	66	51	58	7	0	0.08
3	66	51	58	7	0	0.08
4	66	51	59	6	0	0.07
5	66	51	59	6	0	0.07
6	66	51	59	6	0	0.07
7	66	51	59	6	0	0.07
8	66	51	59	6	0	0.07
9	67	51	59	6	0	0.07
10	67	51	59	6	0	0.07
11	67	51	59	6	0	0.07
12	67	51	59	6	0	0.07
13	67	51	59	6	0	0.07
14	67	51	59	6	0	0.07
15	67	51	59	6	0	0.07
16	66	52	59	6	0	0.07
17	66	52	59	6	0	0.07
18	66	52	59	6	0	0.07
19	66	52	59	6	0	0.07
20	66	52	59	6	0	0.07
21	66	52	59	6	0	0.07
22	66	52	59	6	0	0.07
23	66	52	59	6	0	0.07
24	66	52	59	6	0	0.08
25	66	52	59	6	0	0.08
26	66	52	59	6	0	0.08
27	66	52	59	6	0	0.08
28	66	52	59	6	0	0.08
29	66	52	58.9	6.1	0	0.06
Monthly	66.3	53.6	60	5	0	2.26

DAILY NORMALS OF TEMPERATURE, HEATING AND COOLING DEGREE DAYS AND PRECIPITATION 1971-2000

March

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	66	52	59	6	0	0.08
2	66	52	59	6	0	0.08
3	66	52	59	6	0	0.08
4	66	53	59	6	0	0.08
5	66	53	59	6	0	0.08
6	65	53	59	6	0	0.08
7	65	53	59	6	0	0.08
8	65	53	59	6	0	0.08
9	66	53	59	6	0	0.08
10	66	53	60	5	0	0.08
11	66	53	60	5	0	0.08
12	66	53	60	5	0	0.08
13	66	53	60	5	0	0.08
14	66	53	60	5	0	0.08
15	66	53	60	5	0	0.08
16	66	54	60	5	0	0.08
17	66	54	60	5	0	0.08
18	66	54	60	5	0	0.07
19	66	54	60	5	0	0.07
20	66	54	61	4	0	0.07
21	67	54	61	4	0	0.07
22	67	54	61	4	0	0.07
23	67	54	61	4	0	0.07
24	67	54	61	4	0	0.07
25	67	54	61	4	0	0.07
26	67	54	61	4	0	0.06
27	67	55	61	4	0	0.06
28	67	55	61	4	0	0.06
29	67	55	61	4	0	0.06
30	67	55	61	4	0	0.05
31	67	55	61	4	0	0.05
Monthly	66.3	53.6	60	5	0	2.26

April

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	68	55	61	4	0	0.05
2	68	55	61	4	0	0.05
3	68	55	61	4	0	0.05
4	68	55	61	4	0	0.04
5	68	55	62	3	0	0.04
6	68	55	62	3	0	0.04
7	68	56	62	3	0	0.04
8	68	56	62	3	0	0.03
9	68	56	62	3	0	0.03
10	68	56	62	3	0	0.03
11	69	56	62	3	0	0.03
12	69	56	62	3	0	0.03
13	69	56	62	3	0	0.03
14	69	56	63	2	0	0.02
15	69	56	63	2	0	0.02
16	69	57	63	2	0	0.02
17	69	57	63	2	0	0.02
18	69	57	63	2	0	0.02
19	69	57	63	2	0	0.02
20	69	57	63	2	0	0.02
21	69	57	63	2	0	0.02
22	69	57	63	2	0	0.02
23	69	57	63	2	0	0.01
24	69	58	63	2	0	0.01
25	69	58	64	1	0	0.01
26	69	58	64	1	0	0.01
27	69	58	64	1	0	0.01
28	69	58	64	1	0	0.01
29	69	58	64	1	0	0.01
30	69	58	64	1	0	0.01
Monthly	68.7	56.4	62.6	2.4	0	0.75

May

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	69	58	64	1	0	0.01
2	69	58	64	1	0	0.01
3	69	58	64	1	0	0.01
4	69	59	64	1	0	0.01
5	69	59	64	1	0	0.01
6	69	60	64	1	0	0.01
7	69	60	64	1	0	0.01
8	69	60	64	1	0	0.01
9	69	60	64	1	0	0.01
10	69	60	64	1	0	0.01
11	69	60	64	1	0	0.01
12	69	60	64	1	0	0.01
13	69	60	64	1	0	0.01
14	69	60	64	1	0	0.01
15	69	60	65	0	0	0.01
16	69	60	65	0	0	0.01
17	69	60	65	0	0	0.01
18	69	60	65	0	0	0.01
19	69	60	65	0	0	0.01
20	69	60	65	0	0	0.01
21	69	60	65	0	0	0
22	69	60	65	0	0	0
23	70	60	65	0	0	0
24	70	60	65	0	0	0
25	70	60	65	0	0	0
26	70	60	65	0	0	0
27	70	60	65	0	0	0
28	70	60	65	0	0	0
29	70	60	65	0	0	0
30	70	60	65	0	0	0
31	70	61	66	0	1	0
Monthly	69.3	59.8	64.6	0.4	0	0.2

DAILY NORMALS OF TEMPERATURE, HEATING AND COOLING DEGREE DAYS AND PRECIPITATION 1971-2000

June

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	70	61	66	0	1	0.01
2	71	61	66	0	1	0.01
3	71	61	66	0	1	0.01
4	71	61	66	0	1	0.01
5	71	62	66	0	1	0.01
6	71	62	66	0	1	0.01
7	71	62	66	0	1	0.01
8	71	62	66	0	1	0.01
9	71	62	67	0	2	0.01
10	71	62	67	0	2	0
11	72	62	67	0	2	0
12	72	62	67	0	2	0
13	72	62	67	0	2	0
14	72	62	67	0	2	0
15	72	62	67	0	2	0
16	72	63	68	0	3	0
17	72	63	68	0	3	0
18	72	63	68	0	3	0
19	73	63	68	0	3	0
20	73	63	68	0	3	0
21	73	63	68	0	3	0
22	73	63	68	0	3	0
23	73	63	68	0	3	0
24	73	63	68	0	3	0
25	73	64	69	0	4	0
26	74	64	69	0	4	0
27	74	64	69	0	4	0
28	74	64	69	0	4	0
29	74	64	69	0	4	0
30	74	64	69	0	4	0
Monthly	72.2	62.6	67.4	0	2.4	0.09

July

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	74	64	69	0	4	0.01
2	74	64	69	0	4	0.01
3	74	65	70	0	5	0.01
4	75	65	70	0	5	0
5	75	65	70	0	5	0
6	75	65	70	0	5	0
7	75	65	70	0	5	0
8	75	65	70	0	5	0
9	75	65	70	0	5	0
10	75	65	70	0	5	0
11	75	66	71	0	6	0
12	76	66	71	0	6	0
13	76	66	71	0	6	0
14	76	66	71	0	6	0
15	76	66	71	0	6	0
16	76	66	71	0	6	0
17	76	66	71	0	6	0
18	76	66	71	0	6	0
19	76	66	71	0	6	0
20	76	66	71	0	6	0
21	76	66	71	0	6	0
22	76	66	71	0	6	0
23	76	67	72	0	7	0
24	77	67	72	0	7	0
25	77	67	72	0	7	0
26	77	67	72	0	7	0
27	77	67	72	0	7	0
28	77	67	72	0	7	0
29	77	67	72	0	7	0
30	77	67	72	0	7	0
31	77	67	72	0	7	0
Monthly	75.8	65.9	70.9	0	5.9	0.03

August

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	77	67	72	0	7	0
2	77	67	72	0	7	0
3	77	67	72	0	7	0
4	77	67	72	0	7	0
5	77	67	72	0	7	0
6	77	67	72	0	7	0
7	77	67	72	0	7	0
8	77	67	72	0	7	0
9	77	67	72	0	7	0
10	77	67	72	0	7	0
11	77	67	72	0	7	0
12	77	67	72	0	7	0
13	77	67	72	0	7	0
14	77	68	72	0	7	0
15	77	68	72	0	7	0
16	77	68	72	0	7	0
17	77	68	72	0	7	0
18	78	68	73	0	8	0
19	78	68	73	0	8	0
20	78	68	73	0	8	0
21	78	68	73	0	8	0
22	78	68	73	0	8	0
23	78	68	73	0	8	0.01
24	78	68	73	0	8	0.01
25	78	67	73	0	8	0.01
26	78	67	73	0	8	0.01
27	78	67	73	0	8	0.01
28	78	67	73	0	8	0.01
29	78	67	73	0	8	0.01
30	78	67	73	0	8	0.01
31	78	67	73	0	8	0.01
Monthly	77.5	67.4	72.5	0	7.5	0.09

DAILY NORMALS OF TEMPERATURE, HEATING AND COOLING DEGREE DAYS AND PRECIPITATION 1971-2000

September

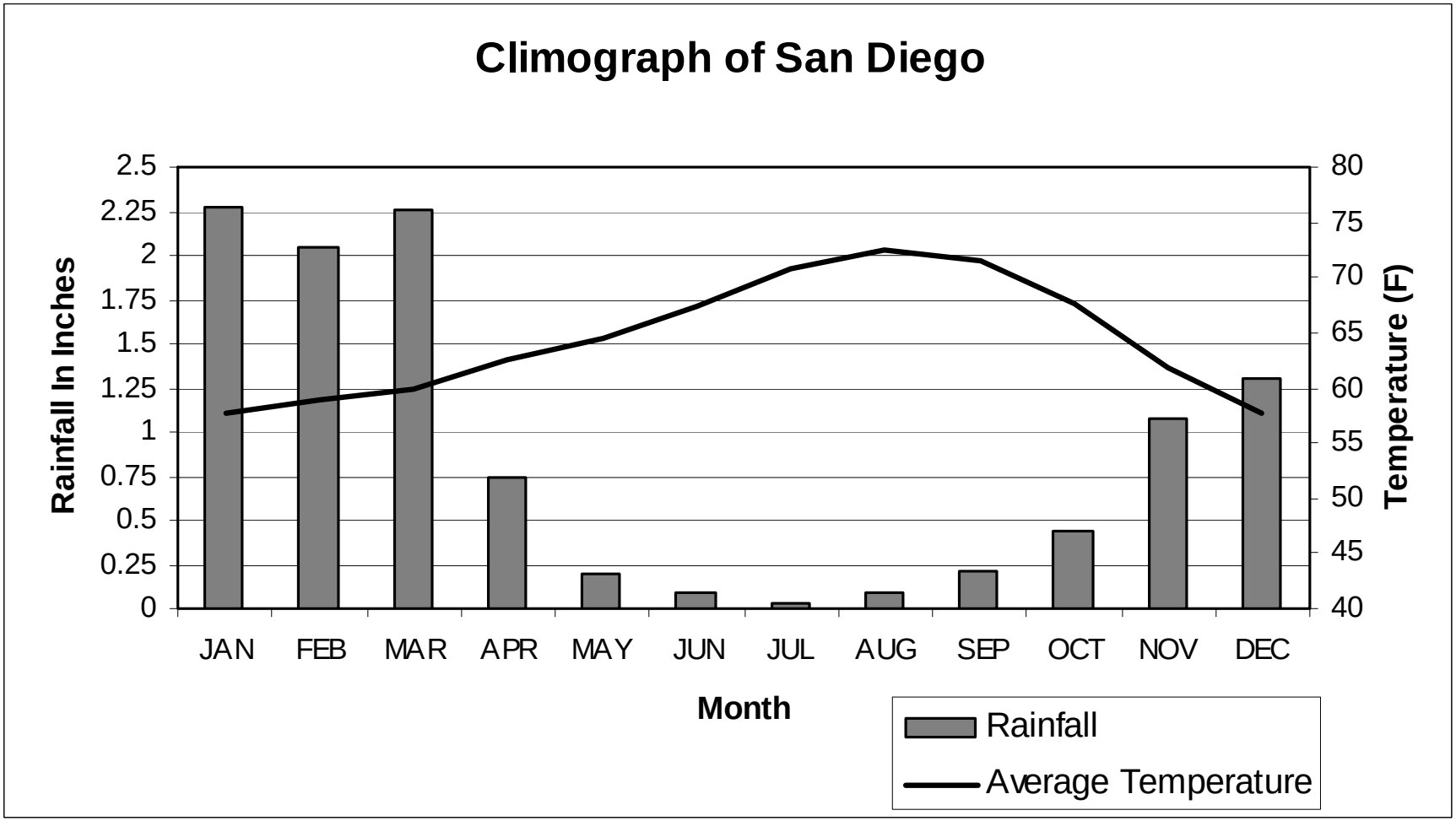
Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	78	67	73	0	8	0
2	78	67	73	0	8	0
3	78	67	72	0	7	0
4	78	67	72	0	7	0
5	78	67	72	0	7	0
6	78	67	72	0	7	0
7	77	67	72	0	7	0
8	77	67	72	0	7	0
9	77	67	72	0	7	0
10	77	67	72	0	7	0.01
11	77	67	72	0	7	0.01
12	77	67	72	0	7	0.01
13	77	66	72	0	7	0.01
14	77	66	72	0	7	0.01
15	77	66	72	0	7	0.01
16	77	66	72	0	7	0.01
17	77	66	72	0	7	0.01
18	77	66	72	0	7	0.01
19	77	66	71	0	6	0.01
20	77	66	71	0	6	0.01
21	77	66	71	0	6	0.01
22	77	65	71	0	6	0.01
23	77	65	71	0	6	0.01
24	76	65	71	0	6	0.01
25	76	65	71	0	6	0.01
26	76	65	71	0	6	0.01
27	76	65	71	0	6	0.01
28	76	65	71	0	6	0.01
29	76	64	70	0	5	0.01
30	76	64	70	0	5	0.01
Monthly	77	66.1	71.6	0	6.6	0.21

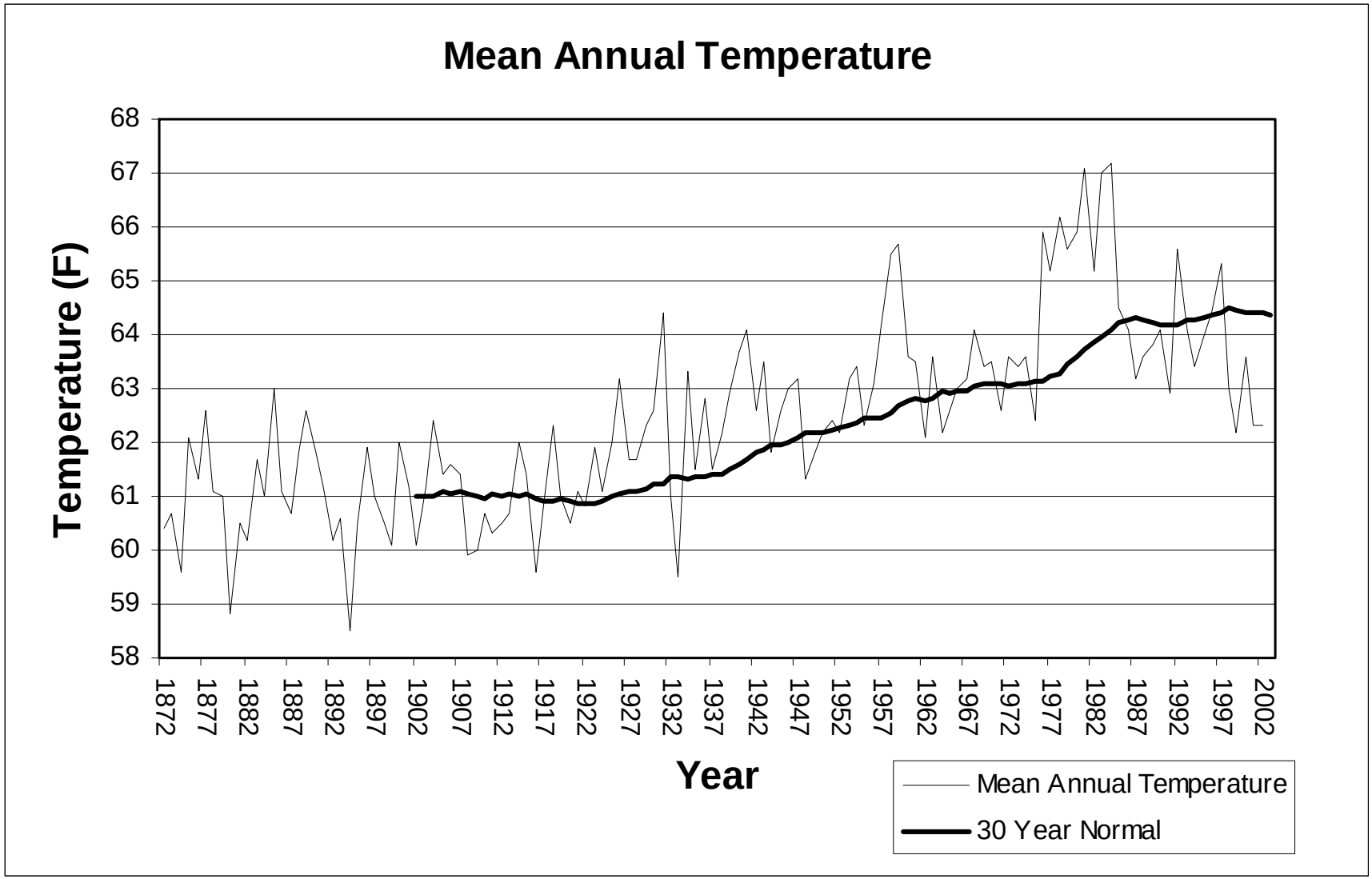
October

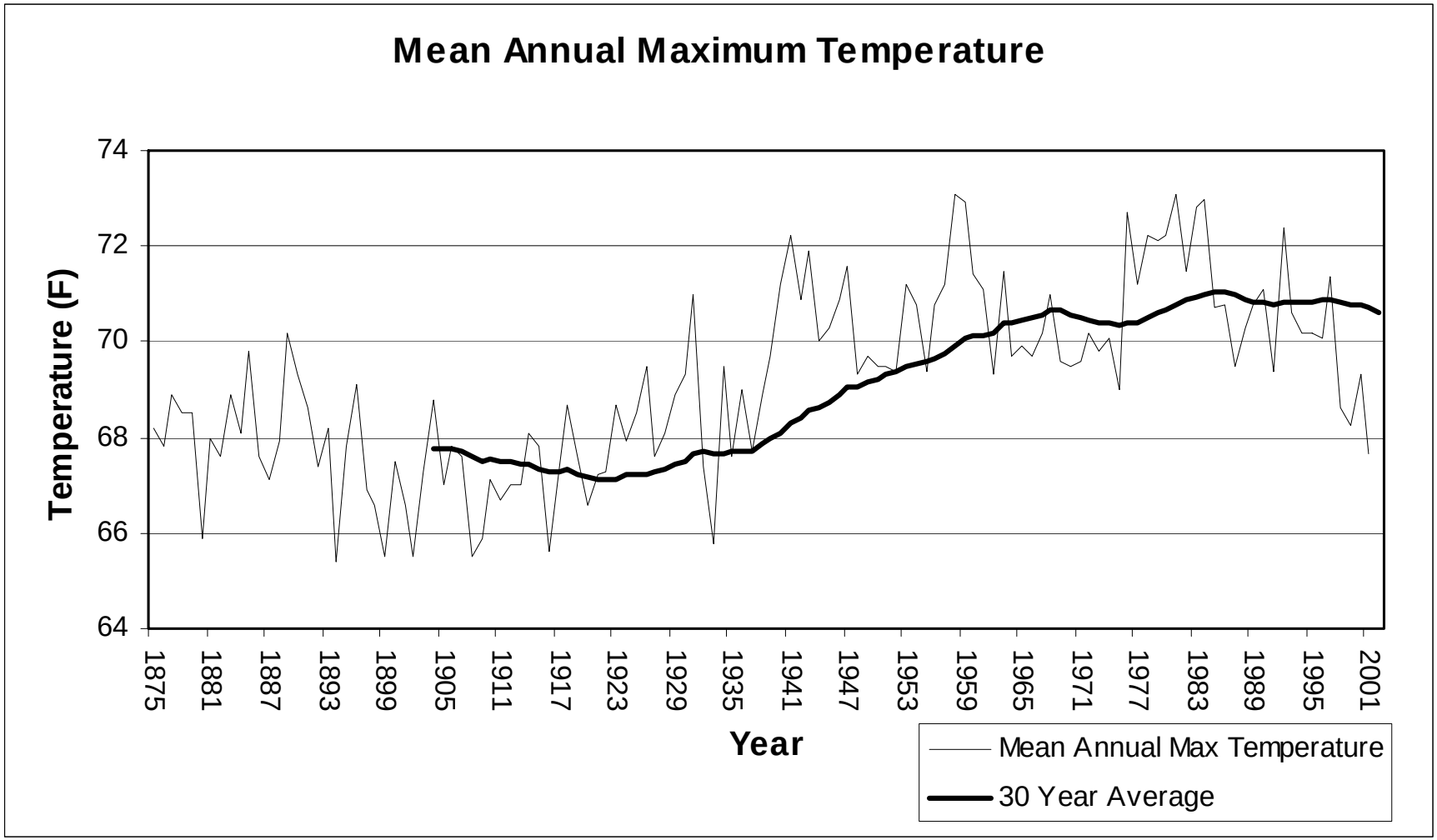
Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	76	64	70	0	5	0.01
2	76	64	70	0	5	0.01
3	76	64	70	0	5	0.01
4	75	63	69	0	4	0.01
5	75	63	69	0	4	0.01
6	75	63	69	0	4	0.01
7	75	63	69	0	4	0.01
8	75	63	69	0	4	0.01
9	75	63	69	0	4	0.01
10	75	63	69	0	4	0.01
11	75	62	68	0	3	0.01
12	75	62	68	0	3	0.01
13	74	62	68	0	3	0.01
14	74	62	68	0	3	0.01
15	74	62	68	0	3	0.01
16	74	61	68	0	3	0.01
17	74	61	68	0	3	0.01
18	74	61	67	0	2	0.01
19	74	61	67	0	2	0.01
20	74	61	67	0	2	0.02
21	73	60	67	0	2	0.02
22	73	59	66	0	1	0.02
23	73	59	66	0	1	0.02
24	73	59	66	0	1	0.02
25	73	59	66	0	1	0.02
26	73	59	66	0	1	0.02
27	73	59	66	0	1	0.02
28	72	59	66	0	1	0.02
29	72	59	66	0	1	0.02
30	72	59	66	0	1	0.02
31	72	58	65	0	0	0.03
Monthly	74	61.2	67.6	0	2.6	0.44

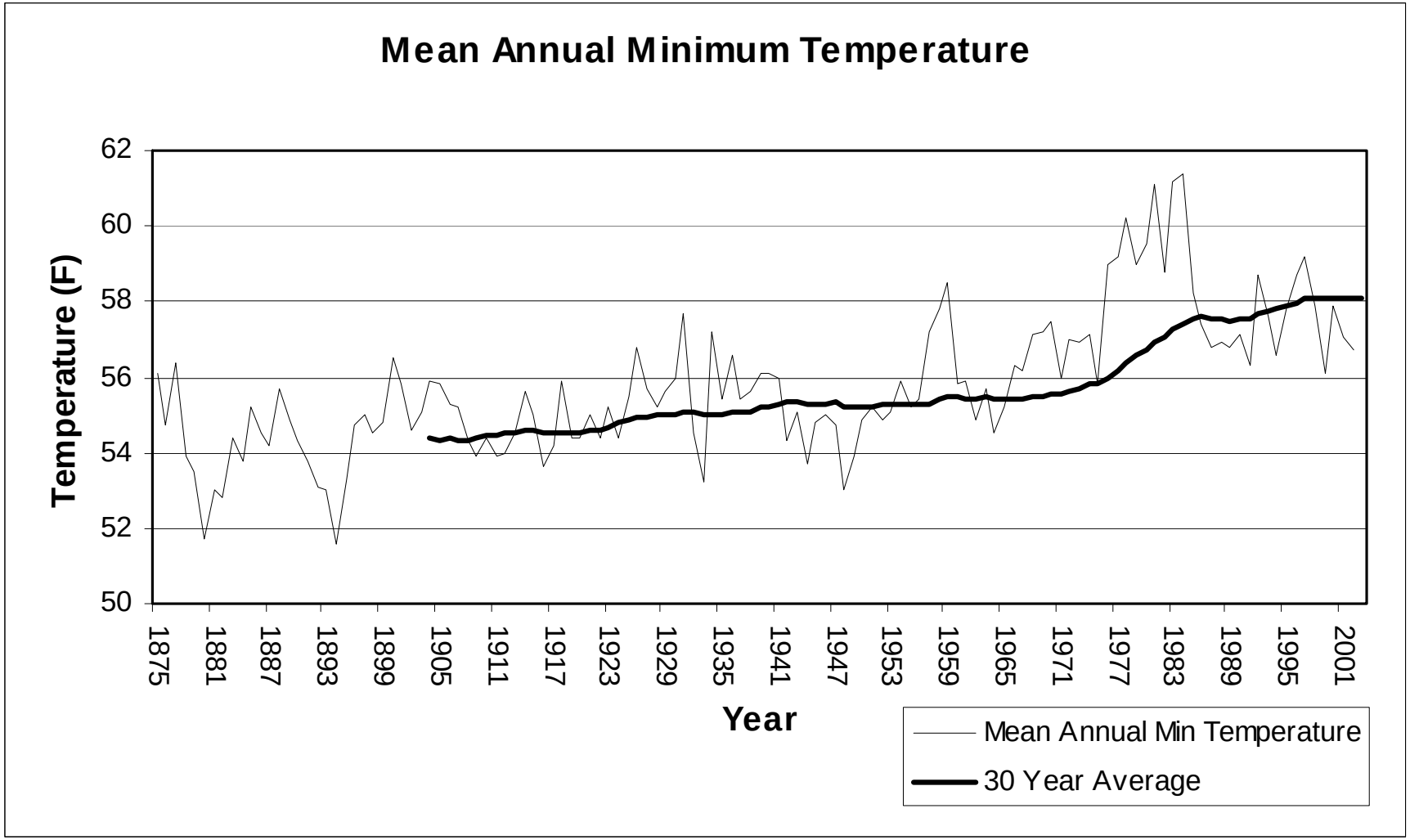
November

Daily	MAX	MIN	AVG	Heating	Cooling	Precip
1	72	57	64	1	0	0.03
2	72	57	64	1	0	0.03
3	72	57	64	1	0	0.03
4	72	56	64	1	0	0.03
5	71	56	64	1	0	0.03
6	71	56	63	2	0	0.03
7	71	55	63	2	0	0.03
8	71	55	63	2	0	0.03
9	71	55	63	2	0	0.03
10	71	55	63	2	0	0.03
11	71	55	63	2	0	0.03
12	70	55	63	2	0	0.03
13	70	55	63	2	0	0.04
14	70	55	63	2	0	0.04
15	70	54	62	3	0	0.04
16	70	53	62	3	0	0.04
17	69	53	61	4	0	0.04
18	69	53	61	4	0	0.04
19	69	53	61	4	0	0.04
20	69	52	61	4	0	0.04
21	69	52	61	4	0	0.04
22	69	52	61	4	0	0.04
23	69	51	60	5	0	0.04
24	69	51	60	5	0	0.04
25	69	51	60	5	0	0.04
26	68	51	60	5	0	0.04
27	68	51	60	5	0	0.04
28	68	51	60	5	0	0.04
29	68	50	59	6	0	0.04
30	68	50	59	6	0	0.04
Monthly	69.9	53.6	61.8	3.2	0	1.07


Climograph of San Diego
Rainfall In Inches
Temperature (F)
2.5
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
80
75
70
65
60
55
50
45
40
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
Month
Rainfall
Average Temperature


Mean Annual Temperature
Temperature (F)
68
67
66
65
64
63
62
61
60
59
58
1872
1877
1882
1887
1892
1897
1902
1907
1912
1917
1922
1927
1932
1937
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
Year
Mean Annual Temperature
30 Year Normal


Mean Annual Maximum Temperature
Temperature (F)
74
72
70
68
66
64
1875
1881
1887
1893
1899
1905
1911
1917
1923
1929
1935
1941
1947
1953
1959
1965
1971
1977
1983
1989
1995
2001
Year
Mean Annual Max Temperature
30 Year Average


Mean Annual Minimum Temperature
Temperature (F)
62
60
58
56
54
52
50
1875
1881
1887
1893
1899
1905
1911
1917
1923
1929
1935
1941
1947
1953
1959
1965
1971
1977
1983
1989
1995
2001
Year
Mean Annual Min Temperature
30 Year Average

TEMPERATURE READINGS OF 100 DEGREES AND HIGHER

BY SEVERITY		CHRONOLOGICALLY	
Temperature	**Date**	**Temperature**	**Date**
111	September 26, 1963	100	September 25, 1989
110	September 17, 1913	107	September 4, 1988
107	September 4, 1988	104	October 3, 1987
107	October 14, 1961	100	September 8, 1984
106	September 21, 1939	100	June 16, 1981
104	October 3, 1987	100	September 15, 1979
104	October 22, 1965	101	June 10, 1979
104	September 27, 1963	101	September 25, 1978
104	September 1, 1955	103	September 23, 1975
103	September 23, 1975	101	October 6, 1971
102	September 11, 1959	104	October 22, 1965
101	October 6, 1971	101	October 21, 1965
101	June 10, 1979	104	September 27, 1963
101	September 25, 1978	111	September 26, 1963
101	October 21, 1965	107	October 14, 1961
101	September 22, 1939	102	September 11, 1959
101	September 22, 1883	104	September 1, 1955
100	September 25, 1989	101	September 22, 1939
100	September 8, 1984	106	September 21, 1939
100	June 16, 1981	100	July 30, 1930
100	September 15, 1979	110	September 17, 1913
100	July 30, 1930	100	September 16, 1909
100	September 16, 1909	101	September 22, 1883
100	September 11, 1878	100	September 11, 1878

TEMPERATURE READINGS OF 32 DEGREES AND COLDER

BY SEVERITY		CHRONOLOGICALLY	
Temperature	**Date**	**Temperature**	**Date**
25	January 7, 1913	32	December 25, 1879
28	January 6, 1913	32	January 31, 1880
29	January 4, 1949	32	January 21, 1883
30	January 5, 1949	32	December 26, 1891
30	January 22, 1937	32	January 7, 1894
31	January 13, 1963	28	January 6, 1913
32	January 7, 1894	25	January 7, 1913
32	December 26, 1891	30	January 22, 1937
32	January 21, 1883	29	January 4, 1949
32	January 31, 1880	30	January 5, 1949
32	December 25, 1879	31	January 13, 1963

MEAN YEARLY TEMPERATURES IN DESCENDING ORDER

Year	Temp	Year	Temp	Year	Temp	Year	Temp
1984	67.2	1953	63.2	1883	61.7	1908	59.9
1981	67.1	1947	63.2	1928	61.7	1916	59.6
1983	67.0	1987	63.2	1927	61.7	1874	59.6
1978	66.2	1956	63.1	1906	61.6	1933	59.5
1980	65.9	1998	63.0	1937	61.5	1880	58.8
1976	65.9	1946	63.0	1935	61.5	1894	58.5
1959	65.7	1966	63.0	1905	61.4		
1992	65.6	1885	63.0	1907	61.4		
1979	65.6	1939	62.9	1915	61.4		
1958	65.5	1991	62.9	1876	61.3		
1997	65.3	1936	62.8	1948	61.3		
1977	65.2	1877	62.6	1903	61.2		
1982	65.2	1945	62.6	1901	61.2		
1985	64.5	1965	62.6	1891	61.2		
1996	64.4	1942	62.6	1924	61.1		
1931	64.4	1930	62.6	1921	61.1		
1957	64.2	1889	62.6	1886	61.1		
1993	64.1	1971	62.6	1878	61.1		
1941	64.1	1904	62.4	1919	61.0		
1968	64.1	1951	62.4	1897	61.0		
1990	64.1	1975	62.4	1884	61.0		
1986	64.1	2001	62.3	1932	61.0		
1995	64.0	2002	62.3	1879	61.0		
2003	63.8	1955	62.3	1922	60.8		
1989	63.8	1918	62.3	1917	60.8		
1940	63.7	1929	62.3	1873	60.7		
2000	63.6	1999	62.2	1887	60.7		
1963	63.6	1964	62.2	1910	60.7		
1972	63.6	1938	62.2	1913	60.7		
1974	63.6	1950	62.2	1893	60.6		
1988	63.6	1952	62.2	1898	60.5		
1960	63.6	1875	62.1	1895	60.5		
1970	63.5	1962	62.1	1881	60.5		
1943	63.5	1925	62.0	1912	60.5		
1961	63.5	1914	62.0	1920	60.5		
1973	63.4	1900	62.0	1872	60.4		
1969	63.4	1923	61.9	1911	60.3		
1994	63.4	1896	61.9	1882	60.2		
1954	63.4	1949	61.8	1892	60.2		
1934	63.3	1890	61.8	1902	60.1		
1926	63.2	1888	61.8	1899	60.1		
1967	63.2	1944	61.8	1909	60.0		

MEAN MONTHLY TEMPERATURE

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1872	52.7	55.2	56.4	56.0	60.4	64.9	66.6	68.9	66.0	62.5	59.4	55.4	60.4
1873	57.0	53.0	57.0	58.0	60.0	62.0	67.0	69.0	68.0	62.0	61.0	54.0	60.7
1874	54.7	52.6	52.6	56.2	60.5	63.2	68.3	68.1	65.7	62.2	57.0	53.8	59.6
1875	55.0	54.6	55.2	61.2	62.2	65.8	68.6	70.9	68.5	65.6	60.8	57.1	62.1
1876	51.6	56.0	53.7	59.6	61.4	66.0	68.8	69.5	66.1	64.9	60.0	57.8	61.3
1877	57.1	58.4	59.2	60.8	60.8	67.4	69.3	68.9	68.6	63.8	60.8	56.4	62.6
1878	55.2	55.8	56.8	58.4	62.5	65.4	67.8	68.2	68.2	62.8	58.0	54.2	61.1
1879	52.4	55.0	58.4	59.8	61.5	65.6	67.0	69.0	67.2	65.1	56.6	53.8	61.0
1880	52.8	50.5	52.1	57.0	61.2	63.4	64.4	66.4	63.8	61.6	56.6	56.0	58.8
1881	52.5	55.2	54.5	60.9	62.8	64.6	68.0	68.2	66.6	61.2	56.4	55.1	60.5
1882	50.3	51.2	55.0	56.8	62.3	65.0	67.6	70.8	67.0	61.8	57.0	57.6	60.2
1883	53.6	54.2	57.8	57.7	61.1	67.6	69.8	69.7	70.6	61.8	58.9	57.3	61.7
1884	58.1	55.8	55.4	56.8	61.3	65.2	69.2	70.4	65.8	61.6	58.6	53.8	61.0
1885	57.9	57.8	59.2	62.4	64.1	64.6	68.6	71.8	68.4	64.2	59.7	57.3	63.0
1886	55.8	59.0	55.1	57.4	61.0	64.0	67.9	71.5	67.5	60.0	57.9	56.3	61.1
1887	54.2	52.6	57.4	59.2	62.2	66.0	67.4	66.5	66.2	64.8	57.4	54.4	60.7
1888	51.5	54.4	55.5	61.4	61.9	66.4	68.4	69.2	69.7	65.0	59.9	58.2	61.8
1889	54.8	58.0	59.2	60.4	60.8	64.0	67.6	70.8	70.2	65.4	62.0	57.4	62.6
1890	51.0	54.3	56.4	58.6	60.4	64.1	68.5	69.8	69.1	64.6	63.8	60.8	61.8
1891	54.6	53.3	56.9	58.2	60.8	63.6	69.0	72.4	70.2	63.8	59.4	52.2	61.2
1892	55.1	55.0	56.0	57.8	61.0	62.0	64.9	67.8	65.4	62.7	60.9	54.2	60.2
1893	57.4	54.4	54.2	57.5	61.0	63.4	67.4	70.0	64.6	62.7	57.6	57.4	60.6
1894	49.5	50.5	52.6	56.4	58.6	61.4	64.8	67.0	66.0	62.8	57.1	54.8	58.5
1895	53.2	55.8	55.4	57.8	61.9	63.0	65.6	67.1	67.4	64.4	59.4	55.0	60.5
1896	55.5	57.7	58.2	56.5	62.0	64.8	68.6	69.4	66.7	64.2	59.7	59.0	61.9
1897	55.8	54.7	54.2	59.8	60.9	63.4	67.0	69.9	68.1	62.4	60.2	55.0	61.0
1898	50.8	55.2	54.5	59.1	58.8	63.8	66.7	70.6	68.5	62.3	59.4	56.6	60.5
1899	55.5	53.4	56.4	58.2	57.7	61.4	65.6	65.8	65.5	62.7	60.8	58.7	60.1
1900	57.8	57.6	59.2	56.8	60.9	64.4	67.6	66.2	65.6	63.1	64.6	60.4	62.0
1901	56.2	57.5	60.0	57.4	60.0	62.5	65.8	68.2	64.8	62.8	60.8	57.8	61.2
1902	56.4	54.8	54.8	57.2	60.2	62.2	65.4	66.8	66.2	62.6	58.3	55.8	60.1

MEAN MONTHLY TEMPERATURE

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1903	56.8	52.2	57.6	58.4	60.5	63.2	66.2	68.4	67.9	63.5	61.6	57.8	61.2
1904	55.7	54.6	56.4	58.9	60.5	64.5	66.7	71.0	70.2	66.8	64.2	58.8	62.4
1905	58.1	59.0	59.6	59.1	59.9	62.7	65.2	67.4	66.4	63.8	59.2	56.0	61.4
1906	54.6	58.0	57.8	58.2	60.0	64.8	68.7	68.5	68.2	65.4	58.2	56.4	61.6
1907	52.8	60.1	56.6	59.4	60.8	62.9	68.1	67.2	65.1	64.9	61.2	57.8	61.4
1908	56.9	54.0	56.8	59.4	57.4	60.1	66.8	68.0	66.6	61.6	57.8	53.8	59.9
1909	54.2	54.2	54.5	59.0	59.8	62.6	65.2	68.6	66.6	63.8	57.2	53.8	60.0
1910	52.2	52.9	57.2	61.7	61.1	62.0	67.0	67.8	67.8	64.0	58.7	56.2	60.7
1911	56.2	52.2	58.0	57.7	59.3	62.4	66.2	67.4	66.2	63.0	61.7	53.4	60.3
1912	57.0	56.2	55.2	56.1	60.6	63.2	66.9	66.4	65.8	63.3	61.2	54.1	60.5
1913	50.6	53.4	55.1	58.0	59.7	62.8	68.2	68.9	70.3	65.5	60.8	55.4	60.7
1914	56.3	57.4	61.4	61.4	60.2	63.8	65.8	66.2	66.0	66.0	64.4	54.6	62.0
1915	55.2	55.4	59.4	59.7	60.6	64.8	67.5	69.5	66.4	62.8	59.6	55.6	61.4
1916	52.5	56.4	59.2	60.2	60.8	61.4	65.0	67.0	64.4	59.3	56.5	52.4	59.6
1917	51.6	54.7	54.6	57.0	58.4	63.7	68.9	68.6	68.2	64.6	60.8	58.6	60.8
1918	54.4	55.1	58.5	60.4	60.8	66.8	68.0	69.8	70.6	68.1	59.8	54.8	62.3
1919	56.6	53.6	55.0	59.2	61.0	66.2	68.6	68.4	66.5	62.0	58.6	56.6	61.0
1920	54.6	56.8	55.6	57.6	59.8	63.6	67.0	70.4	66.2	61.4	58.2	54.8	60.5
1921	53.6	55.2	57.5	57.4	58.4	63.1	68.4	68.2	66.8	64.6	60.4	59.3	61.1
1922	52.5	53.7	54.6	56.3	60.3	64.3	67.7	70.7	70.0	64.0	58.0	58.0	60.8
1923	56.3	55.2	58.4	59.0	63.2	62.3	67.0	67.8	68.2	64.4	64.0	57.4	61.9
1924	55.2	59.0	56.6	59.4	63.0	65.5	67.0	67.0	66.4	60.5	60.0	54.0	61.1
1925	54.4	56.6	57.2	58.6	62.3	64.6	70.2	68.8	66.6	63.6	60.8	60.3	62.0
1926	56.7	59.7	62.4	63.4	63.8	66.2	67.6	69.3	66.0	64.0	63.8	55.2	63.2
1927	55.4	56.4	56.6	58.2	61.4	63.3	69.2	69.0	66.4	64.6	63.3	56.0	61.7
1928	57.8	57.5	59.4	59.6	63.0	64.0	66.6	67.2	66.2	62.2	60.2	56.1	61.7
1929	54.4	53.2	55.6	57.5	62.7	65.2	69.4	72.0	68.2	66.7	62.1	60.3	62.3
1930	55.8	57.9	59.6	62.0	60.0	64.6	69.6	70.3	66.9	64.8	63.0	57.1	62.6
1931	57.7	59.2	61.9	63.8	66.2	68.7	73.6	73.8	69.7	66.6	57.2	53.8	64.4
1932	52.2	55.6	59.0	60.2	61.8	63.8	65.6	66.0	65.6	63.2	64.2	54.2	61.0

MEAN MONTHLY TEMPERATURE

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1933	52.8	52.7	57.0	57.8	58.2	61.6	65.4	66.6	62.8	62.4	61.4	55.1	59.5
1934	56.1	58.3	61.8	62.3	64.7	64.0	69.0	69.0	69.7	64.9	61.2	59.1	63.3
1935	56.0	57.4	54.6	60.0	61.6	63.4	67.8	70.4	67.3	64.1	58.0	57.4	61.5
1936	56.6	56.3	57.4	58.2	63.2	65.3	70.6	71.4	68.0	65.0	63.7	58.1	62.8
1937	49.2	54.4	56.6	59.7	62.1	64.9	68.4	68.8	69.4	64.6	60.0	60.2	61.5
1938	58.4	57.2	57.2	60.0	61.6	63.2	66.8	69.5	70.4	63.6	59.2	59.6	62.2
1939	55.6	52.4	55.2	61.0	62.2	64.8	68.1	70.1	72.8	67.8	63.8	61.0	62.9
1940	58.6	57.9	60.3	62.6	64.8	65.2	68.4	69.0	68.7	66.4	61.1	60.8	63.7
1941	57.6	59.9	62.0	60.9	67.2	66.4	69.4	70.8	68.0	65.6	63.4	57.6	64.1
1942	57.7	55.6	57.9	60.2	63.3	64.9	69.6	70.0	67.8	66.0	61.0	57.5	62.6
1943	57.0	59.7	60.0	61.0	65.0	65.2	69.0	71.2	68.7	65.8	61.7	57.8	63.5
1944	56.4	54.6	58.7	59.5	62.8	64.2	66.8	69.4	66.9	64.6	59.8	58.2	61.8
1945	55.2	56.8	55.8	58.4	62.6	65.0	69.0	71.8	71.4	67.4	60.0	57.3	62.6
1946	56.1	54.4	57.1	62.4	63.7	68.0	70.8	72.4	71.0	64.2	58.2	57.1	63.0
1947	53.5	58.5	60.8	62.7	63.9	66.7	69.4	71.0	71.1	66.6	58.4	55.8	63.2
1948	55.7	54.2	55.9	61.2	62.4	64.6	67.0	68.2	68.3	64.1	60.0	53.6	61.3
1949	47.8	52.7	56.2	61.3	63.0	67.2	69.4	70.2	70.0	64.3	64.6	54.8	61.8
1950	52.1	55.6	58.3	60.7	61.2	64.1	69.7	68.2	67.5	66.8	62.5	59.8	62.2
1951	55.7	55.6	58.7	60.7	62.2	65.7	69.3	69.0	67.8	66.8	61.6	55.5	62.4
1952	54.4	57.8	55.9	59.7	64.1	63.9	68.3	70.2	70.5	65.2	59.6	56.4	62.2
1953	60.0	57.0	57.7	58.9	62.9	64.8	70.8	69.9	68.1	67.4	63.1	57.7	63.2
1954	55.0	61.2	57.2	61.0	62.9	65.0	71.9	71.0	69.3	64.2	63.7	58.2	63.4
1955	53.9	55.5	59.7	59.6	61.7	64.7	68.3	72.4	71.5	63.3	60.0	57.1	62.3
1956	55.4	53.5	58.1	58.8	64.5	66.3	69.4	69.7	72.1	65.7	64.2	59.9	63.1
1957	56.5	60.1	59.7	60.7	63.2	68.2	71.3	73.3	70.1	65.6	60.7	61.4	64.2
1958	59.5	60.5	57.6	63.8	65.9	68.0	70.1	73.0	72.7	70.9	61.9	61.9	65.5
1959	59.7	57.1	63.3	64.7	64.3	68.2	73.7	73.6	71.6	67.2	65.3	60.2	65.7
1960	54.9	56.9	60.0	62.9	64.8	66.4	71.2	71.2	72.3	66.0	60.5	56.3	63.6
1961	60.7	59.0	58.9	61.9	61.5	64.7	70.1	72.6	69.6	66.7	60.3	56.1	63.5
1962	56.7	56.5	55.7	61.8	62.6	63.9	68.3	70.5	68.4	64.6	59.8	56.4	62.1

MEAN MONTHLY TEMPERATURE

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1963	55.1	61.2	57.5	58.7	63.6	64.7	68.2	72.1	74.3	68.2	61.2	58.5	63.6
1964	55.3	56.7	57.8	60.2	60.9	64.0	69.2	70.7	67.7	68.6	59.1	55.6	62.2
1965	56.0	55.9	58.6	60.7	62.5	63.7	67.7	72.0	68.5	69.4	60.9	55.1	62.6
1966	53.9	54.6	58.1	61.3	63.5	66.5	69.2	72.6	69.9	67.6	61.9	57.2	63.0
1967	55.0	57.8	59.0	56.5	63.5	63.6	70.4	73.1	72.0	68.1	64.1	55.5	63.2
1968	57.2	60.7	60.7	62.4	63.9	65.8	71.7	72.2	71.3	66.6	61.7	54.9	64.1
1969	58.1	54.9	56.8	61.7	62.9	65.5	69.4	72.8	69.9	66.0	64.1	59.1	63.4
1970	57.0	59.7	60.5	60.1	63.6	65.6	70.4	72.8	69.7	66.3	61.4	55.4	63.5
1971	54.3	55.4	57.8	60.7	61.5	64.9	69.4	75.4	72.2	65.7	59.5	54.2	62.6
1972	54.9	57.8	60.2	62.3	64.7	67.0	72.7	72.2	68.7	65.6	59.8	57.5	63.6
1973	55.6	59.9	58.1	61.5	63.4	68.0	69.1	70.5	68.8	66.8	60.6	58.2	63.4
1974	56.9	58.2	59.1	62.0	63.3	66.9	71.4	70.2	70.3	66.8	62.2	56.3	63.6
1975	56.1	56.4	57.5	58.7	62.2	65.0	69.4	68.9	71.5	65.9	60.4	56.9	62.4
1976	58.9	59.6	60.3	61.0	65.2	69.7	71.1	72.4	73.8	71.2	66.8	60.7	65.9
1977	60.3	61.7	57.5	61.4	61.9	65.8	71.6	73.1	72.2	68.9	64.9	63.3	65.2
1978	61.0	60.9	64.3	63.4	68.2	71.3	71.6	72.9	74.0	70.1	61.7	55.2	66.2
1979	56.9	56.9	60.1	63.4	65.6	70.2	71.8	73.9	76.3	68.7	62.4	60.6	65.6
1980	61.1	63.5	61.5	63.9	63.8	68.5	72.9	74.2	70.4	67.3	62.7	60.8	65.9
1981	61.3	62.2	61.1	64.4	67.3	72.9	75.6	75.8	73.7	67.1	63.5	60.3	67.1
1982	56.6	60.7	60.5	63.8	65.8	66.7	71.9	73.5	73.1	70.1	62.1	57.4	65.2
1983	60.7	60.9	62.0	62.4	66.2	68.1	72.6	77.4	76.8	72.2	64.4	60.6	67.0
1984	61.2	60.2	63.7	64.3	68.1	69.9	77.2	76.6	78.9	68.5	61.4	56.7	67.2
1985	57.0	57.2	58.9	63.6	64.8	69.0	75.3	72.4	69.8	67.9	60.1	58.0	64.5
1986	61.0	58.9	60.5	62.8	64.6	67.4	69.6	71.8	66.9	65.5	62.8	57.6	64.1
1987	55.4	58.0	59.1	63.4	64.7	65.8	67.1	69.9	69.9	69.5	61.8	53.9	63.2
1988	56.7	59.9	61.6	62.4	63.9	64.9	70.4	71.0	70.0	66.7	60.1	56.0	63.6
1989	54.7	56.7	59.8	65.6	63.7	66.0	70.1	71.0	70.4	66.3	63.1	58.7	63.8
1990	56.6	55.4	58.7	63.2	64.3	69.0	72.3	71.6	71.7	68.6	62.7	55.6	64.1
1991	57.4	59.4	56.5	61.7	62.1	64.1	67.4	68.9	69.4	68.0	62.3	57.3	62.9
1992	57.4	61.1	60.4	67.0	68.0	68.1	71.8	74.9	72.4	68.2	62.6	55.3	65.6

MEAN MONTHLY TEMPERATURE

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1993	56.9	58.0	61.3	63.8	66.0	68.6	69.8	70.2	69.0	67.3	61.6	57.0	64.1
1994	57.9	56.5	60.4	61.0	62.1	68.1	69.5	74.0	72.5	66.8	56.4	55.8	63.4
1995	56.9	61.4	60.4	61.5	62.0	64.8	69.0	71.9	72	67.1	63.2	58.3	64.0
1996	57.6	58.8	60.1	64.4	66.8	67.8	70	72.8	71	64.3	61.6	57.8	64.4
1997	58.0	57.9	61.6	62.5	68.7	67.4	69.3	72.9	75.5	68.7	64.0	57.4	65.3
1998	58.2	57.3	59.3	59.6	62.8	65.7	68.8	72.8	70.3	65.7	59.7	55.4	63.0
1999	57.5	57.8	58.3	58.9	60.5	62.8	68.5	68.0	67.0	68.8	60.5	57.8	62.2
2000	58.2	59.0	58.1	62.4	64.6	68.1	69.1	72.0	70.4	65.1	58.4	58.1	63.6
2001	54.7	54.9	58.9	58.5	63.6	67.6	69.0	69.6	68.2	66.3	61.3	55.5	62.3
2002	55.6	57.5	57.7	59.6	61.8	64.7	67.8	68.6	70.1	64.2	63.4	57.0	62.3
2003	61.7	59.0	60.3	59.9	62.4	64.2	70.0	72.7	69.9	67.7	60.8	56.9	63.8

HIGHEST AND LOWEST DAILY TEMPERATURES FOR JANUARY

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	**HIGH**	**YEAR**	**LOW**	**YEAR**	**HIGH**	**YEAR**	**LOW**	**YEAR**
1	78	1898	53	1917*	57	1981*	35	1919*
2	80	1893	53	1910	60	1997	35	1919*
3	83	1943	51	1910	59	1997	34	1949
4	86	1969	51	1971	57	1991*	29	1949
5	80	1969	49	1913	63 X	1978	30	1949
6	78	1958*	45 X,Y	1913	61	1978	28	1913
7	81	1963*	49	1913	60	1993	25 X,Y	1913
8	78	1983*	52	1888	60	1984*	33	1894*
9	85	1923	52	1913	60	1980	35	1891
10	88 X	1953	48	1949	61	1980	34	1888
11	83	1983	46	1949	62	1981	35	1913*
12	82	1986	50	1882	62	1981*	34	1882
13	83	1904	49	1882	62	1980	31	1963
14	82	1975*	54	1949	63 X	1980	35	1963
15	80	1976*	52	1882	61	1980	34	1888
16	86	1976	53	1987*	59	1993*	34	1947
17	86	1977	53	1933	61	1980	34	1888
18	81	1971	55	1922*	59	2000	34	1888
19	80	1975*	52	1917	59	1983*	39	1948*
20	80	1976*	52	1937*	58	2000*	33	1883
21	82	1912	50	1945	62	1976	32	1883
22	76	1910	52	1937*	57	1977*	30	1937
23	81	1953	51	1937	58	1981	37	1937
24	82	1951	51	1898	57	1983	35	1932
25	81	1951	51	1949	60	1969	36	1949*
26	82	2003	53	2001	59	1980	36	1949
27	83	1984	54	2001*	58	1980	37	1950*
28	83	1962	54	1922*	58	1980*	36	1948
29	81	1984*	53	2002*	60	1911	33	1880
30	82	1984	50	1975	61	1980*	34	1949
31	83	2003	53	1932*	58	1980	32	1880

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR FEBRUARY

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	84	1935	52	1923	58	1984*	36	1880
2	83	2000	51	1903	60	1884	35	1880
3	85	1963*	52	1978*	61	1935	37	1932*
4	82	2001*	53	1903*	57	1978*	37	1922
5	80	1963	52	1899	61	1978	38	1894*
6	83	1952	50 X	1899	62	1978	34 X	1899
7	88	1954	53	1949*	60	1920	37	1899
8	85	1954	54	1939	59	1978*	37	1883
9	77	1907	54	1908	60	1978	38	1929*
10	81	1988	52	1939	59	1970	34 X	1891
11	83	1988	53	1880	59	1981	34 X	1894
12	86	1943	55	1949*	58	1957	35	1880
13	87	1943	50 X	1949	60	1980*	35	1894
14	85	1943	51	1903	62	1980	36	1903
15	85	1943	52	1911	63	1980	35	1903
16	81	1981*	53	1932	63	1980	34 X	1911
17	84	1930	55	1898	62	1980	36	1894*
18	80	1981*	54	1918*	63	1980	37	1894*
19	90 X	1995	53	1882	61	1980	38	1955*
20	81	1982	54	1890	61	1980	37	1882
21	83	1981	53	1922	61	1980	39	1953*
22	87	2002	55	1967	59	1977*	38	1897
23	85	1954	53	1953	59	1983*	38	1887
24	89	1921	55	1987	60	1982	38	1897*
25	82	1926	55	1913	58	1989*	41	1956*
26	87	1926	55	1911*	57	1994*	38	1894
27	83	1883	53	1911	61	1988*	39	1876
28	83	1901	56	2001*	64 X	1978	40	1890
29	74	1924	58	1892*	58	1988	45	1996*

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR MARCH

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	82	1901	56	1915*	63	1901	41	1888
2	78	1994*	54	1886	60	1978	39	1971
3	79	1931	51 X	1894	59	1989*	38	1894
4	85	1987	52	1894	60	1884	39	1894
5	86	1899	56	1896*	60	1987	36 X	1894
6	83	1899	56	1893	60	1905	38	1880
7	88	1914	57	1935*	59	1905	41	1891
8	85	1996	58	1925*	60	1983	39	1882
9	85	1934	54	1893	59	1943	42	1939*
10	85	1997	54	1876	59	1983	40	1935
11	88	1959	52	1922	62	1983*	40	1935*
12	84	1947*	55	1917	62	1983	38	1922
13	87	1994	55	1969*	61	1984	40	1917*
14	83	1951	53	1881	59	1984*	38	1898
15	80	1978*	57	1895	59	1993	39	1880
16	91	1978	54	1881	60	1980	38	1895
17	93	1978	56	1922*	59	1993	40	1881
18	82	1960*	55	1898	64 X	1978	41	1920
19	86	1997	56	1913*	62	1978	39	1880
20	88	1997	54	1894	62	1978	42	1898*
21	90	1931	56	1919*	61	1978	37	1894
22	82	1887	57	1909	61	1978	38	1894
23	88	1926	55	1929	60	1993*	40	1898*
24	85	1896	55	1913*	60	1993*	43	1929*
25	89	1988	56	1936*	62	1984	41	1880
26	93	1988	55	1898	62	1984	41	1936
27	82	1952	58	2002*	61	1984*	41	1880
28	95	1879	58	1935*	62	1978	41	1920
29	99 X	1879	53	1998	63	1978	43	1884
30	82	2003	56	1905*	62	1879	39	1875
31	84	1945*	57	1913	60	1983*	38	1905

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR APRIL

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	87	1985	57	1906	60	1981	41	1892
2	92	1960	58	1937*	60	1885	42	1906
3	89	1960	58	1898	59	1992*	41	1945
4	91	1971	56	1921	62	1992	43	1945*
5	95	1989	57	1922	63	1989	43	1945
6	98 X	1989	55	1875	65	1989	41	1875
7	93	1989	57	2001	64	1989	39 X	1875
8	82	1885	57	1922	61	1989*	41	1875
9	90	1968	58	1922*	60	1989*	43	1893*
10	85	1968	58	1927*	65	1885	44	1935
11	90	1940	54 X	1912	62	1984	44	1945*
12	93	1888	57	1912	62	1978	43	1927*
13	95	1940	57	1883	62	1978*	44	1911
14	91	1964	56	1921	62	1989	42	1883
15	90	1948	57	1917	60	1990*	44	1913*
16	87	1948	55	1917	61	1989*	45	1887*
17	82	1879	57	1917	62	1958	46	1967*
18	83	1914	55	1933	62	1992	44	1896*
19	85	1914	59	1902	62	1992	42	1880
20	93	1899	57	1883	63	1980	42	1896
21	88	1899	58	1925*	62	1958	43	1896
22	95	1910	58	1999	62	1958	44	1878
23	96	1910	59	1899	64	1910	46	1963*
24	83	1995*	59	1899	62	1981	44	1880*
25	83	1992	59	1911*	63	1992*	44	1883*
26	83	1992*	56	1900	63	1992	47	1932*
27	87	1986	57	1884	62	1992*	45	1883
28	88	1921	58	1933*	62	1982*	45	1900*
29	87	1996	57	1898	66 X	1992	43	1894
30	86	1996	57	1915	65	1981	46	1942*

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR MAY

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	81	1929	56 X	1915	65	1981	47	1932
2	87	1929	59	1913	63	1982*	45 X	1883
3	90	1953	58	1892	64	1980	45 X	1915
4	90	1953	59	1930	64	1992*	47	1930
5	96	1953	60	1921*	64	1984*	46	1910
6	87	1990	58	1899	65	1992	47	1892
7	85	1941	60	1930*	64	1997*	49	1964*
8	81	1941	60	1999*	63	1997	49	1965*
9	87	1984	57	1922	63	1997*	47	1908
10	85	1943	56 X	1933	65	1981	48	1933
11	83	1996	60	1933*	65	1992	47	1879
12	88	1979	57	1908	65	1992	46	1890
13	94	1979	60	1920*	64	1992*	48	1908
14	87	1956	60	1911*	65	1981	46	1880
15	91	1956	58	1953	65	1997*	46	1880
16	92	1956	61	1950*	65	1997*	45 X	1894
17	94	1956	61	1922*	65	1997	48	1894
18	87	1892	60	1899	65	1997	48	1880*
19	87	1943	60	1916*	65	1978	49	1894*
20	89	1883	60	1927*	65	1978	48	1896
21	85	1941	60	1903*	65	1997	49	1948
22	88	1893	60	1909	65	1997*	48	1878
23	82	1932	59	1917	65	1997*	48	1879
24	95	1896	58	1917	65	1984*	48	1879
25	98 X	1896	61	1917*	70 X	1896	49	1879
26	87	1896	60	1908	67	1896	50	1916*
27	84	1915*	61	1921*	66	1984*	50	1917
28	86	1997	61	1971*	66	1997*	52	1893
29	88	1978	61	1917*	67	1997*	52	1895
30	88	1879	59	1908	67	1997*	50	1878
31	94	1879	58	1899	67	1997	52	1906

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR JUNE

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	89	1879	62	1899*	67	1997	52	1916*
2	93	1879	58 X	1908	66	1997*	51	1967*
3	91	1919	62	1908	67	1981	51	1890
4	88	1898	62	1908*	66	1981	50 X	1908
5	85	1890	61	1908	66	1993*	52	1880
6	93	1890	61	1899	67	1981	52	1948
7	92	1890	63	1917*	68	1981	53	1906
8	81	1890	63	1964*	67	1993	52	1950
9	93	1877	63	1971*	67	1984	54	1950*
10	101 X	1979	62	1901	68	1877	52	1892
11	98	1979	62	1899	70	1877	51	1892
12	90	1979	62	1901	72 X	1979	50 X	1894
13	90	1979	62	1911*	70	1979	50 X	1894
14	87	1917	62	1911	66	1984*	50 X	1943*
15	97	1981	64	1911	66	1984	52	1907*
16	100	1981	61	1908	69	1981	54	1897*
17	93	1957	62	1908	68	1981	52	1879
18	97	1957	63	1897	70	1981	54	1886
19	90	1957	63	1908	69	1981	53	1894*
20	90	1973	63	1908	67	1981*	53	1909*
21	88	1973	64	1916*	69	1981	54	1893
22	86	1978	63	1912	71	1981	55	1916
23	90	1978	61	1901	70	1981	51	1886
24	96	1931	64	1933*	70	1984*	53	1892
25	89	2000	65	1965*	71	1981	54	1943*
26	94	1990*	65	1920*	70	1981	52	1885
27	91	1990	63	1910	69	1984	52	1884
28	95	1980	63	1910	70	1976	56	1950*
29	84	1980	64	1902	70	1980	56	1910*
30	96	1985	64	1902	69	1984*	54	1910*

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR JULY

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	95	1985	66	1933*	73	1985	56	1890
2	94	1985	64 X	1910	73	1985	56	1908
3	90	1981	64 X	1912	71	1985	57	1910*
4	89	1957	65	1902	71	1981	54 X	1880
5	84	1981	66	1933	72	1981	55	1948
6	83	1981	65	1912	73	1981	57	1948*
7	86	1954	66	1909*	71	1984	56	1915
8	86	1984*	65	1902	73	1984	57	1899*
9	95	1985	66	1909*	74	1984	57	1948*
10	93	1959	67	1916*	73	1985*	57	1882
11	89	1959	66	1965*	72	1985*	58	1952*
12	85	1983	67	1909	71	1985*	55	1888
13	85	1984	66	1908	72	1984	55	1902*
14	93	1911	66	1905	73	1984	55	1902
15	90	1984	66	1899	75	1984	56	1908
16	88	2003	67	1962*	74	1984	54 X	1884
17	86	1984	66	1894	74	1984	56	1884
18	83	1992*	67	1905	74	1984	56	1884
19	87	1951	66	1916	75	1984	58	1894
20	86	1974*	67	1880	74	1984	57	1894*
21	86	1877	66	1911	73	1984*	57	1894
22	87	1960	66	1899	72	1984	59	1940*
23	89	1960	68	1932*	72	1984	58	1892
24	84	1959	67	1899*	73	1984	56	1878
25	88	1891	68	1932*	72	1931	57	1893
26	87	1977*	67	1901	74	1984	59	1932*
27	86	1972*	67	1909	74	1984	58	1892
28	92	1972	67	1905	74	1984	59	1909
29	89	1972	67	1914	73	1984	57	1893
30	100 X	1930	68	1903*	76 X	1980	56	1896
31	92	1930	67	1903	75	1980	58	1924

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR AUGUST

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	90	1972	67	1903	74	1980	60	1944*
2	85	1971	67	1905	72	1980	59	1944
3	85	1971	68	1909*	72	1984	57	1888
4	86	1971	68	1990*	71	1984*	59	1880
5	88	1961	68	1999*	72	1971	56	1912
6	89	1884	68	1990*	75	1982	56	1912
7	87	1983	67	1894	76 X	1983	55	1894
8	94	1936	68	1980*	75	1983	58	1944
9	89	1965	68	1932*	74	1983	60	1948*
10	85	1998*	67	1900	72	1983*	58	1894
11	86	1994	68	1907	72	1998*	58	1894
12	94	1991	68	1902	73	1984*	57	1894
13	93	1994	68	1916	76 X	1983	57	1892
14	90	1994	67	1987	74	1992*	57	1892
15	92	1884	66 X	1899	74	1992*	58	1880
16	88	1983	68	1916*	76 X	1983	59	1881*
17	88	1992*	67	1916*	75	1984	58	1932
18	90	1986	68	1912*	75	1984	59	1932*
19	88	1986	68	1902	75	1984	54 X	1884
20	89	1897	67	1924*	75	1984	58	1912
21	89	1982	69	1899	75	1984	58	1916*
22	90	1972	66 X	1924	74	1984	59	1916*
23	89	1968	69	1903*	73	1984	55	1878
24	85	1985*	67	1902*	73	1984	58	1899
25	89	1985*	66 X	1908	74	1984	57	1906
26	92	1981	68	1912	75	1981	58	1890
27	91	1915	67	1880	74	1981	58	1881
28	90	1983	67	1880	75	1984	54 X	1887
29	88	1896	67	1908*	76 X	1984	54 X	1895*
30	93	1909	67	1912*	75	1984	56	1880*
31	98 X	1955	68	1933*	73	1984	58	1942*

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR SEPTEMBER

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	**HIGH**	**YEAR**	**LOW**	**YEAR**	**HIGH**	**YEAR**	**LOW**	**YEAR**
1	104	1955	67	1898	73	1983	58	1881
2	99	1955	68	1999*	76	1955	56	1898*
3	92	1998*	67	1933	74	1997*	58	1916*
4	107	1988	66	1910	76	1984	55	1899
5	97	1988	66	1899	76	1984	54	1912
6	90	1952	67	1965	73	1995*	56	1942*
7	92	1949	65	1899	73	1984	55	1911*
8	100	1984	65	1933	75	1984	55	1893*
9	96	1956	67	1933*	78 X,Y	1984	54	1911
10	95	1878	67	1933	76	1984	55	1876
11	102	1959	64 X	1933	75	1984*	56	1924*
12	97	1878	64 X	1933	75	1984	54	1884*
13	92	1971*	64 X	1933	75	1984	55	1909
14	92	1879	65	1933	76	1984	53	1894*
15	100	1979	66	1933*	76	1984	52	1884
16	100	1909	66	1933	76	1984	51	1884
17	110	1913	65	1908*	78 X,Y	1984	53	1908
18	93	1939	65	1908	77	1984	50 X	1882
19	96	1939	66	1932	77	1984	50 X	1882
20	99	1939	67	1933*	76	1984*	53	1893*
21	106	1939	66	1933*	77	1939	53	1893
22	101	1939*	66	1880	77	1939	53	1944
23	103	1975	65	1933	76	1939	52	1941
24	99	1978	66	1928*	73	1982	52	1881
25	101	1978	66	1916*	74	1978	52	1920
26	111X,Y	1963	66	1908	73	1984*	50 X	1907
27	104	1963	66	1901	73	1984*	52	1908
28	99	1963	64 X	1933*	73	1963	53	1880*
29	91	1918	66	1933*	73	1984	50 X	1880
30	91	1906	64 X	1899	71	1997*	51	1880

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR OCTOBER

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	93	1965*	64	1903	70	1997*	52	1893
2	94	1945	63	1908	70	1997	50	1925
3	104	1987	62	1916	69	1997*	48	1884
4	97	1987	63	1912	70	1997*	48	1884
5	97	1971	64	1912	70	1997	48	1884
6	101	1971	64	1916*	70	1971	47	1884
7	91	1951	64	1939*	69	1976	48	1916
8	93	1899	64	1933	69	1983*	49	1883
9	99	1994	64	1932*	71	1983	50	1879
10	92	1991*	62	1924	70	1984	47	1879
11	89	1991*	63	1899	69	1984	46	1879
12	96	1939	65	1928*	67	1993*	47	1886
13	94	1912	62	1879	68	1991*	48	1886
14	107 X	1961	62	1899*	68	1984*	48	1892*
15	97	1961	62	1910*	73 X	1961	47	1881
16	97	1958	61	1916	68	1983*	48	1892*
17	98	1958	57 X	1895	69	1983	47	1938*
18	91	1940	63	1916*	69	1976	47	1881
19	97	1964	62	1920	68	1983	46	1892*
20	95	1964	62	1916	70	1976	46	1949
21	101	1965	63	1924*	68	1978*	45	1949*
22	104	1965	63	1916	68	1965*	46	1906
23	93	1965	62	1941	67	1982	47	1886
24	94	1965*	63	2000*	69	1982	47	1892
25	95	1983	61	1924*	67	1982	48	1879
26	92	1983*	63	1924*	71	1983	46	1874
27	91	1879	61	1883	71	1983	47	1885
28	92	1879	62	1946*	69	1983	47	1874
29	89	1931	61	1971	69	1983	45	1971
30	89	1962	61	1920*	68	1983	43 X	1971
31	90	1918	60	1886	67	1983	45	1894

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR NOVEMBER

	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	97 X	1966	61	1916*	68 X	1983	45	1916*
2	90	1997*	61	1935	63	1983	44	1886
3	93	1921	61	1916	65	1888	47	1876
4	97 X	1976	62	1924*	63	1983*	44	1935*
5	92	1976	59	1905	68 X	1983	42	1881
6	90	1949	59	1905	64	1983	46	1935*
7	89	1956	60	1890	62	1997*	46	1874
8	93	1904	62	1946*	64	1983	46	1881*
9	96	1956	59	1879	63	2002*	42	1881
10	91	1956	59	1912	62	2001*	44	1919
11	86	1974*	59	1909	63	1980	43	1915*
12	91	1974	60	1938*	68 X	1983	42	1938
13	89	1949	59	1910	66	1983	40	1880
14	87	1949	59	1964*	61	1983*	39	1916
15	89	1940	58	1894	60	1875	38	1964
16	86	1912	59	1958	62	1966	42	1958
17	88	1976	57	1964	64	1986	41	1958
18	86	1949	55	1893	62	1983*	38	1881
19	85	1917*	59	1994*	62	1967	39	1994
20	86	1914	59	1898	62	1967	38	1964
21	86	1954	56	1905	62	1936	40	1941
22	86	1939	57	1906	61	1976	40	1931
23	86	1950*	56	1906	61	1965	38	1931
24	87	1932	56	1909*	60	1981*	38	1931*
25	89	1953	58	1908	61	1989	39	1906
26	85	1956	58	1906	64	1976	41	1880
27	83	1903	54 X	1919	61	1903	40	1948*
28	82	1980	56	1919	59	1977*	36 X	1919
29	86	1907	54 X	1906	60	1982	41	1919*
30	85	1964	56	1908*	59	1892*	40	1931*

* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

HIGHEST AND LOWEST DAILY TEMPERATURES FOR DECEMBER

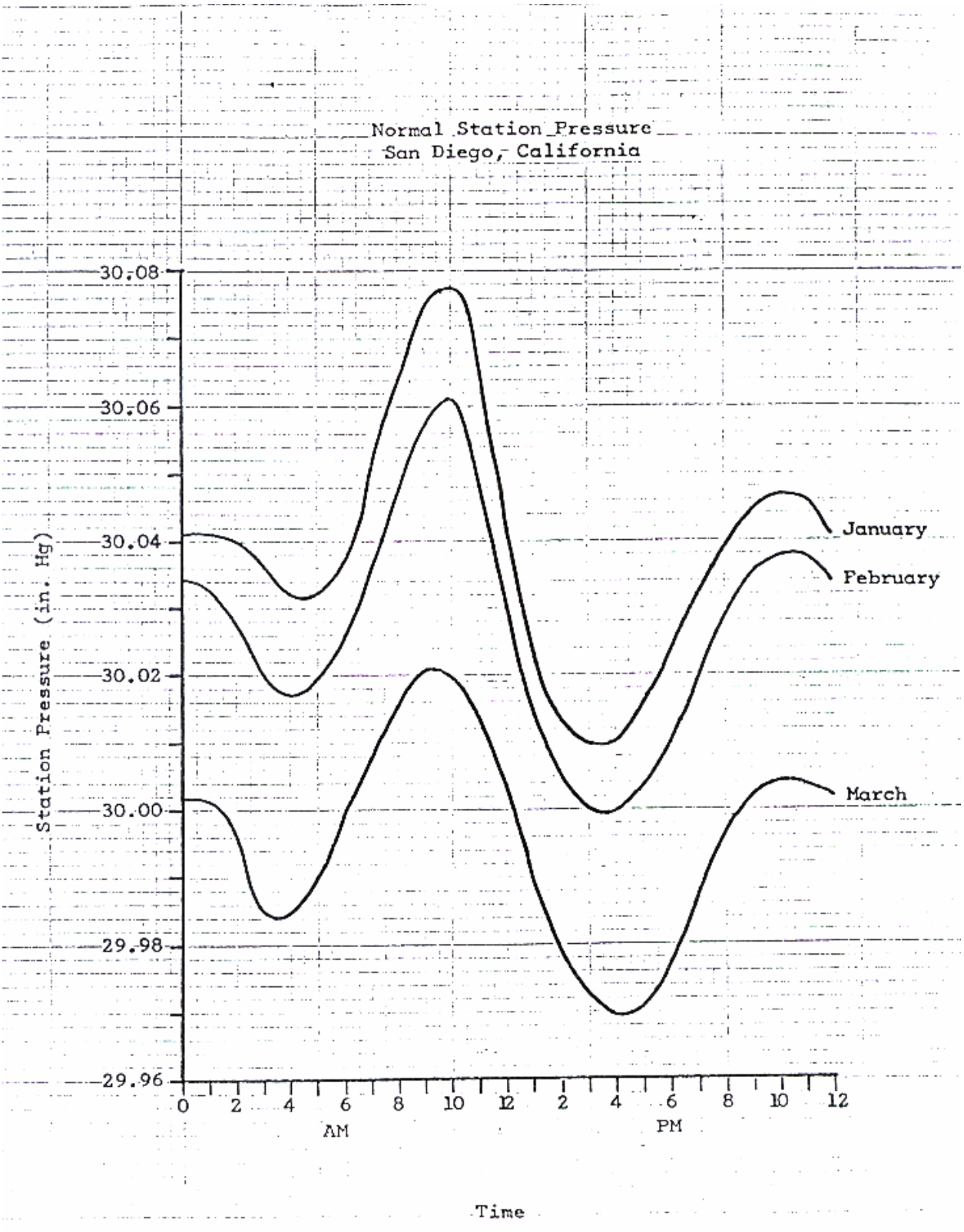
	MAXIMUM TEMPERATURES				MINIMUM TEMPERATURES			
DAY	HIGH	YEAR	LOW	YEAR	HIGH	YEAR	LOW	YEAR
1	83	1959	59	1933*	60	1983*	38	1884
2	83	1959	58	1909*	59	1925	42	1991
3	85	1958	57	1909*	59	1969*	42	1909*
4	83	1979	57	1908	60	1980	39	1909
5	83	1965	54	1909	60	1966	38	1948
6	85	1979	58	1998	59	1995	40	1891
7	80	1989*	57	1909	58	2000	37	1891
8	84	1938	51	1884	62	1988	34	1978
9	84	1957	55	1972	60	1977	35	1960
10	84	1950	54	1972	60	1991	40	1884
11	84	1958	53	1927	61	1977*	39	1947
12	81	1952	56	1932*	59	1934	36	1949
13	81	1952	55	1901	59	1922	35	1901
14	83	1953	55	1987*	59	1889	36	1878
15	81	1958	54	1967	60	1977	35	1878
16	84	1980	55	1948*	62	1957*	38	1892*
17	82	1979	54	1924	57	1962*	38	1916
18	78	1985*	55	1897	58	1977*	36	1892*
19	80	1954	54	1916	59	1921	36	1909
20	82	1954	55	1990	59	1969	37	1878
21	80	1906	53	1990	59	1969*	37	1968*
22	80	1899	52	1990	61	1977	36	1968*
23	78	1989*	53	1879	61	1977	36	1990
24	79	1989	52	1879	59	1977*	36	1879
25	83	1925	52	1916	63	1977	32 X	1879
26	79	1919*	51	1916	62	1977	32 X	1891
27	85	1956	54	1916	64	1977	37	1987*
28	84	1919	54	1916	63	1977	37	1987
29	88 X	1963	54	1879	62	1977	38	1966*
30	87	1980	49 X	1915	61	1977	34	1895
31	80	1958	53	1905	65 X	1977	35	1918

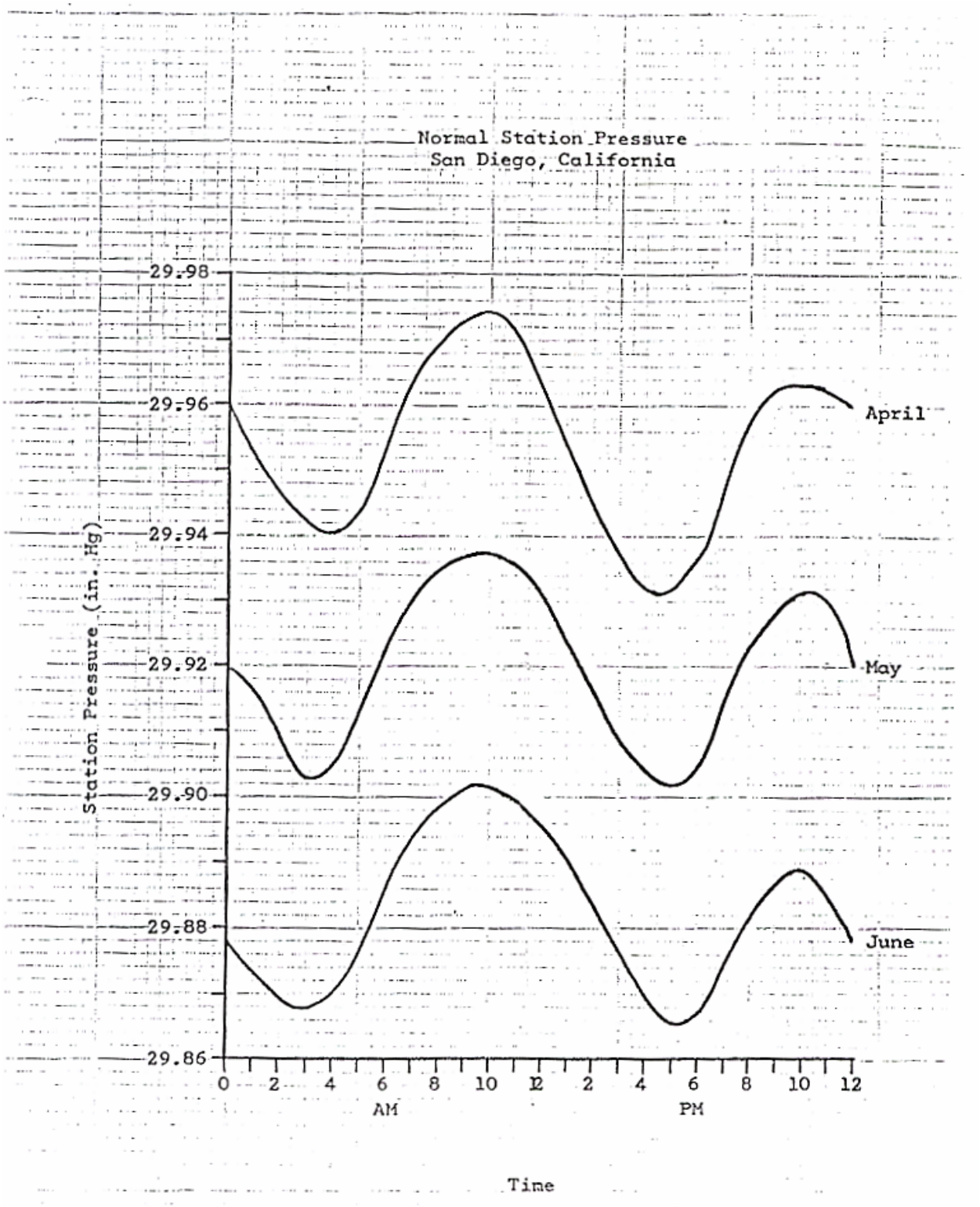
* - LAST OF SEVERAL OCCURRENCES
X - RECORD FOR THE MONTH Y - RECORD FOR THE YEAR

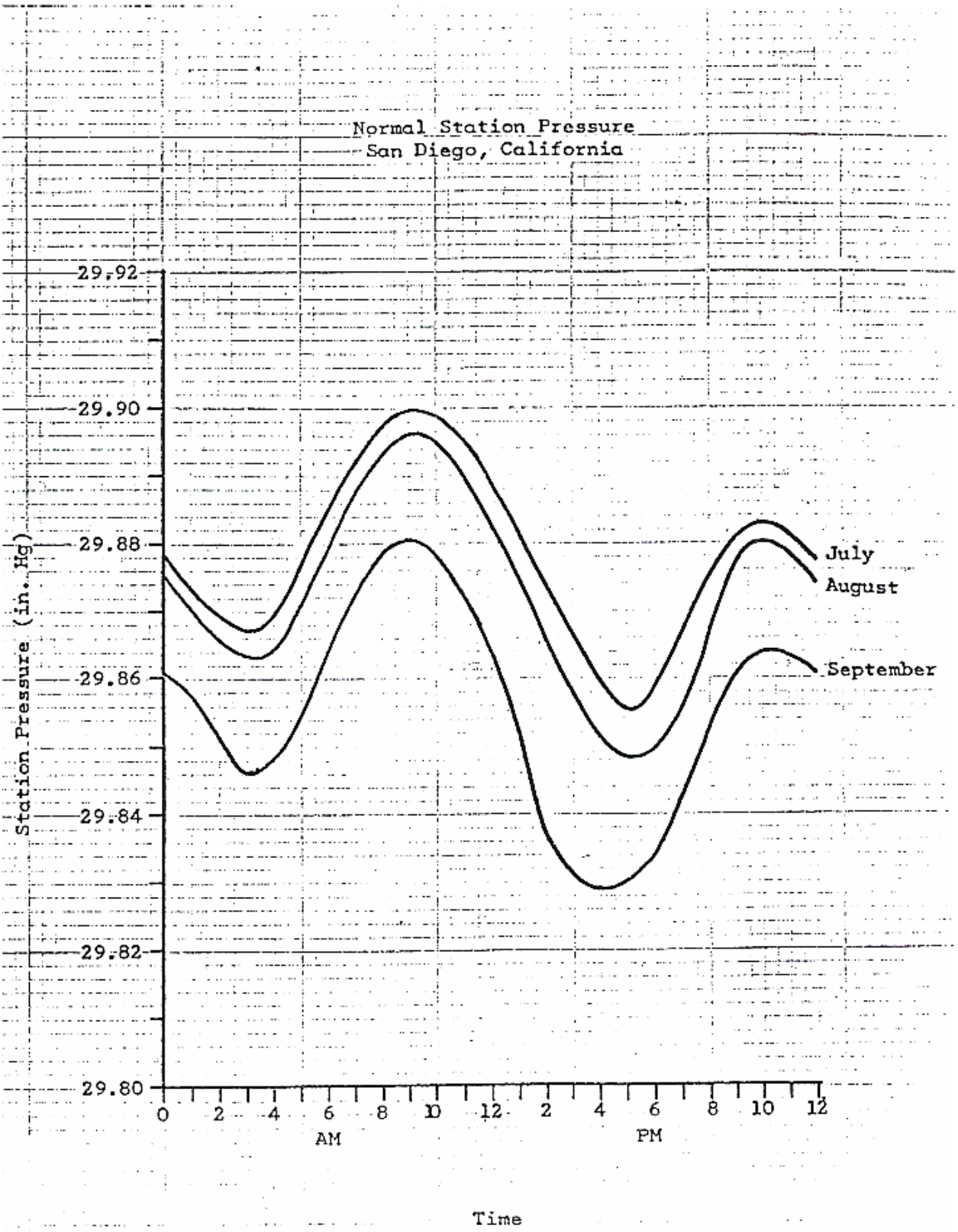
PRESSURE STATISTICS

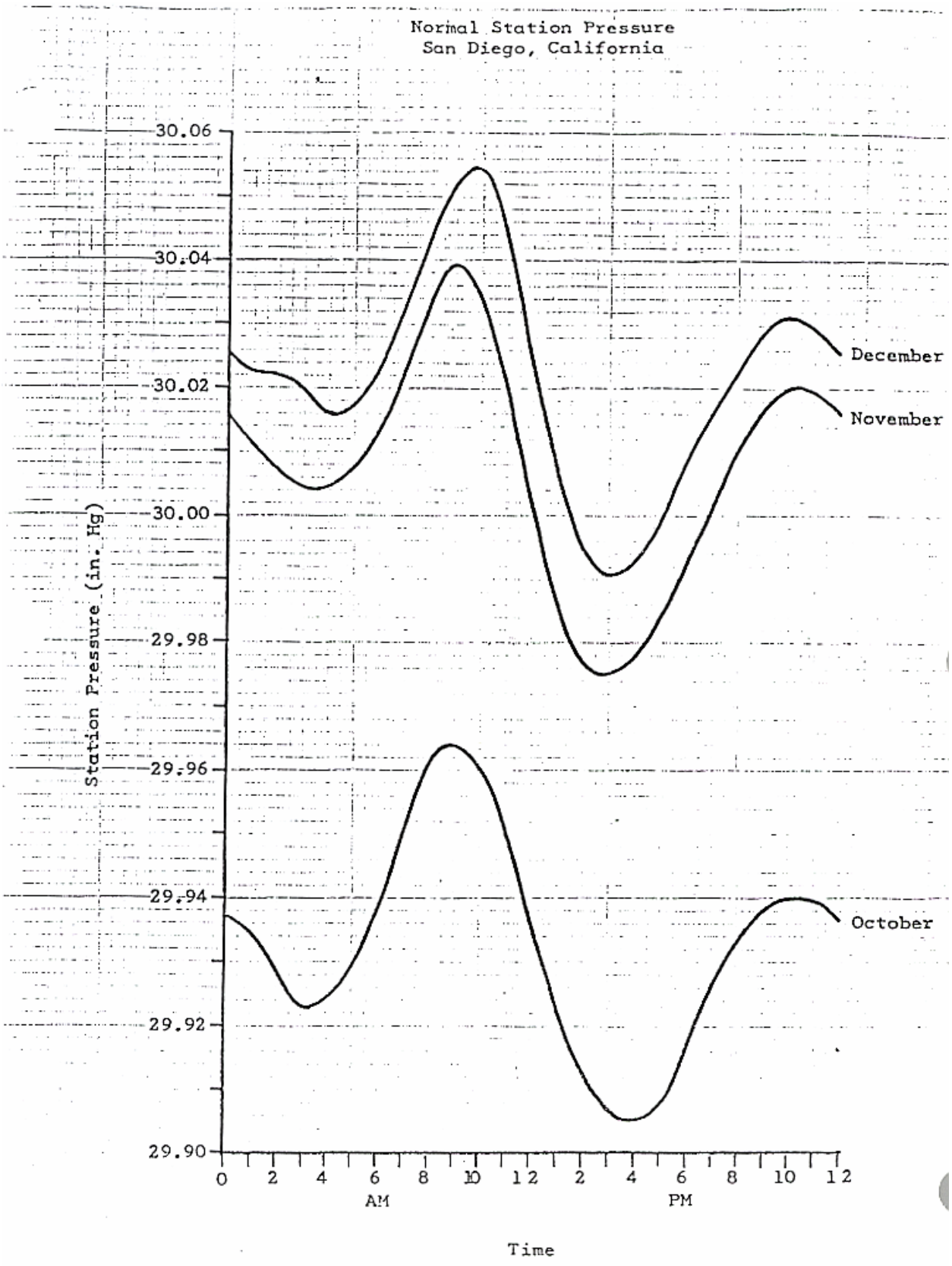
Two Highest Monthly Sea Level Pressures in inches			Average Station Pressure	Two Lowest Monthly Sea Level Pressures in inches		
January	30.48	1913	1017.0 mb	**January**	29.46	1988
	30.47	1916	30.03 in		29.48	1882
February	30.53	1883	1017.0 mb	**February**	29.48	1913
	30.49	1916	30.03 in		29.50	1980
March	30.45	1917, 1971	1015.2 mb	**March**	29.37	1983
	30.41	1890	29.98 in		29.46	1912
April	30.36	1875	1015.0 mb	**April**	29.61	1941
	30.33	1945	29.97 mb		29.67	1886, 1932, 1998
May	30.26	1879	1013.3 mb	**May**	29.67	1902
	30.22	1983	29.92 in		29.68	1876, 1923, 1937
June	30.17	1953, 1998	1012.3 mb	**June**	29.65	1976
	30.12	1873,1971, 1975	29.89 in		29.66	1904
July	30.17	1980	1012.5 mb	**July**	29.66	1936
	30.13	1974	29.90 in		29.68	1934
August	30.16	1896	1012.3 mb	**August**	29.64	1906,1933, 1981
	30.10		29.89 in		29.66	1995
September	30.16	1972	1011.5 mb	**September**	29.53	1927
	30.14	1889	29.87 in		29.59	1896, 1930, 1963,
October	30.27	1957	1013.9 mb	**October**	29.57	1887, 1928
	30.24	1886	29.94 in		29.60	1925,1959
November	30.41	1975	1015.8 mb	**November**	29.52	1919
	30.40	1979	30.00 in		29.60	1931
December	30.53	1978	1017.2 mb	**December**	29.49	1959
	30.47	1997	30.04 in		29.51	1940

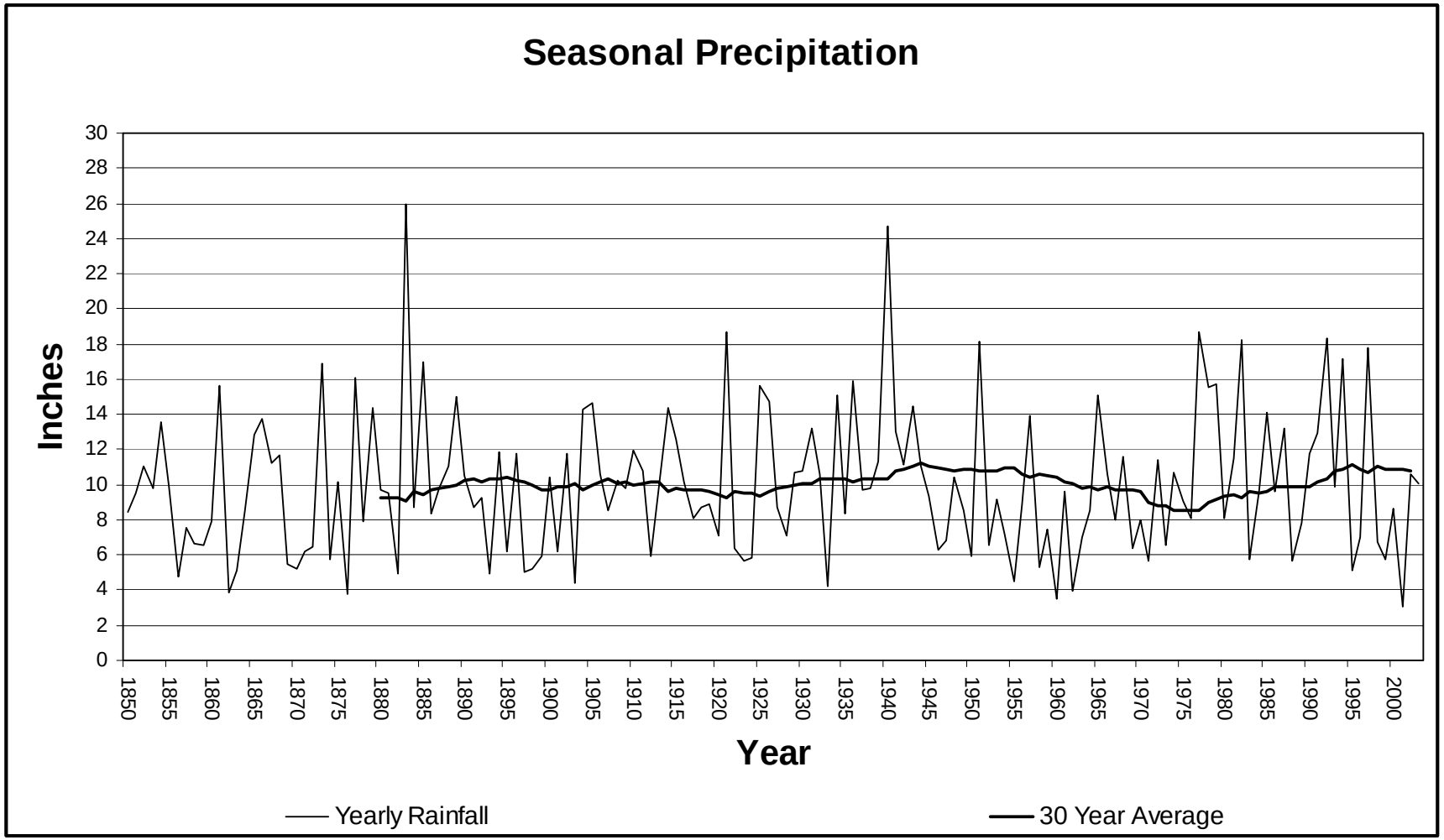
Extreme Highest		Yearly Average	Extreme Lowest	
30.53 in	February 1883 and December 1978	1014.4 mb 29.955 in	29.37 in	March 1983

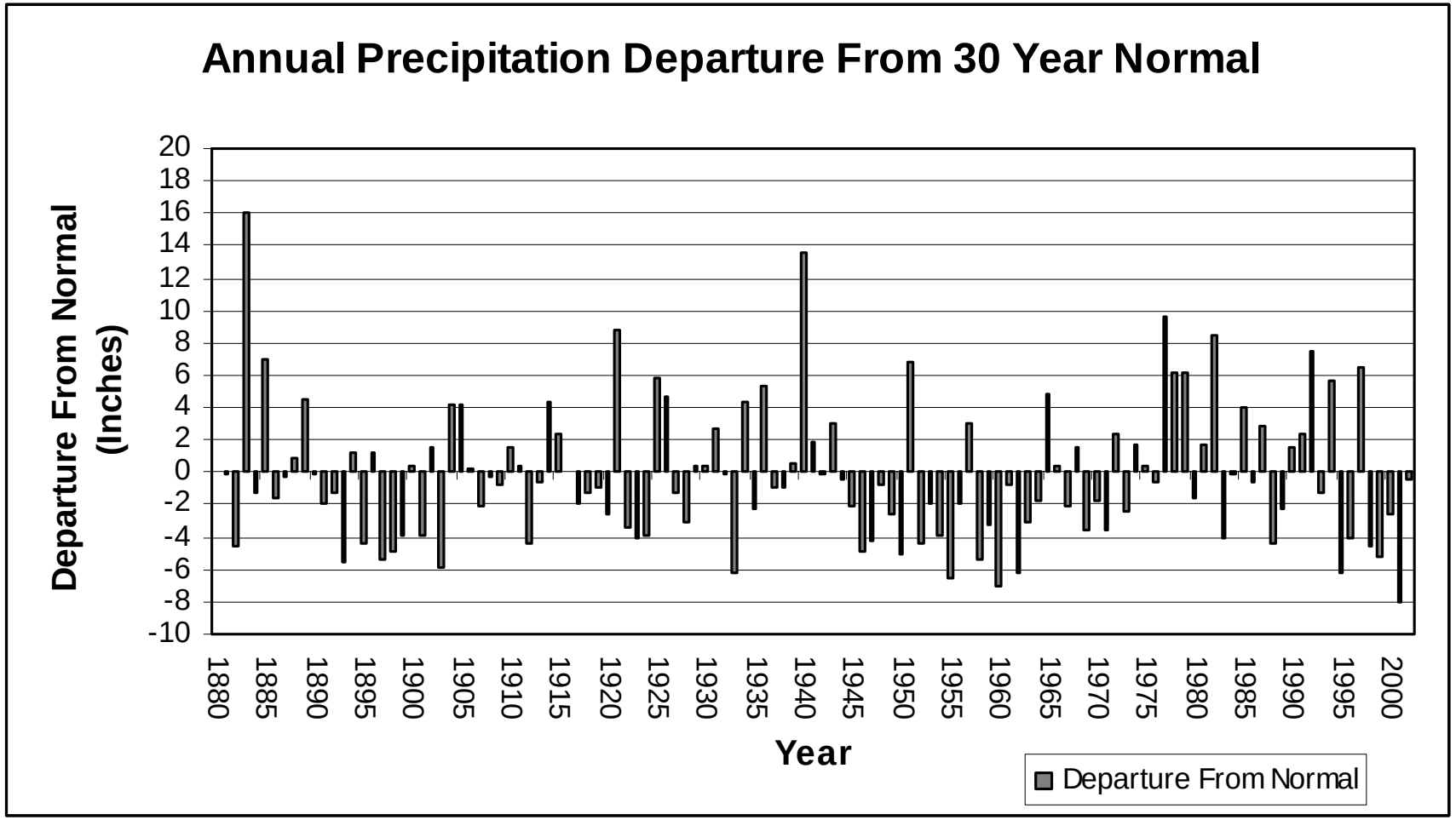

Normal Station Pressure
San Diego, California
30.08
30.06
30.04
30.02
30.00
29.98
29.96
Station Pressure (in. Hg)
January
February
March
0
2
4
6
8
10
12
2
4
6
8
10
12
AM
PM
Time


Normal Station Pressure
San Diego, California
29.98
29.96
29.94
29.92
29.90
29.88
29.86
Station Pressure (in. Hg)
April
May
June
0
2
4
6
8
10
12
2
4
6
8
10
12
AM
PM
Time


Normal Station Pressure
San Diego, California
29.92
29.90
29.88
29.86
29.84
29.82
29.80
Station Pressure (in. Hg)
July
August
September
0
2
4
6
8
10
12
2
4
6
8
10
12
AM
PM
Time


Normal Station Pressure
San Diego, California
30.06
30.04
30.02
30.00
29.98
29.96
29.94
29.92
29.90
Station Pressure (in. Hg)
December
November
October
0
2
4
6
8
10
12
2
4
6
8
10
12
AM
PM
Time


Seasonal Precipitation
Inches
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
1850
1855
1860
1865
1870
1875
1880
1885
1890
1895
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
Year
Yearly Rainfall
30 Year Average


Annual Precipitation Departure From 30 Year Normal
Departure From Normal (Inches)
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
1880
1885
1890
1895
1900
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
Year
Departure From Normal

MONTHLY AND SEASONAL PRECIPITATION (in inches)

Year	July	August	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	Season
1850-51	0	0	0	0.19	2.82	1.93	0.03	1.51	0.34	0.87	0.71	0.01	8.41
1851-52	0	0	0.02	0.01	0.25	3.74	0.58	1.84	1.87	0.85	0.32	0	9.48
1852-53	0	0.4	0	0.06	1.45	4.5	0.5	0.2	1.52	0.25	2.1	0.05	11.03
1853-54	0	0.21	0	0	1.28	1.77	0.99	2.56	1.88	0.89	0.18	0.01	9.77
1854-55	0.07	1.36	0.09	0.27	0.04	3.29	1.97	3.59	1.3	1.52	0.06	0	13.56
1855-56	0	0.04	0	0.11	2.15	0.41	1.27	1.86	1.59	2.17	0.29	0	9.89
1856-57	0	0	0.07	0	1.22	1.3	0.26	1.76	0	0.04	0.08	0.03	4.76
1857-58	0	0.02	0.01	0.49	2.16	1.3	1.52	0.44	1.24	0.17	0	0.19	7.54
1858-59	0	0.04	0.1	0.47	0.28	3.1	0	1.89	0.2	0.36	0.17	0	6.61
1859-60	0.02	0	0	0.18	1.49	1.79	0.72	1.49	0.15	0.65	0.04	0.05	6.58
1860-61	0.14	0	0	0	2.88	2.99	0.82	0.79	0.05	0.04	0	0.19	7.9
1861-62	0	0	1.59	0.05	1.19	3.2	5.56	1.39	0.97	1.05	0.16	0.48	15.64
1862-63	0.11	0	0	0.89	0.05	0.93	0.32	1.09	0.33	0.13	0.02	0	3.87
1863-64	0	0	0.36	0	0.73	0.04	0.04	2.5	0.2	0.01	1.25	0.01	5.14
1864-65	0.11	0	0	0.04	2.41	1.04	1.28	3	0	0.56	0	0.01	8.45
1865-66	1.29	0	0	0.02	0.52	0.84	5.05	3.43	1.47	0.11	0.09	0	12.82
1866-67	0	0.1	0	0	0.24	1.82	2.32	0.85	7.88	0.48	0.04	0	13.73
1867-68	0	0.3	0	0.34	0.45	3.06	3.37	1.63	0.73	1.2	0.15	0	11.23
1868-69	0.51	0	0.05	0	2	1.52	2.88	1.88	1.98	0.53	0.33	0	11.68
1869-70	0.05	0	0	0.05	2.32	0.94	0.54	0.77	0.33	0.2	0.28	0	5.48
1870-71	0.04	0.07	0	1.54	0.18	0.42	0.52	1.35	0.01	0.7	0.34	0	5.17
1871-72	0	0	0	0	1.33	1.39	0.99	1.63	0.46	0.26	0.12	0	6.18
1872-73	0	0.18	0	0	0	1.43	0.44	4.21	0.11	0.1	0.03	0	6.5
1873-74	0	1.95	0	0	0.77	5.46	3.11	3.73	1.2	0.34	0.32	0	16.88
1874-75	0.12	0	0.13	0.53	0.88	0.55	2.38	0.37	0.45	0.12	0.2	0.02	5.75
1875-76	0	0.21	0.39	0	2.25	0.41	2.47	2.44	1.78	0.06	0.05	0.05	10.11

T indicates a trace - unmeasurable

MONTHLY AND SEASONAL PRECIPITATION (in inches)

Year	July	August	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	Season
1876-77	0.03	0.06	0.03	0.08	0.04	0.15	1.05	0.18	1.44	0.26	0.43	T	3.75
1877-78	0	0	T	0.81	0.06	3.89	1.45	4.83	1.41	2.91	0.58	0.16	16.1
1878-79	0	T	0	0.96	T	1.57	3.54	1.04	0.1	0.6	T	0.07	7.88
1879-80	0	0	0	0.29	2.77	6.32	0.61	1.5	1.43	1.34	0.06	0.06	14.38
1880-81	0.09	0.32	0	0.53	0.28	4.15	0.52	0.45	1.88	1.35	0.04	0.05	9.66
1881-82	0	0.01	0.04	0.24	0.12	0.3	4.53	2.55	1.02	0.45	0.18	0.07	9.51
1882-83	0	T	0.01	0.41	0.39	0.13	1.09	0.95	0.41	0.31	1.14	0.08	4.92
1883-84	0	0	0	2.01	0.2	1.82	1.34	9.05	6.23	2.84	2.17	0.31	25.97
1884-85	0	T	0.07	0.35	0.11	5.12	0.35	0.02	0.78	1.2	0.61	0.06	8.67
1885-86	T	0.13	T	0.31	1.56	0.71	6.95	1.51	3.73	1.95	0.04	0.07	16.96
1886-87	T	T	0	0.05	0.95	0.1	0.04	4.51	0.02	2.14	0.47	0.04	8.32
1887-88	0.01	T	T	T	2.08	1.14	1.96	1.48	2.79	0.1	0.22	0.04	9.82
1888-89	0.01	T	0.04	0.26	1.83	2.84	1.72	1.8	2.2	0.19	0.03	0.1	11.02
1889-90	T	0.04	T	2.12	0.12	7.71	2.79	1.7	0.41	0.05	0.08	0	15.02
1890-91	0	T	0.65	0.01	0.72	1.61	1.21	4.84	0.27	0.76	0.35	0.05	10.47
1891-92	T	0	0.08	0.04	0.1	1.29	1.58	2.96	0.96	0.41	1.15	0.13	8.7
1892-93	0	0.05	T	0.22	0.94	0.69	0.78	0.47	5.5	0.22	0.39	T	9.26
1893-94	T	0	0	0.11	0.91	1.91	0.29	0.49	1.05	0.11	0.09	0.01	4.97
1894-95	0	0.04	0.01	T	0	2.26	7.33	0.53	1.43	0.11	0.19	0	11.9
1895-96	0	0	0.01	0.27	1.19	0.27	1.27	0.02	2.89	0.25	0.03	0.01	6.21
1896-97	T	0.13	T	0.97	0.98	2.18	3.13	2.72	1.53	0.02	0.12	T	11.78
1897-98	0.01	T	T	1.06	0.02	0.32	1.71	0.06	0.91	0.22	0.66	0.02	4.99
1898-99	0	0	0.07	0	0.15	0.87	2.34	0.3	0.85	0.29	0.1	0.27	5.24
1899-1900	0	0.07	0	0.35	0.86	0.65	0.69	0.03	0.53	1.26	1.45	0.08	5.97
1900-01	0	T	T	0.3	1.43	0	2.08	4.77	1.07	0.01	0.77	0.02	10.45
1901-02	T	T	0.06	0.28	0.41	0.02	1.7	1.57	1.86	0.21	0.06	T	6.17
1902-03	0.92	T	T	0.06	1.53	3.58	0.69	2.27	1.17	1.4	0.14	T	11.76

T indicates a trace - unmeasurable

MONTHLY AND SEASONAL PRECIPITATION (in inches)

Year	July	August	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	Season
1903-04	0	T	T	0.07	T	0.35	0.04	1.5	2.17	0.15	0.12	0	4.4
1904-05	0	T	T	0.17	0	2.46	2.16	5.9	2.98	0.3	0.35	T	14.32
1905-06	0.16	0	0.5	0.25	3.38	0.38	0.98	2.62	4.68	0.98	0.72	0.03	14.68
1906-07	T	0.1	0.12	0.03	0.62	4.02	3.27	0.45	1.62	0.13	0.07	0.19	10.62
1907-08	0.03	0	0	1.71	0.05	0.43	2.8	2.41	0.61	0.35	0.16	0	8.55
1908-09	0	0.64	0.2	0.15	1	0.27	3.57	1.76	2.62	0.02	T	T	10.23
1909-10	T	T	0.02	0	2.39	3.76	2	0.19	1.3	0.08	0.05	0	9.79
1910-11	0.01	0.05	0.17	1.35	0.4	0.15	3.35	4.92	0.92	0.65	0.01	0.01	11.99
1911-12	0.12	0	0.1	0.28	0.02	1.39	0.66	0	5.72	2.13	0.17	0.16	10.75
1912-13	0.14	0.26	0	0.89	0.4	0.03	1.19	2.4	0.42	0.08	0.07	0.09	5.97
1913-14	0.06	0.02	0.02	T	2.23	0.72	3.59	1.9	0.36	0.85	0.08	T	9.83
1914-15	0	0	T	1.05	0.86	2.21	4.91	3.62	0.33	1.15	0.28	T	14.41
1915-16	T	0	T	0	0.73	2.6	7.56	0.66	0.98	0.01	0.01	T	12.55
1916-17	0.02	0.01	0.25	0.87	0.05	1.14	4.32	1.84	0.26	1.06	0.31	T	10.13
1917-18	T	T	T	0.17	0.08	T	1.64	1.52	4.57	T	T	0.06	8.04
1918-19	T	0.11	0.08	0.42	1.91	1.68	0.61	1.46	1.83	0.3	0.34	0	8.74
1919-20	T	0.01	0.26	1.04	0.43	0.48	0.43	2.87	2.46	0.47	0.44	0.02	8.91
1920-21	T	0.01	0.08	0.18	0.19	0.54	2.02	0.35	1.13	0.04	2.54	T	7.08
1921-22	T	T	1.24	0.67	0.3	9.26	3.45	1.86	1.34	0.17	0.36	T	18.65
1922-23	0.01	T	0	0.09	0.75	1.21	1.34	1.53	0.34	1.05	0	0.04	6.36
1923-24	0.01	T	0.03	0.37	0.16	1.65	0.26	T	2.41	0.77	0	T	5.66
1924-25	0	T	0	0.35	0.55	1.34	0.08	0.3	1.78	1.11	0.15	0.15	5.81
1925-26	T	0.01	0	3.67	1.16	1.5	0.78	2.33	0.82	5.37	0.01	0.01	15.66
1926-27	T	0.05	0	0.21	0.59	3.89	0.32	6.68	2.05	0.71	0.12	0.12	14.74
1927-28	0	0.01	0.04	1.76	0.05	4.57	0.21	0.79	0.69	0.14	0.36	0.09	8.71
1928-29	T	0.03	T	0.14	0.63	2.42	0.9	1.14	1.22	0.57	0.05	T	7.1
1929-30	0	0	0.26	0	T	0	3.9	0.66	3.02	1.06	1.81	0.02	10.73
1930-31	T	T	T	0.22	1.04	0	3.72	4.11	0.06	1.38	0.24	0.01	10.78

T indicates a trace - unmeasurable

MONTHLY AND SEASONAL PRECIPITATION (in inches)

Year	July	August	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	Season
1931-32	T	0.08	T	0.05	1.95	3.56	1.45	5.15	0.42	0.5	0.01	0.01	13.18
1932-33	T	0	0	1.1	0.3	2.4	4.32	0.02	0.13	1.75	0.53	0.08	10.63
1933-34	0.02	0.01	0.02	0.16	0.03	1.1	0.3	1.88	0.24	0.01	0.02	0.47	4.26
1934-35	T	0.02	0.18	0.42	1.95	3.38	2.15	4.54	1.42	1.02	0.02	0	15.1
1935-36	T	0.18	0.01	0.05	0.07	0.74	0.75	5.18	0.92	0.48	T	0.01	8.39
1936-37	0.01	0.28	0.04	1.86	0.44	4.45	1.52	4.22	2.65	0.13	0.32	0.01	15.93
1937-38	0.16	0	T	T	0.02	1.06	0.89	3.26	3.73	0.44	0.15	0.01	9.72
1938-39	T	0.03	0	0.23	0.02	4.25	2.38	1.23	1.17	0.47	0.01	0	9.79
1939-40	T	T	2.58	0.61	1.04	0.48	1.75	3.56	0.82	0.46	T	T	11.3
1940-41	T	T	0.08	1.5	0.49	6.09	2.03	5.31	5.89	3.35	T	T	24.74
1941-42	0.06	0.03	0.28	2.9	2.23	2.85	0.21	1.06	1.91	1.4	0.11	0.01	13.05
1942-43	0	T	0	0.27	0.27	0.69	6.26	1.4	1.66	0.52	0.02	0.01	11.1
1943-44	0	T	0.04	0.2	0.03	7.6	1.22	3.65	0.8	0.61	0.22	0.1	14.47
1944-45	T	T	T	T	4.93	1.53	0.42	1.91	2.03	0.03	0.04	0.15	11.04
1945-46	T	0.87	0.03	T	0.13	3.62	0.89	0.6	2.67	0.52	0.01	0	9.34
1946-47	0	T	T	0.34	2.53	1.18	0.35	0.43	0.97	0.36	0.17	T	6.33
1947-48	0	0	0.18	0.08	0.72	3.02	T	1.07	1.6	0.13	0.01	0.02	6.83
1948-49	T	0	T	1.32	0.1	2.38	3.56	1.81	0.75	0.09	0.41	T	10.42
1949-50	T	T	T	0.23	1.16	0.86	3.31	1.62	1	0.28	0.09	T	8.55
1950-51	0.08	0	T	0.01	1.23	0.05	1.6	0.5	0.5	1.95	0	T	5.92
1951-52	0	0.85	0.04	0.68	1.23	3.87	4.24	0.6	4.97	1.54	0	0.14	18.16
1952-53	T	T	T	T	1.83	2.2	0.58	0.58	0.79	0.33	0.09	0.14	6.54
1953-54	T	T	T	0.07	0.8	0.03	2.76	1.03	4.31	0.09	0.01	0.03	9.13
1954-55	T	T	0	0	0.74	0.55	3.59	0.56	0.38	0.9	0.49	T	7.21
1955-56	T	0.11	T	T	0.55	0.33	1.65	0.22	T	1.56	0.1	T	4.52
1956-57	T	T	T	0.68	0	0.18	4.8	0.5	0.75	0.84	0.88	0.26	8.89
1957-58	T	T	0.37	1.76	0.59	1.38	0.62	3.15	3.98	1.65	0.4	T	13.9

T indicates a trace - unmeasurable

MONTHLY AND SEASONAL PRECIPITATION (in inches)

Year	July	August	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	Season
1958-59	T	T	0.62	0.01	0.44	0.06	0.08	3.76	T	0.31	T	T	5.28
1959-60	T	T	0.04	0.23	0.02	1.44	2.99	1.45	0.55	0.56	0.17	T	7.45
1960-61	T	0	0.06	0.04	1.01	0.22	1.21	0.06	0.85	T	0.01	T	3.46
1961-62	T	0.04	T	0.2	0.79	1.45	2.71	3.08	0.64	0.01	0.62	0.09	9.63
1962-63	T	T	0	0.01	0.01	0.22	0.11	1.22	1.33	0.71	0.09	0.28	3.98
1963-64	0	T	1.9	0.13	1.85	0.1	1.3	0.37	0.97	0.2	0.15	0.08	7.05
1964-65	0	T	0	0.02	1.01	1.17	0.4	0.52	1.79	3.58	T	0.01	8.5
1965-66	0.02	T	0.29	T	5.82	6.6	1.29	0.86	0.17	T	0.02	T	15.07
1966-67	T	0	T	0.8	0.82	3.22	2.2	0	1.14	2.24	0.05	0.16	10.63
1967-68	0.01	0.14	0.08	0	3.53	1.66	0.35	0.22	1.55	0.34	0.08	T	7.96
1968-69	0.13	T	T	0.04	0.36	0.61	4.78	4.34	0.94	0.21	0.17	0.02	11.6
1969-70	T	0.01	T	0.04	0.79	0.46	0.86	2.58	1.5	0.09	0.01	T	6.34
1970-71	T	0	T	0.07	2.05	2.22	0.3	1.27	0.2	0.93	0.95	0.01	8
1971-72	T	0.03	T	1.66	0.06	3.27	0.07	0.1	T	0.02	0.1	0.38	5.69
1972-73	T	0.02	0.44	0.58	3.16	1.61	1.68	1.63	2.26	0.05	T	T	11.43
1973-74	T	T	0.02	0.01	1.63	0.19	2.96	0.04	1.7	0.02	0.01	0.02	6.6
1974-75	0.01	T	T	1.03	0.14	2.2	0.49	0.96	3.79	2	0.01	0.02	10.65
1975-76	T	T	T	0.09	0.64	0.37	T	5.4	0.99	1.33	0.27	0.02	9.11
1976-77	0.02	0.01	1	0.38	0.75	1.06	2.36	0.06	0.61	0.01	1.79	0.03	8.08
1977-78	T	2.13	T	0.5	0.05	1.67	5.95	2.64	5	0.73	0.04	T	18.71
1978-79	0	T	0.72	0.05	2.09	2.19	5.82	0.85	3.71	0.02	0.09	0.01	15.55
1979-80	0.09	0.01	0	0.73	0.27	0.02	5.58	4.47	2.71	1.18	0.65	0.01	15.72
1980-81	T	0	T	0.05	0	0.31	1.48	2.26	3.74	0.22	0.04	0	8.1
1981-82	T	0	0.03	0.14	1.79	0.54	2.71	0.88	4.74	0.62	0.01	0.04	11.5
1982-83	0	T	0.38	0.05	2.1	1.43	2.1	3.88	6.57	1.74	0.01	T	18.26
1983-84	0.01	0.39	0.21	0.4	1.94	1.53	0.46	0.09	0.04	0.62	0	0.04	5.73
1984-84	0.19	0.06	T	0.29	2.37	4.55	0.52	0.77	0.58	0.32	T	T	9.65

T indicates a trace - unmeasurable

MONTHLY AND SEASONAL PRECIPITATION (in inches)

Year	July	August	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	Season
1985-86	0	T	0.2	0.29	4.92	1.06	0.75	2.59	3.12	1.17	0	T	14.1
1986-87	T	0	1.04	1.39	1.16	0.95	1.68	1.53	1.04	0.78	0.03	T	9.6
1987-88	0.03	0.01	0.7	1.74	1.33	2.73	0.89	1.37	0.59	3.71	0.08	0	13.18
1988-89	T	T	T	T	1.39	2.23	0.42	0.7	0.69	0.12	0.04	0.06	5.65
1989-90	0	T	0.23	0.47	0.09	1.01	2.52	1.13	0.25	0.76	0.51	0.87	7.84
1990-91	T	0.01	T	T	0.65	0.59	1.06	2.46	6.96	0.05	0.01	T	11.79
1991-92	0.24	0.01	0.28	0.69	0.05	1.7	1.81	3.34	4.42	0.28	0.07	0.04	12.93
1992-93	0.03	0.05	0	0.18	0.03	2.56	9.09	4.73	1.22	0	0.01	0.41	18.31
1993-94	0.03	T	T	0.22	0.77	0.78	0.7	2.75	3.67	0.93	0.07	T	9.92
1994-95	0.03	0.01	T	0.01	0.46	0.8	8.06	1.93	3.81	0.96	0.59	0.46	17.12
1995-96	0.05	0	T	T	0.3	0.88	1.52	0.88	1.1	0.36	0.02	0	5.11
1996-97	0.09	T	0.03	0.94	1.70	0.64	3.02	0.31	0	0.28	T	T	7.01
1997-98	T	0	0.85	0.02	1.17	1.35	2.68	7.65	2.21	1.11	0.64	0.10	17.78
1998-99	0.20	T	0.03	0.08	0.69	0.67	1.54	0.70	1.09	1.62	0.06	0.04	6.72
1999-00	T	0	0.02	0	0.04	0.32	0.18	3.68	1.00	0.54	T	T	5.78
2000-01	0	0.01	T	1.24	0.26	0.01	3.30	2.38	0.63	0.76	0.02	0	8.61
2001-02	T	0	0	0	0.99	0.45	0.32	0.17	0.46	0.63	T	T	3.02
2002-03	0	T	0.31	0.04	0.32	1.98	0.02	4.88	1.36	1.41	0.30	T	10.62
Averages	0.04	0.09	0.13	0.41	0.98	1.81	1.96	1.91	1.66	0.71	0.26	0.06	10.02

T indicates a trace - unmeasurable

GREATEST DAILY PRECIPITATION

JANUARY		FEBRUARY		MARCH		APRIL	
DAY	HIGHEST	YEAR	HIGHEST	YEAR	HIGHEST	YEAR	HIGHEST	YEAR
1st	.70	1910	.99	1880	1.64	1981	.77	1958
2nd	1.53	1879	1.64	1905	1.95	1992	.51	1880
3rd	.62	1917	1.52	1998*	1.32	1896	.55	1965
4th	2.24	1995	1.13	1935	.80	1876	.75	1926
5th	.99	1992	1.13	1935	1.18	1981	3.23	1926
6th	1.19	1993	2.71	1937	1.44	1975	1.13	1986
7th	1.27	1957	.78	1983	2.11	1952	.57	1965
8th	.96	1931	1.71	1976	1.33	1968	1.21	1965
9th	1.02	1980	2.39	1901	.79	1884	.82	1912
10th	1.76	1911	1.21	1915	.98	1980	1.03	1952
11th	1.56	1886	.86	1959	1.77	1995*	1.18	1941
12th	2.49	1882	1.20	2003	1.10	1941	.83	1956
13th	1.29	1952	1.01	1878	1.28	1941	.28	1886
14th	2.12	1978	1.84	1927	1.39	1942*	1.06	2003
15th	1.80	1993	1.96	1887	1.40	1930	.82	1878
16th	1.12	1993	1.67	1932	1.32	1958	.86	1917
17th	1.55	1916	1.38	1998	2.03	1982	.61	1903
18th	1.35	1874	.81	1980	.57	1886	.42	1983
19th	2.15	1895	1.47	1993	1.15	1991	.70	1881
20th	1.37	1962	1.41	1980	.98	1919	1.42	1988
21st	1.67	1915	1.59	1999	1.83	1893	1.33	1988
22nd	1.53	1967	1.50	1941	1.39	1954	.46	1914
23rd	2.23	1943	1.09	1891	.81	1904	.25	1980
24th	.62	1941	1.17	1873	2.36	1906	.28	1967
25th	1.99	1995	1.48	2003	.85	1998	.86	1951
26th	2.04	1914	1.14	1902	.98	1991	1.06	1931
27th	2.19	1916	1.61	1911	.92	1991	.80	1885
28th	1.32	1915	1.64	1970	.99	1896	1.34	1933
29th	1.92	1980	.75	1888	.47	1925	.46	1983
30th	.80	1966			1.00	1946	.88	1930
31st	2.57	1979			1.18	1941		

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GREATEST DAILY PRECIPITATION

* last of several occurrences

MAY	JUNE	JULY	AUGUST

DAY	HIGHEST	YEAR	HIGHEST	YEAR	HIGHEST	YEAR	HIGHEST	YEAR
1st	.54	1980	.25	1899	.03	1994	.01	1991*
2nd	.23	1905	.05	1944*	.05	1902	.03	1971
3rd	.95	1892	.13	1952	.02	1912	T	1955*
4th	.85	1900	.12	1945	T	1980*	.02	1961
5th	1.01	1921	.38	1993	.01	1986	.05	1926
6th	.31	1921	.29	1934	.03	1968	.02	1983
7th	.32	1971	.07	1879	.02	1992	.15	1983
8th	1.49	1977	.07	1998	.08	1950	.25	1936
9th	.22	1893	.38	1990	T	1959*	.64	1908
10th	.38	1933	.49	1990	.09	1996	.03	1945*
11th	.42	1957	.26	1963	.02	1880	.15	1873
12th	.69	1883	.14	1967	T	1958*	1.80	1873
13th	.28	1955	.15	1884	T	1990*	.05	1992
14th	.40	1884	.05	1878	.16	1905	.17	1983
15th	1.05	1884	.13	1995	.07	1880	.07	1918
16th	.07	1921	.17	1995	.05	1995	1.44	1977
17th	.29	1883	.14	1995	.12	1912	.69	1977
18th	.17	1922	.08	1953	.01	1922*	.83	1945
19th	.44	1887	.02	1928*	T	1994*	.01	1933
20th	.25	1878	.28	1972	.20	1998	.08	1906
21st	.58	1921	.01	1982	.02	1911	T	1975*
22nd	.36	1921	.04	1992	.09	1874	T	1924
23rd	.17	1882	.01	1918	T	1954*	T	1959*
24th	.07	1917	.03	1918	T	1990*	.13	1885
25th	.19	1931	.03	1913	.83	1902	.18	1935
26th	.10	1942	.01	1952*	.05	1941	.01	1994*
27th	.10	1962	.02	1913	.13	1984	.04	1894
28th	.49	1990	.06	1925	.10	1968	.76	1951
29th	.20	1877	.16	1912	.14	1937	.11	1912
30th	.09	1884	T	1972*	.01	1923	.21	1875
31st	.11	1925			.23	1991	.14	1967

GREATEST DAILY PRECIPITATION

SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER

* last of several occurrences

DAY	HIGHEST	YEAR	HIGHEST	YEAR	HIGHEST	YEAR	HIGHEST	YEAR
1st	.02	1909	.44	1921	.30	1995	.94	1889
2nd	T	1950*	.23	1916	.44	1875	1.06	1925
3rd	.07	1884	.55	1914	.14	1960	1.03	1928
4th	.86	1963	2.95	1925	.28	1957	2.52	1873
5th	.44	1939	.55	1925	1.69	1905	1.34	1966
6th	.65	1939	.35	1912	.62	1905	.73	1966
7th	.37	1957	.57	1939	.77	1931	1.15	1992
8th	.16	1982	.24	1889	.52	1946	1.66	1884*
9th	.09	1976	.74	1932	2.68	1879	1.53	1926
10th	.87	1976	.91	1986	.96	1949	2.56	1943
11th	.02	1939*	.51	1987	1.96	1944	1.22	1943
12th	.30	1939	.45	1941	1.71	1941	1.01	1943
13th	.28	1941	1.54	1889	1.11	1950	.85	1902
14th	.29	1875	.78	1887	1.12	1944	1.18	1889
15th	.12	1906	.96	1878	1.07	1965	2.35	1938
16th	.07	1965	.68	1971	1.25	1965	1.36	1987
17th	.48	1963	.72	1971	1.08	1986	1.76	1902
18th	.41	1963	1.00	1948	.58	1973	1.93	1921
19th	.19	1939	.23	1949*	.70	1913	.75	1970
20th	.24	1991	.59	1979	1.46	1963	2.09	1921
21st	.07	1947	.32	1976	1.22	1967	1.07	1921
22nd	.70	1987	.91	1941	1.53	1965	2.60	1945
23rd	.14	1958	.88	1941	1.75	1887	2.31	1940
24th	.48	1958	1.00	1919	.62	1984	1.47	1940
25th	.90	1986	.80	1940	2.04	1985	1.50	1921
26th	.13	1919	.44	1991	.95	1909	1.90	1921
27th	.15	1890	1.82	1883	.75	1939	2.15	1879
28th	.16	1905	.60	1974*	1.32	1981	1.01	1989*
29th	.37	1890	.50	2000	.92	1970	1.38	1879
30th	1.23	1921	.68	1957	.33	1982	1.96	1951
31st			1.01	1927			.81	1904

* last of several occurrences

NUMBER OF CONSECUTIVE DAYS WITH NO MEASURABLE PRECIPITATION

Days	Year	Time Period	# of Traces
181	2003	May 3 to October 31	14
165	1988	May 30 to November 10	11
164	1915	May 25 to November 4	4
164	1924	April 25 to October 5	5
164	1997	April 4 to September 14	3
161	1893	May 14 to October 21	2
159	2001	May 29 to November 3	2
153	1914	May 2 to October 1	10
152	1949	May 20 to October 18	15
149	1954	June 14 to November 9	12
148	1956	May 28 to October 22	9
147	1944	June 11 to November 4	13
145	1966	May 12 to October 3	9
139	1917	May 30 to October 15	12
138	1959	April 27 to September 11	5
136	1877	May 30 to October 12	2
135	1909	April 19 to August 31	6
133	1952	June 27 to November 6	12
131	1904	May 27 to October 4	3
128	1903	May 26 to September 30	4
128	1940	April 28 to September 2	12
128	1970	May 28 to October 2	12
127	1946	May 27 to September 30	3

YEARS THAT MEASURABLE PRECIPITATION FELL EVERY MONTH

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1854	.99	2.56	1.88	.89	.18	.01	.07	1.36	.09	.27	.04	3.29	11.63
1876	2.47	2.44	1.78	.06	.05	.05	.03	.06	.03	.08	.04	.15	7.24
1933	4.32	.02	.13	1.75	.53	.08	.02	.01	.02	.16	.03	1.10	8.17

MAXIMUM MONTHLY PRECIPITATION WITH FOUR INCHES OR MORE

* last of several occurrences

Amount	Date	Amount	Date	Amount	Date
9.26	December 1921	5.58	January 1980	4.68	March 1906
9.09	January 1993	5.56	January 1862	4.57	December 1927
9.05	February 1884	5.50	March 1893	4.57	March 1918
8.06	January 1995	5.46	December 1873	4.55	December 1984
7.88	March 1867	5.40	February 1976	4.54	February 1935
7.65	February 1998	5.37	April 1926	4.53	January 1882
7.71	December 1889	5.31	February 1941	4.51	February 1887
7.60	December 1943	5.18	February 1936	4.50	December 1852
7.56	January 1916	5.15	February 1932	4.47	February 1980
7.33	January 1895	5.12	December 1884	4.45	December 1936
6.96	March 1991	5.05	January 1866	4.42	March 1992
6.95	January 1886	5.00	March 1978	4.34	February 1969
6.68	February 1927	4.97	March 1952	4.32	January 1933
6.60	December 1965	4.93	November 1944	4.32	January 1917
6.57	March 1983	4.92	November 1985	4.31	March 1954
6.32	December 1879	4.92	February 1911	4.25	December 1938
6.26	January 1943	4.91	January 1915	4.24	January 1952
6.23	March 1884	4.88	February 2003	4.22	February 1937
6.09	December 1940	4.84	February 1891	4.21	February 1873
5.95	January 1978	4.83	February 1878	4.15	December 1880
5.90	February 1905	4.80	January 1957	4.11	February 1931
5.89	March 1941	4.78	January 1969	4.02	December 1906
5.82	January 1979	4.77	February 1901		
5.82	November 1965	4.74	March 1982		
5.72	March 1912	4.73	February 1993		

GREATEST RAINFALL FOR A CALENDAR DAY

Amount	Date	Amount	Date
3.23	April 5, 1926	2.04	January 26, 1914 November 25, 1985
2.95	October 4, 1925	2.03	February 17, 1982
2.71	February 6, 1937	2.01	January 14, 1969
2.68	November 9, 1879	1.99	January 25, 1995
2.60	December 22, 1945	1.96	February 15, 1887 November 11, 1944 December 30, 1951
2.57	January 31, 1979	1.95	March 2, 1992
2.56	December 10, 1943	1.93	December 18, 1921
2.52	December 4, 1873	1.92	January 29, 1980
2.49	January 12, 1882	1.90	December 26, 1921
2.39	February 9, 1901	1.85	January 29, 1950
2.36	March 24, 1906	1.84	February 14, 1927
2.35	December 15, 1938	1.83	March 21, 1893
2.31	December 23, 1940	1.82	October 27, 1883
2.24	January 4, 1995	1.80	August 12, 1873 January15, 1993
2.23	January 23, 1943	1.79	December 20, 1879
2.19	January 27, 1916	1.77	March 11, 1918 March 11, 1995
2.15	January 19, 1895 December 27, 1879 December 10, 1965	1.76	January 10, 1911 February 6, 1935 December 17, 1902
2.12	January 14, 1978	1.75	January 15, 1895 November 23, 1887 December 15, 1889
2.11	March 7, 1952	1.73	February 15, 1927
2.09	December 20, 1921	1.71	February 8, 1976 November 12, 1941

PRECIPITATION STATISTICS BY THE MONTH (in inches)

	January	February	March	April	May	June
Greatest Daily Precipitation	2.57 on the 31st in 1979	2.71 on the 6th in 1937	2.36 on the 24th in 1906	3.23 on the 5th in 1926	1.49 on the 8th in 1977	.49 on the 10th in 1990
Normal for the Month	1.80	1.43	1.60	.78	.24	.06
Maximum Monthly Precipitation	9.09 in 1993	9.05 in 1884	7.88 in 1867	5.37 in 1926	2.54 in 1921	.87 in 1990
Minimum Monthly Precipitation	0 in 1850 and 1859	0 in 1912 and 1967	0 in 1865, 1857, and 1997	T in 1918, 1961, and 1966	0 in 1952 and 1984	0 in 2001*
Normal Seasonal[1] through the Month	5.55	7.08	8.85	9.64	9.83	9.90
Maximum Seasonal[1] through the Month	14.92 in 1921-22	16.78 in 1921-22	21.39 in 1940-41	24.74 in 1940-41	25.66 in 1883-84	25.97 in 1883-84
Minimum Seasonal[1] through the Month	0.35 in 1962-63	1.57 in 1962-63	2.39 in 2001-02	3.02 in 2001-02	3.02 in 2001-02	3.02 in 2001-02
Greatest in 5 minutes	.26 on the 5th in 1935	.27 on the 14th in 1981*	.33 on the 1st in 1983*	.28 on the 8th in 1926	.19 on the 4th in 1930	.09 on the 6th in 1934
Greatest in 10 minutes	.36 on the 5th in 1935	.49 on the 14th in 1927	.48 on the 9th in 1926	.35 on the 5th in 1926	.21 on the 8th in 1977*	.16 on the 6th in 1934
Greatest in 15 minutes	.49 on the 10th in 1955	.63 on the 14th in 1927	.59 on the 9th in 1926	.47 on the 5th in 1926	.25 on the 8th in 1977	.17 on the 6th in 1934
Greatest in 30 minutes	.68 on the 10th in 1955	.76 on the 14th in 1927	.94 on the 15th in 1905	.75 on the 5th in 1926	.33 on the 8th in 1977	.17 on the 6th in 1934
Greatest in 60 minutes	.87 on the 19th in 1933	1.12 on the 28th in 1970	1.21 on the 7th in 1952	1.16 on the 5th in 1926	.46 on the 8th in 1977	.19 on the 6th in 1934
Greatest in 2 hours	1.06 on the 10th in 1096	1.50 on the 28th in 1970	1.64 on the 7th in 1952	2.09 on the 5th in 1926	.62 on the 8th in 1977	.39 on the 10th in 1990
Greatest in 24 hours	2.65 on the 14-15 in 1978*	2.90 on the 6-7 in 1937	2.40 on 7-8 in 1952 and 24-25 in 1906	3.23 on the 5th in 1926	1.50 on 8-9 in 1977	.38 on 5-6 in 1934

* Last of Several Occurrences

[1] The season begins on July 1st

PRECIPITATION STATISTICS BY THE MONTH (in inches)

	July	August	September	October	November	December
Greatest Daily Precipitation	.83 on the 25th in 1902	1.80 on the 12th in 1873	1.23 on the 30th in 1921	2.95 on the 4th in 1925	2.68 on the 9th in 1879	2.60 on the 22nd in 1945
Normal for the Month	.01	.11	.19	.33	1.10	1.36
Maximum Monthly Precipitation	1.29 in 1865	2.13 in 1977	2.58 in 1939	3.67 in 1925	5.82 in 1965	9.26 in 1921
Minimum Monthly Precipitation	0 in 2002*	0 in 2001*	0 in 2001*	0 in 2001*	0 in 1956*	0 in 1930*
Normal Seasonal[1] through the Month	.02	.12	.36	.73	2.18	3.75
Maximum Seasonal[1] through the Month	1.29 in 1865	2.14 in 1977	2.58 in 1939	3.68 in 1925	6.13 in 1965	12.73 in 1965
Minimum Seasonal[1] through the Month	0 in 2002*	0 in 1995*	0 in 1883*	0 in 1871	.02 in 1962	.24 in 1962
Greatest in 5 minutes	.07 on the 25th in 1902	.15 on the 14th in 1983	.20 on the 22nd in 1905	.20 on the 10th in 1966	.32 on the 21st in 1967	.31 on the 1st in 1947
Greatest in 10 minutes	.12 on the 25th in 1902	.16 on the 14th in 1983	.34 on the 7th in 1957	.28 on the 10th in 1966	.51 on the 21st in 1967	.47 on the 20th in 1921
Greatest in 15 minutes	.15 on the 25th in 1902	.16 on the 14th in 1983	.35 on the 7th in 1957	.40 on the 7th in 1939	.65 on the 27th in 1939	.54 on the 10th in 1965
Greatest in 30 minutes	.20 on the 25th in 1902	.31 on the 16th in 1977	.36 on the 7th in 1957	.41 on the 7th in 1939	.81 on the 21st in 1967	.85 on the 10th in 1965
Greatest in 60 minutes	.25 on the 25th in 1902	.48 on the 16th in 1977	.41 on the 24th in 1958	.57 on the 10th in 1966	.95 on the 21st in 1967	1.36 on the 10th in 1965
Greatest in 2 hours	Incom-plete data	.63 on the 16th in 1977	.55 on the 25th in 1986	.83 on the 10th in 1986	1.11 on the 21st in 1967	1.77 on the 10th in 1965
Greatest in 24 hours	.83 on the 24-25 in 1902	2.13 on the 16-17 in 1977	1.50 on 9/30-10/1 in 1921	3.24 on 4-5 in 1925	2.75 on the 9-10 in 1879	3.62 on the 23-24 in 1940

* Last of Several Occurrences
[1] The season begins on July 1st

RETURN PERIOD[1] - MAXIMUM PRECIPITATION

Return Period in Years	5 Minutes	10 Minutes	15 Minutes	30 Minutes	1 Hour	2 Hours	24 Hours
2	.17	.25	.31	.42	.54	.70	1.62
5	.23	.34	.43	.59	.76	1.01	2.23
10	.27	.40	.50	.70	.91	1.21	2.63
20	.30	.46	.58	.81	1.05	1.40	3.02
25	.31	.48	.60	.84	1.09	1.46	3.14
40	.34	.51	.65	.91	1.18	1.58	3.39
50	.35	.53	.67	.94	1.22	1.64	3.50
100	.38	.59	.74	1.04	1.35	1.82	3.86
200	.41	.64	.81	1.14	1.47	1.99	4.21
1,000	.49	.76	.97	1.36	1.76	2.39	5.01
10,000	.59	.92	1.18	1.67	2.16	2.94	6.11
Theoretical Max Ever	1.10	1.75	2.25	3.19	4.13	5.67	11.60

[1] A return period is defined as a statistical parameter used in frequency analysis as a measure of the average time interval between the occurrence of a given quantity and that of an equal or greater quantity.

SIGNIFICANT MONTHLY RAINFALL FOR JANUARY

2.0 INCHES OR MORE				LESS THAN OR EQUAL TO .50	
Amount	**Date**	**Amount**	**Date**	**Amount**	**Date**
9.09	1993	2.34	1899	0.5	1853
8.06	1995	2.32	1867	0.49	1975
7.56	1916	2.2	1967	0.46	1984
7.33	1895	2.16	1905	0.44	1873
6.95	1886	2.15	1935	0.43	1920
6.26	1943	2.1	1983	0.42	1945, 1989
5.95	1978	2.08	1901	0.4	1965
5.82	1979	2.03	1941	0.35	1885, 1947, 1968
5.58	1980	2.02	1921	0.32	1863, 1927
5.56	1862	2	1910	0.3	1934, 1971
5.05	1866			0.29	1894
4.91	1915			0.26	1857, 1924
4.8	1957			0.21	1928, 1942
4.78	1969			0.18	2000
4.53	1882			0.11	1963
4.32	1917, 1933			0.08	1925, 1959
4.24	1952			0.07	1972
3.9	1930			0.04	1887, 1904, 1864
3.72	1931			0.03	1851
3.59	1914, 1955			0.02	2003
3.57	1909			T	1948, 1976
3.56	1949			0.00	1850, 1859
3.54	1879				
3.45	1922				
3.37	1868				
3.35	1911				
3.31	1950				
3.3	2001				
3.27	1907				
3.13	1897				
3.11	1874				
3.02	1997				
2.99	1960				
2.96	1974				
2.88	1869				
2.8	1908				
2.79	1890				
2.76	1954				
2.71	1962, 1982				
2.68	1998				
2.52	1990				
2.47	1876				
2.38	1875, 1939				
2.36	1977				

SIGNIFICANT MONTHLY RAINFALL FOR FEBRUARY

2.0 INCHES OR MORE				LESS THAN OR EQUAL TO .50	
Amount	**Date**	**Amount**	**Date**	**Amount**	**Date**
9.05	1884	2.5	1864	0.5	1951, 1957
7.65	1998	2.46	1991	0.49	1894
6.68	1927	2.44	1876	0.47	1893
5.9	1905	2.41	1908	0.45	1881, 1907
5.4	1976	2.4	1913	0.44	1858
5.31	1941	2.38	2001	0.43	1947
5.18	1936	2.33	1926	0.37	1875, 1964
5.15	1932	2.27	1903	0.35	1921
4.92	1911	2.26	1981	0.31	1997
4.88	2003			0.3	1899, 1925
4.84	1891			0.22	1956, 1968
4.83	1878			0.2	1853
4.77	1901			0.19	1910
4.73	1993			0.18	1877
4.54	1935			0.17	2002
4.51	1887			0.15	1958
4.47	1980			0.1	1972
4.34	1969			0.09	1984
4.22	1937			0.06	1898, 1961, 1977
4.21	1873			0.04	1974
4.11	1931			0.03	1900
3.88	1983			0.02	1885, 1896, 1933
3.76	1959			T	1924
3.73	1874			0.00	1912, 1967
3.68	2000				
3.65	1944				
3.62	1915				
3.59	1855				
3.56	1940				
3.43	1866				
3.34	1992				
3.26	1938				
3.15	1958				
3.08	1962				
3	1865				
2.96	1892				
2.87	1920				
2.75	1994				
2.72	1897				
2.64	1978				
2.62	1906				
2.59	1986				
2.58	1970				
2.56	1854				
2.55	1882				

SIGNIFICANT MONTHLY RAINFALL FOR MARCH

1.50 INCHES OR MORE				LESS THAN OR EQUAL TO .50	
Amount	**Date**	**Amount**	**Date**	**Amount**	**Date**
7.88	1867	1.79	1965	0.5	1951
6.96	1991	1.78	1876, 1925	0.46	1872, 2002
6.57	1983	1.7	1974	0.45	1875
6.23	1884	1.66	1943	0.42	1913, 1932
5.89	1941	1.62	1907	0.41	1883, 1890
5.72	1912	1.6	1948	0.38	1955
5.5	1893	1.59	1856	0.36	1914
5	1978	1.55	1968	0.34	1851, 1923
4.97	1952	1.53	1897	0.33	1863, 1870, 1915
4.74	1982	1.52	1853	0.27	1891
4.68	1906	1.5	1970	0.26	1917
4.57	1918			0.25	1990
4.42	1992			0.24	1934
4.31	1954			0.2	1859, 1864, 1971
3.98	1958			0.17	1966
3.81	1995			0.15	1860
3.79	1975			0.13	1933
3.74	1981			0.11	1873
3.73	1886, 1938			0.1	1879
3.71	1979			0.06	1931
3.67	1994			0.05	1861
3.12	1986			0.04	1984
3.02	1930			0.02	1877
2.98	1905			0.01	1871
2.89	1896			T	1956, 1959, 1972
2.79	1888			0.00	1857, 1865, 1997
2.71	1980				
2.67	1946				
2.65	1937				
2.62	1909				
2.46	1920				
2.41	1924				
2.26	1973				
2.21	1998				
2.2	1889				
2.17	1904				
2.05	1927				
2.03	1945				
1.98	1869				
1.91	1942				
1.88	1854, 1881				
1.87	1852				
1.86	1902				
1.83	1919				

SIGNIFICANT MONTHLY RAINFALL FOR APRIL

.75 INCHES OR MORE	
Amount	**Date**
5.37	1926
3.71	1988
3.58	1965
3.35	1941
2.91	1878
2.84	1884
2.24	1967
2.17	1856
2.14	1887
2.13	1912
2	1975
1.95	1886, 1951
1.75	1933
1.74	1983
1.65	1958
1.62	1999
1.56	1956
1.54	1952
1.52	1855
1.41	2003
1.4	1903, 1942
1.38	1931
1.35	1881
1.34	1880
1.33	1976
1.26	1900
1.2	1868, 1885
1.18	1980
1.17	1986
1.15	1915
1.11	1925, 1998
1.06	1917, 1930
1.05	1862, 1923
1.02	1935
0.98	1906
0.96	1995
0.93	1971, 1994
0.9	1955
0.89	1854
0.87	1851
0.85	1852, 1914
0.84	1957
0.78	1987
0.77	1924
0.76	1891, 1990, 2001

LESS THAN OR EQUAL TO .20	
Amount	**Date**
0.2	1870, 1964
0.19	1889
0.17	1858, 1922
0.15	1904
0.14	1928
0.13	1863, 1907, 1937, 1948
0.12	1875, 1989
0.11	1866, 1894, 1895
0.1	1873, 1888
0.09	1850, 1949, 1954, 1970
0.08	1910, 1913
0.06	1876
0.05	1890, 1973, 1991
0.04	1857, 1861, 1921
0.03	1945
0.02	1897, 1909, 1972, 1974, 1979
0.01	1864, 1901, 1916, 1934, 1962, 1977
T	1918, 1961, 1966
0.00	1993

SIGNIFICANT MONTHLY RAINFALL FOR MAY

.25 INCHES OR MORE	
Amount	**Date**
2.54	1921
2.17	1884
2.1	1853
1.81	1930
1.79	1977
1.45	1900
1.25	1864
1.15	1892
1.14	1883
0.95	1971
0.88	1957
0.77	1901
0.72	1906
0.71	1851
0.66	1898
0.65	1980
0.64	1998
0.62	1962
0.61	1885
0.59	1995
0.58	1878
0.53	1933
0.51	1990
0.49	1955
0.47	1887
0.44	1920
0.43	1877
0.41	1949
0.4	1958
0.39	1893
0.36	1922, 1928
0.35	1891, 1905
0.34	1871, 1919
0.33	1869
0.32	1852, 1874, 1937
0.31	1917
0.3	2003
0.29	1856
0.28	1870, 1915
0.27	1976

LESS THAN .02	
Amount	**Date**
0.01	1911, 1916, 1926, 1932, 1939, 1946, 1948, 1954, 1961, 1970, 1974, 1975, 1982, 1983, 1991, 1993
T	1879, 1909, 1918, 1936, 1940, 1941 1959, 1965, 1973, 1985, 1997, 2000
0.00	1850, 1858, 1861, 1865, 1923, 1924, 1951, 1952,1984, 1986

SIGNIFICANT MONTHLY RAINFALL FOR JUNE

.05 INCHES OR MORE	
Amount	**Date**
0.87	1990
0.68	1850
0.48	1862
0.47	1934
0.46	1995
0.41	1993
0.38	1972
0.31	1884
0.28	1963
0.27	1899
0.26	1957
0.19	1858, 1861, 1907
0.17	1995
0.16	1878, 1912, 1967
0.15	1925, 1945
0.14	1952, 1953
0.13	1892
0.12	1927
0.1	1889, 1944, 1998
0.09	1913, 1928, 1962
0.08	1883, 1900, 1933, 1964
0.07	1879, 1882, 1886
0.06	1880, 1885, 1918, 1989
0.05	1853, 1860, 1876, 1881, 1891

LESS THAN .02	
Amount	**Date**
0.01	1851, 1854, 1864, 1865, 1894, 1896, 1911, 1926, 1931, 1932, 1936, 1937, 1938, 1942, 1943, 1965, 1971, 1979, 1980, 1983,
T	1877, 1893, 1897, 1902, 1903, 1905, 1909 1914, 1915, 1916, 1917, 1921, 1922, 1924, 1929, 1940, 1941, 1947, 1949, 1950, 1951, 1955, 1956, 1958, 1959, 1960, 1961, 1966, 1968, 1970, 1973, 1978, 1983, 1985,
	1986, 1987, 1991, 1994, 1997, 2000, 2002,
	2003
0.00	1852, 1855, 1856, 1859, 1863, 1866, 1867, 1868, 1869, 1870, 1871, 1872, 1873, 1874, 1890, 1895, 1904, 1908, 1910, 1919, 1935, 1939, 1946, 1981, 1988, 1996, 2001

SIGNIFICANT MONTHLY RAINFALL FOR JULY

Amount (In Inches)	Date
1.29	1865
0.92	1902
0.51	1868
0.24	1991
0.2	1998
0.19	1984
0.16	1905, 1937
0.14	1860, 1912
0.13	1968
12	1874, 1911
0.11	1862, 1864
0.09	1880, 1979, 1996
0.08	1950
0.07	1854
0.06	1913, 1941
0.05	1869, 1995
0.04	1870
0.03	1859, 1876, 1907, 1987, 1992, 1993, 1994
0.02	1916, 1933, 1965, 1976
0.01	1887, 1888, 1897, 1910, 1922, 1923, 1936, 1967, 1974, 1983
T	1885, 1886, 1889, 1891 1893, 1896, 1901, 1906, 1909, 1915, 1917, 1918, 1919, 1920, 1921, 1925, 1926, 1928, 1930, 1931, 1932, 1934, 1935, 1938, 1939, 1940, 1944, 1945, 1948, 1949, 1952, 1953, 1954, 1955, 1956, 1957, 1958, 1959, 1960, 1961, 1962, 1966, 1969, 1970, 1971, 1972, 1973, 1975, 1977, 1980, 1981, 1986, 1988, 1990, 1997, 1999, 2001, 2003
0.00	1850, 1851, 1852, 1853, 1855, 1856, 1857, 1858, 1861, 1863, 1866, 1867, 1871, 1872, 1873, 1875, 1877, 1878, 1879, 1881, 1882, 1883, 1884, 1890, 1892, 1894, 1895, 1898, 1899, 1900, 1903, 1904, 1908, 1914, 1924, 1927, 1929, 1942, 1943, 1946, 1947, 1951, 1963, 1964, 1978, 1982, 1985, 1989, 2000, 2002

*This is all of the measurable precipitation for July

SIGNIFICANT MONTHLY RAINFALL FOR AUGUST

Amount (In Inches)	Date
2.13	1977
1.95	1873
1.36	1854
0.87	1945
0.85	1951
0.64	1908
0.4	1852
0.39	1983
0.32	1880
0.3	1867
0.28	1936
0.26	1912
0.21	1853, 1875
0.18	1872, 1935
0.14	1967
0.13	1885, 1896
0.11	1918, 1955
0.1	1866, 1906
0.08	1931
0.07	1870, 1899
0.06	1876, 1984
0.05	1892, 1910, 1926, 1992
0.04	1855, 1858, 1889, 1894, 1961
0.03	1928, 1938, 1941, 1971
0.02	1857, 1913, 1934, 1972
0.01	1881, 1916, 1919, 1920, 1925, 1927, 1933, 1969, 1976, 1979, 1987, 1990, 1991, 1994, 1995, 2000
T	1878, 1882, 1884, 1886, 1887, 1888, 1890, 1897, 1900, 1901, 1902, 1903, 1904, 1909, 1917, 1921, 1922, 1923, 1924, 1930, 1939, 1940, 1942, 1943, 1944, 1946, 1949, 1952, 1953, 1954, 1956, 1957, 1958, 1959, 1962, 1963, 1964, 1965, 1968, 1973, 1974, 1975, 1978, 1982, 1985, 1988, 1989, 1993, 1996, 1998, 2002
0.00	1850, 1851, 1856, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1868, 1869, 1871, 1874, 1877, 1879, 1883, 1891, 1893, 1895, 1898, 1905, 1907, 1911, 1914, 1915, 1929, 1932, 1937, 1947, 1948, 1950, 1960, 1966, 1970, 1980, 1981, 1986, 1995, 1997, 1999, 2001, 2003

*This is all of the measurable precipitation for August

SIGNIFICANT MONTHLY RAINFALL FOR SEPTEMBER

.10 INCHES OR MORE	
Amount	**Date**
2.58	1939
1.9	1963
1.59	1861
1.24	1921
1.04	1986
1	1976
0.85	1997
0.72	1978
0.7	1987
0.65	1890
0.62	1958
0.5	1905
0.44	1972
0.39	1875
0.38	1982
0.37	1957
0.36	1863
0.31	2002
0.29	1965
0.28	1941, 1991
0.26	1919, 1929
0.25	1916
0.23	1989
0.21	1983
0.2	1908, 1985
0.18	1934, 1947
0.17	1910
0.13	1874
0.12	1906
0.1	1858, 1911

LESS THAN .10	
Amount	**Date**
0.09	1854
0.08	1891, 1918, 1920, 1940, 1967
0.07	1856, 1884, 1898
0.06	1901, 1960
0.05	1868
0.04	1881, 1888, 1927, 1936, 1943, 1951, 1959
0.03	1876, 1923, 1945, 1981, 1996, 1998
0.02	1851, 1909, 1913, 1933, 1973, 1999
0.01	1857, 1882, 1894, 1895, 1935
T	1877, 1885, 1887, 1889,1892, 1896, 1897, 1900, 1902, 1903, 1904, 1914, 1915, 1917, 1928, 1930, 1931, 1937, 1944, 1946, 1948, 1949, 1950, 1952, 1953, 1955, 1956, 1961, 1966, 1968, 1969, 1970, 1971, 1974, 1975, 1977, 1980, 1984, 1988, 1990, 1993, 1994, 1995, 2000
0.00	1850, 1852, 1853, 1855, 1859, 1860, 1862, 1864, 1865, 1866, 1867, 1869, 1870, 1871, 1872, 1873, 1878, 1879, 1880, 1883, 1886, 1893, 1899, 1907, 1912, 1922, 1924, 1925, 1926, 1932, 1938, 1942, 1954, 1962, 1964, 1979, 1992, 2001, 2003

SIGNIFICANT MONTHLY RAINFALL FOR OCTOBER

.25 INCHES OR MORE				LESS THAN .01	
Amount	**Date**	**Amount**	**Date**	**Amount**	**Date**
3.67	1925	0.34	1867, 1946	Trace	1887, 1894, 1913, 1937
2.9	1941	0.31	1885		1944, 1945, 1952, 1955,
2.12	1889	0.3	1900		1988, 1990, 1995, 2003
2.01	1883	0.29	1879, 1984, 1985	0.00	1853, 1856, 1860, 1863,
1.86	1936	0.28	1901, 1911		1866, 1868, 1871, 1872,
1.76	1927, 1957	0.27	1854, 1895, 1942		1873, 1875, 1898, 1909,
1.74	1987	0.26	1888		1915, 1929, 1954, 1967,
1.71	1907	0.25	1905		1992, 1999, 2001
1.66	1971				
1.54	1870				
1.5	1940				
1.39	1986				
1.35	1910				
1.32	1948				
1.24	2000				
1.1	1932				
1.06	1897				
1.05	1914				
1.04	1919				
1.03	1974				
0.97	1896				
0.96	1878				
0.94	1996				
0.89	1862, 1912				
0.87	1916				
0.81	1877				
0.8	1966				
0.73	1979				
0.69	1991				
0.68	1951, 1956				
0.67	1921				
0.61	1939				
0.58	1972				
0.53	1874, 1880				
0.5	1977				
0.49	1857				
0.47	1858, 1989				
0.42	1918, 1934				
0.41	1882				
0.4	1983				
0.38	1976				
0.37	1923				
0.35	1884, 1899, 1924				

SIGNIFICANT MONTHLY RAINFALL FOR NOVEMBER

ONE INCH OR MORE				LESS THAN .10	
Amount	**Date**	**Amount**	**Date**	**Amount**	**Date**
5.82	1965	1.22	1856	0.1	1891, 1948
4.93	1944	1.19	1861, 1895	0.09	1989
4.92	1985	1.17	1997	0.08	1917
3.53	1967	1.16	1925, 1949, 1986	0.07	1935
3.38	1905	1.04	1930, 1939	0.06	1877, 1971
3.16	1972	1.01	1960, 1964	0.05	1862, 1907, 1916, 1927, 1977, 1991
2.88	1860	1	1908		
2.82	1850			0.04	1854, 1876, 1999
2.77	1879			0.03	1933, 1943, 1992
2.53	1946			0.02	1897, 1911, 1937, 1938, 1959
2.41	1864				
2.39	1909			0.01	1962
2.37	1984			T	1878, 1903, 1929
2.32	1869			0.00	1872, 1894, 1904, 1956, 1980
2.25	1875				
2.23	1913, 1941				
2.16	1857				
2.15	1855				
2.1	1982				
2.09	1978				
2.08	1887				
2.05	1970				
2	1868				
1.95	1931, 1934				
1.94	1983				
1.91	1918				
1.85	1963				
1.83	1888, 1952				
1.79	1981				
1.7	1996				
1.63	1973				
1.56	1885				
1.53	1902				
1.49	1859				
1.45	1852				
1.43	1900				
1.39	1988				
1.33	1871, 1987				
1.28	1853				
1.23	1950, 1951				

SIGNIFICANT MONTHLY RAINFALL FOR DECEMBER

TWO INCHES OR MORE	
Amount	**Date**
9.26	1921
7.71	1889
7.6	1943
6.6	1965
6.32	1879
6.09	1940
5.46	1873
5.12	1884
4.57	1927
4.55	1984
4.5	1852
4.45	1936
4.25	1938
4.15	1880
4.02	1906
3.89	1877, 1926
3.87	1951
3.76	1909
3.74	1851
3.62	1945
3.58	1902
3.56	1931
3.38	1934
3.29	1854
3.27	1971
3.22	1966
3.2	1861
3.1	1858
3.06	1867
3.02	1947
2.99	1860
2.85	1941
2.84	1888
2.73	1987
2.6	1915
2.56	1992
2.46	1904
2.42	1928
2.4	1932
2.38	1948
2.26	1894
2.23	1988
2.22	1970
2.21	1914
2.2	1952, 1974
2.19	1978
2.18	1896

.10 INCHES OR LESS	
Amount	**Date**
0.1	1886, 1963, 2000
0.06	1958
0.05	1950
0.04	1863
0.03	1912, 1953
0.02	1901, 1979
0.01	2000
T	1917
0.00	1900, 1929, 1930

DAYS WITH THUNDERSTORMS

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
1872								2					2
1873		1											1
1874		1			1		1						3
1875						1			1				2
1876													0
1877													0
1878													0
1879													0
1880			1					1					2
1881													0
1882		1											1
1883													0
1884					1			1					2
1885			2					1					3
1886	1		2	1									4
1887								1					1
1888				1					1				2
1889			2										2
1890													0
1891													0
1892										1			1
1893					1		1						2
1894								1					1
1895										1			1
1896							1	1		1			3
1897		2	1	1				1					5
1898												1	1
1899													0
1900				1									1
1901		1	1	1									3
1902	1												1
1903													0
1904					2								2
1905		1	2						1		1		5
1906				1				1				1	3
1907										1			1
1908	1						1	1	1	2			6
1909	1		1										2
1910								1	1				2
1911							3					2	5
1912			1			2				2	1		6
1913								3					3

DAYS WITH THUNDERSTORMS

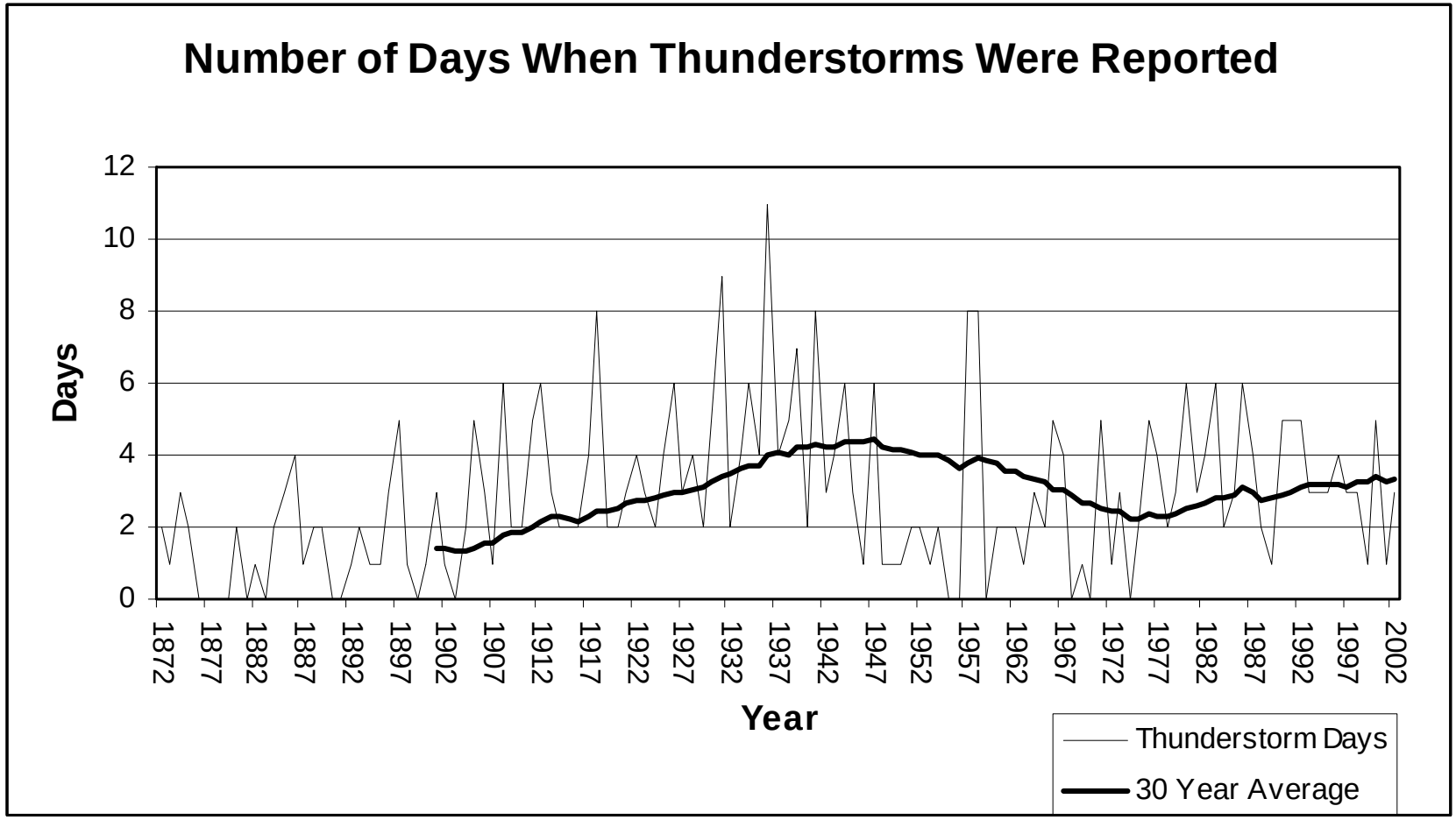
Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
1914										1	1		2
1915	1			1									2
1916	1						1						2
1917							2	1		1			4
1918						3	1	1			1	2	8
1919		1						1					2
1920					2								2
1921	1				1							1	3
1922	2						1	1					4
1923									3				3
1924			1	1									2
1925				1	1					2			4
1926	1			3				1				1	6
1927						1	1			1			3
1928	1							2		1			4
1929			2										2
1930	1		1				2				1		5
1931	2	1				1	1	2			2		9
1932		1								1			2
1933	1						2					1	4
1934		2						2	1			1	6
1935			1					1	1		1		4
1936		1				1	2	3		1	2	1	11
1937						2	1			1			4
1938	1		1				1	2					5
1939	3								2		2		7
1940		1										1	2
1941		1	4	1						1		1	8
1942		2						1					3
1943	1					1						2	4
1944	1	2									1	2	6
1945		1							1			1	3
1946											1		1
1947					2					1	1	2	6
1948										1			1
1949			1										1
1950									1				1
1951									2				2
1952											2		2
1953		1											1
1954	1						1						2
1955													0
1956													0

DAYS WITH THUNDERSTORMS

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
1957	1			1			1		2	2	1		8
1958		1	3	1	1			1			1		8
1959													0
1960									2				2
1961								1		1			2
1962		1			1								2
1963					1								1
1964	1		1							1			3
1965												2	2
1966		1					1			1	1	1	5
1967					1			2			1		4
1968													0
1969			1										1
1970													0
1971								1		3		1	5
1972						1							1
1973		1	2										3
1974													0
1975							1				1		2
1976				1					1	2	1		5
1977			2			1					1		4
1978			1						1				2
1979	1		1				1						3
1980		1	1	1	1	1						1	6
1981		1							1	1			3
1982	1								1		1	1	4
1983			2					3		1			6
1984				1							1		2
1985							1				1	1	3
1986		1	2				1	1				1	6
1987		2							1		1		4
1988				1						1			2
1989												1	1
1990	2					1		2					5
1991		1	1				1		1			1	5
1992			1			1		1		1		1	5
1993	2										1		3
1994				1			1	1					3
1995		1		1								1	3
1996		1					1	1		1			4
1997				2								1	3
1998		1				1						1	3
1999	1												1

DAYS WITH THUNDERSTORMS

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
2000		2						1	1		1		5
2001		1											1
2002	1								1		1		3
2003													0
Total	32	37	42	23	16	18	32	48	28	35	31	34	376


Number of Days When Thunderstorms Were Reported
Days
0
2
4
6
8
10
12
1872
1877
1882
1887
1892
1897
1902
1907
1912
1917
1922
1927
1932
1937
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
Year
Thunderstorm Days
30 Year Average

NUMBER OF DAYS WITH FOG[1] REPORTED

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1942	11	4	4	6	4	7	4	4	8	8	12	9	81
1943	8	5	3	9	5	10	12	4	23	17	14	3	113
1944	4	3	6	1	9	4	7	16	13	6	2	6	77
1945	11	8	4	12	4	6	10	8	8	8	11	9	99
1946	11	11	13	8	1	12	8	10	17	7	9	14	121
1947	10	17	5	5	5		12		15	11	7	3	90
1948	26	5	1	1	9	2	13	5	14	16	9	8	109
1949	4	5	4	5	6	2	4	11	11	4	12	12	80
1950	11	19	12	11	6	7	8	11	11	16	16	24	152
1951	9	7	5	3	5	2	5	13	19	12	10	11	101
1952	6	4		10	11	5	14	11	12	23	7	3	106
1953	12	8	6	4	1	9	5	4	10	6	9	4	78
1954	14	14	9	13	4	6	9	3	8	16	12	7	115
1955	7	5	4	6	4	7		6	12	14	13	15	93
1956	21	5	15	7	2	7		3	11	6	2	11	90
1957	6	8	5	5	5	12	10	1	10	7	6	7	82
1958	5	11	4	5	3	4	5	1	12	13	13	19	95
1959	15	2	8	4		2	7	1	2	15	11	8	75
1960	7	5	15	7	7	10	9	3	6	10	10	14	103
1961	6	6	6	8	2	6	4	1	8	7	11	18	83
1962	9	9	5	14	1	10	3	9	11	13	14	18	116
1963	4	11	7	5	1	5	5	2	8	3	8	8	67
1964	4		1	2	4	10	7	5	5	15	5	10	68
1965	8	8	3	12	3	1	6	4	6	7	11	5	74
1966	9	5	12	8	3	2	7		1	6	13	13	79
1967	17	10	8	1	8	7	5	4	1	12	7	8	88
1968	5	14	2	3	5	5		4	1	12	13	9	73
1969	11	4	4	2	6	7	8	8	8	4	3	9	74

[1] - Includes days with dense fog.

NUMBER OF DAYS WITH FOG[1] REPORTED

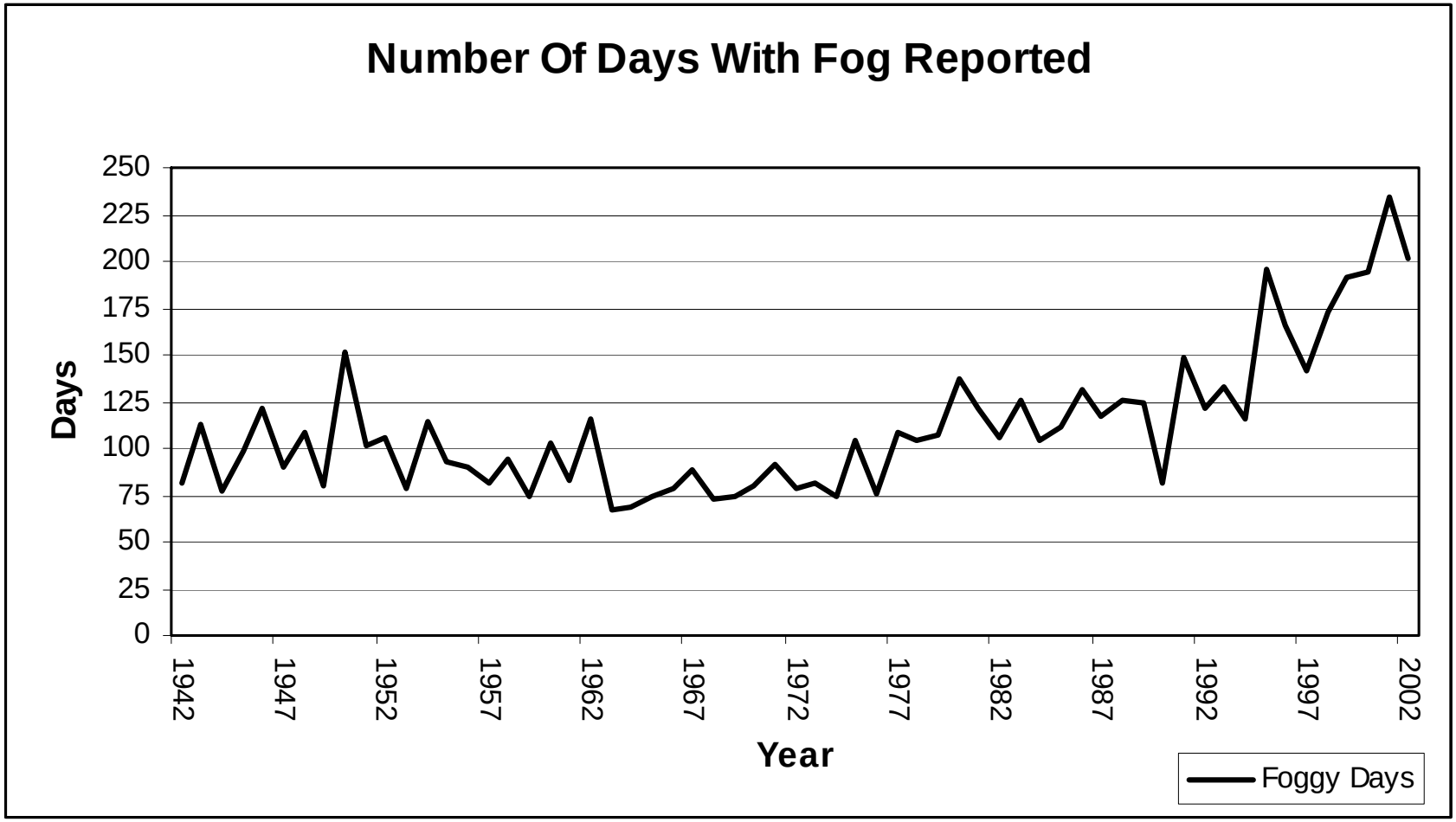
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1970	15	8	5		4	4	5	5	8	5	14	7	80
1971	10	10	6	5	7	10	6	1	7	8	12	10	92
1972	12	16	6	1	5	7	2	6	7	6	6	5	79
1973	7	6	5	1	8	9	8	5	3	10	7	13	82
1974	9	6	7	7	4	9	2	4	7	7	4	9	75
1975	12	13	12	4	5	2	4	12	6	7	13	14	104
1976	4	16	4	3	8	4	3	7	3	9	10	5	76
1977	8	10	3	9	7	9	9	5	6	16	10	17	109
1978	15	11	15	4	3	4	5	3	5	16	14	9	104
1979	10	10	7	4	10	10	8	8	15	9	11	5	107
1980	20	15	6	7	8	9	12	11	8	17	8	16	137
1981	18	14	6	2	7	9	2	4	13	6	18	22	121
1982	12	11	11	4	7	9	7	10	11	4	9	11	106
1983	10	15	16	8	11	11	8	10	6	7	8	16	126
1984	8	8	11	7	11	5	3	8	8	7	15	14	105
1985	8	13	7	15	3	10	5	11	7	9	11	13	112
1986	14	12	17	4	11	13	6	13	5	15	12	10	132
1987	8	9	7	8	10	7	4	9	19	18	8	10	117
1988	8	11	8	14	8	9	6	8	6	18	19	11	126
1989	11	8	14	2	6	11	10	5	17	15	12	13	124
1990	10	5	9	10	3	6	5	1	10	15	7		81
1991	11	17	9	6	7	6	10	20	19	18	11	14	148
1992	12	15	10	11	5	5	12	9	13	17	6	6	121
1993	17	10	17	10	5	13	4	9	16	13	12	7	133
1994	12	6	13	12	8	15	7	10	5	10	5	13	116
1995	19	12	15	8	8	14	20	21	16	21	25	17	196
1996	15	17	12	12	4	11	16	18	9	18	12	22	166
1997	18	18	13	9	19	5	9	14	11	5	15	5	141

[1] - Includes days with dense fog.

NUMBER OF DAYS WITH FOG[1] REPORTED

1998	19	14	14	11	7	5	20	24	12	15	18	14	173
1999	18	14	9	10	13	19	18	20	16	22	21	12	192
2000	22	17	17	16	16	10	11	19	11	21	15	19	194
2001	17	15	22	14	24	24	10	26	24	21	23	15	235
2002	17	18	15	14	11	19	15	24	21	10	17	20	201
2003	20	10	14	8	19	21	23	17	24	24	13	19	212

[1] - Includes days with dense fog.


Number Of Days With Fog Reported
Days
250
225
200
175
150
125
100
75
50
25
0
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
Year
Foggy Days

NUMBER OF DAYS WITH DENSE FOG[1] REPORTED

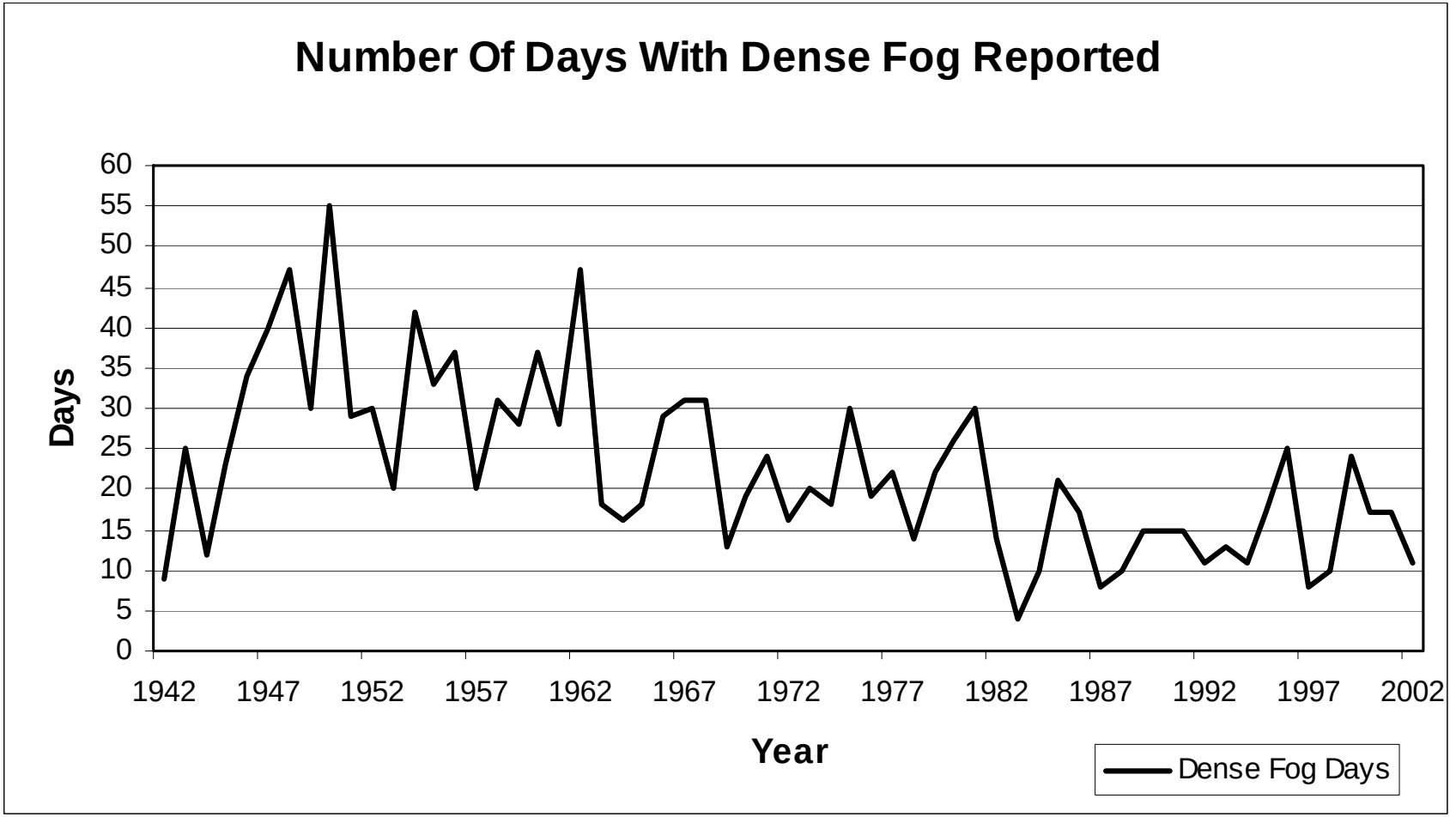
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1942									3	1	3	2	9
1943	3	1	1	2	3	2	1		4	4	4		25
1944		1			1			3	3			4	12
1945	5	2	2	1				1	1	3	3	5	23
1946	4	4	3	1		2			4	1	5	10	34
1947	6	8		1	3		4		5	6	4	3	40
1948	17	2			4		3	2	10	5	2	2	47
1949			2	2	2			1	4	2	10	7	30
1950	4	10	5	3	1	2		2	1	5	9	13	55
1951	2	4	2			1		1	8	5	5	1	29
1952	2	1		5	1		1	2	4	9	3	2	30
1953	4	4	2						2	3	1	4	20
1954	5	7	2	4			3		4	8	9		42
1955	2	3	2	1		1		3	3	3	7	8	33
1956	9	2	6	2		2		2	4	3	2	5	37
1957			3	2		5	3		2	1		4	20
1958	1	2	1	1			3		5	5	7	6	31
1959	7		7				1		1	7	4	1	28
1960	1	2	4	4	1	1	3		5	1	5	10	37
1961		2		2		1			3	4	5	11	28
1962	6	5	2	8	1	2			1	6	7	9	47
1963	2	4	1						2	1	3	5	18
1964	2		1	1		1	1		1	6	1	2	16
1965	4	2		4					1	5	2		18
1966	6	2	4	1			1			4	5	6	29
1967	7	5	1		1					9	4	4	31
1968	1	5	1		1	1			1	8	8	5	31
1969	1		2			1		1	2	1	2	3	13
1970	4		2		3			1	1	1	5	2	19
1971	4	4	2	2		3	1		1	2	5		24
1972	5	6	1		1			1				2	16
1973	2	1			2	3	1			7	2	2	20
1974	2	1	4	1					2	2	1	5	18
1975	5	4			1			2	1	3	6	8	30
1976	1	3				2		3		3	7		19
1977		5	1	1			1		1	4	4	5	22
1978		1	2		2					3	2	4	14
1979		6	2	1		2	1		6		1	3	22
1980	4	4		1		1		1	2	3	1	9	26
1981	4	2	1						1	3	7	12	30
1982	3	3		1					1	1		5	14

[1] – Visibility of ¼ mile or less

NUMBER OF DAYS WITH DENSE FOG[1] REPORTED

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1983	3	1											4
1984	3	2		1					1	1	1	1	10
1985		2		3		3	1	1	3		2	6	21
1986	3	3	3							5	1	2	17
1987				1	1				1	3		2	8
1988	1	1		1					3	2	1	1	10
1989		1	2						2	3	3	4	15
1990	2		4		1				2	5	1		15
1991	1	2	1	1					1	3	4	2	15
1992	1	2					1		4	3			11
1993	3		3						5	2			13
1994	6		1					1				3	11
1995	1	3					1			1	8	3	17
1996	2	4			1		3	2		5	4	4	25
1997	1	1	2						2	2			8
1998				1			3	1			3	2	10
1999	4		3	2				1	2	3	7	2	24
2000	3		1							1	3	9	17
2001									4	4	7	2	17
2002	2	2							4	2	1		11
2003	6		2							5		4	17

[1] – Visibility of ¼ mile or less

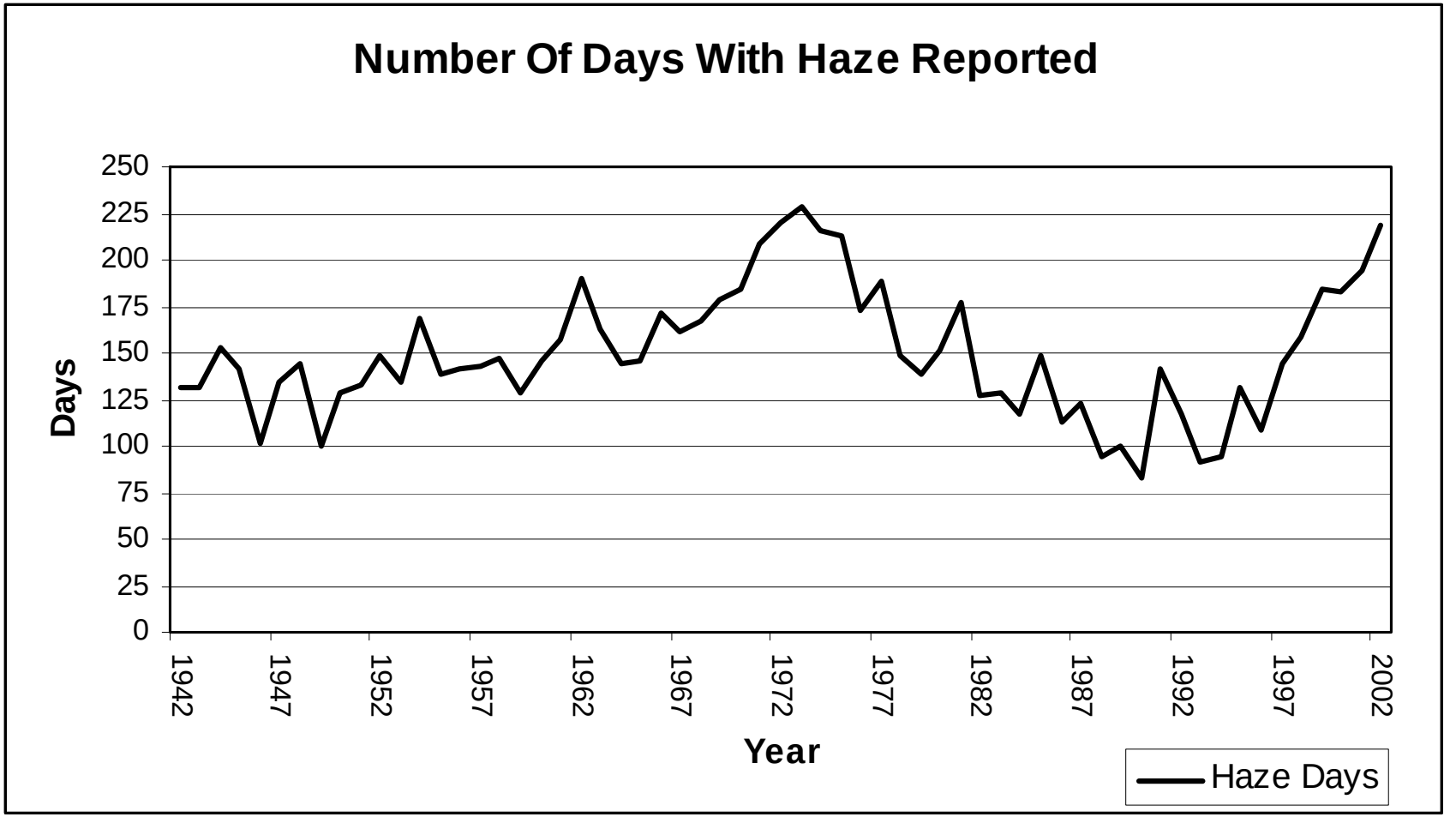

Number Of Days With Dense Fog Reported
Days
60
55
50
45
40
35
30
25
20
15
10
5
0
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
Year
Dense Fog Days

NUMBER OF DAYS WITH HAZE REPORTED

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1942	11	7	5	3	5	9	14	4	16	19	21	18	132
1943	7	0	2	8	14	11	14	6	21	18	19	12	132
1944	11	6	1	2	8	7	18	25	19	26	11	19	153
1945	17	8	11	8	5	11	20	18	13	14	9	8	142
1946	4	4	6	10	6	5	10	13	16	11	7	10	102
1947	8	15	7	3	10	7	22	9	19	19	8	8	135
1948	19	7	3	3	8	8	18	22	18	17	12	9	144
1949	0	6	4	6	2	5	15	13	17	11	12	9	100
1950	7	16	9	5	3	5	11	15	14	17	8	19	129
1951	6	9	5	6	8	10	10	19	27	11	12	10	133
1952	4	4	2	7	15	6	24	21	19	28	10	8	148
1953	16	9	9	5	1	10	14	17	15	12	17	9	134
1954	15	8	11	14	11	11	20	8	22	21	16	11	168
1955	4	9	7	4	6	10	14	14	17	25	13	16	139
1956	19	8	18	7	8	7	12	10	20	13	11	9	142
1957	5	17	11	9	4	13	19	14	14	11	14	12	143
1958	11	8	2	7	14	8	13	13	19	17	15	20	147
1959	18	3	13	12	0	11	16	9	9	18	12	8	129
1960	7	5	18	13	7	21	13	10	15	15	10	12	146
1961	11	11	6	9	1	20	15	19	16	14	15	20	157
1962	12	8	7	14	7	8	22	24	25	21	18	24	190
1963	13	21	7	8	6	9	21	16	16	14	14	18	163
1964	7	5	5	4	15	16	18	17	18	21	7	11	144
1965	11	11	5	13	10	7	22	19	10	19	13	6	146
1966	14	10	20	12	10	16	20	8	12	19	17	14	172
1967	12	13	7	2	13	13	16	25	13	22	17	8	161
1968	7	20	9	10	10	22	13	11	15	20	17	13	167
1969	11	8	11	9	19	11	22	27	23	11	7	19	178
1970	15	10	11	6	15	15	23	21	22	14	18	14	184
1971	21	19	20	8	12	19	30	17	21	12	21	8	208
1972	22	18	25	15	17	22	20	21	22	13	13	12	220
1973	8	18	5	15	22	23	25	29	25	21	12	26	229
1974	13	13	17	15	17	25	16	22	25	16	20	17	216
1975	13	13	12	8	24	24	21	23	25	14	15	21	213
1976	13	11	11	6	13	16	21	14	16	21	14	17	173
1977	11	15	4	18	5	20	27	19	12	24	15	18	188
1978	12	10	7	2	11	12	24	16	8	25	11	11	149
1979	5	10	10	5	7	13	20	11	21	13	14	9	138
1980	4	16	4	9	7	15	20	17	15	16	16	13	152
1981	18	14	8	9	8	20	10	22	18	8	19	23	177
1982	7	11	1	5	9	6	15	23	10	13	13	14	127
1983	4	10	2	3	16	15	19	14	11	15	11	8	128
1984	14	7	10	6	18	8	7	8	12	4	11	12	117
1985	11	11	11	18	7	17	15	15	7	10	10	16	148

NUMBER OF DAYS WITH HAZE REPORTED

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1986	14	6	11	1	12	14	6	13	5	15	5	11	113
1987	6	5	5	9	9	11	8	8	21	21	10	10	123
1988	7	7	5	8	7	7	9	8	3	19	13	2	95
1989	3	6	8	8	8	11	9	2	13	12	9	11	100
1990	5	4	10	6	3	8	7	8	10	17	5	0	83
1991	14	19	1	5	6	10	13	16	18	19	11	9	141
1992	8	5	5	16	8	6	12	16	18	17	3	3	117
1993	6	4	11	6	4	11	3	9	15	10	6	6	91
1994	11	0	9	10	7	16	11	10	9	5	1	6	95
1995	5	9	4	3	4	15	21	14	12	10	21	13	131
1996	8	8	5	4	9	10	8	16	14	16	8	3	109
1997	10	16	14	9	23	10	14	15	12	7	11	4	145
1998	10	2	10	10	2	7	25	28	14	17	21	13	159
1999	14	14	14	7	13	21	16	20	22	7	23	14	185
2000	19	7	11	15	17	16	13	22	16	11	15	21	183
2001	20	3	15	10	17	18	14	21	23	21	18	15	195
2002	21	20	17	13	12	20	18	25	19	15	18	20	218
2003	20	8	14	3	15	12	18	9	22	25	10	11	167


Number Of Days With Haze Reported
Days
250
225
200
175
150
125
100
75
50
25
0
1942
1947
1952
1957
1962
1967
1972
1977
1982
1987
1992
1997
2002
Year
Haze Days

AVERAGE DAILY SURFLINE WATER TEMPERATURE FOR MISSION BEACH

DAY	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	58	57	58	60	62	64	65	68	68	65	63	60
2	57	57	58	60	61	64	65	68	68	65	63	60
3	57	57	58	60	61	64	66	69	68	65	62	60
4	57	57	58	60	61	64	66	69	68	65	62	59
5	57	57	58	60	61	64	66	69	67	65	62	59
6	57	58	58	60	61	64	66	69	67	65	62	59
7	57	58	58	60	61	64	66	69	67	65	62	59
8	57	57	58	60	62	64	66	69	67	65	62	59
9	57	57	58	60	62	64	67	69	67	65	62	59
10	57	57	58	60	62	64	66	68	67	65	62	59
11	57	57	58	60	62	64	67	69	67	65	62	59
12	57	57	59	60	62	64	67	69	67	64	62	59
13	57	58	58	60	62	65	67	69	67	65	62	59
14	57	58	59	60	62	65	67	69	67	64	62	59
15	57	58	59	60	62	65	67	69	66	64	62	59
16	57	58	59	61	62	64	67	69	67	64	61	58
17	57	58	59	61	63	65	67	68	67	64	61	58
18	57	58	59	60	62	65	67	68	67	64	61	58
19	57	58	59	61	63	65	67	69	67	64	61	58
20	57	58	59	61	63	65	67	69	67	64	61	58
21	57	58	59	61	63	65	67	69	66	64	61	58
22	57	58	59	61	63	65	67	69	66	64	60	58
23	57	58	59	61	63	65	67	68	66	64	60	58
24	57	58	59	61	63	65	68	68	66	64	60	58
25	57	58	59	61	63	65	68	68	66	64	60	58
26	57	58	59	61	63	65	68	68	66	64	60	58
27	57	58	59	61	63	65	67	68	66	64	60	58
28	57	58	59	61	64	65	67	68	66	64	60	58
29	57	58	59	61	64	65	68	68	66	63	60	57
30	57		59	61	63	65	68	68	65	63	60	57
31	57		59		64		68	68		63		57
MEAN	57	58	58.6	60.5	62.4	65	67	68.5	67	64.3	61.3	58.5

ABSOLUTE HIGHEST WATER TEMPERATURE: 78 on August 15 and 18, 1971
ABSOLUTE LOWEST WATER TEMPERATURE: 47 on March 4, 1975

MEAN MONTHLY WIND DIRECTION FOR EACH HOUR OF THE DAY

					A.M.												P.M.							
1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	Mean
January																								
NE	NE	NE	NE	NE	NE	NE	NE	E	SE	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NE	NE	NE	NW
February																								
NE	NE	NE	NE	NE	NE	NE	E	NE	S	NW	W	W	W	NW	NW	NW	NW	NW	NW	NW	NW	E	E	NW
March																								
NE	NE	NE	NE	E	NE	NE	E	NW	NW	W	W	W	W	W	W	NW	NW	NW	NW	NW	NW	NW	NW	NW
April																								
NW	NW	NE	NE	E	NE	E	NW	S	W	W	W	W	W	W	W	W	NW	NW	NW	NW	NW	NW	NW	NW
May																								
NW	SW	SW	NW	NW	NW	NW	S	SW	W	W	W	W	W	W	W	W	W	NW	NW	NW	NW	NW	NW	W
June																								
NW	NW	NW	NW	N	N	NW	NW	W	W	W	W	W	W	W	W	W	W	NW	NW	NW	NW	NW	NW	W
July																								
NW	NW	NW	NW	NW	N	NW	NW	W	W	W	W	W	W	W	W	W	W	NW	NW	NW	NW	NW	NW	W
August																								
NW	NW	NW	NW	NW	NW	NW	NW	W	W	W	W	W	W	W	W	W	W	NW	NW	NW	NW	NW	NW	NW
September																								
NW	NW	NW	NW	NW	NW	NW	NW	NW	W	W	W	W	W	W	W	NW	NW	NW	NW	NW	NW	NW	NW	NW
October																								
NW	N	N	NE	NE	NE	NE	NW	NW	NW	W	W	W	W	W	W	NW	NW	NW	NW	NW	NW	NW	NW	NW
November																								
NE	NE	NE	NE	NE	NE	NE	NE	NE	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	N	NE	NE	NW
December																								
NE	NE	NE	NE	NE	NE	NE	NE	E	SE	NW	NW	NW	NW	NW	NW	NW	NW	NW	NW	E	E	NE	NE	NW

MEAN MONTHLY WIND SPEED FOR EACH HOUR OF THE DAY

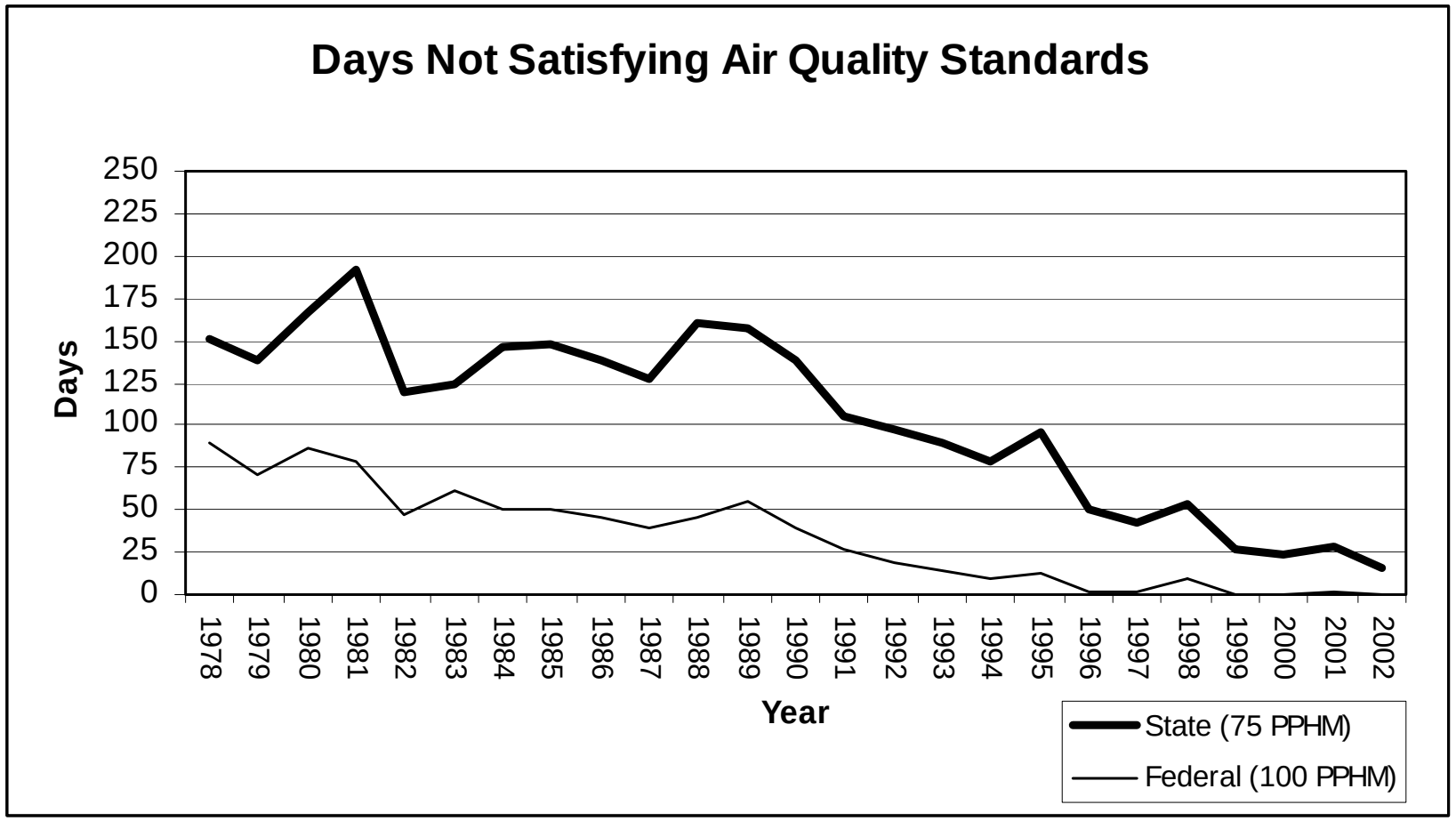
A.M.												P.M.												
1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	Mean
January																								
4.2	4.3	4.4	4.4	4.4	4.4	4.4	4.3	4.1	4.6	5.5	6.7	8.1	8.8	8.9	8.5	7.2	5.3	4.6	4.5	4.1	4.1	4.2	4.2	5.3
February																								
4.5	4.6	4.7	4.5	4.6	4.7	4.7	4.6	4.8	5.6	6.7	8.1	9.4	10.1	10.2	9.7	8.7	7	5.5	4.8	4.6	4.6	4.6	4.5	6.1
March																								
4.5	4.7	4.7	4.7	4.7	4.6	4.5	4.5	5.2	6.4	7.9	9.2	10.3	10.7	10.6	10.2	9.2	7.8	6.1	5.2	4.8	4.6	4.6	4.6	6.4
April																								
4.5	4.6	4.7	4.6	4.5	4.5	4.4	4.9	5.3	7.4	8.9	10.1	10.9	11.1	10.9	10.3	9.4	8.2	6.8	5.5	4.8	4.5	4.6	4.5	6.7
May																								
4.4	4.4	4.4	4.3	4.3	4.3	4.5	5.1	6.2	7.9	9.4	10.3	10.9	11	10.7	10.1	9.2	8.2	7	5.8	5	4.5	4.3	4.3	6.7
June																								
3.9	4.9	4	4.1	4	4.1	4.3	4.9	6.2	7.8	9.2	10.1	10.7	10.6	10.3	9.7	9	8	6.9	5.8	4.8	4.2	3.9	3.9	6.5
July																								
3.4	3.4	3.5	3.6	3.6	3.6	3.8	4.5	6	7.7	9.2	10	10.5	10.5	10.2	9.6	8.9	8	6.8	5.8	4.7	4	3.6	3.5	6.2
August																								
3.4	3.4	3.5	3.5	3.4	3.5	3.8	4.2	5.7	7.5	9.1	10.1	10.6	10.6	10.3	9.6	8.8	7.8	6.6	5.5	4.4	3.9	3.5	3.4	6.1
September																								
3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	5.1	7	9	10.2	11	11	10.6	9.8	8.9	7.6	6.1	4.9	4.1	3.8	3.6	3.6	6
October																								
3.5	3.6	3.6	3.6	3.7	3.6	3.7	3.7	4.4	6	7.3	9.3	10.3	10.4	10	9.2	7.9	6.2	4.7	4	3.8	3.6	3.7	3.6	5.6
November																								
3.7	3.7	3.7	3.7	3.7	3.8	3.9	3.6	3.8	4.7	6.2	7.9	9.3	9.6	9.5	8.8	7.1	5.1	4.1	3.8	3.7	3.6	3.6	3.6	5.2
December																								
4.2	4.3	4.3	4.2	4.3	4.2	4.2	4.1	3.9	4.5	5.5	6.8	8.1	8.8	8.8	8.2	6.7	5.1	4.4	4.3	4.2	4.1	4.1	4.2	5.3

PEAK WIND GUSTS IN MILES PER HOUR

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1970	20 NW	42 S	28 S	30 NW	24 NW	24 S	22 NW	18 NW	26 NE	23 NW	35 SE	27 SW	42 S
1971	38 W	26 W	30 W	30 NW	24 SW	22 NW	21 NW	22 NW	22 W	28 W	25 SE	34 SE	38 W
1972	22 W	23 S	21 SW	28 NW	24 SW	26 NE	26 S	24 SE	23 SE	29 N	41 W	30 W	41 W
1973	28 W	33 S	34 W	30 NE	21 S	21 S	20 W	23 SE	20 NW	22 SW	28 W	21 S	34 W
1974	34 S	23 NE	36 SW	26 W	26 W	21 NW	20 W	19 SE	18 W	30 W	23 W	26 W	36 SW
1975	24 W	23 NE	29 SE	32 SE	23 SW	21 NW	23 S	18 NW	18 NW	21 W	37 W	22 W	37 W
1976	26 S	32 SE	34 NW	37 W	20 SW	20 NW	21 NW	23 NW	28 S	23 SE	26 W	25 SW	37 W
1977	28 NE	22 NW	31 NW	20 NW	34 S	22 NW	20 NW	29 S	22 NW	22 NW	22 NW	32 E	34 S
1978	33 S	44 SE	46 S	20 NW	24 NW	32 W	20 NW	19 NW	38 S	27 S	30 S	34 NW	46 S
1979	34 NW	29 NW	30 SE	23 W	25 W	22 SW	21 NW	20 NW	21 NW	30 NW	22 SE	24 NW	34 NW
1980	44 S	45 S	33 W	29 N	24 NW	22 NW	21 W	23 SW	22 W	29 W	20 NW	20 SE	45 S
1981	30 SE	24 NW	29 W	28 W	23 SW	23 NW	23 SW	23 NW	35 NW	23 NW	22 S	24 NW	30 SE
1982	36 W	32 S	45 SW	34 SW	24 NW	22 NW	20 NW	22 NW	22 S	21 NW	42 NW	38 SW	45 SW
1983	35 SW	30 SE	38 S	30 SE	22 W	20 W	20 NW	22 SW	30 S	25 NE	32 NW	28 W	38 S
1984	38 N	30 N	32 W	32 NW	22 NW	26 SW	23 NW	22 NW	25 S	23 NW	31 SW	40 NW	40 NW
1985	29 S	32 W	41 NW	23 NW	28 NW	24 NW	30 SW	24 NW	25 NW	22 W	37 SW	37 N	41 NW
1986	32 S	35 SE	37 S	28 W	28 SW	21 W	21 W	21 NW	28 SE	25 W	35 SE	26 W	37 S
1987	35 SW	37 W	40 SW	29 SW	30 SW	25 W	26 W	24 SW	25 W	32 SE	30 NE	38 NW	40 SW
1988	64 W	36 NE	26 NW	40 SW	40 NW	28 NW	21 NW	22 NW	31 NE	25 S	35 W	35 NE	64 W
1989	35 N	25 NW	35 S	24 NW	31 SW	23 NW	24 S	23 NW	31 NW	29 NW	28 SW	23 NE	35 S
1990	31 W	36 NW	30 NW	30 SW	31 S	24 NW	23 NW	26 N	23 NW	24 NW	36 NW	37 NW	37 NW
1991	29 NW	38 SW	43 SW	25 NW	30 SW	24 NW	23 NW	29 SW	25 NW	32 NW	35 N	44 NW	44 NW
1992	35 S	37 SE	38 S	26 N	23 NW	23 NW	24 NW	23 SW	21 NW	28 NE	23 SE	32 NW	38 S
1993	43 NW	46 SW	33 SW	22 NW	23 NW	23 SW	20 NW	20 W	23 NW	21 NE	28 NW	39 NE	46 SW
1994	29 NW	40 S	35 S	31 W	24 NW	21 SW	22 NW	25 SW	35 W	31 SE	30 NW	24 NW	40 S
1995	52 S	32 S	44 S	35 NW	26 NW	22 SW	24 S	22 NW	21 NW	20 NW	21 NW	26 S	52 S
1996	33 NW	36 W	29 S	25 NW	25 S	35 W	25 NW	23 W	22 W	32 W	25 SW	32 E	36 W
1997	33 SE	33 NW	23 NW	29 E	20 W	25 W	23 W	23 NW	24 NW	28 NW	31 W	43 NE	43 NE
1998	28 S	45 S	38 S	36 S	32 S	23 W	22 W	23 SE	22 W	23 NW	34 S	34 W	45 S
1999	24 S	28 W	36 SW	37 SW	28 W	23 W	22 W	21 W	22 W	21 W	21 W	32 NE	37 SW
2000	25 W	36 SE	45 SW	32 SE	26 NW	25 SW	22 W	23 W	21 W	24 SE	29 W	31 W	45 SW
2001	37 SE	46 SE	32 SW	33 NW	22 W	22 W	22 W	21 W	23 SE	25 NW	28 S	26 W	46 SE
2002	23 W	22 SW	33 W	24 W	26 W	22 W	22 W	25 NW	22 W	21 NW	37 E	33 S	37 E
2003	38 E	32 S	36 S	32 S	30 S	24 SW	22 W	21 NW	25 NW	24 W	23 NW	37 W	38 E

THE NUMBER OF DAYS NOT SATISFYING THE AIR QUALITY STANDARDS IN PARTS OF OZONE PER HUNDRED MILLION PARTS OF AIR (PPHM)

YEAR	STATE (75 PPHM)	FEDERAL (100 PPHM)
1978	151	90
1979	138	70
1980	167	87
1981	192	78
1982	120	47
1983	125	61
1984	146	51
1985	148	50
1986	138	46
1987	127	40
1988	160	45
1989	158	55
1990	139	39
1991	106	27
1992	97	19
1993	90	14
1994	79	9
1995	96	12
1996	51	2
1997	43	1
1998	54	9
1999	27	0
2000	24	0
2001	29	2
2002	15	0


Days Not Satisfying Air Quality Standards
250
225
200
175
150
125
100
75
50
25
0
Days
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
Year
State (75 PPHM)
Federal (100 PPHM)

SAN DIEGO CONSOLIDATED GAS & ELECTRIC COMPANY
SAN DIEGO, CALIFORNIA
BYLLESBY ENGINEERING AND MANAGEMENT CORPORATION

SAN PASQUAL 11 K.V. TIE LINE

SCALE 1" 200'

DRAWN BY J. A. CROSIER
TRACED BY LINDERFELT

A-3432

1 Mar 20, 28 Construction line completed 5/31

RECEIVED
San Diego Gas & Electric Co.
MAY 8 1980
MICROFILMED

M

HV-1
N 1878824.88
E 8343043.88
EL= 551.69

HV-4
N 1878638.78
E 8344082.88
EL= 427.26
#254

HV-6
N 1878804.38
E 8344818.08
EL= 427.47
#253

EL=443.49
HV-3
N 1879081.21
E 8343870.19
#255

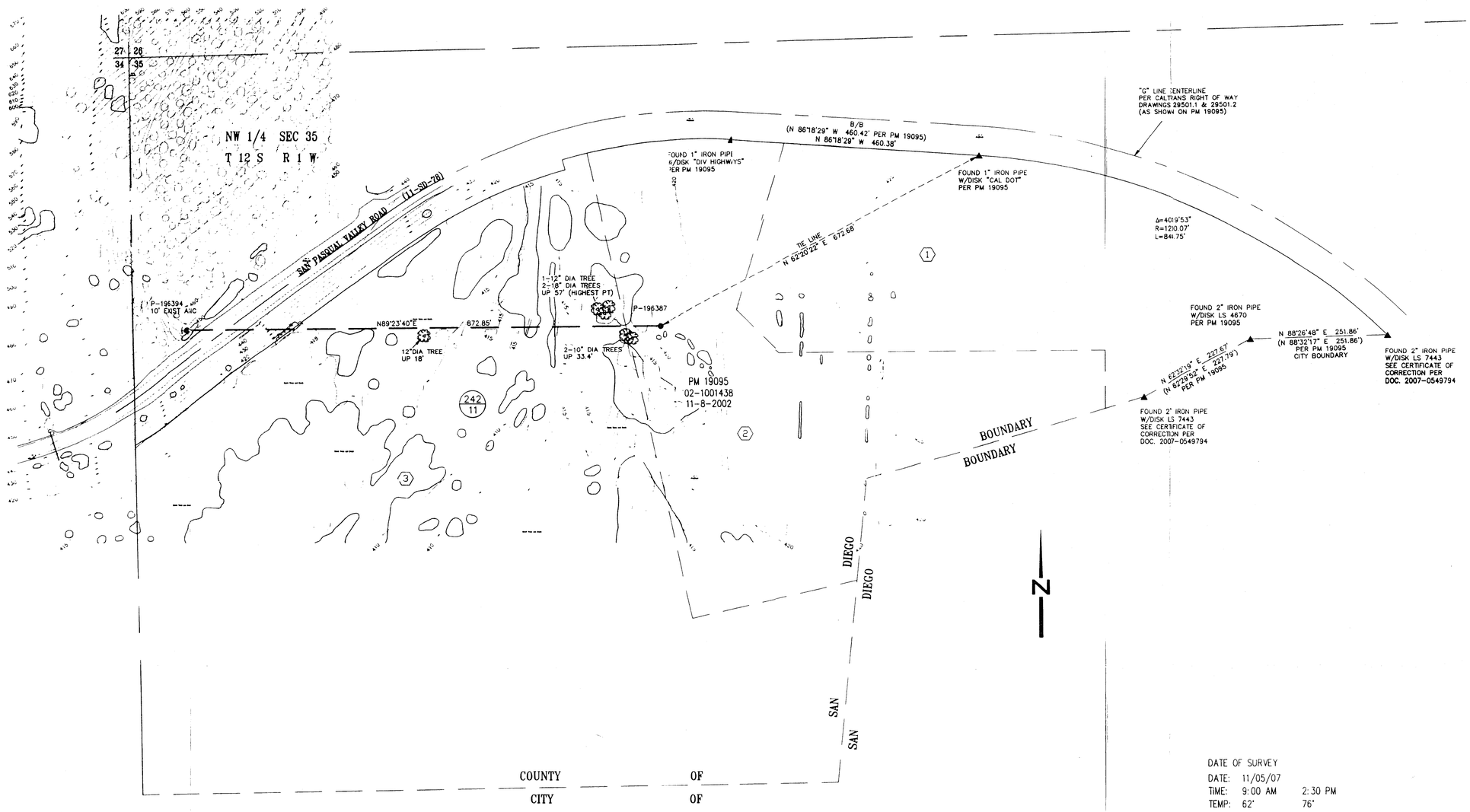
HV-2
EL 445.04
N 1878828.74
E 8343870.46
#256

HV-5
EL= 420.46
N 1878778.34
E 8344087.87
SR 250

AT LEAST 3 PTS

GUESITO FIRE

NOLTE SDGE TB 36X22



DATE OF SURVEY
DATE: 11/05/07
TIME: 9:00 AM 2:30 PM
TEMP: 62° 76°

TOPOGRAPHY PREPARED BY PROJECT DESIGN CONSULTANTS
PHOTOGRAMMETRY DEPARTMENT. DATE OF PHOTOGRAPHY: 12/04/07

BASIS OF BEARINGS/COORDINATES: CCS NAD'83 BASED ON NGS PUBLISHED COORDINATES OF 1ST ORDER PT. ROCKWOOD (EPOCH 1991.35) (N1978223.75,E6342997.35) AND TRANSLATED USING NGS HTDP TO AN ADJUSTED VALUE (ON 11-27-0') OF N1978225.504, E6342995.980. A CHECK TO SD GPS 3: (2007 EPOCH) YIELDED A 0.15' HORIZONTAL ERROR.

BENCHMARK: PT ROCKWOOD WITH A NGVD'29 COUNTY PUBLISHED ELEVATION (1ST ORDER) OF 438.30'. USING CORPSCON (VERTCON), A NAVD'88 VALUE OF 440.43' WAS OBTAINED AND HELD.

THIS PLAT WAS PREPARED BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE LAND SURVEYOR'S ACT ON NOVEMBER 9, 2007.

Paul G Robotta 2/15/08

PAUL G. ROBOTTA LS 5334

LICENSED LAND SURVEYOR PAUL G ROBOTTA No. 5334 EXP. 12-31-09 STATE OF CALIFORNIA

REF: R OF S 14300
R OF S 10225
PM 19095

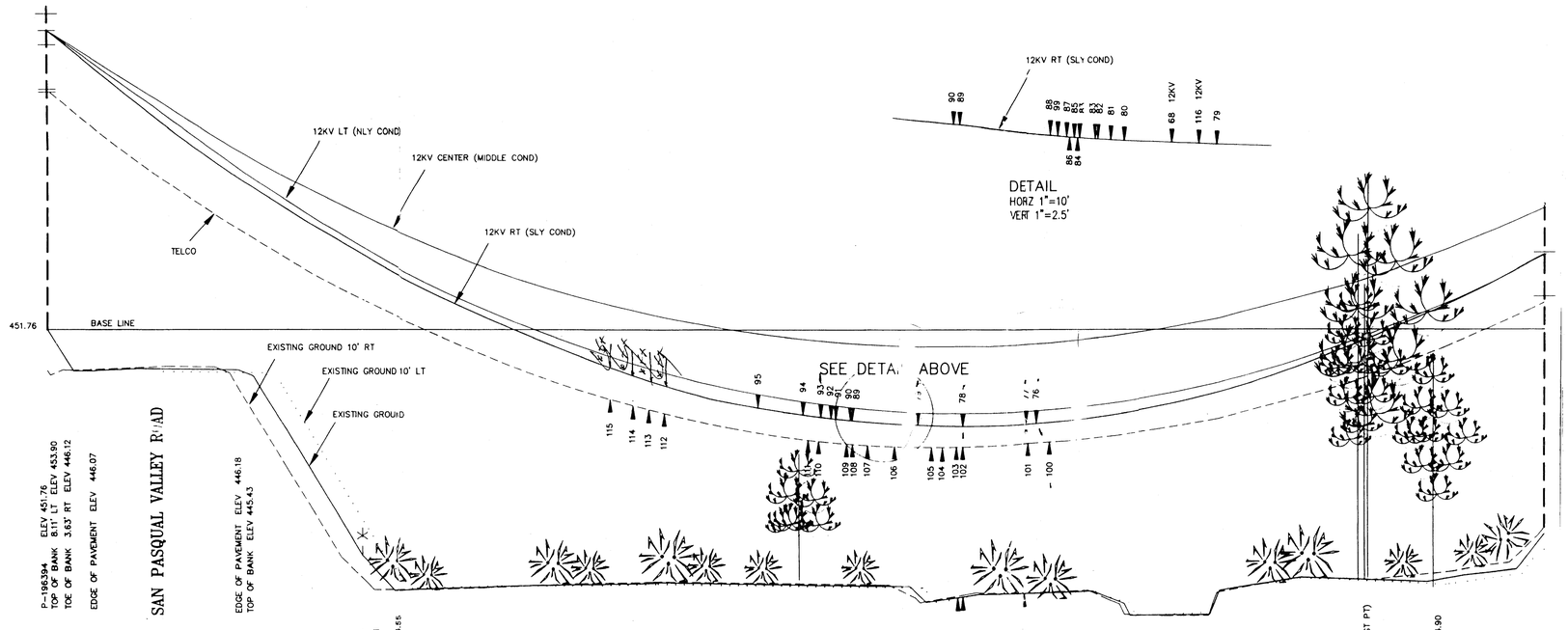
SHEET 1 OF 2 SHEETS

SAN DIEGO GAS & ELECTRIC SAN DIEGO, CALIFORNIA	ORIGINATOR: D.LEBRECHT	OK TO INSTALL:	PROJECT NO.
	SURVEYED BY: NOLTE/SWH	R/W OK:	
GUEJITO FIRE SAN PASQUAL VALLEY ROAD SAN PASQUAL	DRAWN BY: NOLTE/LAP	DATE:	CONST. NO.
	DATE: 11-09-07	THOS. BROS. 1131-E6	DRAWING NO.
	SCALE: 1"=100'		

NO.	SUPPLEMENTS	DATE:	BY	APP'D
1	CHANGED DRAWING NAME	12/10/07	PGR	
2	REVISED DRAWING LOCATION TO PDC TOPO	02/13/08	LAP	

NOLTE: N:\SDGE\R071140\S070666\CADD\ACCIDENT_adjusted.DWG
POINTS FILE: N:\SDGE\R071140\S070666\SURVEY\FIELD DATA\BANDYSMH1102.CSV

NOLTE SDGE 19 36X22



REV 3

NUMBERS INDICATE FIELD SURVEY POINT NUMBER

SLY CONDUCTOR (WEST TO EAST)	ELEV	TELCO (WEST TO EAST)	ELEV	VERT DIST TO SLY CONDUCTOR
95 SPLICE IN COND	440.9	115 LASHING BREAK WEST END	422.0	1
94 NICK IN COND	439.8	114 LASHING BREAK EAST END	441.1	1
93 NICK IN COND	439.4	113 LASHING BREAK WEST END	440.5	1
92 PIECE OF LASHING	439.2	112 LASHING BREAK EAST END	439.9	1
91 NICK IN COND	439.2	111 LASHING BREAK WEST END	436.1	
90 NICK IN COND	439.0	110 LASHING BREAK EAST END	436.0	
89 NICK IN COND	438.9	109 LASHING BREAK WEST END	435.6	
88 NICK IN COND	438.6	108 LASHING BREAK EAST END	435.5	
99 12KV DAMAGE LOCATION	415.5	107 LASHING BREAK WEST END	435.3	
87 NICK IN COND	438.6	106 LASHING BREAK EAST END	435.0	
86 NICK IN COND	438.6	105 LASHING BREAK WEST END	434.9	
85 NICK IN COND	438.5	104 LASHING BREAK EAST END	434.8	
84 NICK IN COND	438.5	103 LASHING BREAK WEST END	434.8	
83 PIECE OF LASHING	438.5	102 LASHING BREAK EAST END	434.8	
82 NICK IN COND	438.5	101 LASHING BREAK WEST END	434.9	
81 NICK IN COND	438.4	100 LASHING BREAK EAST END	435.2	
80 NICK IN COND	438.4			
79 NICK IN COND	438.3			
78 PIECE OF LASHING	438.1			
77 NICK IN COND	438.4			
76 PIECE OF LASHING	438.5			

VERTICAL DISTANCE FROM

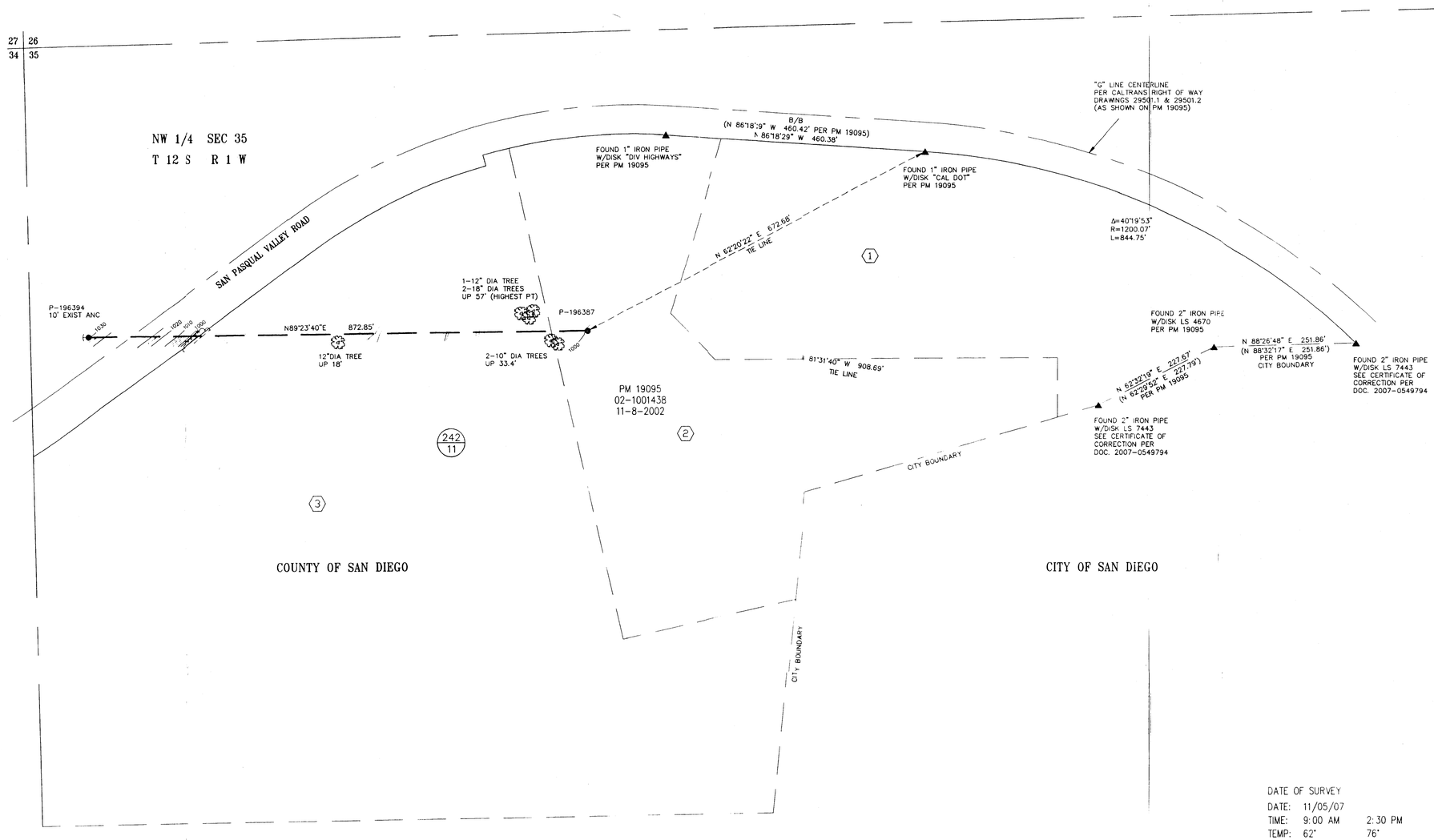
G VALTIERRO

SHEET 2 OF 2 SHEETS

SAN DIEGO GAS & ELECTRIC SAN DIEGO, CALIFORNIA	ORIGINATOR: D.LEBRECHT	OK TO INSTALL:	PROJECT NO.
	SURVEYED BY: NOLTE/SWH	R/W OK:	
GUEJITO FIRE SAN PASQUAL VALLEY ROAD SAN PASQUAL	DRAWN BY: NOLTE/LAP	DATE:	CONST. NO.
	DATE: 11-09-07	THOS. BROS. 1131-E6	DRAWING NO.
	SCALE: 1"=40'		

NO.	SUPPLEMENTS	DATE:	BY	APP'D
1	CHANGED DRAWING NAME	12/10/07	PGR	
2	REVISED DRAWING LOCATION TO PDC TOPO	02/13/08	LAP	

NOLTE: N:\SDGE\R071140\S070666\CADD\ACCIDENT_adjusted.DWG
POINTS FILE: N:\SDGE\R071140\S070666\SURVEY\FIELD DATA\BANDYSWH1102.CSV



DATE OF SURVEY
DATE: 11/05/07
TIME: 9:00 AM 2:30 PM
TEMP: 62° 76°

REF: R OF S 14300

SHEET 1 OF 2 SHEETS

THIS PLAT WAS PREPARED BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE LAND SURVEYOR'S ACT ON NOVEMBER 9, 2007.

Paul G. Robotta 12/10/07

PAUL G. ROBOTTA LS 5334

LICENSED LAND SURVEYOR PAUL G. ROBOTTA No. 5334 EXP. 12-31-07 STATE OF CALIFORNIA

SAN DIEGO GAS & ELECTRIC SAN DIEGO, CALIFORNIA	ORIGINATOR: D.LEBRECHT	OK TO INSTALL:	PROJECT NO.
	SURVEYED BY: NOLTE/SWH	R/W OK:	
GUEJITO FIRE SAN PASQUAL VALLEY ROAD SAN PASQUAL	DRAWN BY: NOLTE/LAP	DATE:	CONST. NO.
	DATE: 11-09-07	THOS. BROS. 1131-E6	DRAWING NO.
	SCALE: 1"=100'		

NO.	SUPPLEMENTS	DATE:	BY	APP'D
	Changed Drawing Name	12/10/07	PGR	

NOLTE: N:\SDGE\R07140\S070666\CADD\ACCIDENT.DWG
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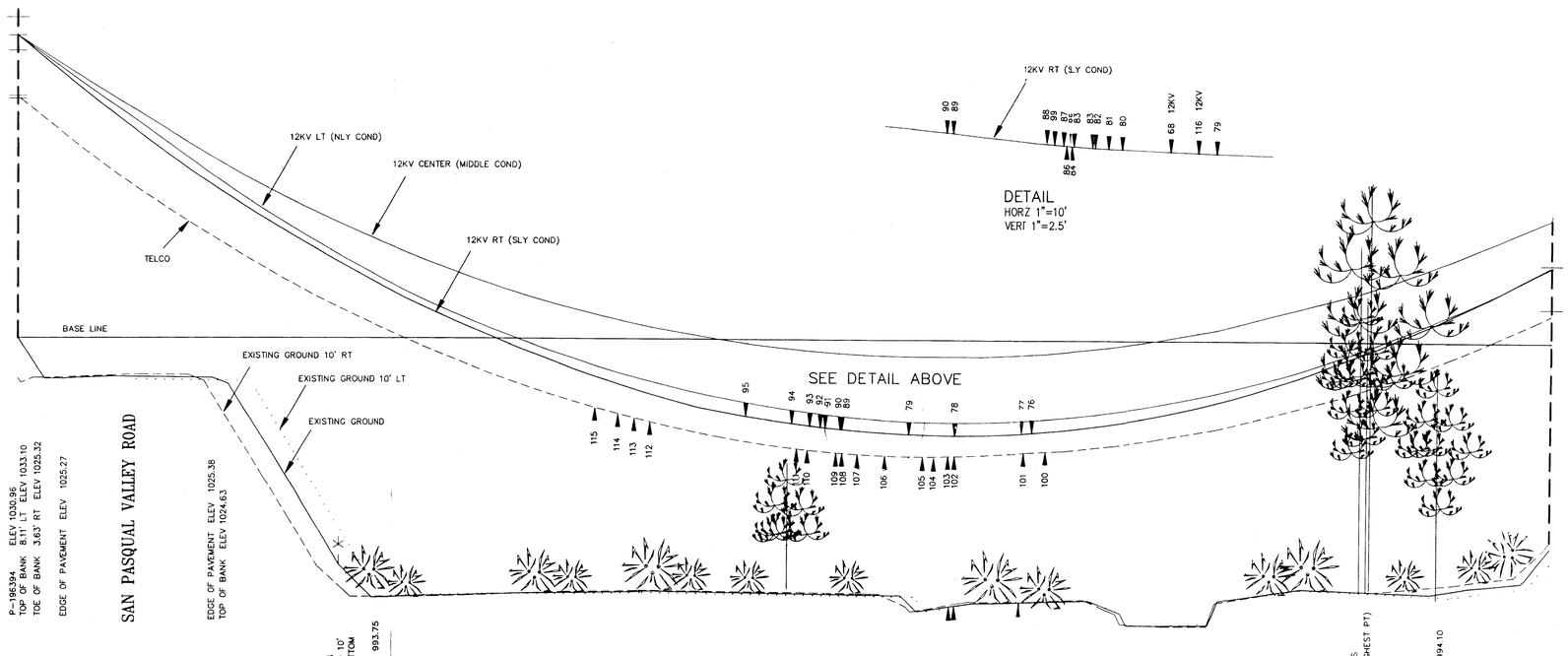


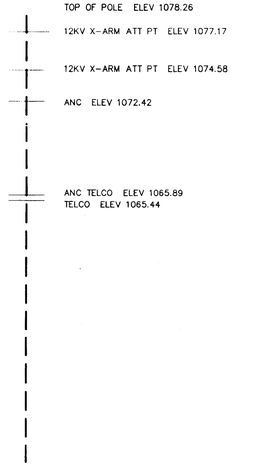
DETAIL
HORZ 1"=10'
VERT 1"=2.5'

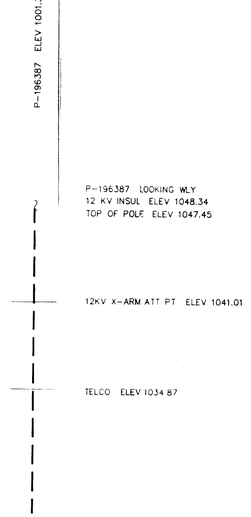
PROFILE SCALE
HORIZ 1"=40'
VERT 1"=10'

NUMBERS INDICATE FIELD SURVEY POINT NUMBER

SLY CONDUCTOR (WEST TO EAST)	ELEV
95 SPLICE IN COND	1020.1
94 NICK IN COND	1019.0
93 NICK IN COND	1018.6
92 PIECE OF LASHING	1018.4
91 NICK IN COND	1018.4
90 NICK IN COND	1018.2
89 NICK IN COND	1018.1
88 NICK IN COND	1017.8
99 12KV DAMAGE LOCATION	994.7
87 NICK IN COND	1017.8
86 NICK IN COND	1017.8
85 NICK IN COND	1017.7
84 NICK IN COND	1017.7
83 PIECE OF LASHING	1017.7
82 NICK IN COND	1017.7
81 NICK IN COND	1017.6
80 NICK IN COND	1017.6
79 NICK IN COND	1017.5
78 PIECE OF LASHING	1017.3
77 NICK IN COND	1017.6
76 PIECE OF LASHING	1017.7

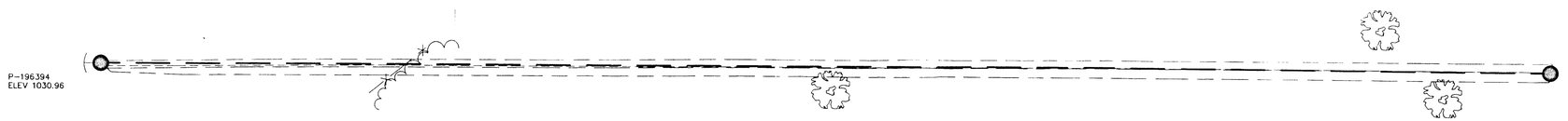
TELCO (WEST TO EAST)	ELEV
115 LASHING BREAK WEST END	1021.2
114 LASHING BREAK EAST END	1020.3
113 LASHING BREAK WEST END	1019.7
112 LASHING BREAK EAST END	1019.1
111 LASHING BREAK WEST END	1015.3
110 LASHING BREAK EAST END	1015.2
109 LASHING BREAK WEST END	1014.8
108 LASHING BREAK EAST END	1014.7
107 LASHING BREAK WEST END	1014.5
106 LASHING BREAK EAST END	1014.2
105 LASHING BREAK WEST END	1014.1
104 LASHING BREAK EAST END	1014.0
103 LASHING BREAK WEST END	1014.0
102 LASHING BREAK EAST END	1014.0
101 LASHING BREAK WEST END	1014.1
100 LASHING BREAK EAST END	1014.4





DETAIL
NO SCALE

PLAN VIEW
HORIZ 1"=40'



SHEET 2 OF 2 SHEETS

SAN DIEGO GAS & ELECTRIC SAN DIEGO, CALIFORNIA	ORIGINATOR: D.LEBRECHT	OK TO INSTALL:	PROJECT NO.
	SURVEYED BY: NOLTE/SWH	R/W OK:	
GUEJITO FIRE SAN PASQUAL VALLEY ROAD SAN PASQUAL	DRAWN BY: NOLTE/LAP	DATE: MM-DD-YY	CONST. NO.
	DATE: 11-09-07	THOS. BROS. 1131-E6	DRAWING NO.
	SCALE: 1"=40'		

NO.	SUPPLEMENTS	DATE:	BY	APP'D
	Changed Drawing Name	12/10/07	PGR	

NOLTE: N:\SDGE\R071140\S070666\CADD\ACCIDENT.DWG
POINTS FILE: N:\SDGE\R071140\S070666\SURVEY\FIELD DATA\BANDYSWH1102.CSV

08

242-10

1" = 800'

CHANGES			
BLK	OLD	NEW	CUT
3		74	9231
	8.2	77	2442
7	10	87	4609
2.8	10		

11-3-71 4 LOTS

DETAIL "A"
SCALE: 1" = 400'

SEC 27 T.12S.R.1W.

SAN PASQUAL VALLEY RD.
HWY. 18

10 760-170-19
1261.93AC
-48 POR.
-50 POR.
-18 POR.
-61 POR.
-77 POR.
-78 POR.
-32

SAN PASQUAL UNION SCHOOL

SEE DETAIL "A"

9 0.95 AC SAN PASQUAL BATTLE MONUMENT

5 1.00 AC

OLD SAN PASQUAL RD.

SANTA ISABEL CREEK

SEC 33 SEC 34 SEC 35 T.12S.R.1W.

BANDY CANYON RD

CITY OF SAN DIEGO

SEC. 3 T.13S.R.1W.

SHT 1

A	S61°31'E	111.50
B	S22°54'W	164.70
C	S68°36'W	209.33
D	N47°46'W	108
E	N0°48'W	76.75
F	N89°11'45"E	243.60
G	N0°48'W	128.30
H	N61°30'W	74.50
I	N80°10'W	190
J	S0°51'E	200

J.R.W. 7-29-70

SEC 33 - T12S-R1W
SEC 34 - T12S-R1W
ROS 6557 6690 7069 8194 8205

08 09/12/2007 RG SCC CANC

CHANGES	BLK	OLD	NEW	YR	CUT
	110	5	DES Count	67	3564
		2	74		2528
		8	MHP	74	3380
		7	PE HWY DP	91	1968
		6	SAME & HWY OP	92	4044
		8	SAME & PARCEL MOBILE HOME	97	4097
		9	10–12	03	1783
		6	SAME & HWY OP	04	4703
		11&12	13&14	08	1139

PARCEL NO.
1* 772-421-10-01 97 4097
2* OPEN SPACE

THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY. NO LIABILITY IS ASSUMED FOR THE ACCURACY OF THE DATA SHOWN. ASSESSOR'S PARCELS MAY NOT COMPLY WITH LOCAL SUBDIVISION OR BUILDING ORDINANCES.

242–11

1"=200'

242-11

AG PR (C)=AGRICULTURAL PERSERVE (CONTRACT)

27 26
34 35

AG PR (C) 1 7.60 AC

N. 88°05'55"E. 2666.53

N 1/4 COR

RTE. 15 629.34 N 86°50'02"W 1138.19 DIV. I

SAN PASQUAL VALLEY RD

ACCESS NO

PAR 1 10 8.00 AC

PAR 2 13 8.00 AC

110

6 18.41 AC
1* MOBILE HOME

OPEN SPACE

PAR 3 14 23.46 AC

2 2.34 AC

3

4

5 1.09 AC

SAN PASQUAL CEMETERY

SAN DIEGO

HWY OP R/W 26064

XI-SD-197A-B

CITY

YSABEL CREEK

APPR. ℄ SANTA

BANDY CANYON RD

PM19095

BDY.

N. 88°32'44"E.
S 88°35'34"W (ROS)

1362.80

1287.57 (ROS)
1285.82

13 SHT 1

13 SHT 2

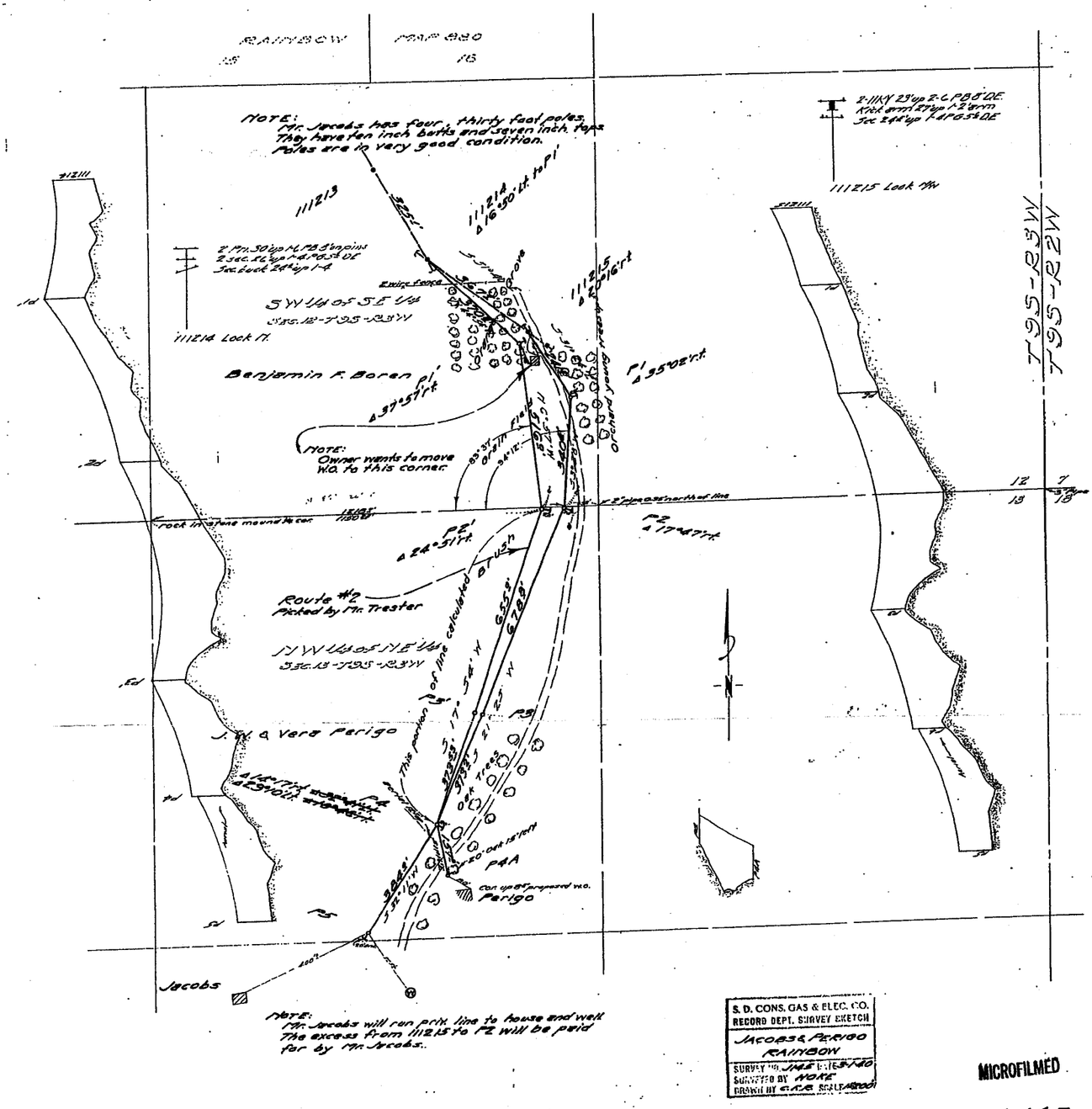
10

7

J.R.W. 7-29-70

SAN DIEGO COUNTY
ASSESSOR'S MAP
BOOK 242 PAGE 11

SEC 35–T12S–R1W–POR NW 1/4
MAP 1377–SAN PASQUAL CEMETERY
ROS 4082, 10225, 14300

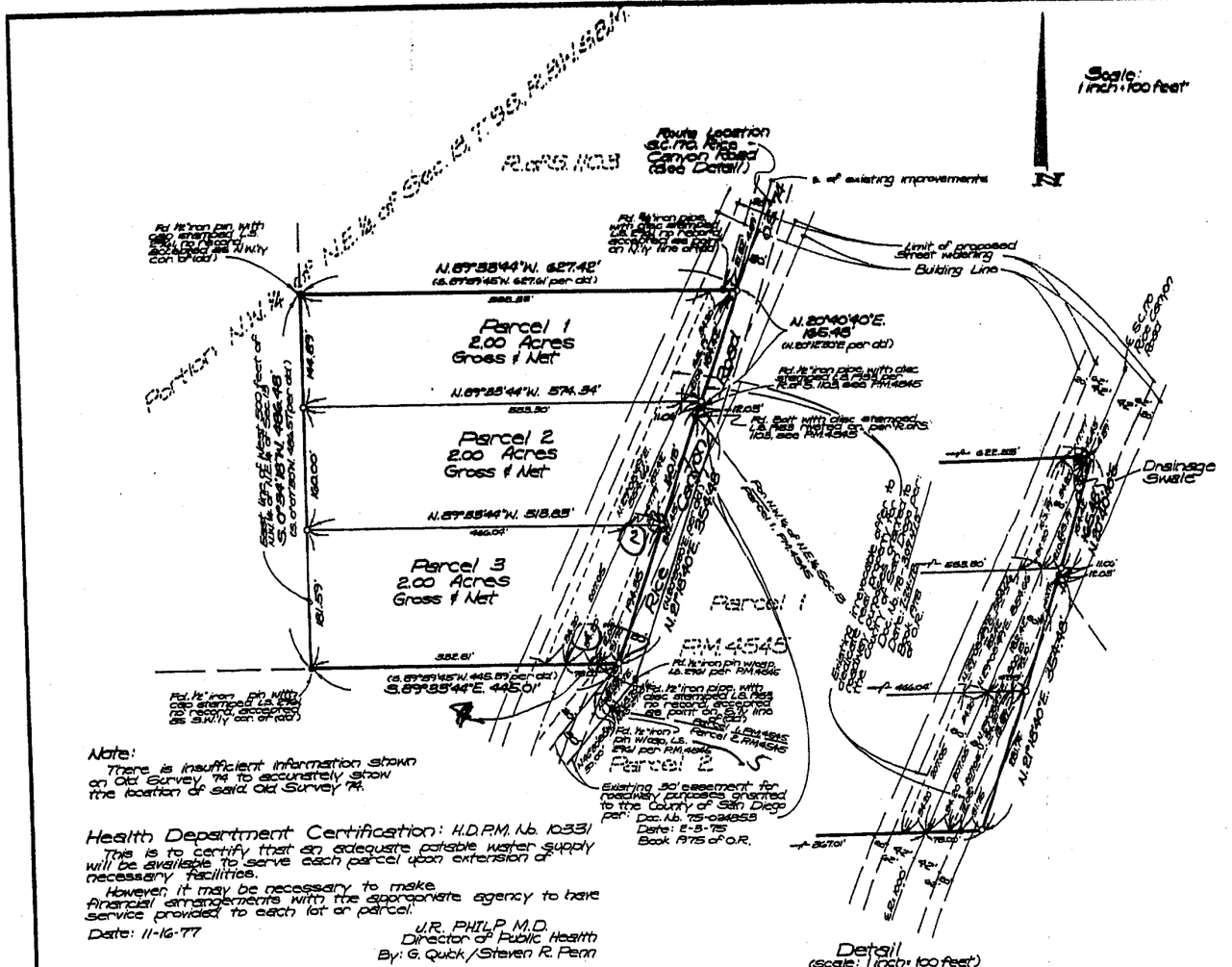

RAINBOW
MAP 620
16
NOTE:
Mr. Jacobs has four thirty foot poles.
They have ten inch butts and seven inch tops
Poles are in very good condition.
111213
111214
Δ 16°30' Rt. Mpl
111214 Look Pt.
111215 Look Pt.
Benjamin F. Boren pl
Δ 37°57' Rt
Δ 35°02' Rt
Note:
Owner wants to move
W.O. to this corner
Route #2
Picked by Mr. Trester
J. M. & Vera Perigo
Perigo
Jacobs
Note:
Mr. Jacobs will run prin. line to house and well
The excess from 111215 to P2 will be paid
for by Mr. Jacobs.
T95-R23W
S. D. CONS. GAS & ELEC. CO.
RECORD DEPT. SURVEY SKETCH
JACOBS & PERIGO
RAINBOW
SURVEYED BY MOAT
MICROFILMED
L-145

1231

TM14201

PARCEL MAP NO. 7669

SHEET 1 OF 2 SHEETS



Scale: 1 inch = 100 feet

N

PARCEL MAP:

Portion of the N.W.¼ of N.E.¼ of Sec 13, T.9S, R.3W, S.B.M, San Diego County, California.

LEGEND:

(dd) Indicates vesting deed, i.e. instrument recorded Aug 31,1977 as File No. 77-341936 Book 1977 of O.R.

• Found points as noted

o Set ¾" x 18" iron pipe with disc stamped L.S. 2821

Drainage Swale

Parcel Map Guarantee issued by First American Title Insurance Company, Order No. 771756-11 on 3-21-78

BASIS OF BEARINGS:

The Basis of Bearings for this survey is the N'ly line of the N.E.¼ of Sec. 13, T.9S., R.3W., S.B.M. per P.M. 4545, i.e. N.89°55'44"E. Said bearing and the bearings shown hereon are in terms of the California Coordinate System, Zone 6. Quoted bearings may or may not be in terms of said Index.

I, R. J. MASSMAN, COUNTY ENGINEER OF SAN DIEGO COUNTY, STATE THAT THIS PARCEL MAP DOES NOT APPEAR TO BE A MAP OF A MAJOR SUBDIVISION FOR WHICH A FINAL MAP IS REQUIRED PURSUANT TO SECTION 66426 OF THE SUBDIVISION MAP ACT. I FURTHER CERTIFY THAT THIS PARCEL MAP CONFORMS TO THE TENTATIVE PARCEL MAP AND APPROVED ALTERATIONS THEREOF AND THAT ALL PROVISIONS OF DIVISION 1 OF TITLE 8 OF THE SAN DIEGO COUNTY CODE HAVE BEEN COMPLIED WITH.

R. J. MASSMAN
COUNTY ENGINEER

DATED 8-3-78 BY: A. H. Kerr
FOR COUNTY ENGINEER

THIS MAP CONFORMS WITH THE REQUIREMENTS OF THE SUBDIVISION MAP ACT AND DIVISION 1 OF TITLE 8 OF THE SAN DIEGO COUNTY CODE.

R. J. MASSMAN
COUNTY ENGINEER

DATED 8-3-78 BY: A. H. Kerr
FOR COUNTY ENGINEER

THIS MAP WAS PREPARED BY ME OR UNDER MY DIRECTION AND IS BASED UPON A FIELD SURVEY IN CONFORMANCE WITH THE REQUIREMENTS OF THE SUBDIVISION MAP ACT AT THE REQUEST OF Earl R. Taylor and Lynn E. Taylor, Leonard Bedolis and Carol Bedolis on 3-18-78, I HEREBY STATE THAT THE PARCEL MAP PROCEDURES OF THE LOCAL AGENCY HAVE BEEN COMPLIED WITH AND THAT THIS PARCEL MAP CONFORMS TO THE APPROVED TENTATIVE MAP AND THE CONDITIONS OF APPROVAL THEREOF WHICH WERE REQUIRED TO BE FULFILLED PRIOR TO THE FILING OF THE PARCEL MAP.

SIDNEY R. HALE LIC. No 2821 CALIFORNIA REGISTERED LAND SURVEYOR

Sidney R. Hale
Sidney R. Hale, L.S. 2821
March 28, 1978
Date

FILE NO. 78-129210
FILED THIS 3 DAY OF August 19 78 AT 3:36 P.M.
IN BOOK OF PARCEL MAPS AT PAGE 7669
AT THE REQUEST OF Sidney R. Hale

HARLEY F. BLOOM
COUNTY RECORDER

BY: Nancy Mahlaus
DEPUTY COUNTY RECORDER

FEE: $7.50

Note:
There is insufficient information shown on Old Survey 714 to accurately show the location of said Old Survey 714.

Health Department Certification: H.D.P.M. No. 10331
This is to certify that an adequate potable water supply will be available to serve each parcel upon extension of necessary facilities.
However, it may be necessary to make financial arrangements with the appropriate agency to have service provided to each lot or parcel.
Date: 11-16-77
J.R. PHILP, M.D.
Director of Public Health
By: G. Quick / Steven R. Penn

Each parcel is approved for a standard septic tank connected to * feet of tile drain field to serve a three bedroom dwelling. Provided the original soil is not disturbed in any way, such as cutting, filling or ripping. This does not constitute approval for commercial establishments.

* See percolation tests under the name "Earl Taylor" (11-3-77)
Percolation Data Supplied By Brian Donald R.C.E. 22175

Parcel 1 = 460 feet
Parcel 2 = 450 feet
Parcel 3 = 440 feet
} 100% Reserve

Steven R. Penn
11-16-77

Note:
Access to subject property is by Rice Canyon Road, which is a publicly maintained road. Only portions of Rice Canyon Road are known to have easements of record dedicated to the public for roadway purposes. Where right of way widths are not specified by existing easements, right of way width of 40 feet is assumed.

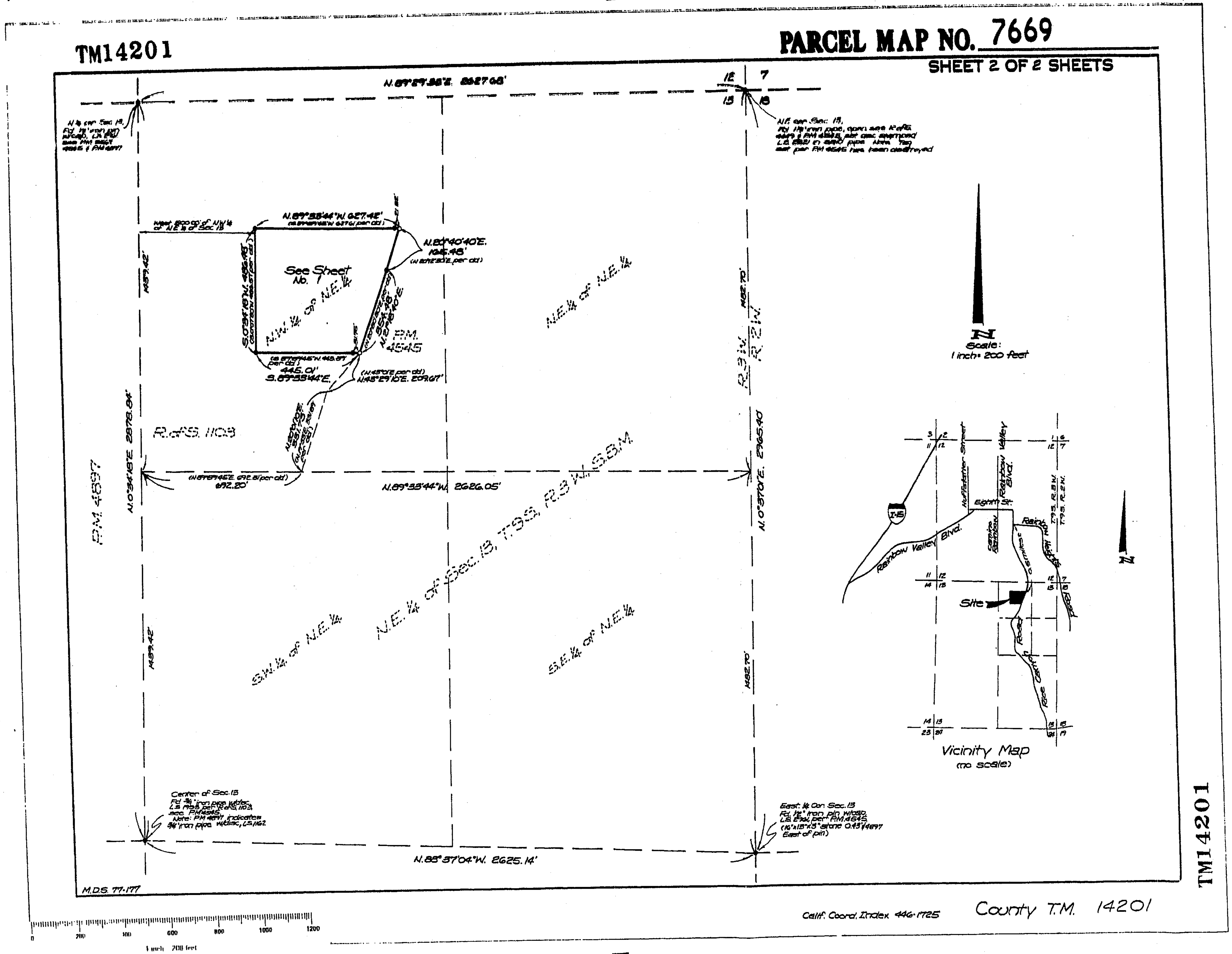
See Sheet No. 2 For Procedure of Survey & Vicinity Map

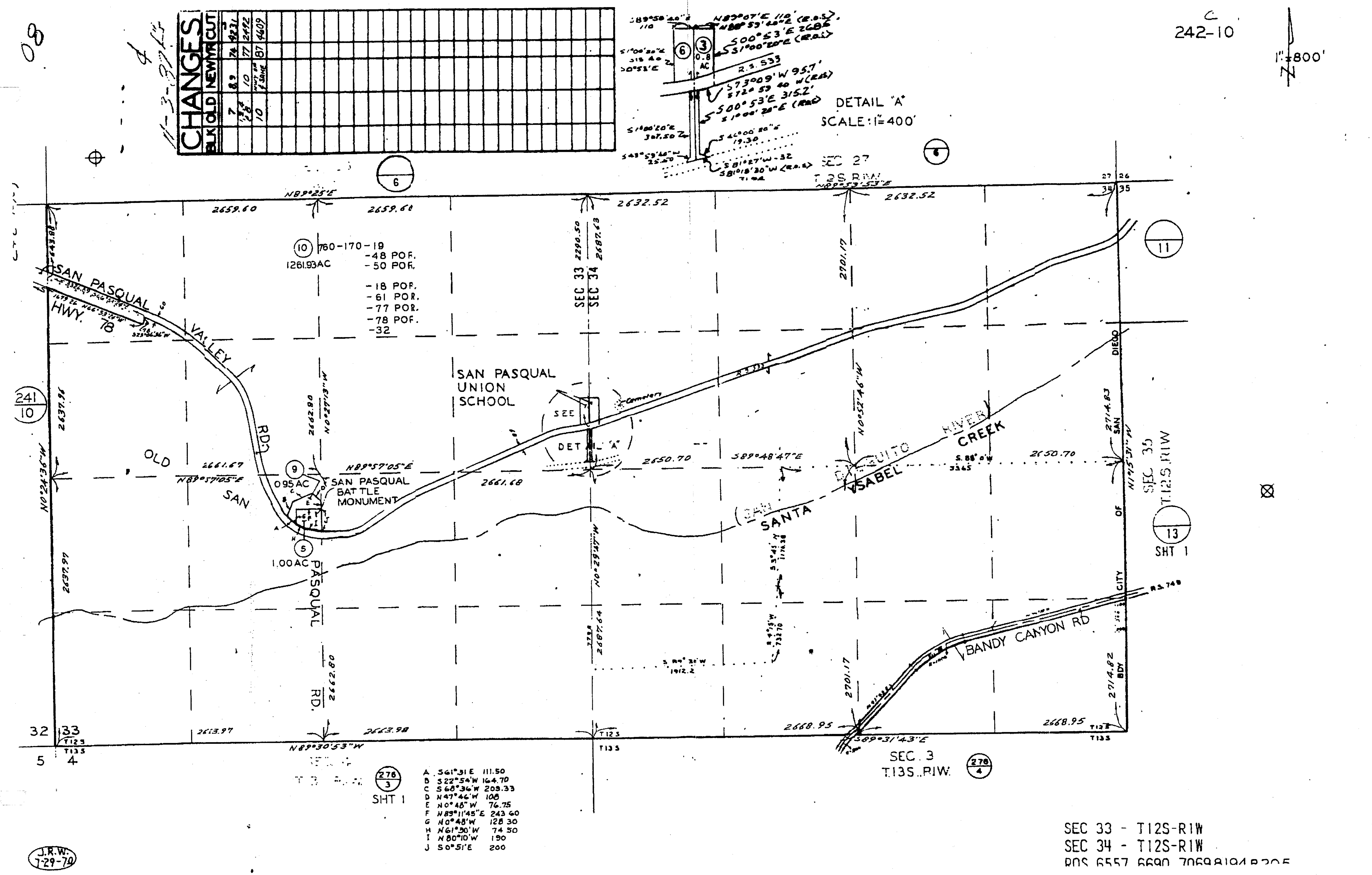
M.D.S. 77-177

0 100 200 300 400 500 600
1 inch 100 feet

CALIF. COORD. INDEX 446-1725 (X) COUNTY TM 14201

TM14201


TM14201
PARCEL MAP NO. 7669
SHEET 2 OF 2 SHEETS
N.89°29'38"E. 2627.08'
N.88°37'04"W. 2625.14'
N.89°33'44"W. 2626.05'
N.0°37'01"E. 2965.40
N.0°34'18"E. 2978.84'
N.E.¼ of Sec.13, T.9S., R.3 W., S.B.M.
N.W.¼ of N.E.¼
N.E.¼ of N.E.¼
S.W.¼ of N.E.¼
S.E.¼ of N.E.¼
See Sheet No. 1
P.M. 4645
P.M. 4897
R.of S. 1103
R.3 W.
R.2 W.
Center of Sec.13
East ¼ Cor. Sec.13
Vicinity Map
(no scale)
Site
Rainbow Valley Blvd.
Eighth St.
I-15
Scale:
1 inch = 200 feet
M.D.S. 77-177
Calif. Coord. Index 446-1725
County T.M. 14201
TM14201


242-10
1" = 800'
CHANGES
BLK OLD NEW YR CUT
7 8.9 74 9231
10 77 2492
10 87 4609
DETAIL "A"
SCALE: 1" = 400'
SEC 27
T 12S R1W
SEC 33
SEC 34
SAN PASQUAL UNION SCHOOL
SAN PASQUAL BATTLE MONUMENT
0.95 AC
1.00 AC
760-170-19
1261.93 AC
-48 POR.
-50 POR.
-18 POR.
-61 POR.
-77 POR.
-78 POR.
-32
SAN PASQUAL VALLEY RD.
HWY. 78
OLD SAN PASQUAL RD.
SANTA YSABEL CREEK
BANDY CANYON RD
SEE DETAIL "A"
CITY OF SAN DIEGO BDY
SEC 35 T.12S R1W
SHT 1
SEC 3 T13S R1W
A S61°31'E 111.50
B S22°54'W 164.70
C S68°36'W 209.33
D N47°46'W 108
E N0°48'W 76.75
F N89°11'45"E 243.60
G N0°48'W 128.30
H N61°30'W 74.50
I N80°10'W 190
J S0°51'E 200
J.R.W. 7-29-70
SEC 33 - T12S-R1W
SEC 34 - T12S-R1W

COUNTY TM9908-1

Cal. Coord. Index 446.1225(d)

TM9908-1

B.4460

"BAKER"
N 449,539.54
E. 1720,755.64

MS 675

"PEG"
N 447 268.33
E.1724, 350.24

DETAIL "B"
NO SCALE

DETAIL "A"
SCALE: 1"=100'

NOTE
② Existing 30' Easement for roadway purposes granted to the County of San Diego per Doc. No. 75-088422
Date recorded 2-3-75 in Book 1975 of O.R.

PARCEL 2

PARCEL 1

BUILDING LINE 67' From ℄ SCTNO

ROUTE LOCATION SC 170
RICE CANYON ROAD

NE ¼ SEC. 13

SHEET 2 OF 2 SHEETS

PARCEL MAP NO. 4545

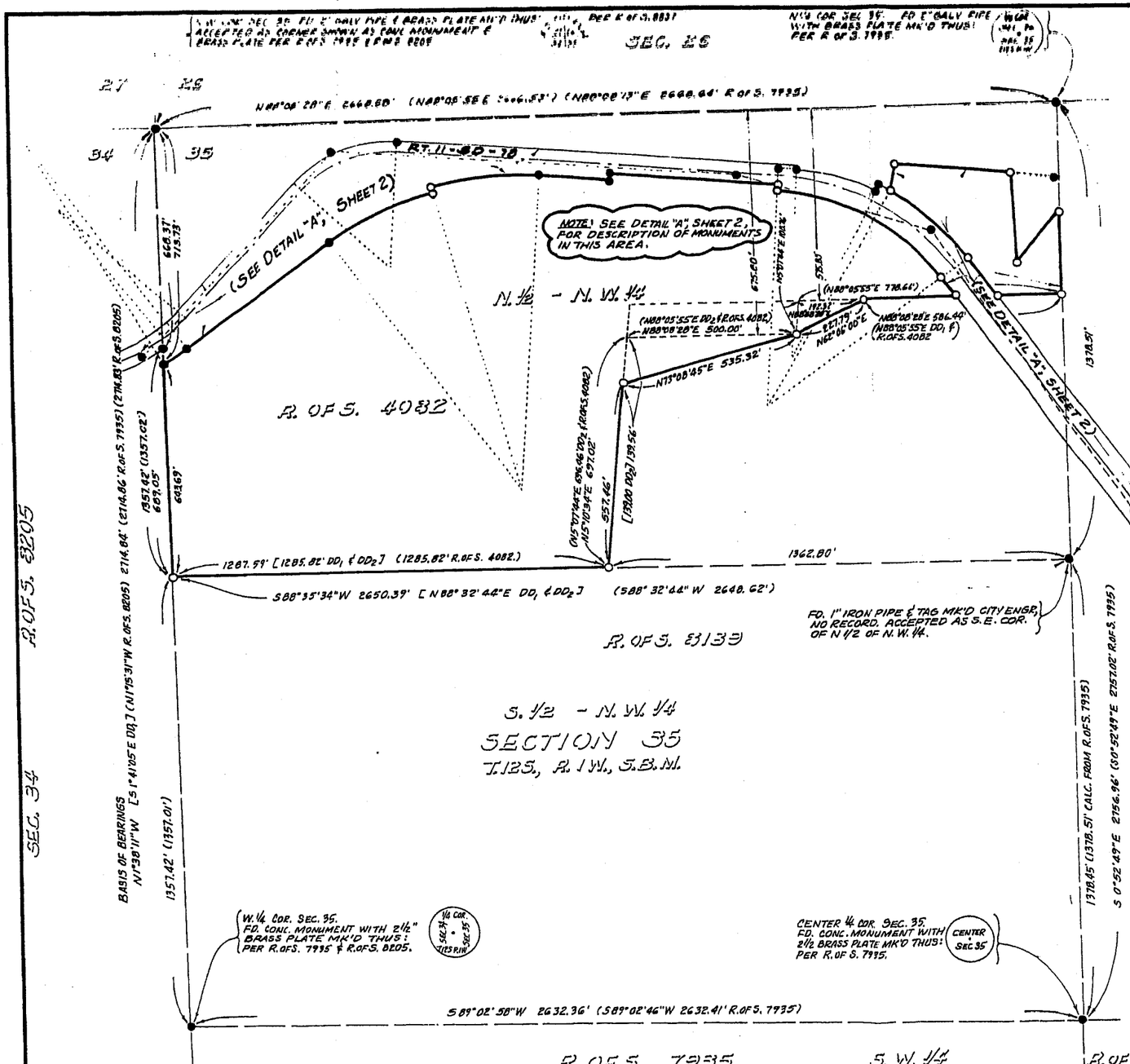
TM9908-1

R. OF S. MAP NO. 10225

SHEET 1 OF 3 SHEETS

RECORD OF SURVEY

OF A PORTION OF THE N½ OF THE N.W. ¼ OF SECTION 35 T.12S., R.1W., S.B.M. CITY OF SAN DIEGO, SAN DIEGO COUNTY, CALIFORNIA



LEGEND:

- ● INDICATES POINTS FOUND AND DESCRIBED HEREON.
- O INDICATES SET 2"X 24" IRON PIPE WITH DISC MK'D "L.S. 4670"
- ( ) INDICATES RECORD VALUES PER R. OF S. 4082 UNLESS OTHERWISE NOTED.
- [ ] INDICATES RECORD VALUES PER DEED AS NOTED.
- DD1 DEED DATA PER F/P 116849, REC. 7-3-63, OFFICIAL RECORDS.
- DD2 DEED DATA PER F/P 116850, REC. 7-3-63, OFFICIAL RECORDS.

NOTE: SEE SHEET 3 FOR VICINITY MAP.

BASIS OF BEARINGS:
THE BASIS OF BEARINGS FOR THIS SURVEY IS THE WEST LINE OF THE N.W. ¼ OF SECTION 35, T.12S., R.1W, S.B.M., PER R.OF S. 7935, I.E. N 1°38'11" W.

SURVEYOR'S STATEMENT:
THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE LAND SURVEYOR'S ACT AT THE REQUEST OF JUSTINE B. FENTON, APRIL THROUGH JULY 1985.

Brian Polley
BRIAN POLLEY, L. S. 4670

LICENSED LAND SURVEYOR BRIAN P. POLLEY NO. 4670 State of California

COUNTY ENGINEER'S STATEMENT:
THIS MAP HAS BEEN EXAMINED IN ACCORDANCE WITH SECTION 8766 OF THE LAND SURVEYOR'S ACT THIS 12TH DAY OF SEPTEMBER 1985.

H. E. SORLIE
ACTING COUNTY ENGINEER
R.C.E. 15589

BY Louis R. Hall
LOUIS R. HALL, L.S. 3433

LICENSED LAND SURVEYOR LOUIS R. HALL L. S. 3433 STATE OF CALIFORNIA

RECORDER'S CERTIFICATE
FILE NO. 85-334710
FILED THIS 13th DAY OF September 1985 AT 10:40 O'CLOCK A.M., IN BOOK OF RECORD OF SURVEY MAPS AT PAGE 102 AT THE REQUEST OF BRIAN POLLEY.

YERA L. LYLE, COUNTY RECORDER

FEE: $9.00 RF
$1.00 M4

BY Susan Norris
DEPUTY COUNTY RECORDER

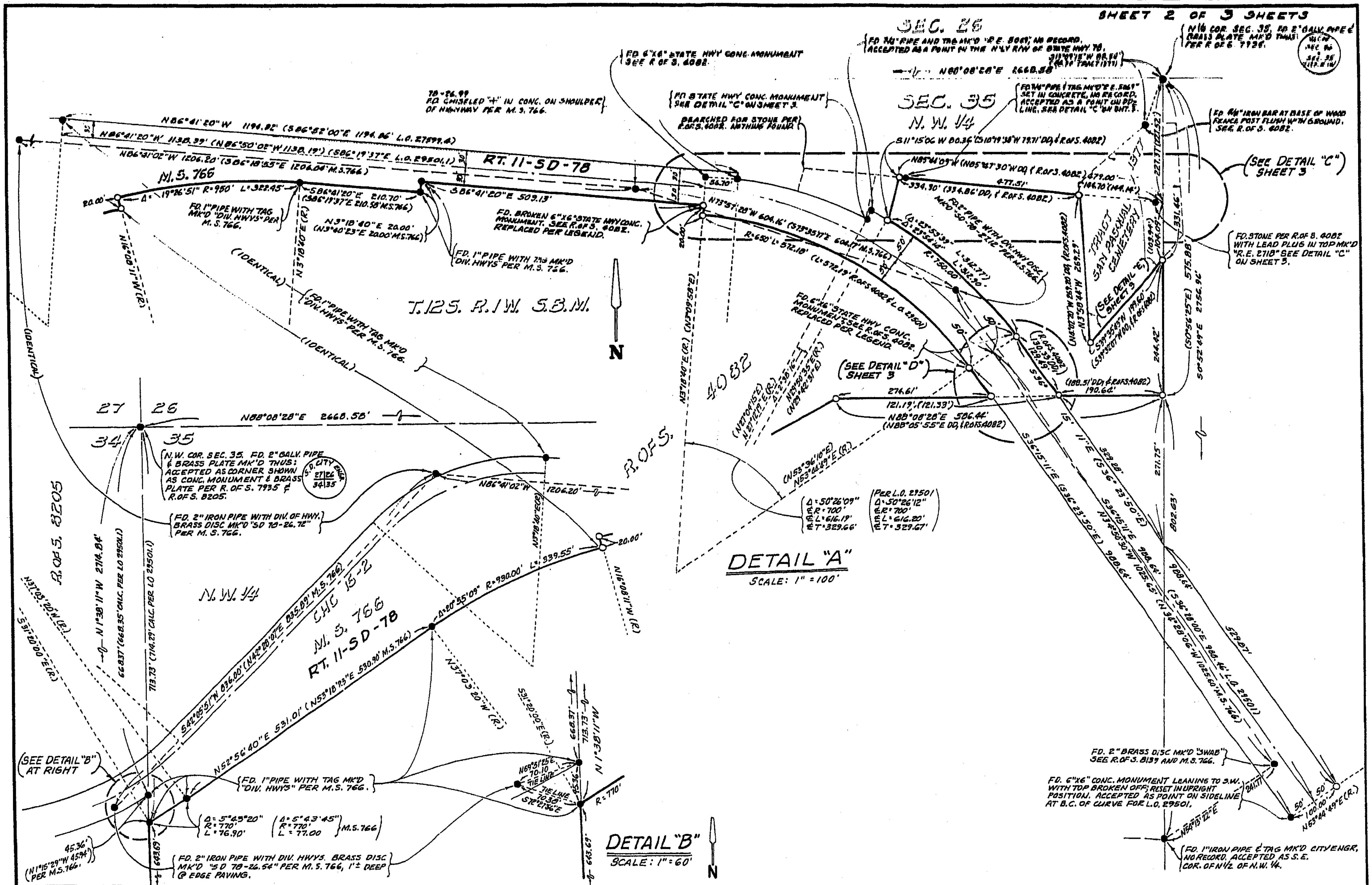
KENNEY, POLLEY & ASSOCIATES
656 METCALF ST.
ESCONDIDO, CA 92025
(619) 745-3805

CALIFORNIA COORDINATE INDEX 334-1779 X

FENTON

85-191

R. OF S. MAP NO. 10225



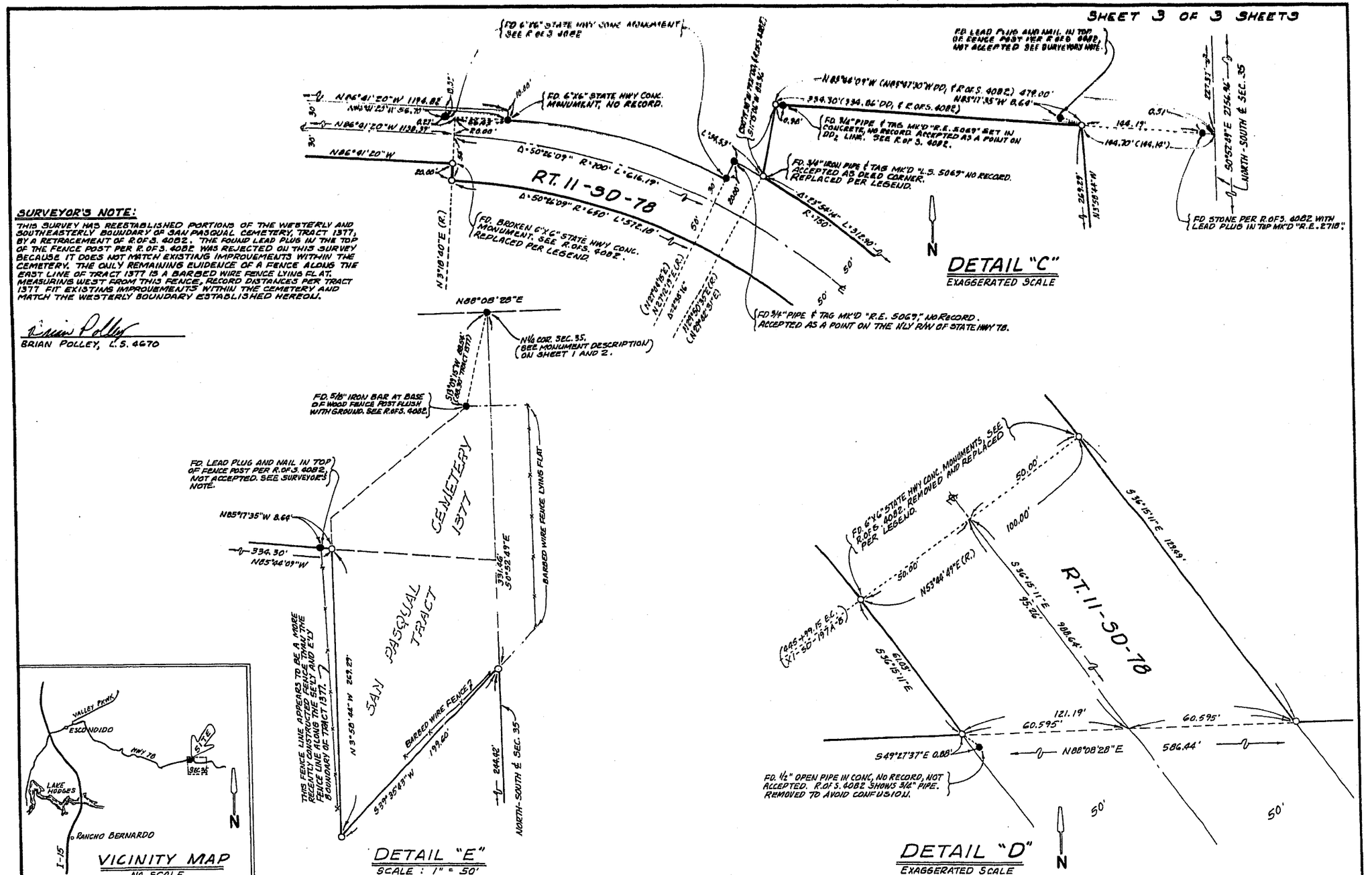
KENNEY, POLLEY & ASSOCIATES
656 METCALF ST.
ESCONDIDO, CA. 92025
(619) 745-3805

CALIFORNIA COORDINATE INDEX 334-1779 X

FENTON 35-181

R. OF S. MAP NO. 10225

SHEET 3 OF 3 SHEETS



SURVEYOR'S NOTE:

"THIS SURVEY HAS REESTABLISHED PORTIONS OF THE WESTERLY AND SOUTHEASTERLY BOUNDARY OF SAN PASQUAL CEMETERY, TRACT 1377, BY A RETRACEMENT OF R OF S. 4082. THE FOUND LEAD PLUG IN THE TOP OF THE FENCE POST PER R OF S. 4082 WAS REJECTED ON THIS SURVEY BECAUSE IT DOES NOT MATCH EXISTING IMPROVEMENTS WITHIN THE CEMETERY. THE ONLY REMAINING EVIDENCE OF A FENCE ALONG THE EAST LINE OF TRACT 1377 IS A BARBED WIRE FENCE LYING FLAT. MEASURING WEST FROM THIS FENCE, RECORD DISTANCES PER TRACT 1377 FIT EXISTING IMPROVEMENTS WITHIN THE CEMETERY AND MATCH THE WESTERLY BOUNDARY ESTABLISHED HEREON."

Brian Polley

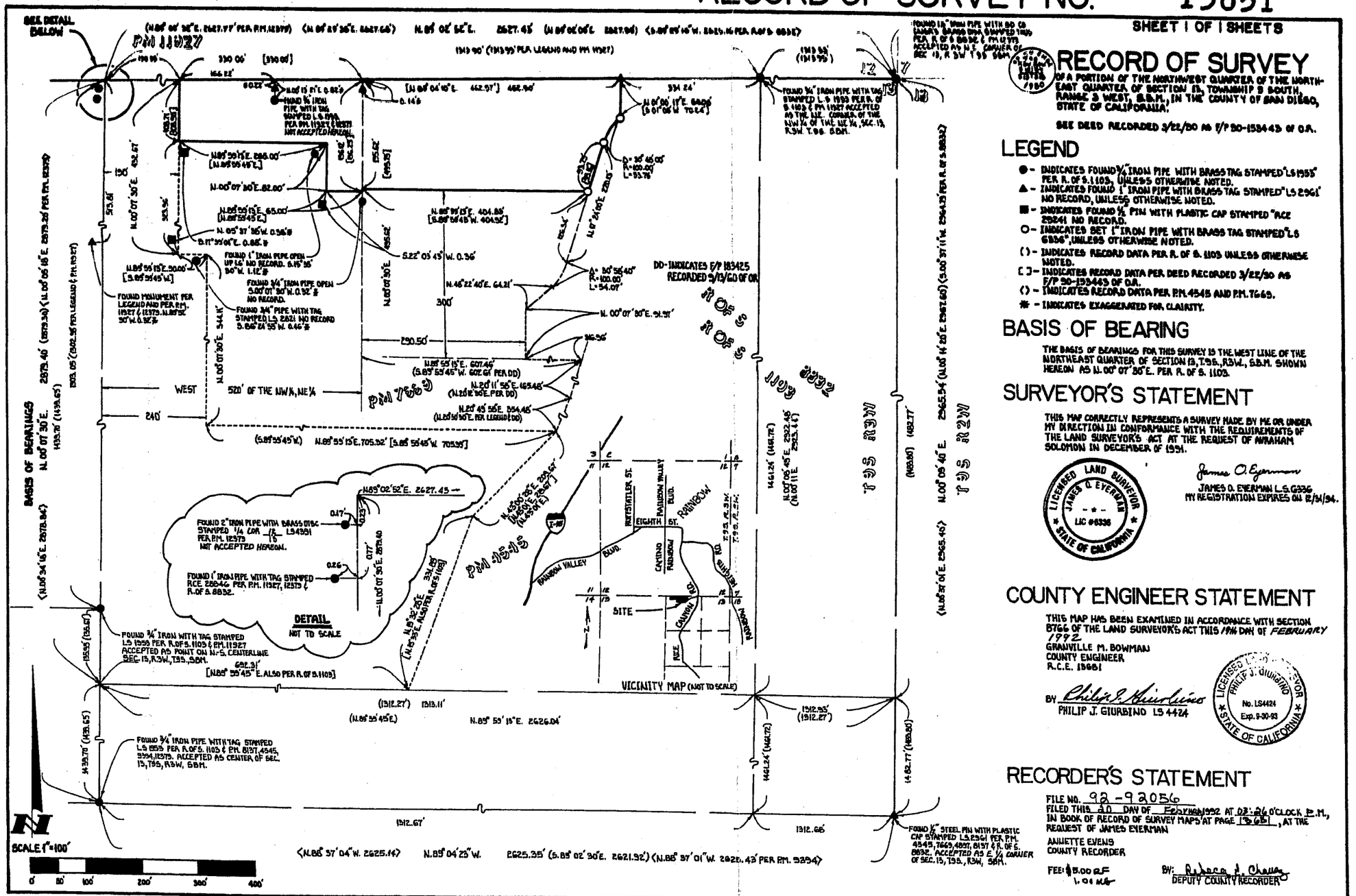
BRIAN POLLEY, L.S. 4670

KENNEY, POLLEY & ASSOCIATES
696 METCALF ST.
ESCONDIDO, CA 92025
(619) 745-3805

CALIFORNIA COORDINATE INDEX 334-1779 X

RECORD OF SURVEY NO. 13651

SHEET 1 OF 1 SHEETS



RECORD OF SURVEY

OF A PORTION OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 13, TOWNSHIP 9 SOUTH, RANGE 3 WEST, S.B.M., IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA.

SEE DEED RECORDED 3/22/50 AS F/P 50-15844 S OF O.R.

LEGEND

- ● - INDICATES FOUND ¾" IRON PIPE WITH BRASS TAG STAMPED "LS 1995" PER R. OF S. 1103, UNLESS OTHERWISE NOTED.
- ▲ - INDICATES FOUND 1" IRON PIPE WITH BRASS TAG STAMPED "LS 2961" NO RECORD, UNLESS OTHERWISE NOTED.
- ■ - INDICATES FOUND ½" PIN WITH PLASTIC CAP STAMPED "ACE 23241" NO RECORD.
- O - INDICATES SET 1" IRON PIPE WITH BRASS TAG STAMPED "LS 6336", UNLESS OTHERWISE NOTED.
- ( ) - INDICATES RECORD DATA PER R. OF S. 1103 UNLESS OTHERWISE NOTED.
- [ ] - INDICATES RECORD DATA PER DEED RECORDED 3/22/50 AS F/P 50-139443 OF O.R.
- ⟨ ⟩ - INDICATES RECORD DATA PER P.M. 4545 AND P.M. 7669.
- ✱ - INDICATES EXAGGERATED FOR CLARITY.

BASIS OF BEARING

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE WEST LINE OF THE NORTHEAST QUARTER OF SECTION 13, T.9S., R.3W., S.B.M. SHOWN HEREON AS N. 00° 07' 30" E. PER R. OF S. 1103.

SURVEYOR'S STATEMENT

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE LAND SURVEYOR'S ACT AT THE REQUEST OF ANNAHAM SOLOMON IN DECEMBER OF 1991.

LICENSED LAND SURVEYOR JAMES O. EVERMAN LIC #6336 STATE OF CALIFORNIA

James O. Everman

JAMES O. EVERMAN L.S. 6336
MY REGISTRATION EXPIRES ON 12/31/94.

COUNTY ENGINEER STATEMENT

THIS MAP HAS BEEN EXAMINED IN ACCORDANCE WITH SECTION 8766 OF THE LAND SURVEYOR'S ACT THIS 19th DAY OF FEBRUARY 1992.

GRANVILLE M. BOWMAN
COUNTY ENGINEER
R.C.E. 19681

BY Philip J. Giurbino
PHILIP J. GIURBIND LS 4424

LICENSED LAND SURVEYOR PHILIP J. GIURBIND No. LS4424 Exp. 9-30-93 STATE OF CALIFORNIA

RECORDER'S STATEMENT

FILE NO. 92-92056
FILED THIS 20 DAY OF February 1992 AT 03:26 O'CLOCK P.M., IN BOOK OF RECORD OF SURVEY MAPS AT PAGE 15 061, AT THE REQUEST OF JAMES EVERMAN

ANNETTE EVENS
COUNTY RECORDER

FEE: $5.00 RF
1.00 MF

BY: Rebecca J. Chavez
DEPUTY COUNTY RECORDER

EYERMAN LAND SURVEYING

CALIFORNIA COORDINATE INDEX: 450-1725

A.P.N.: 108-310-42

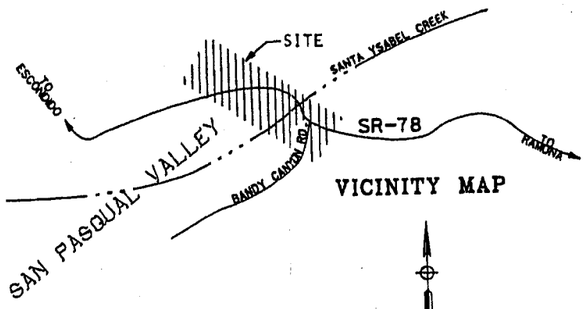
R.O.S. MAP NO. 14300

SHEET 1 OF 4 SHEETS

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
MONUMENTATION MAP

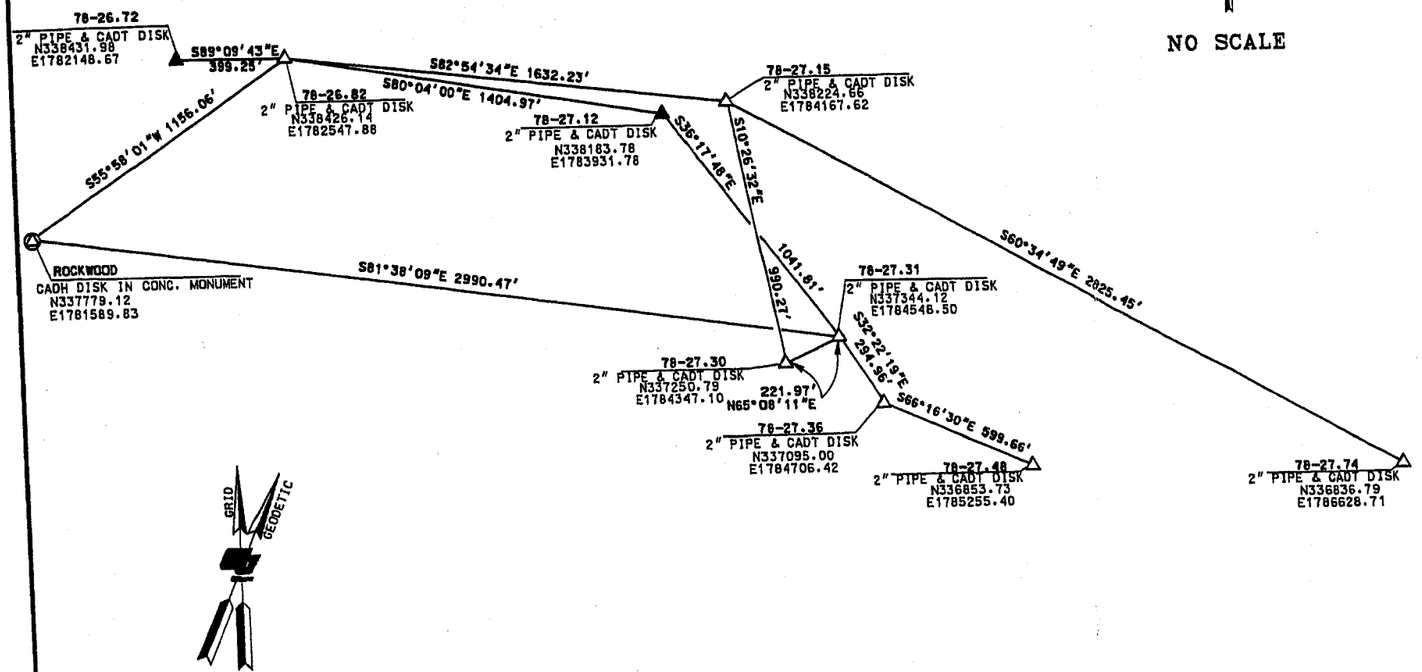
11-SD-78

PM 26.9 - 27.6



VICINITY MAP

NO SCALE



SCALE: 1"= 300'

MAPPING ANGLE = (-) 00°23'14"

CGF= 0.9999420

@ MONUMENT 78-27.15

RECORD OF SURVEY

OF NEW RIGHT OF WAY FOR STATE ROUTE 78 POST MILE 26.9 THRU 27.6 IN A PORTION OF SECTION 35, T.12S. R.1W., SBM. IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA.

LEGEND

- ⊙ 1ST OR 2ND ORDER MONUMENT IN THE NATIONAL GEODETIC REFERENCE SYSTEM
- △ SET PROJECT CONTROL SURVEY MONUMENT
- ▲ FOUND CONTROL MONUMENT PER CADT CONTROL BOOK 11-SD-78
- ● FOUND MONUMENT AS NOTED
- ■ FOUND 6" CHC MONUMENT UNLESS NOTED OTHERWISE
- ○ SET 1" PIPE & "CAL DOT" TAG UNLESS NOTED OTHERWISE
- CADH CALIFORNIA DIVISION OF HIGHWAYS
- CADT CALIFORNIA DEPARTMENT OF TRANSPORTATION

BASIS OF BEARINGS

COORDINATES AND BEARINGS ARE BASED ON CCS27, ZONE 6. PROJECT CONTROL SURVEY MONUMENTS WERE ESTABLISHED USING MODIFIED 2ND ORDER HORIZONTAL CONTROL TRAVERSE PROCEDURES. COORDINATES SHOWN FOR RIGHT OF WAY, CENTERLINE AND FOUND POINT MONUMENTS WERE DERIVED FROM FIELD TIES TO SAID CONTROL MONUMENTS. THEY ARE FOR INFORMATION ONLY, AND ARE NOT INTENDED TO BE USED IN THE EXTENSION OF THE CALIFORNIA COORDINATE SYSTEM.

DISTANCES AND STATIONING ARE GRID DISTANCES. MULTIPLY BY 1.000058 TO OBTAIN GROUND DISTANCES.

ALL DISTANCES REFERENCED TO RECORD DOCUMENTS OR MAPS ARE GROUND DISTANCES, UNLESS NOTED OTHERWISE.

SUPPLEMENTARY INFORMATION MAY BE OBTAINED FROM CALTRANS DISTRICT 11 HEADQUARTERS, THROUGH THE SURVEY OR RIGHT OF WAY ENGINEERING BRANCH LOCATED AT 2829 JUAN STREET, SAN DIEGO, CA 92110.

SURVEYOR'S STATEMENT

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE LAND SURVEYOR'S ACT AT THE REQUEST OF THE CALIFORNIA DEPARTMENT OF TRANSPORTATION IN JANUARY 1993.

V.F. Bresheears

VANCE F. BRESHEARS, P.L.S. 5842
DISTRICT SURVEYS ENGINEER
MY REGISTRATION EXPIRES 12/31/96

PROFESSIONAL LAND SURVEYOR
VANCE F. BRESHEARS
EXP:12-31-96
L.S. 5842
STATE OF CALIFORNIA

COUNTY SURVEYOR'S STATEMENT

THIS MAP HAS BEEN EXAMINED IN ACCORDANCE WITH SECTION 8766 OF THE LAND SURVEYOR'S ACT THIS 2nd DAY OF SEPTEMBER 19 93

PHILIP J. GIURBIND L.S. 4424
COUNTY SURVEYOR

Philip J. Giurbind

LICENSED LAND SURVEYOR
PHILIP J. GIURBIND
No. LS4424
Exp. 9-30-93
STATE OF CALIFORNIA

COUNTY RECORDER'S STATEMENT

FILE NO. 93-582782
FILED THIS 02 DAY OF SEPTEMBER, 1993 AT 1:50 O'CLOCK P.M. IN BOOK OF RECORD OF SURVEY MAPS AT PAGE 14300, AT THE REQUEST OF THE STATE DEPARTMENT OF TRANSPORTATION

ANNETTE EVANS
COUNTY RECORDER

BY Jeannen Granillo
DEPUTY COUNTY RECORDER

NO FEE

CALIFORNIA COORDINATE INDEX: 334-1779 (x)

78-27.H EA 161152 MAY 1993

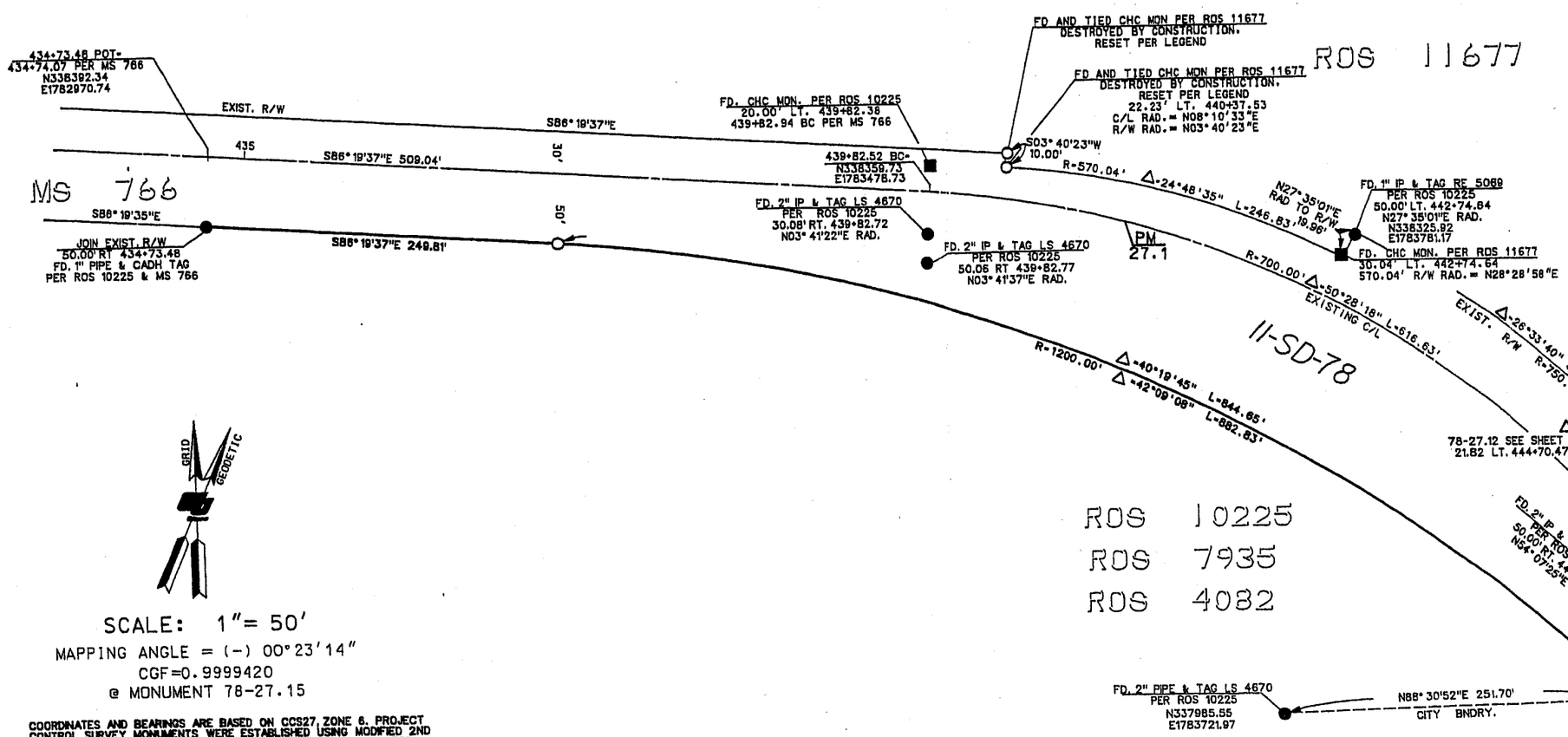
R.O.S. MAP NO. 14300

SHEET 2 OF 4 SHEETS

COUNTY OF SAN DIEGO

T. 12 S. R. 1 W. SBM.

SECTION 35



GRID
GEODETIC

SCALE: 1"= 50'

MAPPING ANGLE = (-) 00°23'14"

CGF=0.9999420

@ MONUMENT 78-27.15

COORDINATES AND BEARINGS ARE BASED ON CCS27, ZONE 6. PROJECT CONTROL SURVEY MONUMENTS WERE ESTABLISHED USING MODIFIED 2ND ORDER HORIZONTAL CONTROL TRAVERSE PROCEDURES. COORDINATES SHOWN FOR RIGHT OF WAY, CENTERLINE AND FOUND POINT MONUMENTS WERE DERIVED FROM FIELD TIES TO SAID CONTROL MONUMENTS. THEY ARE FOR INFORMATION ONLY, AND ARE NOT INTENDED TO BE USED IN THE EXTENSION OF THE CALIFORNIA COORDINATE SYSTEM.

DISTANCES AND STATIONING ARE GRID DISTANCES. MULTIPLY BY 1.000058 TO OBTAIN GROUND DISTANCES.

ALL DISTANCES REFERENCED TO RECORD DOCUMENTS OR MAPS ARE GROUND DISTANCES, UNLESS NOTED OTHERWISE.

78-27_2 EA 161152 MAY 1993

CALIFORNIA COORDINATE INDEX: 338-1779

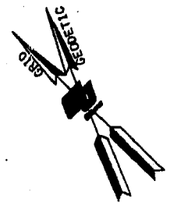
A.P.N.: 242-11

R.O.S. MAP NO. 14300

SHEET 3 OF 4 SHEETS

1" = 100'

CITY OF SAN DIEGO
T. 12 S. R. 1 W. SBM.
SECTION 35



SCALE: 1"= 50'

MAPPING ANGLE = (-) 00°23'14"
CGF= 0.9999420
@ MONUMENT 78-27.15

DATA

	BEARING	DISTANCE
A	N88°30'52"E	22.72'
B	S35°51'19"E	52.22'
C	S35°51'19"E	27.81'
D	S00°30'20"E	8.00'
E	N54°08'41"E	50.00'
F	N54°08'41"E	50.00'
G	S35°51'19"E	57.00'
H	S35°51'19"E	42.76'
I	N54°08'41"E	30.33'
J	S00°30'00"E	52.43'
K	N52°28'10"E	14.49'
L	N72°12'22"E	10.52'

FD 2" IP & CITY ENGR. DISK
PER ROS 11677 & ROS 10225
ACCEPTED AS N1/4 COR SEC 35
N338576.64
E1784383.09

326.60'

FD 2" IP & TAG LS 4670
PER ROS 11677
N338249.95
E1784305.94

CITY OF SAN DIEGO
COUNTY OF SAN DIEGO

(N00°52'49"W 1378.51' PER ROS 10225)
N00°30'00"W 1378.33'

78-27.15 SEE SHEET 1
225.14' LT. 445+78.76
N52°28'35"E RAD TO CL

FD 2" IP & TAG LS 4670
PER ROS 10225
N338000.76
E1784308.11

FD. 2" IP & TAG LS 4670
PER ROS 10225
DESTROYED BY CONSTRUCTION
REPLACED PER LEGEND
50.00' LT. 445+89.15

JOIN EXIST. R/W
50.00' LT. 447+28.28

FD. 2" IP & TAG LS 4670
PER ROS 10225
DESTROYED BY CONSTRUCTION
REPLACED PER LEGEND

R=750.00'
S35°51'19"E 129.13'
(S36°15'11"E 129.49' PER ROS 10225)

136.19'
MITIGATION SITE
102.84'
N54°08'41"W
125.29'
80.03'
S35°51'19"E
60.58'
60.57'
N54°08'41"E 170.00'
120.00'
50.00'
MITIGATION SITE
S60°54'46"W 120.84'
60.49'

SEE SHEET 2

445+99.15 EC
R=700.00'
N88°30'52"E 586.33'
60.57'
446+94.09
JOIN EXIST. R/W
S35°51'19"E 130.00'
JOIN EXIST. R/W
50.00' LT. 449+44.70
337820.41
1784244.17
450

FD 2" IP & TAG LS 4670
PER ROS 10225
SEE SHEET 2

FD 2" IP & TAG LS 4670
PER ROS 10225
49.99' RT. 446+59.89

S35°51'19"E 986.07'

S35°51'19"E 456.19'

112.34'

451+28.41

65.00' LT. 454+92.99
N337384.81
E1784577.48
R=1200.00' Δ=52°28'10" L=1098.92'

II-SD-78

PM 27.3

R=1200.00'
Δ=01°19'23"
L=46.18'
RAD. N43°49'53"E
COUNTY OF SAN DIEGO
CITY OF SAN DIEGO
62.37'
S54°08'41"W
80.00'
S35°51'19"E

R=1200.00' L=93.72
Δ=04°28'30"
N49°40'11"E RAD.
N54°08'41"E
71.34'
JOIN EXIST. R/W
76.37'
S35°51'19"E

337769.90
1784157.29
JOIN EXIST. R/W
50.00' RT. 449+34.75

N337725.97
E1784086.50
S54°08'41"W
75.00'
80.00'
S35°51'19"E
N54°08'41"E
65.00'

198.22'
278.25'
S35°51'19"E 476.47'

103.69'

455

455+85.22 BC
N337271.98
E1784576.82
R=704.00' Δ=29°49'33" L=366.47'

JOIN EXIST. R/W
50.00' RT. 454+94.48
N337316.24
E1784485.15

S35°51'19"E 90.73'
L=392.50'
R=754.00' Δ=29°49'33"

APPROX. LOCATION
OF BANDY CANYON ROAD
60'

1/4 SEC. LINE
340.29'

FD 1" IP & CITY ENGR. TAG
PER ROS 10225
ACCEPTED AS SE COR N1/2 NW1/4 SEC 35
N337198.26
E1784315.12

FD 2" IP & TAG LS 4670
PER ROS 10225
N337985.85
E1783721.97

SEE SHEET 4

COORDINATES AND BEARINGS ARE BASED ON CCS27, ZONE 6. PROJECT CONTROL SURVEY MONUMENTS WERE ESTABLISHED USING MODIFIED 2ND ORDER HORIZONTAL CONTROL TRAVERSE PROCEDURES. COORDINATES SHOWN FOR RIGHT OF WAY, CENTERLINE AND FOUND POINT MONUMENTS WERE DERIVED FROM FIELD TIES TO SAID CONTROL MONUMENTS. THEY ARE FOR INFORMATION ONLY, AND ARE NOT INTENDED TO BE USED IN THE EXTENSION OF THE CALIFORNIA COORDINATE SYSTEM.

DISTANCES AND STATIONING ARE GRID DISTANCES. MULTIPLY BY 1.000058 TO OBTAIN GROUND DISTANCES.

ALL DISTANCES REFERENCED TO RECORD DOCUMENTS OR MAPS ARE GROUND DISTANCES, UNLESS NOTED OTHERWISE.

78-27.3 EA 161152 MAY 1993

CALIFORNIA COORDINATE INDEX: 334-1779

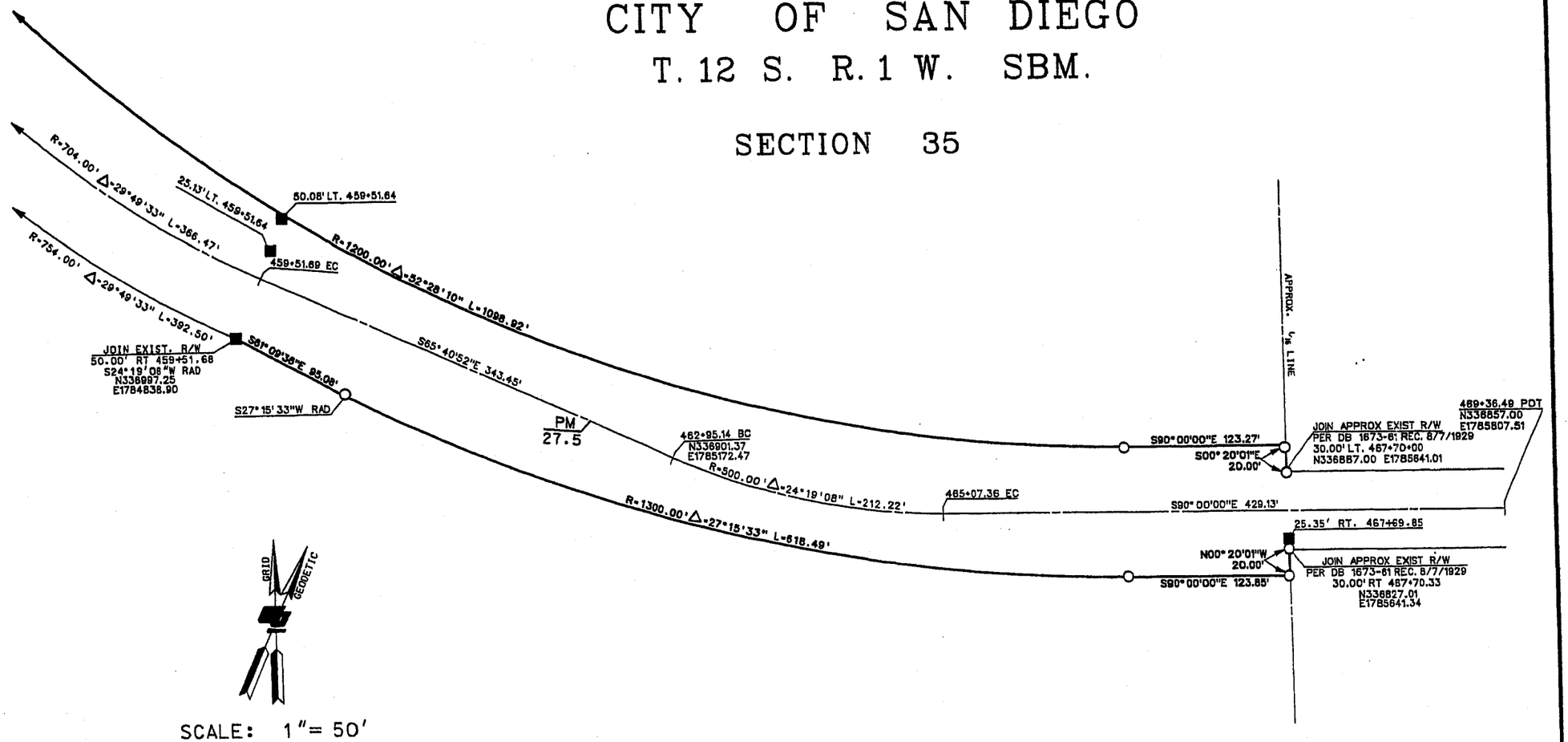
A.P.N.: 242-11 &13

R.O.S. MAP NO. 14300

SHEET 4 OF 4 SHEETS

CITY OF SAN DIEGO
T. 12 S. R. 1 W. SBM.

SECTION 35



GRID GEODETIC

SCALE: 1"= 50'

MAPPING ANGLE = (-) 00°23'14"

CGF=0.9999420

@ MONUMENT 78-27.15

COORDINATES AND BEARINGS ARE BASED ON CCS27, ZONE 6. PROJECT CONTROL SURVEY MONUMENTS WERE ESTABLISHED USING MODIFIED 2ND ORDER HORIZONTAL CONTROL TRAVERSE PROCEDURES. COORDINATES SHOWN FOR RIGHT OF WAY, CENTERLINE AND FOUND POINT MONUMENTS WERE DERIVED FROM FIELD TIES TO SAID CONTROL MONUMENTS. THEY ARE FOR INFORMATION ONLY, AND ARE NOT INTENDED TO BE USED IN THE EXTENSION OF THE CALIFORNIA COORDINATE SYSTEM.

DISTANCES AND STATIONING ARE GRID DISTANCES. MULTIPLY BY 1.000058 TO OBTAIN GROUND DISTANCES.

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78-27_4 EA 161152 MAY 1993

CALIFORNIA COORDINATE INDEX: 334-1779

A.P.N.: 242-13

PARCEL MAP NO. 19095

SHEET 1 OF 5 SHEETS

WE HEREBY STATE THAT WE ARE THE OWNERS OF OR ARE INTERESTED IN THE LAND SUBDIVIDED BY THIS MAP AND WE CONSENT TO THE PREPARATION AND RECORDATION OF THIS MAP.

WE HEREBY DEDICATE TO THE PUBLIC THE RIGHT TO EXTEND AND MAINTAIN DRAINAGE FACILITIES, EVACUATION AND EMBANKMENT SLOPES BEYOND THE LIMITS OF SAN PASQUAL VALLEY ROAD (SR78).

WE HEREBY RELINQUISH AND WAIVE THE ACCESS RIGHTS FROM PARCELS 1,2,& 3 IN AND TO SAN PASQUAL VALLEY ROAD EXCEPTING THEREFROM ACCESS OPENINGS NO.1 AND 2, AS SHOWN ON SAID MAP.

WE HEREBY DEDICATE TO THE SAN DIEGO COUNTY FLOOD CONTROL DISTRICT THE DRAINAGE EASEMENTS AS SHOWN ON SAID MAP.

WE HEREBY DEDICATE TO THE SAN DIEGO COUNTY FLOOD CONTROL DISTRICT A PERPETUAL EASEMENT AND RIGHT-OF-WAY FOR THE FLOAGE OF WATERS OVER, UPON AND ACROSS THE LAND DELINEATED ON THIS MAP AND DESIGNATED HEREON AS "FLOWAGE EASEMENT"; PROVIDED HOWEVER, WE RESERVE TO OURSELVES, OUR SUCCESSORS AND ASSIGNS, THE RIGHT TO USE SUBJECT LAND AT ANY TIME, IN ANY MANOR AND FOR ANY PURPOSE NOT INCONSISTENT WITH THE FULL USE AND ENJOYMENT BY THE SAN DIEGO COUNTY FLOOD CONTROL DISTRICT, ITS SUCCESSORS AND ASSIGNS

WE HEREBY GRANT TO THE COUNTY OF SAN DIEGO A PERPETUAL EASEMENT FOR OPEN SPACE OVER THAT AREA SHOWN AS "OPEN SPACE EASEMENT" OVER ALL OF PARCEL 3 AND A PORTION OF PARCEL 2 ON SHEET 4 OF THIS MAP. THIS EASEMENT PROHIBITS ALL OF THE FOLLOWING ON ANY PORTION OF THE LAND SUBJECT TO SAID EASEMENT: GRADING, EXCAVATION, PLACEMENT OF SOIL, SAND, ROCK, GRAVEL OR OTHER MATERIAL, CLEARING OF VEGETATION, CONSTRUCTION, ERECTION OR PLACEMENT OF ANY BUILDING OR STRUCTURE, VEHICULAR ACTIVITIES, TRASH DUMPING OR USE FOR ANY PURPOSE OTHER THAN AS OPEN SPACE.

THE COUNTY OF SAN DIEGO SHALL HAVE THE RIGHT, BUT NOT THE OBLIGATION, TO ENTER UPON THE LAND SUBJECT TO THIS EASEMENT AND REMOVE ANY MATERIAL, STRUCTURE OR OTHER THING PLACED OR MAINTAINED CONTRARY TO THE TERMS OF THIS EASEMENT, AND TO DO ANY WORK NECESSARY TO ELIMINATE THE EFFECTS OF ANY VIOLATION OF THIS EASEMENT. THIS EASEMENT SHALL NOT AUTHORIZE ANY MEMBER OF THE PUBLIC TO USE OR ENTER UPON THE LAND SUBJECT TO THIS EASEMENT, IT BEING UNDERSTOOD THAT THE PURPOSE OF THIS EASEMENT IS SOLELY TO RESTRICT THE USE OF SAID LAND. THE TERMS OF THIS EASEMENT MAY BE SPECIFICALLY ENFORCED OR ENJOINED BY PROCEEDINGS IN A COURT OF COMPETENT JURISDICTION, AND SHALL BE BINDING UPON THE GRANTOR(S) AND IT'S OR THEIR SUCCESSORS AND ASSIGNS.

JUSTINE B. FENTON, AS TRUSTEE OF THAT CERTAIN REVOCABLE TRUST DATED OCTOBER 16, 1984, AS OWNER

DONALD J. METZLER (CO-TRUSTEE)
CAROLYN HAAG (CO-TRUSTEE)

SIGNATURES OF THE PARTIES LISTED BELOW, OWNERS OF EASEMENTS PER DOCUMENTS NOTED BELOW, HAVE BEEN OMITTED UNDER THE PROVISIONS OF SECTION 66436, SUBSECTION (a) (3) (A) (i) OF THE SUBDIVISION MAP ACT SINCE THEIR INTEREST IS SUCH THAT IT CANNOT RIPEN INTO A FEE TITLE AND SAID SIGNATURES ARE NOT REQUIRED BY THE GOVERNING BODY.

1. STATE OF CALIFORNIA
   RECORDED AUGUST 26, 1980 AS FILE NO. 80-272609, O.R.
2. SAN DIEGO GAS & ELECTRIC
   RECORDED AUGUST 3, 1927 IN BOOK 1363, PAGE 151 OF DEEDS
3. PACIFIC TELEPHONE AND TELEGRAPH COMPANY
   RECORDED JANUARY 16, 1917 IN BOOK 723, PAGE 468 & JANUARY 16, 1917 IN BOOK 723, PAGE 466 OF DEEDS & FEBRUARY 8, 1912 IN BOOK 536, PAGE 254 OF DEEDS OF OFFICIAL RECORDS
4. SUSIE E. WOODS, ET AL, OWNER OF AN EASEMENT AS RECORDED APRIL 14, 1924 IN BOOK 994, PAGE 313 OF DEEDS OF OFFICIAL RECORDS.
   THE EXACT LOCATION AND EXTENT OF SAID EASEMENT IS NOT PLOTTED HEREON.
5. CLIFFORD PEET, OWNER OF AN EASEMENT AS RECORDED NOVEMBER 9, 1926 IN BOOK 1276, PAGE 172 OF DEEDS OF OFFICIAL RECORDS.
   THE EXACT LOCATION AND EXTENT OF SAID EASEMENT IS NOT PLOTTED HEREON.

OFFICIAL SEAL
MATTHEW R. MONTEITH
NOTARY PUBLIC-CALIFORNIA
COMM. NO. 1306905
SAN DIEGO COUNTY
MY COMM. EXP. JUNE 2, 2005

PARCEL MAP OF A PORTION OF THE NORTH HALF OF THE NORTHWEST QUARTER OF SECTION 35, TOWNSHIP 12 SOUTH, RANGE 1 WEST, SAN BERNADINO BASE, IN THE COUNTY OF SAN DIEGO, STATE OF CALIFORNIA.

PARCEL MAP GUARANTEE BY COMMONWEALTH LAND TITLE COMPANY, ORDER NO. 1090771-7 DATED OCTOBER 25, 2002

HEALTH DEPARTMENT CERTIFICATE HD PO 3047-6R E72

EACH PARCEL IS APPROVED FOR A STANDARD SEPTIC TANK CONNECTED TO FEET OF TILE DRAIN FIELD TO SERVE A THREE BEDROOM DWELLING, PROVIDED THE ORIGINAL SOIL IS NOT DISTURBED IN ANY WAY, SUCH AS CUTTING, FILLING OR RIPPING. THIS DOES NOT CONSTITUTE APPROVAL FOR COMMERCIAL ESTABLISHMENTS.

ALL PARCELS SHALL HAVE A LAYOUT OF THE SEWAGE DISPOSAL SYSTEM APPROVED BY THE SAN DIEGO DEPARTMENT OF PUBLIC HEALTH PRIOR TO THE APPROVAL OF THE BUILDING PERMIT AND/OR ISSUANCE OF A SEPTIC TANK PERMIT. CUTS AND FILLS FOR DRIVEWAYS AND BUILDING SITES SHALL BE MADE PRIOR TO APPROVAL OF THE LAYOUTS. AN ADDITIONAL EXPANSION AREA OF 100% OF THE INITIAL TITLE LINE AREA SHALL BE PROVIDED BY GRAVITY FOR POTENTIAL EXPANSION IN THE EVENT OF FAILURE

SEE PERCOLATION TEST DATA AND RECOMMENDATIONS IN THE NAME OF JUSTINE FENTON BY THOMAS GRAVES, RCE 48299

PARCEL 1:
EXISTING SFD (2 BEDROOMS)

PARCEL 2:
EXISTING SFD (4 BEDROOMS)

PARCEL 3:
NOT APPROVED FOR A SUBSURFACE SEWAGE DISPOSAL SYSTEM WITHOUT FULL PERCOLATION TESTING AND ENGINEERING

APPROVED WITH THE CONDITION THAT THE PROPOSED CONSERVANCY IS ACCEPTABLE WITH AN OPEN SPACE EASEMENT ON THE ENTIRE LOT OF PARCEL 3 PRIOR TO FINAL RECORDATION OF THIS MAP

GARY STEPHANIE, DEPUTY DIRECTOR (DEPARTMENT OF HEALTH SERVICES)
BY: MARY ANN SEDGHIAN , 7-24-92
THIS CERTIFICATION DOES NOT IMPLY ALL CONDITIONS PURSUANT TO THE RESOURCE PROTECTION ORDINANCE AND THE GROUNDWATER ORDINANCE HAVE BEEN MET. THE DEPARTMENT OF PLANNING AND LAND USE SHOULD BE CONSULTED REGARDING THE APPLICATION OF THESE ORDINANCES RELATIVE TO THIS PROJECT. ANY RESULTANT CHANGES TO THE SEPTIC SYSTEM DESIGN(S) MUST BE REEVALUATED BY THE DEPARTMENT OF HEALTH SERVICES.

STATE OF CALIFORNIA)
COUNTY OF SAN DIEGO)

ON 9/18/2002 BEFORE ME, Matthew R. Monteith, personally appeared Donald J. Metzler and Carolyn Haag ~~PERSONALLY KNOWN TO ME OR~~ PROVED TO ME ON THE BASIS OF SATISFACTORY EVIDENCE) TO BE THE PERSON(S) WHOSE NAME(S) IS/ARE SUBSCRIBED TO THE WITHIN INSTRUMENT AND ACKNOWLEDGED TO ME THAT ~~HE/SHE~~/THEY) EXECUTED THE SAME IN ~~HIS/HER~~/THEIR) AUTHORIZED CAPACITY(IES), AND THAT BY ~~HIS/HER~~/THEIR) SIGNATURE(S) ON THE INSTRUMENT THE PERSON(S), OR THE ENTITY UPON BEHALF OF WHICH THE PERSON(S) ACTED, EXECUTED THE INSTRUMENT.

WITNESS MY HAND.

SIGNATURE Matthew R. Monteith

PRINT NAME Matthew R. Monteith
A NOTARY PUBLIC IN AND FOR SAID STATE

PRINCIPAL PLACE OF BUSINESS IS COUNTY OF San Diego

MY COMMISSION EXPIRES 6/2/2005

THIS MAP WAS PREPARED BY ME OR UNDER MY DIRECTION AND IS BASED UPON A FIELD SURVEY IN CONFORMANCE WITH THE REQUIREMENTS OF THE SUBDIVISION MAP ACT AND LOCAL ORDINANCE AT THE REQUEST OF JUSTINE B. FENTON ON DECEMBER 1999, AND THE MONUMENTS ARE OF THE CHARACTER INDICATED AND OCCUPY THE POSITIONS SHOWN THEREON. I WILL SET ALL OTHER MONUMENTS OF THE CHARACTER AND AT THE POSITIONS INDICATED BY THE LEGEND IN THIS MAP (PRIOR TO SPECIFIC DATE OR COMPLETION OF AN EVENT, AS APPROVED BY THE COUNTY SURVEYOR, AND ALL SUCH MONUMENTS ARE OR WILL BE SUFFICIENT TO ENABLE THE SURVEY TO BE RETRACED (SEE LEGEND ON SHEET 2).

I HEREBY STATE THAT THIS PARCEL MAP SUBSTANTIALLY CONFORMS TO THE APPROVED OR CONDITIONALLY APPROVED TENTATIVE MAP, IF ANY.

SIGNED Chris Dodds
CHRIS DODDS
LIC. EXP. 6-30-04
LS 5770

PROFESSIONAL LAND SURVEYOR
CHRIS DODDS
L.S. 5770
EXP. 6-30-04
STATE OF CALIFORNIA

I, PHILIP J. GIURBINO, COUNTY SURVEYOR OF SAN DIEGO COUNTY, STATE THAT THIS MAP DOES NOT APPEAR TO BE A MAP OF A MAJOR SUBDIVISION FOR WHICH A FINAL MAP IS REQUIRED PURSUANT TO SECTION 66426 OF THE SUBDIVISION MAP ACT. I FURTHER STATE THAT THIS PARCEL MAP CONFORMS THE THE TENTATIVE PARCEL MAP AND APPROVED ALTERATIONS THEREOF AND THAT ALL PROVISIONS OF DIVISION 1 OF TITLE 8 OF THE SAN DIEGO COUNTY CODE HAVE BEEN COMPLIED WITH. THIS MAP CONFORMS WITH THE REQUIREMENTS OF THE SUBDIVISION MAP ACT AND LOCAL ORDINANCE. I HAVE EXAMINED THIS MAP AND AM SATISFIED THAT IT IS TECHNICALLY CORRECT.

PHILIP J. GIURBINO, P.L.S. 4424
COUNTY SURVEYOR

Philip J. Giurbino

DATE 9-19-02

LICENSED LAND SURVEYOR
PHILIP J. GIURBINO
Exp. 9-30-05
NO. LS4424
STATE OF CALIFORNIA

THIS TO CERTIFY THAT, PURSUANT TO AUTHORITY CONFERRED BY THE RESOLUTION OF THE BOARD OF SUPERVISORS ADOPTED MARCH 20, 1979, THE DIRECTOR OF PUBLIC WORKS, ACTING ON BEHALF OF THE BOARD OF SUPERVISORS, HAS ACCEPTED, ON BEHALF OF EACH OFFEREE OR GRANTEE, EACH OFFER OF DEDICATION, GRANT AND WAIVER OF RIGHTS EXCEPTING THEREFROM ACCESS OPENINGS NO. 1 AND NO. 2 SET FORTH ON THIS MAP AND SHOWN AS ACCEPTED, SUBJECT TO IMPROVEMENTS, IF ANY; AND HAS REJECTED, ON BEHALF OF EACH OFFEREE OR GRANTEE, EACH OFFER OF DEDICATION, GRANT, OR WAIVER OF RIGHTS SHOWN AS REJECTED ON THIS MAP.

THIS TO CERTIFY THAT THE INTEREST IN REAL PROPERTY CONVEYED BY THE DEDICATION TO THE SAN DIEGO COUNTY FLOOD CONTROL DISTRICT AND AS SHOWN ON THIS MAP, IS HEREBY ACCEPTED SUBJECT TO THE IMPROVEMENTS, IF ANY, BY THE UNDERSIGNED OFFICER OR AGENT ON BEHALF OF THE BOARD OF DIRECTORS OF THE SAN DIEGO COUNTY FLOOD CONTROL DISTRICT PURSUANT TO THE AUTHORITY CONFERRED BY THE RESOLUTION OF SAID BOARD OF DIRECTORS ADOPTED ON MARCH 20, 1979, AND THE DISTRICT CONSENTS TO THE RECORDATION THEREOF BY ITS DULY AUTHORIZED OFFICER.

NOTE:
SECTION 66463 OF THE GOVERNMENT CODE OF THE STATE OF CALIFORNIA PROVIDES THAT A REJECTED OFFER OF DEDICATION SHALL REMAIN OPEN AND SUBJECT TO FUTURE ACCEPTANCE BY THE COUNTY

JOHN L. SNYDER
DIRECTOR OF PUBLIC WORKS

BY: Philip J. Giurbino DATE: 09-19-02
FOR DIRECTOR OF PUBLIC WORKS

FILE NO 02-1004730 FILED THIS 20th DAY OF NOVEMBER AT 11:03 O'CLOCK IN BOOK OF PARCEL MAPS AT PAGE 19095 AT THE REQUEST OF DODDS AND ASSOCIATES

GREGORY J. SMITH
COUNTY RECORDER
BY: [signature]
DEPUTY COUNTY RECORDER

FEE $16.00

P:\acad\haleyranch\map_1.dwg 09/18/02 02:17:20 PM PDT

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GRADING PLAN L- NONE TPM 20044

CALIF. COORD. INDEX 334-1779(X)(CLS27)

PARCEL MAP NO. 19095

242/1.

SHEET 2 OF 5 SHEETS

PROCEDURE OF SURVEY

STATION NAME: 78-26.72 CDH
FOUND 2-1/4" CADH BRASS DISC STAMPED "SD 78-26.72" IN 2" IRON PIPE.
N1978876.250, E6343556.330

STATION NAME: ROCKWOOD
FOUND 3-1/2" CADH BRASS DISK STAMPED "ROCKWOOD 1973" IN CONCRETE MONUMENT.
N1978223.790
E6342987.430
NGVD 29 ELEVATION=438.30 MSL

FOUND 2" GALV. PIPE & BRASS PLATE PER ROS 10225

FOUND 2" GAVL. PIPE & BRASS PLATE PER ROS 10225

M.S. 766

R.O.S. 14300

R.O.S. 10225

11-SD-78

DIEGO

SAN

CITY

N. 1/2 N.W. 1/4

S. 1/2 N.W. 1/4
SECTION 35
T.12S., R.1W., S.B.M.

2" IRON PIPE & DISC STAMPED LS 4670 PER ROS 10225. NOT FOUND.

FOUND DISTURBED 2" IRON PIPE AND DISC STAMPED LS 4670 PER ROS 10225. RESET PER LEGEND.

FOUND 1" IRON PIPE & CITY ENGINEER TAG PER ROS 10225

FOUND CONC. MON WITH 2-1/2" BRASS PLATE PER ROS 10225

FOUND CONC. MON WITH 2-1/2" BRASS PLATE PER ROS 10225

BASIS OF BEARINGS

(S 88°08'28" W
S 88°32'17" W
2668.58')
2668.55

(714.28')
1357.39' (1357.42')

S 40°34'58" W 858.40'

S 53°18'30" W 530.98'
[S 53°16'23" W 530.93']

1368.68' (GRID)

Δ=20°55'09"
R=930.05'
L=339.57

Δ=19°26'51"
R=950.05'
L=322.47

Δ=42°09'06"
R=1200.07'
L=882.88'

(N 88°08'28" E 586.44')
<N 88°30'52" E 586.36'(CALC)>
N 88°32'17" E 586.42'

251.88'
<251.70'>

(N 62°29'52" E 227.78'
(N 62°06'00" E (227.70')

N 73°32'35" E 535.33'
(N 73°08'45" E 535.32')

S 44°01'24" W (RAD)
(S 45°30'53" W (RAD))

Δ=01°49'15"
R=1200.07'
L=38.13'
<Δ=01°49'15"
R=1200.07'(CALC)
L=38.18'>

(1378.51')
<1378.41'(CALC)>
1378.41'

Δ=05°43'39"
R=770.04'
L=76.98'
<Δ=05°43'20"
R=770.00'
L=76.90'>
[Δ=05°43'45"
R=770.04'(CALC)
L=77.00']

S 32°33'16" E 1493.14' (GRID)

N 20°41'16" E 643.18'

(N 05°10'34" E 557.48')
N 05°34'33" E 557.39'
OF

1287.57'
1287.57'

CITY

N 88°59'18" E
(N 88°35'34" E)

1362.80'

(N 00°52'49" W 2756.98')
<N 00°30'00" W>
N 00°28'57" W 2756.82'

S 01°14'17" E 2774.78'
(S 01°36'11" E 2774.84')

(1357.42')
1357.36'

1378.41'
(1378.45')

N 89°26'41" E
(N 89°02'58" E

2632.36'
2632.36')

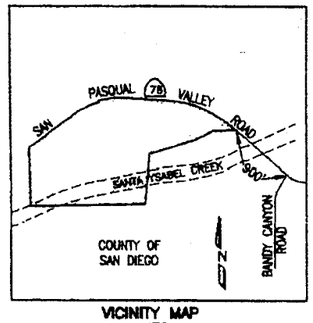
LEGEND

- ● FOUND 2" IRON PIPE W/DISC STAMPED L.S. 4670, PER ROS 10225 UNLESS OTHER WISE NOTED.
- ■ FOUND 1" IRON PIPE W/DISC STAMPED "DIV. HWYS" PER MS 766 & ROS 10225.
- ▲ FOUND 1" IRON PIPE & "CAL DOT" DISC PER ROS 14300, UNLESS OTHERWISE NOTED.
- ○ INDICATES SET 2"X24" IRON PIPE AND TAG STAMPED "LS 5770"
- < > INDICATES RECORD VALUES PER ROS 14300 UNLESS OTHERWISE NOTED.
- ( ) INDICATES RECORD VALUES PER ROS 10225 UNLESS OTHERWISE NOTED.
- [ ] INDICATES RECORD VALUES PER FINAL ORDER OF CONDEMNATION RECORDED 6-5-92 AS FILE NO. 1992-0352799.
- /// (RAD) INDICATES RADIAL BEARING
- INDICATES ACCESS RIGHTS FROM PARCELS 1, 2 AND 3 IN SAN PASQUAL VALLEY ROAD (EXCEPTING THEREFROM ACCESS OPENINGS NO. 1. AND 2) ARE RELINQUISHED AND WAIVED AND ACCEPTED HEREON.
- [A] INDICATES EASEMENT FOR THE RIGHT TO EXTEND AND MAINTAIN DRAINAGE FACILITIES, EXCAVATION AND EMBANKMENT SLOPES BEYOND THE LIMITS OF THE EXISTING RIGHT-OF-WAY OF SAN PASQUAL VALLEY ROAD (SR 78) DEDICATED AND REJECTED HEREON.

MONUMENTATION NOTE
UNLESS OTHERWISE SHOWN ON THIS MAP, ALL LOT CORNERS ARE MONUMENTED BY A 1/2" X 18" IRON PIPE WITH PLASTIC CAP STAMPED "RCE 30592".

BASIS OF BEARINGS
THE BASIS OF BEARINGS FOR THIS SURVEY IS THE NAD 83, ZONE 6, GRID BEARING BETWEEN STATION 78-26.72 CHD AND STATION ROCKWOOD, AS SAID STATIONS ARE PUBLISHED IN THE SAN DIEGO COUNTY HORIZONTAL CONTROL BOOK. I.E. N40°34'58"E.

SOLAR NOTE
ALL LOTS WITHIN THIS SUBDIVISION HAVE A MINIMUM OF 100 SQUARE FEET OF SOLAR ACCESS FOR EACH EXISTING AND/OR PROPOSED DWELLING UNIT AS REQUIRED BY SECTION 81.401(m) OF THE SUBDIVISION ORDINANCE.



VICINITY MAP
NTS

-00°23'32.44" AT STA ROCKWOOD

CCS 83 GRID NORTH
GEODETIC NORTH

CONVERGENCE ANGLE
N.T.S.

200' 0' 200' 400' 600'
GRAPHIC SCALE: 1"=200'

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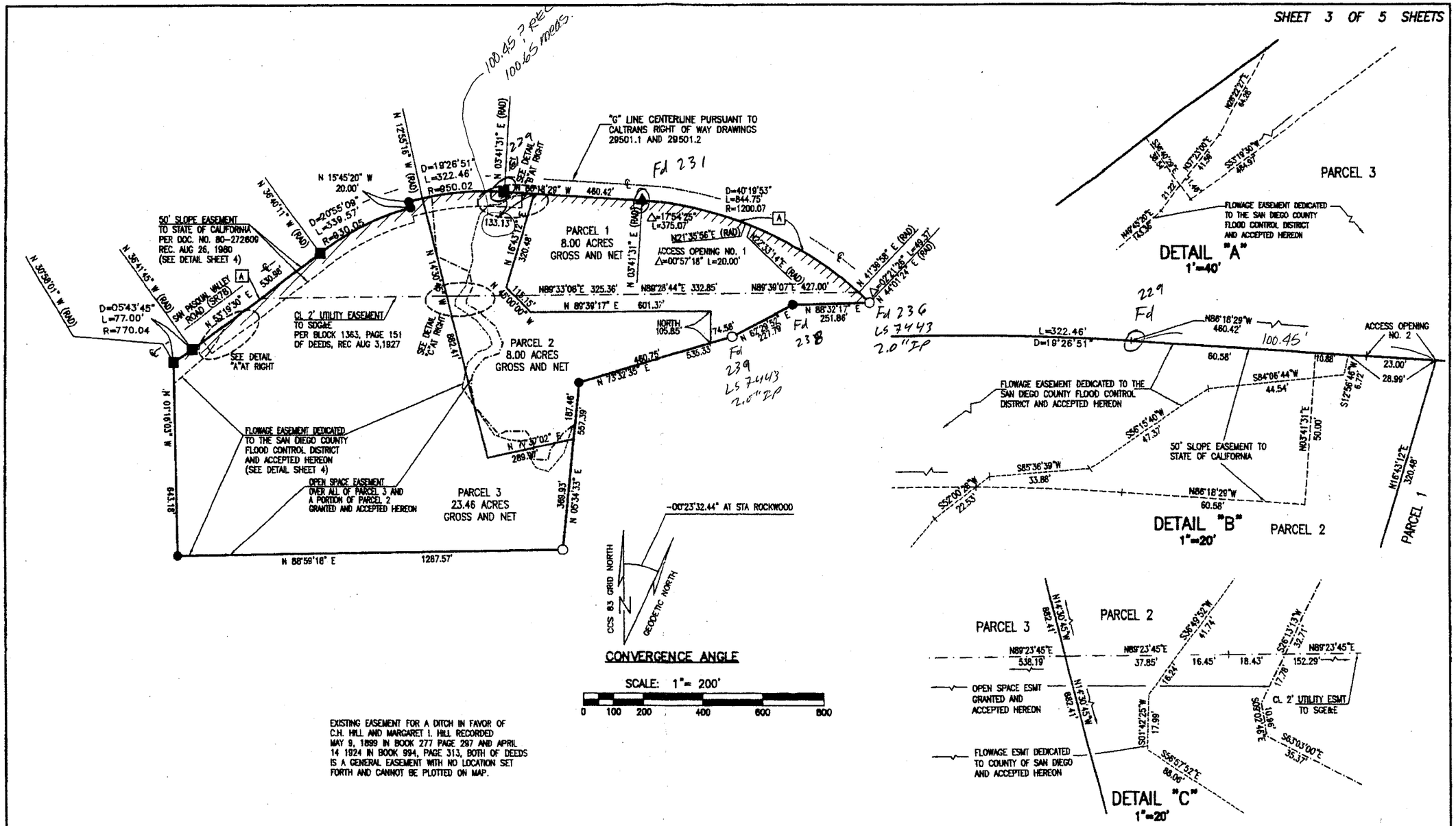
GRADING PLAN L- NONE TPM 20044
CALIF. COOR. INDEX 334-4779(X)(CCS27)

PARCEL MAP NO. 19095



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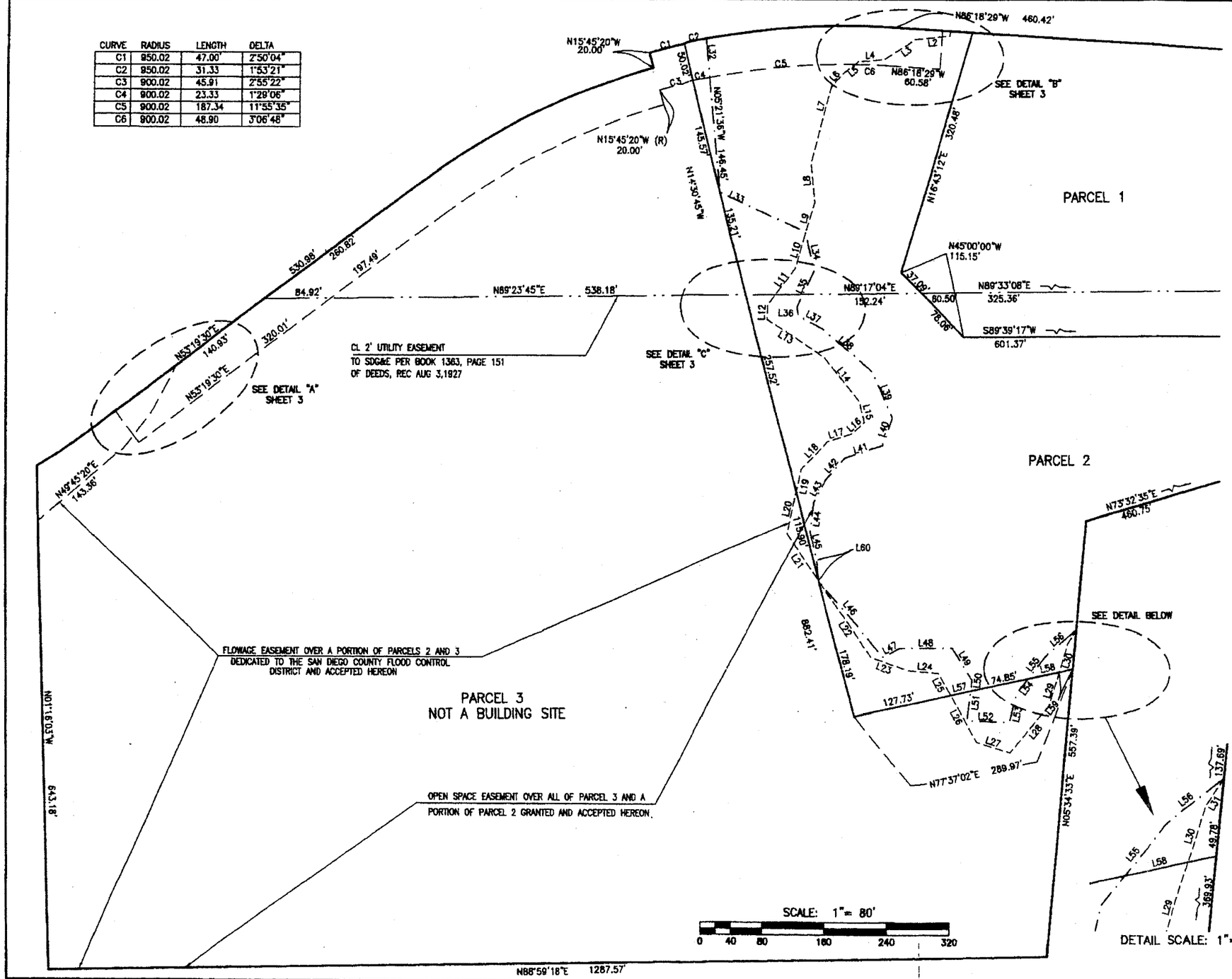
GRADING PLAN L- NONE TPM 20044
CALIF. COOR. INDEX 334-1779(X)(CCS27)

PARCEL MAP NO. 19095

SHEET 4 OF 5 SHEETS

CURVE	RADIUS	LENGTH	DELTA
C1	950.02	47.00'	2°50'04"
C2	950.02	31.33	1°53'21"
C3	900.02	45.91	2°55'22"
C4	900.02	23.33	1°29'06"
C5	900.02	187.34	11°55'35"
C6	900.02	48.90	3°06'48"



L2	N 84°06'44"	E	44.54'
L3	N 56°15'40"	E	47.37'
L4	N 85°36'39"	E	33.88'
L5	N 52°00'28"	E	22.53'
L6	N 40°29'28"	E	23.49'
L7	N 15°15'09"	E	101.93'
L8	N 05°27'54"	E	49.77'
L9	N 16°34'11"	E	39.55'
L11	N 36°49'52"	E	57.98'
L12	N 01°42'25"	E	17.99'
L13	N 56°57'52"	W	86.06'
L14	N 38°38'16"	W	71.23'
L15	N 14°31'32"	W	26.91'
L16	N 49°35'53"	E	22.92'
L17	N 71°43'25"	E	30.62'
L18	N 44°19'55"	E	50.22'
L19	N 12°45'11"	E	29.32'
L20	N 12°45'11"	E	54.31'
L21	N 34°42'34"	W	72.07'
L22	N 34°42'34"	W	116.88'
L23	N 70°05'05"	W	49.23'
L24	N 85°02'10"	W	40.29'
L25	N 29°43'53"	W	33.14'
L26	N 29°43'53"	W	68.44'
L27	N 72°48'52"	W	44.11'
L28	N 40°12'58"	E	77.73'
L29	N 17°44'39"	E	46.10'
L30	N 17°44'39"	E	46.10'
L31	N 33°17'04"	E	20.79'
L32	N 05°21'36"	W	50.26'
L33	N 65°19'15"	W	120.97'
L34	N 12°30'06"	W	51.49'
L35	N 26°13'13"	E	50.49'
L36	N 09°02'46"	W	10.96'
L37	N 63°03'00"	W	35.37'
L38	N 49°55'33"	W	85.21'
L39	N 23°17'11"	W	62.96'
L40	N 19°19'58"	E	37.16'
L41	N 71°41'58"	E	51.32'
L42	N 40°39'31"	E	36.92'
L43	N 29°30'24"	E	32.52'
L44	N 06°52'37"	E	37.58'
L45	N 13°06'51"	W	37.10'
L46	N 40°41'27"	W	126.89'
L47	N 61°11'21"	E	24.44'
L48	N 89°40'48"	E	66.95'
L49	N 32°36'15"	W	49.05'
L50	N 07°30'32"	E	14.09'
L51	N 07°30'32"	E	37.77'
L52	N 87°38'07"	W	53.98'
L53	N 13°44'51"	E	37.82'
L54	N 36°33'09"	E	24.27'
L55	N 36°33'09"	E	42.62'
L56	N 52°01'07"	E	47.39'
L57	N 77°37'02"	E	26.89'
L58	N 77°37'02"	E	41.92'
L59	N 77°37'02"	E	18.57'
L60	N 05°35'09"	E	25.99'

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GRADING PLAN L– NONE TPM 20044

CALIF. COOR. INDEX 334-4779(X)(CCS27)

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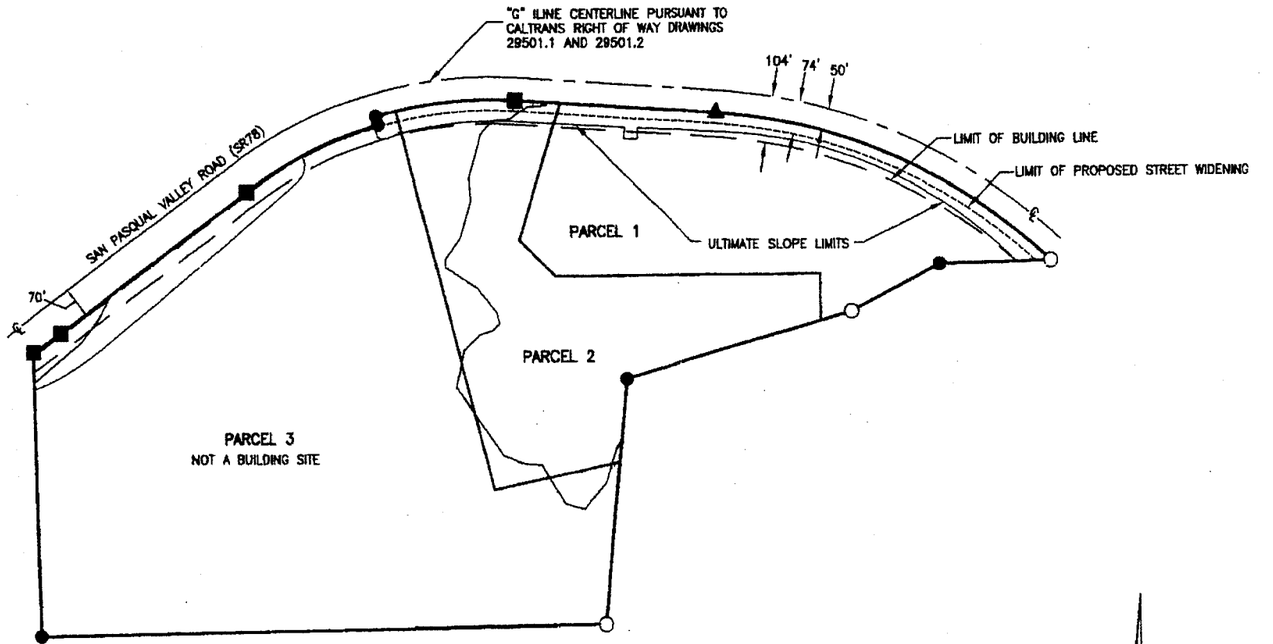
PARCEL MAP NO. 19095

SHEET 5 OF 5 SHEETS

NON-TITLE INFORMATION



LEGEND

▭ APPROXIMATE AREA SUBJECT TO INUNDATION BY 100-YEAR FLOOD

NOTE A: INFORMATION SHOWN ON THIS SHEET IS ADVISORY ONLY AND IS NOT INTENDED TO AFFECT RECORD TITLE INTEREST.

NOTE B: INFORMATION SHOWN HEREON IS COMPILED FROM PUBLIC RECORDS OR REPORTS AND ITS INCLUSION IN THIS MAP DOES NOT IMPLY THE CORRECTNESS OR SUFFICIENCY OF THESE RECORDS OR REPORTS BY THE PREPARER OF THIS MAP.

N

1"= 200'

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GRADING PLAN L- NONE TPM 20044

CALIF. COOR. INDEX 334-4779(X)(CCS27)

Raymond Chandler
Red Wind
(1938)

ONE

There was a desert wind blowing that night. It was one of those hot dry Santa Anas that come down through the mountain passes and curl your hair and make your nerves jump and your skin itch. On nights like that every booze party ends in a fight. Meek little wives feel the edge of the carving knife and study their husbands' necks. Anything can happen. You can even get a full glass of beer at a cocktail lounge.

I was getting one in a flossy new place across the street from the apartment house where I lived. It had been open about a week and it wasn't doing any business. The kid behind the bar was in his early twenties and looked as if he had never had a drink in his life.

There was only one other customer, a souse on a bar stool with his back to the door. He had a pile of dimes stacked neatly in front of him, about two dollars' worth. He was drinking straight rye in small glasses and he was all by himself in a world of his own.

I sat farther along the bar and got my glass of beer and said: "You sure cut the clouds off them, buddy. I will say that for you."

"We just opened up," the kid said. "We got to build up trade. Been in before, haven't you, mister?"

"Uh-huh."

"Live around here?"

"In the Berglund Apartments across the street," I said. "And the name is Philip Marlowe."

"Thanks, mister. Mine's Lew Petrolle." He leaned close to me across the polished dark bar. "Know that guy?"

"No."

"He ought to go home, kind of. I ought to call a taxi and send him home. He's doing his next week's drinking too soon."

"A night like this," I said. "Let him alone."

"It's not good for him," the kid said, scowling at me.

"Rye!" the drunk croaked, without looking up. He snapped his fingers so as not to disturb his piles of dimes by banging on the bar.

The kid looked at me and shrugged. "Should I?"

"Whose stomach is it? Not mine."

The kid poured him another straight rye and I think he doctored it with water down behind the bar because when he came up with it he looked as guilty as if he'd kicked his grandmother. The drunk paid no attention. He lifted coins off his pile with the exact care of a crack surgeon operating on a brain tumor.

The kid came back and put more beer in my glass. Outside the wind howled. Every once in a while it blew the stainedglass door open a few inches. It was a heavy door.

The kid said: "I don't like drunks in the first place and in the second place I don't like them getting drunk in here, and in the third place I don't like them in the first place."

"Warner Brothers could use that," I said.

"They did."

Just then we had another customer. A car squeaked to a stop outside and the swinging door came open. A fellow came in who looked a little in a hurry. He held the door and ranged the place quickly with flat, shiny, dark eyes. He was well set up, dark, good-looking in a narrow-faced, tight-lipped way. His clothes were dark and a white handkerchief peeped coyly from his pocket and he looked cool as well as under a tension of some sort. I guessed it was the hot wind. I felt a bit the same myself only not cool.

He looked at the drunk's back. The drunk was playing checkers with his empty glasses. The new customer looked at me, then he looked along the line of half-booths at the other side of the place. They were all empty. He came on in-down past where the drunk sat swaying and muttering to himself-and spoke to the bar kid.

"Seen a lady in here, buddy? Tall, pretty, brown hair, in a print bolero jacket over a blue crêpe silk dress. Wearing a widebrimmed straw hat with a velvet band." He had a tight voice I didn't like.

"No, sir. Nobody like that's been in," the bar kid said.

"Thanks. Straight Scotch. Make it fast, will you?"

The kid gave it to him and the fellow paid and put the drink down in a gulp and started to go out. He took three or four steps and stopped, facing the drunk. The drunk was grinning. He swept a gun from somewhere so fast that it was just a blur coming out. He held it steady and he didn't look any drunker than I was. The tall dark guy stood quite still and then his head jerked back a little and then he was still again.

A car tore by outside. The drunk's gun was a .22 target automatic, with a large front sight. It made a couple of hard snaps and a little smoke curled-very little.

"So long, Waldo," the drunk said.

Then he put the gun on the barman and me.

The dark guy took a week to fall down. He stumbled, caught himself, waved one arm, stumbled again. His hat fell off, and then he hit the floor with his face. After he hit it he might have been poured concrete for all the fuss he made.

The drunk slid down off the stool and scooped his dimes into a pocket and slid towards the door. He turned sideways, holding the gun across his body. I didn't have a gun. I hadn't thought I needed one to buy a glass of beer. The kid behind the bar didn't move or make the slightest sound.

The drunk felt the door lightly with his shoulder, keeping his eyes on us, then pushed through it backwards. When it was wide a hard gust of air slammed in and lifted the hair of the man on the floor. The drunk said: "Poor Waldo. I bet I made his nose bleed."

The door swung shut. I started to rush it-from long practice in doing the wrong thing. In this case it didn't matter. The car outside let out a roar and when I got onto the sidewalk it was flicking a red smear of taillight around the nearby corner. I got its license number the way I got my first million.

There were people and cars up and down the block as usual. Nobody acted as if a gun had gone off. The wind was making enough noise to make the hard quick rap of .22 ammunition sound like a slammed door, even if anyone heard it. I went back into the cocktail bar.

The kid hadn't moved, even yet. He just stood with his hands flat on the bar, leaning over a little and looking down at the dark guy's back. The dark guy hadn't moved either. I bent down and felt his neck artery. He wouldn't move-ever.

The kid's face had as much expression as a cut of round steak and was about the same color. His eyes were more angry than shocked.

I lit a cigarette and blew smoke at the ceiling and said shortly: "Get on the phone."

"Maybe he's not dead," the kid said.

"When they use a twenty-two that means they don't make mistakes. Where's the phone?"

"I don't have one. I got enough expenses without that. Boy, can I kick eight hundred bucks in the face!"

"You own this place?"

"I did till this happened."

He pulled his white coat off and his apron and came around the inner end of the bar. "I'm locking this door," he said, taking keys out.

He went out, swung the door to and jiggled the lock from the outside until the bolt clicked into place. I bent down and rolled Waldo over. At first I couldn't even see where the shots went in. Then I could. A couple of tiny holes in his coat, over his heart. There was a little blood on his shirt.

The drunk was everything you could ask-as a killer.

The prowl-car boys came in about eight minutes. The kid, Lew Petrolle, was back behind the bar by then. He had his white coat on again and he was counting his money in the register and putting it in his pocket and making notes in a little book.

I sat at the edge of one of the half-booths and smoked cigarettes and watched Waldo's face get deader and deader. I wondered who the girl in the print coat was, why Waldo had left the engine of his car running outside, why he was in a hurry, whether the drunk had been waiting for him or just happened to be there.

The prowl-car boys came in perspiring. They were the usual large size and one of them had a flower stuck under his cap and his cap on a bit crooked. When he saw the dead man he got rid of the flower and leaned down to feel Waldo's pulse.

"Seems to be dead," he said, and rolled him around a little more. "Oh yeah, I see where they went in. Nice clean work. You two see him get it?"

I said yes. The kid behind the bar said nothing. I told them about it, that the killer seemed to have left in Waldo's car.

The cop yanked Waldo's wallet out, went through it rapidly and whistled. "Plenty jack and no driver's license." He put the wallet away. "O.K., we didn't touch him, see? Just a chance we could find did he have a car and put it on the air."

"The hell you didn't touch him," Lew Patrolle said.

The cop gave him one of those looks. "O.K., pal," he said softly. "We touched him."

The kid picked up a clean highball glass and began to polish it. He polished it all the rest of the time we were there.

In another minute a homicide fast-wagon sirened up and screeched to a stop outside the door and four men came in, two dicks, a photographer and a laboratory man. I didn't know either of the dicks. You can be in the detecting business a long time and not know all the men on a big city force.

One of them was a short, smooth, dark, quiet, smiling man, with curly black hair and soft intelligent eyes. The other was big, raw-boned, long-jawed, with a veined nose and glassy eyes. He looked like a heavy drinker. He looked tough, but he looked as if he thought he was a little tougher than he was. He shooed me into the last booth against the wall and his partner got the kid up front and the bluecoats went out. The fingerprint man and photographer set about their work.

A medical examiner came, stayed just long enough to get sore because there was no phone for him to call the morgue wagon.

The short dick emptied Waldo's pockets and then emptied his wallet and dumped everything into a large handkerchief on a booth table. I saw a lot of currency, keys, cigarettes, another handkerchief, very little else.

The big dick pushed me back into the end of the half-booth. "Give," he said. "I'm Copernik, Detective Lieutenant."

I put my wallet in front of him. He looked at it, went through it, tossed it back, made a note in a book.

"Philip Marlowe, huh? A shamus. You here on business?"

"Drinking business," I said. "I live just across the street in the Berglund."

"Know this kid up front?"

"I've been in here once since he opened up."

"See anything funny about him now?"

"No."

"Takes it too light for a young fellow, don't he? Never mind answering. Just tell the story."

I told it-three times. Once for him to get the outline, once for him to get the details and once for him to see if I had it too pat. At the end he said: "This dame interests me. And the killer called the guy Waldo, yet didn't seem to be anyways sure he would be in. I

mean, if Waldo wasn't sure the dame would be here, nobody could be sure Waldo would be here."

"That's pretty deep," I said.

He studied me. I wasn't smiling. "Sounds like a grudge job, don't it? Don't sound planned. No getaway except by accident. A guy don't leave his car unlocked much in this town. And the killer works in front of two good witnesses. I don't like that."

"I don't like being a witness," I said. "The pay's too low."

He grinned. His teeth had a freckled look. "Was the killer drunk really?"

"With that shooting? No."

"Me too. Well, it's a simple job. The guy will have a record and he's left plenty prints. Even if we don't have his mug here we'll make him in hours. He had something on Waldo, but he wasn't meeting Waldo tonight. Waldo just dropped in to ask about a dame he had a date with and had missed connections on. It's a hot night and this wind would kill a girl's face. She'd be apt to drop in somewhere to wait. So the killer feeds Waldo two in the right place and scrams and don't worry about you boys at all. It's that simple."

"Yeah," I said.

"It's so simple it stinks," Copernik said.

He took his felt hat off and tousled up his ratty blond hair and leaned his head on his hands. He had a long mean horse face. He got a handkerchief out and mopped it, and the back of his neck and the back of his hands. He got a comb out and combed his hair-he looked worse with it combed-and put his hat back on.

"I was just thinking," I said.

"Yeah? What?"

"This Waldo knew just how the girl was dressed. So he must already have been with her tonight."

"So, what? Maybe he had to go to the can. And when he came back she's gone. Maybe she changed her mind about him."

"That's right," I said.

But that wasn't what I was thinking at all. I was thinking that Waldo had described the girl's clothes in a way the ordinary man wouldn't know how to describe them. Printed bolero jacket over blue crêpe silk dress. I didn't even know what a bolero jacket was, And I might have said blue dress or even blue silk dress, but never blue crêpe silk dress.

After a while two men came with a basket. Lew Petrolle was still polishing his glass and talking to the short dark dick.

We all went down to Headquarters.

Lew Petrolle was all right when they checked on him. His father had a grape ranch near Antioch in Contra Costa County. He had given Lew a thousand dollars to go into business and Lew had opened the cocktail bar, neon sign and all, on eight hundred flat.

They let him go and told him to keep the bar closed until they were sure they didn't want to do any more printing. He shook hands all around and grinned and said he guessed the killing would be good for business after all, because nobody believed a

newspaper account of anything and people would come to him for the story and buy drinks while he was telling it.

"There's a guy won't ever do any worrying," Copernik said, when he was gone. "Over anybody else."

"Poor Waldo," I said. "The prints any good?"

"Kind of smudged," Copernik said sourly. "But we'll get a classification and teletype it to Washington some time tonight. If it don't click, you'll be in for a day on the steel picture racks downstairs."

I shook hands with him and his partner, whose name was Ybarra, and left. They didn't know who Waldo was yet either. Nothing in his pockets told.

TWO

I got back to my street about 9 P.M. I looked up and down the block before I went into the Berglund. The cocktail bar was farther down on the other side, dark, with a nose or two against the glass, but no real crowd. People had seen the law and the morgue wagon, but they didn't know what had happened. Except the boys playing pinball games in the drugstore on the corner. They know everything, except how to hold a job.

The wind was still blowing, oven-hot, swirling dust and torn paper up against the walls.

I went into the lobby of the apartment house and rode the automatic elevator up to the fourth floor. I unwound the doors and stepped out and there was a tall girl standing there waiting for the car.

She had brown wavy hair under a wide-brimmed straw hat with a velvet band and loose bow. She had wide blue eyes and eyelashes that didn't quite reach her chin. She wore a blue dress that might have been crêpe silk, simple in lines but not missing any curves. Over it she wore what might have been a print bolero jacket.

I said: "Is that a bolero jacket?"

She gave me a distant glance and made a motion as if to brush a cobweb out of the way.

"Yes. Would you mind-I'm rather in a hurry. I'd like-"

I didn't move. I blocked her off from the elevator. We stared at each other and she flushed very slowly.

"Better not go out on the street in those clothes," I said.

"Why, how dare you-"

The elevator clanked and started down again. I didn't know what she was going to say. Her voice lacked the edgy twang of a beer-parlor frill. It had a soft light sound, like spring rain.

"It's not a make," I said. "You're in trouble. If they come to this floor in the elevator, you have just that much time to get off the hall. First take off the hat and jacket-and snap it up!"

She didn't move. Her face seemed to whiten a little behind the not-too-heavy make-up.

"Cops," I said, "are looking for you. In those clothes. Give me the chance and I'll tell you why."

She turned her head swiftly and looked back along the corridor. With her looks I didn't blame her for trying one more bluff.

"You're impertinent, whoever you are. I'm Mrs. Leroy in Apartment Thirty-one. I can assure-"

"That you're on the wrong floor," I said. "This is the fourth." The elevator had stopped down below. The sound of doors being wrenched open came up the shaft.

"Off!" I rapped. "Now!"

She switched her hat off and slipped out of the bolero jacket, fast. I grabbed them and wadded them into a mess under my arm. I took her elbow and turned her and we were going down the hall.

"I live in Forty-two. The front one across from yours, just a floor up. Take your choice. Once again-I'm not on the make."

She smoothed her hair with that quick gesture, like a bird preening itself. Ten thousand years of practice behind it.

"Mine," she said, and tucked her bag under her arm and strode down the hall fast. The elevator stopped at the floor below. She stopped when it stopped. She turned and faced me.

"The stairs are back by the elevator shaft," I said gently.

"I don't have an apartment," she said.

"I didn't think you had."

"Are they searching for me?"

"Yes, but they won't start gouging the block stone by stone before tomorrow. And then only if they don't make Waldo."

She stared at me. "Waldo?"

"Oh, you don't know Waldo," I said.

She shook her head slowly. The elevator started down in the shaft again. Panic flicked in her blue eyes like a ripple on water.

"No," she said breathlessly, "but take me out of this hall."

We were almost at my door. I jammed the key in and shook the lock around and heaved the door inward. I reached in far enough to switch lights on. She went in past me like a wave. Sandalwood floated on the air, very faint.

I shut the door, threw my hat into a chair and watched her stroll over to a card table on which I had a chess problem set out that I couldn't solve. Once inside, with the door locked, her panic had left her.

"So you're a chess player," she said, in that guarded tone, as if she had come to look at my etchings. I wished she had.

We both stood still then and listened to the distant clang of elevator doors and then steps-going the other way.

I grinned, but with strain, not pleasure, went out into the kitchenette and started to fumble with a couple of glasses and then realized I still had her hat and bolero jacket under my arm. I went into the dressing room behind the wall bed and stuffed them into a drawer, went back out to the kitchenette, dug out some extra-fine Scotch and made a couple of highballs.

When I went in with the drinks she had a gun in her hand. It was a small automatic with a pearl grip. It jumped up at me and her eyes were full of horror.

I stopped, with a glass in each hand, and said: "Maybe this hot wind has got you crazy too. I'm a private detective. I'll prove it if you let me."

She nodded slightly and her face was white. I went over slowly and put a glass down beside her, and went back and set mine down and got a card out that had no bent corners. She was sitting down, smoothing one blue knee with her left hand, and holding the gun on the other. I put the card down beside her drink and sat with mine.

"Never let a guy get that close to you," I said. "Not if you mean business. And your safety catch is on."

She flashed her eyes down, shivered, and put the gun back in her bag. She drank half the drink without stopping, put the glass down hard and picked the card up.

"I don't give many people that liquor," I said. "I can't afford to."

Her lips curled. "I supposed you would want money."

"Huh?"

She didn't say anything. Her hand was close to her bag again.

"Don't forget the safety catch," I said. Her hand stopped. I went on: "This fellow I called Waldo is quite tall, say fiveeleven, slim, dark, brown eyes with a lot of glitter. Nose and mouth too thin. Dark suit, white handkerchief showing, and in a hurry to find you. Am I getting anywhere?"

She took her glass again. "So that's Waldo," she said. "Well, what about him?" Her voice seemed to have a slight liquor edge now.

"Well, a funny thing. There's a cocktail bar across the street . . . Say, where have you been all evening?"

"Sitting in my car," she said coldly, "most of the time."

"Didn't you see a fuss across the street up the block?"

Her eyes tried to say no and missed. Her lips said: "I knew there was some kind of disturbance. I saw policemen and red searchlights. I supposed someone had been hurt."

"Someone was. And this Waldo was looking for you before that. In the cocktail bar. He described you and your clothes."

Her eyes were set like rivets now and had the same amount of expression. Her mouth began to tremble and kept on trembling.

"I was in there," I said, "talking to the kid that runs it. There was nobody in there but a drunk on a stool and the kid and myself. The drunk wasn't paying any attention to

anything. Then Waldo came in and asked about you and we said no, we hadn't seen you and he started to leave."

I sipped my drink. I like an effect as well as the next fellow. Her eyes ate me.

"Just started to leave. Then this drunk that wasn't paying any attention to anyone called him Waldo and took a gun out. He shot him twice-I snapped my fingers twice-' 'like that. Dead."

She fooled me. She laughed in my face. "So my husband hired you to spy on me," she said. "I might have known the whole thing was an act. You and your Waldo."

I gawked at her.

"I never thought of him as jealous," she snapped. "Not of a man who had been our chauffeur anyhow. A little about Stan, of course-that's natural. But Joseph Coates-"

I made motions in the air. "Lady, one of us has this book open at the wrong page," I grunted. "I don't know anybody named Stan or Joseph Coates. So help me, I didn't even know you had a chauffeur. People around here don't run to them. As for husbands-yeah, we do have a husband once in a while. Not often enough."

She shook her head slowly and her hand stayed near her bag and her blue eyes had glitters in them.

"Not good enough, Mr. Marlowe. No, not nearly good enough. I know you private detectives. You're all rotten. You tricked me into your apartment, if it is your apartment. More likely it's the apartment of some horrible man who will swear anything for a few dollars. Now you're trying to scare me. So you can blackmail me-as well as get money from my husband. All right," she said breathlessly, "how much do I have to pay?"

I put my empty glass aside and leaned back. "Pardon me if I light a cigarette," I said. "My nerves are frayed."

I lit it while she watched me without enough fear for any real guilt to be under it. "So Joseph Coates is his name," I said. "The guy that killed him in the cocktail bar called him Waldo."

She smiled a bit disgustedly, but almost tolerantly. "Don't stall. How much?"

"Why were you trying to meet this Joseph Coates?"

"I was going to buy something he stole from me, of course. Something that's valuable in the ordinary way too. Almost fifteen thousand dollars. The man I loved gave it to me. He's dead. There! He's dead! He died in a burning plane. Now, go back and tell my husband that, you slimy little rat!"

"I'm not little and I'm not a rat," I said.

"You're still slimy. And don't bother about telling my husband. I'll tell him myself. He probably knows anyway."

I grinned. "That's smart. Just what was I supposed to find out?"

She grabbed her glass and finished what was left of her drink. "So he thinks I'm meeting Joseph. Well, perhaps I was. But not to make love. Not with a chauffeur. Not with a bum I picked off the front step and gave a job to. I don't have to dig down that far, if I want to play around."

"Lady," I said, "you don't indeed."

"Now, I'm going," she said. "You just try and stop me." She snatched the pearl-handled gun out of her bag. I didn't move.

"Why, you nasty little string of nothing," she stormed. "How do I know you're a private detective at all? You might be a crook. This card you gave me doesn't mean anything. Anybody can have cards printed."

"Sure," I said. "And I suppose I'm smart enough to live here two years because you were going to move in today so I could blackmail you for not meeting a man named Joseph Coates who was bumped off across the street under the name of Waldo. Have you got the money to buy this something that cost fifteen grand?"

"Oh! You think you'll hold me up, I suppose!"

"Oh!" I mimicked her, "I'm a stick-up artist now, am I? Lady, will you please either put that gun away or take the safety catch off? It hurts my professional feelings to see a nice gun made a monkey of that way."

"You're a full portion of what I don't like," she said. "Get out of my way."

I didn't move. She didn't move. We were both sitting down-and not even close to each other.

"Let me in on one secret before you go," I pleaded. "What in hell did you take the apartment down on the floor below for? Just to meet a guy down on the street?"

"Stop being silly," she snapped. "I didn't. I lied. It's his apartment."

"Joseph Coates'?"

She nodded sharply.

"Does my description of Waldo sound like Joseph Coates?"

She nodded sharply again.

"All right. That's one fact learned at last. Don't you realize Waldo described your clothes before he was shot-when he was looking for you-that the description was passed on to the police-that the police don't know who Waldo is-and are looking for somebody in those clothes to help tell them? Don't you get that much?"

The gun suddenly started to shake in her hand. She looked down at it, sort of vacantly, and slowly put it back in her bag.

"I'm a fool," she whispered, "to be even talking to you." She stared at me for a long time, then pulled in a deep breath. "He told me where he was staying. He didn't seem afraid. I guess blackmailers are like that. He was to meet me on the street, but I was late. It was full of police when I got here. So I went back and sat in my car for a while. Then I came up to Joseph's apartment and knocked. Then I went back to my car and waited again. I came up here three times in all. The last time I walked up a flight to take the elevator. I had already been seen twice on the third floor. I met you. That's all."

"You said something about a husband," I grunted. "Where is he?"

"He's at a meeting."

"Oh, a meeting," I said, nastily.

"My husband's a very important man. He has lots of meetings. He's a hydroelectric engineer. He's been all over the world. I'd have you know-"

"Skip it," I said. "I'll take him to lunch some day and have him tell me himself. Whatever Joseph had on you is dead stock now. Like Joseph."

"He's really dead?" she whispered. "Really?"

"He's dead," I said. "Dead, dead, dead. Lady, he's dead."

She believed it at last. I hadn't thought she ever would somehow. In the silence, the elevator stopped at my floor.

I heard steps coming down the hall. We all have hunches. I put my finger to my lips. She didn't move now. Her face had a frozen look. Her big blue eyes were as black as the shadows below them. The hot wind boomed against the shut windows. Windows have to be shut when a Santa Ana blows, heat or no heat.

The steps that came down the hall were the casual ordinary steps of one man. But they stopped outside my door, and somebody knocked.

I pointed to the dressing room behind the wall bed. She stood up without a sound, her bag clenched against her side. I pointed again, to her glass. She lifted it swiftly, slid across the carpet, through the door, drew the door quietly shut after her.

I didn't know just what I was going to all this trouble for.

The knocking sounded again. The backs of my hands were wet. I creaked my chair and stood up and made a loud yawning sound. Then I went over and opened the door-without a gun. That was a mistake.

THREE

I didn't know him at first. Perhaps for the opposite reason Waldo hadn't seemed to know him. He'd had a hat on all the time over at the cocktail bar and he didn't have one on now. His hair ended completely and exactly where his hat would start. Above that line was hard white sweatless skin almost as glaring as scar tissue. He wasn't just twenty years older. He was a different man.

But I knew the gun he was holding, the .22 target automatic with the big front sight. And I knew his eyes. Bright, brittle, shallow eyes like the eyes of a lizard.

He was alone. He put the gun against my face very lightly and said between his teeth: "Yeah, me. Let's go on in."

I backed in just far enough and stopped. Just the way he would want me to, so he could shut the door without moving much. I knew from his eyes that he would want me to do just that.

I wasn't scared. I was paralyzed.

When he had the door shut he backed me some more, slowly, until there was something against the back of my legs. His eyes looked into mine.

"That's a card table," he said. "Some goon here plays chess. You?"

I swallowed. "I don't exactly play it. I just fool around."

"That means two," he said with a kind of hoarse softness, as if some cop had hit him across the windpipe with a blackjack once, in a third-degree session.

"It's a problem," I said. "Not a game. Look at the pieces."

"I wouldn't know."

"Well, I'm alone," I said, and my voice shook just enough.

"It don't make any difference," he said. "I'm washed up anyway. Some nose puts the bulls on me tomorrow, next week, what the hell? I just didn't like your map, pal. And that smugfaced pansy in the bar coat that played left tackle for Fordham or something. To hell with guys like you guys."

I didn't speak or move. The big front sight raked my cheek lightly almost caressingly. The man smiled.

"It's kind of good business too," he said. "Just in case. An old con like me don't make good prints, all I got against me is two witnesses. The hell with it."

"What did Waldo do to you?" I tried to make it sound as if I wanted to know, instead of just not wanting to shake too hard.

"Stooled on a bank job in Michigan and got me four years. Got himself a nolle prosse. Four years in Michigan ain't no summer cruise. They make you be good in them lifer states."

"How'd you know he'd come in there?" I croaked.

"I didn't. Oh yeah, I was lookin' for him. I was wanting to see him all right. I got a flash of him on the street night before last but I lost him. Up to then I wasn't lookin' for him. Then I was. A cute guy, Waldo. How is he?"

"Dead," I said.

"I'm still good," he chuckled. "Drunk or sober. Well, that don't make no doughnuts for me now. They make me downtown yet?"

I didn't answer him quick enough. He jabbed the gun into my throat and I choked and almost grabbed for it by instinct.

"Naw," he cautioned me softly. "Naw. You ain't that dumb."

I put my hands back, down at my sides, open, the palms towards him. He would want them that way. He hadn't touched me, except with the gun. He didn't seem to care whether I might have one too. He wouldn't-if he just meant the one thing.

He didn't seem to care very much about anything, coming back on that block. Perhaps the hot wind did something to him. It was booming against my shut windows like the surf under a pier.

"They got prints," I said. "I don't know how good."

"They'll be good enough-but not for teletype work. Take 'em airmail time to Washington and back to check 'em right. Tell me why I came here, pal."

"You heard the kid and me talking in the bar. I told him my name, where I lived."

"That's how, pal. I said why." He smiled at me. It was a lousy smile to be the last one you might see.

"Skip it," I said. "The hangman won't ask you to guess why he's there."

"Say, you're tough at that. After you, I visit that kid. I tailed him home from Headquarters, but I figure you're the guy to put the bee on first. I tail him home from the

city hall, in the rent car Waldo had. From Headquarters, pal. Them funny dicks. You can sit in their laps and they don't know you. Start runnin' for a streetcar and they open up with machine guns and bump two pedestrians, a hacker asleep in his cab, and an old scrubwoman on the second floor workin' a mop. And they miss the guy they're after. Them funny lousy dicks."

He twisted the gun muzzle in my neck. His eyes looked madder than before.

"I got time," he said. "Waldo's rent car don't get a report right away. And they don't make Waldo very soon. I know Waldo. Smart he was. A smooth boy, Waldo."

"I'm going to vomit," I said, "if you don't take that gun out of my throat."

He smiled and moved the gun down to my heart. "This about right? Say when."

I must have spoken louder than I meant to. The door of the dressing-room by the wall bed showed a crack of darkness. Then an inch. Then four inches. I saw eyes, but didn't look at them. I stared hard into the bald-headed man's eyes. Very hard. I didn't want him to take his eyes off mine.

"Scared?" he asked softly.

I leaned against his gun and began to shake. I thought he would enjoy seeing me shake. The girl came out through the door. She had her gun in her hand again. I was sorry as hell for her. She'd try to make the door-or scream. Either way it would be curtains-for both of us.

"Well, don't take all night about it," I bleated. My voice sounded far away, like a voice on a radio on the other side of a street.

"I like this, pal," he smiled. "I'm like that."

The girl floated in the air, somewhere behind him. Nothing was ever more soundless than the way she moved. It wouldn't do any good though. He wouldn't fool around with her at all. I had known him all my life but I had been looking into his eyes for only five minutes.

"Suppose I yell," I said.

"Yeah, suppose you yell. Go ahead and yell," he said with his killer's smile.

She didn't go near the door. She was right behind him.

"Well-here's where I yell," I said.

As if that was the cue, she jabbed the little gun hard into his short ribs, without a single sound.

He had to react. It was like a knee reflex. His mouth snapped open and both his arms jumped out from his sides and he arched his back just a little. The gun was pointing at my right eye.

I sank and kneed him with all my strength, in the groin.

His chin came down and I hit it. I hit it as if I was driving the last spike on the first transcontinental railroad. I can still feel it when I flex my knuckles.

His gun raked the side of my face but it didn't go off. He was already limp. He writhed down gasping, his left side against the floor. I kicked his right shoulder-hard.

The gun jumped away from him, skidded on the carpet, under a chair. I heard the chessmen tinkling on the floor behind me somewhere.

The girl stood over him, looking down. Then her wide dark horrified eyes came up and fastened on mine.

"That buys me," I said. "Anything I have is yours-now and forever."

She didn't hear me. Her eyes were strained open so hard that the whites showed under the vivid blue iris. She backed quickly to the door with her little gun up, felt behind her for the knob and twisted it. She pulled the door open and slipped out.

The door shut.

She was bareheaded and without her bolero jacket.

She had only the gun, and the safety catch on that was still set so that she couldn't fire it.

It was silent in the room then, in spite of the wind. Then I heard him gasping on the floor. His face had a greenish pallor. I moved behind him and pawed him for more guns, and didn't find any. I got a pair of store cuffs out of my desk and pulled his arms in front of him and snapped them on his wrists. They would hold if he didn't shake them too hard.

His eyes measured me for a coffin, in spite of their suffering. He lay in the middle of the floor, still on his left side, a twisted, wizened, bald-headed little guy with drawn-back lips and teeth spotted with cheap silver fillings. His mouth looked like a black pit and his breath came in little waves, choked, stopped, came on again, limping.

I went into the dressing room and opened the drawer of the chest. Her hat and jacket lay there on my shirts. I put them underneath, at the back, and smoothed the shirts over them. Then I went out to the kitchenette and poured a stiff jolt of whiskey and put it down and stood a moment listening to the hot wind howl against the window glass. A garage door banged, and a power-line wire with too much play between the insulators thumped the side of the building with a sound like somebody beating a carpet.

The drink worked on me. I went back into the living room and opened a window. The guy on the floor hadn't smelled her sandalwood, but somebody else might.

I shut the window again, wiped the palms of my hands and used the phone to dial Headquarters.

Copernik was still there. His smart-aleck voice said: "Yeah? Marlowe? Don't tell me. I bet you got an idea."

"Make that killer yet?"

"We're not saying, Marlowe. Sorry as all hell and so on. You know how it is."

"O.K., I don't care who he is. Just come and get him off the floor of my apartment."

"Holy Christ!" Then his voice hushed and went down low. "Wait a minute, now. Wait a minute." A long way off I seemed to hear a door shut. Then his voice again. "Shoot," he said softly.

"Handcuffed," I said. "All yours. I had to knee him, but he'll be all right. He came here to eliminate a witness."

Another pause. The voice was full of honey. "Now listen, boy, who else is in this with you?"

"Who else? Nobody. Just me."

"Keep it that way, boy. All quiet. O.K.?"

"Think I want all the bums in the neighborhood in here sightseeing?"

"Take it easy, boy. Easy. Just sit tight and sit still. I'm prac tically there. No touch nothing. Get me?"

"Yeah." I gave him the address and apartment number again to save him time.

I could see his big bony face glisten. I got the .22 target gun from under the chair and sat holding it until feet hit the hallway outside my door and knuckles did a quiet tattoo on the door panel.

Copernik was alone. He filled the doorway quickly, pushed me back into the room with a tight grin and shut the door. He stood with his back to it, his hand under the left side of his coat. A big hard bony man with flat cruel eyes.

He lowered them slowly and looked at the man on the floor. The man's neck was twitching a little. His eyes moved in short stabs-sick eyes.

"Sure it's the guy?" Copernik's voice was hoarse.

"Positive. Where's Ybarra?"

"Oh, he was busy." He didn't look at me when he said that. "Those your cuffs?"

"Yeah."

"Key."

I tossed it to him. He went down swiftly on one knee beside the killer and took my cuffs off his wrists, tossed them to one side. He got his own off his hip, twisted the bald man's hands behind him and snapped the cuffs on.

"All right, you bastard," the killer said tonelessly.

Copernik grinned and balled his fist and hit the handcuffed man in the mouth a terrific blow. His head snapped back almost enough to break his neck. Blood dribbled from the lower corner of his mouth.

"Get a towel," Copernik ordered.

I got a hand towel and gave it to him. He stuffed it between the handcuffed man's teeth, viciously, stood up and rubbed his bony fingers through his ratty blond hair.

"All right. Tell it."

I told it-leaving the girl out completely. It sounded a little funny. Copernik watched me, said nothing. He rubbed the side of his veined nose. Then he got his comb out and worked on his hair just as he had done earlier in the evening, in the cocktail bar.

I went over and gave him the gun. He looked at it casually, dropped it into his side pocket. His eyes had something in them and his face moved in a hard bright grin.

I bent down and began picking up my chessmen and dropping them into the box. I put the box on the mantel, straightened out a leg of the card table, played around for a while. All the time Copernik watched me. I wanted him to think something out.

At last he came out with it. "This guy uses a twenty-two," he said. "He uses it because he's good enough to get by with that much gun. That means he's good. He

knocks at your door, pokes that gat in your belly, walks you back into the room, says he's here to close your mouth for keeps-and yet you take him. You not having any gun. You take him alone. You're kind of good yourself, pal."

"Listen," I said, and looked at the floor. I picked up another chessman and twisted it between my fingers. "I was doing a chess problem," I said "Trying to forget things."

"You got something on your mind, pal," Copernik said softly. "You wouldn't try to fool an old copper, would you, boy?"

"It's a swell pinch and I'm giving it to you," I said. "What the hell more do you want?"

The man on the floor made a vague sound behind the towel. His bald head glistened with sweat.

"What's the matter, pal? You been up to something?" Copernik almost whispered.

I looked at him quickly, looked away again. "All right," I said. "You know damn well I couldn't take him alone. He had the gun on me and he shoots where he looks."

Copernik closed one eye and squinted at me amiably with the other. "Go on, pal. I kind of thought of that too."

I shuffled around a little more, to make it look good. I said, slowly: "There was a kid here who pulled a job over in Boyle Heights, a heist job. It didn't take. A two-bit service station stick-up. I know his family. He's not really bad. He was here trying to beg train money off me. When the knock came he sneaked in-there."

I pointed at the wall bed and the door beside. Copernik's head swiveled slowly, swiveled back. His eyes winked again. "And this kid had a gun," he said.

I nodded. "And he got behind him. That takes guts, Copernik. You've got to give the kid a break. You've got to let him stay out of it."

"Tag out for this kid?" Copernik asked softly.

"Not yet, he says. He's scared there will be."

Copernik smiled. "I'm a homicide man," he said. "I wouldn't know-or care."

I pointed down at the gagged and handcuffed man on the floor. "You took him, didn't you?" I said gently.

Copernik kept on smiling. A big whitish tongue came out and massaged his thick lower lip. "How'd I do it?" he whispered.

"Get the slugs out of Waldo?"

"Sure. Long twenty-two's. One smashed a rib, one good."

"You're a careful guy. You don't miss any angles. You know anything about me? You dropped in on me to see what guns I had."

Copernik got up and went down on one knee again beside the killer. "Can you hear me, guy?" he asked with his face close to the face of the man on the floor.

The man made some vague sound. Copernik stood up and yawned. "Who the hell cares what he says? Go on, pal."

"You wouldn't expect to find I had anything, but you wanted to look around my place. And while you were mousing around in there"-! pointed to the dressing room-"and

me not saying anything, being a little sore, maybe, a knock came on the door. So he came in. So after a while you sneaked out and took him."

"Ah," Copernik grinned widely, with as many teeth as a horse. "You're on, pal. I socked him and I kneed him and I took him. You didn't have no gun and the guy swiveled on me pretty sharp and Ileft-hooked him down the backstairs. O.K.?"

"O.K.," I said.

"You'll tell it like that downtown?"

"Yeah," I said.

"I'll protect you, pal. Treat me right and I'll always play ball. Forget about that kid. Let me know if he needs a break."

He came over and held out his hand. I shook it. It was as clammy as a dead fish. Clammy hands and the people who own them make me sick.

"There's just one thing," I said. "This partner of yours- Ybarra. Won't he be a bit sore you didn't bring him along on this?"

Copernik tousled his hair and wiped his hatband with a large yellowish silk handkerchief.

"That guinea?" he sneered. "To hell with him!" He came close to me and breathed in my face. "No mistakes, pal-about that story of ours."

His breath was bad. It would be.

FOUR

There were just five of us in the chief-of-detective's office when Copernik laid it before them. A stenographer, the chief, Copernik, myself, Ybarra. Ybarra sat on a chair tilted against the side wall. His hat was down over his eyes but their softness loomed underneath, and the small still smile hung at the corners of the clean-cut Latin lips. He didn't look directly at Copernik. Copernik didn't look at him at all.

Outside in the corridor there had been photos of Copernik shaking hands with me, Copernik with his hat on straight and his gun in his hand and a stern, purposeful look on his face.

They said they knew who Waldo was, but they wouldn't tell me. I didn't believe they knew, because the chief-of-detectives had a morgue photo of Waldo on his desk. A beautiful job, his hair combed, his tie straight, the light hitting his eyes just right to make them glisten. Nobody would have known it was a photo of a dead man with two bullet holes in his heart. He looked like a dance-hall sheik making up his mind whether to take the blonde or the redhead.

It was about midnight when I got home. The apartment door was locked and while I was fumbling for my keys a low voice spoke to me out of the darkness.

All it said was: "Please!" but I knew it. I turned and looked at a dark Cadillac coupe parked just off the loading zone. It had no lights. Light from the street touched the brightness of a woman's eyes.

I went over there. "You're a darn fool," I said.

She said: "Get in."

I climbed in and she started the car and drove it a block and a half along Franklin and turned down Kingsley Drive. The hot wind still burned and blustered. A radio lilted from an open, sheltered side window of an apartment house. There were a lot of parked cars but she found a vacant space behind a small brand-new Packard cabriolet that had the dealer's sticker on the windshield glass. After she'd jockeyed us up to the curb she leaned back in the corner with her gloved hands on the wheel.

She was all in black now, or dark brown, with a small foolish hat. I smelled the sandalwood in her perfume.

"I wasn't very nice to you, was I?" she said.

"All you did was save my life."

"What happened?"

"I called the law and fed a few lies to a cop I don't like and gave him all the credit for the pinch and that was that. That guy you took away from me was the man who killed Waldo."

"You mean-you didn't tell them about me?"

"Lady," I said again, "all you did was save my life. What else do you want done? I'm ready, willing, and I'll try to be able."

She didn't say anything, or move.

"Nobody learned who you are from me," I said. "Incidentally, I don't know myself."

"I'm Mrs. Frank C. Barsaly, Two-twelve Fremont Place, Olympia Two-four-five-nine-six. Is that what you wanted?"

"Thanks," I mumbled, and rolled a dry unlit cigarette around in my fingers. "Why did you come back?" Then I snapped the fingers of my left hand. "The hat and jacket," I said. "I'll go up and get them."

"It's more than that," she said. "I want my pearls." I might have jumped a little. It seemed as if there had been enough without pearls.

A car tore by down the street going twice as fast as it should. A thin bitter cloud of dust lifted in the streetlights and whirled and vanished. The girl ran the window up quickly against it.

"All right," I said. "Tell me about the pearls. We have had a murder and a mystery woman and a mad killer and a heroic rescue and a police detective framed into making a false report. Now we will have pearls. All right-feed it to me."

"I was to buy them for five thousand dollars. From the man you call Waldo and I call Joseph Coates. He should have had them."

"No pearls," I said. "I saw what came out of his pockets. A lot of money, but no pearls."

"Could they be hidden in his apartment?"

"Yes," I said. "So far as I know he could have had them hidden anywhere in California except in his pockets. How's Mr. Barsaly this hot night?"

"He's still downtown at his meeting. Otherwise I couldn't have come."

"Well, you could have brought him," I said. "He could have sat in the rumble seat."

"Oh, I don't know," she said. "Frank weighs two hundred pounds and he's pretty solid. I don't think he would like to sit in the rumble seat, Mr. Marlowe."

"What the hell are we talking about anyway?"

She didn't answer. Her gloved hands tapped lightly, provokingly on the rim of the slender wheel. I threw the unlit cigarette out the window, turned a little and took hold of her.

When I let go of her, she pulled as far away from me as she could against the side of the car and rubbed the back of her glove against her mouth. I sat quite still.

We didn't speak for some time. Then she said very slowly: "I meant you to do that. But I wasn't always that way. It's only been since Stan Phillips was killed in his plane. If it hadn't been for that, I'd be Mrs. Phillips now. Stan gave me the pearls. They cost fifteen thousand dollars, he said once. White pearls, forty-one of them, the largest about a third of an inch across. I don't know how many grains. I never had them appraised or showed them to a jeweler, so I don't know those things. But I loved them on Stan's account. I loved Stan. The way you do just the one time. Can you understand?"

"What's your first name?" I asked.

"Lola."

"Go on talking, Lola." I got another dry cigarette out of my pocket and fumbled it between my fingers just to give them something to do.

"They had a simple silver clasp in the shape of a two-bladed propeller. There was one small diamond where the boss would be. I told Frank they were store pearls I had bought myself. He didn't know the difference. It's not so easy to tell, I dare say. You see-Frank is pretty jealous."

In the darkness she came closer to me and her side touched my side. But I didn't move this time. The wind howled and the trees shook. I kept on rolling the cigarette around in my fingers.

"I suppose you've read that story," she said. "About the wife and the real pearls and her telling her husband they were false?"

"I've read it," I said, "Maugham."

"I hired Joseph. My husband was in Argentina at the time. I was pretty lonely."

"_You_ should be lonely," I said.

"Joseph and I went driving a good deal. Sometimes we had a drink or two together. But that's all. I don't go around-"

"You told him about the pearls," I said. "And when your two hundred pounds of beef came back from Argentina and kicked him out-he took the pearls, because he knew they were real. And then offered them back to you for five grand."

"Yes," she said simply. "Of course I didn't want to go to the police. And of course in the circumstance Joseph wasn't afraid of my knowing where he lived."

"Poor Waldo," I said. "I feel kind of sorry for him. It was a hell of a time to run into an old friend that had a down on you."

I struck a match on my shoe sole and lit the cigarette. The tobacco was so dry from the hot wind that it burned like grass. The girl sat quietly beside me, her hands on the wheel again.

"Hell with women-these fliers," I said. "And you're still in love with him, or think you are. Where did you keep the pearls?"

"In a Russian malachite jewelry box on my dressing table. With some other costume jewelry. I had to, if I ever wanted to wear them."

"And they were worth fifteen grand. And you think Joseph might have hidden them in his apartment. Thirty-one, wasn't it?"

"Yes," she said. "I guess it's a lot to ask."

I opened the door and got out of the car. "I've been paid," I said. "I'll go look. The doors in my apartment are not very obstinate. The cops will find out where Waldo lived when they publish his photo, but not tonight, I guess."

"It's awfully sweet of you," she said. "Shall I wait here?"

I stood with a foot on the running board, leaning in, looking at her. I didn't answer her question. I just stood there looking in at the shine of her eyes. Then I shut the car door and walked up the street towards Franklin.

Even with the wind shriveling my face I could still smell the sandalwood in her hair. And feel her lips.

I unlocked the Berglund door, walked through the silent lobby to the elevator, and rode up to Three. Then I soft-footed along the silent corridor and peered down at the sill of Apartment 31. No light. I rapped-the old light, confidential tattoo of the bootlegger with the big smile and the extra-deep hip pockets. No answer. I took the piece of thick hard celluloid that pretended to be a window over the driver's license in my wallet, and eased it between the lock and the jamb, leaning hard on the knob, pushing it toward the hinges. The edge of the celluloid caught the slope of the spring lock and snapped it back with a small brittle sound, like an icicle breaking. The door yielded and I went into near darkness. Street light filtered in and touched a high spot here and there.

I shut the door and snapped the light on and just stood. There was a queer smell in the air. I made it in a moment- the smell of dark-cured tobacco. I prowled over to a smoking stand by the window and looked down at four brown butts- Mexican or South American cigarettes.

Upstairs, on my floor, feet hit the carpet and somebody went into a bathroom. I heard the toilet flush. I went into the bathroom of Apartment 31. A little rubbish, nothing, no place to hide anything. The kitchenette was a longer job, but I only half searched. I knew there were no pearls in that apartment. I knew Waldo had been on his way out and that he was in a hurry and that something was riding him when he turned and took two bullets from an old friend.

I went back to the living room and swung the wall bed and looked past its mirror side into the dressing room for signs of still current occupancy. Swinging the bed farther I was no longer looking for pearls. I was looking at a man.

He was small, middle-aged, iron-gray at the temples, with a very dark skin, dressed in a fawn-colored suit with a winecolored tie. His neat little brown hands hung limply by his sides. His small feet, in pointed polished shoes, pointed almost at the floor.

He was hanging by a belt around his neck from the metal top of the bed. His tongue stuck out farther than I thought it possible for a tongue to stick out.

He swung a little and I didn't like that, so I pulled the bed shut and he nestled quietly between the two clamped pillows. I didn't touch him yet. I didn't have to touch him to know that he would be cold as ice.

I went around him into the dressing room and used my handkerchief on drawer knobs. The place was stripped clean except for the light litter of a man living alone.

I came out of there and began on the man. No wallet. Waldo would have taken that and ditched it. A flat box of cigarettes, half full, stamped in gold: "Louis Tapia y Cia, Calle de Paysandü, 19, Montevideo." Matches from the Spezia Club. An under-arm holster of dark-grained leather and in it a 9-millimeter Mauser.

The Mauser made him a professional, so I didn't feel so badly. But not a very good professional, or bare hands would not have finished him, with the Mauser-a gun you can blast through a wall with-undrawn in his shoulder holster.

I made a little sense of it, not much. Four of the brown cigarettes had been smoked, so there had been either waiting or discussion. Somewhere along the line Waldo had got the little man by the throat and held him in just the right way to make him pass out in a matter of seconds. The Mauser had been less useful to him than a toothpick. Then Waldo had hung him up by the strap, probably dead already. That would account for haste, cleaning out the apartment, for Waldo's anxiety about the girl. It would account for the car left unlocked outside the cocktail bar.

That is, it would account for these things if Waldo had killed him, if this was really Waldo's apartment-if I wasn't just being kidded.

I examined some more pockets. In the left trouser one I found a gold penknife, some silver. In the left hip pocket a handkerchief, folded, scented. On the right hip another, unfolded but clean. In the right leg pocket four or five tissue handkerchiefs. A clean little guy. He didn't like to blow his nose on his handkerchief. Under these there was a small new keytainer holding four new keys-car keys. Stamped in gold on the keytainer was: Compliments of R. K. Vogelsang, Inc. "The Packard House."

I put everything as I had found it, swung the bed back, used my handkerchief on knobs and other projections, and flat surfaces, killed the light and poked my nose out the door. The hall was empty. I went down to the street and around the corner to Kingsley Drive. The Cadillac hadn't moved.

I opened the car door and leaned on it. She didn't seem to have moved, either. It was hard to see any expression on her face. Hard to see anything but her eyes and chin, but not hard to smell the sandalwood.

"That perfume," I said, "would drive a deacon nuts ... no pearls."

"Well, thanks for trying," she said in a low, soft vibrant voice. "I guess I can stand it. Shall I ... Do we . . . Or . . . ?"

"You go on home now," I said. "And whatever happens you never saw me before. Whatever happens. Just as you may never see me again."

"I'd hate that."

"Good luck, Lola." I shut the car door and stepped back.

The lights blazed on, the motor turned over. Against the wind at the corner the big coupe made a slow contemptuous turn and was gone. I stood there by the vacant space at the curb where it had been.

It was quite dark there now. Windows, had become blanks in the apartment where the radio sounded. I stood looking at the back of a Packard cabriolet which seemed to be brand new. I had seen it before-before I went upstairs, in the same place, in front of Lola's car. Parked, dark, silent, with a blue sticker pasted to the right-hand corner of the shiny windshield.

And in my. mind I was looking at something else, a set of brand-new car keys in a keytainer stamped: "The Packard House," upstairs, in a dead man's pocket.

I went up to the front of the cabriolet and put a small pocket flash on the blue slip. It was the same dealer all right. Written in ink below his name and slogan was a name and address- Eugenie Kolchenko, 5315 Arvieda Street, West Los Angeles.

It was crazy. I went back up to Apartment 31, jimmied the door as I had done before, stepped in behind the wall bed and took the keytainer from the trousers pocket of the neat brown dangling corpse. I was back down on the street beside the cabriolet in five minutes. The keys fitted.

FIVE

It was a small house, near a canyon rim out beyond Sawtelle, with a circle of writhing eucalyptus trees in front of it. Beyond that, on the other side of the street, one of those parties was going on where they come out and smash bottles on the sidewalk with a whoop like Yale making a touchdown against Princeton.

There was a wire fence at my number and some rose trees, and a flagged walk and a garage that was wide open and had no car in it. There was no car in front of the house either. I rang the bell. There was a long wait, then the door opened rather suddenly.

I wasn't the man she had been expecting. I could see it in her glittering kohl-rimmed eyes. Then I couldn't see anything in them. She just stood and looked at me, a long, lean, hungry brunette, with rouged cheekbones, thick black hair parted in the middle, a mouth made for three-decker sandwiches, coraland-gold pajamas, sandals-and gilded toenails. Under her ear lobes a couple of miniature temple bells gonged lightly in the breeze. She made a slow disdainful motion with a cigarette in a holder as long as a baseball bat.

"We-el, what ees it, little man? You want sometheeng? You are lost from the bee-ootiful party across the street, hem?"

"Ha-ha," I said. "Quite a party, isn't it? No, I just brought your car home. Lost it, didn't you?"

Across the street somebody had delirium tremens in the front yard and a mixed quartet tore what was left of the night into small strips and did what they could to make the strips miserable. While this was going on the exotic brunette didn't move more than one eyelash.

She wasn't beautiful, she wasn't even pretty, but she looked as if things would happen where she was.

"You have said what?" she got out, at last, in a voice as silky as a burnt crust of toast.

"Your car." I pointed over my shoulder and kept my eyes on her. She was the type that uses a knife.

The long cigarette holder dropped very slowly to her side and the cigarette fell out of it. I stamped it out, and that put me in the hall. She backed away from me and I shut the door.

The hall was like the long hall of a railroad flat. Lamps glowed pinkly in iron brackets. There was a bead curtain at the end, a tiger skin on the floor. The place went with her.

"You're Miss Kolchenko?" I asked, not getting any more action.

"Ye-es. I am Mees Kolchenko. What the 'ell you want?"

She was looking at me now as if I had come to wash the windows, but at an inconvenient time.

I got a card out with my left hand, held it out to her. She read it in my hand, moving her head just enough. "A detective?" she breathed.

"Yeah."

She said something in a spitting language. Then in English: "Come in! Thees damn wind dry up my skeen like so much teesue paper."

"We're in," I said. "I just shut the door. Snap out of it, Nazimova. Who was he? The little guy?"

Beyond the bead curtain a man coughed. She jumped as if she had been stuck with an oyster fork. Then she tried to smile. It wasn't very successful.

"A reward," she said softly. "You weel wait 'ere? Ten dollars it is fair to pay, no?"

"No," I said.

I reached a finger towards her slowly and added: "He's dead."

She jumped about three feet and let out a yell.

A chair creaked harshly. Feet pounded beyond the bead curtain, a large hand plunged into view and snatched it aside, and a big hard-looking blond man was with us. He had a purple robe over his pajamas, his right hand held something in his robe pocket. He stood quite still as soon as he was through the curtain, his feet planted solidly, his jaw out, his colorless eyes like gray ice. He looked like a man who would be hard to take out on an off-tackle play.

"What's the matter, honey?" He had a solid, burring voice, with just the right sappy tone to belong to a guy who would go for a woman with gilded toenails.

"I came about Miss Kolchenko's car," I said.

"Well, you could take your hat off," he said. "Just for a light workout."

I took it off and apologized.

"O.K. ," he said, and kept his right hand shoved down hard in the purple pocket. "So you came about Miss Kolchenko's car. Take it from there."

I pushed past the woman and went closer to him. She shrank back against the wall and flattened her palms against it. Camille in a high-school play. The long holder lay empty at her toes.

When I was six feet from the big man he said easily: "I can hear you from there. Just take it easy. I've got a gun in this pocket and I've had to learn to use one. Now about the car?"

"The man who borrowed it couldn't bring it," I said, and pushed the card I was still holding towards his face. He barely glanced at it. He looked back at me.

"So what?" he said.

"Are you always this tough?" I asked. "Or only when you have your pajamas on?"

"So why couldn't he bring it himself?" he asked. "And skip the mushy talk."

The dark woman made a stuffed sound at my elbow.

"It's all right, honeybunch," the man said. "I'll handle this. Go on."

She slid past both of us and flicked through the bead curtain.

I waited a little while. The big man didn't move a muscle. He didn't look any more bothered than a toad in the sun.

"He couldn't bring it because somebody bumped him off," I said. "Let's see you handle that."

"Yeah?" he said. "Did you bring him with you to prove it?"

"No," I said. "But if you put your tie and crush hat on, I'll take you down and show you."

"Who the hell did you say you were, now?"

"I didn't say. I thought maybe you could read." I held the card at him some more.

"Oh, that's right," he said. "Philip Marlowe, Private Investigator. Well, well. So I should go with you to look at who, why?"

"Maybe he stole the car," I said.

The big man nodded. "That's a thought. Maybe he did. Who?"

"The little brown guy who had the keys to it in his pocket, and had it parked around the corner from the Berglund Apartments."

He thought that over, without any apparent embarrassment. "You've got something there," he said. "Not much. But a little. I guess this must be the night of the Police Smoker. So you're doing all their work for them."

"Huh?"

"The card says private detective to me," he said. "Have you got some cops outside that were too shy to come in?"

"No, I'm alone."

He grinned. The grin showed white ridges in his tanned skin. "So you find somebody dead and take some keys and find a car and come riding out here-all alone. No cops. Am I right?"

"Correct."

He sighed. "Let's go inside," he said. He yanked the bead curtain aside and made an opening for me to go through. "It might be you have an idea I ought to hear."

I went past him and he turned, keeping his heavy pocket towards me. I hadn't noticed until I got quite close that there were beads of sweat on his face. It might have been the hot wind but I didn't think so.

We were in the living room of the house.

We sat down and looked at each other across a dark floor, on which a few Navajo rugs and a few dark Turkish rugs made a decorating combination with some well-used overstuffed furniture. There was a fireplace, a small baby grand, a Chinese screen, a tall Chinese lantern on a teakwood pedestal, and gold net curtains against lattice windows. The windows to the south were open. A fruit tree with a whitewashed trunk whipped about outside the screen, adding its bit to the noise from across the street.

The big man eased back into a brocaded chair and put his slippered feet on a footstool. He kept his right hand where it had been since I met him-on his gun.

The brunette hung around in the shadows and a bottle gurgled and her temple bells gonged in her ears.

"It's all right, honeybunch," the man said. "It's all under control. Somebody bumped somebody off and this lad thinks we're interested. Just sit down and relax."

The girl tilted her head and poured half a tumbler of whiskey down her throat. She sighed, said, "Goddam,"in a casual voice, and curled up on a davenport. It took all of the davenport. She had plenty of legs. Her gilded toenails winked at me from the shadowy corner where she kept herself quiet from then on.

I got a cigarette out without being shot at, lit it and went into my story. It wasn't all true, but some of it was. I told them about the Berglund Apartments and that I had lived there and that Waldo was living there in Apartment 31 on the floor below mine and that I had been keeping an eye on him for business reasons.

"Waldo what?" the blond man put in. "And what business reasons?"

"Mister," I said, "have you no secrets?" He reddened slightly.

I told him about the cocktail lounge across the street from the Berglund and what had happened there. I didn't tell him about the printed bolero jacket or the girl who had worn it. I left her out of the story altogether.

"It was an undercover job-from my angle," I said. "If you know what I mean." He reddened again, bit his teeth. I went on: "I got back from the city hall without telling anybody I knew Waldo. In due time, when I decided they couldn't find out where he lived that night, I took the liberty of examining his apartment."

"Looking for what?" the big man said thickly.

"For some letters. I might mention in passing there was nothing there at all-except a dead man. Strangled and hanging by a belt to the top of the wall bed-well out of sight. A

small man, about forty-five, Mexican or South American, well-dressed in a fawn-colored---.-

"That's enough," the big man said. "I'll bite, Marlowe. Was it a blackmail job you were on?"

"Yeah. The funny part was this little brown man had plenty of gun under his arm."

"He wouldn't have five hundred bucks in twenties in his pocket, of course? Or are you saying?"

"He wouldn't. But Waldo had over seven hundred in currency when he was killed in the cocktail bar,"

"Looks like I underrated this Waldo," the big man said calmly. "He took my guy and his pay-off money, gun and all. Waldo have a gun?"

"Not on him."

"Get us a drink, honeybunch," the big man said. "Yes, I certainly did sell this Waldo person shorter than a bargaincounter shirt."

The brunette unwound her legs and made two drinks with soda and ice. She took herself another gill without trimmings, wound herself back on the davenport. Her big glittering black eyes watched me solemnly.

"Well, here's how," the big man said, lifting his glass in salute. "I haven't murdered anybody, but I've got a divorce suit on my hands from now on. You haven't murdered anybody, the way you tell it, but you laid an egg down at police Headquarters. What the hell! Life's a lot of trouble, anyway you look at it. I've still got honeybunch here. She's a white Russian I met in Shanghai. She's safe as a vault and she looks as if she could cut your throat for a nickel. That's what I like about her. You get the glamor without the risk."

"You talk damn foolish," the girl spat him.

"You look O.K. to me," the big man went on ignoring her. "That is, for a keyhole peeper. Is there an out?"

"Yeah. But it will cost a little money."

"I expected that. How much?"

"Say another five hundred."

"Goddam, thees hot wind make me dry like the ashes of love," the Russian girl said bitterly.

"Five hundred might do," the blond man said. "What do I get for it?"

"If I swing it-you get left out of the story. If I don't-you don't pay."

He thought it over. His face looked lined and tired now. The small beads of sweat twinkled in his short blond hair.

"This murder will make you talk," he grumbled. "The second one, I mean. And I don't have what I was going to buy. And if it's a hush, I'd rather buy it direct."

"Who was the little brown man?" I asked.

"Name's Leon Valesanos, a Uruguayan. Another of my importations. I'm in a business that takes me a lot of places. He was working in the Spezzia Club in

Chiseltown-you know, the strip of Sunset next to Beverly Hills. Working on roulette, I think. I gave him the five hundred to go down to this-this Waldo-and buy back some bills for stuff Miss Kolchenko had charged to my account and delivered here. That wasn't bright, was it? I had them in my briefcase and this Waldo got a chance to steal them. What's your hunch about what happened?"

I sipped my drink and looked at him down my nose. "Your Uruguayan pal probably talked curt and Waldo didn't listen good. Then the little guy thought maybe that Mauser might help his argument-and Waldo was too quick for him. I wouldn't say Waldo was a killer-not by intention. A blackmailer seldom is. Maybe he lost his temper and maybe he just held on to the little guy's neck too long. Then he had to take it on the lam. But he had another date, with more money coming up. And he worked the neighborhood looking for the party. And accidentally he ran into a pal who was hostile enough and drunk enough to blow him down."

"There's a hell of a lot of coincidence in all this business," the big man said.

"It's the hot wind," I grinned. "Everybody's screwy tonight."

"For the five hundred you guarantee nothing? If I don't get my cover-up, you don't get your dough. Is that it?"

"That's it," I said, smiling at him.

"Screwy is right," he said, and drained his highball. "I'm taking you up on it."

"There are just two things," I said softly, leaning forward in my chair. "Waldo had a getaway car parked outside the cocktail bar where he was killed, unlocked with the motor running. The killer took it. There's always the chance of a kickback from that direction. You see, all Waldo's stuff must have been in that car."

"Including my bills, and your letters."

"Yeah. But the police are reasonable about things like that-unless you're good for a lot of publicity. If you're not, I think I can eat some stale dog downtown and get by. If you are- that's the second thing. What did you say your name was?"

The answer was a long time coming. When it came I didn't get as much kick out of it as I thought I would. All at once it was too logical.

"Frank C. Barsaly," he said.

After a while the Russian girl called me a taxi. When I left, the party across the street was doing all that a party could do. I noticed the walls of the house were still standing. That seemed a pity.

SIX

When I unlocked the glass entrance door of the Berglund I smelled policeman. I looked at my wrist watch. It was nearly 3 AM. In the dark corner of the lobby a man dozed in a chair with a newspaper over his face. Large feet stretched out before him. A corner of the paper lifted an inch, dropped again. The man made no other movement.

I went on along the hall to the elevator and rode up to my floor. I soft-footed along the hallway, unlocked my door, pushed it wide and reached in for the light switch.

A chain switch tinkled and light glared from a standing lamp by the easy chair, beyond the card table on which my chessmen were still scattered.

Copernik sat there with a stiff unpleasant grin on his face. The short dark man, Ybarra, sat across the room from him, on my left, silent, half smiling as usual.

Copernik showed more of his big yellow horse teeth and said: "Hi. Long time no see. Been out with the girls?"

I shut the door and took my hat off and wiped the back of my neck slowly, over and over again. Copernik went on grinning. Ybarra looked at nothing with his soft dark eyes.

"Take a seat, pal," Copernik drawled. "Make yourself to home. We got pow-wow to make. Boy, do I hate this night sleuthing. Did you know you were low on hooch?"

"I could have guessed it," I said. I leaned against the wall.

Copernik kept on grinning. "I always did hate private dicks," he said, "but I never had a chance to twist one like I got tonight."

He reached down lazily beside his chair and picked up a printed bolero jacket, tossed it on the card table. He reached down again and put a wide-brimmed hat beside it.

"I bet you look cuter than all hell with these on," he said.

I took hold of a straight chair, twisted it around and straddled it, leaned my folded arms on the chair and looked at Copernik.

He got up very slowly-with an elaborate slowness, walked across the room and stood in front of me smoothing his coat down. Then he lifted his open right hand and hit me across the face with it-hard. It stung but I didn't move.

Ybarra looked at the wall, looked at the floor, looked at nothing.

"Shame on you, pal," Copernik said lazily. "The way you was taking care of this nice exclusive merchandise. Wadded down behind your old shirts. You punk peepers always did make me sick."

He stood there over me for a moment. I didn't move or speak. I looked into his glazed drinker's eyes. He doubled a fist at his side, then shrugged and turned and went back to the chair.

"O.K.," he said. "The rest will keep. Where did you get these things?"

"They belong to a lady."

"Do tell. They belong to a lady. Ain't you the lighthearted bastard! I'll tell you what lady they belong to. They belong to the lady a guy named Waldo asked about in a bar across the street-about two minutes before he got shot kind of dead. Or would that have slipped your mind?"

I didn't say anything.

"You was curious about her yourself," Copernik sneered on. "But you were smart, pal. You fooled me."

"That wouldn't make me smart," I said.

His face twisted suddenly and he started to get up. Ybarra laughed, suddenly and softly, almost under his breath. Copernik's eyes swung on him, hung there. Then he faced me again, bland-eyed.

"The guinea likes you," he said. "He thinks you're good."

The smile left Ybarra's face, but no expression took its place. No expression at all.

Copernik said: "You knew who the dame was all the time. You knew who Waldo was and where he lived. Right across the hall a floor below you. You knew this Waldo person had bumped a guy off and started to lam, only this broad came into his plans somewhere and he was anxious to meet up with her before he went away. Only he never got the chance. A heist guy from back East named Al Tessilore took care of that by taking care of Waldo. So you met the gal and hid her clothes and sent her on her way and kept your trap glued. That's the way guys like you make your beans. Am I right?"

"Yeah," I said. "Except that I only knew these things very recently. Who was Waldo?"

Copernik bared his teeth at me. Red spots burned high on his sallow cheeks. Ybarra, looking down at the floor, said very softly: "Waldo Ratigan. We got him from Washington by Teletype. He was a two-bit porch climber with a few small terms on him. He drove a car in a bank stick-up job in Detroit. He turned the gang in later and got a nolle prosse. One of the gang was this Al Tessilore. He hasn't talked a word, but we think the meeting across the street was purely accidental."

Ybarra spoke in the soft quiet modulated voice of a man for whom sounds have a meaning. I said: "Thanks, Ybarra. Can I smoke-or would Copernik kick it out of my mouth?"

Ybarra smiled suddenly. "You may smoke, sure," he said.

"The guinea likes you all right," Copernik jeered. "You never know what a guinea will like, do you?"

I lit a cigarette. Ybarra looked at Copernik and said very softly: "The word guinea-you overwork it. I don't like it so well applied to me."

"The hell with what you like, guinea."

Ybarra smiled a little more. "You are making a mistake," he said. He took a pocket nail file out and began to use it, looking down.

Copernik blared: "I smelled something rotten on you from the start, Marlowe. So when we make these two mugs, Ybarra and me think we'll drift over and dabble a few more words with you. I bring one of Waldo's morgue photos-nice work, the light just right in his eyes, his tie all straight and a white handkerchief showing just right in his pocket. Nice work. So on the way up, just as a matter of routine, we rout out the manager here and let him lamp it. And he knows the guy. He's here as A. B. Hummel, Apartment Thirty-one. So we go in there and find a stiff. Then we go round and round with that. Nobody knows him yet, but he's got some swell finger bruises under that strap and I hear they fit Waldo's fingers very nicely."

"That's something," I said. "I thought maybe I murdered him."

Copernik stared at me a long time. His face had stopped grinning and was just a hard brutal face now. "Yeah. We got something else even," he said. "We got Waldo's getaway car-and what Waldo had in it to take with him."

I blew cigarette smoke jerkily. The wind pounded the shut windows. The air in the room was foul.

"Oh, we're bright boys," Copernik sneered. "We never figured you with that much guts. Take a look at this."

He plunged his bony hand into his coat pocket and drew something up slowly over the edge of the card table, drew it along the green top and left it there stretched out, gleaming. A string of white pearls with a clasp like a two-bladed propeller. They shimmered softly in the thick smoky air.

Lola Barsaly's pearls. The pearls the flier had given her. The guy who was dead, the guy she still loved.

I stared at them, but I didn't move. After a long moment Copernik said almost gravely: "Nice, ain't they? Would you feel like telling us a story about now, Mis-ter Marlowe?"

I stood up and pushed the chair from under me, walked slowly across the room and stood looking down at the pearls. The largest was perhaps a third of an inch across. They were pure white, iridescent, with a mellow softness. I lifted them slowly off the card table from beside her clothes. They felt heavy, smooth, fine.

"Nice," I said. "A lot of the trouble was about these. Yeah, I'll talk now. They must be worth a lot of money."

Ybarra laughed behind me. It was a very gentle laugh. "About a hundred dollars," he said. "They're good phonies-but they're phony."

I lifted the pearls again. Copernik's glassy eyes gloated at me. "How do you tell?" I asked.

"I know pearls," Ybarra said. "These are good stuff, the kind women very often have made on purpose, as a kind of insurance. But they are slick like glass. Real pearls are gritty between the edges of the teeth. Try."

I put two or three of them between my teeth and moved my teeth back and forth, then sideways. Not quite biting them. The beads were hard and slick.

"Yes. They are very good," Ybarra said. "Several even have little waves and flat spots, as real pearls might have."

"Would they cost fifteen grand-if they were real?" I asked.

"Si. Probably. That's hard to say. It depends on a lot of things."

"This Waldo wasn't so bad," I said.

Copernik stood up quickly, but I didn't see him swing. I was still looking down at the pearls. His fist caught me on the side of the face, against the molars. I tasted blood at once. I staggered back and made it look like a worse blow than it was.

"Sit down and talk, you bastard!" Copernik almost whispered.

I sat down and used a handkerchief to pat my cheek. I licked at the cut inside my mouth. Then I got up again and went over and picked up the cigarette he had knocked out of my mouth. I crushed it out in a tray and sat down again.

Ybarra filed at his nails and held one up against the lamp. There were beads of sweat on Copernik's eyebrows, at the inner ends.

"You found the beads in Waldo's car," I said, looking at Ybarra. "Find any papers?"

He shook his head without looking up.

"I'd believe you," I said. "Here it is. I never saw Waldo until he stepped into the cocktail bar tonight and asked about the girl. I knew nothing I didn't tell. When I got home and stepped out of the elevator this girl, in the printed bolero jacket and the wide hat and the blue silk crêpe dress-all as he had described them-was waiting for the elevator, here on my floor. And she looked like a nice girl."

Copernik laughed jeeringly. It didn't make any difference to me. I had him cold. All he had to do was know that. He was going to know it now, very soon.

"I knew what she was up against as a police witness," I said. "And I suspected there was something else to it. But I didn't suspect for a minute that there was anything wrong with her. She was just a nice girl in a jam-and she didn't even know she was in a jam. I got her in here. She pulled a gun on me. But she didn't mean to use it."

Copernik sat up very suddenly and he began to lick his lips. His face had a stony look now. A look like wet gray stone. He didn't make a sound.

"Waldo had been her chauffeur," I went on. "His name was then Joseph Coates. Her name is Mrs. Frank C. Barsaly. Her husband is a big hydroelectric engineer. Some guy gave her the pearls once and she told her husband they were just store pearls. Waldo got wise somehow there was a romance behind them and when Barsaly came home from South America and fired him, because he was too good-looking, he lifted the pearls."

Ybarra lifted his head suddenly and his teeth flashed. "You mean he didn't know they were phony?"

"I thought he fenced the real ones and had imitations fixed up," I said.

Ybarra nodded. "It's possible."

"He lifted something else," I said. "Some stuff from Barsaly's briefcase that showed he was keeping a woman-out in Brentwood. He was blackmailing wife and husband both, without either knowing about the other. Get it so far?"

"I get it," Copernik said harshly, between his tight lips. His face was still wet gray stone. "Get the hell on with it."

"Waldo wasn't afraid of them," I said. "He didn't conceal where he lived. That was foolish, but it saved a lot of finagling, if he was willing to risk it. The girl came down here tonight with five grand to buy back her pearls. She didn't find Waldo. She came here to look for him and walked up a floor before she went back down. A woman's idea of being cagey. So I met her. So I brought her in here. So she was in that dressing room when Al Tessilore visited me to rub out a witness." I pointed to the dressing-room door. "So she came out with her little gun and stuck it in his back and saved my life," I said.

Copernik didn't move. There was something horrible in his face now. Ybarra slipped his nail file into a small leather case and slowly tucked it into his pocket.

"Is that all?" he said gently.

I nodded. "Except that she told me where Waldo's apartment was and I went in there and looked for the pearls. I found the dead man. In his pocket I found new car keys in a case from a Packard agency. And down on the street I found the Packard and took it to where it came from. Barsaly's kept woman. Barsaly had sent a friend from the Spezzia

Club down to buy something and he had tried to buy it with his gun instead of the money Barsaly gave him. And Waldo beat him to the punch."

"Is that all?" Ybarra said softly.

"That's all," I said licking the torn place on the inside of my cheek.

Ybarra said slowly: "What do you want?"

Copernik's face convulsed and he slapped his long hard thigh. "This guy's good," he jeered. "He falls for a stray broad and breaks every law in the book and you ask him what does he want? I'll give him what he wants, guinea!"

Ybarra turned his head slowly and looked at him. "I don't think you will," he said. "I think you'll give him a clean bill of health and anything else he wants. He's giving you a lesson in police work."

Copernik didn't move or make a sound for a long minute. None of us moved. Then Copernik leaned forward and his coat fell open. The butt of his service gun looked out of his underarm holster.

"So what do you want?" he asked me.

"What's on the card table there. The jacket and hat and the phony pearls. And some names kept away from the papers. Is that too much?"

"Yeah-it's too much," Copernik said almost gently. He swayed sideways and his gun jumped neatly into his hand. He rested his forearm on his thigh and pointed the gun at my stomach.

"I like better that you get a slug in the guts resisting arrest," he said. "I like that better, because of a report I made out on Al Tessilore's arrest and how I made the pinch. Because of some photos of me that are in the morning sheets going out about now. I like it better that you don't live long enough to laugh about that baby."

My mouth felt suddenly hot and dry. Far off I heard the wind booming. It seemed like the sound of guns.

Ybarra moved his feet on the floor and said coldly: "You've got a couple of cases all solved, policeman. All you do for it is leave some junk here and keep some names from the papers. Which means from the D.A. If he gets them anyway, too bad for you."

Copernik said: "I like the other way." The blue gun in his hand was like a rock. "And God help you, if you don't back me up on it."

Ybarra said: "If the woman is brought out into the open, you'll be a liar on a police report and a chisler on your own partner. In a week they won't even speak your name at Headquarters. The taste of it would make them sick."

The hammer clicked back on Copernik's gun and I watched his big finger slide in farther around the trigger.

Ybarra stood up. The gun jumped at him. He said: "We'll see how yellow a guinea is. I'm telling you to put that gun up, Sam."

He started to move. He moved four even steps. Copernik was a man without a breath of movement, a stone man.

Ybarra took one more step and quite suddenly the gun began to shake.

Ybarra spoke evenly: "Put it up, Sam. If you keep your head everything lies the way it is. If you don't-you're gone."

He took one more step. Copernik's mouth opened wide and made a gasping sound and then he sagged in the chair as if he had been hit on the head. His eyelids dropped.

Ybarra jerked the gun out of his hand with a movement so quick it was no movement at all. He stepped back quickly, held the gun low at his side.

"It's the hot wind, Sam. Let's forget it," he said in the same even, almost dainty voice.

Copernik's shoulders sagged lower and he put his face in his hands. "O.K.," he said between his fingers.

Ybarra went softly across the room and opened the door. He looked at me with lazy, half-closed eyes. "I'd do a lot for a woman who saved my life, too," he said. "I'm eating this dish, but as a cop you can't expect me to like it."

I said: "The little man in the bed is called Leon Valesanos. He was a croupier at the Spezzia Club."

"Thanks," Ybarra said. "Let's go, Sam."

Copernik got up heavily and walked across the room and out of the open door and out of my sight. Ybarra stepped through the door after him and started to close it.

I said: "Wait a minute."

He turned his head slowly, his left hand on the door, the blue gun hanging down close to his right side.

"I'm not in this for money," I said. "The Barsalys live at Two-twelve Fremont Place. You can take the pearls to her. If Barsaly's name stays out of the paper, I get five C's. It goes to the Police Fund. I'm not so damn smart as you think. It just happened that way-and you had a heel for a partner."

Ybarra looked across the room at the pearls on the card table. His eyes glistened. "You take them," he said. "The five hundred's O.K. I think the fund has it coming."

He shut the door quietly and in a moment I heard the elevator doors clang.

SEVEN

I opened a window and stuck my head out into the wind and watched the squad car tool off down the block. The wind blew in hard and I let it blow. A picture fell off the wall and two chessmen rolled off the card table. The material of Lola Barsaly's bolero jacket lifted and shook.

I went out to the kitchenette and drank some Scotch and went back into the living room and called her-late as it was.

She answered the phone herself, very quickly, with no sleep in her voice.

"Marlowe," I said. "O.K. your end?"

"Yes ... yes," she said. "I'm alone."

"I found something," I said. "Or rather the police did. But your dark boy gypped you. I have a string of pearls. They're not real. He sold the real ones, I guess, and made you up a string of ringers, with your clasp."

She was silent for a long time. Then, a little faintly: "The police found them?"

"In Waldo's car. But they're not telling. We have a deal. Look at the papers in the morning and you'll be able to figure out why."

"There doesn't seem to be anything more to say," she said. "Can I have the clasp?"

"Yes. Can you meet me tomorrow at four in the Club Esquire bar?"

"You're really rather sweet," she said in a dragged out voice. "I can. Frank is still at his meeting."

"Those meetings-they take it out of a guy," I said. We said goodbye.

I called a West Los Angeles number. He was still there, with the Russian girl.

"You can send me a check for five hundred in the morning," I told him. "Made out to the Police Relief Fund, if you want to. Because that's where it's going."

Copernik made the third page of the morning papers with two photos and a nice half-column. The little brown man in Apartment 31 didn't make the paper at all. The Apartment House Association has a good lobby too.

I went out after breakfast and the wind was all gone. It was soft, cool, a little foggy. The sky was close and comfortable and gray. I rode down to the boulevard and picked out the best jewelry store on it and laid a string of pearls on a black velvet mat under a daylight-blue lamp. A man in a wing collar and striped trousers looked down at them languidly.

"How good?" I asked.

"I'm sorry, sir. We don't make appraisals. I can give you the name of an appraiser."

"Don't kid me," I said. "They're Dutch."

He focused the light a little and leaned down and toyed with a few inches of the string.

"I want a string just like them, fitted to that clasp, and in a hurry," I added.

"How, like them?" He didn't look up. "And they're not Dutch. They're Bohemian."

"O.K., can you duplicate them?"

He shook his head and pushed the velvet pad away as if it soiled him. "In three months, perhaps. We don't blow glass like that in this country. If you wanted them matched-three months at least. And this house would not do that sort of thing at all."

"It must be swell to be that snooty," I said. I put a card under his black sleeve. "Give me a name that will-and not in three months-and maybe not exactly like them."

He shrugged, went away with the card, came back in five minutes and handed it back to me. There was something written on the back.

The old Levantine had a shop on Melrose, a junk shop with everything in the window from a folding baby carriage to a French horn, from a mother-of-pearl lorgnette in a faded plush case to one of those .44 Special Single Action six-shooters they still make for Western peace officers whose grandfathers were tough.

The old Levantine wore a skull cap and two pairs of glasses and a full beard. He studied my pearls, shook his head sadly, and said: "For twenty dollars, almost so good. Not so good, you understand. Not so good glass."

"How alike will they look?"

He spread his firm strong hands. "I am telling you the truth," he said. "They would not fool a baby."

"Make them up," I said. "With this clasp. And I want the others back, too, of course."

"Yah. Two o'clock," he said.

Leon Valesanos, the little brown man from Uruguay, made the afternoon papers. He had been found hanging in an unnamed apartment. The police were investigating.

At four o'clock I walked into the long cool bar of the Club Esquire and prowled along the row of booths until I found one where a woman sat alone. She wore a hat like a shallow soup plate with a very wide edge, a brown tailor-made suit with a severe mannish shirt and tie.

I sat down beside her and slipped a parcel along the seat. "You don't open that," I said. "In fact you can slip it into the incinerator as is, if you want to."

She looked at me with dark tired eyes. Her fingers twisted a thin glass that smelled of peppermint. "Thanks." Her face was very pale.

I ordered a highball and the waiter went away. "Read the papers?"

"Yes."

"You understand now about this fellow Copernik who stole your act? That's why they won't change the story or bring you into it."

"It doesn't matter now," she said. "Thank you, all the same. Please-please show them to me."

I pulled the string of pearls out of the loosely wrapped tissue paper in my pocket and slid them across to her. The silver propeller clasp winked in the light of the wall bracket. The little diamond winked. The pearls were as dull as white soap. They didn't even match in size.

"You were right," she said tonelessly. "They are not my pearls."

The waiter came with my drink and she put her bag on them deftly. When he was gone she fingered them slowly once more, dropped them into the bag and gave me a dry mirthless smile.

I stood there a moment with a hand hard on the table.

"As you said-I'll keep the clasp."

I said slowly: "You don't know anything about me. You saved my life last night and we had a moment, but it was just a moment. You still don't know anything about me. There's a detective downtown named Ybarra, a Mexican of the nice sort, who was on the job when the pearls were found in Waldo's suitcase. That is in case you would like to make sure-"

She said: "Don't be silly. It's all finished. It was a memory. I'm too young to nurse memories. It may be for the best. I loved Stan Phillips-but he's gone-long gone."

I stared at her, didn't say anything.

She added quietly: "This morning my husband told me something I hadn't known. We are to separate. So I have very little to laugh about today."

"I'm sorry," I said lamely. "There's nothing to say. I may see you sometime. Maybe not. I don't move much in your circle. Good luck."

I stood up. We looked at each other for a moment. "You haven't touched your drink," she said.

"You drink it. That peppermint stuff will just make you sick."

I stood there a moment with a hand on the table.

"If anybody ever bothers you," I said, "let me know."

I went out of the bar without looking back at her, got into my car and drove west on Sunset and down all the way to the Coast Highway. Everywhere along the way gardens were full of withered and blackened leaves and flowers which the hot wind had burned.

But the ocean looked cool and languid and just the same as ever. I drove on almost to Malibu and then parked and went and sat on a big rock that was inside somebody's wire fence. It was about half-tide and coming in. The air smelled of kelp. I watched the water for a while and then I pulled a string of Bohemian glass imitation pearls out of my pocket and cut the knot at one end and slipped the pearls off one by one.

When I had them all loose in my left hand I held them like that for a while and thought. There wasn't really anything to think about. I was sure.

"To the memory of Mr. Stan Phillips," I said aloud. "Just another four-flusher."

I flipped her pearls out into the water one by one at the floating seagulls.They made little splashes and the seagulls rose off the water and swooped at the splashes.

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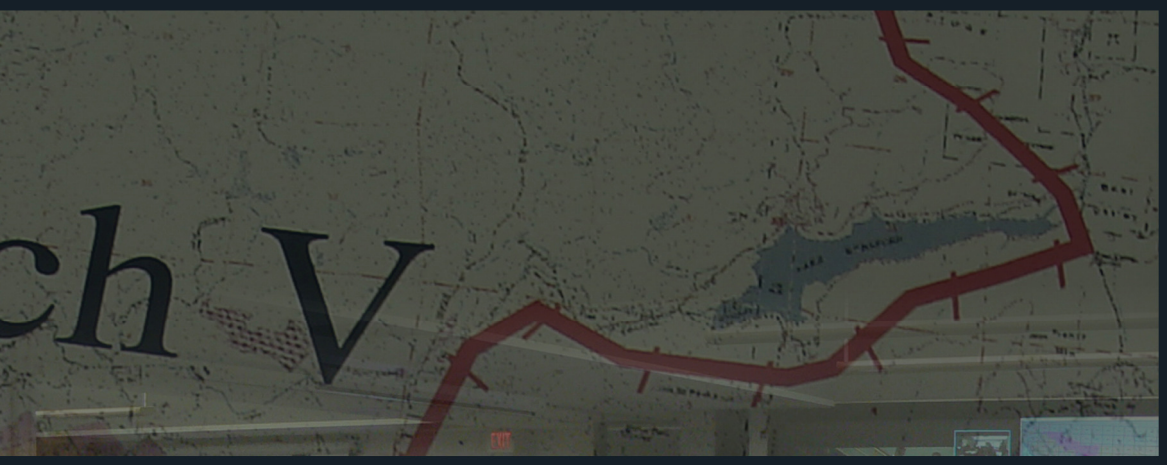

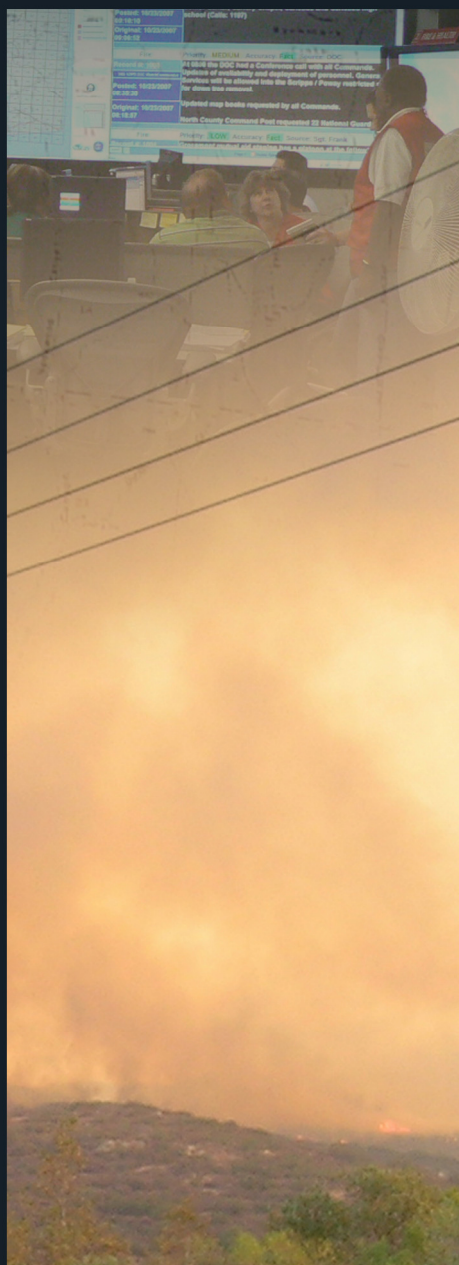

County of San Diego

2007 Firestorms After Action Report

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EXECUTIVE SUMMARY

The 2007 San Diego County Firestorms were the largest in county history, far surpassing the 2003 Firestorms in terms of intensity and duration. As a result of extensive planning, equipment procurement, training, and exercises in the years since 2003, the response by San Diego County went exceptionally well. Based on the lessons learned and identified in the 2003 San Diego County Firestorms After Action Report (AAR), significant adjustments and improvements were made to overall county operations, including enhancements to the Operational Area Emergency Operations Center (OAEOC) and revision and development of county plans. This AAR is intended to serve as an asset to further enhance San Diego County's ability to respond effectively and minimize life and property loss to disasters such as the 2007 fires.

Due to forecasted Santa Ana winds and ongoing drought, the San Diego County Office of Emergency Services (OES) and other regional partner agencies initiated preparation for potential wildland fires the week prior to the start of the firestorm. The 2007 fires began at approximately 0923 Pacific Standard Time (PST) on October 21, 2007, near the U.S./Mexico border with the Harris Fire. At the height of the firestorms, there were seven separate fires burning in San Diego County, including the Witch Creek, Rice Canyon, and Poomacha fires. The seven fires resulted in 10 civilian deaths, 23 civilian injuries, and 89 firefighter injuries—more than 6,200 fire personnel fought to control the wildland fires. The fires consumed approximately 369,000 acres or about 13% of the county's total land mass. Additionally, the fires destroyed an estimated 1,600 homes; 800 outbuildings; 253 structures; 239 vehicles; and 2 commercial properties. To date, the costs incurred to contain the Harris, Witch Creek, Rice Canyon, and Poomacha fires are estimated at $41.3 million. The total projected damage costs are expected to exceed $1.5 billion.

The OAEOC was initially activated at 1116 PST on October 21, 2007, in response to the Harris Fire. With the onset of the Witch Creek Fire, a full Level 3 activation was achieved at approximately 1602 PST. Personnel from more than 60 disciplines were present in the OAEOC during the fires and represented Federal, State, and local departments and agencies. The OAEOC improved its infrastructure through technological enhancements, including the purchase and implementation of WebEOC, a real-time, web-based emergency management system, and Reverse 911 and AlertSanDiego, two automated telephone delivery systems used throughout the county for emergency and evacuation notifications. Also, the OAEOC underwent a staffing reorganization to provide for a more seamless emergency response.

During the 2007 fires, newly developed county, city, and community evacuation plans were implemented for the first time. These plans were used to assist the San Diego County Sheriff's Department in issuing evacuation orders for an estimated 515,000 county residents through the use of the Reverse 911 and AlertSanDiego mass-notification systems. This resulted in the largest single fire evacuation in the Nation's history. Furthermore, through the use of the mass-notification systems, 28 boil-water orders were issued to approximately 7,000 residents.

During the disaster, the Joint Information Center (JIC), in coordination with the OAEOC, and 211 San Diego, a non-profit organization, provided critical emergency information directly to the public. The JIC successfully disseminated more than 200 press releases and collaborated with regional partners to conduct routine press conferences. Information was also distributed through the use of numerous media outlets including the www.sdcountyemergency.com website, which received approximately 10 million visitors. In addition, 211 San Diego answered approximately 109,000 calls and assisted with rumor control activities.

With more than 7,000 volunteers and a significant amount of donations, volunteer organizations—along with municipal, State, and Federal agencies—operated 45 shelters throughout the county, including two mega-shelters: one at Qualcomm Stadium and the other at Del Mar Fairgrounds. In addition, approximately 400 animals were brought into three county animal shelters; more than 3,000 animals were rescued, relocated, temporarily housed, and returned to owners; and an estimated 5,000 animals per day were fed and cared for at evacuated owners' properties for up to 5 days after the disaster.

The short-term recovery process commenced shortly after the response to provide financial assistance, damage assessments, and the eventual establishment of four county Local Assistance Centers (LACs). The LACs provided 24,000 residents with financial and temporary housing information assistance. The arrival of Federal Emergency Management Agency (FEMA) representatives enabled the county LACs to transition to Federal Assistance Centers.

Several memorandums of understanding (MOUs) and memorandums of agreement (MOAs) were developed to further coordination and cooperation among regional partners. These included, but were not limited to, agreements between the San Diego County OES and California Department of Forestry and Fire Protection (CAL FIRE) to provide fire liaisons to the OAEOC, and the San Diego County Geographical Information Service (GIS) and the National Aeronautics and Space Administration (NASA) for the sharing of sophisticated imagery technologies. Additionally, the Emergency Managers Mutual Aid (EMMA) agreement was refined, resulting in less resistance to requests for additional emergency management personnel.

Continued cooperation among regional partners contributed to significant successes during the 2007 fires. These successes include an organized response from the OAEOC; multiple sources for evacuation and critical Internet-based disaster information; pre-mapping of evacuation routes using GIS technology; the use of WebEOC, a web-enabled crisis information management system, as a "virtual liaison;" military liaisons who provided a conduit to a variety of critical resources, such as aerial reconnaissance; the ability to coordinate and disseminate timely public information; and the establishment and operation of numerous shelters.

Areas for improvement include continued integration of the Medical Operations Center (MOC) functional role; increased information sharing among several county agencies; additional training on WebEOC and other technological resources; volunteer and donations management coordination; the formation of a formal repopulation plan; and further development of critical MOUs/MOAs.

Recommendations include reviewing initial fire notifications with OAEOC personnel; reviewing the length of operational periods; continuing to develop information sharing and personnel management systems used during disasters; formalizing sheltering MOUs/MOAs that include the pre-positioning of shelter supplies; and clarifying reimbursement and documentation responsibilities within county departments.

Overall, San Diego County's response to the 2007 fires was efficient, effective, and successful. Through increased preparedness efforts, regional collaboration and cooperation, and the ability to adapt to changing fire activities, county personnel were able to effectively respond to the largest disaster in county history.

NEXT STEPS

This AAR provides a depiction of the events of the 2007 San Diego County Firestorms, and a starting point from which lessons learned in this tragedy can be incorporated into emergency management plans and processes.

This AAR does not specifically address the much-discussed issue of fire agency consolidation within San Diego County. Consolidation is an important issue, and a discussion that should continue. However, the true merits of consolidation are based on day-to-day fire and medical response, including regional service levels and response times. The unique magnitude of the 2007 fires, which required the response of more than 5,000 firefighters, 100 aircraft, and 5 incident management teams, makes it impractical to evaluate consolidation in relationship to this particular fire response.

Additionally, this AAR does not review the firefighting activities overseen by the individual CAL FIRE Incident Management Teams for each of the fires. CAL FIRE is creating its own internal AAR, which will review these activities in detail. The San Diego region is appreciative of all the tireless and heroic efforts of firefighters from across California and the Nation that assisted in the 2007 San Diego County Firestorms.

At a high level, a careful review of the events of the 2007 fires, as well as a review of this AAR, suggests three distinct steps to be taken by the San Diego County region: implement the recommendations of this report; implement a regional master fuel management plan; and continue to improve regional fire resources. These steps are further explained in the following paragraphs:

1. Implement the recommendations of this report. The AARs for the 2003 Cedar Fires, published in 2004, delineated several important and critical improvements needed, including upgrading the county communications system, implementing a mass-notification system, and implementing a JIC. All of these recommendations were implemented and worked extremely well during the 2007 fires. Significant emergency management improvements, achieved after the 2003 Cedar Fires, decreased the necessity for major programmatic changes following the recent fires. However, there were many things done during the 2007 fires that the region had never attempted before, such as evacuating hospitals, establishing mega-shelters, and using satellite imagery. It is important to codify the lessons learned from these activities into the region's emergency plans.

2. Implement a regional master fuel management plan. The firestorms that hit Southern California are much like the hurricanes that impacted the Gulf Coast—they are naturally occurring events that were occurring long before humans arrived, and when they occur, there is little we can do to stop them. However, firestorms require three key components to be present: extreme winds, extremely low humidity, and an abundance of fuel. Of these elements, only fuel can be humanly controlled. During the 2007 fires, more than 17,000 homes were in the fire perimeter, or within ¼ mile of the perimeter, yet only 1,700 homes burned. The fact that less then 10% of the homes in the fire-threat area burned is a testament to the fire-safe activities of San Diego County residents and communities as well as the outstanding structure protection effort put forth by firefighters. Careful study of the damage assessment reports finds that many homes burned as a result of flaws in defensible space. Examples of homes destroyed by embers include embers starting fires on: wooden decks, trash cans next to homes, and

shake-wood roofs. Garage doors left open and patio furniture being blown into windows were other culprits. Although a 90-mile-per-hour (mph), wind-fueled firestorm cannot be stopped, fuel management around homes and communities can dramatically mitigate damage.

Fuel management in today's environment is extremely complex. Environmental concerns, non-native plant intrusion, watershed management, and many other factors make management of the wildland urban interface a complex undertaking. There is much disagreement regarding the utility of controlled burns and firebreaks. For example, one of the best firebreaks in the county, the 8-lane Interstate 15 (I-15) freeway, proved ineffective—the fires jumped the freeway in at least three locations. However, the fires demonstrated unequivocally that defensible space around homes works. One key imperative learned from this fire is the need for San Diego County to continue to expand its fuel management efforts within the region. Also, it is important that these efforts begin with individual homeowners—a fire-safe community begins with individual homeowners creating defensible space around their homes. These homeowners need support from the more than 50 FireSafe Councils in the county, which can provide advice and support, such as chipping programs, to combine these defensible homes into fire-safe communities. It is then important for local governments to support homeowners and communities with aggressive public awareness campaigns, as well as conduct efforts to thin government-owned property near homes and roads. The State and Federal Government can enhance these efforts through financial support and complementing legislation.

Another lesson learned is that newer homes, built in accordance with new fire-safe building codes, withstood the fire better than older homes built to less stringent codes. Homeowners, communities, and the region should look at ways to retrofit, or at least mitigate, homes in the wildland-urban interface that are not built to today's standards. Again, a key lesson learned from this fire is that fuel management works and is the county's best defense against future firestorms.

3. Continue to improve regional fire resources. One thing the 2003 and 2007 fires have in common is that they were statewide events, not just San Diego County events. It is a safe planning assumption that these extremely dangerous Santa Ana wind events will not happen in isolation, and San Diego County will always be competing for State and Federal resources with other communities experiencing similar fires. Accordingly, it is imperative that the region enhance its regional firefighting capability for the first 48

hours of a firestorm, when outside resources are going to be scarce. Since the 2003 fires, the region has invested heavily in additional fire capability, including the purchase of the region's first three firefighting helicopters. It is important that the region explore ways to continue to expand its capacity to fight the first 48 hours of a firestorm. Possible strategies include purchasing additional helicopters; purchasing additional fire engines (to be manned by off-duty firefighters); and exploring the expansion of structure protection vehicles, such as trucks to apply fire gel (which had considerable success at Palomar Mountain during the 2007 fires).

This AAR provides tremendous detail of the San Diego County response to the 2007 fires. What is evident from this report is that, as a community, San Diego's response was one in which each resident should take considerable pride. In many ways, this report prescribes the three ingredients for a successful disaster response: a competent government response, combined with a caring community and prepared individual residents. A careful study of disasters throughout the world reveals that disasters can bring out the best or worst in a community. For San Diego County, the 2007 fires were a defining moment—for 5 days in October, the Nation's attention was focused on San Diego, and what the Nation saw was San Diego at its very best, in the worst of circumstances.

DISASTER OVERVIEW

The 2007 San Diego County Firestorms started on October 21, 2007, near the U.S./Mexico border at 0930 Pacific Standard Time (PST). The fires burned throughout San Diego County until the last fire was fully contained on November 9, 2007.

The Harris Fire was the first of the 2007 wildfires to ignite, starting at Highway 94 and Harris Ranch Road near Potrero, in the southernmost section of San Diego County. The Harris Fire burned northwest towards eastern Chula Vista, causing thousands of advisory and mandatory evacuations throughout southern San Diego County. The Harris Fire burned 90,440 acres before it was contained.

The Witch Creek Fire started just a few hours after the Harris Fire in Witch Creek Canyon near Santa Ysabel. The wildfire quickly spread to Ramona, Rancho Bernardo, Poway, and Escondido. With reported winds of more than 100 miles per hour (mph) in some areas, the fire jumped over Interstate 15 (I-15) and continued west, causing significant damage in Lake Hodges, 4S Ranch, Del Dios, and Rancho Santa Fe. The Witch Creek Fire burned a total of 197,990 acres, making it the largest of the 2007 wildfires.

The Rice Canyon Fire started the next day on October 22, 2007, in Rice Canyon on Clearwater Road in Fallbrook. It burned 9,472 acres and caused the closure of I-15 and thousands of evacuations in the northern part of San Diego County. Later the same day, the Poomacha Fire started as a structure fire on the La Jolla Indian reservation. The fire quickly spread to Palomar Mountain where it joined the Witch Creek Fire and entered the Agua Tibia Wilderness. The Poomacha Fire burned 49,410 acres and was not fully contained until November 9, 2007. It was the last fire of the 2007 wildfires to be contained.

Other wildfires of the 2007 San Diego County Firestorms included the Marine Corps Base Camp Pendleton Fires (the Wilcox Fire, the Ammo Fire, and the Horno Fire), as well as the Coronado Hills Fire, the El Capitan Fire, and the McCoy Fire.

The 2007 fires resulted in 10 civilian deaths, 23 civilian injuries, and 89 firefighter injuries. It burned a total of 368,340 acres, destroyed an estimated 1,600 homes; 800 outbuildings; 253 structures; 239 vehicles; and 2 commercial properties. More than 6,200 fire personnel fought to control the 2007 fires. Almost all public schools in San Diego County were closed, as were many

businesses. Some of the major freeways were shut down for periods of time, and county residents were strongly encouraged to stay off the roads.

To date, the costs incurred to fight the Poomacha, Rice Canyon, Harris, and Witch Creek fires are estimated at $41.3 million. Total projected damage costs for the 2007 San Diego County Firestorms are expected to exceed $1.5 billion. During the entire course of the 2007 fires, 515,000 county residents received voluntary or mandatory evacuation notices, which exceeded the number of residents evacuated from New Orleans during Hurricane Katrina.

SEQUENCE OF EVENTS / TIMELINE

SUNDAY, OCTOBER 21, 2007

Weather Conditions: A red flag warning is in effect. Hot, dry Santa Ana winds begin blowing through the Los Angeles and San Diego areas. Wind speeds ranging from 30 to 50 miles per hour (mph) were measured in the area, with extremely low relative humidity. The temperatures throughout the region are as follows:

Coastal	high 93	low 48
Inland	high 85	low 53
Desert	high 85	low 44
Mountains	high 68	low 30

Events according to Pacific Standard Time (PST) are as follows:

0923 The Harris Fire begins. The cause of the fire is unknown. Santa Ana winds of 30–40 mph drive the fire to the west.

0925 The San Diego County Sheriff's Department receives initial dispatch for aviation support (Helicopters 10 and 12).

0955 The San Diego County Office of Emergency Services (OES) staff duty officer receives a Radio Amateur Civil Emergency Service (RACES) report about a 30-to-40-acre fire off of Highway 94 at Harris Ranch Road near Tecate. The cause of the fire is unknown. Strong Santa Ana winds are reported in the area. The incident is named the Harris Fire. Sheriff's Department helicopters are on scene.

1030 The Sheriff's Department Operations Center (DOC) is activated. Reverse 911 is activated, and calls are made to approximately 70 residences immediately threatened by the Harris Fire.

1116 The Operational Area Emergency Operations Center (OAEOC) is activated at Level 1. OAEOC personnel notifications via AlertSanDiego begin.

1133 The California Department of Forestry and Fire Protection (CAL FIRE) reports that the Harris Fire is now 100-plus acres and has destroyed one structure. Approximately 300 firefighters are on scene with air and ground support. An information hotline is established for media personnel only.

1241 The Sheriff's Department reports mandatory evacuations for Tecate residents. Reverse 911 messages are sent to 700 homes. The Steele Canyon High School evacuation point is established. Animal Services is dispatched to the Steele Canyon shelter. San Diego County Humane Society establishes a large animal shelter near Jamul Fire Station.

1306 CAL FIRE reports a second fire burning near Santa Isabel at Highway 78. Structures are immediately threatened, and Highway 78 is closed. The fire is named the Witch Creek Fire.

1338 The Sheriff's Department reports mandatory Harris Fire evacuations for the community of Dulzura, and 322 reverse 911 calls are made. Residents are urged to call 211 or obtain additional fire information at www.211sandiego.org.

1349 The OAEOC increases its activation to Level 2.

1422 CAL FIRE reports that the Harris and Witch Creek fires have grown to 2,500 acres and 3,000 acres, respectively. The Witch Creek Fire is moving toward southeastern Ramona and San Diego Country Estates. The Sheriff's Department issues an advisory evacuation message via reverse 911 to approximately 8,900 homes. Poway High School is established as the evacuation point.

1446 In response to the Harris and Witch Creek fires, the San Diego County director of emergency services issues a proclamation of local emergency and requests State Proclamation and Presidential Declaration.

1602 The OAEOC is activated at Level 3.

1610 The Sheriff's Department issues a mandatory evacuation for approximately 700 homes in the Otay Lakes / Barrett Junction vicinity in response to the Harris Fire.

1640 The Sheriff's Department issues a mandatory evacuation for approximately 300 homes in the Witch Creek vicinity.

Summary of logistical activities for October 21 and 22, 2007:

- The Ramona Incident Command Post (ICP) requests that the Fuel Pump Station at Highway 78 be opened.
- The Ramona ICP Logistics Chief requests N-95 masks.
- The Department of Environmental Health (DEH) requests safety goggles (quantity to be determined).
- Animal Control requests 55, 5-gallon buckets.
- The Del Mar Shelter requests 1,000 bottles of water and 1,000 snacks.

1936 CAL FIRE reports that the Harris Fire has increased to 14,000 acres and is 5% contained. The communities of Potrero, Tecate, and Dulzura, and parts of Deerhorn Valley have been evacuated. The Witch Creek Fire has increased to 5,000 acres and is 0% contained. Mandatory evacuations are made for Witch Creek, Old Julian Highway, and the northeast side of San Diego Country Estates.

2210 The Sheriff's Department issues a mandatory evacuation order for all residents of Ramona. This evacuation constitutes approximately 10,000 reverse 911 calls. Poway and Escondido High Schools are designated as shelters.

2241 The presiding judge of San Diego County Superior Court decides to close all San Diego County Courts on October 22. Sheriff's deputies normally assigned to the courts will assist with fire operations.

2245 The City of Escondido EOC is activated.

2300 The American Red Cross closes the Poway High School shelter due to health concerns. Evacuees are relocated to Mira Mesa High School.

The Sheriff's Department aviation operations consisted of the following response:

Copter 10	8.0 flight hours	Harris Fire	57 water drops
Copter 12	7.6 flight hours	Harris Fire	23 water drops

Copter 12 was involved in a search based on a report of a burnover of firefighters.

Additionally, there were OAEOC briefings and press conferences conducted; press releases issued; and Situation Status Reports and OAEOC Action Plans developed.

MONDAY, OCTOBER 22, 2007

Weather Conditions: There is a red flag warning in effect until 1500 PST Wednesday due to strong northeast-to-east winds and low humidity. There will be long periods of single-digit humidity through Wednesday. The temperatures throughout the region are as follows:

Coastal	high 92	low 45
Inland	high 87	low 51
Desert	high 84	low 49
Mountains	high 57	low 36

Events according to PST are as follows:

Summary of key events for October 22, 2007:

- The Coronado Hills Fire begins.
- The Rice Canyon Fire begins.
- Local Emergencies are proclaimed in Poway, Chula Vista, and Carlsbad.
- Mandatory evacuations are issued for: Discovery Hills; Coyote Holler; Poway; Del Dios; Escondido; Rainbow; Valley Center; Pomerado Hospital; Rancho Santa Fe; Leucadia; Elfin Forrest; Fallbrook; Olivenhain; and Encinitas.

0033 Precautionary evacuation planning is underway in the City of Escondido. Reverse 911 calls are used to provide residents with "be prepared to evacuate" information.

0136 The Escondido Fire Department requests reverse 911 calls for approximately 2,000 residents in southeastern Escondido.

0201 The OAEOC receives reports of a new fire burning near the California State San Marcos campus. This fire is named the Coronado Hills Fire.

0227 The Sheriff's Department is calling numbers for the San Pasqual Academy to provide it with the evacuation notice.

0230 The Sheriff's Department dispatch advises the Sheriff's DOC that deputies made contact with San Pasqual Academy at 0205 and evacuated them.

0256 The Sheriff's Department issues a mandatory evacuation order for the Discovery Hills area of San Marcos. Approximately 4,300 reverse 911 calls are made. Escondido High School is the designated evacuation point.

0300 The City of Poway EOC is activated.

0314 The City of San Marcos EOC and the Cal State San Marcos EOC are activated.

0332 The Sheriff's Department issues a mandatory evacuation order for Coyote Holler in response to the Harris Fire. Approximately 970 reverse 911 calls are made. Evacuees are instructed to move toward Campo.

0345 The City of San Diego EOC is activated.

0416 The Rice Canyon Fire begins in northern San Diego County near Rainbow.

0422 The Sheriff's Department issues a mandatory evacuation order for portions of Poway in response to the Witch Creek Fire. Approximately 1,900 reverse 911 calls are made. Evacuees are instructed to move to the evacuation center at the Poway Community Center.

0436 The City of Poway proclaims a local emergency.

0442 The City of Carlsbad EOC is activated at Level 1.

0458 The City of Chula Vista advises that it will activate its EOC at 0830.

0524 City of Carlsbad residents are notified via AlertSanDiego to plan for a precautionary evacuation in response to the Coronado Hills Fire. Approximately 22,770 reverse 911 calls are made.

0600 The Sheriff's Department issues a mandatory evacuation order for Del Dios and the unincorporated area of Escondido in response to the Witch Creek Fire. Approximately 43,240 reverse 911 calls are made. Evacuees are instructed to move to shelters in the western part of the county.

0601 The OAEOC is advised of the City of San Marcos local emergency proclamation that occurred at 0200.

0614 The Sheriff's Department issues a mandatory evacuation for the Rainbow area in response to the Rice Canyon Fire, and approximately 36 reverse 911 calls are made. Evacuees are advised to move west away from the fires.

0635 The Sheriff's Department issues a mandatory evacuation for Valley Center north of Lake Wohlford, and approximately 2,300 reverse 911 calls are made.

0635 After a brief lull, winds throughout the county are reported as increasing. Wind gusts in Potrero, Alpine, Ramona, and Valley Center exceed 50 mph.

0736 The Sheriff's Department issues an advisory evacuation for additional areas of Poway in response to the Witch Creek Fire. Approximately 4,000 reverse 911 calls are made, and evacuees are directed to the Poway Civic Center.

0759 Pomerado Hospital and the Monte Vista Nursing Home in Escondido are evaluated for possible evacuation.

0830 The City of Chula Vista EOC is activated.

0830 Pomerado Hospital and nursing homes along Monte Vista Road begin evacuating with 10 ambulances and 23 Poway Unified School District busses assisting.

0831 The City of Escondido requests additional mandatory evacuations with the Sheriff's assistance.

1008 The Sheriff's Department issues a mandatory evacuation order for Rancho Santa Fe and portions of Leucadia, and approximately 17,600 reverse 911 calls are made.

1045 The Solana Beach Fire Department begins door-to-door voluntary evacuation notifications for portions of Solana Beach.

1055 The Sheriff's Department issues a mandatory evacuation order for additional areas of Poway in response to the Witch Creek Fire, and approximately 8,700 reverse 911 calls are made.

1056 Weather reports throughout the county report wind gusts of 50–70 mph.

1115 The announcement is made that all San Diego County schools will be closed on October 23, 2007.

1224 The Sheriff's Department issues a mandatory evacuation order for Poway, Elfin Forrest, Escondido, Fallbrook, Olivenhain, and Encinitas between 1118 and 1224 in

response to the Witch Creek Fire and the Rice Canyon Fire, and approximately 19,000 reverse 911 calls are made.

1300 The City of Chula Vista proclaims a local emergency.

1356 The City of Carlsbad issues a voluntary evacuation for south Carlsbad in response to the Coronado Hills Fire.

1400 San Diego County OES requests to use Camp Pendleton as an evacuation site.

1404 The City of San Diego reports the evacuation of Scripps Ranch, and approximately 45,000 residents are affected.

1428 The National Guard stages at Del Mar Fairgrounds, and 100 troops are expected in the next 12 hours with 1,100 troops in 24 hours.

1438 The City of Carlsbad proclaims a local emergency.

1445 The San Diego County OES requests the use of the United States Ship (USS) Mercy Hospital to shelter patients evacuated from two area hospitals. Medical facility evacuees are expected to exceed 3,000. Public Health and the Medical Reserve Corps are expected to provide staff to assist.

1552 The Coronado Hills Fire in San Marcos is 100% contained.

1612 The City of Imperial Beach EOC activates at Level 1.

1642 The City of Encinitas EOC activates at Level 1.

1800 County employees are advised that all county offices will be open October 23, with the exception of the County Library System. County departments have activated their continuity of operations (COOP) plans and are directing essential personnel to report for duty and non-essential personnel to telecommute.

1825 The Sheriff's Department issues advisory evacuation notices to Del Mar, Solana Beach, and Rancho Santa Fe in response to the Witch Creek Fire. Approximately 34,700 reverse 911 calls are made advising residents to evacuate to Qualcomm Stadium.

1857 Del Mar Fairgrounds reports that 2,000 evacuated horses are currently in stalls and have adequate food and care.

2009 The City of Encinitas requests the mandatory evacuation of portions of Olivenhain in response to the Witch Creek Fire. Approximately 1,640 reverse 911 calls are made.

Sheriff's Department Aviation Operations consisted of the following flights:

Astrea 1	1.8 flight hours		
Astrea 2	2.6 flight hours		
Astrea 3	1.4 flight hours		
Copter 10	9.5 flight hours	Harris Fire	67 water drops
Copter 12	9.7 flight hours	Harris Fire	43 water drops

Additionally, there were OAEOC briefings and press conferences conducted; press releases issued; and Situation Status Reports and OAEOC Action Plans developed.

TUESDAY, OCTOBER 23, 2007

Weather Conditions: A red flag warning is in effect until 1500 PST Wednesday. The offshore Santa Ana winds will continue to gradually decrease and weaken tonight through Wednesday. This will bring a potential for erratic winds and local effects near the wildfires. The temperatures throughout the region are as follows:

Coastal	high 99	low 49
Inland	high 97	low 55
Desert	high 93	low 51
Mountains	high 79	low 42

Events according to PST are as follows:

0243 Lakeside Fire Department requests the mandatory evacuation of Wildcat Canyon and Muth Valley in response to the Harris Fire. Approximately 3,800 reverse 911 calls are made, and residents are instructed to evacuate to Santana High School.

0309 The Sheriff's Department issues a mandatory evacuation order for North Jamul and Indian Springs. Approximately 1,550 reverse 911 calls are made, and residents are instructed to evacuate to Qualcomm Stadium.

Summary of key events for October 23, 2007:

- The Poomacha Fire begins.
- The American Red Cross National Management Team arrives with supplies and staff.
- Mandatory evacuation orders are issued for: Wildcat Canyon; Muth Valley; Jamul; Indian Springs; La Jolla Indian Reservations; Pauma Valley; Palomar Mountain; Hidden Meadows; De Luz; Eastern Chula Vista; Pine Hills; Winola; Harmony Grove; Eagle Peak; Cuyamacha; Fallbrook; Ramona; and Lakeside.
- Evacuation orders are lifted for: Chula Vista, Solana Beach, Olivenhain, and Del Mar.

0313 The Poomacha (Palomar Mountain / Valley Center) Fire begins as a structure fire on the La Jolla Indian Reservation and eventually joins the Witch Creek Fire.

0445 The Sheriff's Department issues a mandatory evacuation order for La Jolla Indian Reservation and Pauma Valley between 0415 and 0445 in response to the Poomacha Fire, and approximately 4,100 reverse 911 calls are made.

0630 The Sheriff's Department issues a mandatory evacuation order of the Palomar Mountain area between 0450 and 0630 in response to the Poomacha Fire. Approximately 8,000 reverse 911 calls are made, and residents are instructed to evacuate to shelters established in Temecula.

0645 The Sheriff's Department issues a mandatory evacuation of Hidden Meadows in response to the Witch Creek Fire, and approximately 2,900 reverse 911 calls are made.

0707 National Guard troops are deployed to Rancho Santa Fe, Fallbrook, Valley Center, and Ramona to assist with road blocks and security.

0724 The American Red Cross National Management Team arrives and brings supplies and staff to support 20 shelters, which are being managed by county personnel or volunteer organizations.

1018 The Sheriff's Department issues a mandatory evacuation order of the De Luz area and portions of Rainbow in response to the Rice Canyon Fire, and approximately 1,000 reverse 911 calls are made.

1034 The Chula Vista Police Department and Chula Vista Fire Department begin mandatory evacuations for eastern Chula Vista areas in response to the Harris Fire.

1113 The San Diego County Water Authority (SDCWA) EOC reports the Ramona Water District Poway pump station is inoperable. Emergency generators were ordered and are coming from Los Angeles. Estimated time to operation is 1300 hours. San Diego Gas & Electric Company will provide updates if the timeframe changes.

Summary of logistical activities for October 23, 2007:

- 300 cots are provided to the Chula Vista shelter.
- 10 porta-potties are provided to Gillespie Field.
- 60 bales of hay are requested and delivered to Gillespie Field.
- 54 shower trailers are requested for local shelters.
- 200 cots, pillows, blankets, towels, and personal items are provided to the Borrego shelter.
- 300 cots, blankets, pillows, food, and personal items are provided to the Escondido shelter.
- Two 25-yard dumpsters are ordered for Lakeside Rodeo Grounds.
- 100 10-foot by 10-foot pop-up tents are ordered for Qualcomm and Fiesta Island shelters.
- A Cannon copier is ordered for Qualcomm Stadium.

1238 The CAL FIRE requests mandatory evacuation of Ramona/Lakeside (Highway 67 corridor) in response to the Harris Fire. Approximately 1,800 reverse 911 calls are made, and residents are instructed to evacuate to Santana High School.

1327 The Sheriff's Department issues a mandatory evacuation order of areas near Julian (Pine Hills, Winola, and Harmony Grove). Approximately 2,400 reverse 911 calls are made, and residents are instructed to evacuate to Borrego Springs.

1413 The Sheriff's Department issues a mandatory evacuation of De Luz in response to the Rice Canyon Fire in north San Diego County, and approximately 4,400 reverse 911 calls are made.

1445 The Sheriff's Department issues a mandatory evacuation of Jamul in response to the Harris Fire, and approximately 800 reverse 911 calls are made.

1612 All San Diego Schools are closed through Friday, October 26, 2007.

1613 The Sheriff's Department issues an advisory evacuation of Julian, and approximately 3,100 reverse 911 calls are made.

1618 The cities of Chula Vista and Solana Beach lift all evacuation orders. Residents of both cities are allowed to return to their homes.

1730 The Sheriff's Department issues a mandatory evacuation of Eagle Peak and Cuyamaca in response to the Poomacha Fire, and approximately 142 reverse 911 calls are made.

1800 The City of Encinitas lifts Olivenhain evacuation orders, and residents are allowed to return to their homes. Secretary of Homeland Security Chertoff and Governor Schwarzenegger meet with county officials at the County EOC.

1833 All City of Del Mar evacuation notices are lifted, and residents are allowed to return to their homes.

2015 The Sheriff's Department issues a mandatory evacuation for the Fallbrook area in response to the Rice Canyon Fire, and approximately 14,000 reverse 911 calls are made.

2305 The SDCWA EOC requests the OAEOC to supply 1,200 gallons of red dye diesel fuel on October 24. The Ramona Water District orders fuel needed to run the replacement generators. Reports indicate the first generator will be operational after midnight, but the second generator will not be operational until the morning of October 24.

Sheriff's Department aviation operations consisted of the following response:

Astrea 1	1.9 flight hours
Astrea 2	3.6 flight hours
Astrea 3	0.2 flight hours
Astrea 4	4.4 flight hours

Copter 10	7.8 flight hours	Witch Fire	72 water drops
Copter 12 (HELCO)	1.5 flight hours	Harris Fire	working with CAL FIRE
Copter 12	.9 flight hours	Harris Fire	46 water drops

Additionally, there were OAEOC briefings and press conferences conducted; press releases issued; and Situation Status Reports and OAEOC Action Plans developed.

WEDNESDAY, OCTOBER 24, 2007

Weather Conditions: Skies are mostly sunny with areas of smoke. Morning ridge winds are easterly at 4–8 mph, becoming southwest to 10 mph after 1400 PST. Evening ridge winds are southwest at 4–8 mph. Night diurnal flow is down slope and down canyon. Inversion may begin to clear by 1000 PST. The temperatures throughout the region are as follows:

Coastal	high 98	low 49
Inland	high 101	low 52
Desert	high 97	low 53
Mountain	high 78	low 36

Events according to PST are as follows:

0210 The Sheriff's Department issues a mandatory evacuation for the De Luz area in response to the Rice Canyon Fire. Approximately 900 reverse 911 calls are made, and residents are instructed to evacuate to shelters established in Temecula.

Summary of key events for October 24, 2007:

- The Horno Fire at Camp Pendleton begins.
- Evacuation orders are lifted for: Poway, Northeastern Rancho Bernardo, Rancho Penasquitos, 4S Ranch, and Santa Luzare.
- The Ramona Water District sends the message to limit water for emergency use only.

0334 Camp Pendleton advises that the Horno Fire is 6,000 acres and growing. Train service between San Clemente and Oceanside is halted. California Highway Patrol closes Interstate 5 (I-5) at 0100 at the request of Base officials.

1000 The City of Poway lifts evacuation orders, and residents are allowed to return.

1023 Work continues to bring both Ramona Water District pumps online. The time it will take to regain full operational status and system re-pressurization is not determined at this time. CAL FIRE indicates that its priority is to restore service to Ramona airport to support firefighting operations. SDCWA has queried the Ramona Water District regarding mutual aid needed to restore service.

1155 The City of San Diego announces the re-opening of northeastern Rancho Bernardo. Additional repopulation messages are forthcoming.

1346 City of Del Mar EOC deactivates.

1401 CAL FIRE has water service at Ramona airport, but Ramona Water District has asked CAL FIRE to refrain from using the system until the entire system is filled and pressurized. CAL FIRE will continue to fill its aerial tankers with water from the water trucks. Ramona Airport has 16 tankers flying on October 24. The water system usage restraint may negatively impact aircraft turnaround times.

Summary of logistical activities for October 24, 2007:

- 2,000 bottles of water and 2,000 snacks are provided to Local Assistance Center (LAC) operations in Ramona and Fallbrook.
- 60 cases of water are ordered for the San Diego County Sheriff's Communications Center.
- Personal items are ordered for Qualcomm and Del Mar Fairgrounds evacuation centers.
- 6,000 cots are ordered for evacuation centers.
- 90 bales of hay are ordered for horses and cattle near Highway 67.
- One truckload of ice is provided to animal services operations at Qualcomm Stadium.
- Bus transportation is provided for 206 special needs patients from Qualcomm Stadium to special needs shelters in Escondido and Rancho Bernardo.
- 220 bales of hay are ordered for Gillespie Field.
- 250 bales of hay are ordered for Del Mar Show Park.
- 25 personnel are requested at the county warehouse to unload four Wal-Mart semi-trucks of supplies.
- 150 bath towels are ordered for the Campo Community Center.

1407 The City of San Diego announces that Rancho Penasquitos, 4S Ranch, and Santa Luzare are open for repopulation.

1444 Ramona Water District begins the process to request a reverse 911 message be sent to the entire Ramona community. The message will state that water restrictions are limited to emergency use only for all Ramona residents. The Ramona Pump Station was disabled during the fire, and the Ramona Water District is attempting to charge the lines, which cannot be done while water is being used in town. The Ramona Water District needs lines shut so it can charge the entire system and load reservoirs around town. Residents will be re-notified as soon as full restoration is complete.

1515 The City of San Marcos EOC deactivates.

1556 A Regional Assistance Center opens in Rancho Bernardo.

1654 The public is notified of the request to not use water in Ramona in order to rebuild water system pressure to support fire suppression operations. Ramona Municipal Water District staff lock out water meters. A boil-water notice was issued for the Ramona area on October 23 at 1900 and will remain in effect until further notice. Sufficient water pressure must be present in the system prior to allowing Ramona repopulation.

1700 The City of Poway EOC deactivates.

2135 The City of Escondido downsizes staffing.

Sheriff's Department aviation operations consisted of the following response:

Astrea 1	0.4 flight hours		
Astrea 2	1.6 flight hours		
Astrea 5	2.3 flight hours		
Copter 10	6.0 flight hours	Witch Fire	74 water drops
Copter 12	6.2 flight hours	Harris Fire	29 water drops

Additionally, there were OAEOC briefings and press conferences conducted; press releases issued; and Situation Status Reports and OAEOC Action Plans developed.

THURSDAY, OCTOBER 25, 2007

Weather Conditions: There will be typical diurnal winds over the region through early next week. Winds will be light offshore or down slope during nights and mornings and light onshore or upslope in the afternoons. The temperatures throughout the region are as follows:

Coastal	high 92	low 53
Inland	high 98	low 48
Desert	high 92	low 33
Mountains	high 96	low 49

0026 The San Diego County Sheriff's Department reports that it will evaluate the Ramona area for repopulation in the morning.

0911 The City of Escondido lifts evacuation orders.

0925 The Sheriff's DOC awaits an OAEOC policy group decision on Ramona repopulation. CAL FIRE Incident Command advises that the wildfires no longer threaten the community of Ramona, clearing repopulation once all health and safety issues, including unsafe household water and lack of water in fire hydrants, are mitigated.

Summary of key events October 25, 2007:

- Repopulation begins for Escondido, Ramona, Potrero, Tecate, Rancho Santa Fe, Valley Center, San Pasqual Reservations, and Fallbrook.
- The California Department of Health issues an unsafe water alert for Ramona.
- A mandatory evacuation order is issued for Lawson Valley and Carveacre.
- Qualcomm Stadium evacuees are moved to the Del Mar Fairgrounds shelter.

0957 The City of Escondido EOC deactivates.

0958 The Harris Fire incident commander advises Potrero to re-open at 1200. The Tecate Border Crossing will also re-open at 1200.

1130 Portions of Rancho Santa Fe are authorized to repopulate.

1219 The State Office of Drinking Water requests OAEOC assistance to provide drinking water to Ramona Residents. The State requests that bottled water or hauled potable water be provided.

1343 Portions of Valley Center are authorized to repopulate.

1354 CAL FIRE orders a mandatory evacuation for Lawson Valley and Carveacre in response to the Harris Fire, and approximately 950 reverse 911 calls are made.

Summary of logistical activities for October 25, 2007:

- Thomas Brother Guides and office materials are ordered to support OAEOC operations.
- 100 fly masks are ordered to support operations at Lakeside Rodeo Grounds.
- 9,000 photocopies of a "Do Not Drink Water" document are ordered for Ramona.
- One 10-foot by 28-foot trailer is ordered to support Gillespie Field.

1439 Qualcomm Stadium evacuees move to the Del Mar Fairgrounds shelter.

1448 The San Pasqual Reservation is authorized to repopulate.

1502 Portions of Valley Center evacuation orders are lifted.

1556 OAEOC advises the Sheriff's DOC that water issues continue to be the problem with repopulating the community of Ramona. Low water-pressure problems continue and could adversely hamper fire suppression efforts. The Ramona Water District is working on the problem and hopes to restore water pressure within the next 6–12 hours (estimated), thus clearing the way to open up Ramona.

1552 The City of Santee EOC deactivates.

1930 The Ramona evacuation order is lifted at 1915 with the provision that the Ramona Municipal Water System not be used until properly re-pressurized.

1931 Evacuation orders for portions of Fallbrook are lifted.

1951 The county launches a recovery website: www.sdcountyrecovery.com.

2056 The reverse 911 system is used to notify the community of Ramona. The text reads: "The following information is an advisory to residents in the community of Ramona on October 25th, 2007, at 7:00 p.m. The California Department of Health has issued an unsafe water alert for the Ramona area. Do no drink the water from the Ramona Water Municipal District. Failure to follow this advisory can result in illness. Use only bottled water. Additionally, residents are requested to not use water resources to help ensure adequate water for fire fighting efforts. This advisory is in effect until further notice. For additional information visit www.sdcountyemergency.com or call 211."

2208 Personnel from the SDCWA, Helix Water District, City of San Diego Water Department, Padre Dam Municipal Water District, Vallecitos Water District, Poway, and the Sweetwater Authority are on site in Ramona to assist with shutting down 10,000 water meters in an effort to recharge the water system. The system is 75% charged at this time. Once the system is charged, mutual aid personnel will be dispatched to open the meters.

Sheriff's Department aviation operations consisted of the following response:

Copter 10	5.5 flight hours	Witch Fire	40 water drops
Copter 12	5.7 flight hours	Harris Fire	60 water drops

Additionally, there were OAEOC briefings and press conferences conducted; press releases issued; and Situation Status Reports and OAEOC Action Plans developed.

FRIDAY, OCTOBER 26, 2007

Weather Conditions: Winds will turn southwest to west by this afternoon between 5 and 15 mph. A ridge of high pressure will build over the region by Sunday allowing temperatures to warm and humidity to lower once again. The temperatures throughout the region are as follows:

Coastal	high 85	low 46
Inland	high 90	low 43
Desert	high 92	low 40
Mountains	high 87	low 33

0800 Valley Center is authorized to repopulate.

0810 Western Jamul is authorized to repopulate.

1610 Shelter status: 21 shelters are open. The current shelter population is 2,900 residents.

Summary of logistical activities for October 26, 2007:

- Four 53-foot trailers are leased for 2 months to support Qualcomm Stadium cleanup.
- Four 12-foot by 40-foot trailers are provided to operations at Cuyamaca College.
- One lot of assorted medications is ordered for the Campo shelter.
- One pallet of dust masks is ordered for distribution to all four LACs.
- Hand sanitizers are provided to 7,500 students and faculty of Ramona High School.
- Bus transportation is provided to move16 special needs patients.
- Four upright canisters are provided to Campo shelter operations.

1620 San Diego Superior Court is scheduled to re-open on October 29, 2007.

1802 Rancho Heights, Pauma Valley, and the Highway 76 corridor are authorized for repopulation.

1814 Julian, Wynola, Pine Hills, and Cuyamaca are authorized to repopulate.

1827 All areas affected by the Rice Canyon Fire are authorized to repopulate.

Summary of key events for October 26, 2007:

- Repopulation orders are issued for Jamul, Rancho Heights, Pauma Valley, Highway 76 corridor, Julian, Wynola, Pine Hills, and Cuyamaca.
- 21 shelters are open with a population of 2,900 evacuees.

Sheriff's Department aviation operations consisted of the following response:

Astrea 5 (HELCO)	4.5 flight hours	Witch Fire	worked with CAL FIRE
Copter 10	6.2 flight hours	Witch Fire	47 water drops
Copter 12	3.2 flight hours	Harris Fire	19 water drops

Additionally, there were OAEOC briefings and press conferences conducted; press releases issued; and Situation Status Reports and OAEOC Action Plans developed.

SATURDAY, OCTOBER 27, 2007

Weather Conditions: Tropical moisture flowing from the south replaces the hot, Santa Ana winds that roared in a week earlier. The temperatures throughout the region are as follows:

Coastal	high 84	low 50
Inland	high 86	low 45
Desert	high 93	low 47
Mountains	high 79	low 40

0056 Del Dios is authorized to repopulate.

0911 Dulzura is authorized to repopulate.

1322 Bonsall and Rainbow are authorized to repopulate.

Summary of key events for October 27, 2007:

- Repopulation is authorized for Del Dios, Dulzura, Bonsall, and Rainbow.
- 14 shelters are open with a population of 2,044 evacuees.
- "Unsafe Water" notices and "Do Not Drink The Water" alerts are continued in Ramona.
- Municipal water delivery remains in effect.

1334 Ramona Water District, SDCWA, and 10 member agencies are in the process of connecting water meters. Estimated completion is Sunday, October 28, in the afternoon. Water service to essential services (e.g., medical offices and schools) were completed Friday, October 24, in the late afternoon. A "Do Not Drink" order is still in place.

1443 Shelter status: 14 shelters are open. The shelter population is approximately 2,044 evacuees.

1554 All evacuation orders issued for the Harris Fires are lifted. Repopulation of all evacuated areas is authorized.

1741 In Fire Update #170, Ramona residents are warned not to have contact with municipal water. A reverse 911 message was sent to Ramona residents with the following information about the use of water: Municipal water delivery will resume today and tomorrow for Ramona residents. Drinking the water is unsafe, even if the water is boiled. The water should be used only in toilets and laundry. Residents should avoid showering or bathing in the water; hot showers are available at the Ramona Rodeo on Aqua Lane. Bottled water or hand sanitizer should be used when washing hands. Bottled water should be used for brushing teeth, washing dishes, making ice, and preparing food. Outdoor water use is prohibited. This advisory remains in effect until further notice. A formal "unsafe water notice" was delivered to Ramona homes on Thursday, October 25. The reverse 911 call was placed this afternoon to remind residents that the advisory remains in place. An "unsafe water notice" is more restrictive than a "boil-water alert." Boiling municipal water in Ramona will not make it safe for human contact or consumption. Residents can find additional information online at www.sdcountyresponse.com, or by phone at 211.

Summary of logistical activities for October 27, 2007:

- Water to support 1,500 people is ordered for Dulzura shelter.
- 25–30 workers support Qualcomm Stadium demobilization.
- Two buses support transportation of 89 elderly people from Qualcomm Stadium; 20 wheelchairs are also requested to support.
- Two trucks of panels (500 total) are dispatched to the Jamul shelter location.
- 400 horse leads and halters are ordered for Lakeside Rodeo Grounds.
- Two porta-potties are ordered for the El Cajon shelter.
- 500 pairs of goggles are ordered for the Department of Environmental Health (DEH).
- 200 county-owned cots require pickup at Santana High School.
- 100 blankets, 200 pillows, and 50 cases of water are requested for Del Mar Fairgrounds.
- 40 bales of hay and 200, 5-gallon buckets are requested for the Fiesta Island animal shelter.
- Two tower light units are requested for Lakeside Rodeo Grounds.
- 100 cots, blankets, and pillows are requested for Del Mar Fairgrounds.
- Three light tower units are requested for Campo Community Center.
- 60 bales of hay and 10 porta-potties are ordered for Gillespie Field.

1744 A request was made to the Sheriff's Department to make announcements in several areas in Ramona: "Do not use water. Call Ramona Water District." This assignment was given to Astrea to fly over three separate areas. Many of the areas were burned so residents may or may not be in the area. The Incident Command in Ramona was also given this information and will have units on the ground make the same announcements.

Sheriff's Department aviation operations consisted of the following response:

Astrea 5 (HELCO)	3.7 flight hours	Witch Fire	worked with CAL FIRE
Astrea 7	4.2 flight hours		

Copter 10	0.1 flight hours	Witch Fire
Copter 12	0.5 flight hours	Harris Fire

Additionally, there were OAEOC briefings and press conferences conducted; press releases issued; and Situation Status Reports and OAEOC Action Plans developed on October 27, 2007.

Although the Poomacha Fire continued to burn in northeastern San Diego County into November 2007, the majority of operations after October 27, 2007, focused on recovery operations. The Ramona Water District requested the Sheriff's Department issue a reverse 911 call after 2000 PST on October 29 to advise Ramona residents that their water supply was safe to drink. The OAEOC remained activated with minimal staffing until November 9, 2007, and OES personnel supported recovery operations in Dulzura, Barrett Junction, Potrero, and Intermountain communities impacted by both the Harris Fire and the Witch Creek Fire.

Summary of logistical activities for October 28 through November 9, 2007:

- 44 pallets are ordered to support water delivery operations in Ramona.
- One semi-trailer of ice is ordered for Red Cross Warehouse #2.
- One refrigerated trailer is ordered to support recovery operations in Ramona.
- Pet supplies and personal hygiene items are purchased from Wal-Mart to support Dulzura shelter operations.
- One 40-foot connex container is provided to Campo.
- Four porta-potties with wash facilities are provided to the Highway 94 staging area.
- Tetanus vaccines and syringes are provided to Ramona and Dulzura.
- Two roll-off dumpsters are provided for recovery operations in Ramona.
- Two water delivery trucks are requested to support 1,200 cattle in Dulzura.
- 200 gallons of diesel fuel are ordered to support power generation in Potrero.
- 500, 40-pound bags of ice are ordered to support Dulzura recovery operations.
- 330 porta-potties and 16 washing stations are ordered for Ramona.
- 400, 20-pound bags of ice are ordered for Ramona.
- Sprint/Nextel Cell-on-Wheels (COW) are requested for fire-damaged towers in Deer Horn Valley.

ADDITIONAL AVIATION OPERATIONS

The Sheriff's Department continued to conduct aviation operations on the following dates:

Sunday, October 28, 2007

Astrea 1	0.5 flight hours		
Astrea 7	4.6 flight hours		
Copter 10	3.5 flight hours	Witch Fire	15 water drops
Copter 12	4.3 flight hours	Harris Fire	28 water drops

Monday, October 29, 2007

Astrea 1	0.5 flight hours		
Astrea 3	2.0 flight hours		
Copter 10 (Recon)	2.7 flight hours	All Fires	
Copter 12	0.4 flight hours	Harris Fire	

Tuesday, October 30, 2007

Copter 12	2.3 flight hours	Harris Fire	10 water drops

CHAPTER 1: REGIONAL RESPONSE

1 ADVANCED PREPARATION

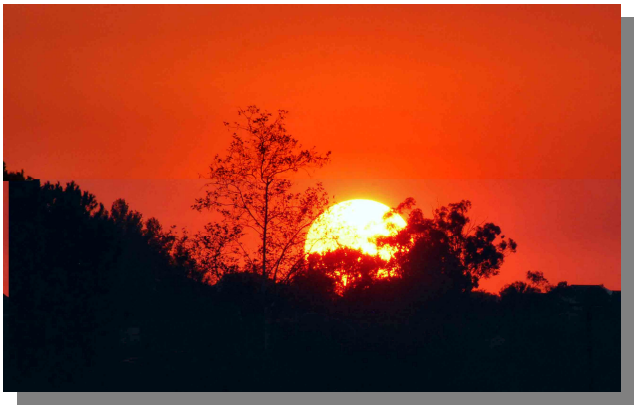
1.1 Public Awareness Campaign

1.1.1 Improvements Since 2003 Fires

1.1.1.1 Plans

- A countywide public awareness campaign was started in the summer of 2006. Although the campaign was an all-hazards approach to public emergency preparedness, it provided important information that residents could easily apply to a wildland fire event.

1.1.2 Impact to 2007 Fires



The San Diego County Office of Emergency Services (OES) started a public awareness campaign in July 2006. The goal of the campaign was to encourage residents to take proactive steps to prepare for emergencies by, among other things, completing a family disaster plan. The written document, officially named the *Family Disaster Plan and Personal Survival Guide*, was created as an all-hazards campaign and included information that could apply to a wildland fire scenario. The campaign began with the county sending 1.2 million survival guides to residents. This was followed by a media campaign to emphasize the plan's importance in disaster preparation and encourage the public to use it, as necessary.

The county created the www.ReadySanDiego.org website, which includes all forms of media to get the word out to the public; it also includes interactive web pages for kids with puzzles and games to encourage kids to become involved in family preparedness planning. Additionally, OES solicited child involvement through a "Preparedness Starts with You" school campaign, and Fallbrook Union and Vista Unified School Districts held poster contests to encourage children to take preparedness materials home.

Public Service Announcements (PSAs) were provided to residents through a variety of sources, including radio, television, sporting events scoreboards, city buses, highway department signs, and other creative media outlets. The county attempted to reach every segment of the

community, which included specially tailored PSAs for the military, Community Emergency Response Teams (CERTs), and pet owners.

A new campaign aimed at local businesses (the "Ready San Diego Partner Program") was started in September 2007 aimed at encouraging businesses to adopt an all-hazards approach to preparedness. As part of this program, local businesses register to participate in ongoing public/private partnership efforts and receive Business Emergency Response Team (BERT) training sponsored by OES. Prior to the 2007 fires, 49 businesses had registered to participate; 18 businesses have registered since the fires.

Although the plan and website were not established specifically for or during the wildland fires of 2007, they did provide residents and businesses with important information that was useful for preparedness, evacuation, and recovery.

1.1.3 Successes

- Approximately 1.2 million residents received the all-hazards *Family Disaster Plan and Personal Survival Guide*.
- An estimated 300,000 residents took action towards emergency planning as a result of the county's information and promotional campaign.
- The guide is available in four languages: English, Spanish, Vietnamese, and Tagalog via the Ready San Diego website. It was also distributed to special populations in Braille and audio recordings.
- Local businesses, professional sports teams, museums, and media outlets donated time, money, radio and television advertising, and promotional items to disseminate preparedness information to the public.
- The "Preparedness Starts with You" school campaign allowed children to get involved in preparing their families for all hazards.

1.1.4 Areas for Improvement

- None

1.2 Countywide Improvements Since 2003

Foresight and flexibility are two key characteristics of a successful emergency management program. San Diego County has prepared exhaustively for the most probable emergencies while maintaining the agility to adapt to the changing needs and circumstances that will inevitably arise during a disaster. During the 4 years following the 2003 fires, San Diego County officials engaged in a number of activities to build upon the lessons learned during those fires and to further preparedness and response efforts of their personnel. These activities were funded in conjunction with homeland security grants. The following provides an overview of the preparedness improvements since 2003.

1.2.1 Plans

- Continuity of operations (COOP) plans were written and exercised for all 57 San Diego County departments and agencies.
- A county Joint Information Center (JIC) plan was developed and exercised.
- Community protection and evacuation plans were developed in coordination with the Fire Safe Councils to assist small jurisdictions in all of San Diego County. These plans identified evacuation routes, safe areas to go when unable to evacuate, and water sources (e.g., pools, water tanks).
- County and regional partners completed a recovery plan that addresses short- and long-term restoration plans for communities impacted by disaster to include debris removal and financial assistance.
- A draft volunteer management plan was written but has not been finalized.
- The Operations Section for the Unified Disaster Council Committee developed a special populations plan and assisted in the development of the evacuation plans.
- A memorandum of understanding (MOU) between San Diego County OES and 211 San Diego was established to ensure that 211 liaison personnel are provided to the JIC to assist with public inquiry and rumor control functions.
- A memorandum of agreement (MOA) between the California Department of Forestry and Fire Protection (CAL FIRE) and OES was established to ensure a fire service liaison is provided to the Operational Area Emergency Operations Center (OAEOC) during wildland fire events.
- A Regional Evacuation Plan was developed and approved by the Unified Disaster Council.

1.2.2 Training

- The county instituted regional, annual staff training for all OAEOC sections (one OAEOC section per quarter). Training was made available to personnel from county departments, incorporated and unincorporated cities, and special districts.
- County probation officers and Radio Amateur Civil Emergency Service (RACES) personnel were trained as field liaisons.
- Approximately 200 county OES personnel were trained as shelter managers and workers with a specific focus on special needs shelters.
- County personnel were trained on evacuation plans.
- The county instituted an OES staff duty officer training program with formal qualifications and a requirement to go through board certification.
- The county conducted more than 40 preparedness exercises between 2003 and 2007, which were vital to OAEOC staff training and for identifying gaps and deficiencies in existing plans, policies, and procedures.

1.2.3 Equipment

- OAEOC equipment upgrades were made that included new video teleconferencing capability and electronic status boards built to enhance communications and information management. (Please refer to section *8, Technology and Automation,* for additional details.)
- The county purchased two mass-notification systems:
  - Reverse 911, which was purchased and operated by the San Diego County Sheriff's Department.
  - An emergency notification system called AlertSanDiego, which was purchased and operated by OES. AlertSanDiego has the capability of calling every household in the county in less than 3 hours.

- The county purchased additional Geographic Information System (GIS) equipment, software programs, and plotters.
- The county upgraded to more capable 800-megahertz (MHz) radios and provided them to response personnel.
- All professional OES staff personnel were issued notebook computers with wireless cards, which allow them to work remotely if needed.
- The county purchased the WebEOC crisis information management system, which was used countywide in city EOCs and agency Department Operations Centers (DOCs). At the height of the 2007 fires, approximately 400 individual users were logged into the system.
- OES obtained six satellite telephones.
- Nextel provided a "go kit" with 25 phones to be used by OES staff during response operations.
- The county completed a $20 million renovation of the Regional Communication System, which expanded the communication capacity in eastern San Diego County. The system successfully supported 264 agencies throughout the 2007 fires response.
- The county purchased two firefighting helicopters.
- The county purchased 20 new firefighting vehicles, including water tenders, engines, and rescue vehicles.

1.2.4 Staffing

- OES staff is twice the size it was in 2003. This growth is primarily due to funding made available through homeland security grants. Current staffing levels are as follows:
  - 3 senior emergency services coordinators

- 6–7 emergency services coordinators
- 3 finance personnel
- 1 part-time GIS coordinator
- 1 full-time public information officer (PIO)
- Student interns
- Trainees

1.2.5 Brush and Vegetation Management / Fire Safe Community Design Concepts

- Approximately $52.5 million has been spent in San Diego County to reduce hazardous fuels such as 500,000 dead, dying, and diseased trees. The strategy was to first identify at-risk areas and prioritize geographical regions according to the greatest risk. Next, the focus was placed on removing the dead, dying, and diseased trees that posed the greatest risk due to their proximity to homes, roads, and evacuation routes.
- Improvements to building codes for building in the Urban Wildland Interface (UWI) areas were made, as well as improvements in the requirements for vegetation management in new major subdivisions by requiring Homeowners Associations to maintain fire-safe open spaces.
- The county has also adopted codes requiring brush clearing and weed abatement for private land owners. The Weed Abatement Ordinance requires the clearing of combustible vegetation in a 100-foot radius around all structures, including those on public lands. The local fire district conducts initial inspections.
- Additionally, the county recently adopted guidelines that require wildland fire and fire protection review of all discretionary land use applications. The guidelines require that all new subdivisions have a Fire Protection Plan that must be approved by the county and the local Fire Authority.

1.2.6 Public Education and Personal Preparedness

- A *Family Disaster Plan and Personal Survival Guide* was mailed to every household in the county, providing residents with step-by-step instructions for protecting their homes and families.
- OES launched an extensive disaster preparedness public education campaign that included television, radio, and billboard announcements. The campaign was recognized in 2007 with an award from the International Association of Emergency Managers.

- The San Miguel Consolidated Fire Protection District (the District), with assistance from a Federal Emergency Management Agency (FEMA) grant, established a Community Education Program that, in the last 2 years, provided disaster preparedness and evacuation planning information to more than 10,000 urban interface homes and businesses.
- The District, in partnership with the American Red Cross, co-presented family disaster planning seminars to all District employees and, to date, more than 600 community members.
- The county has launched numerous public education campaigns about fire safety and defensible space.
- Preparedness wheels designed especially for people with disabilities were developed and distributed.

1.2.7 Other Improvements

- San Diego County is the only jurisdiction in California to receive Emergency Management Accreditation Program (EMAP) certification.
- A Three-Year Preparedness Exercise Program was developed and presented with the "2005 Best in Category" award by the National Association of Counties.

- The OAEOC completed a reorganization and revision of staffing positions to include separating the planning and intelligence functions from the Plans/Intel Section. The reorganized OAEOC now has five general staff sections: Planning, Operations, Logistics, Finance/Administration, and Intelligence.
- OAEOC position binders were created to include position checklists, instructions on telephone and WebEOC use, instructions on how to log onto the computers, seating charts, and contact numbers for personnel.
- The county established a functional JIC that provided the opportunity to conduct joint, city-county press briefings during the 2007 fires with agency representatives disseminating the same coordinated message. Joint press briefings and coordinated messaging did not occur during the 2003 fires.
- The OAEOC established a GIS Section that now has a dedicated room, with dedicated plotters and other equipment, as well as trained staff to create tailored GIS products. The GIS Section and equipment did not exist during the 2003 fires.

- The county established field liaison personnel to gather and provide information back to the OAEOC. Field liaison personnel were deployed to the Harris, Poomacha, and Witch Creek fires, and were integrated into the Incident Command at each location.
- The county continued to develop the CERT program. There are now 26 CERT teams in comparison to one team in 2003. Several hundred CERT members responded to the 2007 fires.
- The Medical Reserve Corps (MRC) was enhanced. MRC personnel responded during the 2007 fires and provided support to evacuation shelters.
- The OAEOC staffed all five general sections. Please see Appendix D for the Organizational Chart for the Level 3 activation.

1.3 Increased Fire Readiness

Due to the ongoing drought and forecast for upcoming red flag conditions, OES staff and county agency personnel engaged in increased readiness activities the week prior to the fires. These activities included the following:

- Reviewing and establishing critical fire-related milestones
- Identifying alert stages
- Reviewing notification procedures
- Double checking staff phone numbers
- Identifying available staff and checking vacation schedules
- Identifying personnel to fill key OAEOC positions if activation was required
- Ensuring that fire agencies pre-position equipment and assets
- Assessing fire agencies' staffing levels and pre-identifying "draw down" to ensure COOP at base levels

2 EMERGENCY OPERATIONS CENTER

2.1 OAEOC Management and Operations

2.1.1 Improvements Since 2003 Fires

2.1.1.1 Plans

- Numerous positive changes were made to the organizational structure.
- Formal agreements were developed between San Diego County OES and CAL FIRE to provide liaisons to the OAEOC during large-scale wildfires.

2.1.1.2 Training

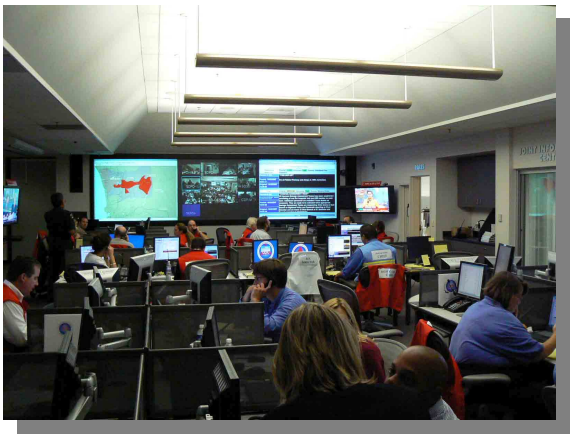
- The OAEOC participated in numerous preparedness exercises, including the San Diego County Biological Full-Scale Exercise (FSE) conducted in March 2007.
- WebEOC training continued for personnel, and specific, annual training was conducted for each functional section (e.g., Planning Section).

2.1.1.3 Equipment

- Significant improvements were made to the OAEOC facility, including remodeling seating areas, acquiring new furniture, creating a functional JIC, introducing GIS mapping capabilities, and improving security features surrounding the perimeter.
- The county purchased a new, web-based emergency management system (WebEOC) that was successfully utilized in recent emergencies and exercises.

2.1.2 2007 Fires Overview

The initial 2007 wildfire (Harris Fire) started at approximately 0923 Pacific Standard Time (PST) on Sunday, October 21, 2007, and was fueled by Santa Ana winds. RACES reported the fire to OAEOC personnel at approximately 0955 PST. Upon initial notification of the wildfire, emergency management personnel began to monitor the situation and consider activation if needed. At 1116, the OAEOC was activated to a Level 1 and, within minutes, AlertSanDiego notified emergency management personnel to respond to the OAEOC. As the incident progressed, more personnel were requested to respond to the OAEOC—at 1347, Level 2 activation was achieved. The county proclaimed a local emergency at 1448. The initial wildland fire, the Harris Fire, was minimally contained when fire danger increased with the start of another large wildland fire, the Witch Creek Fire. As a result, the OAEOC activated to a Level 3 at approximately 1602 on Sunday, October 21, 2007.



Operational periods at the OAEOC were from 0700–1900 for Shift A and from 1900–0700 for Shift B. Personnel from San Diego County OES were able to fill most of the crucial OAEOC leadership positions, including Operations Sections Chief. Additional personnel were requested and utilized through the Emergency Managers Mutual Aid (EMMA) agreement. Response operations continued around the clock for several days, but by the following weekend (on Saturday, October 27, 2007), the OAEOC began to downsize staffing and begin short-term recovery operations. Deactivation of the OAEOC took place on Friday, November 9, 2007, at approximately 1400.

2.1.3 Successes

- San Diego County OES personnel were able to fill a majority of the key leadership roles and functions within the OAEOC.
- The newly created field liaison positions provided crucial information back and forth between the OAEOC and the Incident Command Posts (ICPs).
- Activation of the EMMA agreement provided additional personnel familiar with emergency management to fill necessary positions within the OAEOC.
- Restructuring the OAEOC Organizational Chart provided a more seamless and organized response.
- Pre-planning began to take place between Public Health, special needs advocates, hospitals/clinics, and numerous volunteer agencies regarding evacuation and shelter operations.

- Contributions from the private sector were critical in the response efforts, including providing supplies to evacuation shelters and giving food/crates to evacuees with family pets.

2.1.4 Areas for Improvement

- The existing protocols for fire notification from CAL FIRE to San Diego County OES should be updated.
- The 12-hour operational period (before and after which shift changes occurred) was long, and formal shift-change procedures were not always followed.
- A centralized function for care and shelter operations and/or special needs populations should be more fully integrated.
- There was confusion regarding the roles and responsibilities of the Medical Operations Center (MOC)—specifically, how it communicated with the OAEOC.
- The OAEOC may consider taking advantage of the availability of trailers that could provide sleeping areas and showers, which could reduce dependence on hotels and motels and also reduce safety issues presented by OAEOC staff driving while fatigued.

2.2 JIC/211/OES Website

2.2.1 Improvements Since 2003 Fire – JIC

2.2.1.1 Plans

- Annex L, the emergency public information component of San Diego County's Operational Area Emergency Plan was updated in 2006.

2.2.1.2 Training

- Routine training and drills were conducted for PIOs and 211 San Diego staff members.
- Two-day training on the JIC system and role responsibility was conducted for 20 regional PIOs in 2007.
- Routine WebEOC training was conducted for PIOs to ensure fluid communication flow during an emergency.

2.2.1.3 Equipment

- Multiple flat screen monitors were purchased and installed in the JIC for increased media visibility.

2.2.1.4 Communications

- The emergency management software WebEOC was procured and implemented in the JIC.

2.2.1.5 Other

- The county added a full-time public information specialist to the OES staff.

2.2.2 Improvements Since 2003 Fire – 211 San Diego

2.2.2.1 Training

- The county conducted the 2007 San Diego County Biological FSE and San Onofre Nuclear Generating Station (SONGS) exercise.

2.2.2.2 Equipment

- A generator was purchased with a $120,000 county OES grant to ensure adequate power was supplied to all communications systems for 211 telephone specialists.

2.2.2.3 Other

- In July 2005, 211 was established as a non-profit organization to provide around-the-clock community, health, and disaster information.

- The county established an MOU with OES to provide a staff position in the JIC and to act as a rumor control and liaison for OES and Volunteer Organizations Active in Disaster (VOAD).

2.2.3 2007 Fires Overview

The JIC is the primary coordination location for collection and dissemination of public information during an emergency. The JIC works in coordination with the OAEOC, 211 San Diego, subject matter experts, and the media to ensure accurate and timely information is provided to the public. The JIC and 211 San Diego both began emergency operations on Sunday, October 21, 2007, with around-the-clock operational coverage.

The JIC was operational for a total of 11 days and was comprised of approximately 8–10 county PIOs and a 211 San Diego liaison. PIOs were assigned specific functions within the JIC to include gathering information and writing press releases, conducting phone interviews with the media, and updating county websites. Information was primarily gathered from WebEOC significant events boards and from CAL FIRE personnel in the OAEOC. The information was then incorporated into press releases. Press releases were posted on the JIC WebEOC board and then e-mailed to appropriate media outlets. The JIC maintains and routinely updates a media distribution list to ensure information is disseminated efficiently. Approximately 210 press releases were disseminated to the media and public. Furthermore, the county website, www.sdcountyemergency.com, contained all press release information in addition to field reports, incident maps, health information, power outages, evacuation orders, and other critical emergency information. Prior to the fires, County web site hits were in the range of 300,000 to 600,000 per day. On Monday, October 22nd, hits increased to 10 million—a factor of approximately 25 times. Website hits increased significantly when national media outlets, such as CNN, started linking to the county website. Due to this surge in traffic, the website experienced a period in which response was extremely slow. The County Technology Office took immediate steps, and split the emergency website from the main county web site, and hosted it on its own separate server later on Monday, October 22nd. To ensure adequate capacity, the website was re-hosted to additional larger servers during the week, eventually reaching a capacity of 8 times the original capacity of the initial server.

The Federal Communications Commission established the 211 dial code as a community-based information hotline; 211 San Diego is the primary agency authorized by the California Public

Utilities Commission within San Diego County to provide community information. Throughout the disaster, 211 San Diego functioned as an interactive communication asset with personnel routinely gathering information from the JIC, WebEOC, private sector corporations, and other informative resources to get information to county officials and the public in a timely manner. Initially, general fire information was collected and stored in binders and was updated every 30 minutes. However, new software was developed within a week of operations to support the automation of information. San Diego Futures Foundation assisted this effort by donating 50 computers to the 211 San Diego facility.

During a typical weekday, 211 San Diego operators answer an estimated 500 calls within a 24-hour period. Within the first operational day of the fires, approximately 6,000 calls were made to 211, which reached its peak of 44,000 calls on October 23, 2007. By the end of the operational period, a total of 140,000 calls had been answered by 35 staff members and approximately 1,200 volunteers. A full-time volunteer manager was assigned to help coordinate the influx of volunteers and to ensure a 30-minute training session was completed. Approximately 80% of 211 staff were bilingual. In addition, 211 has access to 156 languages through the use of a translation assistance group. The volume of incoming calls caused some phone networks to be over subscribed. Within 3 operational days, IBM Corporation assisted in doubling 211's network size, and AT&T added six additional T1 lines at the 211 facility. Furthermore, 211 San Diego and the Department of Child Services jointly implemented a virtual call center.

2.2.4 Successes

2.2.4.1 Joint Information Center

- Routine and frequent joint press conferences by city, county, and State personnel were conducted during the firestorms.
- GIS maps were readily available throughout the JIC and were a valuable tool for PIOs, media personnel, and residents.
- Multiple methods of information distribution (211, county websites, WebEOC, and e-mail) were used to ensure the timely flow of information.
- The efficient flow of information allowed the JIC to send more than 200 fire updates to the media. These updates were also posted on the emergency web page for public viewing.

2.2.4.2 211 San Diego

- The integration of personnel and communication equipment allowed for a 7,000% increase in the 211 information distribution capacity.
- Technological infrastructure—including rebuilding the network and adding new phone lines, new computers, and improved databases—were implemented during 211 disaster operations.

- An increased number of dedicated 211 volunteers were established during the wildland fires.
- The 211 Emergency Operations Plan (EOP) was validated.
- The virtual call center concept was validated and implemented for the first time.

2.2.5 Areas for Improvement

2.2.5.1 Joint Information Center

- The JIC required additional PIOs to fully support communication efforts.
- A master list of evacuated communities, repopulated communities, boil-water orders, and shelters needs to be available in the JIC.
- The JIC needs to identify and establish a media monitoring position to address media inaccuracies.

2.2.5.2 211 San Diego

- The 211 call center did not start up operations in an efficient manner due to an initial lack of volunteers and insufficient infrastructure.
- Transferring raw information from WebEOC and translating it into public information was difficult.
- Draft and finalized media releases were not found on WebEOC where 211 personnel were previously trained to look for them.
- Information concerning outlying communities was not always available on WebEOC.

3 GEOGRAPHICAL INFORMATION SYSTEM

3.1 Improvements Since 2003 Fires

3.1.1 Plans

- San Diego County created the GIS Emergency Group to strengthen GIS community cooperation.
- A GIS Emergency Group Standard Operating Procedure (SOP) was developed to standardize GIS operations conducted in San Diego County.
- GIS positions were established within OES for day-to-day operations and OAEOC response during an incident. GIS staff and resources were established at departmental DOCs and the MOC.

3.1.2 Training

- There was participation in numerous county-level OAEOC disaster preparedness exercises.

- Personnel completed Incident Command Training to include Incident Command System (ICS) 100; ICS 200; Independent Study (IS) 700; and National Incident Management System (NIMS), which enhanced understanding of the support role GIS plays in the ICS structure.
- A county GIS analyst was trained as a GIS specialist for incident response.

3.1.3 Equipment

- WebEOC and mapping of Reverse 911 were used to improve evacuation tracking. WebEOC allowed communication and sharing of GIS data and maps among county and city GIS specialists.
- GIS used advanced imagery, mapping, and fire sensor technology available from the U.S. military.
- San Diego County's "Firemapper" technology was replaced with newer GIS fire-perimeter mapping resources.
- A local geospatial data structure was downloaded and maintained to lessen the dependence on network connections.
- Personnel identified key on-line mapping resources from various State and Federal agencies that could provide key information during an incident.
- Personnel created mapping templates for OES.
- A WebEOC "GIS Significant Events" board was created to communicate GIS activities and share geospatial data.
- The county purchased three engineering workstations for GIS.
- The county acquired GIS software licenses with hardware keys to lessen the dependence on network connections.
- The county purchased a large format plotter for hardcopy reproduction of maps in the OAEOC.
- The County Department of Planning and Land Use (DPLU) purchased, and is in the process of outfitting, a GIS trailer that can be deployed to incidents, although it was not ready for deployment during the 2007 fires.
- A GIS room was established within the OAEOC.

3.2 2007 Fires Overview

A GIS representative reported to the OAEOC early on Sunday, October 21, 2007. First responders, RACES personnel, and San Diego County Sheriff's Department deputies deployed in the field provided initial GIS mapping information. GIS personnel were prepared to implement their new SOP, which was being finalized the week prior to the fires. By late afternoon, two county GIS analysts were deployed to the Harris and Witch Creek fires.

By Monday, October 22, 2007, the OAEOC had a GIS Information Technology (IT) staff of four-to-five people who worked 12-hour shifts. The team primarily consisted of a GIS unit leader and three-to-four analysts/technicians. In addition, San Diego County's GIS manager handled operational logistics, such as scheduling people for shifts, arranging for off-site analyses, and communicating with military personnel. The sheriff's GIS staff also worked closely with the OAEOC GIS Unit to map fire perimeters during the initial days of the incident.

Throughout the incident, the GIS Unit provided the common operating picture (COP) for the seven fires that were burning throughout the county, five of which were considered large in scope and size. The COP incident information included fire perimeters; active fire areas from the Modis Satellite; evacuated areas; evacuation shelters; road closures; and Local Assistances Centers (LACs). Other location information included community names; freeways and major roads; a Thomas Brothers' page grid; Indian reservations; military lands; and U.S. Department of Agriculture (USDA) Forest Service lands.

Incident geospatial information was shared with GIS operators throughout the county on the WebEOC GIS Significant Events board. Maps and data tables were shared with non-GIS personnel on WebEOC through the File Library Map and Incident Data Boards. GIS staff located in other jurisdictions, agencies, and utilities were provided with the geospatial data and COP maps via e-mail if they did not have access to WebEOC. Incident information and/or maps were also shared with the State of California, FEMA, San Diego State University (SDSU), the U.S. Department of Defense (DoD), and the media.

The decision by the OAEOC director, county PIO, and GIS unit leader to release maps to the media was made early in the incident. Portable Document Format (PDF) files of OAEOC maps were available for download on the www.sdcountyemergency.com website. The county PIO communicated the existence of the maps to the media and public. These maps served to provide the public with an overview of the fires.

Incident geospatial information was used for a variety of purposes throughout the fires. Perimeter data was used to help determine evacuations; evacuation data was combined with demographic data to estimate the number of people evacuated, shelter sizes, and locations; the County Department of Environmental Health (DEH) used fire perimeter, evacuation data to identify hazardous materials in the path of the fires and used environmental health GIS layers to map and assess health issues in the area of active fire or power outages; evacuation boundaries were used to track repopulation of communities; government facilities data was overlaid with fire perimeters to determine potential impacts of services; parcel, assessor, and housing unit information was provided to incident teams in the field; and fire imagery from different aerial

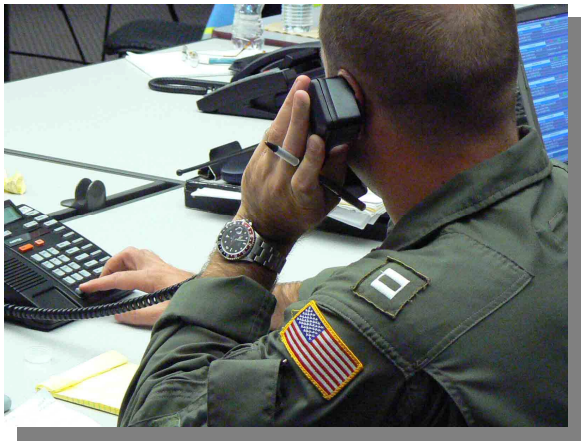
platforms was provided to incident teams, policy members, and hazardous material teams. In addition, the county's Health and Human Services used the data to determine care facilities that were threatened or needed to be evacuated, and mapped health-related incidents.

By Tuesday, October 23, 2007, the SDSU Department of Geography; the Center for Information Technology and Infrastructure Visualization Center; and the local public broadcasting station, KPBS, had established websites on their servers that provided geospatial information on the fires. These sites helped alleviate some of the traffic on the overloaded county website. Throughout the incident, SDSU had a staff of 25–35 people working around the clock to maintain the websites, collect data and imagery, and coordinate with the OAEOC GIS staff. News organizations also utilized the data and set up their own sites.

By Wednesday, October 24, 2007, assistance from the U.S. Geological Survey (USGS) and State OES was provided in the form of "QuickBird" satellite imagery of pre-fire conditions. Additionally, Federal agencies tasked this asset and others to collect imagery of the fires. Also at this time, the SDSU Visualization Center was contacted by representatives from NASA and Google that were providing imagery from the Predator "Ikhana" Unmanned Aerial Vehicle. The Visualization Center facilitated bringing Ikhana's imagery to the OAEOC, which became part of the COP within the operations center. Naval aircraft, capable of providing night vision and laser Global Positioning System (GPS) technology, were used to provide and verify fire-related information during hours of darkness. For example, government infrastructure data was provided to naval aircraft to identify any infrastructure damage as well as information about the location of active fire lines. This technology proved to be very beneficial in the case of the San Miguel 500-Kilovolt (KV) power substation. Initial indications were that the fire was not approaching the substation; however, through the use of night-vision technology, a Navy pilot could see that the fire was close to the substation and was then able to relay that information back to the OAEOC. The OAEOC then notified CAL FIRE to send a strike team to defend the substation. Post-fire GIS maps show the substation as an unburned area surrounded by burn. Had this substation burned, much of San Diego County could have lost power.

The use of GIS for mapping evacuation areas contacted via the Reverse 911 system received mixed reviews. There was a desire to develop GIS maps of the areas that were called using the Reverse 911 and AlertSanDiego systems, so that we had GIS maps of the areas called for evacuation; however, there were delays in mapping because the information from Reverse 911 is not GIS-compatible, and therefore has to be disseminated via computer printout and uploaded manually into the system. The new AlertSanDiego system has the capability to produce data in a GIS-compatible format, but that portion of the system was not fully integrated.

Realizing the need for post-fire aerial imagery for damage assessment and the long-term monitoring of burned areas, the San Diego County OAEOC ordered a high-resolution, geo-referenced, multi-spectral aerial image acquisition of the burned areas. A contract was issued with a private firm that had aircraft available to complete the mission. Imagery was acquired over all the fires within the county on the weekend of November 3, 2007. Delivery of geo-referenced image tiles began on November 8, 2007. Because the imagery does not have any licensing restrictions with the private firm, it could be made available to any and all agencies, as well as to the general public. The use and availability to others proved to be difficult due to the size and tiling scheme of the data. Due to this fact, the county amended the contract several weeks after the fires to have the imagery orthorectified, compressed, and mosaiced.



On October 28, 2007, the OAEOC began to focus on damage assessments efforts. The Department of Planning and Land Use (DPLU)-GIS supported approximately 25 damage assessment teams (three people per team), which used hand-held GPS and paper forms to capture data directly from the scene. The assessment teams' use of GPS allowed for the assessment of 350–500 homes per day compared to 50–100 homes per day by teams using laptop, computer-based GIS programs. However, although more homes can be assessed using the GPS collection process, the information is not as detailed or as accurate as the laptop, computer-based GIS information. Since GPS provides a broad overview of damage and a general location of where the damage occurs, the State of California OES and Environmental Systems Research Institute (ESRI) representatives have recommended the GPS data collection process as a model for the State of California.

The OAEOC moved into the recovery phase on Wednesday, October 31, 2007. GIS services continued and assisted the OAEOC with information concerning debris removal, structural damage assessments, grant writing, road damage assessments, final draft fire perimeter maps, and final evacuation area data and maps. Other agencies that benefited from GIS mapping during the recovery phase included Agriculture; Weights and Measures; Department of Public Works; DEH; DPLU; Sheriff's Department; Parks Department; Health and Human Services Agency; District Attorney's Office; and Registers of Voters.

3.3 Successes

- Quick release of maps and imagery to the press and public helped keep the public informed with the best available information and calmed possible fears due to misinformation.
- The draft GIS SOP was implemented and tested during the fires.

- The GIS ICS provided a clear chain of command structure within the OAEOC and local jurisdictional GIS staff.
- Outstanding cooperation between OAEOC GIS staff and Federal and State agencies facilitated the use of technologies normally reserved for military or intelligence communities.
- Support from Google and NASA was instrumental in obtaining up-to-date imagery.
- DPLU-GIS damage assessment teams' use of a "teleform" and hand-held GPS process to collect data from the field was very beneficial. State OES and ESRI suggest recommending this as a State model.
- Pre-mapping of special needs facilities assisted in the successful evacuation of 2,100 people form skilled nursing facilities.
- Use of the Thomas Brothers' map overlays enhanced the ability to interpret and locate the information portrayed.
- The ability of OAEOC and the public to access GIS maps and imagery via the San Diego State University high-speed Internet website helped to provide information more widely.
- Mapping of evacuation areas using Reverse 911 text-based information was beneficial.
- GIS support distributed to city, county, State, and Federal agencies aided the response.
- The lack of licensing restrictions on the high-resolution, multi-spectral imagery allowed the county to make the data available to other agencies, organizations, and the public.
- WebEOC was available and used among County and City of San Diego GIS staff for viewing, posting, and sharing geospatial data and maps.
- DEH environmental health specialists used intranet/web-based GIS to identify and assess health and safety issues from the office to the field.

3.4 Areas for Improvement

- Some GIS staff members from jurisdictions, agencies, and utilities were not trained in WebEOC and were not aware of information-sharing protocols with the OAEOC.
- Some jurisdictions performed GIS mapping on stand-alone computer systems without access to the Internet. This delayed the dissemination of data between them and the OAEOC.
- There was no standardized terminology among response organizations regarding housing areas, landmarks, and other geographic-specific locations.
- Information on WebEOC became redundant due to multiple users uploading identical data.
- Each jurisdiction conducted damage assessment independently. It is unclear if jurisdictions were using the same criteria for the assessments, and the resulting geospatial data sets could not be integrated due to varying attributes and spatial geometry differences.

- GIS personnel need to be able to continue to track incident information if it moves beyond the boundaries of San Diego County.
- Although the OAEOC GIS Unit was in contact with Federal and State agencies regarding data and imagery being collected, it was unclear what was being made available and when. Better coordination of possible imagery and data acquisition between local, State, and Federal partners needs to happen prior to an incident.
- During and after an incident, local imagery and data needs should be better described.
- The GIS Emergency Group needs to continue training and revise/update the standard operating procedures that are defined by the group.

4 ANIMAL SERVICES

4.1 Improvements Since 2003 Fires

4.1.1 Training

- A strike team training program has been developed, and pre-identified strike teams are established. Strike teams consist of 10 officers and 2 lieutenants and enable a more efficient animal evacuation response.
- Community awareness programs and educational seminars have been implemented for CERTs.
- A weekly micro-chipping clinic was developed to include national registration for all animals in San Diego.

4.1.2 Communications

- Improved relationships with the San Diego Humane Society allowed for efficient communication flow and a coordinated response.

4.2 2007 Fires Overview

The County of San Diego's Department of Animal Services is the lead agency for a disaster of any kind involving animals. The County of San Diego's Department of Animal Services began emergency operations on Sunday, October 21, 2007, and concluded operations on Friday, October 26, 2007. The operations were based out of the Animal Services dispatch office, which functioned as a DOC. Animal Services also provided one representative to the OAEOC as well as field response officers.

During the first day of operations, Animal Services personnel assumed their designated roles throughout the county to ensure sustained animal services operations. A total of five animal shelters were established: Lakeside Rodeo Grounds, Jamul Ranch, Gillespie Field, Fiesta Island, and Del Mar Fairgrounds. Throughout the disaster, Animal Services personnel, assisted by San Diego Humane Society personnel, provided animal evacuation assistance to individuals living in

unincorporated areas and contracted cities. Animal Services personnel also provided care and feeding support at the established animal shelters, coordinated animal resource needs at Red Cross shelters, and provided long-term care and feeding to animals unable to evacuate in Ramona, Jamul, and Fallbrook. Following the conclusion of the fires, Animal Services personnel assisted in reuniting animals with their owners. The success of the mass care and sheltering of animals can also be attributed to large donations of animal crates, food, and other essential animal supplies provided by organizations such as PetSmart, PetCo, and Carter's Hay and Grain. Overall, approximately 400 animals were brought into three county animal shelters; more than 3,000 animals were rescued, relocated, temporarily housed, and returned to owners in the field; and an estimated 5,000 animals per day were fed and cared for at evacuated owners' properties for up to 5 days after the disaster.

During operations, Animal Services personnel experienced difficulties in sustaining effective communications and efficiently tracking resources. These difficulties were attributed to a shortage of communications equipment and the need for mobile command posts. Animal Services personnel had access to 800-MHz radios, but their Humane Society counterparts did not. This communications deficiency was remedied in the past by collocating Animal Services and Humane Society field personnel, but the scope and scale of the 2007 fires and the requirement to conduct simultaneous operations at multiple locations throughout the county did not allow for collocation. Additionally, Animal Services personnel lacked access to the resources afforded by a mobile command post. Access to WebEOC, GIS products, and other types of automation were not available at established temporary animal shelters. Although Animal Services personnel were able to care for, shelter, and feed evacuated animals, they indicated that their operational and administrative efficiency and effectiveness was hampered due to the lack of a mobile command post.

A greater number of animals were evacuated sooner and over a longer period of time compared to the 2003 fires. This was largely due to the dedicated and trained Animal Services staff. Animal Services is comprised of 30 full-time Animal Services officers. Of the 30 officers, 10 officers and 2 lieutenants went through strike team training in order to enhance operational response time and evacuation coordination. During the fires, strike team operations were highly effective and well coordinated. Personnel not assigned to strike teams worked 12-hour shifts. Due to limited staffing, Animal Services worked in conjunction with the San Diego Humane Society to utilize approximately 60 trained animal rescue reserve members, local law enforcement mounted patrols, and Humane Society of the United States (HSUS) staff. Staffing was required at all five designated animal shelters with two individuals supporting the Del Mar

Fairgrounds shelter site. Moreover, Animal Services and Humane Society staffs were deployed throughout the county to ensure the care and feeding of non-evacuated animals.

4.3 Successes

- The development and implementation of a strike team concept resulted in organized and efficient animal evacuations.
- Animal Services effectively conducted routine community education programs to help better prepare the community.
- Animal Services personnel effectively provided long-term care for animals whose owners were unable to return home.
- Animal Services successfully reunited animals with their owners.

4.4 Areas for Improvement

- Animal Services personnel deployed to the field did not have access to computers and other critical communication tools, which did not allow for efficient tracking and information flow.
- No mutual aid agreements were established with animal evacuation sites throughout San Diego County.

5 CONSTRUCTION AND ENGINEERING

5.1 Improvements Since 2003 Fires – San Diego County Water Authority

5.1.1 Plans

- The San Diego County Water Authority maintained the mutual aid agreement executed in 1992 and updated in 2002 with 19 of the 24 member agencies in San Diego County.
- Since 1996, the Water Authority has maintained participation in regional and statewide mutual agreements with the Metropolitan Water District of Southern California (MWD) and through the California Water Agency Response Network (CalWARN).
- The Water Authority revised EOPs and developed an Integrated Contingency Plan, incorporating NIMS, to include hazard-specific action plans.

5.1.2 Training

- The Water Authority conducted NIMS training for its staff.
- Water Authority personnel attended county OES training in EOC operations, ICS, and recovery planning.

- The Water Authority conducted tabletop exercises with Water Authority ICS unit leaders and interagency exercises with the 24 member agencies as well as other regional and State agencies.
- The Water Authority coordinated bi-monthly meetings with water agencies' emergency coordinators that included discussions of emergency topics and training.

5.1.3 Equipment

- The Water Authority implemented a web-based notification system (MIR3) for employee and stakeholder notifications.
- The Water Authority adopted the web-based emergency management system (WebEOC) provided by the county OES.
- The Water Authority purchased personal emergency kits for first responders.

5.2 Improvements Since 2003 Fires – San Diego Gas & Electric Company

5.2.1 Plans

- SDG&E modified and implemented EOC procedures based on information contained in the After Action Report (AAR) for the 2003 fires. These modifications enabled EOC personnel to operate more effectively.

5.2.2 Training

- SDG&E conducted routine training and exercises that assisted EOC personnel in reinforcing their roles and responsibilities.

5.2.3 Equipment

- SDG&E implemented plans with vendors that aided in the procurement of needed generators.

5.2.4 Other Improvements

- SDG&E applied lessons learned from the 2003 fires.
- Through the use of mutual assistance contracts, five different utility companies from across the country provided crews to assist in power restoration activities.

5.3 2007 Fires Overview – San Diego County Water Authority

The Water Authority is a public agency, under the County Water Authority Act, serving the San Diego region as a wholesale supplier of water since 1947. The Water Authority works through its 24 member agencies to provide a safe, reliable water supply to support the region's $130 billion economy and the quality of life of 3 million residents. The Water Authority imports water from

MWD for distribution to its 24 member agencies. The Water Authority's member agencies include a public utility, three irrigation districts, four water districts, six cities, nine municipal water districts, and a Federal agency.

The Water Authority activated its EOC on Monday, October 22, 2007. On Tuesday, October 23, 2007, a Water Authority representative was present in the OAEOC to support operations of the Construction and Engineering Branch. A Water Authority representative continued to provide around-the-clock support in the OAEOC for the first week of the event. The Water Authority EOC remained fully activated the first week of the fires and continued operations with reduced level of activation during the second week.

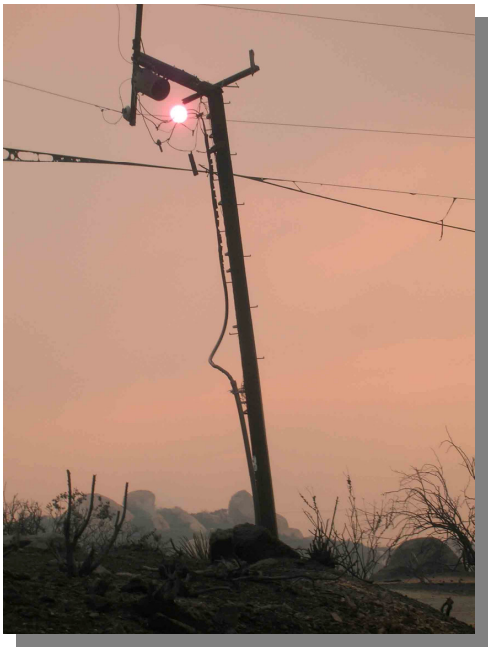
The Water Authority provided and coordinated mutual aid assistance to water agencies impacted by the fire, primarily Ramona Municipal Water District and Fallbrook Public Utility District. Assistance was also given in Potrero at the request of the OAEOC. Coordination of mutual aid assistance by both the Water Authority and the OAEOC resulted in effectively maintaining water systems in the county. One example is the procurement of generators to support the reestablishment of water services in several burned areas. Water Authority personnel manually adjusted the flow of water in a timely manner when electronic means were not operational.

Approximately half of the Water Authority staff (100–150 personnel) deployed to support field and EOC operations. Approximately 75 Water Authority staff members were affected by residential mandatory evacuations, thus affecting the size of available work force.

5.4 2007 Fires Overview – San Diego Gas & Electric Company

Sempra Energy is the parent company for the Sempra Energy Utilities (SDG&E and Southern California Gas Company), which provide electricity and natural gas to customers in San Diego County. SDG&E activated its EOC in monitor mode on Sunday, October 21, 2007, in response to the first fire, with a full activation on Monday, October 22, 2007, and maintained that level of activation for 3 weeks. Southern California Gas Company activated its EOC and maintained a full activation for the first week, and a limited activation for the second 2 weeks. Sempra Energy activated its Crisis Management Center to monitor the activities of the utility companies. Approximately 100 personnel staffed these EOCs, and two personnel (one per shift) staffed the SDG&E liaison seat in the OAEOC for the first 12 days of the OAEOC activation. Additional personnel were deployed countywide to command centers, ICPs, community outreach centers, crews conducting damage assessments and restoring power lines, and staffing electric company call centers. Although the primary function of electric company personnel was to restore power to the affected areas of the county, the assistance provided by company personnel in other areas was invaluable.

There are two major transmission lines that provide power to the county. During the fires, both lines had fires burning underneath, which presented the imminent loss of power to the entire county. The SDG&E representative in the OAEOC worked with the military fire liaison to get helicopters to drop fire retardant in the area of the active transmission line, and crews expedited the maintenance required to bring the other transmission line back into service. In addition, SDG&E personnel began looking for whom they needed to provide power, and identifying priority customers (e.g., hospitals). Had the crews not been able to bring the inactive line back into service when they did, and if the helicopters had not been available, approximately minutes later, significant parts of the county would have been without electricity.



At the height of the firestorms, 80,000 customers were without power due to critical infrastructure being destroyed including key transmission lines. Through the use of mutual assistance, five different utility companies provided crews to assist in restoration of services. Once damage assessments had been completed, crews engaged in restoration activities that included reconstruction of burned lines and the use of helicopters to aerially drop poles to restore lines.

Due to the extensive damage suffered in the rural areas of the county, Sempra Energy has donated $5 million dollars to help those communities rebuild. As the details of the donation are still being established, an example of how the money is expected to help would be to assist rural customers offset the cost of replacing private property power lines destroyed during the fires.

5.5 Successes – San Diego County Water Authority

- Water Authority representatives at the OAEOC were effective in working with the OAEOC in the Operations' Construction and Engineering Branch, and were called on to provide support to the Planning and Logistics sections.
- The Water Authority's mutual aid agreements with member agencies and the MWD were utilized and worked well in supplying the resources needed.
- Water Authority staff and member agencies showed impressive dedication to the mission of providing safe and reliable water, working long hours under unfavorable conditions, despite physical and mental hardships, and displacement due to evacuations.
- Key Water Authority personnel exhibited familiarity with ICS roles and responsibilities.
- Previously developed relationships with outside agencies aided cooperation and readiness to respond.

5.6 Successes – San Diego Gas & Electric Company

- Two utility company EOCs were rapidly activated, and lessons learned from the 2003 fires were applied.
- Mutual assistance crews from across the country were arranged.
- Community outreach activities were conducted.
- SDG&E restored power to affected areas ahead of schedule. Within 10 days after SDG&E had access to the damaged areas, power was 97% restored; it was 100% restored within 13 days.
- Having an SDG&E representative in the OAEOC was invaluable and provided the opportunity to share information between electric companies and other agencies.
- SDG&E crews were able to gain access to evacuated areas due to the ability to work with law enforcement agencies in the OAEOC.
- Interfacing with the GIS unit in the OAEOC and the ability to obtain the most updated maps enabled SDG&E and Southern California Gas Company to determine where crews could begin restoration activities.

5.7 Areas for Improvement – San Diego County Water Authority

- Awareness in the operational area, particularly by fire and law enforcement, that water agencies are first responders and must gain access to facilities and their EOCs must be raised so that restoration of water is not impeded by barricades.
- To avoid confusion and the dissemination of misinformation to the public in future water quality events, State and county public health representatives need to agree on a procedure for approving public health messages prior to issuance.
- Ramifications for repopulating an area when services are not fully restored need to be determined. Agency responsibilities prior to release for repopulation need to be defined. Preparedness documents need to clarify that water agencies do not provide public health facilities or potable water in an emergency event; the documents need to indicate who will be responsible for these items.

5.8 Areas for Improvement – San Diego Gas & Electric Company

- Comprehensive plans for enabling residents to return to their communities were not available, resulting in conflicting priorities influencing key decisions.
- A more elevated role of SDG&E officers in the policy group is needed in order to provide key information regarding utility clearance and restoration.
- There was a lack of clarity or understanding regarding SDG&E's policies for loaning generators.
- Establishing a consistent branch coordinator for the Construction and Engineering branch would have aided in continuity of communication within the branch.

6 LOGISTICS

6.1 Improvements Since 2003 Fires

6.1.1 Training

- The Logistics Section conducted routine WebEOC training to ensure efficient information sharing during a disaster.

6.1.2 Other

- Manual requisition and log forms were created for purchasing and contracting.
- The OAEOC was redesigned to include enhanced communications equipment and improved staffing organization.
- Purchasing and Contracting implemented a policy to ensure routine updating of pre-identified vendors.
- County OES implemented the automated Resource Tracker module of WebEOC in 2007.

6.2 2007 Fires Overview

The OAEOC Logistics Section began initial operations on October 21, 2007, and continued operations until November 9, 2007. Throughout its activation, the Logistics Section was responsible for managing incoming resource requests, maintaining situational awareness of resource inventory, coordinating resource distribution, and acknowledging resource delivery. The Logistics team was comprised of county OES staff, facility operations personnel, Purchasing and Contracting personnel, buyers, and off-site personnel at the primary warehouse.

Logistics personnel used WebEOC task tracker and telephones to conduct operations. They received requests for resources in numerous ways, including telephone, e-mail, and face-to-face communications in the OAEOC. Logistics personnel worked with the primary warehouse to assess available resources for incoming requests. The warehouse was used to store donated and purchased goods—although it was often difficult to distinguish between these two types of goods. If available, resources were sent from the warehouse to the requesting location. Requests outside of normal operations often came from other OAEOC sections and were then processed by Logistics. Emergency vendors were contacted to obtain necessary resources that were not available in the warehouse. The resources were then sent directly from the vendor to the area in need. An estimated total of 978 resource requests

were made during the OAEOC activation, including requests for water, food, medical supplies, bedding, communications equipment, and evacuation vehicles. Although OAEOC Logistics personnel, emergency vendors, and warehouse staff worked together to effectively distribute resources, there was no mechanism to confirm resources arrived at the requesting sites. Furthermore, invoices for purchased resources were difficult to track.

6.3 Successes

- Water was efficiently obtained and distributed to areas in need (e.g., Ramona).
- The county and the city of San Diego effectively coordinated logistical support and operations at the Qualcomm Stadium mega-shelter.
- County communication networks were well utilized and allowed for efficient notification of personnel and accurate information sharing.
- Purchase cards were appropriately used at LACs.

6.4 Areas for Improvement

- The county does not have resources (e.g., beds, food, clothing) to support county staff at the OAEOC that were unable to return home during the disaster.
- An informal process was in place, but a formalized process for the forward-staging and deployment of resources during a disaster was not in place prior to the fires.
- Regional warehouses should be identified to better spread resources throughout the county.
- Additional rented trucks were not available immediately following the disaster declaration to aid in resource mobilization and distribution.
- Additional training is needed within the region in the use of WebEOC's resource tracker module.

7 EMERGENCY MANAGERS MUTUAL AID

7.1 Improvements Since 2003 Fires

7.1.1 Plans

- Recent revisions were made to the EMMA plan and guidance, resulting in a more usable document.
- The EMMA plan and guidance are easily accessible on the State of California OES website.

7.2 2007 Fires Overview

The EMMA plan is intended to "support disaster operations in affected jurisdictions by providing professional emergency management personnel." Due to the developing emergency and need for additional emergency management staff in the OAEOC, the EMMA request was initiated. The OAEOC requested the initial five personnel from the Southern Regional EOC (S-REOC) on Monday, October 22, 2007, at approximately 1030 PST. The positions requested were a Plans Section chief, Logistics Section chief, situation status unit leader, and deputy Operations Section chief. The S-REOC approved the request and forwarded it to the State Operations Center (SOC) at approximately 1145. The SOC authorized EMMA activation and was tasked with providing logistical support for the deployment of EMMA personnel, per the plan. Within 2 hours, EMMA support was offered from San Luis Obispo, Yuba, Sutter, and Butte counties. After the proper approvals, San Luis Obispo County was able to provide two people; Yuba, Sutter, and Butte counties each provided one person.

The first contingent of EMMA personnel arrived to support OAEOC operations in the late evening hours of Monday, October 22, 2007, although some staff did not start duty until the first shift (Shift A from 0700–1900) on Tuesday, October 23, 2007. On Wednesday, October 24, 2007, an additional two staff members were requested through EMMA. The request was made from the OAEOC to the S-REOC through the Response Information Management System (RIMS). Positions requested were a deputy Operations Section chief and a Planning Section chief from Friday, October 26, 2007, to Sunday, October 28, 2007 (Shifts B from 1900–0700). As a result of the request, personnel from Santa Clara and Kern counties responded. Activation of EMMA personnel from San Luis Obispo County lasted until Monday, October 29, 2007, and Inland Region (Yuba, Butte, Sutter counties) personnel left on Friday, October 26, 2007.

7.3 Successes

- Activation of the EMMA plan resulted in seven additional personnel supporting crucial OAEOC activities, including staffing the Operations Section, the Planning Section, and the Intelligence Section.
- EMMA personnel were able to gain knowledge of and support a different jurisdiction's emergency response, resulting in an opportunity to make positive changes within their own agencies.
- Personnel were given an opportunity to use an unfamiliar emergency management tool (WebEOC) that worked remarkably well and was straightforward to learn and use.

7.4 Areas for Improvement

- OAEOC personnel did not use the forms found in the EMMA plan (specifically the "EMMA Check-in and Check-out Form" and the "EMMA Personnel Exit Survey Form").
- There was little-to-no information provided to incoming EMMA personnel containing logistical details, such as maps of the region with the directions to the OAEOC, and county "cheat sheets" with demographic information.
- There was a lag time for EMMA logistical support due to the lack of an EMMA coordinator (Logistics Section) in the SOC during initial activation of the SOC, S-REOC, and the OAEOC on Sunday, October 21, 2007.
- There were deployment and reimbursement issues prior to and during EMMA activation, including personnel having to pay out-of-pocket for flights and not being provided a point of contact to report to upon arrival.
- Not all EMMA personnel were provided with the necessary documentation in a timely manner. These materials include phone extension lists and directions to use WebEOC, and how to properly function in the OAEOC.
- A commitment period of a minimum of 7 days to a maximum of 14 days is too long for most personnel to realistically respond under the EMMA plan.

8 TECHNOLOGY AND AUTOMATION

8.1 Improvements Since 2003 Fires

8.1.1 Training

- Technology and automation was used during quarterly OAEOC exercises.
- WebEOC training was conducted on a monthly basis for countywide EOC/DOC personnel.

8.1.2 Equipment and Technology

- The county procured the WebEOC emergency management system to replace E-Team.
- Reverse 911 and AlertSanDiego public notification systems were purchased and integrated into the county's notification procedures.
- The 211 San Diego system replaced the county's high-volume information phone line recording that provided emergency information to residents.
- Redundant systems for Internet access were established.
- There was large-scale operational use of the county's emergency information website, www.sdcountyemergency.com.

- OAEOC went through a major renovation, including technological, organizational, and information upgrades.

8.2 2007 Fires Overview

Technology and automation played a major role in the successful response to the 2007 San Diego County Firestorms. The fires provided an opportunity to employ and test the OAEOC's technological enhancements and its upgraded information-sharing capabilities. OAEOC personnel at all levels used information technology tools to command, control, and share emergency management information with personnel in the field and at local, regional, and State EOCs.

The technology that received the most use and praise from OAEOC staff was WebEOC. WebEOC was the catalyst for information sharing throughout the county at all levels. Personnel with WebEOC access could view OAEOC status boards, GIS maps, status reports, and a plethora of emergency management information pertaining to the fires from any Internet-capable computer. WebEOC even allowed an employee of the San Diego Water Authority to monitor the situation and provide information while vacationing in Italy. ESi, the design team that created WebEOC, stated that the 2007 San Diego County Firestorms were the largest operational use of WebEOC in its history. OAEOC staff members reported that the system's performance exceeded their expectations.

WebEOC proved especially useful to public information personnel seeking to disseminate "one message" to the media and public. The county's JIC used WebEOC to coordinate unified press releases to the media. PIOs at all levels were able to upload their information to WebEOC where it was used by JIC personnel to compose unified press releases for dissemination to the entire county.

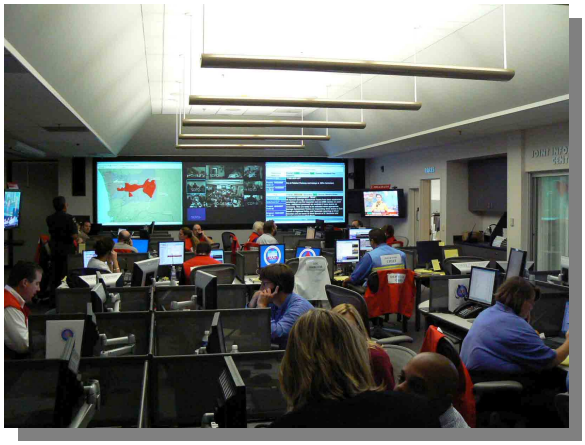
Technology played a key role in the successful delivery of evacuation notifications. Reverse 911, AlertSanDiego, and 211 San Diego allowed the county to quickly notify residents of the need to evacuate. This technology was not available during the 2003 fires, during which residents had to rely on an archaic high-volume phone line with an audio recording and information that was harder to keep current. The 211 system also served as a clearing house for "rumor control" and eased the workload of dispatchers and first responders by lessening the numbers of phone calls from the public on the 911 system.

The 211 San Diego call center answered nearly 109,000 calls from residents in need of timely information about shelters, evacuations, road closures, and the progression of the fires. During the week of October 21–28, operators and volunteers answered questions, such as:

"Can you please give me more details about the evacuation?"
"Where should I go?"
"What do I do with my animals?"
"How do I get assistance to move my mother?"

The average wait time was 1.36 minutes for the entire week, and during peak call times, the average wait time never exceeded 4 minutes. Although wait times were longer in the beginning stages of the fires, San Diego County provided personnel and equipment to quickly increase the 211 San Diego call capacity. The service provided by 211 San Diego is a critical resource during disasters, allowing 911 operators to answer emergency calls.

Video screens and monitors were used extensively throughout the OAEOC to project WebEOC-based information to OAEOC staff. Data displayed included GIS maps; information on shelter status, road closures, evacuation routes; and other emergency management information. OAEOC staff members were able to monitor status boards projected on the video screens and WebEOC on their computers at the same time. Screens and monitors were also used for video conferencing and to broadcast news conferences in the OAEOC.



A "hub and spoke" concept was used to relay information from multiple organizations into the OAEOC and provide a better span of control for information sharing. For example, the MOC served as the "hub" for all hospitals. Information flowed from hospitals ("spokes") to the MOC who would then act as a "clearing house" for information to be loaded onto WebEOC. The County Water Department used the same concept to relay information from all county water districts to the OAEOC via WebEOC.

Overall, technology and automation played a major role in the response to the 2007 fires. Improvements to the OAEOC, the procurement and employment of WebEOC, use of Reverse 911 and AlertSanDiego, GIS mapping, radio upgrades, wireless Internet enhancements, and other technologies all contributed to the county's successful response and recovery.

8.3 Successes

- At the peak of the disaster, WebEOC allowed approximately 1,400 concurrent users to upload information and served as a "virtual liaison" between the OAEOC and all users.
- WebEOC enabled the ability to track status boards, maps, and other pertinent information in real time.

- Reverse 911, AlertSanDiego, and 211 San Diego were used to provide evacuation notifications and other emergency information to the public.
- The county JIC was established, and WebEOC was used for local PIOs to send information for inclusion in a unified press release.
- Video teleconferencing was used throughout the operational area, including a number of video conferences with the Governor.
- An open, wireless Internet system was established that eliminated computer compatibility issues within the OAEOC.

- Acquisition of a second map plotter decreased the time required to produce high-quality GIS products.
- Contracts with Sprint Nextel and other communication companies allowed for the county to obtain additional phones (40 donated by Nextel) and portable cell towers (deployed by Sprint Nextel and AT&T). Portable cell towers also benefited the general public in making cell phone calls in areas impacted by the fires.

8.4 Areas for Improvement

- Although the JIC used WebEOC to obtain information from PIOs countywide, press releases were posted to the JIC website and not WebEOC.
- Some of the available status boards on WebEOC were not used, such as the fire status board.
- CAL FIRE did not integrate its information directly into WebEOC.
- Some unincorporated area agency personnel did not attend WebEOC training prior to the fires and were unable to operate the system during the fires.
- Video teleconference times were not always coordinated across the operational area.
- The State only accepts mission requests via RIMS. Some OAEOC personnel were not familiar with RIMS, but with training, were able to process requests.
- Status boards on WebEOC contained duplicative information that ultimately cluttered some boards.
- By Day 3 or 4, some WebEOC status boards had stopped updating and refreshing. A full Microsoft Internet Explorer temporary file folder was determined to be the cause. Periodic deletion of temporary files remedied the problem.
- The resource manager function of WebEOC was not used to track donations received from the public and private sector. Therefore, accurate tracking of what was donated, where donations were going, or who to contact was not done in WebEOC.

- SDG&E temporarily cut power to the OAEOC grid without notification. The OAEOC video projectors used to broadcast status boards were not connected to generator power. They inadvertently shut down and took several minutes to start up when power was re-established.
- The community of Warner Springs in northeastern San Diego County did not receive Reverse 911 calls. It was discovered that there are several, but relatively small, anomalies in the 911 database provided by the phone companies that result in problems in geo-coding some homes for Reverse 911. In particular, homes that are in one community, but their post office address is in another, are problematic. In addition, there are some communities, like Warner Springs, that have a Riverside County Area Code, which also presents problems for the mass notification system. Some residents on Indian reservations that do not have formal street addresses are another example of homes that are difficult to identify in the mass notification system.

9 VOLUNTEER AND DONATIONS MANAGEMENT

9.1 Improvements Since 2003 Fires

9.1.1 Plans

- The San Diego County Office of Emergency Services and Volunteer San Diego developed an MOU and disaster response plan with 211 San Diego and the American Red Cross to better define roles and responsibilities during a disaster.
- Volunteer San Diego developed a spontaneous volunteer management plan to help better coordinate volunteers arriving at disaster scenes.

9.1.2 Training

- Twenty-five CERTs received the standard 24-hour CERT training. In 2003, San Diego County had only one CERT.
- The MRC participated in several point of dispensing (POD) exercises and additional training.
- The county incorporated volunteer organizations into numerous mass-casualty exercises, including the 2007 San Diego County Biological FSE.

9.1.3 Other

- Improved relationships were fostered with Goodwill and the county OES. An MOU is currently being developed to establish Goodwill as the primary donations collection agency during a disaster for the pre-owned personal items donated.
- The MRC increased volunteers with the acceptance of the 2003 Office of the Surgeon General Grant.

9.2 Overview

Volunteer and Donations Management is a coordinated effort between volunteer and donations agencies that requires the logistical support of the OAEOC during a disaster. The 2007 fires necessitated the collaboration of Volunteer San Diego, the American Red Cross, the Salvation Army, CERTs, the MRC, and many others. During the fires, volunteer and donations management was organized within the OAEOC Logistics Branch. On October 21, 2007, the first fire evacuees were forced from their homes and initial requests were made to the OAEOC for goods and supplies to support the evacuees. Requests for goods continued into the second week of November. By October 22, 2007, donations from the community and local organizations began to inundate local shelters and volunteer agencies.

Throughout the county, 45 shelters were opened, including two mega-shelters at Qualcomm Stadium and Del Mar Fairgrounds, as well as various faith-based and city shelters. The large number of shelters dictated the need for hundreds of volunteers and donations. To satisfy the need for volunteers, Volunteer San Diego deployed 3,500 volunteers and had a total of 8,862 registered volunteers. Volunteer San Diego is comprised of both affiliated volunteers and spontaneous, unaffiliated volunteers. While there were numerous spontaneous volunteers at the beginning of the firestorms, the desire of the spontaneous volunteers diminished by about the third day, and there is no accountability currently in place for the spontaneous volunteers. The American Red Cross processed 2,400 new volunteers, providing background checks and a formal 2-hour training course focused on mass care and shelter operations. In total, there were 3,000 Red Cross volunteers with 2,200 volunteers deployed to shelters. The Salvation Army deployed 700 volunteers; CERTs used 600 volunteers; and the MRC deployed 70 volunteers. The combined efforts of these volunteer organizations resulted in an approximate total of 7,000 volunteers assisting in care and shelter needs, plus numerous other community-based groups whose numbers were not captured. Although volunteer agencies worked in coordination with the OAEOC Logistics Branch, there was no specific lead or coordination position to unify volunteer efforts.

Support from the community and its willingness to donate goods was a huge success. However, collection, tracking, and dispensing of the donated goods proved to be problematic. Donation management efforts were coordinated out of the OAEOC Logistics Branch. Although the OAEOC used a WebEOC task tracker, the lack of a community-wide, formal system to track what goods were being donated and where goods were most needed resulted in some disorganization. Donated goods arrived at shelters, retail stores, and three LACs. The media served as a valuable communication tool to inform people where donations centers were located and what financial donations were preferred.

9.3 Successes

- Response activation of the MRC resulted in over 70 volunteers providing more than 700 hours of care.
- Volunteers were trained and deployed to shelters in a timely manner.
- The community provided large quantities of volunteers and donations.
- The media was an effective communication source for promoting Volunteer San Diego and asking for financial donations rather than physical goods.

9.4 Areas for Improvement

- Volunteer agencies and county personnel have not implemented a formal tracking system for donated goods.
- Finalization of the county's Donations Management Plan is needed to better allocate donated goods to various agencies based upon need and supply.
- The credentialing program to validate spontaneous health volunteers should be enhanced.
- Volunteer and donation agencies need to improve cross communications and enhance good working relationships.
- Additional education, outreach, and training needs to be conducted in the healthcare community to establish a county-wide strategy for health workers during a disaster.

10 MEDICAL EXAMINER

10.1 Improvements Since 2003 Fires

10.1.1 Plans

- A phone tree was developed for notification and recall of staff during emergency situations.
- A protocol to pre-stage an investigator or field office ahead of the fire was developed for use during the fires, unlike in 2003.
- In 2006, Annex F: Medical Examiner Operations of the County Operational Plan was revised to include a protocol for forming teams of investigators to continue routine support operations during crisis operations.

10.1.2 Training

- County personnel participated in numerous mass-casualty exercises, including planning for the Golden Guardian 2007 exercise in Anaheim.
- A senior Medical Examiner staff member is on the San Diego County exercise planning team as a subject matter expert.

10.1.3 Equipment

- All vehicle radios were upgraded to digital, and digital hand-held radios were procured for each investigator and command staff member.
- Two additional Medical Examiner radio channels were added, as well as access to all countywide radio channels.
- Through an OES Department of Homeland Security Grant application, $190,000 has recently been obtained for the procurement of a mobile morgue vehicle by and for the Medical Examiner.
- Through the generosity of the Sheriff's Department, an older-model ambulance was outfitted to serve as a Medical Examiner Command Center vehicle.
- Acquired through grant funding, the portable Dental Electronic X-ray Imaging System (DEXIS) enables field collection and processing of dental x-rays for identification.
- Equipment for use in fire deaths, as well as other mass-fatality events, is now stocked on the premises, available to be loaded into vehicles in minutes. This equipment includes shovels, goggles, respirators, sifters, and heavy-duty body bags.
- Individual protective equipment has been obtained for each investigator, including protective coveralls, safety helmets, and heavy-duty gloves.

10.1.4 Infrastructure

- The design of a new Medical Examiner's facility was completed. The facility will significantly enhance current capabilities to handle a disaster with multiple casualties. This new facility is currently scheduled to be operational in September 2009.

10.2 2007 Fires Overview

The San Diego County Medical Examiner's Office began initial activities as a result of the fires on Sunday, October 21, 2007, at approximately 1400 PST and maintained emergency operations through Saturday, October 27, 2007. The Medical Examiner's Office was contacted on Sunday as a result of the first deceased body due to the wildfires, and quickly sent an investigator into the field. Furthermore, the office dispatched investigators to both north and south county early in the emergency in order to ensure access to the scene before fire restricted movement within the affected areas. On-scene firefighters and law enforcement officers usually find deaths as a result of fires, and the Medical Examiner's

Office is dispatched directly to the scene, not coordinated through the EOC.

On Sunday, October 21, 2007, at approximately 1900 PST, the OAEOC requested initial estimates on the amount of fatalities as a result of the fires. According to projected numbers, the Medical Examiner's Office was anticipating approximately 200 fatalities. However, fatality numbers were ultimately far lower than anticipated. During the incident, there was significant concern that the capacity to handle normal, "routine" deaths and those from the fires would quickly overwhelm present capabilities. By the end of the incident, there were 10 fatalities as a direct result of the fires at six different scenes throughout the affected areas.

Starting on Monday, October 22, 2007, the Chief Medical Examiner and the Operations administrator provided support at the OAEOC as liaisons. There was a clear chain of command within the Medical Examiner's operations; field-level investigators reported to the senior investigator who then reported to the Operations administrator. There were Medical Examiner's staff members at the EOC from Monday, October 22, 2007, through Saturday, October 27, 2007, and they provided specific support focused on Medical Examiner operations. These operations included providing information on the number and identification of decedents (direct and indirect), assisting with press releases, determining the cause of death, and identifying the manner of death. In addition, investigators provided support with evacuations as they did during the 2003 fires. The Medical Examiner's Office was not evacuated during this fire response, so the alternate facilities that have been identified were not needed.

10.3 Successes

- The alternate morgue facility (with a 50-body capacity) was arranged through a north county mortuary, but it was not used.
- Investigators were dispatched ahead of the fire before the fire blocked access to and from the area; these investigators were able to provide real-time information back to the Medical Examiner's Office.
- Refrigerated trucks, used for additional morgue capacity, were requested on standby through private vendors.
- Approximately 25% of the Medical Examiner's Office staff was personally affected by the fires and the resulting evacuations; however, all staff members were committed to being in the office for support.
- Medical Examiner's Office operations were initially reactive following the identification of the first victim but became proactive throughout the disaster.
- Press releases were developed with county assistance and used a newly developed form that separates direct and indirect fire-related fatalities.

10.4 Areas for Improvement

- The county should ensure continued participation of the Medical Examiner's Office in exercises and training, as applicable.

- Medical Examiner investigators in the field do not have adequate equipment to provide data back to the Medical Examiner's Office staff and the Chief Medical Examiner. Specifically, they do not have real-time video capability, surveillance equipment, or a system to do a "data dump" back to the office.

11 LIAISON OPERATIONS

11.1 Improvements Since 2003 Fires

11.1.1 Plans

- An MOA was created to ensure that fire service liaisons are provided to the OAEOC.
- Field liaison positions were created and personnel were trained to provide situational awareness back to the OAEOC and act as "information collectors."

11.1.2 Training

- Emergency management personnel participated in numerous all-hazard exercises, including the May 2005 Countywide High-Explosives Functional Exercise (FE) in which OAEOC operations were successfully evaluated.

11.2 2007 Fires Overview

Liaison operations as a result of the wildfires began within the initial few hours of the emergency on Sunday, October 21, 2007. Some of the first liaison positions to be activated were the field liaisons, who comprise personnel from the San Diego County Probation Office and RACES. The field liaisons' foremost duty is to report information from the scene back to the OAEOC; however, during the wildfires it was noted that the field liaisons were also an asset to the on-scene incident commander by providing information from the OAEOC back to the ICPs. Field liaisons were deployed to the three largest wildfires (Witch Creek, Harris, and Poomacha) and operated around-the-clock during the critical first days, scaling back to the hours of 0600–1900 daily as conditions improved.

By Monday, October 22, 2007, the military liaisons were arriving at the OAEOC to provide assistance. Military liaisons represented most, if not all, military branches, including the Marines, Navy, Coast Guard, Army National Guard, and Air Force. The resources acquired through the military liaisons were crucial to the response operations, including Coast Guard helicopter flights, cots provided by the Marines, and Air Force drones providing aerial reconnaissance data.

The California Army National Guard (CANG) provided hundreds of individuals who were used to augment law enforcement resources and provide logistical support in the field. Non-military liaisons were also located in the OAEOC and represented agencies including the U.S. Forest Service and Immigration and Customs Enforcement. Liaison operations were ongoing throughout the response period and ceased when the OAEOC transitioned from response to recovery operations.

11.3 Successes

- Liaison personnel were provided to the OAEOC by appropriate agencies and contributed to the success of the wildfire response operations.
- Military liaisons provided a conduit to a variety of critical resources including thousands of cots for shelters, feed for livestock, and aerial reconnaissance flights.

11.4 Areas for Improvement

- Some agencies provided too many liaison personnel during the wildfires, which resulted in inadequate space in the OAEOC and redundant personnel responsibilities.
- It was unclear which agencies were represented in liaison positions. OAEOC check-in procedures were not as formal as required.
- Some field liaisons did not have access to computers and were unable to monitor the situation or provide updates to WebEOC from the scene.
- It was unclear how liaisons were notified (or requested) to respond to the OAEOC, or if some self deployed as a result of the incident.

12 ENVIRONMENTAL HEALTH ISSUES

12.1 Improvements Since 2003 Fires – Air Pollution Control District

12.1.1 Plans

- The Air Pollution Control District (APCD) developed and implemented a COOP plan to help maintain continuous performance of its essential functions during an emergency.

12.1.2 Training

- APCD participated in routine OAEOC training.

12.1.3 Communications

- APCD incorporated additional public information links on the county air pollution website.
- APCD improved and expanded internal phone trees.

12.2 Improvements Since 2003 Fires – Department of Environmental Health

12.2.1 Plans

- DEH developed a COOP plan to ensure essential functions were operational during a disaster.

12.2.2 Communications

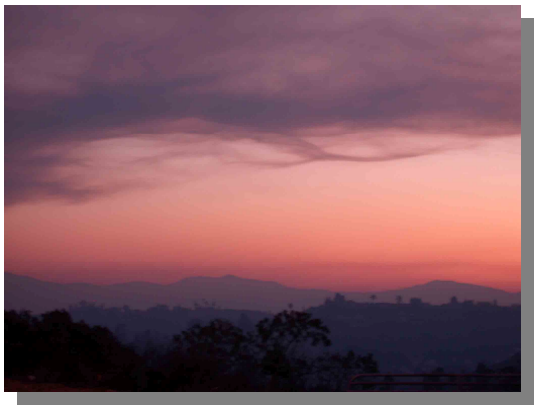
- DEH implemented the County Alert Service System (CASS) emergency alert notification system.

12.2.3 Operations

- DEH developed a fully operational DOC with communications capabilities and essential supplies to work in conjunction with the OAEOC.

12.3 2007 Fires Overview – Air Pollution Control District

The San Diego County APCD is the primary government agency that regulates sources of air pollution within San Diego County. APCD began operations in the OAEOC on Sunday, October 21, 2007, and maintained operations through Thursday, October 25, 2007. During firestorm operations, APCD provided a staff member in the OAEOC at all times. In addition to OAEOC operations, personnel worked out of APCD facility offices until fire threats forced them to evacuate. Throughout their operational period, APCD personnel were deployed to the field to monitor nine routine air monitoring areas, four real-time areas, and five heavily populated areas downwind from the fires. Air quality samples from these testing areas were taken daily and analyzed in conjunction with the California Air Resources Board. Also, APCD personnel had a full-time meteorologist in the OAEOC to provide predicted weather outlooks to the OAEOC director and provide informative weather statements to county personnel regarding fumes from the fires. The meteorologist continued to provide weather outlooks for approximately 1 week after the APCD operational period. Furthermore, APCD personnel directly, and in collaboration with the Public Health officer, provided ongoing health safety statements to the media, the general public, and schools.



12.4 2007 Fires Overview – Department of Environmental Health

DEH is the lead agency responsible for protecting the environment and protecting environmental health in San Diego County. During the fires, DEH adjusted normal operational duties for field

and hazardous materials (HazMat) personnel to meet county environmental and public safety needs. DEH activated its new DOC on October 22, 2007, and provided staff members to the OAEOC on October 21, 2007. DOC operations included environmental health GIS staff who communicated with OAEOC GIS staff for shared geospatial data and mapping. In addition, HazMat teams provided logistical support to the OAEOC and all fire ICPs. DEH also provided staff to various shelters throughout the county for additional support, as needed. Furthermore, DEH inspected all shelters to ensure food and water safety.

During operations, DEH worked with Emergency Medical Services (EMS) and the Public Health officer to identify necessary boil-water orders and other pertinent health alerts. There were at least 28 boil-water orders issued for approximately 7,000 residents. Reverse 911, press releases, and water district web pages were used to help notify returning residents of the "Do Not Drink the Water" order in Ramona. Approximately 27 small water systems lost power and were out of service due to the fires. DEH worked with the State of California to identify the impact of the wildfires on large water systems. In addition, DEH maintained communications with OAEOC Policy Group personnel to inform them of environmental issues. Lastly, DEH provided information on water quality, food safety, and hazardous materials during the wildfires response and recovery.

12.5 Successes – Air Pollution Control District

- APCD directly, and in collaboration with the Public Health Officer, maintained and provided up-to-date health safety information to the media, the general public, and schools.
- APCD personnel were in constant contact with the California State Air Resources Board (ARB) when the fire began, enabling them to obtain five portable monitoring stations from ARB within 24 hours into the area during the firestorm. APCD personnel coordinated with ARB to get the monitoring stations delivered, located, and calibrated.
- APCD provided beneficial weather outlooks for the OAEOC director.
- APCD personnel were appropriately used to collect informative data from the field.
- APCD facilitated the rapid utilization of out-of-state equipment, needed in remediation operations without delays to obtain permits.

12.6 Successes – Department of Environmental Health

- DEH efficiently established and executed DOC operations.
- DEH established excellent working relationships with San Diego fire and law enforcement personnel.
- DEH provided detailed environmental health updates to the Public Health Officer.

12.7 Areas for Improvement – Air Pollution Control District

- Additional back-up systems are needed to ensure electronic information can be accessed on various types of equipment.

12.8 Areas for Improvement – Department of Environmental Health

- DEH needs to ensure routine training is provided for PIOs in the JIC.
- DEH needs to ensure multiple electronic back-up systems are available.
- Critical HazMat data needs to be placed on a secured OAEOC database for easier access during an emergency.
- DEH needs to coordinate routine briefings in the OAEOC to ensure efficient information sharing.

13 COMMUNICATIONS

13.1 Improvements Since 2003 Fires

13.1.1 Plans

- A Regional Communications System (RCS) Storm Plan was designed and developed to identify opportunities to manipulate communication system activities and discard non-critical communications.
- In July 2006, the Tactical Interoperable Communications Plan (TICP) was designed and developed. TICP assessed interoperable communications capabilities among Federal, State, and local agencies and incorporated both law enforcement and Unified Command components.

13.1.2 Training

- RCS Division-funded radio classes began in July 2007, and to date nearly 300 personnel have attended the training. Radio training enhanced end users' system and operational knowledge, skills, and abilities to effectively use RCS and radios. Additional training is planned for the remainder of the fiscal year.

13.1.3 Equipment

- A $23 million communications enhancement project includes increased capacity at simulcast zones, as well as 800-MHz radio caches.

13.2 2007 Fires Overview

The San Diego County / Imperial County RCS began initial disaster operations Sunday, October 21, 2007, and maintained emergency operations through Sunday, October 28, 2007. Beginning on Monday, October 22, 2007, technologists from the San Diego County Sheriff's Department assumed their designated roles within the RCS Division to ensure that communications throughout the county remained operational. During the disaster, technologists monitored the fire activities and arranged for fuel deliveries to sites utilizing emergency generators; performed

on-site equipment repairs; provided technical assistance for programming and repairs in fire camps; installed temporary generators at sites; deployed the Transportable Radio Facility (TRF); pre-positioned cache equipment; interfaced RCS equipment with military equipment; and performed many other valuable communications operations. During the fires, 19 transmitter sites were powered by emergency generators, and 4 transmitter sites burned. Despite these challenges, the entire RCS network remained operational and available for use throughout the emergency.

Summary of Communication Response:

- On average, RCS handles 3.2 million requests for channel assignments ("calls") a month with 1,950 delayed assignments ("busies").
- From October 21–26, 2007, RCS handled 1.2 million calls with 46,572 busies averaging a delay of 4.1 seconds.
- On the busiest day, October 22, 2007, there were 264,048 calls with 33,021 busies and an average delay of 5.6 seconds.
- Overall, this represents a 71% improvement over the figures from the 2003 fires where there were 104,605 busies with an average duration of 19 seconds.

Throughout the 2007 wildfires, communications remained operational and effective. The RCS wireless network deployed an additional 380, 800-MHz radios that were used by cooperating and assisting agencies throughout San Diego County. In addition, RCS technologists successfully incorporated local resources into the California State communications structure. California integrated the use of RCS as a logistical network for the first time. Furthermore, through the use of WebEOC, the interoperability communications coordinator efficiently provided communication frequencies and coordinated military, Federal, and State assets as needed. Lastly, RCS technologists succeeded in programming 800-MHz radios and providing them to Drug Enforcement Agency and Border Patrol helicopter personnel aiding in firestorm operations.

Successful RCS operations were due in large part to a dedicated and well-trained staff. Approximately 21 technologists performed operational duties around the clock for 7 days. Communications personnel worked 12-hour shifts supporting OAEOC and field communications operations. Specifically, day- and night-shift infrastructure technologists provided communications maintenance and logistical support to the fire camps and transmission sites. These technologists performed daily checks on generators at the transmission sites to ensure continued operations. This was the first time fire camp technologists serviced the communications equipment needs as part of the Unified Command. Support for operational area communications was provided by two interoperability communications coordinators that provided 24-hour communications support

throughout the emergency. Although the communications coordinator position was not staffed at the OAEOC, communications were well maintained through the use of WebEOC and the command, control, and communications network.

13.3 Successes

- Operational communications were effectively maintained despite four transmitter sites being burned and 19 transmitter sites being powered by emergency generators.
- The RCS Division successfully met all county requests for communications support.
- RCS personnel deployed in a timely manner and were appropriately trained for disaster operations.

13.4 Areas for Improvement

- RCS needs to continue to develop and update the RCS Storm Plan.
- RCS should develop a process to identify and standardized appropriate opportunities to adjust communication systems.
- RCS should increase the capacity of the remaining 19 transmitters as frequencies become available, using on-hand surplus equipment to the level required for major incidents.

14 SHELTER OPERATIONS

14.1 Improvements Since 2003 Fires

14.1.1 Plans

- The County Operational Plan was updated to include a Care and Shelter Annex (Annex G).
- An MOU was established with the Humane Society for animal sheltering.
- An MOU was established to designate Volunteer San Diego as the lead agency to handle spontaneous volunteers. At the time of the fires, the MOU had not been signed yet, but the spontaneous volunteer management plan had been completed.

14.1.2 Training

- A shelter training program was developed to provide the cities within San Diego County with the knowledge and training necessary to establish local shelters. The cities of Escondido, Poway, and Oceanside have completed the training program.
- County shelter teams were created and trained.
- Shelter training courses were conducted for CERT members, Red Cross volunteers, and county Public Health personnel.
- The Red Cross conducted disaster kitchen training for local volunteers.

- Annual training was implemented for Public Health nurses to assist the Red Cross in shelter operations.

14.1.3 Communications

- The county purchased two mass-notification systems: Reverse 911 and AlertSanDiego, which were used to notify residents of the need to evacuate and provided shelter information.
- The 211 San Diego system was established to assist with providing information to the public regarding shelter locations.

14.2 2007 Fires Overview

Shelter operations were coordinated from the OAEOC Care and Shelter Branch and worked in conjunction with the American Red Cross DOC. Shelter operations began on October 21, 2007, with seven shelters opened for evacuees. Two of the seven shelters were later forced to evacuate. By October 22, 2007, approximately 500,000 people from at least 346,000 homes were under mandatory evacuations. Approximately 10 shelters were opened to support the mass evacuees. By mid-week, a total of 45 shelters and evacuation centers were operational, 20 of which were established as Red Cross shelters and 25 supported by faith-based organizations and jurisdictions. The 45 shelters included two mega-shelters at Qualcomm Stadium and Del Mar Fairgrounds, special needs shelters, pet shelters, and evacuation sites (e.g., parking lots). Although the establishment of 45 shelters throughout the county met the needs of evacuees, there were coordination issues that hindered operations. First, the OAEOC Care and Shelter Branch did not initially have sufficient staff with shelter operations experience. Secondly, internal tracking of shelters on WebEOC and the National Shelter System proved problematic during the initial days of the disaster. As a result, posting shelter information to the internal tracking board was not as timely as desired. Despite these difficulties, the OAEOC Care and Shelter Branch worked efficiently with the Red Cross DOC and the various city EOCs to provide adequate shelter facilities for thousands of evacuees.

Throughout shelter operations, OAEOC personnel leveraged technology to provide information on shelter operations. The use of WebEOC enabled the OAEOC to coordinate shelter operations with jurisdictional EOCs. Through WebEOC, jurisdictions easily accessed information pertaining to shelter location, status, and capacity. In addition to WebEOC, 211 San Diego was an interactive communication tool used to gather and relay critical shelter information to both the

county personnel and the public. Shelter-related information was easily extracted from WebEOC and/or the JIC and provided to 211 San Diego.

Qualified personnel located at the OAEOC, the American Red Cross DOC, and the various city EOCs accomplished the command and control of evacuation operations. In the field, approximately 4,000 Red Cross personnel—augmented by 70 MRC volunteers, and 25 county workers—staffed positions in two shelters opened in the county. Moreover, the Red Cross trained an estimated 2,400 spontaneous volunteers to assist during shelter operations, only 800 of which were deployed. In addition to spontaneous volunteers, health/medical services volunteers offered their services at several shelter sites. In most cases, shelter managers could not employ these volunteers because they could not verify volunteers' credentials to provide medical services.

The combined efforts of county and Red Cross personnel, as well as spontaneous volunteers, enabled the timely establishment of 45 shelters throughout the county. This resulted in the estimated 500,000 evacuees having access to numerous shelter options for appropriate care and shelter.

14.3 Successes

- Throughout the county, 45 shelters were established, including two mega-shelters (Qualcomm Stadium and Del Mar Fairgrounds), special needs shelters, and animal shelters.
- Community and county shelters efficiently transitioned into Red Cross shelters.
- Transportation resources, including ambulances and buses, were well coordinated.
- Previous training and exercises helped to build successful working relationships.
- Ten American Red Cross teams from Mexico were used to assist with evacuees and translation barriers.

14.4 Areas for Improvement

- Shelter operations (as specified in Annex G of the County Operational Plan) need to be incorporated into future training and exercise opportunities.
- Coordination between Reverse 911 and the Care and Shelter Branch is needed during a mass-evacuation incident in order to provide advanced notice for shelters.
- Additional bilingual and sign language staff and volunteers are needed during a mass-casualty incident.
- Better coordination is needed for spontaneous volunteers arriving at shelters.

15 COORDINATION WITH THE MILITARY

15.1 Improvements Since 2003 Fires

15.1.1 Training

- Preparation activities took place for Golden Guardian 2007 and Golden Guardian 2008.

15.1.2 Other

- An MOA has been established between Commander Naval Air Forces Reserve and Commander Navy Region Southwest to allow Commander Navy Region Southwest the authority over Commander Naval Forces aircrafts during a fire disaster.
- Routine training was developed and conducted on an internal notification process to inform the military chain of command that Commander Naval Air Forces Reserve aircrafts will be used for firefighting response.

15.2 2007 Fires Overview

The military began firefighting response coordination with San Diego County on Monday, October 22, 2007 and continued support efforts until Sunday, October 28, 2007. The Navy was informed of the need for its support to the county fires through the Defense Support to Civil Authority (DSCA). DSCA allows civilians to request immediate response and assistance from the military. In response to the DSCA request, the Navy deployed three Navy Emergency Preparedness Liaison Officers (NEPLOs) to the OAEOC. In addition, Navy Region Southwest activated and staffed the Naval Operations Center with numerous duty officers on a 24-hour schedule. The Naval Operations Center maintained communication with the NEPLOs at the OAEOC to ensure efficient communication sharing.

Following the initial DSCA notification, personnel at Commander Naval Air Forces Reserve in San Clemente were alerted to the need for fire air support by Commander Navy Region Southwest.

In addition to airborne firefighting response, the military also provided ground support. Through the pre-establishment of an MOA with the county, a minimum of three Federal fire trucks were operational during the fire response. Furthermore, the military developed a Task Force Bulldozer Team. The Task Force Bulldozer Team used bulldozers, trucks, water tanks, and other equipment to assist CAL FIRE with approximately 15 miles of secondary fire lines. Initially,

personnel supporting the Task Force Bulldozer Team had little-to-no training; however, the Navy developed and conducted a field training program during the first day of the fires to ensure personnel were certified to assist in fire response.

During the fires, power outages at the San Onofre Nuclear power plant and damages to SDG&E lines threatened to cause a rolling black out throughout the county. The State notified the Navy that power outages were likely and that ships may be affected. To help alleviate the loss of power, ships returned to port and operated off their own power sources. The ability to operate off of independent power sources helped the county to maintain enough power to prevent rolling blackouts.

Military personnel and their families are a large part of the San Diego community. During the fires, the Navy opened evacuation shelters at Naval Base Coronado, Naval Base Point Loma, and Naval Station San Diego to support Navy families forced to evacuate. However, better coordination between civilian shelters and military shelters is needed. Many Navy families were unaware of the available shelters on the bases. Furthermore, military personnel deployed from the area were unable to efficiently contact family members who were not located at a military shelter. Through better coordination, military and civilian shelters can work together to ensure military shelter information is more readily available and to allow more space in civilian shelters.

The Navy also provided 1,400 cots to local shelters and opened the Balboa Navy Hospital to receive patients from civilian skilled nursing facilities. Furthermore, the Marine Corps provided 6,000 cots and 15 tents to Qualcomm Stadium; 2,000 cots to Del Mar Fairgrounds; and 2 trailers to help deliver their resources.

15.3 Successes

- Field personnel were trained during the first day of the fires and created a Task Force Bulldozer Team to assist with secondary fire lines.
- Through a pre-established MOA, the county and State effectively utilized Federal fire trucks.
- The ability of Navy ships to access their own power supply when in port helped with the region's power shortage during the fires.
- Close coordination with Camp Pendleton facilitated a successful evacuation of Fallbrook residents through the U.S. Marine facility.

15.4 Areas for Improvement

- The Naval Regional Operations Center needs additional WebEOC accounts.
- There currently is no process to ensure appropriate coordination and communication between civilian evacuation centers and military evacuation centers.

CHAPTER 2: REGIONAL RESPONSE RECOMMENDATIONS

Recommendations related to regional response to the 2007 San Diego County Firestorms are as follows:

- Create a support unit leader position in the Operational Area Emergency Operations Center (OAEOC) to oversee various support functions (e.g., WebEOC training, runner/controller duties).
- Review protocols for notifying the OAEOC of an initial fire, specifically if red flag warnings or Santa Ana wind conditions are to be taken into consideration for notification of all wildland fires (rather than only "significant" ones).
- Within the OAEOC Care and Shelter Branch, include a coordinator and at least one additional support person (focused on shelter management), as well as a special needs position dedicated to the OAEOC.
- Create formalized staff check-in and check-out procedures, including a checklist of key items that will be briefed to incoming staff and written protocols for shift arrival (to arrive no less than ½ hour prior to a shift) and departure.
- Review recovery/repopulation procedures and ensure they continue to meet all safety concerns while maintaining flexibility and expediency.
- Add more Internet connection lines in the Joint Information Center (JIC).
- Establish a position for a public safety liaison in 211 San Diego during emergency operations.
- Integrate the new AlertSanDiego Geographic Information System (GIS) capabilities with the GIS technologies in the OAEOC.
- Provide the GIS Emergency Group SOP to other jurisdictions and agencies so they can better understand the county's response and can formulate their response in accordance.
- Improve coordination with agencies and utilities that can provide mapping capabilities pertaining to their assets and infrastructure. Examples include the California Department of Transportation (Caltrans) for road closures, San Diego Gas & Electric Company (SDG&E) for power outages, and the San Diego County Water Authority for water supply.
- Identify and acquire necessary equipment to support mobile command post operations for animal evacuation operations.
- Establish mutual aid agreements with animal evacuation sites.
- Provide additional laptops, landlines, and headsets to the Logistics Section at the OAEOC.
- Update and improve the resource list on WebEOC.
- Continue to refine mass-notification databases so that as many unique homes (e.g., those homes with addressing anomalies) are in the system. This may entail and overlap city and county systems. Ensure the SOP addresses the community of Warner Springs.

- Continue WebEOC training and outreach to county fire agencies.
- Establish a volunteer coordinator position within the OAEOC to communicate with all volunteer agencies regarding spontaneous volunteers.
- Ensure that field liaisons have easily identifiable credentials. In addition, an official county vehicle would help to ensure access to restricted areas. Laptop computer and wireless Internet capabilities should be available for use by field liaison personnel.
- Pre-identify agencies, based on the type of incident, for which liaison personnel may be needed. Suggest that agencies only send one person per shift, unless otherwise requested.
- Identify and train assessment teams to be available at shelter locations in order to better communicate resource needs to the OAEOC.
- Revise Annex G of the County Operational Plan to include all necessary areas that will be addressed during a disaster in respect to care and shelter.
- Expand coordination with local military, and continue to conduct joint regional training and exercises with the military, including the Golden Phoenix and Golden Guardian annual exercises.
- Establish a series of regional shelter caches, to include cots, blankets and comfort kits, to supplement the capabilities of the Red Cross.

CHAPTER 3: MEDICAL OPERATIONS

1 MEDICAL OPERATIONS CENTER

1.1 Improvements Since 2003 Fires

1.1.1 Plans

- A Tactical Interoperability Communications Plan (TICP) was developed and designed specifically for the Medical Operations Center (MOC).
- Continuity of operations (COOP) and continuity of government (COG) plans were finalized within the past 2 years.

1.1.2 Training

- Training has been recently completed with the EMS duty officer positions at the MOC.
- Numerous all-hazard exercises have been conducted, including the March 2007 San Diego County Biological Full-Scale Exercise (FSE) and annual participation in hospital drills with full activation of the MOC.

1.1.3 Equipment

- Establishment of the MOC, also known as the Emergency Medical Services (EMS) Department Operations Center (DOC), has been accomplished in recent years. It includes advanced communications systems, teleconferencing capabilities, and the functionality (e.g., seating, screens, fax) of an Emergency Operations Center (EOC).
- The MOC has been updated with Geographic Information System (GIS) capabilities, including the ability to pre-identify key locations such as hospitals, schools, and skilled nursing facilities.
- Personnel have access to a computer-based incident management system (WebEOC) that is customized for the MOC—more importantly, it is linked into the Operational Area Emergency Operations Center (OAEOC) WebEOC system.

1.2 2007 Fires Overview

Response operations for the MOC began on Sunday, October 21, 2007, at 1445 Pacific Standard Time (PST) and continued essentially around-the-clock until Monday, October 29, 2007. On the first day of the wildfires, the MOC focused on gathering information and anticipating possible hospital and skilled nursing facility evacuations. Additionally, the MOC sent out alerts to hospital emergency preparedness coordinators through the County Alert Service System (CASS) at 1724 PST. EMS also sent representatives to the OAEOC (at Level 2) on Sunday, October 21, 2007, to provide assistance and medical subject matter expertise. Representatives in the MOC included EMS personnel; ambulance coordinators; GIS personnel; hospital coordinators (up to

four); community health clinics; Medical Reserve Corps (MRC) personnel; Emergency Medical Alert Network (EMAN) personnel; Information Technology (IT) support; Public Health nurses; American Red Cross representatives; and clerical support.

By Monday, October 22, 2007, the MOC was planning for evacuations that were inevitable due to the advancing wildfires. A total of 12 nursing homes and 3 hospitals (one psychiatric facility) were evacuated, which was a significant undertaking resulting in the movement of more than 2,000 patients. On Tuesday, October 23, 2007, the MOC coordinated shelter operations as well as use of the MRC that deployed approximately 70 medical personnel to various locations. On Wednesday and Thursday, October 24 and 25, 2007, respectively, the MOC was tasked with repatriation issues (i.e., returning patients to medical facilities) and medical system analyses. By Monday, October 29, 2007, the MOC was able to scale back operations and be staffed from 0700–2400.

1.3 Successes

- The MOC managed the evacuation of 3 hospitals and 12 skilled nursing facilities, which constitutes approximately 2,000 patients, in one day. The MOC provided a centralized coordination point for planning and response. Many patients were sent to a "like" facility, and those sent to temporary facilities were provided care in those locations.
- Communication systems (CASS and EMAN) were successful in getting critical information to hospitals, clinical providers, and first responders in a timely manner.
- The use of WebEOC significantly improved communication ability in the MOC and with hospitals and outside agencies.
- Pre-identified GIS data (i.e., locations of hospitals and skilled nursing facilities) assisted with the quick evacuation of facilities and potentially saved human lives.
- Community partner coordination and representation within the MOC was a significant accomplishment and included ambulance coordinators, Public Health personnel, hospital liaisons, volunteer organizations, and clinic coordinators.
- New staff members were afforded hands-on training during the wildfires and were also able to assist with incident management by using WebEOC.
- The MOC was proactive throughout the emergency by contacting facilities in advance of evacuation orders, encouraging them to get plans ready, and utilizing prehospital EMS supervisors as field liaisons.
- A full-time medical director was available in the MOC to provide crucial guidance and regulatory protocols.

- Employing the MRC to assist at shelters was essential to the success of the emergency response.
- Activation of the Pharmacy Emergency Response Team provided the mechanism to deliver critical medical supplies and medications, as well as pharmacy staff, to evacuation shelters.
- Amateur Radio Emergency Services (ARES) was used as a back-up form of communication at the MOC and at area hospitals to assist with evacuation operations.

1.4 Areas for Improvement

- There was insufficient support staff available for medical personnel at the OAEOC.
- Shelter and medical management operations lack an adequate command and control structure.
- Medical logistics was often handled by medical personnel at the OAEOC rather than the Logistics Section at the OAEOC.
- The MRC volunteers need more formal processes, and training in shelter operations should be enhanced.
- Providers, including hospitals, clinics, and skilled nursing facilities, are unfamiliar with Federal guidelines concerning reimbursement of expenses incurred as a result of the wildfires (e.g., ambulance fees).
- Evacuees from medical facilities were in need of a "patient push pack" that would include basic necessities that could be used in an emergency including water, food/snacks, and personal needs such as diapers and masks.
- The best location (DOC or MOC) for the Public Health Nursing representative needs to be determined.

2 HOSPITAL EVACUATIONS

2.1 Improvements Since 2003 Fires

2.1.1 Plans

- Hospitals have written evacuation plans that address the coordinated removal of patients.
- Protocols were developed to provide guidance for ARES so hospitals would have a back-up communication system during emergencies.

2.1.2 Training

- Numerous evacuation and emergency drills were conducted with hospital participation, including the March 2007 San Diego County Biological FSE.
- Hospital Incident Command System (HICS) training takes place frequently.

2.1.3 Equipment

- CASS, a notification system used by EMS personnel, includes a hospital emergency contact group.
- Hospitals have purchased equipment through Federal grants such as the Hospital Preparedness and Protection grant. Items purchased included surge tents (some were used during the wildfires), emergency generators, etc.

2.2 2007 Fires Overview

The initial request for information to the hospitals took place on Sunday, October 21, 2007, at 1515 PST by way of a CASS / Quality Assurance Network Collector System (QCS) alert. The report inquired about ambulance and hospital capacity in advance of anticipated medical evacuations and the potential for significant injuries and deaths resulting from the wildfires. Hospitals and skilled nursing facilities in fire-affected areas began pre-planning for evacuations with assistance from the MOC, beginning the evening of Sunday, October 21, 2007.

Due to the escalating situation, the evacuation of Pomerado Hospital began in the early morning of Monday, October 22, 2007, and was completed by 1048 PST. Additionally, Aurora Mental Health facility began to place patients at another facility that same morning and relocated 40 patients. By the afternoon of Monday, October 22, 2007, Fallbrook Hospital also began evacuating patients to other facilities. As a result of the wildfires, three hospitals (two acute care hospitals and one psychiatric facility) and twelve skilled nursing homes were evacuated, resulting in the transport of approximately 2,000 patients.

The central coordination point for medical evacuation was the MOC. However, the evacuation of patients required coordination with an array of agencies including base hospital nurse coordinators, Ambulance Strike Teams (ASTs) staffed with emergency medical technicians (EMTs), paramedics and critical care nurses, and transportation companies (including school bus providers). Hospitals and skilled nursing facilities were repatriated with the assistance of MOC staff, Public Health Services, ASTs, other departments within the County of San Diego Health & Human Services Agency working alongside the California Department of Health Services. Some were opened as early as Thursday, October 25, 2007, while others were closed for a week or more.

2.3 Successes

- Evacuation of skilled nursing facilities and hospitals was accomplished in an organized and timely manner.
- Coordination and communication between MOC staff and the medical facilities requiring evacuation was outstanding.
- Hospitals and skilled nursing facilities were proactive with evacuations rather than using a "wait and see" approach.
- Patients that were evacuated to temporary facilities were given necessary care and were at temporary facilities no more than 40 hours.
- ARES assisted hospitals during the wildfires by providing redundant communications capabilities; this was particularly helpful due to the fact that ARES representatives were also stationed at the MOC.

2.4 Areas for Improvement

- Some bus drivers providing transport of evacuated patients were unfamiliar with roads and highways in some parts of the county, which resulted in some confusion regarding directions to temporary facilities and highways closures.
- Some evacuated patients were in need of an "evacuation push pack" of items (e.g., water, food, diapers) for use during the transport, which took hours for some due to traffic congestion.
- There needs to be continued evacuation planning with adjacent counties in the event that out-of-county evacuation is required.
- Hospital evacuation plans should address evacuation of patients beyond the boundaries of the hospital or to temporary facilities.
- Some medical facilities only stored medical records electronically, which resulted in significant problems attempting to print them during the evacuation orders.
- A need for a "summary sheet" of patients that included their originating facility, medical conditions, temporary facility location (or multiple locations if they moved more than once), and other essential information.

3 SPECIAL NEEDS POPULATION

3.1 Improvements Since 2003 Fires

3.1.1 Plans

- Informal agreements have been created with transportation providers, but no formal documentation, such as mutual aid agreements, has been developed.
- The MRC was newly established in 2003 but more operationally capable during the 2007 fires.

- Special needs planning has improved between the American Red Cross, the MRC, Public Health, Aging and Independence Services, OES, and numerous volunteer agencies.
- Cooperation with the San Diego County Association for the Deaf has improved and led to the use of a sign language interpreter during the 2007 fires' news conferences.
- Development of "Preparedness Wheels Designed Especially for People with Disabilities" has been used as the primary method for outreach for this targeted population.

3.1.2 Training

- Public Health nurses have trained with the American Red Cross in preparation for supporting shelter operations.
- Shelter operations and special needs training have been provided to members of the county shelter team program.

3.1.3 Equipment

- Improved GIS capability allowed for the identification and mapping of medical care facilities (e.g., hospitals, SNFs).

3.2 2007 Fires Overview

As a result of the wildfires that began on Sunday, October 21, 2007, numerous agencies that provide assistance to special needs populations were pre-planning for an emergency response. However, the response came from multiple directions because there is no single EOC or agency that has overall command and control of special needs population planning. Personnel representing special needs populations were located in the EMS DOC, otherwise referred to as the MOC; OAEOC; San Diego City EOC; Southern Region EOC (S-REOC); as well as some medical facility EOCs. Agencies involved with coordinating special needs populations included the County Health and Human Services Agency; EMS; the Ombudsman Program; Community Care and State Licensing & Certification; the San Diego County OES; Hospice; American Medical Response (AMR) Transport; the American Red Cross; and the Metropolitan Transit System (MTS).

Due to the severity of the approaching wildfires, many special needs population residents (e.g., those in skilled nursing facilities) had to be evacuated to shelters and temporary evacuation points. The evacuation of special needs populations was aided by the pre-planning that took place in recent months by OES and Health and Human Services Agency staff. Shelters were established for evacuated special needs populations, and medical resources were deployed to provide medical care at these shelters. Patients from three hospitals (two acute care facilities and one psychiatric hospital) and twelve nursing homes were also successfully evacuated. Within a few days after the fire, most special needs residents were able to return to their homes and/or care facilities.

3.3 Successes

- GIS layering of medical facilities and license residential care facilities aided in the identification of, and communication to, those needing to be evacuated.
- The MOC was available to assist in transportation, patient accountability, and other support functions.
- The evacuation of medical facilities was aided by patients receiving reverse 911 notification in their rooms.
- The shelter at Del Mar Fairgrounds was established quickly and was able to assist patients with special needs.
- Community Care and Licensing (CCL) provided on-line information for special needs populations to include shelter locations, preparedness checklists, and other disaster-related information.
- Patients were returned to their care facilities quickly following the lifting of evacuation orders.

3.4 Areas for Improvement

- There were inadequate Public Service Announcements (PSAs) released during the wildfires addressing the opening of special needs shelters and what services these shelters would be providing (and what they would not be providing).
- There are many definitions of what classifies an individual as being a special needs patient or resident, which results in additional confusion during an emergency.
- Coordination of special needs populations took place in variety of locations, such as the MOC, OAEOC, and Health and Human Services Agency DOC.
- Approximately 75 of 300 MRC volunteers were actively used during this event. In a future response, more reliance should be placed on the utilization of MRC members.
- There was no formal, organized system for care facilities to relay information to families of patients regarding the status of evacuations and relocation to temporary locations.

CHAPTER 4: MEDICAL OPERATIONS RECOMMENDATIONS

Recommendations related to medical operations during the 2007 San Diego County Firestorms are as follows:

- Enhance the Medical Reserve Corps (MRC) deployment protocols, instructions for response, improved training in shelter operations, and a "Shelter Starter Kit" that would contain forms/materials/supplies needed for opening a shelter.
- Enhance credentialing system for convergent volunteers (i.e., ad hoc medical volunteers).
- Expand the relationship with skilled nursing facilities throughout the operational area.
- Ensure that providers receive a guidebook (or instructions) for disaster reimbursement that would specifically address reimbursement issues for the medical community.
- Formalize the "patient push pack" concept with medical facilities.
- Ensure adequate support personnel are available for the Medical Health Branch Coordinator at the OAEOC.
- Further discuss the feasibility of a hospital and skilled nursing facility patient tracking system consisting of identification bands with critical medical information.
- Further develop hospital evacuation plans to adequately address transport of patients to temporary facilities; work closely with the MOC in planning efforts.
- Continue planning efforts between special needs advocates, volunteer agencies, the MOC, the American Red Cross, the OAEOC, and various other agencies and departments.
- Identify a centralized location to coordinate special needs response operations, and ensure it includes the necessary agency representatives and support staff.

CHAPTER 5: LAW ENFORCEMENT

1 SAN DIEGO SHERIFF'S DEPARTMENT AND REVERSE 911

1.1 Improvements Since 2003 Fires

1.1.1 Plans

- A protocol was developed to use Reverse 911 in conjunction with emergency alert systems (emergency vehicles, media, television, radio, and manual notification).
- The San Diego County Sheriff's Department established a single emergency planning unit that manages disaster and emergency planning and the Sheriff's Department Operations Center (DOC), among other functions.
- Significant efforts were made to plan for multi-jurisdictional emergency operations while developing cooperative support from the San Diego County Office of Emergency Services (OES) and municipal law enforcement agencies within the county.

1.1.2 Training

- The county participated in numerous county and regional disaster preparedness exercises, including the 2005 High-Explosives Full-Scale Exercise (FSE) as well as the 2007 Golden Guardian FSE in Anaheim, California.
- There has been significant and frequent real-world use of the Sheriff's Emergency Response Assessment Team (ERAT) personnel management system during numerous events that incorporated significant countywide law enforcement personnel.

1.1.3 Equipment

- The Reverse 911 system was purchased and implemented for emergency mass notification and important community alerts.
- Live video teleconferencing was installed and used for communication between the DOC and the OAEOC.
- To aid after-action cost recovery, the ERAT personnel management system was deployed to multiple staging areas in order to manage, support, and account for personnel.

1.2 2007 Fires Overview

On the morning of October 21, 2007, at approximately 1030 Pacific Standard Time (PST), the San Diego County Sheriff's Department opened its DOC in response to the Harris Fire. The DOC assisted in coordinating law enforcement operations and worked with personnel from all levels of government. Through the use of WebEOC, DOC personnel provided situational updates—including fire and weather conditions, fire fighting operations, staffing levels, and operations planning—to department, area, county, and State personnel.

The San Diego County Sheriff's DOC personnel were also responsible for the mass notification of voluntary and mandatory evacuations during the fires. This was primarily accomplished through the implementation of the automated telephone notification system, Reverse 911. This was the first time Reverse 911 was used during a significant disaster. Reverse 911 effectively delivered 415,188 emergency notification recorded voice messages classified as either advisory or mandatory evacuation orders, as well as water district notifications to targeted geographical areas. Prior to the fires, the county used a Reverse 911 public awareness media campaign and disseminated press releases through the Sheriff's public information officer (PIO) to increase county household and business familiarization of the notification system.

1.3 Successes

- DOC-to-OAEOC communication was timely, assisted by technology, and adequately delivered resource requests to the appropriate operational levels.
- Law enforcement personnel maintained their rural incident command post (ICP) as fire approached from multiple directions. This action ensured continuous communication between the DOC and field incident commanders.
- Frequent participation in county preparedness exercises assisted emergency planning teams in familiarizing DOC participants with their positional roles and responsibilities.

1.4 Areas for Improvement

- Some jurisdictions did not recognize county-level law enforcement mutual aid memorandums of understanding (MOUs) outlining assistance agreements across jurisdictional boundaries.
- Policies for management and deployment of Federal resources, specifically chain of command and operational duties for National Guard resources, were not utilized effectively.
- During the initial phases of incident response, field-level supervisory staff was not adequately trained to assume Incident Command and personnel management roles.
- Incident commanders in the field did not have immediate access to situational awareness updates and could not electronically submit incident information via WebEOC.

- Movement from the Reverse 911 system to AlertSanDiego will allow public agencies within the county to access the notification system and its 15,000-line capacity from any Internet web-based system.
- A small number of evacuation notifications were delivered to areas not affected by evacuation orders, which caused some confusion, but was quickly remedied. Power and telephone line outages prevented use of the Reverse 911 system in some areas. In these locations, manual forms of evacuation notification were used.

2 EVACUATIONS

2.1 Improvements Since 2003 Fires

2.1.1 Plans

- Collaborative evacuation plans between county emergency preparedness agencies, the Sheriff's Department, and municipalities allowed emergency responders to plan and forecast evacuation requirements well into the future.

2.1.2 Other

- The Reverse 911 system was used to supplement manual forms of evacuation, especially in hard-to-reach terrain or isolated communities.
- Relationships continued with California Highway Patrol (CHP) officers for assistance in managing, or in some cases changing, the flow of highway traffic along evacuation routes.

2.2 Overview

As the lead San Diego County law enforcement agency, the Sheriff's Department is responsible for issuing evacuation orders to unincorporated areas and to Sheriff service-contracted areas within the county. By utilizing the intelligence, planning, and guidance assistance of county emergency officials and fire department personnel, along with the experience of command personnel within the Sheriff's Department, the agency issues varying levels of evacuation orders based on emergency conditions and the threat of imminent danger.

Approximately 500,000 people were evacuated from areas within San Diego County due to the 2007 fires. Incredibly, injuries and fatalities in relation to this extremely large amount of evacuees were very low. The Reverse 911 system, along with conventional means of evacuation notification and the involvement of mutual aid through regional, county, and Federal resources, contributed to the effectiveness of the evacuations throughout the county. The county's new 211 system allowed evacuees and the general public to receive non-emergency information assistance regarding road closures, shelter locations, and environmental conditions, significantly reducing the call volume to the Sheriff's communication center.

2.2.1 Ramona Station

Ramona was one of several cities heavily impacted by fire evacuations. At approximately 1215 PST on Sunday, October 21, 2007, Ramona Sheriff officers began conducting door-to-door fire evacuations. Sheriff teams initially began to evacuate residents west and northwest of Escondido. An ICP was established at approximately 1430 to assist Sheriff teams with evacuation coordination. Reverse 911 went into affect shortly after the door-to-door evacuation notifications had begun. This was the first time Reverse 911 was activated in the Ramona area. The Reverse 911 system triggered a complete evacuation of the Ramona area and caused severe traffic jams.

Ramona had all westbound lanes on Highway 67 and San Vicente Road open for evacuating residents. Eastbound lanes were kept clear for incoming emergency vehicles. Although CHP was available to assist the Ramona Sheriff's Department with traffic, there was not sufficient traffic control until approximately midnight on October 22. On Thursday, October 25, 2007, at approximately 0930, the Ramona Sheriff's Department assessed the Ramona community safe for re-entry from a law enforcement perspective. All Highway 67 eastbound lanes were open and all stop lights were turned to flashing red for repopulation purposes. Shortly after repopulation efforts began, Sheriff's authorities received word from the Sheriff's DOC to immediately shutdown the repopulation due to unsafe water conditions and a lack of water for fire prevention. This resulted in jammed roads and disgruntled residents wanting to return home. Repopulation activities resumed at 1900 on October 25, 2007.

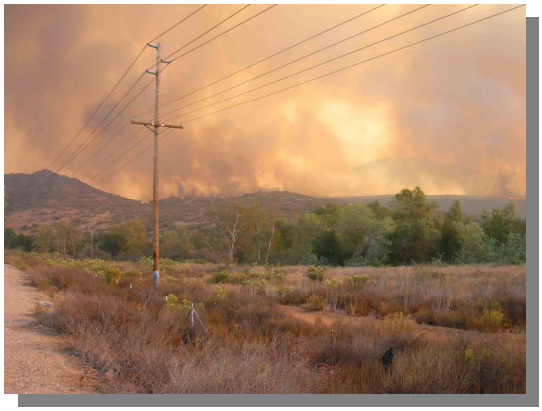
2.2.2 Valley Center Station

Valley Center was another community affected by wildfire evacuations. Evacuations began on Tuesday, October 23, 2007, through the use of Reverse 911, but pre-planning began the evening of October 21, as the Witch Creek Fire moved through San Pasqual towards Valley Center. All 22,000 residents were appropriately evacuated and no loss of life or serious injuries were reported. To assist in the evacuation process, Sheriff deputies were deployed to street lights and stop signs to wave people through intersections. There was also additional evacuation support from the CHP. Harrah's Resort and Casino was designated as a shelter site for evacuated residents as well as Pala Casino, although Pala Casino was never used. The evacuation sites were convenient locations for evacuated individuals. However, there were some miscommunications between the American Red Cross and tribal leaders on these shelters. Throughout the evacuation period, agricultural and emergency response personnel were allowed through the checkpoints with valid identification. Repopulation activities began on Thursday, October 25, 2007. The repopulation process was done incrementally in four stages. Initially, the repopulation was authorized by local law enforcement. However, this process was disrupted because there was a

miscommunication of who had the actual authority to allow residents to return home. Eventually, notification came from the Sheriff's DOC and the OAEOC to the ICP and then to local law enforcement to proceed with the repopulation.

2.2.3 Fallbrook Station

The Fallbrook community in Northern San Diego County was another area requiring evacuation and repopulation during the wildland fires. The Sheriff's Department Fallbrook Station Command Center began operations at approximately 0430 on Monday, October 22, 2007. Activities conducted on the first day of operations initially proved to be difficult due to law enforcement staff having been deployed to other areas of the county. However, as the week progressed, personnel had been reassigned and at any given time there were approximately 200 personnel available to complete the mission in Fallbrook. Also on the first day of operations for the Fallbrook Station, the ability to communicate through the use of 800 MHz radios was problematic as some Sheriff's Department personnel experienced busy signals, or "honking" indicating the system was overloaded but as the week progressed, the communication system worked well and was an improvement over the 2003 Cedar Fires. Once it was determined that the area needed to be evacuated, mandatory evacuation notices were implemented through the use of the Reverse 911 system as well as law enforcement personnel conducting door-to-door notifications to the impacted residents. As the evacuation of the area began, this caused a strain on resources because not enough personnel were initially available and some of those who did respond did not have the proper equipment needed.



Due to rural nature of the Fallbrook area and the limited road access into and out of the community, evacuation routes through Camp Pendleton were established and effectively utilized. Because Fallbrook is a rural area, there was also a need to evacuate large animals. This process was also effectively conducted and no animals were injured.

The Fallbrook Station has very experienced staff, and credit should be given to the residents of Fallbrook as well. Fallbrook is a community that has experience in dealing with wildland fires, and because of this the residents responded well. Experience and preparedness of the community attributed to a successful evacuation of the community.

2.2.4 Rural Station

The rural communities in eastern San Diego County, such as Julian, Jamul and Pine Valley, among others required evacuation in response to the Harris Fire. On Sunday, October 21, 2007, the Sheriff's Department Rural Station was operational in the field at approximately 1000. There

were two deputies in the field who began initiating door-to-door evacuation notices. Initially, Reverse 911 was not utilized. Because this area is rural in nature, the Sheriff's Deputies, many of whom live in the area as well, know the residents in the area, which assisted with the evacuation efforts. A full platoon of additional officers was requested on day one, which eventually was not enough personnel, so an additional two platoons were requested. By day three, October 23, 2007, approximately 205 law enforcement personnel from the Regional Law Enforcement Group as well as State and Federal personnel were deployed to the area.

In order to assist with communication efforts, a Sheriff's Deputy was placed in the Fire Logistics section in the Fire Incident Command Post which enabled law enforcement personnel the ability to "stay ahead" of the fire. Due to the fast moving nature of the Harris Fire, law enforcement personnel were able to make decisions regarding evacuation needs while effectively working under the Fire Unified Command System. CHP also provided a liaison to the Fire command, which enabled the effective coordination with CHP regarding evacuation and repopulation activities.

As in Fallbrook, the communities in eastern San Diego County required large animals to be evacuated as well. The coordination of the animal evacuation helped to ensure that residents would also evacuate the area because they knew their animals would be safe.

Before areas were authorized for repopulation, CAL FIRE and law enforcement personnel continually visited the evacuation centers to ensure residents had the updated necessary information. This ensured all agency personnel were on the same page and that a consistent message was being disseminated to the public.

Throughout the operation, there was effective cooperation and communication between CAL FIRE, law enforcement, ARC personnel and community residents.

2.3 Successes

- There were few injuries and fatalities in proportion to the total number of evacuees.
- A significant number of areas were affected by evacuation orders, including areas difficult to reach by traditional means of communication. DOC personnel were innovative in their approaches to notifying residents and businesses of evacuation orders using both conventional communication systems (mass media, television, radio, emergency vehicle public address system, aerial notification) and innovative technology (Reverse 911).
- There was extensive collaboration with the American Red Cross and other disaster service organizations in order to prepare shelter locations and disseminate evacuation information (including providing the direction of safe travel and closest shelter locations).

2.4 Areas for Improvement

- Communicating re-entry in a disaster of this magnitude proved challenging. Providing residents with pre-notification of repopulation may be a prudent step, but must be weighed against the concerns of providing the public with false expectations.
- The appropriate process and authority for repopulation in a disaster that had multiple incident command posts was not well identified.
- Evacuating and returning disaster victims blocked emergency vehicle access on many city, county, and State roadways.

CHAPTER 6: LAW ENFORCEMENT RECOMMENDATIONS

Recommendations related to law enforcement during the 2007 San Diego County Firestorms are as follows:

- Add additional resources and manpower to the Sheriff's Emergency Planning Unit. This will allow the unit to accelerate emergency planning, increase disaster preparedness training for field deputies, and provide continual feature and capacity upgrades for Emergency Response Assessment Team (ERAT) and Department Operations Center (DOC) operations, and other Sheriff's Department technology projects.
- Develop policies for management and deployment of Federal resources, including chain of command and operational duties for National Guard resources.
- Solidify or update mutual aid agreements between law enforcement agencies both within, and adjacent to, San Diego County.
- Establish a Reverse 911 master coordinator position within the Sheriff's Department. The coordinator should be supplemented by an emergency notification team with sufficient resources to manage ingress of notification requests and egress of Reverse 911 and AlertSanDiego emergency notifications.
- Develop a re-entry plan to establish protocols, policies, and procedures for ingress of evacuees back into their local communities. The plan must account for exceptional cases encountered by law enforcement during the fires (e.g., live-stock subsistence, medication-dependent evacuees). Establishment of traffic routes that maintain emergency vehicle access should be a priority and included in the plan.

CHAPTER 7: RECOVERY OPERATIONS

1 SHORT-TERM RECOVERY

1.1 Improvements Since 2003 Fires

1.1.1 Plans

- An Operational Area Recovery Plan was developed in April 2007.

1.1.2 Training

- San Diego County Office of Emergency Services (OES) sponsored a 2-day Recovery Training course for county emergency management personnel.
- Recovery operations have been included as objectives for preparedness exercises.

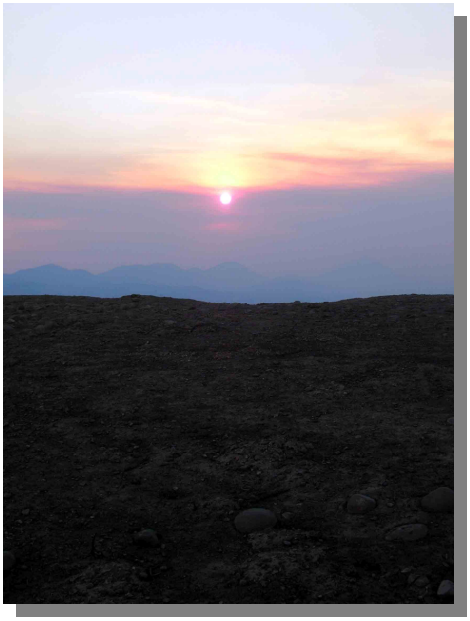
1.2 2007 Fires Overview

Short-term recovery efforts were implemented soon after fire response operations began on October 21, 2007. During a disaster, initial short-term recovery efforts concentrate on financial reimbursements needed for incident-related costs. Additional short-term recovery efforts typically focus on utility restoration; expanded social, medical, and mental health services; re-establishment of government operations; transportation route restoration; debris removal and cleanup; building safety and inspections; and abatement and demolition of hazardous structures.

During the 2007 fires' short-term recovery operations, a recovery coordinator was assigned to the Operational Area Emergency Operations Center (OAEOC) to assist with implementing the recovery organizational structure (refer to Figure 3.3 of the Operational Area Recovery Plan). The Operations Section of the short-term recovery structure focused on damage assessments that occurred within unincorporated areas of the county. Incorporated cities were responsible for the deployment of their own damage assessment teams. The significant amount of damage to businesses and residences required the establishment of four Local Assistance Centers (LACs).

LACs provide a single point of contact for recovery information from representatives of State, Federal, and voluntary agencies, to include loan officers from the U.S. Small Business Administration. Recovery Branch personnel began planning for the opening of LACs on Day 2 of disaster response operations. LAC locations were identified after short-term recovery personnel assessed the needs of those affected by the fires. Several factors contributed to LAC locations, such as proximity to those most in need. On October 25, 2007, the first LAC open was the City of San Diego (with County of San Diego presence) LAC in Rancho Bernardo. The county opened three other LACs located at the Ramona Community School, Cuyamaca College in Rancho San Diego, and the Fallbrook Community Center. Local jurisdictions opened another four LACs that were not operated by county staff; these LACs served their local communities only.

Although the establishment of the LACs was a success during the wildfires, there were several logistical issues that needed to be addressed by OES. The space required for an LAC was difficult to find during the disaster because many community facilities were being used as shelter locations. Moreover, once an LAC location was established, the length of time it could remain operational in that facility was problematic. This was due to the fact that once an evacuation order had been lifted, the management of facilities hosting LACs expected to return to normal business operations. However, in some cases, facilities hosting LACs (e.g., Cuyamaca College) were unable to return to normal operations.



In addition to LACs, the county used its www.sdcountyrecovery.com website to provide information on resources available to residents requiring assistance with disaster recovery. Information on the website included locations of LACs, a list of agencies and services available to residents to include those available at LACs, as well as helpful links to other fire-related information and assistance websites.

The LACs, the San Diego County www.sdcountyrecovery.com website, and the City of San Diego www.sandiego.gov/newsflash/firealert.shtml website were vital resources serving residents in need during short-term recovery efforts. In accordance with the Operational Area Recovery Plan, the responsibility of assisting residents was eventually turned over to the Federal Emergency Management Agency (FEMA), which transitioned all LACs into Disaster Recovery Centers (DRCs). The Short-Term Recovery Branch continued to assist in recovery efforts, as needed. Once the fires were contained, short-term recovery transitioned to long-term recovery efforts. Long-term recovery efforts included the shift of DRCs to Disaster Loan Outreach Centers (DLOCs). Recovery teams continued operations at an alternate facility following deactivation of the OAEOC.

1.3 Successes

- Approximately 24,000 residents used an LAC for assistance and disaster relief information.
- Enhanced coordination, working relationships, and contacts were established between the OES Recovery Branch and other OAEOC functions.
- The county recognized the need to start short-term recovery actions as soon as the incident began.
- County public information officers (PIOs) were available at the LACs to assist with media inquiries.

- County Information Technology (IT) personnel supported LACs with computers and communications including a web-based GIS mapping tool.
- The www.sdcountyrecovery.com website was established.
- Responsibilities transitioned smoothly to FEMA representatives.

1.4 Areas for Improvement

- A standard operating procedure for the activation, operation, and deactivation of an LAC does not exist. Ensure to include information of agencies and/or departments that should be located within the LAC.
- There is a shortage of translators in relation to the number of non-English-speaking residents requiring assistance.
- Some LAC locations interfered with the primary occupant's ability to resume normal operations after evacuation orders were lifted.
- Agencies within the LAC established individual hours of operation independent of the county-released hours of operation.
- Some booklets, handouts, and other information sources were not provided in languages prevalent in the area.

1.5 Short-Term Recovery Recommendations

- Evaluate designating existing county (or other) facilities as being convertible to LACs, much the way centers are designated as emergency shelters.

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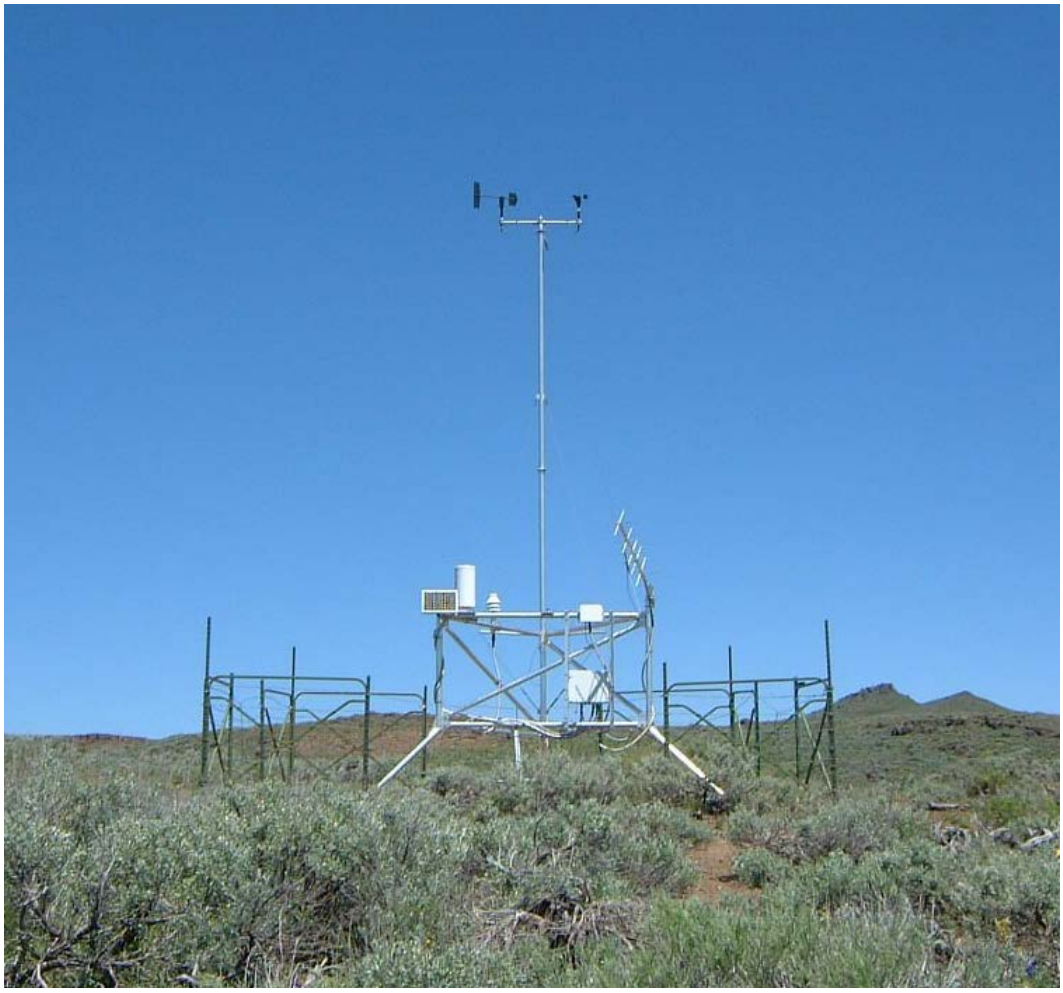
Interagency Wildland Fire Weather Station Standards & Guidelines

PMS 426-3 June 2012



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INTERAGENCY WILDLAND FIRE WEATHER STATION STANDARDS & GUIDELINES

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INTRODUCTION

This document has been composed to provide common standards for weather stations used by the wildland fire agencies to provide weather data observations. These weather data are used for a wide variety of applications including calculation of the National Fire Danger Rating System (NFDRS) indices, fire behavior, burned area fire rehabilitation, planned ignitions, and other land management operations. **This document is intended to supplement and supersede *The Weather Station Handbook: an Interagency Guide for Wildland Managers*, Finklin/Fischer, (NFES 2140, PMS 426-2) with regard to NFDRS standards.**

This document is a re-title of the original *NFDRS Weather Station Standards* and has been modified to include standards for all fire weather stations. This document has been partitioned into three sections: (1) NFDRS Weather Station Standards & Guidelines (2) Fire RAWS Standards & Guidelines and (3) NFDRS Manual Weather Station Standards and Guidelines. The original NFDRS weather station standards were a reflection of a cost/benefit analysis, interagency discussion and direction provided by the Fire Weather Working Team to the Weather Station Standards Task Group. The update of the standards and guidelines in this document were created by the Fire Weather Subcommittee in conjunction with the Fire Environment Observations Unit (FEOU) and reviewed by the Fire Environment Committee (FENC) as well as the Subcommittees under the FENC.

This June 2012 edition of the *Interagency Wildland Fire Weather Station Standards and Guidelines* supersedes the 2009 edition which replaced the *NFDRS Weather Station Standards* and *Fire Weather Station Standards*.

QUALITY ASSURANCE

The station owner, at the field level, is responsible for ensuring weather data quality by:

- Ensuring that maintenance is performed per standards, and that this maintenance and all other significant station activity is documented in the weather section of Wildland Fire Information Management (WFMI).
- Visually confirm outputs from the station to check that the information is reflective of actual conditions, and notify appropriate organizations if data quality is suspect.
- Ensuring that the station is physically secure and that the site is maintained as needed.

Two methods of data quality control can be implemented. The first level is an automated oversight system, such as Station Event Report (SER), to continually monitor data for errors relating to out of range observations and performance problems from non-functional sensors. SER quality control is available to the field user through

coordination with the WFMI Weather system administrator if the station transmits data via GOES satellite. The second level is periodic review and verification by an Agency/Regional/Local Fire Weather user. Should errors or problems be detected, the station owner/user is responsible for initiating action to correct.

Ultimately, the station owner is responsible for ensuring the station is delivering acceptable weather data.

EQUIPMENT SELECTION

When selecting which type of automated weather station equipment to purchase, consider more than just the lowest bid. Consider more detailed life-cycle costs of equipment, data transmission, maintenance, data storage and retrieval, and the value of corporate (shared) data. Talk to several vendors, other users, and consult your agency weather station coordinator. The weather station owner is responsible for ensuring that equipment will meet minimum interagency fire weather station standards.

Additional fire management needs, as well as those of other multiple use interests, should be factored when selecting equipment. Expandability, serviceability (including service contract and training availability), transportability, and compatibility with current and future national systems must be considered.

POSITIONS, RESPONSIBILITIES AND TRAINING STANDARDS

The following positions are used in fire weather station operations and are required to implement the fire weather program. They require a level of specific skill and knowledge to perform the fire weather responsibilities. Personnel should be assigned only to positions in which they have demonstrated the ability to perform successfully. In each position, interagency coordination and communication between different levels (local/regional/national) is necessary.

Agency/Regional Fire Weather Coordinator - Responsible for agency/regional level oversight and quality control. This includes spot checks for data accuracy and WIMS station catalog status (NFDRS stations only). Ensures that WFMI Weather metadata maintenance documentation is current, as appropriate. Ensures that training is available at the regional/local level as needed. Assists with station operation and lifecycle management planning.

Depot Manager - Responsible for administration of depot contract(s). Provides a maintenance summary to Agency coordinator annually.

Depot Technician - Responsible for bench rehabilitation and calibration of all station components under their contract. Provide technical support to field technicians and first responders as needed.

Field Support Technician - Responsible for performing annual site maintenance and responding to system failures in a timely manner, and documenting in WFMI Weather. Provides status report to Station Owner/Program Manager. Required to attend basic field rehabilitation training. Training will include performing field rehabilitation standards for the specific stations within their area of responsibility.

Incident Commander/Burn Boss/Project Leader - Responsible for appropriate incident RAWS site selection and placement, maintenance, and assurance that accurate observations are taken. V*isual checks of data on a frequent basis will ensure that station readings are reflective of actual conditions. If the station is not functioning properly obtains prompt maintenance to bring the station back to standards and/or shuts the station down until such actions can happen.*

Station Owner/Program Manager - Responsible for appropriate site selection and placement of NFDRS weather stations, maintenance, and assurance that accurate observations are taken and transmitted. This includes assuring appropriate response to station malfunctions. *Visual checks of data on a frequent basis (preferably daily), will be done to ensure that station readings are reflective of actual conditions.* Station owners are responsible to make sure that contractors or trained agency personnel are available to perform routine station maintenance, including documentation in WFMI weather, and to respond to emergency breakdowns in a timely manner.

NFDRS WEATHER STATION STANDARDS & GUIDELINES

INTRODUCTION

The National Fire Danger Rating System (NFDRS) is a decision support system used by wildland fire management agencies to assess current fire danger at local and national levels. It consists of a variety of indices that portray current potential fire danger conditions.

The weather station network supporting NFDRS has grown considerably in the last 30 years. The original RAWS network was conceived to support the coarse-scale application of fire danger rating. Today, RAWS data are routinely used to support decisions impacting firefighter safety, whether or not to initiate a fuels treatment prescription, air quality, crew readiness, and strategic seasonal and multi-year resource allocations to name a few. Demand for these data happens every day. The future use of RAWS data to support gridded, digital data products is already here and growing quickly. The current and future purpose of the RAWS network is to support point and gridded applications of fire weather for fire program analysis, fire danger rating, fire behavior prediction fire weather forecasting, and smoke management. The data from these stations support interagency fire danger predictions and provide quantification of risk elements that are critical for daily decisions regarding firefighter resource placement, staffing levels, appropriate suppression response, and strategic decisions at local, regional, and national levels. The most important value among those provided by these data is consideration for firefighter and public safety.

Stations compliant with the NFDRS standards will provide remotely sensed weather data--temperature, humidity, precipitation, wind and solar radiation on an hourly basis via the GOES satellite. Note: this does not apply to manual stations.

STATION CLASSIFICATIONS

This section includes station standards for NFDRS weather stations
Note: **The minimum NFDRS standard is the Seasonal Data Collection Station**.

NFDRS - Year Round Data Collection Stations - Includes all permanent 24-hour observing stations that meet the following criteria:

- operates to minimum standards year round to support designated wildland fire season
- equipped with the minimum NFDRS sensor compliment (see page 13)
- meets minimum quality assurance requirements (see page 4)
- 24-hourly readings are delivered to WIMS hourly via GOES through WFMI Weather.
- NFDRS calculations are processed regularly in WIMS delivering historical data to the FAMWEB data warehouse.
- (Optional) winterized rain gauge (weighing gauge, heated gauge, etc.) if necessary.

NFDRS - Seasonal Data Collection Stations - Includes all permanent 24 hour observing stations that meet the following criteria:

- operates to minimum standards to support designated wildland fire season (can operate 12 months or less)
- equipped with the minimum NFDRS sensor compliment (see page 13)
- meets minimum quality assurance requirements (see page 4)
- 24 hourly readings are delivered to WIMS hourly via GOES through WFMI Weather during seasonal operational period.
- NFDRS calculations are processed regularly (during seasonal operational period) in WIMS delivering historical data to the FAMWEB data warehouse.

Other - Includes all resource, special purpose, portable (non-fire) and miscellaneous stations that provide accurate weather data but does not meet the fire weather station standards.

WIMS IDENTIFICATION NUMBERS

Any permanent RAWS station that is intended to be used for NFDRS purposes needs to obtain a WIMS identification number through the servicing Geographic Area Predictive Services unit. The physical station owner will coordinate with the local dispatch organization to identify a WIMS station owner. The WIMS station owner will contact Predictive Services to obtain a WIMS identification number and set up the station profile in WIMS. Once the station is established in WIMS, the WIMS station owner will assign personnel to conduct the daily observation verification and NFDRS processes.

TELEMETRY POLICY

The following telemetry and input standardization **ONLY affects stations in support of NFDRS**.

All stations designated for NFDRS use will deliver data to WFMI Weather via GOES Satellite telemetry and send to WIMS on an hourly basis. The GOES transmitter and format used must be compatible with the WFMI Weather system.

GOES telemetry is the minimum standard; however, station owners may apply additional telemetry options as desired at the local level.

Any station operating on the High Data Rate (HDR) on the GOES satellite must use GPS (instead of WWV) per the Satellite Telemetry Interagency Working Group's (STIWG) High Data Rate Transition Plan. All stations must be transmitting on high data rate GOES channels by 2013.

Note: GOES telemetered NFDRS stations will be assigned transmission slots as near the top of the hour as possible. The intent is to have these assignments within 15 minutes either side of 00 (0045-0015). Non-NFDRS GOES telemetered stations will be assigned transmissions slots in the bottom half of the hour (0015-0045).

National Environmental Satellite, Data, and Information Service Identifiers (NESDIS ID):
This is an eight digit (letter and number) identification number assigned by NOAA/NESDIS that becomes the RAWS identification number, i.e 234567EO. NESDIS identifiers are assigned to every NFDRS RAWS, as well as some portable RAWS, which allows them to transmit data to the GOES satellites. The NESDIS ID is critical metadata for every station because that identifier ties the RAWS to a specific location on earth which is latitude/longitude. The proper assignment and tracking of NESDIS ID's is critical. Inappropriate assignment or reassignment of NESDIS ID's can result in misdirected weather data and conflicting metadata.

Interagency policy and guidelines for assignment of NESDIS ID's shall be:

1. NESDIS identifiers should not be changed unless there is a compelling reason to change them, such as the RAWS is moved to a new location.
2. Any change in NESDIS for existing NFDRS RAWS requires a change in WIMS and the appropriate station owner in WIMS must be consulted prior to this happening.
3. NESDIS ID's are not unique for any agency per the Satellite Telemetry Interagency Working Group (STIWG). Hence there is no need to assign any special set of identifiers for any given agency.

Note: For additional information on how to obtain or change a NESDIS ID, please contact the RAWS Depot at BLM_FA_RAWS_Helpdesk@blm.gov.

OPERATIONAL PERIOD

The optimal operating period for all weather stations used for the NFDRS is year-round. However, the minimum operational period is dictated by the following:

1. A minimum 30-day start up period prior to the need for NFDRS indices (i.e. the wildland fire season as designated by the local manager, Region, or Geographic Area Coordination Center) is required for each seasonal weather station to properly calibrate the model.

2. Annual fluctuations in season length. Use of the visual greenness (available on the WFAS home page) or Growing Season Index images (available at http://www.wfas.net) is recommended to assist the local or regional fire manager.

Non-owner use. The following guidelines are recommended for any use of a weather station for NFDRS that is not owned by the user.

1. Notify the physical and/or WIMS station owner that you are using this station for NFDRS or other applications.

2. When a longer operating season is required by an adjoining unit, the non-owning user should assist in the management of that station, including any additional costs for operation or maintenance.

SENSOR AND DATA REQUIREMENTS

NFDRS Station Minimum Sensor Compliment

NFDRS requires hourly measurements of precipitation duration and amount. In addition, an instantaneous air temperature reading will be taken each hour. Ten minute averages will be computed for the following variables: relative humidity, wind direction, and wind speed. Solar radiation will be recorded over a 60-minute average. Detailed data sampling requirements are listed under each specific sensor/instrument in the subsections below.

A note about automated fuel temperature/moisture measurements: The Fire Danger Committee recommended that a fuel moisture value be obtained from an automated model. Solar radiation sensors will provide input to the model that will produce derived fuel moisture/fuel temperature values that have been determined to be more reflective of actual conditions. Fuel Moisture Sticks are not required for NFDRS calculations; however, fuel moisture stick data is utilized by a variety of user groups for fire applications.

GOES telemetered station sensor update readings will coincide with the assigned transmission time. The instantaneous readings must be taken within the 5 minutes up to and including the transmission time. Further, if 10-minute averages are taken, the sensor average readings must be taken within the 15 minutes prior to the assigned GOES transmission time. Example: if a station transmits to GOES at 45 minutes past the hour, the sensor's instantaneous readings must be taken between 40 and 45 minutes past the hour and the averaged readings must be initiated between 30 and 35 minutes past the hour. **Sensor data must transmit in English units.**

Rain Gauge

Precipitation is the amount of water falling upon the earth as rain or in frozen form such as snow, sleet, and hail. It is expressed as the depth of water that would cover a flat surface. Rainfall output will be the cumulative total of rainfall for the rain year determined by the agency or maintenance cycle. Year-round precipitation information is not necessary for NFDRS (please see classification section of this documentation for more information). However, if the station reports year-round and the user determines the need for collecting year-round precipitation information, a winterized gauge (heated gauges, weighing-gauge, etc.) may be necessary. (Please note that stations, which do not have winterized precipitation gauges, will often show a large rain event in early spring due to normal thawing cycles.)

Sensor Standards	
Sampling Height	1-6 feet, varies with mounting tower
Measurement Units	Inches
Range	00.00 through 99.99 inches
Resolution	.01 inches
Accuracy	+/-3% of total
Data Standards	
Type Measurement	Continuous cumulative measurement
Data logged	Hourly
Data Format	XX.XX

Wind Speed

Wind speed is the rate at which air passes a given point.

Sensor Standards	
Sampling Height	20 feet
Measurement Units	Statute Miles per Hour
Range	0-100 mph
Accuracy	+/- 5% of reading
Data Standards - 10-Minute Average	
Type of measurement	10-minute average from no less than 120 samples
Data Logged	Hourly
Data Format	XXX
Optional Measurement - Peak WS - Data Format Standards	
Type Of Measurement	Maximum speed for previous 60 minutes from no less than 720 samples.
Data Logged	Hourly
Data Format	XXX

Wind Direction

Wind direction refers to the direction from which the air is moving.

Sensor Standards	
Sampling Height	20 feet
Measurement Units	Degrees from True North
Range	0-360 degrees
Accuracy	+/- 5 degrees
Data Standards - 10 Min Average	
Type of Measurement	10-minute average from no less than 120 samples
Data Logged	Hourly
Data Format	XXX

Optional Measurement - Peak WD - Data Format Standards	
Type of Measurement	Direction at Peak Wind Speed
Data Logged	Hourly
Data Format	XXX

Air Temperature

Air temperature refers to the air surrounding the weather station instrumentation.

Sensor Standards	
Sampling Height	4-8 feet
Measurement Units	Degrees Celsius or Fahrenheit
Range	-50 to +50 degrees Celsius -58 degrees to +140 degrees Fahrenheit
Accuracy	+/- 1 degree Fahrenheit +/- .6 degree Celsius
Data Standards	
Type of Measurement	Instantaneous reading
Data Logged	Hourly
Data Format	XXX

Relative Humidity

Relative humidity is the percentage ratio of the actual amount of water vapor in the air to the amount of water vapor required for saturation at existing temperature.

Sensor Standards	
Sampling Height	4-8 feet
Measurement Units	Percent
Range	0-100 %
Accuracy	0-80% - +/- 2.00% at 25 degrees Celsius 80-100% - +/- 5% at 25 degrees Celsius
Data Standards	
Type of Measurement	10-Minute average from no less than 120 samples
Data Logged	Hourly
Data Format	XXX

Battery Voltage

Battery voltage is the DCP/DataLogger battery current voltage. This item is recorded for remote troubleshooting and data validation purposes.

Data Standards	
Range	0-15 Volts
Accuracy	.1 Volts
Type of Measurement	Instantaneous
Sample Interval	Hourly
Data Format	XX.X

Solar Radiation

Solar radiation measures the amount of sunlight exposed to the fuels.

Sensor Standards	
Sampling Height	5-8 feet (so not to be shaded during the day)
Measurement Units	Millivolts
Output	Watts per meter squared
Accuracy	+/- 5%
Data Standards	
Type of Measurement	60 minute average taken from 60 samples prior to transmit.
Data Logged	Hourly
Data Format	(-)XXXX

Universal Time Coordinated (UTC)

The station must stay synchronized with coordinated universal time. GPS units or WWV synchronization clocks are required for hourly (or more frequent) GOES transmissions. Readings from these receivers are not required as part of the data stream. Make note of the accurate latitude/longitude /elevation information location and ensure that it is recorded in WFMI Weather/WIMS/WRCC. Any station operating on the High Data Rate on the GOES satellite must use GPS (instead of WWV) per the Satellite Telemetry Interagency Working Group's (STIWG) High Data Rate (HDR) Transition Plan. All stations must be to HDR GOES by 2013.

Readings to be output in the following order:

Order	Sensor Name	SHEF Code
01	Rainfall	PC
02	10-Min. Avg. Wind Speed	US
03	10-Min. Avg. Wind Direction	UD
04	Air Temperature	TA
05	Fuel Temperature	MT
06	10-Min Avg. Relative Humidity	XR
07	Battery Voltage	VB

Channels beyond the first 7 are recommended to be output in the following order. Variations after the standard required sensor compliment will be facilitated on a case-by-case basis. Check with Remote Sensing Fire Weather Support Unit (RSFWSU) to be sure your application is compliant with WFMI Weather/WIMS.

08	Barometric Pressure	PA
09	Peak Wind Direction	UX
10	Peak Wind Speed	UG
11	Fuel Moisture	MM
12	Solar Radiation	RD

Variations after the standard required sensor compliment will be facilitated on a case-by-case basis. Check with Remote Sensing Fire Weather Support Unit to be sure your application is compliant with WFMI Weather/WIMS.

08	Barometric Pressure	PA
09	Peak Wind Direction	UX
10	Peak Wind Speed	UG
11	Fuel Temperature	MT
12	Fuel Moisture	MM

Note: This could be modified slightly depending upon WIMS/WFMI Weather interface and modifications necessary to support the Nelson Model. An updated page to this document will be issued at that time.

SITE SELECTION/RELOCATION

The RAWS Network Analysis

In 2010, NWCG commissioned the Desert Research Institute (DRI) to complete a study that addresses the following question. What is the appropriate RAWS Network? The report is fire-centric and provides an analysis of the existing NFDRS RAWS in WIMS and ASOS weather stations that can be used as an aid when making decisions pertaining to the placement or movement RAWS weather stations.

The report stresses that it is best to think of the RAWS network not in terms of size, but rather agency mission. The network has grown through a need to acquire weather information and add value by determining fire danger, fire behavior, etc. RAWS serves in both capacities of point data and weather grids, and provides unique value by representing geographic areas not generally covered by other networks. Uses of the network and the combination of the metrics provided in the study along with local knowledge should serve as network guides given budgetary constraints. Consider the following information found in the report.

1. *If consideration is being given to moving or removing a station, the various station attributes that comprise the RAWS Uniqueness Index (RUI) should be considered in addition to local knowledge including established documents such as Fire Danger Operating Plans. It is probably best to compare index values within GACCs, rather than across the country as a whole. Low index values arise due to one or more quantitative attributes of the station, but low values do not necessarily mean a bad station. It is important to examine all of the input index values comprising the RUI. For example, a high terrain complexity score suggests that the station is measuring across a rapidly changing climate environment due to elevation differences. A high data denial score should be used as an indication that removing a station will have adverse effects on gridded weather and related fields such as fire danger. This may be due to removing the station in the data denial experiment and/or there is a relatively larger horizontal and/or vertical separation to the next station.*

2. *If interest exists in adding a station, the gap maps shown in Appendices 1-10 of the analysis are based on an IDI analysis. These should be used to help assist locating the new site. Zero IDI values on the map show areas of data void (no RAWS representation on the RAWS maps; no RAWS or ASOS representation on the RAWS+ASOS maps); the grid would be improved if areas with low index values had more stations. Utilizing GIS layers, the IDI values can be overlaid on top of other variables such as values at risk, vegetation, agency boundaries, etc. to assist in determining new station locations.*

Process for Installing a New and/or Moving an Existing Station

1. When installing a new or moving an existing station, it is particularly important to involve NWS fire weather and Predictive Services meteorologists along with other interagency wildland fire personnel (as appropriate) in determining a new site or relocating an existing station.

2. Contact your agency and/or regional RAWS coordinator. To get help from your national coordinator, go to the interagency web page at **http://raws.fam.nwcg.gov/contacts.html**. It is particularly important to contact your agency weather station coordinator when moving an existing station in order to maintain integrity of historical data. If an existing station has been moved, relocation information must be updated in WIMS application to clearly include the fact that the station is reporting from a new location.

3. Obtain the following station site information: station name, legal (Township, Range, quarter-section), county, elevation, latitude/longitude, and data measurement elements. Complete station information is to be entered in the WFMI Weather database. For latitude and longitude, NAD 83 is the datum standard and the data are to be entered in degrees/minutes/seconds and decimal seconds out to the nearest hundredth (two decimal places). Ensure that station data entered into WFMI Weather and WIMS are identical.

4. Obtain a 6-digit weather station identification number (also referred to as NWS/WIMS station ID number) for your station through your GACC Predictive Services unit.

5. Transmission via GOES satellite requires a National Environmental Satellite Data Information Systems (NESDIS) Identification Number in addition to the NWS ID number. Contact the RAWS Depot at rawsdepothelp@nifc.blm.gov.

Site Selection Guidelines

The standard fire weather station should be located in a large, open area away from obstructions and sources of dust and surface moisture. The station should be on level ground where there is a low vegetative cover. Furthermore, it should be situated to receive full sun for the greatest possible number of hours per day during the fire season (generally 7a.m. to 7p.m.). If located on a slope, a south or west exposure is required to meet fire danger rating standards (Deeming, Lancaster, Fosberg, and others 1972).

Consider security (from animals and human vandalism) when selecting a site. To prevent any damage from wildlife, livestock etc., installation of a fence is highly recommended.

The following rules govern the location of an NFDRS fire weather station:

1. Locate the station in a place that is representative of the conditions existing in the general area of concern. Consider vegetative cover type, topographic features, elevation, climate, local weather patterns, etc.

2. Select a site that will provide for long-term operation and a relatively unchanged exposure. Consider site development plans, e.g., roads, buildings, parking areas; ultimate sheltering by growth of vegetation; and site accessibility during the intended operational period.

3. Arrange the station so as to give data that is representative of the area in which the station is situated. Consider exposure requirements for each instrument in relation to such things as prevailing winds, movement of the sun, topography, vegetative cover, nearby reflective surfaces, and wind obstructions.

In accordance with the above rules, the following situations should be avoided when selecting a station site:

1. **Sources of dust** such as roads and parking areas. If unavoidable, locate station at least 100 feet on the windward side of the source.

2. **Sources of surface moisture** such as irrigated lawns, pastures, gardens, lakes, swamps, and rivers. If unavoidable, locate station several hundred feet to the windward side of the source.

3. **Large reflective surfaces** such as white painted buildings. The same holds for natural reflective surfaces such as lakes, ponds, canals, and large rock surfaces. If unavoidable, locate station on north side, but far enough away so as not to be artificially shaded or influenced (at least a distance equal to the height of the reflective surface or 50 feet, whichever is greater).

4. **Extensively paved or black-topped areas.** If unavoidable, locate station at least 50 feet to the windward side.

5. **Large buildings, trees, and dense vegetation.** Locate station at least a distance
    a. equal to the height of the obstruction. Ideally, when dealing with tall, dense vegetation the station should be located a distance that is equal to 7 times the height of the obstructing vegetation.

6. **Distinct changes in topography** such as gullies, peaks, ridges, steep slopes, and narrow valleys.

Site Relocation Guidelines

1. Stations that do not meet the siting guidelines should be considered for relocation according to the process outlined above.

2. When moving an existing station, regardless of distance moved, Predictive Services must be contacted to assist in the entire administrative process and to make contact with interagency partners and other users. It is particularly important to contact your agency weather station coordinator when moving an existing station in order to maintain integrity of historical data. Station relocation information must be updated in WFMI Weather, WIMS, and WRCC (wrcc@dri.edu) to clearly include the fact that the station is reporting from a new location. It is important to note that the function of the GPS unit on the RAWS station is not to store and/or transmit location data but to keep track of transmission times.

   A WIMS station ID number must be changed if:
   - The station is moved to a significantly different elevation or distance from the original station location
   - The station is moved across a county boundary

   Other considerations when moving a station with regard to changing WIMS station ID numbers include the following:
   - The station is moved into an area of different exposure (for example shading, wind obstructions, etc.)
   - The station is moved into an area of different topography

A new NESDIS ID is not required for a move, but station location metadata must be kept as accurate as possible. The appropriate person should enter/change that information in WFMI-Weather as soon as appropriate.

For additional information: *Weather Station Handbook-An Interagency Guide for Wildland Managers*, PMS 426-2, NFES 2140 (March 1990).

Note: Agencies that are considering buying a new weather station for use in NFDRS, should consult the local National Weather Service, Predictive Services and other interagency partners. A consensus among these groups will ensure the interagency NFDRS station network is adequate and limit the cost of needless station overlap.

TOWER SPECIFICATIONS

As identified within this standard, NFDRS Weather Stations may be located in very remote and rugged locations. These stations are or will be either permanent or semi-permanent sites. Some sites will be operated 12 months a year in severe environmental conditions.

There are several types of towers that incorporate NFDRS sensor compliments. Installation of these towers should be in accordance with manufacturer's specifications. Agency safety regulations apply to tower climbing.

The positioning of the tower is very important, and if positioned properly, greatly increases the speed of installation and future maintenance actions. Alignments, leveling and structural strength are the primary concerns with all types of tower and instrument installations.

Therefore, any tower that is purchased or used must be very sturdy, rugged and robust. Towers come in free standing, guyed, or portable configurations. Only guyed or freestanding towers should be used for NFDRS purposes. If a tower is "climbable", it must meet all applicable agency and OSHA regulations (See OSHA manuals 1926.32, 1910.66 and 1910.268) for climbing criteria. It should be noted that guyed towers may have additional construction costs at the site to facilitate excavation for concrete mounting pier and concrete anchor blocks.

If a guyed tower does not meet OSHA climbing specifications, it must have a tilting base. This will permit the tower to be laid over close to the ground to service all sensors. All non-climbable towers will have provisions (tilting or pivoting mast) for ground level service of instrumentation by maintenance personnel **or** be accessible by freestanding ladder, lift truck or bucket lift without contacting the tower. They also must provide adequate support and footing for technical staff to service and inspect all sensors while they are in place.

Ensure that towers have adequate mounting locations, facilities, and hardware availability to mount all sensors securely to the tower and their respective locations and heights. Severe conditions, i.e., ice loading, deep snow, high winds may be normal for this equipment.

General Tower Specifications

- Survive 125 MPH winds
- No horizontal or vertical movement (sliding once installed)
- Withstand snow loads of typical high mountain locations (if station is located in an area susceptible to these conditions)
- Support technical personnel on the tower while servicing all sensors.
- Provide adequate mounting surface and locations to meet NFDRS sensor requirements.

INSTALLATION

Once a site is selected that meets all of the site guidelines, it can then be prepared for installation of a weather station. Personnel installing weather stations should have attended a Remote Automated Weather Station (RAWS) maintenance class, or be assisted by trained personnel. Trained personnel can be located through your agency weather station coordinator.

The following is a list of minimum information from the site that is necessary for station documentation. Other information about your station is valuable and needs to be stored in WFMI Weather.

Station Name
DCP/Datalogger Model
State
County
Agency
Region
Unit
Sub-Unit (if needed)
Transmitter Manufacturer and Model
Installation Date
Maintained by (and/or Point of Contact)
Phone number/e-mail for Point of Contact
Contract Type
Elevation
Latitude (degrees, minutes, seconds)
Longitude (degrees, minutes, seconds)

Documentation. Installation and maintenance must be documented. It is required to record this information in WFMI Weather, and station catalogs in WIMS*. Station owners will take digital photos of each NFDRS weather station looking toward the station from each of the four cardinal directions in accordance with the requirements posted on http://www.raws.dri.edu/documents/2006_09_30_Photography_SOP.doc, and submit them for posting to Greg McCurdy at Greg.McCurdy@dri.edu. Photos should be updated every three years at a minimum. A hard copy folder will be kept for each station by the station owner. In this folder should be photos of the area and station, a map, and the information printout from WFMI Weather and WIMS.

*Ultimately, maintenance, station and site information will all be housed online with station metadata. Collaboration will take place between the WFMI Weather and WIMS managers to address and resolve metadata issues with the intent of not duplicating the storage of data and seamless access to the information for the user.

System Alignment and Leveling
The tower, GOES antenna and wind direction are aligned from true north. It is important to include your local magnetic declination (east or west) readings when aligning the

tower, GOES antenna, wind direction sensor, etc.

Once the tower has been aligned, it must be leveled. Once leveled, the tower should be staked to the ground. Staking the legs prevents the tower from being moved inadvertently in the installation process and during future maintenance visits.

The **wind speed/wind direction (WS/WD).** Install according to manufacturer instructions. For NFDRS, these will be mounted at 20 feet. Pay special attention so that the WD sensor is oriented properly, is level and gives correct readings. Route data cable in accordance with manufacturer's instructions.

Using the mounting bracket supplied by the manufacturer, the **tipping bucket** should be leveled using the leveling indicator attached to the sensor.

The **antenna (GOES, cell-phone, radio-voice)** should be assembled in accordance with manufacturer's instructions. The GOES antenna should be properly aligned for azimuth and elevation. Antenna alignment is accomplished using the compass and inclinometer. Remember to compensate for declination if required.

The **solar panel** will be mounted with a southerly exposure to maximize solar input.

The **solar radiation sensor** should be installed and leveled according to the manufacturer's instructions. Mount the instrument on the tower ensuring that it is not shaded by the tower, cables or instruments at any time of the day. For example, in the case of the Vaisala/Handar 403A tower, the instrument should be mounted in the middle of the top west rail of the tower.

Structural Integrity

All **cables** should be routed from their respective sensors to the Data Collection Platform (DCP)/DataLogger. Care should be taken in routing the cables to provide strain relief wherever required to prevent cable damage. When routing the cables, provide enough slack at both ends to permit a drip loop for moisture dissipation. When cable routing is complete, secure all cables to the tower using cable ties. Inspect all cables and ensure that rubber o-rings are used at both ends to make watertight seals. Consider "shielded" cables (metal conduit, pvc tubing) for protection from the elements and animals.

Ensure that all guy wiring is secured and tight. Ensure that the anchor rods are secured in order to prevent the tower from moving. Make sure all tower hardware is properly tightened. The RAWS system is now ready for systems checkout for operational accuracy.

Lifecycle Management

As with any capital investment equipment, a lifecycle management plan for the weather station network should be in place and budgeted for. Ten years is the recommended life-cycle rotation for weather station equipment.

STATION MAINTENANCE POLICY

Annual Maintenance

Annual service of NFDRS RAWS stations will provide an opportunity to ensure general station integrity, perform necessary preventative maintenance, and replace sensor and components prior to expiration of their calibrated lifetimes.

In order to ensure accurate weather readings, a program of annual (+/- 45 days from installation or previous year's maintenance date) RAWS maintenance/calibration is required. Every NFDRS RAWS must receive, at a minimum, one annual on site maintenance visit by either the local user or contracted personnel to ensure sensors are within calibration standards, and verify site and station conditions. Service contracts for this purpose can be requested through the BLM's Remote Sensing / Fire Weather Support Unit (RSFWSU) in Boise, Idaho, or any vendor that will meet the national standards for field or depot-level service as outlined in this document.

The site inspection also allows for maintaining vegetation growth or mitigating other site parameters (e.g. new irrigation systems, buildings) that may be compromising site integrity**. It is important to keep vegetation trimmed at the surface to ensure it doesn't block wind and air flow to sensors.** Reasonable attempts must be made to keep the site in accordance with siting guidelines. If there are regulations prohibiting appropriate site maintenance required to provide representative data, develop a plan to bring the station into compliance. This could be done by obtaining any necessary special authorizations to manage vegetation, or in the most unfavorable case, moving the station. If sites are considerably compromised, it is critical to document this in the station metadata, including photographs, so that users of the data have the opportunity to assess its value to them.

Unscheduled Maintenance / Emergency Repair

Local land managers are responsible for monitoring the quality of the data produced by the weather stations in their fire response area. In the event of system failures, bad data, or questionable data, it is the responsibility of the station owner to initiate corrective action.

1. Year-round response time to GOES systems time drift will be immediate unless it is determined that there is no interference with another station. Validation of interference can be made through the Remote Sensing Fire Weather Support Unit (RSFWSU).
3. All other NFDRS station failures will be responded to as appropriate in light of the following:
    a. Bad data affects the outputs of the model immediately. Responses to bad data, during fire season where the station is located, should be initiated

immediately. Failures that occur outside fire season will be repaired before the station is initiated for the following fire season.

b. **During fire season, action must be taken to respond to missing data system failures where the station is located will be as soon as possible, but no more than 3 days.** Outside fire season responses will be made before the station is initiated for the following fire season.

ANNUAL MAINTENANCE AND SENSOR REPLACEMENT STANDARDS

Sensors and key components of an NFDRS RAWS station must be recalibrated or replaced on a regular basis to ensure the collection of consistent and reliable weather data throughout the NFDRS RAWS network. Annual service of NFDRS RAWS stations will provide an opportunity to ensure general station integrity, perform necessary preventative maintenance, and replace sensors and components prior to expiration of their calibrated lifetimes. The entries for specific equipment below outline yearly preventative maintenance, as well as minimum replacement times for each component. Minimum replacement time represents the optimum time to change any individual component. The servicing personnel may perform this function within +/- 45 days of the yearly expiration data to meet NFDRS maintenance requirements.

Field Service

Tipping Bucket – Remove cover. Clean cover and orifice to ensure free flow of water. Do not disassemble further. Check all connections and verify that the instrument is level. Unless the rain year is reset automatically by the DataLogger/DCP on a certain date each year, reset the tipping bucket to 00.00. Then simulate .02 inches of rain and validate that it was recorded by the DataLogger/DCP.

MINIMUM FIELD VALIDATION - 1 Year
MINIMUM DEPOT CALIBRATION/REPLACEMENT - 3 Years

Wind Speed - Check for damage and alignment of cups, ice skirt, free movement of bearings.

MINIMUM CALIBRATION/REPLACEMENT - 2 Years

Wind Direction - Check for damage of pointer and feather, free movement of bearings. Manually rotate the sensor through each of the four quadrants and scan the data for accuracy.

MINIMUM CALIBRATION/REPLACEMENT - 2 Years

Ultrasonic Wind Speed/Wind Direction – No calibration required, clear any obstruction between arms of transducers.

Relative Humidity/Air Temperature - Not field serviceable; do not open.

MINIMUM CALIBRATION/REPLACEMENT – Yearly

Battery - Perform a voltage test. Replace batteries according to manufacturer recommendations or if you suspect problems. Some manufacturers recommend yearly, others recommend every three years.

MINIMUM REPLACEMENT – As necessary
"D" cell (Supplemental Power) - yearly

WWV Receiver - Perform pass/fail functional check and replace if necessary.
MINIMUM CALIBRATION/REPLACEMENT - As Needed

GOES Antenna - Check for broken, loose, or bent elements, proper alignment, and connectors for corrosion.
MINIMUM CALIBRATION/REPLACEMENT - As Needed

Cables - Check for cracking, deterioration, corrosion, proper routing, and security. Ensure O-rings are installed on all connectors. Replace as required for corrosion, aging, etc. Treat all connectors with moisture inhibitor (if required by manufacturer).
MINIMUM CALIBRATION/REPLACEMENT - As Needed

Tower - Check for structural damage, proper alignment, and leveling. Be aware of potential risk to safety when dealing with a potentially damaged tower (i.e., tower rust, corrosion, cable fray, etc.).
MINIMUM CALIBRATION/REPLACEMENT - As Needed, if structure is compromised or as per manufacturer's specifications.

DCPs and DataLoggers - Check for security, damage, and ensure that all cables are properly connected. Verify the unit has the most recent version of the software or firmware installed. Change out as needed (defective, evidence of moisture, corrosion, rust, etc.).
MINIMUM CALIBRATION/REPLACEMENT – As needed or in accordance with manufacturer's specifications.

Solar Radiation - Sensor must be cleaned periodically using only *water* and/or a mild detergent such as dishwashing soap.
MINIMUM CALIBRATION/REPLACEMENT - 3 Years

Depot Sensor Calibration Standards

The depot or vendor's maintenance facility under contract will rehabilitate and calibrate sensors to the specifications contained in this document.

Sensor Documentation - A maintenance history record shall be kept for each component that is repaired/calibrated by any depot facility under contract. These records are kept on file by serial number and used by depot and agency staff for spotting systematic problem

areas that may have impact on the program. The documentation is useful in working to develop better quality products.

Test Equipment – The test equipment and associated tools used during depot sensor calibration routines shall follow a general practice of "Traceability protocol" based on standards maintained by the National Bureau of Standards (NBS). This results in claims of calibrations that are "traceable to NBS".

Documentation

Complete station information (location, elevation, data measurement elements, etc.,) will be captured in the WFMI Weather database. For latitude and longitude, NAD83 is the datum standard to be used and be recorded in degrees, minutes and seconds. WFMI Weather users should initiate coordination with WIMS users (if not the same person) to ensure that location information matches precisely in both systems. It is especially important that this happen before WIMS managers generate the enhanced location information in WIMS.

Annual maintenance and emergency repair will be documented in WFMI Weather. It is the responsibility of every person that visits the site to ensure that WFMI Weather is updated and reflective of the condition of the station. This will include, at a minimum:

- Maintenance date (e.g. date that Relative Humidity / Air Temperature was changed / calibrated).
- Specific sensors and serial numbers of those sensors (documented in WFMI Weather or other appropriate database).
- A narrative of the site visit, including the date of the visit, the personnel at the site and what maintenance was accomplished.

The station owner will also maintain a hard copy of the documentation file for each station. This will include photos, site access instructions, purchase history and other relevant information.

Note: Basic NFDRS station metadata consists of latitude, longitude, station name, national weather service identifier, NESDIS identifier, elevation and aspect. It is critical that this basic information be shared with all systems and that it is accurate. Basic metadata resides on WFMI Weather and the WIMS system and the goal is to have automated sharing metadata between systems. This will reduce the occurrence of conflicting and inaccurate metadata.

FIRE RAWS STANDARDS & GUIDELINES

INTRODUCTION

Portable Fire RAWS are used in planned ignitions, wildfires and on other incidents and projects to relay current weather information representative of an area of interest. Fire RAWS are extremely beneficial to fire managers as they represent micro-scale climate and weather patterns within a small geographic area. Incident Meteorologists (IMETS) and local users rely on the information from Fire RAWS to help them determine and predict small scale weather features. These forecasts are critical to firefighter safety, fire behavior forecasts, daily decisions regarding resource placement, appropriate suppression response and strategic decisions.

The portable Fire RAWS network consists of approximately 50 NFES #5869 Incident RAWS units based at NIFC in Boise, Idaho, and more than 300 agency owned units scattered in various locations. Although most of the portable Fire RAWS currently being used in the field have similar equipment, the lack of established national standards for Fire RAWS has created ambiguity in the integrity of the network of stations. Established national standards for Fire RAWS will reduce the risk of bad data, malfunctioning sensors or stations, and potential for poor decisions based on misrepresentative data. National standards will provide the greatest opportunity for success in using Fire RAWS. Therefore in order to foster a more effective and efficient use of Fire RAWS and to mitigate the risk of potential bad data, the Fire Weather Committee in conjunction with the RAWS Partners Group established national standards for Fire RAWS in May 2008.

SENSOR AND DATA REQUIREMENTS

By definition, a Fire RAWS is a portable RAWS that conforms to standards of data collection and maintenance specified in this publication. These standards are established to ensure a reliable level of data quality is available to wildland fire management operations, and do not apply to portable RAWS used for non-fire management uses. This category includes but is not limited to Fire RAWS equipment currently available from the National Fire Equipment System Catalog (NFES 5869). Due to the mobile and transient nature of their deployments, Fire RAWS data are not suitable for NFDRS applications. These standards are the minimum required, and may be exceeded by individual organizations.

Stations that are portable or mobile or are sometimes referred to as “quick deploy” should have such an indicator in their name in WFMI Weather (i.e., Los Padres Portable #1). This helps other “downstream” users understand that these stations should not be considered for any long-term study or use.

Both required and optional sensor specifications follow.

STANDARDS FOR REQUIRED SENSORS AND DATA

Sensor data must transmit in English units

Wind Speed

Wind speed is the rate at which air passes a given point.

Sensor Standards	
Sampling Height	6 feet or higher
Measurement Units	Statute Miles per Hour
Resolution	1 Statute Mile per Hour
Range	0-100 mph
Accuracy	+/- 5% of reading
Data Standards - 10-Minute Average	
Type of measurement	10-minute average from no less than 120 samples
Data Logged	Hourly
*Data Format	XXX
Optional Measurement - Peak WS - Data Format Standards	
Type of Measurement	Maximum speed for previous 60 minutes from no less than 720 samples.
Data Logged	Hourly
*Data Format	XXX

Wind Direction

Wind direction refers to the direction from which the air is moving.

Sensor Standards	
Sampling Height	6 feet or higher
Measurement Units	Degrees from True North
Resolution	1 degree
Range	0-360 degrees
Accuracy	+/- 5 degrees
Data Standards - 10 Min Average	
Type of Measurement	10-minute average from no less than 120 samples
Data Logged	Hourly
*Data Format	XXX
Optional Measurement - Peak WD - Data Format Standards	
Type of Measurement	Direction at Peak Wind Speed
Data Logged	Hourly
*Data Format	XXX

Air Temperature

Air temperature refers to the air surrounding the weather station instrumentation.

Sensor Standards	
Sampling Height	4-8 feet
Measurement Units	Degrees Fahrenheit or Celsius
Resolution	1 degree Fahrenheit or .1 Celsius
Range	-58 degrees to +140 degrees Fahrenheit -50 to +50 degrees Celsius
Accuracy	+/- 1 degree Fahrenheit +/- .6 degree Celsius
Data Standards	
Type of Measurement	Instantaneous reading
Data Logged	Hourly
*Data Format	XXX

Relative Humidity

Relative humidity is the percentage ratio of the actual amount of water vapor in the air to the amount of water vapor required for saturation at existing temperature.

Sensor Standards	
Sampling Height	4-8 feet
Measurement Units	Percent
Resolution	1 Percent
Range	0-100 %
Accuracy	0-80% - +/- 2.00% at 25 degrees Celsius 80-100% - +/- 5% at 25 degrees Celsius
Data Standards	
Type of Measurement	10-Minute average from no less than 120 samples
Data Logged	Hourly
*Data Format	XXX

STANDARDS FOR OPTIONAL SENSORS AND DATA

Rain Gauge - Optional

Precipitation is the amount of water falling upon the earth as rain or in frozen form such as snow, sleet, and hail. It is expressed as the depth of water that would cover a flat surface. Rainfall output will be the cumulative total of rainfall for the rain year determined by the agency or maintenance cycle. Year-round precipitation information is not necessary for NFDRS (please see classification section of this documentation for more information). However, if the station reports year-round and the user determines the need for collecting year-round precipitation information, a winterized gauge (heated gauges, weighing-gauge, etc.) may be necessary. (Please note that stations, which do not have winterized precipitation gauges, will often show a large rain event in early spring due to normal thawing cycles.)

Sensor Standards	
Accuracy	+/-3% of total
Sampling Height	1-6 feet, varies with mounting tower
Measurement Units	Inches
Range	00.00 through 99.99 inches
Resolution	.01 inches
Data Standards	
Type of Measurement	Continuous cumulative measurement
Data Logged	Hourly
*Data Format	XX.XX

Battery Voltage – Optional
Battery voltage is the DCP/DataLogger battery current voltage. This item is recorded for remote troubleshooting and data validation purposes.

Data Standards	
Range	0-15 Volts
Resolution	1 Volt
Accuracy	+/- .1 Volts
Type of Measurement	Instantaneous
Sample Interval	Hourly
*Data Format	XX.X

Solar Radiation - Optional
Solar radiation measures the amount of sunlight exposed to the fuels.

Sensor Standards	
Sampling Height	4-8 feet (so not to be shaded during the day)
Measurement Units	Millivolts
Resolution 1	Millivolt
Output	Watts per meter squared
Accuracy	+/- 5%
Data Standards	
Type of Measurement	60 minute average taken from 60 samples prior to transmit.
Data Logged	Hourly
*Data Format	(-)XXXX

Fuel Temperature - Optional
Fuel temperature is a temperature reading imbedded within a standard pine dowel, fully exposed to sunlight, above a representative fuel bed.

Sensor Standards	
Sampling Height	10-12 inches
Measurement Units	Degrees Fahrenheit or Celsius
Range	14 to 140 degrees Fahrenheit 10 to 60 degrees Celsius
Resolution	1 degree Fahrenheit or Celsius
Accuracy	+/- 1 degree Fahrenheit or Celsius
Data Standards	
Type of Measurement	Instantaneous
Data Logged	Hourly
Data Format	XXX

Fuel Moisture - Optional
Fuel moisture is the % weight of water particles present in a 100-gram '10-hour' Ponderosa pine dowel stick.

Sensor Standards	
Sampling Height	10-12 inches or as recommended by manufacturer
Range	0-25 grams
Resolution	1.0%
Accuracy	0-12% FM +/-1.9% 12-30% FM +/- 3.6% > 30% FM +/- 16%
Data Standards	
Type of Measurement	Instantaneous
Data Logged	Hourly
Data Format	XXX

Barometric Pressure - Optional
Barometric pressures measures the force exerted by the weight of the atmosphere per unit area, adjusted for elevation.

Sensor Standards	
Sampling Height	As recommended by manufacturer
Measurement Units	Inches Mercury (Hg)
Range	23.60 to 32.50 Hg
Accuracy	+/- 0.02 Hg
Data Standards	
Type of Measurement	Instantaneous
Data Logged	Hourly
*Data Format	XXX

*For those Fire RAWS that report via GOES, data format and transmission requirements are the same as NFDRS stations.

Radio Alert Function (optional)

The NFES 5869 Incident RAWS has a radio voice alert function that can broadcast current weather information upon either interrogation or detection of pre-set parameters. This function should be adjusted to user requirements. Other commercially available equipment may also offer this feature, and should also be adjusted to local requirements.

SITE SELECTION

Specific fire management and/or incident requirements may dictate site selection for where to setup a Fire RAWS. This should always be done in coordination with appropriate personnel. The general rule of thumb would be to locate the Fire RAWS in the area of your specific concern.

Site Selection Guidelines (typical deployment)

Fire RAWS generally should be located in a large, open area away from obstructions and sources of dust and surface moisture. Consider security (from animals and human vandalism) when selecting a site. The following are guidelines for a typical fire management operation:

1. Locate the station in a place that is representative of the conditions existing in the specific area of concern. Consider vegetative cover type, topographic features, elevation, local climate and weather patterns, etc.

2. Deploy the Fire RAWS so as to give data that is representative of the specific area in which the project or wildland fire is located. Consider exposure requirements for each instrument in relation to such things as prevailing winds, movement of the sun, topography, vegetative cover, nearby reflective surfaces, and wind obstructions. Recommendations for station deployment:
    - Deploy a station where it represents the average conditions for your concerns.
    - If an additional Fire RAWS is available, it may be beneficial to deploy it in an area that represents worst case conditions.

In accordance with the above rules, the following situations would generally be avoided when selecting a station site:

1. **Sources of dust** such as roads and parking areas. If unavoidable, locate station at least 100 feet on the windward side of the source.

2. **Sources of surface moisture** such as irrigated lawns, pastures, gardens, lakes, swamps, and rivers. If unavoidable, locate station several hundred feet to the windward side of the source.
3. **Large reflective surfaces** such as white painted buildings. The same holds for natural reflective surfaces such as lakes, ponds, canals, and large rock surfaces. If unavoidable, locate station on north side, but far enough away so as not to be artificially shaded or influenced (at least a distance equal to the height of the reflective surface or 50 feet, whichever is greater).

4. **Extensively paved or black-topped areas.** If unavoidable, locate station at least 50 feet to the windward side.

5. **Large buildings.** Locate station at least a distance equal to the height of the obstruction.

General Fire RAWS equipment specifications

Any Fire RAWS unit that is purchased or used must be very sturdy, rugged and robust. Requirements include:

- Survive 100 MPH winds when properly anchored
- Withstand extremes of environmental conditions
- Self supporting structure with a sturdy tripod frame or other suitable system.
- Portable, easily transportable and easy to deploy
- Powered by solar panel and/or battery system to allow for "stand alone" remote operations. Battery voltage should be checked periodically. Batteries must be changed every 3-4 years, or as needed.

Note: Prior to demobilization or movement of a Fire RAWS, it is important to consult with neighboring agencies and fire teams. It is possible that these neighbors may be using the Fire RAWS data.

FIRE RAWS MAINTENANCE POLICY

Annual Maintenance

At a minimum, annual service (+/- 45 days) for Fire RAWS must be performed to ensure general system integrity, allow necessary preventative maintenance, and to replace sensors and components prior to expiration of their calibrated lifetimes. Service contracts for this purpose can be requested through the BLM's Remote Sensing / Fire Weather Support Unit (RSFWSU) in Boise, Idaho, or any vendor that will meet the national standards for field or depot-level service as outlined in this document.

Cautionary Note: **A Fire RAWS may be used several times in a one year period, requiring multiple unpacking and repacking actions. Care must be taken to perform this task with care, as environmental sensors are sensitive equipment that can easily be damaged and thrown out of calibration. Also, the humidity sensor is particularly susceptible to degradation when exposed to smoky or dusty conditions. When sensors are damaged or degraded by use before the annual service date, it is the responsibility of the Fire RAWS owner to ensure proper maintenance and recalibration is performed before the equipment is redeployed. Verification of sensor performance with alternate methods (i.e., belt weather kit) is highly recommended. Significant discrepancies should encourage maintenance action.**

ANNUAL MAINTENANCE AND SENSOR REPLACEMENT STANDARDS

Sensors and key components of a Fire RAWS must be recalibrated or replaced on a regular basis to ensure the collection of consistent and reliable weather data. The entries for specific equipment below outline yearly preventative maintenance, as well as minimum replacement times for each component.

Wind Speed - Check for damage and alignment of cups, ice skirt, and free movement of bearings.

MINIMUM CALIBRATION/REPLACEMENT - 2 Years

Wind Direction - Check for damage of pointer and feather, free movement of bearings. Manually rotate the sensor through each of the four quadrants and scan the data for accuracy.

MINIMUM CALIBRATION/REPLACEMENT - 2 Years

Ultrasonic Wind Speed/Wind Direction – No calibration required, clear any obstruction between arms of transducers.

Relative Humidity/Air Temperature - Not field serviceable; do not open.

MINIMUM CALIBRATION/REPLACEMENT – Yearly

Battery - Perform a voltage test. Replace batteries according to manufacturer recommendations or if you suspect problems. Some manufacturers recommend yearly, others recommend every three years.

MINIMUM REPLACEMENT – As needed
for internal "D" cell (Supplemental Power) - Yearly

GOES Antenna - Check for broken, loose, or bent elements, proper alignment, and connectors for corrosion.

MINIMUM CALIBRATION/REPLACEMENT - As needed

Cables/Wiring - Check for cracking, deterioration, corrosion, proper routing, and security. Ensure O-rings are installed on all connectors. Replace as required for corrosion, aging, etc. Treat all connectors with moisture inhibitor (if required by the manufacturer).

MINIMUM CALIBRATION/REPLACEMENT - As needed

Masts/structural members - Check for structural damage, proper alignment, and leveling. Be aware of safety risks when dealing with a potentially damaged structure (i.e., rust, corrosion, cable fray, etc.).

MINIMUM CALIBRATION/REPLACEMENT - As needed
(or per manufacturer's specifications)

DCPs and DataLoggers - Check for security, damage, and ensure that all cables are properly connected. Verify the unit has the most recent version of the software or firmware installed. Change out as needed (defective, evidence of moisture, corrosion, rust, etc.).

MINIMUM CALIBRATION/REPLACEMENT – As needed
(or per manufacturer's specifications)

Tipping Bucket (optional) – Remove cover. Clean cover and orifice to ensure free flow of water. Do not disassemble further. Check all connections and verify that the instrument is level. Unless the rain year is reset automatically by the DataLogger/DCP on a certain date each year, reset the tipping bucket to 00.00. Then simulate .02 inches of rain and validate that it was recorded by the DataLogger/DCP. Other rain gauge equipment should be maintained to manufacturer's specification.

MINIMUM FIELD VALIDATION - 1 Year
MINIMUM DEPOT CALIBRATION/REPLACEMENT - 3 Years

Solar Radiation (optional) - Sensor must be cleaned periodically using only *water* and/or a mild detergent such as dishwashing soap.

MINIMUM CALIBRATION/REPLACEMENT - 3 Years

Fuel Temp (optional) – Fuel stick sensor should be checked for obvious cracking, deterioration and security. Not field serviceable; do not open.

MINIMUM CALIBRATION/REPLACEMENT – As needed
(or per manufacturer's specifications)

Fuel Moisture (optional) – Fuel stick sensor should be checked for obvious cracking, deterioration and security. Not field serviceable; do not open.

MINIMUM CALIBRATION/REPLACEMENT – As needed
(or per manufacturer's specifications)

Barometric Pressure (optional) – Not field serviceable; do not open.

MINIMUM CALIBRATION/REPLACEMENT – As needed
(or per manufacturer's specifications)

Depot Sensor Calibration Standards
The maintenance service under contract will rehabilitate and calibrate sensors to the specifications contained in this document.

Sensor Documentation - A maintenance history record shall be kept for each component that is repaired/calibrated by any maintenance service under contract. These records are kept on file by serial number and used by depot and agency staff for spotting systematic problem areas that may have impact on the program.

Test Equipment – The test equipment and associated tools used during depot sensor

calibration routines shall follow a general practice of “Traceability protocol” based on standards maintained by the National Bureau of Standards (NBS). This results in claims of calibrations that are “traceable to NBS”.

Documentation

The Fire RAWS owner or maintenance service provider must ensure annual maintenance and emergency repair is documented in WFMI Weather. This will include, at a minimum:

- Maintenance date (date that Relative Humidity / Air Temperature was changed / calibrated).
- Specific sensors and serial numbers of those sensors (documented in WFMI Weather or other appropriate database).
- A narrative of the annual service, including what maintenance was accomplished and any miscellaneous information.

NFDRS MANUAL WEATHER STATION STANDARDS AND GUIDELINES

INTRODUCTION

The traditional, manual-type fire weather stations have been a valuable source of data since their inception in the 1920's (Finklin and Fisher 1990). The observations were dependent on the presence of an observer who read the instruments, enter the data on appropriate forms, and communicate the data to a central office. Since the observations were observer dependent, the stations were typically located at an administrative or field office in a valley bottom or at a lookout or guard station at higher elevations.

STATION CLASSIFICATIONS

This section includes station standards for manual weather stations
Note: **The minimum manual standard is the Seasonal Data Collection Station**.

Manual Weather Stations - Includes manual stations providing basic NFDRS inputs to WIMS during operational period. One observation is delivered to WIMS at 1300 hours for every 24-hour period during operating season. There are two types of manual NFDRS weather stations:

Manual - Year Round Data Collection Stations - Includes all permanent stations that meet the following criteria:

- operates to minimum standards year round to support designated wildland fire season
- equipped with the minimum equipment (see page 50)
- meets minimum quality assurance requirements (see page 4)
- NFDRS calculations are processed regularly in WIMS delivering historical data to the FAMWEB data warehouse.
- (Optional) winterized rain gauge (weighing gauge, heated gauge, etc.) if necessary.

Manual - Seasonal Data Collection Stations - Includes all permanent 24 hour observing stations that meet the following criteria:

- operates to minimum standards to support designated wildland fire season (can operate 12 months or less)
- equipped with the minimum equipment (see page 50)
- meets minimum quality assurance requirements (see page 4)
- NFDRS calculations are processed regularly (during seasonal operational period) in WIMS delivering historical data to the FAMWEB data warehouse.

OPERATIONAL PERIOD

The optimal operating period for all manual weather stations used for the NFDRS is year-round. However, the minimum operational period is dictated by the following:

1. A minimum 30-day start up period prior to the need for NFDRS indices (i.e. the wildland fire season as designated by the local manager, Region, or Geographic Area Coordination Center) is required for each seasonal weather station to properly calibrate the model

2. Annual fluctuations in season length. Use of the visual greenness (available on the WFAS home page) or Growing Season Index images (available at http://phenmon.org) is recommended to assist the local or regional fire manager.

Non-owner use. The following guidelines are recommended for any use of a weather station for NFDRS that is not owned by the user.

1. Notify the station owner that you are using this station for NFDRS or other applications.

2. When a longer operating season is required by an adjoining unit, the non-owning user should assist in the management of that station, including any additional costs for operation or maintenance.

SENSOR AND DATA REQUIREMENTS

NFDRS Manual Fire Weather Station Minimum Instrument Complement

To provide the data necessary for computing fire danger rating (NFDRS) components and indexes, a fire-weather station should contain the following basic equipment:

1. Dry bulb and wet bulb thermometers (psychrometer)
2. Maximum and minimum thermometers
3. Instrument shelter for housing the thermometers
4. Anemometer and wind speed readout device.
5. Wind vane
6. Fuel moisture sticks and scale.
7. Nonrecording rain gauge.
8. Hydrothermograph

More specific information related to instrumentation for a manual fire weather station can be found in the *Weather Station Handbook – An Interagency Guide for Wildland Managers*, PMS 426-2, NFES 2140 (March 1990).

Rain Gauge

Precipitation is the amount of water falling upon the earth as rain or in frozen form such as snow, sleet, and hail. It is expressed as the depth of water that would cover a flat

surface.

Sensor Standards	Rim level 36” above the ground
Sampling Height	Varies
Measurement Units	Inches
Range	Varies
Resolution	0.01 inches
Accuracy	0.01 inches
Data Standards	
Type Measurement	1 measurement per day
Data Logged	1 measurement per day
Data Format	XX.XX

Wind Speed

Wind speed is the rate at which air passes a given point.

Sensor Standards	
Sampling Height	20 feet above open level ground or surrounding vegetation
Measurement Units	Statute Miles per Hour
Range	0-100 mph
Accuracy	1 mph
Data Standards	
Type of measurement	10-minute average at the time of observation
Data Logged	1 observation per day
Data Format	XXX

Wind Direction

Wind direction refers to the direction from which the air is moving.

Sensor Standards	
Sampling Height	20 feet above open level ground or surrounding vegetation
Measurement Units	Degrees from true north
Range	0-360 degrees
Accuracy	+/- 10 degrees
Data Standards - 10 Min Average	
Type of Measurement	10-minute average at the time of observation
Data Logged	1 daily measurement
Data Format	XXX

Air Temperature

Air temperature refers to the air surrounding the weather station instrumentation.

Instruments are located inside an instrument shelter. Floor of the shelter is 48" above level ground.

Sensor Standards	
Sampling Height	4.5 to5 feet, inside shelter
Measurement Units	Degrees Fahrenheit
Range	-58 degrees to +140 degrees Fahrenheit
Accuracy	+/- 0.3 degrees Fahrenheit
Data Standards	
Type of Measurement	Instantaneous reading for 1300 observation, max/min temperature
Data Logged	1 daily measurement
Data Format	XXX

Relative Humidity

Relative humidity is the percentage ratio of the actual amount of water vapor in the air to the amount of water vapor required for saturation at existing temperature. Instruments are located inside an instrument shelter. Floor of the shelter is 48" above level ground.

Sensor Standards	
Sampling Height	4 to 4.5 feet, inside shelter
Measurement Units	Percent
Range	0-100 %
Accuracy – from wet bulb/dry bulb	3 percent
Data Standards	
Type of Measurement	Instantaneous from 1300 observation and max/min from hydrothermograph
Data Logged	1 daily measurement
Data Format	XXX

Fuel Moisture

Fuel moisture indicator sticks are used to estimate the moisture content of the small diameter (1/4 to 1 inch or 10-hour time lag) dead woody fuels. Unlike conventional weather instruments, the fuel moisture sticks do not measure any single weather element; rather, they measure the effects of sky condition, temperature, humidity, precipitation, and season on the flammability of forest fuels as characterized by the percent fuel moisture of the stick.

Sensor Standards	
Sampling Height	10 inches above a fresh litter bed, exposed 7 am – 7 pm local time
Measurement Units	Grams – conversion to percent fuel weight moisture
Range	0% - 25%
Accuracy	+/- 0.5%

Data Standards

Type of Measurement	Instantaneous from 1300 observation
Data Logged	1 daily measurement
Data Format	XX.X

SITE SELECTION

Process for Installing a New and/or Moving an Existing Station

1. When installing a new or moving an existing station, it is particularly important to involve NWS fire weather and Predictive Services meteorologists along with other interagency wildland fire personnel (as appropriate) in determining a new site or relocating an existing station.

2. Contact your agency and/or regional RAWS coordinator. To get help from your national coordinator, go to the interagency web page at **http://raws.fam.nwcg.gov/contacts.html**. It is particularly important to contact your agency weather station coordinator when moving an existing station in order to maintain integrity of historical data. If an existing station has been moved, relocation information must be updated in WIMS application to clearly include the fact that the station is reporting from a new location.

3. Obtain the following station site information: station name, legal (Township, Range, quarter-section), county, elevation, latitude/longitude, and data measurement elements. Complete station information is to be entered in the WFMI Weather database. For latitude and longitude, NAD 83 is the datum standard and the data are to be entered in degrees/minutes/seconds and decimal seconds out to the nearest hundredth (two decimal places). Ensure that station data entered into WFMI Weather and WIMS are identical.

4. Obtain a 6-digit weather station identification number (also referred to as NWS/WIMS station ID number) for your station through your GACC Predictive Services unit.

Site Selection Guidelines

The standard fire weather station should be located in a large, open area away from obstructions and sources of dust and surface moisture. The station should be on level ground where there is a low vegetative cover. Furthermore, it should be situated to receive full sun for the greatest possible number of hours per day during the fire season. The site should be "shadow free" from 0700 to 1700 LST. If located on a slope, a south or west exposure is required to meet fire danger rating standards (Deeming, Lancaster, Fosberg, and others 1972).

Consider security (from animals and human vandalism) when selecting a site. To prevent any damage from wildlife, livestock etc., installation of a fence is highly recommended.

The following rules govern the location of an NFDRS fire weather station:

1. Locate the station in a place that is representative of the conditions existing in the general area of concern. Consider vegetative cover type, topographic features, elevation, climate, local weather patterns, etc. Usually a station's data are applied to many 10s of square miles, if not hundreds of square miles.

2. Select a site that will provide for long-term operation and a relatively unchanged exposure. Consider site development plans, e.g., roads, buildings, parking areas; ultimate sheltering by growth of vegetation; and site accessibility during the intended operational period.

3. Arrange the station so as to give data that is representative of the area in which the station is situated. Consider exposure requirements for each instrument in relation to such things as prevailing winds, movement of the sun, topography, vegetative cover, nearby reflective surfaces, and wind obstructions.

In accordance with the above rules, the following situations should be avoided when selecting a station site:

1. **Sources of dust** such as roads and parking areas. If unavoidable, locate station at least 100 feet on the windward side of the source.

2. **Sources of surface moisture** such as irrigated lawns, pastures, gardens, lakes, swamps, and rivers. If unavoidable, locate station several hundred feet to the windward side of the source.

3. **Large reflective surfaces** such as white painted buildings. The same holds for natural reflective surfaces such as lakes, ponds, canals, and large rock surfaces. If unavoidable, locate station on north side, but far enough away so as not to be artificially shaded or influenced (at least a distance equal to the height of the reflective surface or 50 feet, whichever is greater).

4. **Extensively paved or black-topped areas.** If unavoidable, locate station at least 50 feet to the windward side.

5. **Large buildings, trees, and dense vegetation.** Locate station at least a distance equal to the height of the scattered obstructions. Ideally, when dealing with tall, dense vegetation the station should be located a distance that is equal to 7 times the height of the obstructing vegetation.

6. **Distinct changes in topography** such as gullies, peaks, ridges, steep slopes, and narrow valleys.

For additional information: *Weather Station Handbook-An Interagency Guide for Wildland Managers*, PMS 426-2, NFES 2140 (March 1990).

Note: Agencies that are considering buying a new weather station for use in NFDRS, should consult the local National Weather Service, Predictive Services and other interagency partners. A consensus among these groups will ensure the interagency NFDRS station network is adequate and limit the cost of needless station overlap.

INSTALLATION

Once a site is selected that meets all of the site standards, it can then be prepared for installation of a weather station. The suggest layout for a standard fire weather station is available in the *Weather Station Handbook-An Interagency Guide for Wildland Managers*, PMS 426-2, NFES 2140 (March 1990).

STATION MAINTENANCE POLICY

Annual Maintenance

Annual service of NFDRS manual stations will provide an opportunity to ensure general station integrity, perform necessary preventative maintenance.

Every NFDRS manual station must receive, at a minimum, one annual on-site maintenance visit by either the local user or contracted personnel to ensure sensors are within calibration standards, and verify site and station conditions.

The site inspection also allows for maintaining vegetation growth or mitigating other site parameters (e.g. new irrigation systems, buildings) that may be compromising site integrity**. It is important to keep vegetation trimmed at the surface to ensure it doesn't block wind and air flow to sensors.** Reasonable attempts must be made to keep the site in accordance with siting guidelines. If there are regulations prohibiting appropriate site maintenance required to provide representative data, develop a plan to bring the station into compliance. This could be done by obtaining any necessary special authorizations to manage vegetation, or in the most unfavorable case, moving the station. If sites are considerably compromised, it is critical to document this in the station metadata, including photographs, so that users of the data have the opportunity to assess its value to them.

Unscheduled Maintenance / Emergency Repair

Local land managers are responsible for monitoring the quality of the data produced by the weather stations in their fire response area. In the event of instrument failures, bad data, or questionable data, it is the responsibility of the station owner to initiate corrective action.

All NFDRS station failures will be responded to as appropriate in light of the following:

a. Bad data affects the outputs of the model immediately. Responses to bad data, during fire season where the station is located, should be initiated immediately. Failures that occur outside fire season will be repaired before the station is initiated for the following fire season.

b. During fire season, action must be taken to respond to missing data as soon as possible, but no more than 3 days. Outside fire season responses will be made before the station is initiated for the following fire season.

ANNUAL MAINTENANCE AND SENSOR REPLACEMENT STANDARDS

Sensors of an NFDRS manual fire weather station must be recalibrated or replaced on a regular basis to ensure the collection of consistent and reliable weather data throughout the NFDRS fire weather network. Annual service of NFDRS manual fire weather stations will provide an opportunity to ensure general station integrity, perform necessary preventative maintenance, and replace sensors and components prior to expiration of their calibrated lifetimes.

Maintenance Checklist

This checklist servers as a guide for the inspector and is helpful in training new observers. Its use is strongly recommended.

A. Enclosure

1. Fence and gate in good repair
2. Area well maintained
3. Vegetation neatly clipped
4. In keeping with the surroundings

B. Instrument Shelter

1. Well ventilated
2. Door faces north
3. Level and solidly mounted
4. Clean inside and out
5. Kept well painted

C. Rain Gauge

1. Firmly mounted, with top level and round
2. Free of dents, leaks, and debris
3. Measuring stick legible and in good repair
4. 45 degree angle from top of gauge clears all obstructions
5. Top approximately 3 feet above ground
6. Mount kept painted

D. Psychrometers

1. Wick changed every two weeks
2. Wick extends an up stem
3. Wicking clean, and not crusted
4. Thermometer bulbs clean
5. Thermometer marking clearly legible
6. Thermometers agree within ½ degree when read as dry-bulb thermometers
7. Clean mineral-free water used
8. Wet bulb brought to its lowest point
9. Extra wicks on hand

E. Anemometers

1. Cups at proper elevation
2. Cups firmly attached to spindle
3. Cups undamaged
4. Spindle turns freely
5. Firmly mounted and plumb
6. Maintenance schedule followed
7. Protected from lightning
8. Electrical contacts in good order
9. Power supply adequate
10. Recording device satisfactory

F. Fuel Moisture Sticks and Scale

1. Stick fully exposed to the sun throughout the day
2. Stick in good condition. (Replace when cracked or after 60 days)
3. Litter bed in good condition
4. Scale checked with 100 gram weight and adjusted to zero if necessary

G. Operation and Records

1. Precipitation measured and correctly recorded
2. Wind measured and recorded correctly
3. Wet bulb and dry bulb temperatures measured and recorded correctly
4. Maximum and minimum temperature values measured and recorded correctly
5. Station catalog information correct
6. Reading taken at scheduled time
7. Records neat and legible
8. Tables used correctly

When a fire weather station is inspected, a written record should be made for administrative review and subsequent action where needed. An inspection form is a convenient way of summarizing the good or poor characteristics of a site and of indicating where remedial measures are needed.

Maintenance procedures for the instrumentation installed at a manual weather stations are found in the *Weather Station Handbook-An Interagency Guide for Wildland Managers*, PMS 426-2, NFES 2140 (March 1990).

Field Service

Nonrecording rain gauge – Check for leaks or dents. Clean.

MINIMUM CALIBRATION/REPLACEMENT - Yearly

Hydrothermograph – Perform a calibration test.

MINIMUM VALIDATION - Periodically
MINIMUM CALIBRATION/REPLACEMENT - Yearly

Wind Speed - Check for damage and alignment of cups. Clean.

MINIMUM CALIBRATION/REPLACEMENT - Yearly

Wind Direction - Check for damage of pointer and feather, free movement of bearings. Manually rotate the sensor through each of the four quadrants and scan the data for accuracy. Clean.

MINIMUM CALIBRATION/REPLACEMENT - Yearly

Relative Humidity/Air Temperature – Check for defects. Clean.

MINIMUM CALIBRATION/REPLACEMENT – Periodically

Sensor Documentation - A maintenance history record shall be kept for each component that is repaired/calibrated. These records should be kept on file at the local unit. The documentation is useful in working to develop better quality products.

OBSERVER REQUIREMENTS

The observers at manual fire weather stations are typically agency personnel with specialties outside the field of fire weather. Training should be provided to foster proper skill and awareness in observing practices; familiarity with instruments and simple maintenance measures.

Observer responsibilities include the following tasks:

1. Making the required observations at the required times with required accuracy.
2. Encoding the logging or dispatching the data at necessary; actual transmission of data may be the task of another person.
3. Changing the charts of recording instruments on the scheduled days.
4. Performing calibration checks of recording instruments and making simple adjustments as necessary.
5. Maintaining the instrument is in good order. This includes daily or periodic external dusting and cleaning of instruments to maintain easy readability of marked graduations, maintain free movement of linkages on recording instruments, and deter corrosion.
6. Noting instrumental defects, such as column separation in thermometers; applying simple corrective measures or reporting to supervisor for further action.

Further details on observer responsibilities are outlined in the *Weather Station Handbook-An Interagency Guide for Wildland Managers*, PMS 426-2, NFES 2140 (March 1990).

GLOSSARY

DCP - Data Collection Platform, also known as a DataLogger. The central processing unit for an automated weather stations through which all sensor data is gathered and forwarded to the GOES radio transmitter.

FAMWEB Data Warehouse - The FAMWEB Data Warehouse pulls data from existing applications/databases that manage data on FIRESTAT fire occurrence daily-and other federal/state agencies annually, incidents, and weather. Data in the warehouse is organized into categories of data called topic areas.

FENC - Fire Environment Committee chartered under the NWCG

FEOU - Fire Environment Observation Unit – previously the RAWS Partners - chartered by the Fire Weather Subcommittee under the Fire Environment Committee

Fire RAWS - A portable RAWS that conforms to standards of data collection and maintenance specified in the Fire Weather Station Standards document.

FWSC - Fire Weather Subcommittee – a subcommittee under the Fire Environment Committee

GOES - Geostationary Operational Environmental Satellite - The satellite used for data relay from NFDRS weather stations to WFMI Weather.

GREEN-UP - Green-up for the 1978 version of the NFDRS model is defined as the beginning of a new cycle of plant growth. Green-up usually occurs once a year, except in desert areas where rainy periods can produce a flush of new growth more than once a year.

IMET - Incident Meteorologist

NESDIS - National Environmental Satellite Data Information Service

NFDRS - National Fire Danger Rating System

NFDRS Update - Update to the NFDRS system that includes the implementation of the Nelson Model in conjunction with solar radiation sensors to automate fuel moisture calculations

NWCG - National Wildfire Coordinating Group

NWS - National Weather Service

RAWS - Remote Automatic Weather Station

RSFWSU - Remote Sensing/Fire Weather Support Unit – Operated by the BLM as an interagency weather station repair and maintenance facility located in Boise, Idaho.

WFAS - Wildland Fire Assessment System

WIMS - Weather Information Management System – The national operational NFDRS calculator

WFMI Weather - The WFMI Weather module provides access to the weather data that is transmitted from the more than 2500 Remote Automatic Weather Stations (RAWS) located throughout the U.S.

WRCC - Western Regional Climate Center - One of 6 regional climate centers of the National Climatic Data Center (NCDC). The official archive location for hourly RAWS data.

WWV - Call sign for worldwide universal time radio transmission.

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Preface

The *Guide to Wildland Fire Origin and Cause Determination* is designed for use in the field as a guide for wildland fire investigators.

Accurate wildland fire origin and cause determination is an essential first step in a successful fire investigation. Proper investigative procedures which occur during initial attack can more accurately pinpoint fire causes and preserve valuable evidence that might be destroyed by suppression activities. If a fire is human-caused, the protective measures described in the guide can preserve evidence that may lead to effective and fair administrative, civil, or criminal actions.

The investigation should start at the time a fire is reported or discovered. First responders play an important role in protecting evidence, so it is important for the wildland fire investigator to help train first responders to identify and protect the *General Origin Area* of the fire. Wildland fire investigators should impress upon firefighters, law enforcement officers and other first responders that the preliminary protection of the General origin area and any associated evidence on any wildfire is their responsibility, and emphasize to them that they are the most important link in the subsequent origin and cause determination. Not only is it important for the first responders to recognize the need for an accurate origin and cause determination, it is important that they understand how their actions, both during and following suppression, can enable a qualified wildland fire investigator to accurately determine the origin and cause.

Laws are not cited or referenced in the field guide. The format is designed so that agencies, organizations, or individuals may add applicable rules, regulation or statutes if they so desire. Specific federal, state, and local laws and regulations give direction with respect to wildland fire investigations and the legislative authority to investigate wildland fires.

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Introduction

The Guide to Wildland Fire Cause and Determination provides recommended procedures, practices and techniques (methods) for use within a problem solving framework to conduct a systematic wildland fire investigation resulting in a determination of the ignition area, cause, and ignition sequence, including collection of factual data pertinent to the investigation, an analysis of data, formulation of a hypothesis(es), testing of the hypotheses, and selection of a final hypothesis.

The guidelines were developed to assist wildland fire investigators in using peer reviewed and accepted methods, generating evidence and informed conclusions to be used for legal proceedings, to serve as the basis for administrative decisions and policy development. There are many similarities between structural fire investigations and wildland fire investigations, there are also differences requiring specialized training and experience. This guide is not intended to be all-inclusive.

Purpose

The purpose of a wildland fire investigation is to determine the origin, cause, ignition sequence, and responsible party.

There are four basic directions the results of the investigation can take:

- Administrative actions to reduce future fires, risk to the public and/or property loss.
- Court proceedings under civil law to recover costs for suppression, and/or property loss.
- Court proceedings for criminal violations of Federal, State, Tribal or local laws or regulations.
- To assist in policy development, implementation of fire prevention programs, and pre-suppression planning.

General

Every wildland fire investigation is unique. Portions of the guide may not apply to every wildland fire investigation. The recommendations presented in this guide should be followed to the largest extent possible but are not meant to restrict the application of other specific practices to unique fire scene conditions. Further, it is recognized that policy, time, assignment and resources may dictate the scope and extent to which these guidelines may be applied to a specific investigation. The guidelines and recommendations were developed to follow a science-based, systematic methodology which has been peer-reviewed and is generally accepted by the wildland fire investigation profession. The methodology recommends coordinated use of the scientific method for problem solving and methods specific to the wildland fire investigation discipline.

Procedures, practices, or techniques applied during a wildland fire investigation which differ from those recommended within this document are not necessarily wrong, but the wildland fire investigator who uses procedures, practices, or techniques not commonly taught or accepted by the wildland fire investigation community should be ready to explain why such procedures, practices or techniques were applied. It is recommended that a systematic approach be applied to all wildland fire investigations.

The NWCG training course, *Wildland Fire Origin and Cause Determination*, FI-210, is the primary vehicle by which the principles, procedures, practices, and techniques provided in this guide are transmitted to wildland fire investigators; the course is based on the guidelines established in this document.

2016 Edition Changes

The 2016 edition of this guide includes a number of new recommendations, procedures, practices and techniques not included in the 2005 version.

- The Introduction section of the guide includes changes in language to reinforce that this guide is a consensus document and serves as a *Guideline* with recommendations and does not preclude application, as appropriate, of other procedures, practices or techniques to fit each unique fire scene. It is ultimately up to the wildland fire investigator to select the appropriate methods to apply to the investigation and to explain why those methods were adequate.
- Chapters 1A and 1B
  - Changes include a reduction from 14 to 11 fire pattern indicators. The fire pattern indicators that were dropped are; 1) die out, 2) depth of char, and 3) degree of damage.
  - A change in the use of the term *burn indicator* to *fire pattern indicator*.
  - A change in the use of the term *degree of damage* from indicator category to a term used to describe general fire intensity patterns consistent with advancing, lateral, or backing fire areas and transition zones.
- Chapter 2
  - Methodology reflects an expanded section on conducting a systematic wildland fire investigation, including the scientific method for problem solving and recommended wildland fire specific methods for application within the framework of the scientific method.
    - A new term, *Ignition Area*, has been added, defined as: The smallest location which a fire investigator can define, within the Specific Origin Area, in which a heat source and fuel interacted with each other and a fire began. It is recommended that the historical use of the term Point of Origin or P.O. to represent an area be discontinued and the term Point of Origin or P.O. be used only as defined as the exact point where a heat source came into contact with the fuels first ignited. The addition of Ignition Area reflects the reality of fire dynamics which makes it uncommon that an exact point where a heat source and first fuel ignited came together be identified to a reasonable degree of certainty. The term Ignition Area representing the smallest area which should be defined using fire pattern indicators in order to determine the cause of a wildland fire.

        - An emphasis on the use of white flags as designating only the location of evidence, and not the Point of Origin. This includes the recommended addition of a lime green colored pin flag for use as designating items or points of interest other than evidence. This may include the use of lime green flags to mark the corners or perimeter of the Ignition Area.
    - The addition of two recommended search patterns, the *parallel lane* technique and the *grid* technique along with the retention of the *lateral lane* technique.
- Chapter 5
    - Reflects the addition of a new Documentation Unit. The use of GPS to document fire spread and reference points is discussed in Chapter 5, recognizing this tool for use in wildland fire investigation, its various applications and its varying degrees of accuracy and limitations.
- Chapter 7
    - Arson Investigation, no longer includes mention of an arson profile due to the lack of pertinent supporting data, the use of the study being cited, and its lack of specific application to wildland arson incidents.

- An emphasis on the consistent use of the recommended terminology.

Safety

Fire scenes may be dangerous. Wildland fire investigators have a duty to exercise due caution during their investigations. The wildland fire investigator should abide by safety-related policies and procedures established by their agency, federal, state, provincial and local governments, or industry.

Investigating the Scene

Fire scene examinations *should not be undertaken alone*. At least a minimum of two individuals should be present for safety. If it is impossible to be accompanied by a second wildland fire investigator, a firefighter or other suitable person should accompany the lead wildland fire investigator. It is critical that the wildland fire investigator have communications with the suppression forces on the incident. Use of cellular phones is NOT recommended as an adequate substitute for radio communications as cellular phones frequently will not work in remote or rural areas, and may be difficult to use in emergency or high stress situations.

Hazards

Safety is the highest priority on wildland fires. Investigating wildland fires involves specific hazards that must be considered while on the fire scene. The wildland fire investigator must be aware of areas where the fire may still be burning or where fire has been extinguished but could become active. An escape route must always be present and continually evaluated as fire conditions change. A rekindle and availability of fuels, along with a change in the wind direction may create hazards as extreme as a crown fire, which may block the previously planned escape route.

Underground burning in a smoldering stage can erupt into flaming combustion if the fire burns to the surface or if the top layer of soil is disturbed exposing the heated fuel to air. Also, a danger exists if the wildland fire investigator steps into an area burned out from below such as in peat or a stump hole.

Wildland fire suppression operations may also present safety hazards to the wildland fire investigators. Operation of aircraft dropping water or retardant, heavy equipment, tree felling, and suppression tactics such as burning out or backfiring unburned fuel in and around the origin area are all potential hazards. Investigative personnel must contact the appropriate incident personnel and coordinate their planned investigative activities with them.

Other associated hazards are falling debris from charred, fire-weakened trees and limbs. Additional hazards may be present in sloped terrain. Logs

or rocks can be loosened from their location as a result of the fire, from suppression operations, or from the actions of a wildland fire investigator. When the root structure is destroyed by fire, soil may begin to lose its stability, which in turn can cause slides that may injure the wildland fire investigator or destroy evidence.

Stinging or biting insects such as bees or scorpions can cause painful injury and in some instances life threatening emergencies. Poisonous snakes can survive the passage of a wildfire and should be watched for.

Wildland fire investigators should always be alert to the possibility that hazardous materials (HAZMAT) is sometimes found in or near the origin of wildland fires. If HAZMAT is located or suspected, the wildland fire investigators should immediately take appropriate action to protect themselves and others, and notify the Incident Commander.

Power lines, railroads, and roadside fires present obvious hazards. Wildland fire investigators should take appropriate precautions.

The weather can also cause or contribute to hazards. Rain can create slippery footing. Lightning may be a concern as well. During lightning conditions, follow established safety procedures. Hot and dry temperatures and reduced shade due to the fire passage can present conditions which may subject the wildland fire investigator to heat stress.

Personal Protective Equipment

The use of personal protective equipment (PPE) such as protective clothing, safety equipment and law enforcement defensive equipment will vary depending on the circumstances. The wildland fire investigator should comply with agency or industry requirements for personal protective equipment applicable to wildland firefighting.

Investigation Team

The Investigation Team, as a minimum, should consist of a qualified and trained wildland fire investigator. Some wildland fire investigations may be better conducted when additional wildland fire investigators are assigned. Additional wildland fire investigators may be responsible for interviewing, the care and handling of evidence, or a combination of competencies.

Initial investigations may be handled by local law enforcement or fire management officials. As needed, additional expertise may be requested and staffed according to availability.

Another wildland fire investigator may be consulted for a second opinion. This can add weight to the conclusions in subsequent proceedings if the second opinion corroborates that of the original wildland fire investigator. Courts usually place greater weight on corroborated evidence.

Management of Major Investigations

Major fire investigation management includes control of the scene in which many interests may participate. The wildland fire investigator should follow agency policy or practices when dealing with these interests. These interests may include multiple public agencies and private parties and sometimes an investigation team for each interested party. A protocol should be developed to meet agency objectives.

While major incidents are not always large in size or magnitude, they do tend to be more complex. As a result, the primary goals in such circumstances are to preserve the scene, determine the origin, determine the cause, determine potential responsible parties, protect evidence and to preserve the interests of all parties as far as possible.

Thorough investigations do not just happen, but instead are the result of careful planning, organization, and the ability to anticipate problems before they arise. Prior to actually beginning the scene investigation, numerous events, facts and circumstances should be identified and considered before decisions are made as to how the investigation will proceed.

Confidentiality

During an investigation, all evidence and information obtained is confidential in nature. Premature release of information prior to any adjudicative action may jeopardize the outcome.

- Wildland fire investigators need to assure that first responders are aware of the responsibility to maintain confidentiality of any information that they may have received relating to the investigation.

- Wildland fire investigators should only disclose information to authorized personnel.
- Investigative reports are often developed in anticipation of legal proceedings. Under no circumstances should copies be released without prior agency and/or prosecutorial approval.
- The Privacy Act, the Freedom of Information Act and similar privacy legislation apply to all investigative work products.

Chapter 1A - Fire Behavior

Principles of Fire Spread

Determining the origin, the cause, how the ignition source came into contact with the materials first ignited (ignition sequence), and identifying the responsible party, if any, are the fundamental purposes of a wildland fire investigation. This is generally done by employing a systematic method of investigation. Fires burn according to scientific principles and the evidence of a fire's progress takes the form of fire pattern indicators.

A fire pattern indicator is a physical object that displays changes (fire effects) from exposure to heat, flame, and combustion byproducts. An accurate analysis of individual fire direction indicators can reveal fire progression at that precise location and forms a portion of the overall fire pattern. Analyzing the relationship of the majority of individual fire pattern indicators reveals the overall fire pattern. This in turn will reveal overall fire progression.

For a wildfire to occur an ignition source must contact the host fuel, materials first ignited, and have sufficient heat over a sufficient duration of time to raise it to its ignition temperature. The smallest area that the wildland fire investigator can define, within the Specific Origin Area, using the available fire pattern indicators, is referred to as the *Ignition Area*. The ignition area may include indications of smoldering combustion or flaming combustion and evidence of each should be noted as it pertains to the ignition sequence. Any physical remains of the ignition source will most likely be located within this area, if it has not been removed, completely consumed, or destroyed by suppression efforts.

Fire Behavior Factors

Understanding the basic principles of fire behavior is critical for the wildland fire investigator. The ability to re-create the fire progression, based on knowledge of these principles will greatly assist the wildland fire investigator in identifying and correctly interpreting fire pattern indicators and overall burn patterns. It is strongly recommended that a wildland fire investigator take additional training in the area of wildland fire behavior to enhance their understanding of these principles.

A wildland fire is influenced by three main elements. These are *weather, topography and fuels*. Each of these elements has multiple sub-elements. It is the combination of these elements that form the fire behavior context. Understanding how these elements interact and affect the formation of fire pattern indicators is crucial to properly interpreting a wildfire's burn pattern.

Weather: *Wind, temperature and relative humidity* are the three components that comprise weather.

Wind normally has the greatest effect of all the elements on fire spread and intensity. Wind speed and direction are important to the wildland fire investigator when determining both the origin of a fire and the potential ignition sources. Wind speed and direction can vary dramatically at ridge levels and above the canopy of the vegetation as compared to wind speeds and directions below the canopy, and particularly at the mid flame level and ground fuel level where most fires originate and initially burn.

Wind data from most automated weather stations is normally taken at the 20 foot level and in areas often cleared of vegetation, thus having no canopy to affect the speed and direction of the wind. Winds below the 20-foot level, below the canopy, can be reduced through friction loss, by as much or more than 90 percent by the canopy and other obstructions at mid-flame levels. Wind direction at mid flame level can be dramatically different than those indicated by the smoke column after the fire is established and on-site data should be taken as soon as possible after the ignition and compared to wind information taken at the 20-foot level. Further, air movement at the ground level is important when evaluating the potential for a smoldering ignition and transition to flaming combustion.

Fire moving with the wind generally burns faster than a fire backing into the wind. You will be able to observe the difference in the fire patterns and the amount of fuel consumed. After the fire reaches a certain size, it will begin to create its own wind and burn even faster than before. This may result in the creation of in-draft air flow into the main fire which may change the direction of the wind at the flanks and heel or may increase the pre-fire wind speeds in those areas. This in-draft influence may be present when the main fire plume (smoke column) establishes itself as dominant and is referred to as a plume-driven fire. Fires will generally spot in advance of the main fire in the direction the wind is blowing near the head and shoulders of the fire.

Weather patterns can change quickly. A switch in wind direction can substantially affect fire patterns. Winds are rarely steady out of one direction. Winds will typically swing in an arc around the general wind direction.

Relative humidity directly affects ignition probability and fire intensity. The relative humidity also controls fine dead fuel moisture, one-hour time-lag fuels less than ¼ inch in diameter. It is important to understand the lag time and relationship of fuel moisture content and the relative humidity. Fine fuels of less than ¼ inch in diameter respond fairly quickly to changes in the relative humidity while larger diameter fuels will take longer to gain and lose fuel moisture content, often lagging behind changes in the relative humidity. The wildland fire investigator should collect and consider the

changes in relative humidity prior to and after the ignition of a fire when determining the availability of certain fuels.

Temperature influences fire behavior by the drying and preheating effect it has on fuels. Areas exposed to, or shaded from the direct rays of the sun can produce different fuel temperatures and moisture content, thus both slope aspect and canopy cover should be noted during the investigation of a fire.

Like wind speeds, temperatures at ground level can be different from those readings taken from Remote Automated Weather Stations (RAWS) or by handheld instruments. This difference can be significantly higher, by as much as 40 ^{o}F (Fahrenheit).

Topography: Topography consists of *slope, aspect, and terrain*. Following wind, slope is the next greatest potential influence on the rate and direction of fire spread. Fires will burn faster uphill than downhill because of the preheating of the uphill fuels and the influence of daytime upslope and up-canyon winds. A fire backing downslope will normally move slower than a fire advancing upslope. Slope may also contribute to the propensity for hot debris to roll or slide downhill creating spot fires which may burn back uphill to the main fire.

Consideration of the aspect of the slope is also necessary. Generally, due to greater exposure to the sun and the subsequent solar heating, south-facing slopes exhibit higher intensity and more rapid rates of spread. The converse of this is true for fires in the southern hemisphere.

Terrain can also affect both intensity and rate of spread, particularly when there are either barriers or natural chimneys present. Barriers such as a log, bare dirt, or rocks, can cause a fire to slow down or even go out. Almost any barrier will at least lessen the intensity of the fire as it passes. Larger terrain features often cause wind eddies which can change the fire's direction, at least for short distances. Don't confuse the effect of a barrier's temporary change of a fire's direction with the actual direction the fire came from. Natural chimneys can increase wind velocity due to the channeling effect and accelerate fire spread and increase intensity substantially.

Fuels: Fuels are characterized by a variety of factors. These include vertical and horizontal arrangement, type, species, size and fuel moisture, and both live and dead. Fires will tend to ignite more easily and spread more rapidly in fine dead fuels with low moisture contents. Fuels that are most commonly associated with ignition area s are those that are characterized as having a high surface-to-volume ratio. These typically include dead grass, conifer needles, small twigs, duff, punky wood, and other similar fuel packages.

Wildland Fire Terminology

The following terms are recommended for use in wildland fire investigation. Each will be discussed in detail in the following pages.

- Fire Pattern Indicator.
- Fire Pattern.
- Fire Progression.
- Fire Pattern Indicator Vector.
- Advancing Fire.
- Backing Fire.
- Lateral Fire.
- Transition Zone.
- Macroscale Fire Pattern Indicator.
- Microscale Fire Pattern Indicator.
- Indicator Cluster.
- Damage Differential/Compare and Contrast.
- Systematic Methodology.

Fire Pattern Indicator: A physical object that displays changes (fire effects) from exposure to heat, flame, and combustion byproducts. Accurate analysis can reveal fire progression at that precise location. A fire pattern indicator is a single component of the overall fire pattern.

Fire effects are the observable or measurable changes in or on a material as the result of a fire. The term *fire effects* has a similar but broader meaning in the context of prescribed fire (the physical, biological, and ecological impacts of fire on the environment), but in fire investigation it refers to the specific changes that are caused to a combustible or non-combustible object when it is exposed to heat, flame and/or the byproducts of combustion.

Fire pattern indicators that are in disagreement with the majority of indicators in an area used to be called *false indicators*, but they are not false, they simply represent fire progression at that precise point, which may not be reflective of overall fire progression, and therefore could be misleading if not interpreted within the overall fire progression and fire behavior context.

Fire Pattern: The visible or measurable physical changes formed by a fire effect or group of fire effects. This can be over a small area or it can include the overall pattern of fire spread as determined by the entirety of fire pattern indicators over a larger area. Analyzing the relationship of the majority of individual fire pattern indicators reveals the overall fire pattern. This, in turn, will reveal overall fire progression.

Fire Progression: The spread of fire from one location to another. Most fires start small, with smoldering or glowing ignitions. A fire will transition to flaming combustion under the right conditions and burn in all directions

until influenced by: wind, slope, fuel, suppression activity, or combination of these factors. Once influenced, the fire will progress outward in a direction influenced by these factors, with the most dominant factor(s) establishing the primary advancing direction. Vector areas (advancing, lateral, and backing) will become established.

Fire Pattern Indicator Vectors: A group of individual fire pattern indicators located near each other, which as a group reflect the fire spread vector within that area or the physical characteristics of a single fire pattern indicator that shows the direction of fire progression at that point (vector being the same as direction).

Fire pattern indicator vectors identify transition zones which are often subtle in nature.

There are three vector areas based on the dynamics of fire spread; Head, *advancing*; Flanks, *lateral*; and Heel, *backing*.

Advancing Fire Vector: The advancing fire vector is characterized by:

- Rapid fire spread.
  - Head fire.
  - Forward run.
- Higher intensity.
- Increased flame length.
- Macroscale fire pattern indicators.
- More damage when compared with backing and lateral areas.

Figure 1. Example of advancing fire vector.

Backing Fire Vector. The backing fire vector is characterized by:

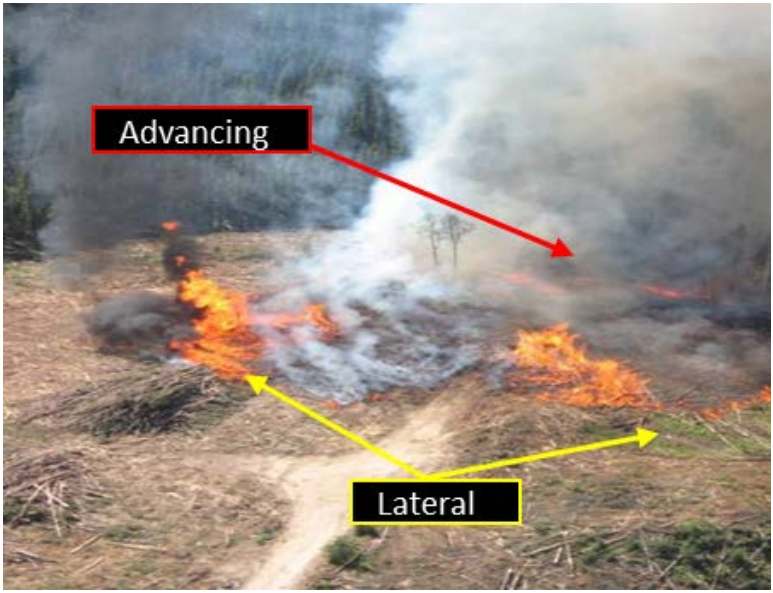
- Slower rate of spread.
  - Against wind.
  - Down slope.
- Lower intensity.
- Lower flame length.
- Less damage when compared with advancing and lateral areas.
- Microscale fire pattern indicators.

Figure 2. Example of backing fire vector.

Lateral Fire Vector. The lateral fire vector is characterized by:

- Rate of spread and intensity between advancing and backing.
  - Flank fire.
  - Spread lateral to main fire.
- Indicators can have characteristics of backing or advancing, depending on fire behavior circumstances.

Figure 3. Example of lateral fire vector.



Lateral Fire Pattern Indicators

- A higher intensity flank may leave indicators consistent with advancing fire spread:
  - Exhibits a more defined and narrower transition zone.
- A lower intensity flank may leave backing-type indicators:
  - Exhibits a more subtle and wider transition zone.
- Intensity on flanks may change with wind, slope, and fuels.

Flanks are defined by strips of unburned or partially burned fuel and their location is influenced by change in wind and slope.

Heat or Flame Exposure Lateral Fire Pattern Indicators

- Sooting, staining, and white ash deposits appear on the exposed side.
- Protection indicators will appear on the unexposed side.
- Generally 45 to 90 degree angle to the direction of advancing fire spread.

Exposed side is generally oriented towards the origin. Unexposed side generally oriented away from the origin.

Wind Influenced Lateral Fire Pattern Indicators

- Foliage freeze, grass stem, cupping, white ash deposits, and angle of char.
- Generally appear on the exposed side of the object.
- Usually aligned with advancing fire indicators:
  - May be at 45 degree angle to advancing spread.
- Grass stems are intensity dependent:
  - May fall into the burned area at 45 to 90 degree angle and remain on ground.
  - May be consumed completely.

Wind influenced lateral fire pattern indicators will align mostly with the direction the wind is blowing, up to about a 45 degree angle from the direction the main advancing fire is progressing. For example, foliage freeze will generally be in line with the wind direction in the advancing zones; grass stem indicators along the flanks will typically fall into the already burned lateral zone with the stem heads facing back to the origin area at an approximate 45 degree angle; angle of char on the flanks will present between direct alignment with the angle of char fire pattern indicators in the advancing zone and out to about a 45 degree angle to the main direction of the advancing zone. Cupping and white ash fire pattern indicators will be similar.

An exception is when high wind vortex flame wrap occurs.

Transition Zone

- Area of **directional** change based on variations in intensity.
  - Advancing to lateral.
  - Advancing to backing.
  - Backing to lateral.
- Change in appearance and characteristics of indicators.
- Transition zones may outline specific origin area.
- A key to accurately interpreting fire patterns is identifying transition zones.

Transition Zone Fuel Effect

Advancing fire will spread at different rates depending upon the type and availability of the fuels. A fire may spread very quickly under the influence of a moderate wind in dry grassy fuels. The same fire burning into a stand of timber may slow its rate of spread while the fire in the grassy area continues to spread. Once the fire in the timber burns past to the grassy fuels again, it will typically pick up its rate of spread.

These changes in the composition of the fuels are part of the fire behavior context that the wildland fire investigator must observe, understand, and take into account. Very few wildland fires burn in the same fuel conditions during their entire duration.

Transition Zone Wind Change Effect

During the duration of a fire, the wind direction may change many times. In actual practice, it is rare for there to be a constant wind direction. Typically, winds that are noted to be out of the south will actually vary in direction to one side of south or the other over short and long periods of time.

These changes in wind direction will affect the spread direction of the advancing fire and the transition zones. An example would be the wind switches to the right and the right lateral becomes the advancing fire vector, the left lateral fire vector becomes backing, and new laterals form around where the old advancing and backing areas were.

Transition Zone Spot-fire or Rolling Material Effect

If the wind picks up embers and carries them downwind, causing spot-fires ahead of main fire front, this will result in the formation of new transition zones which will interact with the main fire. Each spot fire behaves as a separate fire until they burn together or the main flaming front overtakes the spot fires.

Likewise, rolling material can cause fires to start below the main fire, forming new transition zones which will interact with the main fire. Each fire from rolling material behaves as a separate fire until they join with the main fire.

Fire Pattern Indicator Categories

There are 11 categories of fire pattern indicators. They are based on fire behavior and the materials the fire effects. Each category can exhibit any of the three vectors, advancing, lateral, or backing. The physical appearance will differ with the vector (direction of fire progression). The fire pattern indicators are also divided into two general classifications which are:

- Macroscale Fire Pattern Indicators.
- Microscale Fire Pattern Indicators.

Macroscale Fire Pattern Indicators: Usually associated with larger objects or areas and are easily visible from a distance. Macroscale fire pattern indicators are usually found in areas of higher fire intensity. Macroscale fire pattern indicators commonly define areas of advancing fire. Macroscale fire pattern indicators are key clues to identifying the general origin area of the fire.

Microscale Fire Pattern Indicators: Associated with smaller objects or areas, microscale fire pattern indicators may not be as easily observed from a distance. The importance of microscale fire pattern indicators increases with the proximity to the ignition area.

Because microscale fire pattern indicators are typically more subtle than macroscale indicators, these indicators generally need to be observed from a close up position (kneeling, squatting or hands and knees position), not from a standing position.

Fire Pattern Indicator Clusters: Indicator clusters are a group of fire pattern indicators within close proximity which contain fire effects which portray a consistent vector among them. Clusters are most reliable when a variety of fire pattern indicator categories are represented within the group or cluster.

Close proximity of fire pattern indicators within a cluster is relative based on the size of the fire pattern indicators, such as five trees in a cluster. The distance between the fire pattern indicators in a cluster draws closer as you near the ignition area. Macroscale clusters tend to have greater spacing than microscale clusters.

Damage Differential: Damage differential is one of the underlying principles that govern the interpretation of most fire pattern indicators.

Damage differential on individual fire pattern indicators is the change that occurs to combustible and non-combustible objects after interaction with fire. The principle of damage differential on individual fire pattern indicators is a matter of comparing and contrasting the damage to determine which side was exposed to the oncoming fire. In this respect, damage differential underlies the processes which form protection fire pattern indicators and others.

In viewing larger areas (V and U patterns), the principle of damage differential is used to compare and contrast areas of higher intensity burning, indicating advancing fire, to areas of moderate (lateral fire) or low (backing fire) intensity. Identifying large scale damage differential is part of the process of identifying the general origin area. Large scale damage differential should be confirmed through the observation of individual fire pattern indicators. The amount of change will be based on the relative fire intensities and exposure to the oncoming fire.

Possible characteristics to compare and contrast:

- Amount of charring.
- Amount of white ash.
- Degree of loss of material.
- Amount of sooting or staining.
- Height and type of foliage freezing.
- Degree and location of spalling.
- Height and type of angle of char.
- Location and extent of cupping.
- Location and relative extent of general fire damage over larger area.

The degree of material lost is applied to individual items. When comparing and contrasting damage differential, as far as possible it should be on a similar size of fuel, same category of indicator, and at separate locations.

General Principles of Fire Pattern Interpretation

The interpretation of fire pattern indicators is governed by general principles which have been found to be reliable and which the wildland fire investigator needs to apply while conducting their origin investigation. These general principles have been around for many years. First known documentation was by Bob Bourhill of the Oregon Dept. of Forestry (Bourhill, 1982). These principles have been further refined by subsequent testing and experience.

- **Base your interpretation on the majority of the fire pattern indicators within an indicator category.** Single fire pattern indicators reflect the fire direction at a precise point and may be unreliable in the context of overall fire progression.

- **Base your interpretation on the fire pattern indicators within a variety of categories.** Using as many of the 11 categories of fire pattern indicators as possible provides for more reliability. Employ a systematic method when selecting fire pattern indicators in an effort to include the greatest variety.

- **A single fire pattern indicator may be accurate within a 180° arc.** Fire does not burn in perfectly straight lines. Radical but brief

directional changes may occur. The actual progression of the fire is primarily based on the wind, fuels, and slope. Fire pattern indicators will align with the progression at the point of each indicator and reflect the direction of the fire at the time it passed that specific fire pattern indicator.

- **Interpret fire pattern indicators within the context of fire behavior principles.** Determine the fire behavior context through weather observations, topography, reliable witness information and reconstruction of probable fuel conditions. This should include consideration of both unburned fuels and burned remains. Check the observations by interviewing witnesses such as first responders and civilian witnesses.

- **Fire pattern indicators will usually become less pronounced as you approach the Ignition Area.** Most fires start small and with lower intensity. Following ignition, the fire will progress outward from the ignition area. The initial spread of the fire will be generally circular until the fire falls under the influence of wind, slope and fuels. Intensity usually increases as fire progresses outward from the ignition area. In this initial area of combustion, due to the lower intensity, most of the fire pattern indicators will be microscale and subtle.

  This area immediately surrounding the ignition area is called the Specific Origin Area. Because of the lower intensity associated with this area, it is often characterized by the presence of more unburned material, unlike a structure fire origin which is often the location of greatest damage. As the fire comes under the influence of the varying fire behavior factors, it will begin to spread with uneven intensities and rates. This area is referred to as *General Origin Area*. The fire will now exhibit different areas of progression but is often influenced by localized barriers and smaller changes in fuel availability.

- **Document the fire pattern indicators during your investigation.** Use directional flags, fire spread sketches, diagrams and photos to document the fire progression. The use of directional flags (discussed in detail in Chapter 5, Documentation) helps the wildland fire investigator to visually keep track of fire progression and provide a visual representation of that progression.

- **Work from the area of more intense burning to the area of less intense burning, following the fire's progression back to the ignition area**. As the fire spreads, it will create transition zones between these areas of progression. A key to accurately interpreting fire patterns is identifying transition zones. A transition zone is an area of directional change based on variations

in intensity. Transition zones may outline the specific origin area. These zones can be identified by the appearance of the fire pattern indicators and can be subtle in nature.

The initial transition zone may be hard to define. By starting the search for the ignition area where clear advancing fire pattern indicators are present in the form of more intense burning, the wildland fire investigator reduces the risk of prematurely entering the ignition area and damaging it. Macroscale indicators, witness statements, and the fire behavior context form the basis for establishing the initial search for the general origin area. Care should be taken to start far enough out in the higher intensity advancing fire area to account for the possibility of multiple ignitions and origins.

- **Avoid attempts to prematurely locate the Ignition Area.** Indicators become increasingly subtle the closer you get to the ignition area. Wildland fire investigators will need to pay closer attention to detail and take their time, and avoid the pressure to rush. Working the specific origin area and the ignition area is typically the dirtiest and most time consuming portion of the search for the origin of the fire. Wildland fire investigators should be especially disciplined in their work within these areas. Patience is the key.
- **Direction of fire travel will be influenced by obstacles.** The fluid movement of fire is similar to the fluid movement of water around obstacles. Physical objects in the path of the fire's spread will cause the fire to go around, through or over them and may result in loss of intensity and speed. Temporary direction change should be expected as the fire works its way around, through or over obstacles.
- **View and document fire pattern indicators from all sides as appropriate.** Some fire pattern indicators cannot be contrasted unless viewed from various angles. Documenting from only one side may give a *one-sided* viewpoint. Angle of char, protection, white ash, sooting, and staining may not be evident unless looked at from different angles. Photo-document contrasting views where appropriate.

Chapter 1B - Fire Behavior and Fire Patterns

As a fire progresses, it will leave visible marks of its passage on combustible and non-combustible objects in its path. These markings are called *fire pattern indicators*. A fire pattern indicator's vector, (direction of travel, for example, advancing, backing, lateral), can usually be determined by examining the appearance of the fire pattern indicator. When analyzed within the fire behavior context they will form distinct overall fire patterns. These fire patterns will identify areas of fire progression and the accompanying transition zones. Fire progression can then be traced back to the fire's ignition area.

General Reliability and Possible Exceptions

Indicators accurately reflect fire behavior at the particular place and time the fire passed, however the individual vector displayed may not be consistent with general fire progression. Wildland fire investigators must be familiar with the fire behavior conditions (fire behavior context) that may cause an indicator to be inconsistent with other indicators.

Fire pattern indicators may be misleading if not correctly interpreted. Certain circumstances occur creating possible exceptions that apply to most fire pattern indicator categories. Other circumstances may occur creating possible exceptions that only apply to a specific fire pattern indicator category. Reliability and exceptions that apply to most fire pattern indicator categories include: heavy or uneven fuel loading; long-term fire residence; high winds or directional changes; fire backing, downslope, against wind; high variation in sound and rotten fuel; fire pattern indicators that may have moved; and previous fires in the same area (reburns).

Fire pattern indicators should be tested to determine their reliability.

Assess indicators for reliability

- Fire pattern indicator consistent with:
  - Fire behavior context.
  - Other indicators within a nearby pattern cluster.
  - General known fire progression.
  - Eye witness observations.
  - Video or photo evidence.
- Did any of the circumstances that can create exceptions exist during the fire's initial stages?
  - Test the reliability of fire pattern indicators with these exceptions in mind.

Fire Pattern Indicator Categories

Fire pattern indicators are classified into 11 categories and will be discussed further in this chapter. These categories are based on how the fire pattern indicator is formed and the materials upon which they are found. A category can exhibit any one of the three fire vectors, depending on the direction of the fire's progress at that point. Many of these fire pattern indicators will be apparent on both large and small objects and fuels.

The 11 fire pattern indicator categories are:

1. Protection.
2. Grass Stem.
3. Freezing.
4. Angle of Char.
5. Spalling.
6. Curling.
7. Sooting.
8. Staining.
9. White Ash.
10. Cupping.
11. V or U Patterns.

1. Protection Fire Pattern Indicators

A non-combustible object or the fuel itself shields the unexposed side of a fuel from heat damage. Fuels will be unburned or exhibit less damage, less staining, less sooting, less white ash, on the side unexposed to the fires advance (Figures 4 and 5). Look for charring, staining, white ash and clean burn lines on exposed sides of fuels and non-combustible objects. Compare and contrast to the opposing sides of objects. Lift or remove objects to compare and contrast the damage and protection after photographing in place. Objects resting on top of the ground and surface fuels will protect the fuels on the side opposite the fires approach. Surface fuels on the exposed side will exhibit a clean burn line. Surface fuels on the protected side will appear ragged and uneven (Figures 6, 7, and 8).

Figure 4. Protection on a log.

Figure 5. Protection on a pinecone.

Figure 6. Picture of non-combustible object shielding fuel from heat damage.

Figure 7. Picture of fuel with clean and protected burn lines after the non-combustible object has been removed.

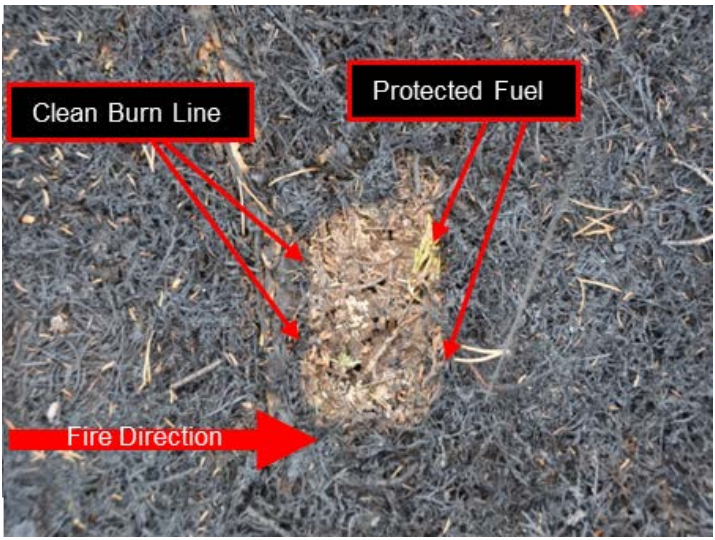


Figure 8. Close-up picture of the clean and protected burn lines.

Figure 9. Close-up picture of burned grass with protected burn lines.

Object shields fuels from heat and flame. Both combustible and non-combustible objects can provide shielding. The same object may shield itself on unexposed side.

General Reliability and Possible Exceptions - Protection

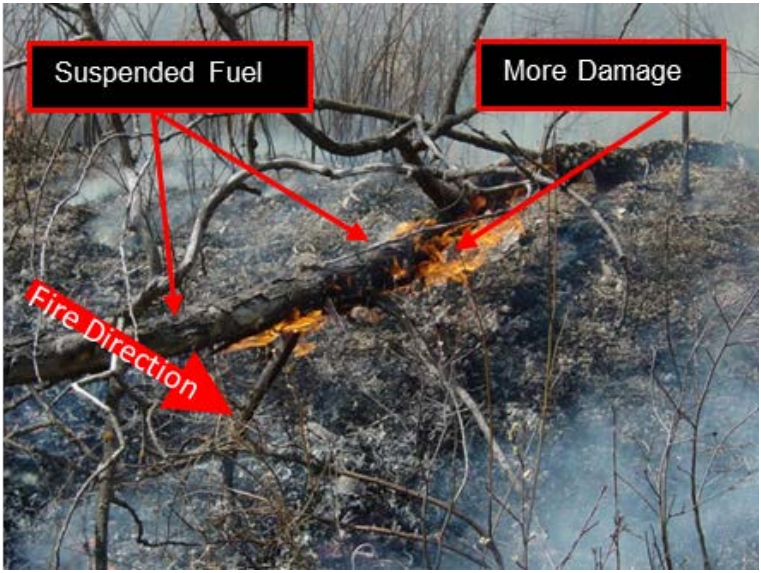
General Reliability: Protection accurately shows fire direction and is most reliable in low to moderate intensity fires.

Possible Exceptions: Pithy stalks: A vascular plant that has a usually continuous central internal strand of spongy tissue in the stem. Pithy stalks may be annual or perennial. Because the outer sheathing is very thin, it may burn through on the unexposed side due to vortex flame wrap, with the fire becoming embedded in the soft, porous tissue. This may cause more damage on the unexposed side of the stem.

Suspended fuels: Limbs and tree trunks may be suspended by other fuels or objects. Gaps between the fuel and the ground causes vortex flame wrap on the unexposed side of the object, creating more damage and leaving

protection on the exposed side. It may appear that the fire came from the opposite direction, especially if the object falls to the ground after the fire has passed where damage may be on the opposing side or equally distributed on both sides under above conditions.

Figure 10. Example of vortex flame wrap on exposed and unexposed side of suspended fuels.



The transition area of a suspended fuel, where it goes from suspended to in contact with the ground, will show less damage on the protected side and increasing damage on the unprotected side.

Figure 11. Picture showing transition area of suspended fuel and fuel in contact with the ground and the differences in damage.

Protection - Advancing fire pattern indicators.

Advancing fire macroscale protection fire pattern indicators are clearer on larger objects. On smaller objects they may be difficult to discern due to the entire object being charred. Difference from exposed side to unexposed side can still be determined (compare and contrast).

Advancing fire microscale protection fire pattern indicators can be used to validate macroscale patterns and indicators. Use when macroscale patterns do not exist. Microscale protection advancing fire pattern indicators may be found in pattern clusters and include fuels shielded from damage on unexposed side; for example, downed logs and tree limbs; pine cones; grass clumps; small stumps; brush; and deer or rabbit pellets.

Figure 12. Example of microscale protection on smaller object that can be used to validate macroscale patterns.

Protection – Backing fire pattern indicators.

Backing fire microscale protection fire pattern indicators are generally on the more protected and smaller fuels and objects due to lower intensity of fire in the backing area.

Protection – Lateral fire pattern indicators.

Lateral fire macroscale protection fire pattern indicators generally exhibit more damage on the side closest to the advancing fire front and presents at 45- 90 degree angle to advancing fire progression. Protection is more noticeable when contrasted against advancing fire area.

2. Grass Stem Fire Pattern Indicators

The charred remains of grass stems left in the fire's wake will have different appearances dependent upon the direction of the fire's travel and intensity. In advancing fire areas, the flames will attack the stem from the top and burn them to ground level, completely consuming all but the very base of the stem. The base of the stem may show cupping.

Figure 13. Picture of advancing, lateral and backing fire vectors.

Look for transition zones between backing and lateral. Heads or stalks may outline lateral transition areas from the advancing fire area.

Advancing Grass Stem Fire Pattern Indicators. Description: Grass stem remains in the advancing area will typically consist of only a small part of the stem base. The stem base may show cupping fire effects. The advancing grass stem area is found by looking for the transition zones between the backing and lateral areas.

Backing and Lateral Grass Stem Fire Pattern Indicators. Description: Backing fire weakens the side exposed to the oncoming fire. The fire burns the exposed side and causes the stem to fall in the direction the fire came from. This effect is similar to that of putting in an undercut on a tree to direct its fall. Backing and lateral fire pattern indicators are more reliable on lower intensity fires. Grass stems pointing towards the direction the fire came from occurs primarily in backing areas, but may occur in lateral transition zones also.

Grass stems in the following photograph have fallen towards the bottom of the photograph, heads pointing back towards the ignition area. The high degree of grass stem remains is consistent with a lower intensity backing fire.

Figure 14. Picture showing example of lower intensity backing fire.

Grass Stem Transition Zone Patterns Near Origin

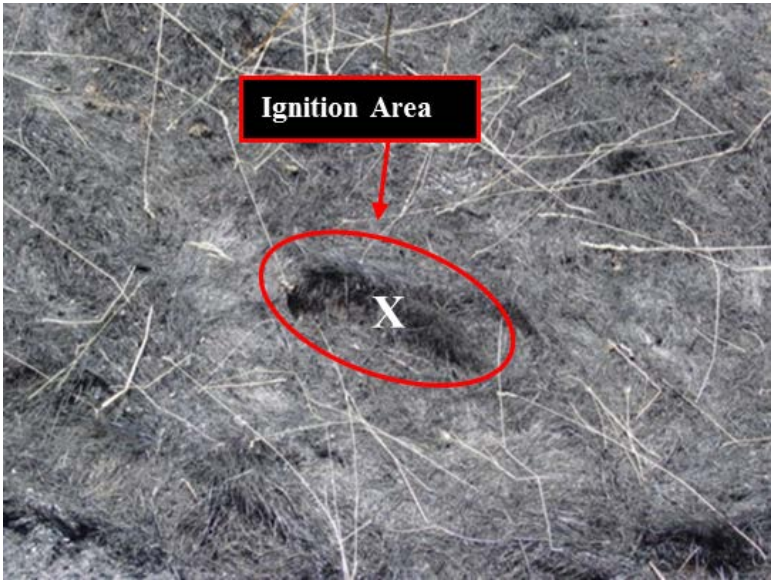
Grass stems may form recognizable patterns within the specific origin area:

- Backing to advancing transition zone.
- Lateral transition areas may be outlined with downed stems.

Circle Fire Pattern:

- Generally, fire burns away from ignition area equally in all directions.
- No wind or slope influence in specific origin area.
- Grass stems fall inward toward ignition area and remain relatively intact forming a circle.

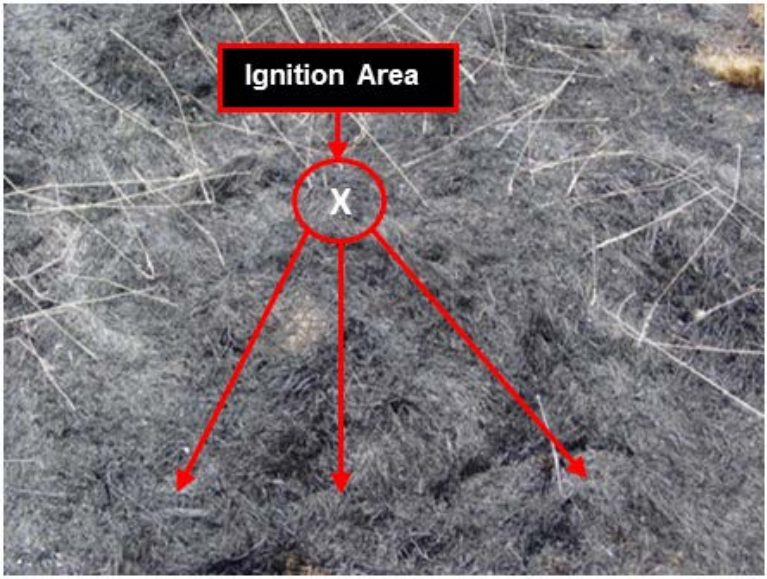
Figure 15. Example of a grass stem circle fire pattern.



V or U microscale fire pattern:

- Takes place near or in the specific origin area when the fire is gathering its initial advancing vector.
- Fire, under the influence of wind or slope, advances in an initial vector (direction).
- Backing, lateral, and advancing transition zones first form, creating a V or U pattern.

Figure 16. Example of a V or U shaped fire patterns.



General Reliability and Possible Exceptions – Grass Stem

General Reliability: Grass stem indicators are usually very reliable. They segregate backing from advancing areas very well and define lateral areas.

Possible exceptions include:

- Snow mat: may leave stalks in all areas and inconsistent direction of fire spread.
- High wind, steep slope: may consume stalks in all areas.
- Wind throw: may leave stalks in all areas and inconsistent direction.

- Uncured fuel: may leave stalks in all areas and inconsistent direction.
- High intensity: may consume stalks in all areas of fire progression.

Always examine the unburned fuel areas to determine if these conditions existed prior to the fire.

Grass stems that have fallen in the same direction due to high winds may not be reliable as a directional indicator but the amount of grass stem remains can be used to help determine transition areas and fire intensity.

Advancing Macroscale Fire Patterns - Grass Stem

Advancing *macroscale* grass stem fire pattern indicators are generally represented by a *clean* burn and the transition to backing and lateral may form a V or U shape fire pattern.

Figure 17. Picture of a *clean* burn showing no grass stems in advancing are with grass stems outlining the lateral and backing areas.

Advancing Microscale Fire Patterns - Grass Stem

- Lack of residual stems.
- Stems and clumps burned off at, or near the base.
- Angle steeper than slope on clumps.
- Individual stems sharp, or pointed on the unexposed side.

Advancing grass stem microscale fire pattern indicators near the specific origin area will generally have less grass stem remains than the lateral and backing transition zones located nearby but will often have more stem remains than in the larger advancing area where the intensity of the advancing fire is much greater. There will often still be a V or U pattern.

Figure 18. Example of microscale fire patterns in grass.

Backing Fire, Macroscale Fire Patterns - Grass Stem

Backing macroscale grass stem burn indicators will show a littering of unburned or partially burned grass stems and seed heads. The majority of stems and seed heads will point in the direction the fire came from.

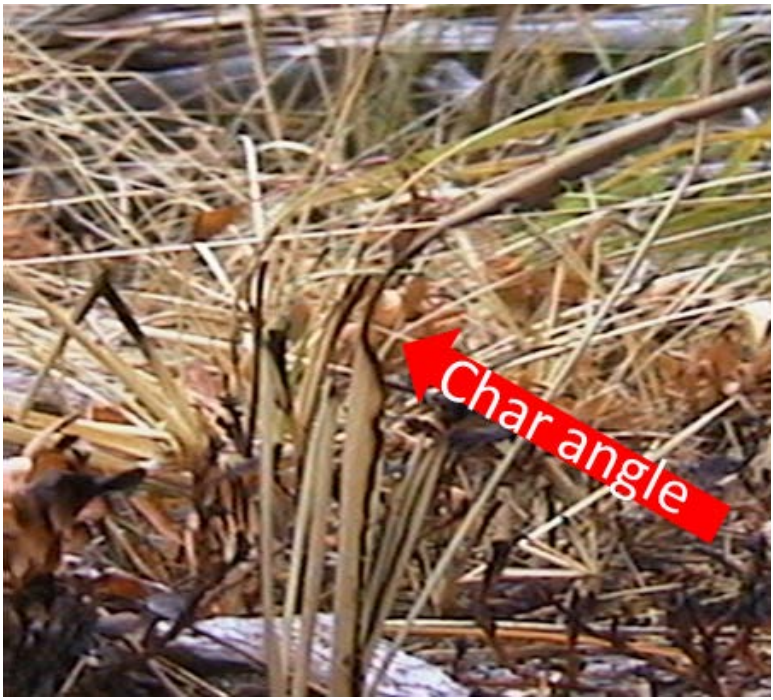
Figure 19. Backing area showing *littering* of grass stems generally pointing back to the Ignition Area of the fire.

Backing Fire, Microscale Fire Patterns - Grass Stem

Grass stem microscale fire pattern indicators in the backing fire area will be viewed by the individual heads and stems which generally point towards the oncoming fire, as well as cupping in some of the individual stems of grass.

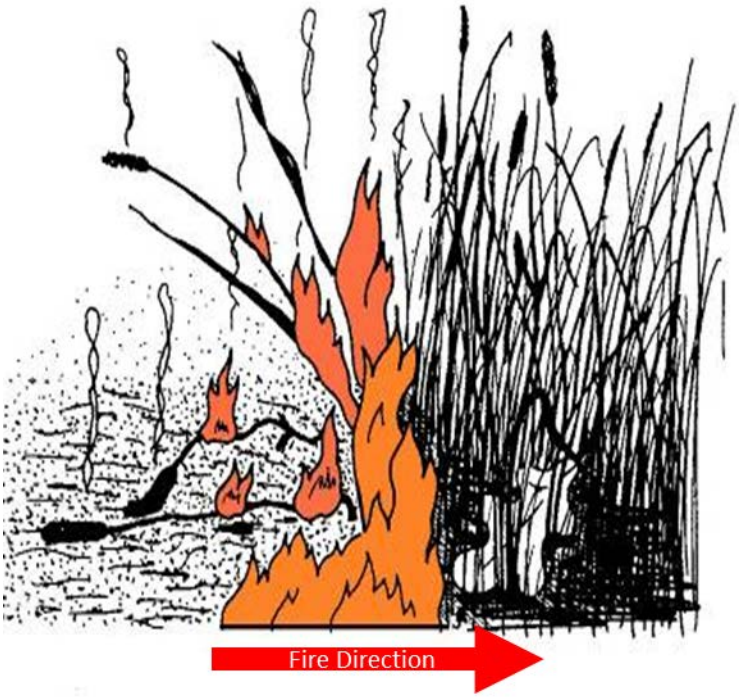
Grass that grows in clumps may not be entirely consumed, showing protection on the unexposed side. When this occurs in advancing areas, the residual basal stalks will normally show an angle of char that is steeper than the slope and exhibit cupping on the tips, with the low side of the cup on the exposed side.

Figure 20. Picture of grass stalk showing char angle.



Backing microscale grass stem fire pattern indicators in higher intensity fires will sometimes result in the stalk being completely consumed. The seed head itself however, while completely blackened, may remain intact and will generally point towards the ignition area. Without close examination it may appear to be an advancing area. Compare and contrast with seed heads in the advancing area which will typically be completely consumed.

Figure 21. Drawing showing the effects of a backing fire on grass stems.



Backing fire weakens the side exposed and stem falls in direction fire came from. Like undercut on tree:

- More reliable on lower intensity fires.
- Occurs primarily in backing areas, but may occur in lateral transition zones.

Fire in the following photo is backing from right to left. Notice wind pushing flames back towards the burn and grass stems falling back into the burn.

Figure 22. Picture showing backing fire with grass stems falling back toward the burn.

3. Foliage Freeze Fire Pattern Indicators

Description: Foliage freeze, in the advancing and lateral areas, takes place when leaves and small stems are heated, tend to become soft and pliable, and easily bent in the direction of the prevailing wind or drafts created by the fire. They often remain pointed in this direction (freeze), as they cool and stiffen following the passage of the flame front.

Figure 23. Foliage freeze in the needles of a pine tree.

Backing fire, foliage freeze is less common than in the lateral and advancing areas of the fire and usually presents in the form of drooped foliage that is still somewhat brittle and dry.

Lateral fire, foliage freeze is most likely to indicate the wind direction rather than the lateral fire spread direction and should not be relied on for lateral spread vector determination.

Figure 24. Picture showing foliage freeze in a backing or lateral fire.

General Reliability and Possible Exceptions - Foliage Freeze

General Reliability: Accurate wind direction indicator. As fire vector indicators, foliage freeze is most reliable within the advancing fire area. Foliage freeze in the lateral areas of the fire will reflect the wind direction and may not reflect the lateral spread vector at 45-90 degrees from the advancing fire.

Possible Exceptions: Locations with a natural prevailing wind where the foliage is already fix in a position and pre-existing drought conditions in green hardwoods.

Advancing Fire, Macroscale Fire Patterns – Foliage Freeze

Advancing fire macroscale foliage freeze is a good indicator of wind direction and often reflects the vector of the fire advance also. This is more common as the wind increases in speed and effect of the spread of a fire. Foliage freeze fire pattern indicators being used for the determination of the fire vector should be contrasted and compared to other fire pattern indicator categories in the same area to check for consistency.

Backing Fire, Macroscale or Microscale Fire Patterns – Foliage Freeze

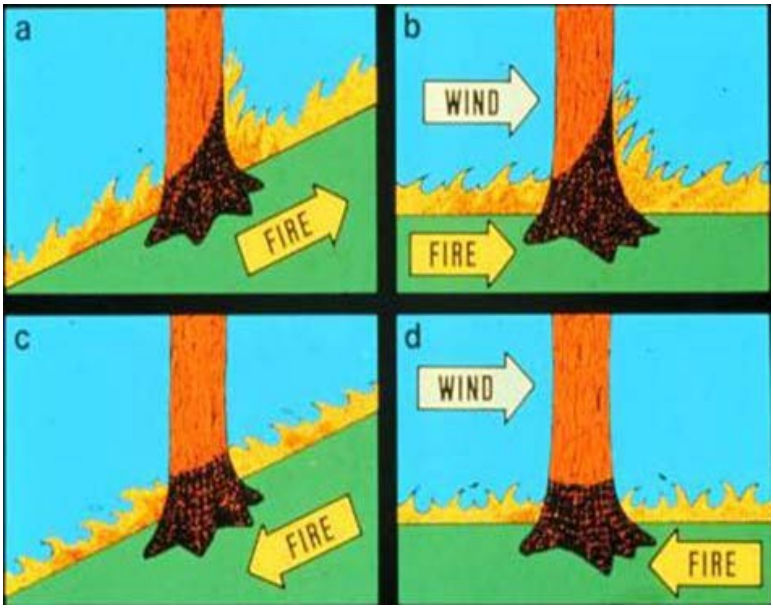
Backing fire macroscale foliage freeze is not as common as foliage freeze in the advancing and lateral fire areas. In backing fire areas, foliage freeze is more likely to be on the foliage of low brush and the lower level of tree crowns near the ground. It may be observed when fire backs into strong wind in heavy fuels and the foliage may appear drooped rather than windswept. The foliage in the backing area may still be somewhat brittle and dried out.

Figure 25. Example of macroscale foliage freeze with drooping and brittle appearance in the backing area of a low intensity ground fire.

4. Angle of Char Fire Pattern Indicators

The angle of char fire pattern indicator is formed when fire burns up to, past, and beyond a standing fuel, such as a tree, utility pole, or bush. Flame height and angle corresponding to advancing, lateral, and backing fire vectors and intensities char the fuel at an angle compared to both the unburned portion of the object and the slope. The angle differs with the fire vector when compared and contrasted. When the fires passage only heats and dries out the canopy of a tree or bush, without actual charring, the fire effect is called angle of scorch.

Figure 26. Examples of char angles on level ground and on slopes and different fire direction.



Description: Angle of Char Indicators – Scorch vs. Char

Angle of char and angle of scorch fire pattern indicators are formed by the same process, fire and heat moving to, past, and beyond a standing fuel. The difference between the two indicators is a matter of heat duration or fire intensity (or both). Scorch typically appears on remaining crowns of trees or brush where the foliage was not consumed but simply heated and dried, scorched. Char is the result of the burning away of portions of the actual crown or charring of the bark or wood of a standing fuel.

Both terms may be applied to this category of fire pattern indicator as the conditions dictate. Char denoting the angle pattern left when material is actually consumed, and scorch used to denote the angle pattern found on foliage which was not consumed, but simply dried.

Figure 27. Example of angle of scorch and char.

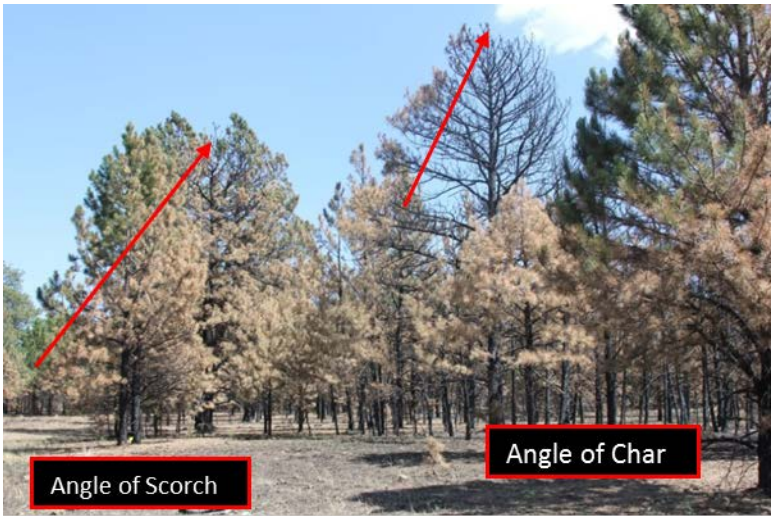


Figure 28. Angle of char on a tree trunk.

Figure 29. Angle of char on a tree crown.

General Reliability and Possible Exceptions – Angle of Char or Scorch

General Reliability: Generally reliable, especially for assessing advancing fire areas.

Possible Exceptions:

- Flat surfaces, small diameters, short heights.
- Fuel accumulations - uphill side when fire is backing downhill.
- Old burns pre-existing char patterns.
- Thin barked conifers, hard woods - evenly blackened on all sides.
- Areas where fire did not burn entirely past the fuel (near control lines, etc.).

Advancing Fire, Macroscale Fire Patterns - Angle of Char

Angle of char and scorch form consistent patterns in advancing fire areas. The angle of char or scorch in the advancing area is steeper than the slope. The low side of the char or scorch fire effect is located on the side facing the advancing fire. Advancing fire normally enters standing fuels low, and comes out high, due to flame angle and wind influences, creating the typical angle fire effect. Angle of char and scorch are often found in clusters in the advancing area of the fire. Contrast and compare the angle and height of the char or scorch to backing and lateral fire areas.

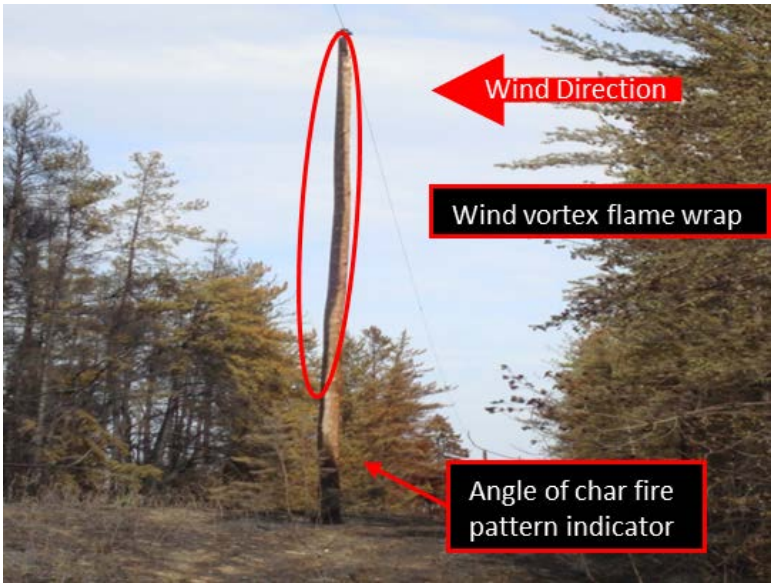
Figure 30. Photo shows advancing angle of char fire pattern indicators in a cluster which are consistent with each other. Angle of char is steeper than the slope and angle indicates the fire vector.

In the advancing fire area, due to the effects of wind, flame is drawn up the lee side of pole-like objects. Under high wind conditions this char pattern can extend to great heights. This phenomenon is referred to as wind vortex flame wrap. The base of the char fire pattern will typically remain at an angle greater than the slope.

Figure 31. Two photos showing wind vortex flame wrap on downwind side of trees.

In Figure 32 the arrow shows the angle of char fire pattern indicator present that should be considered. The upper oval demonstrates the effects of wind vortex flame wrap and is an indicator of wind direction with the char caused by the vortex on the downwind side of the object. It is the lower fire effect, angle of char (arrow) which is used. The upper wind vortex flame wrap pattern can be used to assist in establishing the wind direction at the scene. Generally, the stronger the wind, the higher the wind vortex flame wrap will be.

Figure 32. Picture showing wind vortex flame wrap and angle of char on a pole.



Advancing Fire, Microscale Fire Patterns - Angle of Char

Microscale angle of char fire pattern indicators have many of the same fire effects that macroscale angle of char fire pattern indicators have. Microscale indicators are generally found on smaller objects, such as small shrubs, seedlings, and grass clumps. In the advancing area, the angle will remain steeper than the slope and the low end will be towards the exposed side.

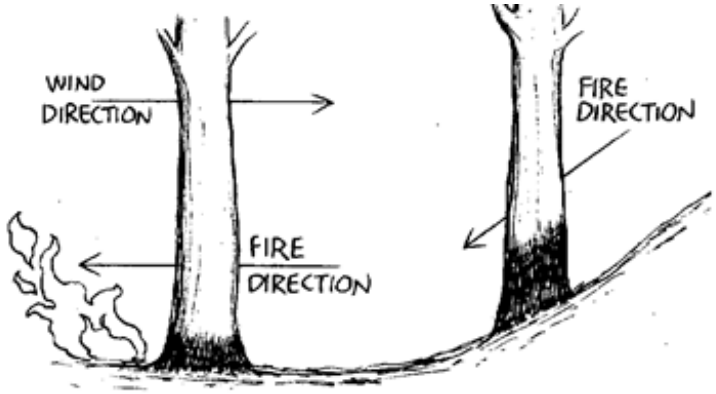
Figure 33 is an example of a microscale fire pattern indicator. The advancing fire is moving from left to right, with an angle of char greater than the slope.

Figure 33. Grass clump microscale fire pattern angle of char.

Backing Fire, Macroscale Fire Pattern - Angle of Char

Fires backing against the wind or down slope, the char angle will be parallel to the slope angle (Figure 34) and low to the ground unless affected by increased fuel loading. Accumulation of debris on the uphill side may cause char up the side of the tree above the debris, but it will have little effect on the char pattern around the rest of the tree.

Figure 34. Example of macroscale fire pattern angle of char for a backing fire.



In Figure 35, the angle of char fire pattern indicator is level with the ground consistent with a backing angle of char fire vector. The height of the char pattern above the ground is a clue as to fire intensity.

Figure 35. Macroscale char pattern on level surface.

Char may sometimes form an L or barber chair burn pattern. The overall pattern remains parallel to the slope. Fuel accumulation, catface, exposure to other nearby fuels or backing into high wind can create this char pattern.

Figure 36. Example of L shaped char pattern on tree trunk.

Backing Fire, Microscale Fire Pattern - Angle of Char

As with advancing microscale angle of char indicators, backing microscale fire patterns will be on smaller bushes and saplings. The angle of char fire pattern in backing vector areas will be parallel to slope, whether backing down-slope on a hill or against the wind on flat ground.

Figure 37. Example of microscale fire pattern on small shrub.

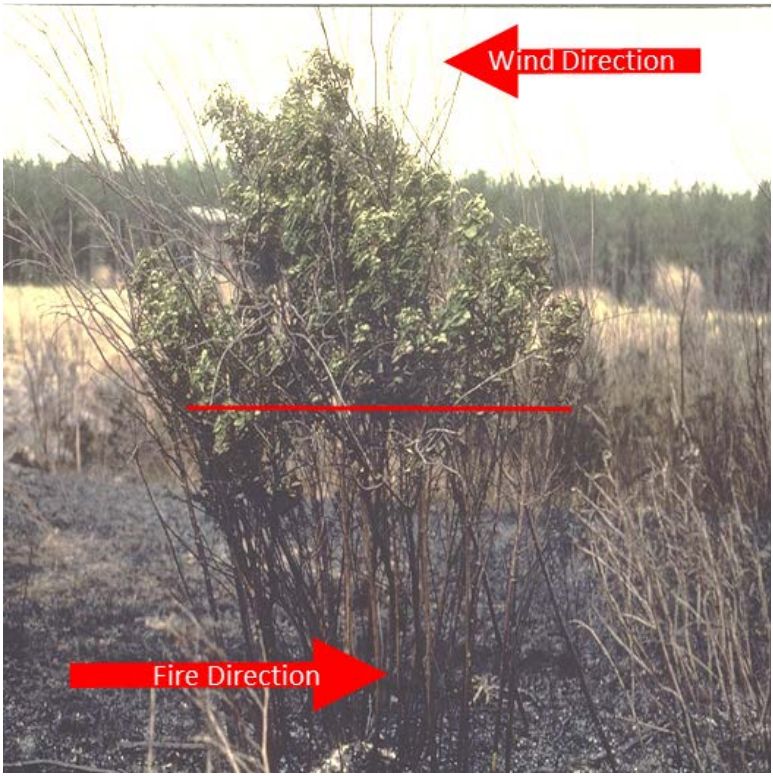
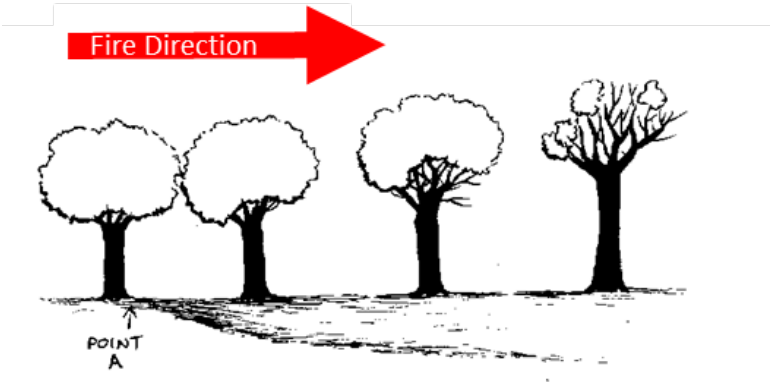


Figure 38 shows the typical effect on the crown of trees or brush as a fire starts at point A and moves out, slowly building up heat and speed. At the ignition area, the fire is still relatively cool as surface fuels involved are only partially consumed and the area involved is limited, therefore the tree's crown is left mostly intact. Farther from the ignition area, the fire has spread out and gained intensity as it involves a larger area and component of the fuel bed, resulting in a higher heat release and more crown is burned. All the crowns may be burned as the fire intensifies.

Figure 38. Example of angle of char effect on tree crowns as the fire moves away from the Ignition Area, Point A.



5. Spalling Fire Pattern Indicators

Description: Spalling fire effects will appear as shallow, light-colored craters or chips in the surface of rocks within the fire area (Figure 39). They will usually be accompanied by slabs or flakes exfoliated from the surface of the rock. Spalling is caused by a breakdown in the tensile strength of the rock's surface that has been exposed to heat. The area surrounding craters will usually be sooted or stained (or both).

In Figure 39, notice the light color of the area where the rock has been chipped. Comparing this to the sooting around the cratered area indicates that the spalling occurred after the heat of the advancing fire passed by. Taking note of this contrast can help to exclude mechanically caused chipping either before or after the fire passage.

Figure 39. Photo showing example of spalling.

Also known as exfoliation, spalling is caused by exposure to the heat or flame. Rocks are not efficient conductors of heat energy and when subjected to the oncoming fire the outermost layer becomes hotter than the rock underneath it. Differential expansion causes sub-surface shear stress and thin layers of rock break off, usually after the fire front has passed.

Figure 40. Combination of spalling and the surrounding area of sooting.

General Reliability and Possible Exceptions – Spalling

General Reliability: Usually reliable for advancing fire areas. Spalling is not commonly encountered in backing areas where heat may not be sufficient to cause the rock to exfoliate. Compare and contrast the opposite sides of the rock to determine where the most spalling has occurred, indicating the exposed side of the rock.

Possible Exceptions: In areas of high fire intensity or long term fire residency spalling may be present on multiple sides. Large rocks which have the backside protected from exposure, as when they are buried in the ground, may not be as reliable as those where all sides are evenly exposed. Moisture in the rock or type of rock may affect the occurrence of spalling. Pre-existing stress cracks may also provide unreliable spalling fire pattern indicators. Contrast and compare the rock structure with nearby rocks to determine if stress cracks are common within that area and type of rock.

Mechanical damage caused by heavy equipment either before or after the fire passes can be mistaken for spalling. Close examination will normally show that the dirt around the rock and the rock itself has been disturbed by the equipment and thus the mechanical damage can be excluded. Areas appearing to have spalling which have sooting within the face of the crater may also indicate mechanical damage that took place prior to the fire.

Advancing Fire, Macroscale Fire Patterns – Spalling

Advancing macroscale and microscale spalling indicators will display on numerous large rocks within the fire run and may be in clusters. Spalling evidence will be concentrated on the exposed side of the rock and absent or less evident on the protected side of the rock.

Advancing Fire, Microscale Fire Patterns – Spalling

Microscale spalling fire pattern indicators will be visible on smaller rocks. As with the macroscale indicators, the spalling on smaller rocks will be concentrated on the exposed side and absent or less evident on the protected side.

Figure 41. Example of spalling on a small rock.

Backing Fire, Microscale Fire Pattern – Spalling

Microscale spalling fire pattern indicators are not usually associated with backing areas and spalling in these areas may be the result of fuel accumulations. Compare and contrast with spalling on the same type rocks in the advancing area. Spalling should be on the exposed side unless influenced by fuel accumulation.

6. Curling Fire Pattern Indicators

Description: Curling occurs when green leaves curl inward toward the heat source. Not normally a macroscale indicator. They may also exhibit wind influenced foliage freezing.

Figure 42. Example of leaf curling.

The process that creates curling is similar to that which forms foliage freezing. Heat exposure causes leaf to dry out and shrink on surface exposed to heat. Shrinkage causes edges to curl in towards the source of heat. The leaf folds in the direction the fire is coming from. This usually occurs with slower moving, lighter burns associated with backing and lateral fire movement. Protection fire patterns may also be present on the individual leaves which can form a cluster of indicators with the curling fire pattern indicators.

General Reliability and Possible Exceptions

General Reliability: Most reliable in low intensity, backing areas of the fire.

Possible Exceptions: Degree of curing, long term drought may cause leaves to be already curled. Direct flame impingement may create false indicators. Fire may impact leaves from a variety of different directions. Thick leaves with strong central vein may not curl at all or may curl in towards vein. Wind driven foliage freeze is an indication of wind direction at the time that the fire passed that point and should be confirmed by other indicators for determining a reliable direction of fire spread. Leaves may curl towards approaching heat source, but then move and freeze with the wind.

Advancing Fire, Microscale Fire Patterns – Curling

Curling will typically only form in the advancing vector during low intensity advancing fire due to light fuels, weather and fuel moisture conditions. Curling is not commonly associated with advancing fire. If present in the advancing area, the curling will take place on the exposed side of the vegetation.

Backing Fire, Microscale Fire Patterns – Curling

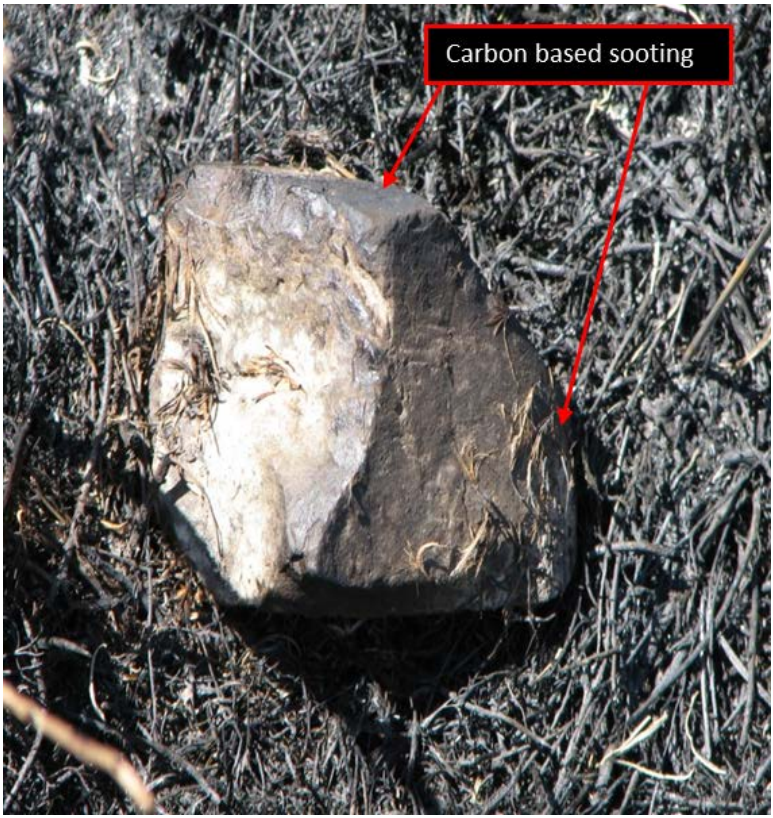
Low intensity backing fire microscale curling fire patterns will form on small vegetation close to the ground and the leaves will curl towards the exposed side.

Figure 43. Example of leaf curl on small vegetation.

7. Sooting Fire Pattern Indicators

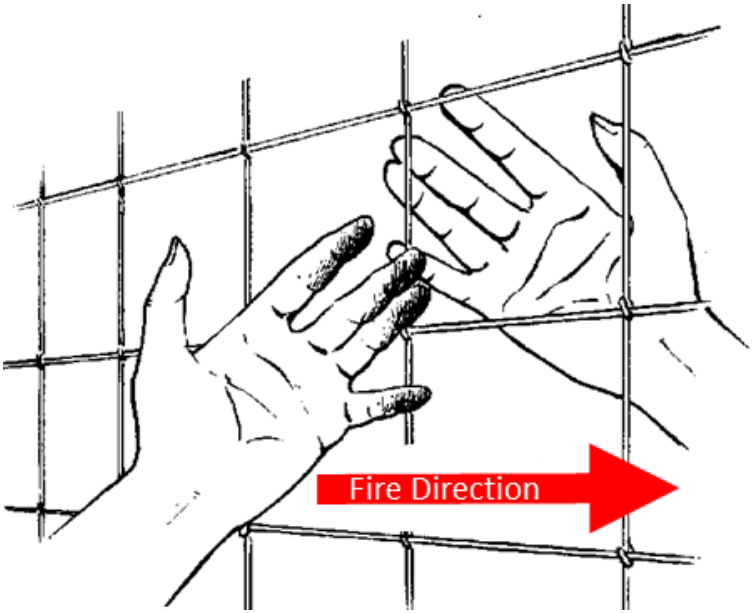
Description: Black, carbon based deposit caused by incomplete combustion and the natural fatty oil content in some vegetation. Carbon is typically more heavily deposited on the side facing the approaching fire.

Figure 44. Example of sooting on a rock.



Soot will be deposited on the side of fence wires facing toward the direction the fire came from and can be detected by rubbing your fingers along the wire. On larger objects, soot deposits can also be noticed by rubbing your hand across the surface. In many cases there will be other indicators, such as protected fuel or staining. When checking a wire fence for soot, check the lower wires as they will show more evidence of soot than higher wires.

Figure 45. Example of sooting on fence wires.



The process which creates sooting fire pattern indicators includes airborne particulates resulting from the incomplete combustion of a hydrocarbon. These particles, in the form of a complex mixture of organic compounds, adhere to rocks, cans, fence wire, metal posts, and some vegetation.

General Reliability and Possible Exceptions – Sooting

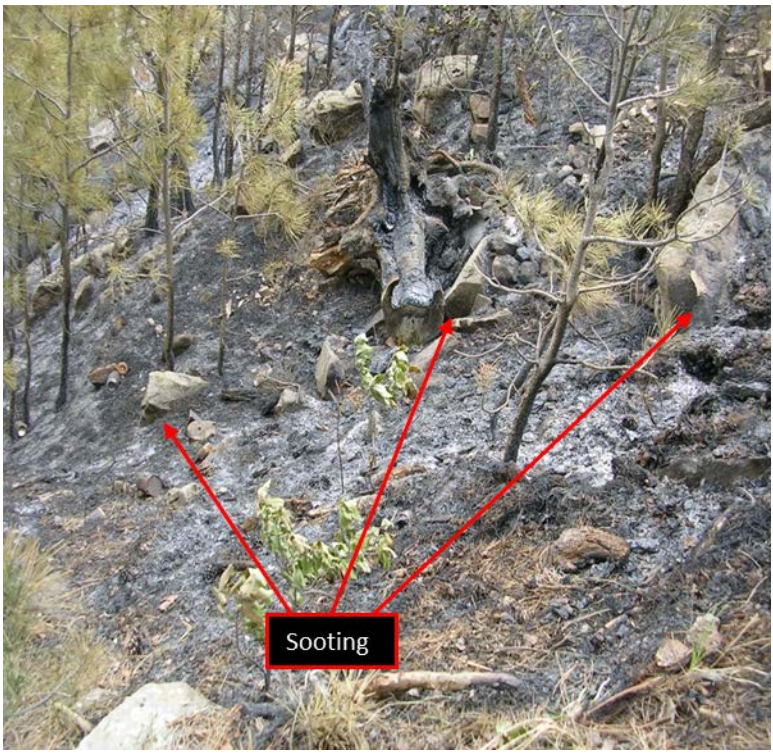
General Reliability: Generally reliable.

Possible Exception: Accumulations of debris that generate large volumes of sooty smoke.

Advancing Fire, Macroscale Fire Patterns – Sooting

Advancing fire macroscale sooting fire pattern indicators may be present on large individual rocks and rock outcroppings or other similar objects. Look for consistency within the run.

Figure 46. Example of sooting on multiple rocks.



Advancing Fire, Microscale Fire Patterns – Sooting

Advancing fire microscale sooting fire pattern indicators may be more subtle as the smaller objects which soot is deposited on may have soot on all sides, the degree of sooting may be the only difference between the protected and non-protected sides.

Figure 47. Example of sooting on a small object.

Backing Fire, Microscale Fire Patterns – Sooting

Backing fire microscale sooting fire pattern indicators are generally not as heavy. Once again, the predominant sooting will be on the exposed side of objects, primarily smaller objects due to the lower intensity of the fire.

8. Staining Fire Pattern Indicators

Description: Staining is caused by vaporized volatile oils and resins in the flame and smoke column condensing on cooler surfaces of objects. Staining will appear glossy or varnish-like (or both), and light yellow-orange to dark brown in color. This occurs most commonly with non-combustible objects such as metal cans or rocks. Stains will appear on the side of the object exposed to the on-coming flames. These yellow-to-dark brown stains may feel tacky to the touch and may be covered with a thin layer or specks of white ash and other light-weight fire debris.

Figure 48. Example of staining on a metal can.

Staining is more commonly a microscale indicator and is more pronounced in advancing than backing fire areas and is often subtle. Examine small pebbles, rocks and other similar items close-up to find staining indicators in backing areas. Smaller objects may have staining on all sides but can display more of a varnished (shiny) look on the exposed side than on the

unexposed side. The color of the staining generally is darker on the exposed side of small objects than on the unexposed side.

General Reliability and Possible Exceptions

General Reliability: Generally reliable.

Possible Exceptions: Repositioning of lightweight objects by wind or suppression activities. Accumulation of man-made debris.

Advancing Fire, Microscale Fire Patterns – Staining

Generally, advancing area microscale staining will be darker and cover a larger area of an object when compared to backing area staining. Stain in advancing area may be all the way to the top of a rock when the same size rock in the backing area may only have staining halfway up.

Figure 49. Example of advancing fire staining on a can.

Backing Fire, Microscale Fire Patterns – Staining

Staining on small objects is less noticeable in the backing areas, and may be very subtle. Examine small pebbles, rocks and other similar items. Small pebbles with staining are often present in the specific origin area and assist in determining the fire vector in that area.

Staining on rock in Figure 50 is on the right side of the rock but not on the left, indicating fire moving from right to left. After photographing in place, the rock was lifted from its resting place showing that it had not been moved and was a reliable indicator.

Figure 50. Example of staining on small objects in a backing fire.

Sooting vs. Staining

Sooting:

- Dull black in color.
- Can be rubbed off with fingers.
- White ash will generally not adhere to it.

Staining:

- Glossy pale yellow to dark brown in color.
- Cannot be rubbed off, but may be tacky to the touch.
- White ash may adhere to it.

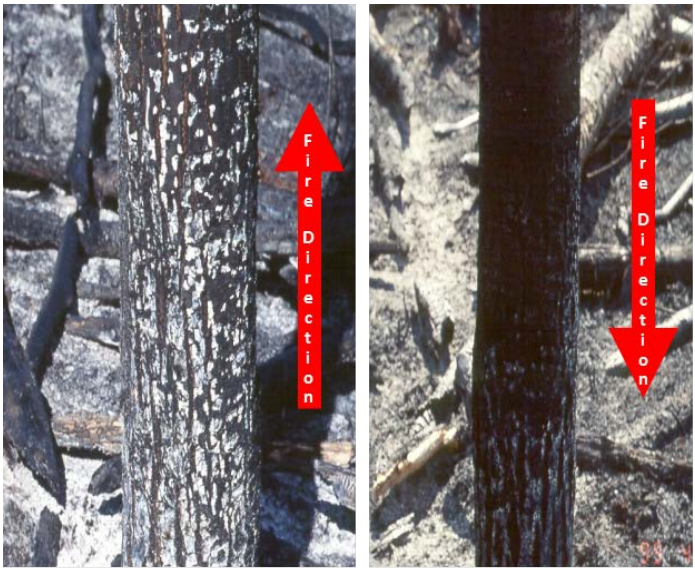
9. White Ash Fire Pattern Indicators

Description: There are two subsets of the white ash fire pattern indicator. White ash caused by exposure to heat and flame and still in place on its host vegetation is the byproduct of more complete combustion. More white ash will be created on the sides of objects exposed to greater amounts of heat and flame. White ash can also be dispersed downwind and deposited on the windward sides of objects. Generally, fuels facing the on-coming fire will appear lighter on the exposed side, darker on the unexposed side in both cases of exposure and deposits.

White Ash Fire Pattern Indicator: Exposure

The following picture, Figure 51, photo on left shows white ash on the tree bole on the side facing the oncoming advancing fire, the origin side. Photo on the right shows the back or unexposed side of the same tree. By comparing and contrasting the two opposing sides, you can distinguish that the side facing the on-coming fire has more white ash present. The arrows correspond with the direction of the advancing fire progression.

Figure 51. Example of white ash on tree trunk facing the fire and the backside (shielded side) of the same tree.



In grass stands, white ash may be more noticeable when looking away from the origin. Looking back towards the origin, the grass may appear darker or may have more *color* due to protection on the unexposed side.

Figure 52. Photo comparing white ash in burned grass looking toward where the fire went, and where the fire came from.

General Reliability and Possible Exceptions (Exposure)

General Reliability: Generally reliable.

Possible Exceptions: Thin-barked conifers and hardwoods may show more white ash on the protected side, particularly during strong winds. Long term fire residency.

Advancing Fire, Macroscale Fire Patterns – White Ash (Exposure)

Compare and contrast damage on opposing sides. Look for consistency on similar objects and with the fire intensity of the area.

In Figure 53 the white ash on the exposed side of tree and the intensity of the burn around the tree is consistent with an advancing fire area. The two elements together with other confirming fire pattern indicators in the area provide an advancing fire vector.

Figure 53. Example of advancing fire with white ash.

Advancing Fire, Microscale Fire Patterns - White Ash (Exposure)

Advancing microscale white ash fire patterns may be on relatively small objects. These fire effects may be closer to ground level than macroscale fire patterns.

Microscale white ash fire pattern indicators created by exposure to heat and flame are typically found on small trees to twigs and branches on low lying brush and trees.

Figure 54. Example of white ash on small tree trunk or sapling.

Backing Fire, Macroscale Fire Patterns - White Ash (Exposure)

In backing areas, there will generally be less white ash overall, compared to advancing areas. These backing areas may have a darker appearance of burned materials or an appearance of *color* when compared to advancing areas due to unburned fuels.

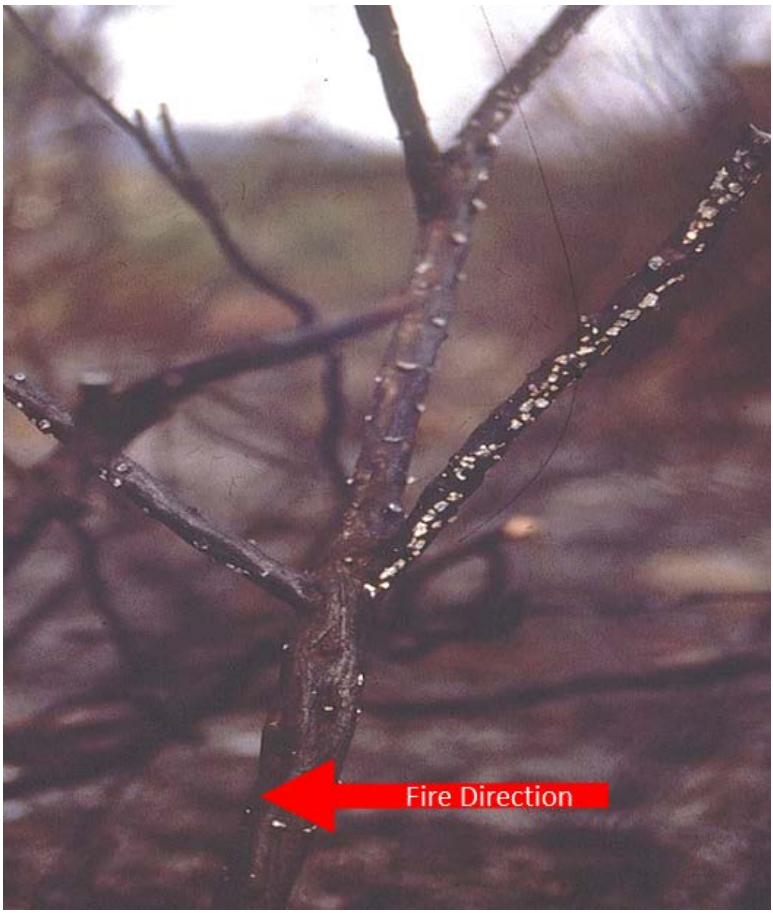
Figure 55. Photo showing both darker burned vegetation and unburned vegetation with color.

Backing Fire, Microscale Fire Patterns – White Ash (Exposure)

Backing areas exhibit a lack of or less white ash than advancing areas. White ash (exposure) fire effects will be found on very fine fuels, and at levels that are generally closer to the ground on the exposed side in the backing area.

Figure 56 shows backing area microscale white ash fire pattern indicator caused by exposure to heat and flame. White ash fire pattern indicators may also be on even smaller items.

Figure 56. Photo showing white ash on a twig from a backing fire.



White Ash Fire Pattern Indicator: Deposits

White ash, dispersed downwind in fine particles, can be layered on fuels and non-combustible objects. White ash on objects created in this manner are generally referred to as white ash *deposits*.

Figure 57. Example of white ash deposits on a stem.

General Reliability and Possible Exceptions - White Ash (Deposits)

General Reliability: Reliable in advancing and lateral fire areas.

Possible Exceptions: Reliability or presence decreases with time.

Inconsistent dispersal under strong and variable wind conditions may cause vector information only reliable during the time of the wind variation. Generally, white ash created and blown in the backing area will present on the protected side of objects.

Advancing Fire, Macroscale Patterns - White Ash (Deposit)

In the advancing area, windblown transport will place white ash deposits on similar objects over wide areas. Look for consistency within an area and identify clusters of fire pattern indicators.

Advancing Fire, Microscale Patterns - White Ash (Deposit)

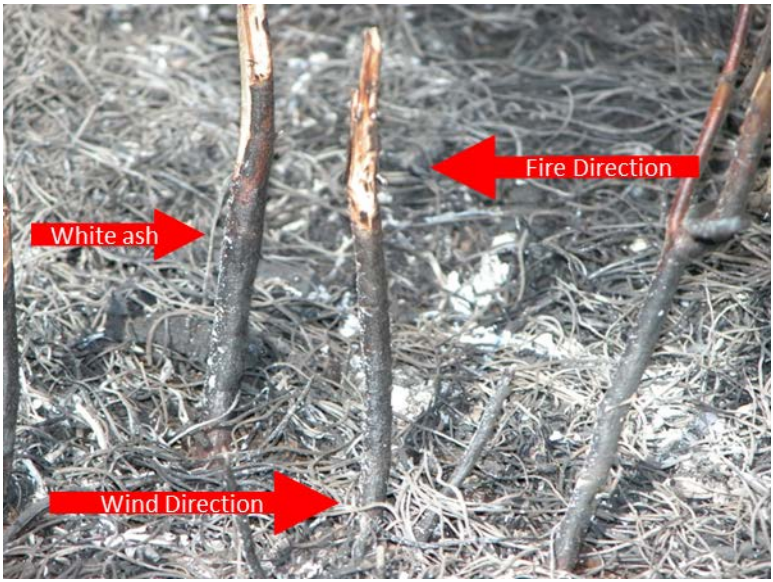
Concentrated areas of white ash on the ground are a result of more complete combustion of fuels. These deposits come from nearby fuels which have sustained high heat. Where little or no remains of the nearby fuels are still present, the depth and amount of white ash deposits will provide information concerning fuel loading in that area and fire intensity, helping to establish the vector.

Backing Fire, Microscale Patterns – White Ash (Deposit)

White ash deposits can be created in backing areas, but transported downwind and deposited on the unexposed side of objects.

It is important to determine if white ash is due to more complete combustion at its location or has been blown by the wind and deposited. As in Figure 58, windblown white ash deposits in a backing area will be on the reverse side of the object.

Figure 58. Example of windblown white ash on vegetation.

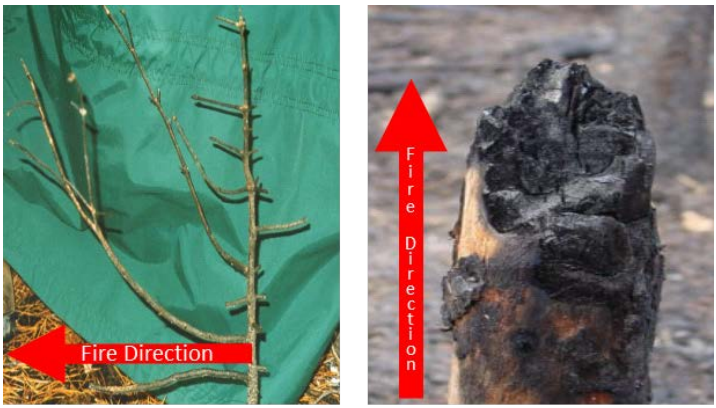


10. Cupping Fire Pattern Indicators

Description: Cupping is a concave or cup-shaped char pattern on grass stem ends, small stumps (generally 10 inch diameter and less are more reliable) and the terminal ends of brush and tree limbs (less than ½ inch diameter best). Limbs and twigs on the exposed side will have their tips burned off by the approaching flames leaving a rounded or blunt end. On the opposing side, twigs and limbs will be exposed to flames from underneath, along the base to the terminal end, creating a tapered point. Therefore, in advancing areas of the fire, twigs and limbs on the unexposed side will show a sharply pointed or tapered end. Limbs on the exposed side of the brush or tree will usually be blunt or rounded off.

Small stumps, terminal ends of upright twigs and the remains of grass stems can also exhibit a tapered point, with the sharp end on the unexposed side. The low side of the cup will face the origin (Figure 59). This indicator is usually not associated with backing areas of the fire, except in areas of steep slopes or under high wind conditions.

Figure 59. Example of cupping on limbs of a bush and on a stump.



Partially charred branch tips may sometimes be found on the ground on the origin side of brush and small trees, where they have fallen after being burned off.

Large diameter stumps and limbs should not be considered when using this indicator due to their longer term fire residency.

General Reliability and Possible Exceptions

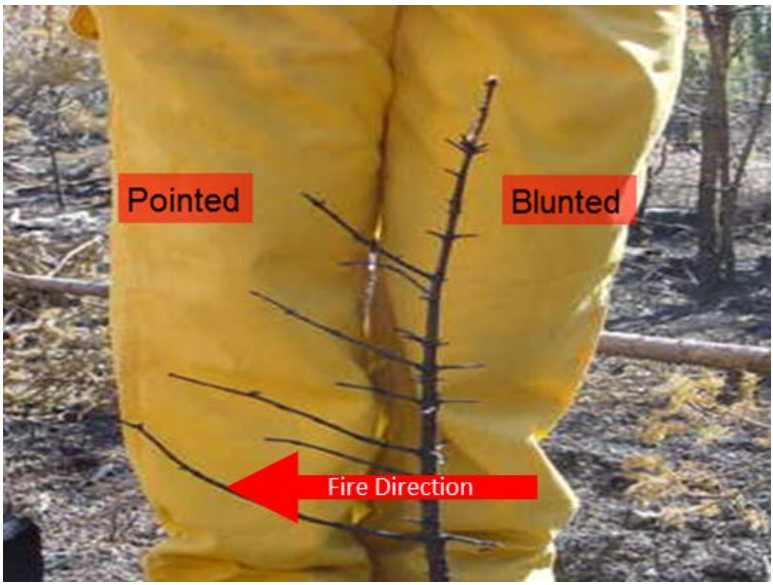
General Reliability: Most reliable in advancing areas of the fire. Cupping is usually not associated with backing areas. When in backing areas cupping is usually the result of high winds or long term fire residency.

Possible Exceptions: On large diameter fuels, the cup direction may be inconsistent with spread vector due to long term fire residency and possible change of wind direction. Small diameter fuels may not be reliable when wind is gusty and erratic.

Advancing Fire, Microscale Fire Patterns – Cupping

- Ends of vegetation.
- Low end of the cup: exposed side.
- Pointed on the protected side.
- Blunted, rounded; exposed side on terminal twig ends.

Figure 60. Example of pointed and blunted twig ends.



Backing Fire, Microscale Fire Patterns – Cupping

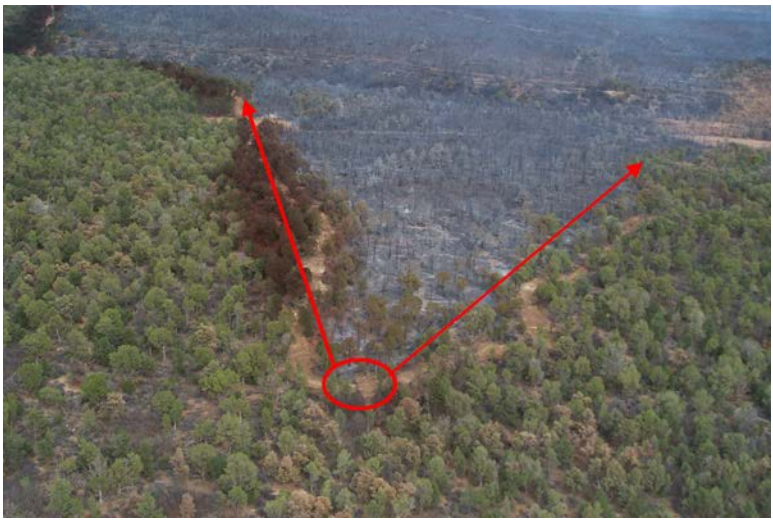
Cupping is not normally associated with backing fire areas. If cupping appears to be present in a backing area, it is usually due to high winds or long term fire residency.

11. V and U Fire Pattern Indicators

Description: This is the overall V or U shape associated with typical wildfire progression in the early stages of the fire. Lateral transition zones form exterior perimeter V or U shape with an advancing vector in between. The lateral transition zones typically get further apart as the advancing fire continues unless barriers, fuel changes, or suppression action affects the fire's ability to spread.

The ignition area is generally located in an area of less intense burning near the cup of the U or apex of the V. View and document this pattern from an aerial perspective, if possible.

Figure 61. Example of a V shaped burn pattern.



Wildland fire investigators should recognize that the two patterns, V and U, are formed by different conditions that may provide further clues to the location of the ignition area. U shaped patterns tend to form on flat ground under light wind conditions or on moderate slopes where the ignition area is often located near a shoulder of the cup. A U shaped pattern can be an indication of a combined slope and wind influence on the fire. V fire patterns are primarily influenced by strong winds or steep slopes (or both). The Ignition Area is often located near the apex of the V pattern, including microscale V fire patterns.

When determining the boundaries of the V or U pattern, consider the conditions of the fuels both where the crown no longer exists and where the

crown still exists based on ground fuel consumption. View these indicators from a combination of aerial and ground perspective.

Pattern boundaries may not be confined to fully consumed canopy. Look below the canopy to identify the actual fire boundary. On a smaller scale the pattern may not show up in the canopy, but may be visible below.

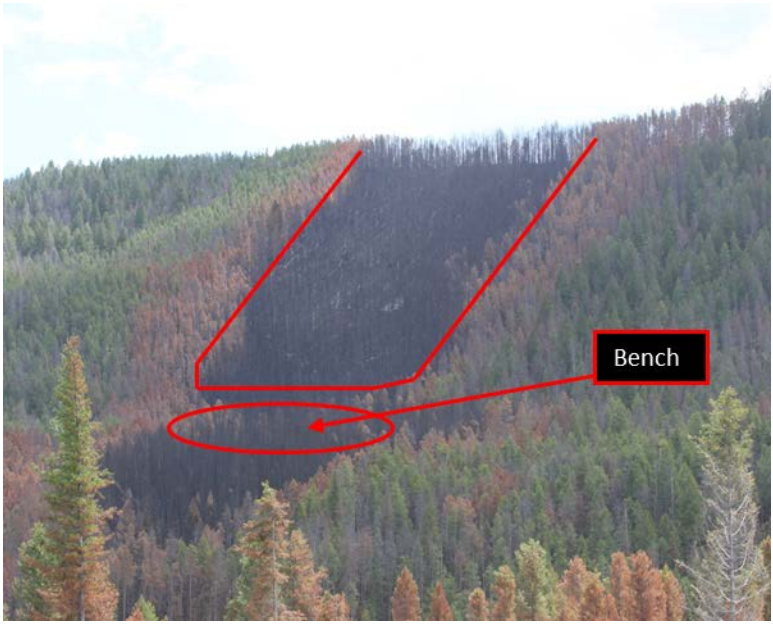
V and U indicators can be both macroscale in size and smaller. Because V and U patterns can be formed over shorter and longer periods of time, multiple V or U patterns may be formed due to wind speed and direction changes. Changes in slope may also effect the formation of V and U patterns.

Figure 62. Example or irregular V or U shaped fire pattern.

Figure 63. Example of how wind or slope can be the primary influence in creating a V pattern.

Figure 64 is an example of a U fire pattern created when the lower initial run reached a bench on the hillside and thunderstorm winds momentarily changed direction spreading the fire to the sides before resuming an advancing vector to the ridgeline.

Figure 64. Example of a U fire pattern.



Always consider the effects of suppression actions, wind and slope changes along with man-made and natural barriers such as roads and lakes.

Figure 65. Example of wind direction and a road on fire pattern.

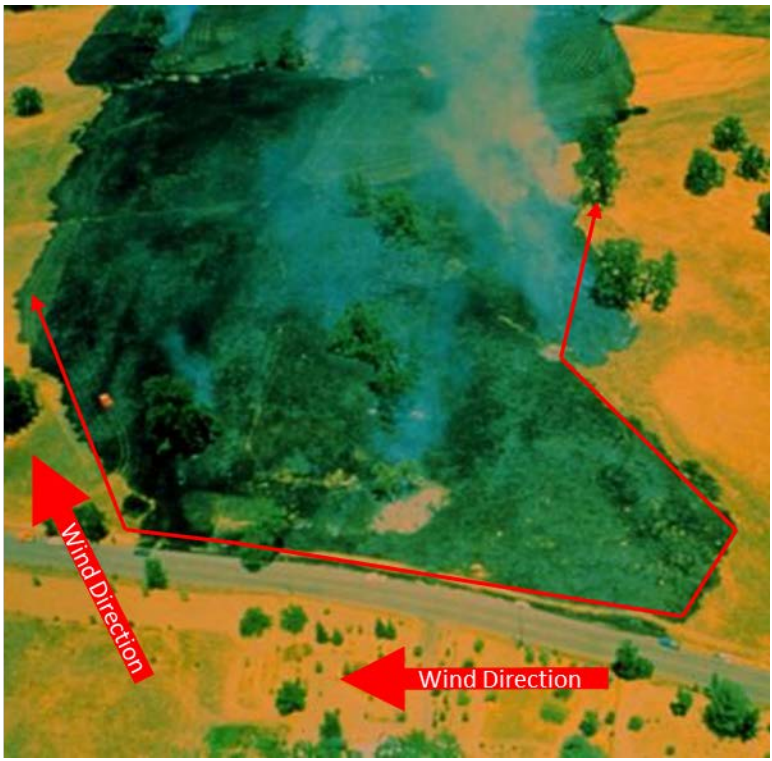
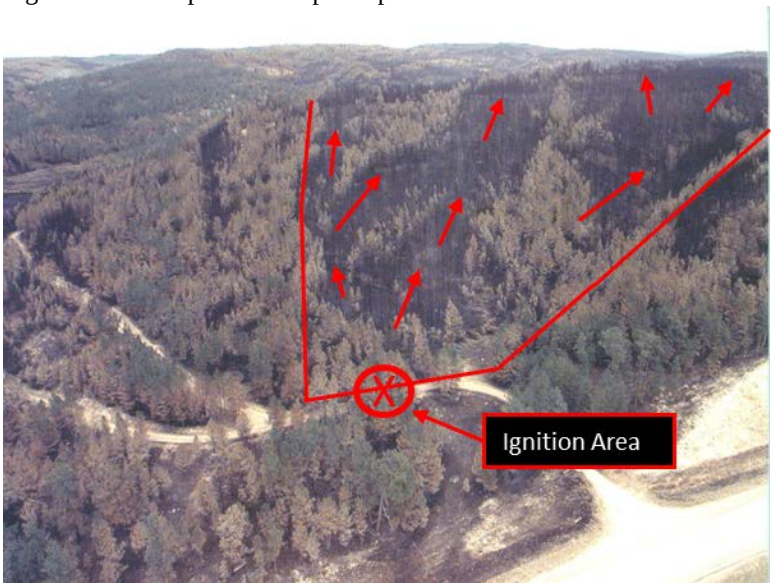


Figure 66 is an example of larger scale U pattern made up of multiple V patterns created due to changes in the terrain, fuels, and wind conditions.

Figure 66. Example of multiple V patterns.



General Reliability and Possible Exceptions

General Reliability: Can be very reliable.

Possible Exceptions: Fire suppression tactics and fire behavior can alter the shape of the initial pattern and must be considered. Rolling material, wind shifts, fuel type changes, spot fires, man-made or natural barriers are some influences that may affect the reliability of a V or U pattern indicator. V or U patterns will often die out due to slope reversals, changes in aspects, fuel bed changes, and other factors. The fire may then go through a period of microscale V or U pattern production or may back or lateral against a slope or wind. Once the slope or wind changes, the macroscale V or U may manifest itself again in the form of what looks to be a separate advancing fire. It is important to follow the indicators that connect these patterns together. V or U patterns may be generated which have no immediate relation to the ignition area.

Advancing Fire Macroscale Fire Patterns – V and U

Always consider the effects of fire suppression methods, barriers, wind changes and slope changes. Advancing V fire patterns are most likely to take place and indicate a wind or slope influenced advancing fire vector.

Advancing U fire patterns are more likely to be created on flat or gentle slopes or on steeper slopes where the wind direction is not in alignment with the slope.

Each shape can be a clue as to the forces that influenced the initial macroscale spread of the fire.

Advancing Fire Microscale Fire Patterns – V and U

The microscale patterns tend to be in areas of lower intensity, which often still retain a canopy over them. These microscale V and U areas are defined by locating the lateral transition zones near the ignition area using individual fire pattern indicators.

The closer you get to the ignition area, the more likely the macroscale V or U fire pattern will turn into a microscale V or U fire pattern. Conversely, fire burning away from the ignition area will likely establish a microscale V or U fire pattern which will transition to a macroscale V or U fire pattern as the intensity of the fire increases. This increase in intensity and transition from microscale V or U fire pattern to a macroscale fire pattern may be due to an increase in slope, wind, or a change in wind direction, including the fire coming under the influence of upper level ridge winds different than normal up canyon daytime winds.

Chapter 2 - Methodology

Methodology: A methodology is the systematic application (framework) of practices, procedures, and techniques (methods) common to the field of wildland fire investigation as applied to solve the problems of specific scene conditions and needs. It is a combination of two processes, a framework for problem solving, and the specific methods applied to gather data during a wildland fire investigation.

Systematic approach: A systematic approach includes the orderly, thorough, methodical, and regular (systematic) application of practices, procedures and techniques (methods) specific to the investigation of wildland fires. There exists more than one systematic approach to fire investigation. The framework for problem solving within a systematic methodology discussed in this guide is the scientific method used in the physical sciences. This framework for problem solving provides for the organizational and analytical process desirable and necessary in a successful wildland fire investigation.

Methods: There are numerous methods which can be used within the framework of the scientific method to accomplish a systematic wildland fire investigation. These methods are often unique to the specific discipline and scene. The scientific method is a framework which in and of itself does not provide or specify the methods that should be applied in solving each problem. It is up to the wildland fire investigator(s) to select the best methods to apply to the specific scene or circumstances. This guide includes recommended methods generally suitable for application to most wildland fire investigations.

Selected methods used during a wildland fire investigation should be those which are recommended and accepted by the discipline and profession of wildland fire investigation. Methods which have not been generally taught or reviewed by the wildland fire investigation community are not excluded from use but should be explained in the documentation of each investigation report along with the reasons for the application of such methods.

A systematic application of methods which have been peer reviewed and accepted by the profession of wildland fire investigators will reduce the number of challenges on purely procedural grounds and add the credibility of the wildland fire investigation community to each investigation.

Consistent application of recognized methods used during wildland fire investigations leads to the development of good investigative habits and practiced skills.

Applying Systematic Method(s)

Facilitates investigative competency

- Helps avoid premature conclusions.
- Helps avoid bias.
- Helps avoid use of rumor, conjecture, speculation.

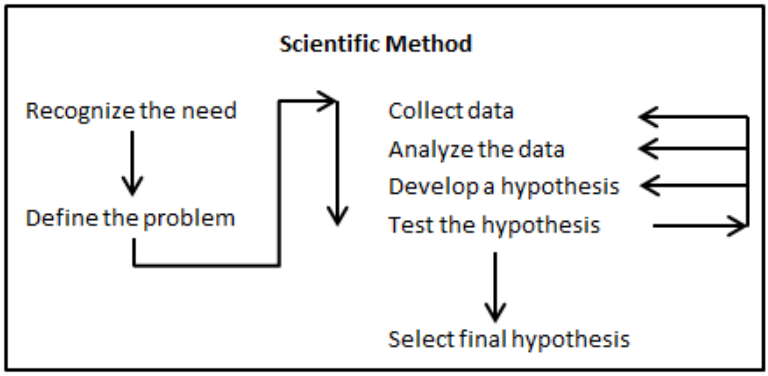
Facilitates consistent approach

- Investigation methods.
- Complete documentation.
- Applicable testing.

Relating fire investigation to the scientific method: The *scientific method* was not designed specifically for the investigation of wildland fires, or for that matter the investigation of any crime or violation. Therefore it may not be a perfect fit for all types of investigations but provides a framework for problem solving to which appropriate methods can be applied. The scientific method does not exclude the use of methods regularly used and accepted in law enforcement investigations.

The scientific method is a form of inquiry that is applied using the processes shown in Figure 67.

Figure 67. Diagram of scientific method.



A wildland fire investigation is really made up of a number of processes or parts (such as, fire pattern analysis, origin determination, cause determination, ignition sequence), each process or part can be accomplished individually or in concert with other parts by applying the scientific method to each. This often results in different parts of the scientific method being applied to different processes at, or nearly at the same time.

While some outlines of the scientific method show a step-by-step process, it should not be thought of as a linear process but rather an interactive

process. Several parts of the process are often taking place at the same time or are repeated at different phases of the investigation. For instance, during the collection of data, analysis of the data will often be taking place relating to the reliability of the data, what the data means, and the formation of a working hypothesis. Further, during the testing of hypotheses, additional data may be used and existing data may be re-evaluated potentially causing new hypotheses to be formed.

Use of the Scientific Method

1. **Recognize the need**: In this case, a wildland fire has occurred and the cause must be determined and documented to identify potential responsible parties and focus future prevention efforts. The needs may be numerous and/or more general, such as; "*The agency needs to prevent future fires and to do so it must investigate each origin and cause to provide data for a fire prevention plan of action*."

2. **Define the problem**: Having determined that a wildland fire has occurred, the wildland fire investigator should define how the problem can be solved. In order to determine cause, an origin investigation must be conducted first. The problem may be defined more specifically, such as: a wildland fire was ignited ten days ago and the area of origin is only available for examination and investigation of the origin and cause.

Applying the scientific method, clearly recognizing the need, and specifically defining the problem, leads to the formation of an investigative plan which will assist in solving the problem and increase the potential of success. An investigative plan will focus on methods which generate empirical data (facts). An investigative plan will identify questions that need answering, specific sources of data, and how data is to be collected.

An investigative plan may be provided in writing or communicated verbally. During extended investigations, written plans are encouraged.

It is important that each member of the investigative team understand what the plan is and what their role is in carrying out the plan. To coordinate and update the plan on an extended investigation, one person should be responsible for reviewing all new data, convey the needed information into modifications of the plan, and make the wildland fire investigators aware of new pertinent data and how it relates to the plan and the investigation as a whole.

The key is to brief the investigative team members and provide them with the knowledge they need to be able to identify what the issues are and how data/information relates to the overall investigation. This may generate follow-up leads and inquiries.

A investigative plan states what the problem is, the objective(s), task(s) for reaching the objective(s), responsibility of tasks, and due date(s).

An investigative plan is valid until new data is collected which indicates a need to change the plan. Sometimes, this is simply done by crossing off a task when it is completed and other times it includes modifying the plan to reflect new investigative leads (tasks) that need to be assigned to someone and a due date established. As empirical data continues to be collected, the plan is modified to reflect the new information gained and new data collection needs. All investigation plans should be viewed as fluid and flexible, rather than a rigid framework that cannot be altered as circumstances change.

3. **Collect data**: In the investigative world, *empirical data* are simply *facts* based on observation and experience that justifies a belief in the truth or falsity of an empirical claim. The definition of empirical data (Merriam-Webster) contains three parts:

- Originating in or based on observation or experience <empirical data>.
- Relying on experience or observation alone often without due regard for system and theory <an empirical basis for the theory>.
- Capable of being verified or disproved by observation or experiment <empirical laws> (Merriam-Webster, n.d.).

The term *facts* is often used in investigative reports to mean much the same as empirical data. The wildland fire investigator should be aware that they may be questioned using the term, *empirical data* and they should know what it means.

Data collection starts upon dispatch. Data collection and analysis often take place at nearly the same time and at all stages of the investigation.

Facts (empirical data) about the fire are collected. This does not include rumor, conjecture, or speculation. This includes an examination and processing of the scene, consideration of the fire behavior context, interviewing of witnesses or other knowledgeable persons, collection of physical evidence and the results of scientific research.

Specific sources of empirical data include:

- Observations.
- Witness statements.
- Physical evidence.
- Experiments.
- Experience.
- Other data collection processes.

4. **Analyze the data**: Prior to using the collected data to form a hypothesis, an analysis for reliability should take place to assure that it is factual and verifiable (empirical data).

Only empirical data, that which is based on observation or experience, which is verifiable or true is used to form working hypotheses. Data collection may continue during this process.

A second analysis is then conducted to determine the meaning (explain the problem) of the empirical data. All of the empirical data (facts) collected are carefully examined in the light of the wildland fire investigator's knowledge, training and experience. Subjective or speculative information should not be included in the analysis, only facts that can be proven clearly by observation or experiment.

The wildland fire investigator should ask, is the data pertinent to the case? If so, what does it mean to the case? While a wildland fire investigator may be able to answer this question based on their knowledge, training, experience, and expertise, sometimes they may not be qualified or only minimally qualified to answer these questions. In that case, requesting assistance from a more qualified person in that specific area of inquiry may be the appropriate level of analysis. In many instances, an initial analysis may be made by the wildland fire investigator(s) which is later subject to further analysis by someone more specifically qualified. For example, the wildland fire investigator may have found a downed conductor within the ignition area of the fire that exhibits artifacts consistent with electrical arcing, based on their training and/or experience. The wildland fire investigator may legitimately form a working hypothesis that the conductor was the cause of the fire, but further examination and testing by an electrical engineer may be necessary to test this hypothesis.

Data collection may continue during this process, leading to the need for further analysis. The process of empirical data analysis continues as new data is received, validated, and compared to existing working hypotheses.

The ongoing analysis of new data may result in the reinforcing or modification of existing working hypotheses, disproving or exclusion of existing working hypotheses and/or the creation of new working hypotheses.

The analysis portion of the systematic process assists the wildland fire investigator in forming working hypotheses by avoiding speculation and conjecture.

5. **Develop working hypotheses:** Hypothesis: "*…an interpretation of a practical situation or condition taken as the ground for action*", "*a tentative assumption made in order to draw out and test its logical or empirical consequences.*" (Merriam-Webster, n.d.)

The term *working hypothesis* simply denotes that enough data has been collected to consider a hypothesis but not enough to reasonably exclude the potential of other hypotheses or to select a final hypothesis. While the objective is to reach a single final hypothesis, numerous working hypotheses may be considered if the data supports such formation and consideration.

Empirical data collected is used to form working hypotheses using inductive reasoning. Empirical data is later used to test each working hypotheses in an effort to reject them using deductive reasoning.

Inductive reasoning is based on experience or empirical data alone, often without regard for system or theory. It is capable of being verified or rejected by observation (further empirical data) or experiment. The whole body of evidence (empirical data) is reviewed and considered using inductive reasoning to objectively analyze the data and form working hypotheses for a fire origin, cause, ignition sequence, etc.

Until data has been collected and analyzed, no hypothesis should be developed. It is not necessary to have all possible data prior to developing a working hypothesis but the data used should be reliable and adequate to form a working hypothesis which can be later tested against all the available empirical data. A hypothesis formed using initial empirical data may be later rejected or modified based upon new empirical data.

Based on the data analysis, the wildland fire investigator produces one or more working hypotheses that explain all of the known data regarding the origin and cause of the fire. These working hypotheses should be based solely on the empirical data that the wildland fire investigator has collected.

If more than one working hypothesis can fit all the data, it may be an indication that further data should be sought in an effort to come to a final single hypothesis. If one of the hypotheses is considered to be probable when compared to the empirical data, and others are only possible, then that is the hypothesis that will most likely be correct. (Probable and possible will be discussed later in this chapter.) Additional relevant data may be developed which will allow for further analysis of the working hypotheses and/or their rejection and/or the formation of additional hypothesis.

Potential Ignition Sources: Addressing potential ignition sources found in a specific origin area and developing working hypotheses should be based upon the data collected during the investigation, not the lack of data of a

cause. Almost anything may be possible. Wildland fire investigators need to address what is reasonable based on the empirical data obtained.

Since the very basis for a working hypothesis is empirical data, there is no process for forming working hypotheses absent data which supports a given cause. For this reason, the exclusion of standard cause categories is not necessary unless there is data which indicates one or more categories should be considered.

For example, if there is no railroad located near the general origin area, there is no need to form a hypothesis that a railroad related activity may have caused a fire. It is sufficient to document the absence of railroads in the area, without the formation of a hypothesis.

The basis for forming a working hypothesis and a determination of cause is the establishment first of a specific origin area, ignition area, and in most cases, physical evidence of an ignition source. There are some exceptions where a credible case can be made about the cause of a fire without determining the ignition area or finding physical evidence of an ignition source in an ignition area. This is an exception and typically includes admissions or eyewitness statements or other conclusive reliable data.

In most cases, the clear determination of a specific origin area and the search of that area in a systematic way will lend further data which can provide stronger evidence of a cause. Absent direct evidence of an ignition source, the wildland fire investigator may use the factors listed below to develop a working hypothesis and provide an opinion that the fire was of a specific incendiary or accidental cause.

Incendiary Factors Include:

- Origin area clearly defined and searched.
- No reasonable accidental ignition source is found after a thorough search of origin.
- Lack of accidental ignition sources.
- History of known and documented incendiary fires in area.
- Geospatial clustering of incendiary fires.
- Temporal clustering of incendiary fires.
- Multiple fires not related to accidental cause.
- Modified fuel bed.
- Ignitable liquids present not associated with other uses.
- Remote location with view blocked.
- Roadside area with low detection risk.
- Access blocked (gate, cut tree, etc.).
- Normally blocked access is open (unlocked gates).
- Fire suppression equipment committed or disabled.
- Witness statements.

The history of incendiary fires in the area should be recent, within the last few years. While two fires in close proximity may be an indication of a developing problem, they may have to be classified as *undetermined* in cause until additional data can be gathered with which a working hypothesis of incendiary can be formed.

The locations of historical incendiary fires should be such that when compared to the fire under investigation, the physical location is near other known incendiary fires, or in locations which are similar in nature to the other known incendiary fires, thus creating a *cluster* of like fires.

The time of day, day of the week, months, etc. create a common pattern which cannot be easily explained by coincidence. This may include the absence of fires during certain times of the day, days of the week, etc.

Multiple fires not related to an accidental cause, does not include two ignition area s near each other which can be attributed to evidence of a common accidental cause. For example, multiple fires along a roadside at the same general time may be determined to be incendiary in nature except when evidence of catalytic converter parts is found at the origin of one or more of them.

Modified fuel bed means the fuels in the ignition area have been arranged to facilitate the ignition, delay, and/or spread of the fire.

Remote area relates to the ease with which the scene is accessed and the level of protection from detection that the remote site allows.

Roadside areas with low detection risk includes nighttime fire starts when traffic is low and headlights can be seen from a distance or portions of a highway which allow someone to pull over to the side of the road and see long distances down the roadway for other traffic. This may also include areas where bends in the road at each end allow a person to eject an incendiary device without being seen by other traffic on the road.

Access blocked includes anything that may hamper fire suppression resources during their response. This may be created by the responsible party or simply taken advantage of by the responsible party.

Open areas that are not normally open indicate forced entry.

Fires occurring consistently during periods of fire suppression commitments to other incidents or when local fire equipment may have been tampered with to make it useless for fighting the fire.

Witness statements include those from reliable witness(es) who observe a person or vehicle of similar description leaving the area on multiple occasions or who actually see someone light a fire or other directly related observations. The wildland fire investigator should be cautioned against

relying upon a single incident of a person or vehicle leaving the area as there are often witnesses who have nothing to do with starting the fire who leave the area without being identified.

These factors are not all-inclusive, the wildland fire investigator may consider other similar factors but should not rely on just one or two factors to determine a cause of incendiary unless the factor is significantly unusual and it clearly cannot be explained by mere coincidence.

Accidental Cause Factors may include:

- Origin area clearly defined and searched.
- No reasonable accidental ignition source is found after a thorough search of origin.
- No reliable factors of incendiary cause.
- Witness statements support a specific cause.
- Video tape or photographic evidence supports a specific accidental cause.
- Data supports specific cause.
- Data supports a specific activity taking place just prior to the fires ignition and detection.

6. **Test the hypothesis**: For a hypothesis to be valid, it has to be able to be tested and withstand such tests without it being rejected. A hypothesis developed without supporting empirical data is not a valid hypothesis. Testing is conducted by comparing all the empirical data (facts) and applicable scientific research in an effort to see if any of the hypotheses can be rejected.

Valid hypotheses are those which can withstand serious tests when compared to all the known empirical data (facts) and scientific knowledge associated with the specific phenomena (Deductive Reasoning).

Deductive Reasoning

Reasoning from a hypothesis to account for specific empirical data, research or experimental results.

- Must be supported by the facts.
- Testing may be either cognitive or experimental.
  - Many fire causes will be tested cognitively, for example, based on knowledge, research and experience.
  - Others will lend themselves to further experimental testing.

Key analysis to this process is what other hypothesis could be supported by the same set of facts?

- If there are alternative hypotheses that are supported by the same facts, then the wildland fire investigator may not have gathered sufficient data.
- Gather more data and re-test.

This process of testing by deductive reasoning should focus on attempting to disprove or reject each hypothesis.

Typical analysis questions that should be considered:

- Does the hypothesis make sense in the context of all the facts?
- What facts support/contradict the hypothesis?
- Is there research that supports/contradicts the hypothesis?
- Can a peer review reject/support the hypothesis?
- What interpretation may an opposing expert apply to reject the hypothesis?
- What are the factual weaknesses of the hypothesis?
- Is there an alternative way to interpret the data?
- If so, why is the chosen interpretation the correct one?

Much of the testing conducted will focus on issues concerning the origin and/or ignition source of the wildland fire. It is recognized that it is impossible to replicate the exact conditions present at the location of a specific fire at the time of ignition. It is also recognized that published

scientific testing and experiments often address similar but not precise conditions as those present at the specific fire scene.

The less that is known about the actual conditions at the scene at the time of ignition, the harder it is to recreate those conditions. Therefore, the wildland fire investigator should strive to collect all useful data at the scene that is practicable in an effort to reconstruct the scene conditions for testing purposes.

Example: If there are pine needles, dry grass, duff, punky wood, and bark present at the origin of the fire, it should be recognized that each specific fuel can have a different ignition temperature/probability given a specific ignition source. The propensity for a pine needle to ignite is not the same as that of dry grass, or duff, or punky wood. Thus, as far as possible, it is important for the wildland fire investigator to identify all the components of a fuel bed.

Knowledge and experience pertaining to wildland fuels and their ignition characteristics is one way to test these fuels in *thought experiments*. Ignition tests may be conducted specifically on each of these components as it is often impossible to say just which of these fuels was the first fuel ignited.

Testing by *thought experiments* may be augmented by various degrees of physical testing, at the same time or at a later date. Physical testing can, and often will, be conducted by the wildland fire investigator and/or others more qualified. For physical testing to be valid, it should closely represent the conditions and circumstances actually present and test all components of the item at issue.

Physical testing of a hypothesis may result in casting doubt upon a hypothesis but fall short of rejecting it. In such a case it is up to the wildland fire investigator to determine if the doubt is significant enough to change their level of confidence in their opinions. Testing which casts doubt upon a hypothesis should also be evaluated for reliability, factual basis, and specific applicability. Further testing and/or data collection may be indicated but may not exclude a preliminary opinion based on sufficient related data.

If any hypothesis cannot withstand this examination, it should be discarded, and a new hypothesis should be developed and tested. This development and testing may include the collection of new data or the reanalysis of existing data. All feasible hypotheses should be tested in this manner.

If no hypothesis withstands the testing process, the cause should be undetermined at that time. The development of additional data or analysis may provide for the determination of cause on a fire cause previously classified as undetermined.

7. **Select the final hypothesis**: If only one hypothesis withstands testing, typically that hypothesis becomes the final hypothesis.

The final hypothesis is the one and only hypothesis which is not rejected by the data or fits the data to the level of probable. There may remain hypotheses which are reasonably possible and not rejected but which the data does not support to the level of *probable*. This determination is the sole responsibility of the wildland fire investigator who must be able to support such an opinion with the known data.

When two or more hypotheses withstand testing, the wildland fire investigator must determine if the facts support one hypothesis to be probable, over others that are just reasonably possible. When all hypotheses not rejected by the data are considered to be reasonably possible and none rises to the level of probable, the cause of the fire should be listed as undetermined.

Level of Certainty: The wildland fire investigator is being asked for their opinion based on their confidence in the data, data analysis, and testing of the hypotheses. There are two levels of certainty, Possible and Probable.

Possible: Hypothesis is feasible but not to the level of probable.

Probable: Likelihood hypothesis is true is greater than 50%.

If two or more hypotheses are equally likely, then the level of certainty must be *possible* for both.

Only when the level of certainty is considered *probable* should an opinion be expressed with reasonable certainty.

Select the hypothesis that best explains all of the known facts surrounding the origin and cause of the fire. This will then become the theory of the case that conclusions will be based upon.

The wildland fire investigator should clearly document the data which is used to form their opinion as to the *probable* cause of a fire and should be prepared to give testimony pertaining to the data upon which they relied for their opinion to determine the probable cause of a fire.

Premature Assumptions: Wildland fire investigators should avoid any type of bias in their investigation. One way to do that is to follow the pertinent leads no matter where they take the investigation while employing a systematic methodology. This allows the wildland fire investigator to come to a final conclusion after all reasonably available pertinent information has been considered.

The wildland fire investigator should avoid presumption as to origin and cause until all the relevant data reasonably available has been gathered and

tested against the working hypotheses, and a final hypothesis has been selected.

Expectation Bias: Coming to a conclusion without considering all relevant data, discounting data, or failing to seek data pertinent to the investigation. Data developed by a wildland fire investigator indicating certain activities or events does not necessarily indicate expectation bias.

For example, a witness providing a statement early in the investigation indicating a certain potential cause of the fire, does not of itself constitute expectation bias unless the wildland fire investigator ignores factual data that could indicate other potential causes.

The formation of only a single hypothesis as dictated by the empirical data is not in and of itself an indication of bias.

Confirmation Bias: Using the data to prove a hypothesis rather than test it and attempt to disprove it. Test all hypotheses for which there is supporting data. A hypothesis without a basis in empirical data is not a valid hypothesis.

Methods

Arrival on Scene

The investigation begins at the time of dispatch. Certain investigative practices take place during the receipt of the dispatch and during the response to the fire which will be discussed in combination with documentation of such activities in Chapter 5, Documentation.

Record the date and time of your arrival at the fire. The conditions at each fire may be different and will dictate the order in which the following actions are taken, but they all should be completed shortly after arriving on scene. Make notes of your actions.

Upon arrival at the fire scene, many issues will be competing for the attention and time of the wildland fire investigator. Sizing up the needs and situation should lead to a plan of action. The investigative plan, discussed earlier in this chapter, will often initially be verbal in nature but may need to expand to a written document during extended investigations.

The need to plan investigations remains constant and ongoing.

Based on the number of tasks that need to be completed and the time and effort required to accomplish them, the lead wildland fire investigator should form a plan of investigation which identifies needs for additional resources such as additional wildland fire investigators, law enforcement,

other experts, etc. Resource requests should be made in a timely fashion considering the time lag for response of such resources.

Additional resources may include specialized personnel who can provide technical assistance. A wildland fire investigator should never hesitate to call on another fire investigation expert who has more knowledge or experience in a particular aspect of the investigation.

Wildland fire investigation is a specialized field. Those individuals not specifically trained and experienced in wildland fire investigation will usually not be qualified to render opinions regarding fire origin and cause. They may, however, be able to give the qualified wildland fire investigator additional data which will aid in developing a sound theory of the origin and cause of the fire. A wildland fire investigator should know and follow agency policy when requesting specialized personnel or technical consultants.

The following descriptions are general and should not be considered all-inclusive.

Fire Behavior Analyst: A qualified wildland fire behavior analyst may be able to develop information about the general fire spread. While able to assist in large scale progression mapping of a fire and location of the heel of a fire, fire modeling is not a reliable tool for identifying a general origin area, Specific Origin Area, Ignition Area, or initial spread of the fire from these locations.

Canine Teams: Trained canine/handler teams may assist wildland fire investigators in locating areas for collection of samples for laboratory analysis to identify the presence of ignitable liquids. Other very specialized canine/handler teams are capable of tracking the responsible person(s) to and from the general origin area of wildland fires. Canine handlers should be consulted early for advice concerning potential contamination issues and information on the methodology of canine use.

Electrical Engineer: An electrical engineer may provide information regarding electrical transmission and distribution systems, along with assistance in evaluating other electrical sources of ignition.

Materials Engineer or Scientist: A person in this field can provide specialized knowledge about how materials react to different conditions, including heat and fire.

Industry Expert: When the investigation involves a specialized industry, piece of equipment, or system, an expert in that field may be needed to fully understand the processes involved.

Legal Counsel: A prosecuting attorney or agency attorney may provide needed legal assistance with regard to rules of evidence, search and

seizure, gaining access to a fire scene, obtaining court orders and preparation for litigation.

Case Management Specialist: In major fire or serial arson cases it is useful to have a specialist to organize, catalog, cross reference, and evaluate the information generated through the investigation and to advise the team leader about data collection and storage.

Geographic Information Systems (GIS) Specialist: With the increasing use of Global Positioning System (GPS) data and the accuracy of GIS mapping technology, consider including a GIS specialist on the investigative team to produce maps of the fire and diagrams of the origin scene.

Other Specialists: Based on unique circumstances, other specialists may be required. Consider the conditions regarding the cause of the fire and consult as appropriate.

Follow agency procedures to make arrangements to have the additional resources respond to the incident. If there is evidence of non-fire related criminal activity, immediately notify the proper authorities. Considerations for determining the number of wildland fire investigators assigned include available staffing, complexity, number of witnesses, and the size of the area to be investigated.

A minimum of two wildland fire investigators is recommended when forming an *investigative team* for some wildland fires. However, on occasion, circumstance may dictate that one wildland fire investigator will be responsible for all investigative tasks.

When multiple wildland fire investigators are assigned to the investigation, each person should be clear about what their responsibilities are and what the reporting expectations are. It is up to the lead wildland fire investigator to communicate this information to each investigative team member.

Safety issues: Safety is the first priority. Safety issues should be identified and mitigations incorporated into the investigative plan. Conditions at a scene may prevent the immediate search for the origin of the fire. If this is the case, secure the general area or heel of the fire as best as possible. Other tasks such as taking weather, identifying and interviewing witnesses, evidence protection, etc. should continue in a timely fashion as conditions allow.

Establish fire behavior context: Note size, direction of spread, rate of spread, flame height and length, fuel type, fuel volume, fuel arrangement, slope and aspect at the heel area of the fire. Be sure to record the time of your observations.

Record weather: Record temperature (wet and dry bulb), relative humidity, wind speed and direction in degrees, cloud cover, etc., and obtain fire weather readings taken by first responders. Weather readings taken as near to the general origin area as possible, and as soon after the fire's ignition are the most useful for understanding the initial ignition and fire spread. This should include taking weather in a location with similar aspect, fuels, elevation, crown closure and exposure to winds.

Weather readings taken at a distance from the general origin area and/or hours after the ignition and initial spread of the fire lose their value for purposes of understanding the ignition and initial fire spread. Representative remote weather station readings for the time of ignition may be of more value than on scene weather data taken hours after the ignition took place or from non-representative locations.

On-scene weather readings, even taken hours after the ignition, may help to validate the most representative remote automated weather stations (RAWS) by comparing weather at a specific time at the scene with weather readings at the RAWS sites. Representative weather stations should be as close to the actual scene as possible while reflecting the general elevation, aspect, shading, and fuels as those at the actual fire scene. The nearest RAWS station may not be the most representative.

Preliminary area of protection: Protection of the scene from further damage and contamination is a priority item. Scenes which have already been damaged by suppression actions or other activities do not exclude the need to protect the scene once the wildland fire investigator arrives. In some cases, trained fire suppression personnel who understand the need to protect the general origin area will have already identified what they believe to be its location and taken steps to protect it.

The preliminary area to protect is generally identified based upon the fire behavior context, macroscale fire pattern indicators, and witness statements. Witness statements include information from first responders and where they located the heel of the fire, if they have done so. The wildland fire investigator should test the first responders' hypothesis as to the location of the heel of the fire by comparing it to other witness statements, the fire behavior context, and macroscale fire indicators.

Based on these factors, the heel of the fire should be identified and secured as well as possible. This area can be small, a tenth acre or less, or it can be of significant size, 5-50 acres or more, depending on the individual fire size and the reliability of the initial data considered.

The techniques used to protect this area will vary depending on the terrain, access, suppression activities and needs, and public interest. Barrier tape and flagging may not be reasonable on larger size fires where the heel area is in excess of an acre in size and verbal warnings may be needed to be

given to suppression personal. Road blocks may need to be considered. If needed, post a security person at the area of protection and provide that person with clear instruction concerning access to the area.

Equipment and firefighters must be routed around this area. As much as possible, ensure that no one places any foreign materials in the area of protection. When appropriate, log the names and times that wildland fire investigators or any other persons enter and leave the secured area of protection. If the fire is such that an area of protection is not easy to locate quickly, as far as possible restrict access to a larger area that you believe contains the fire's general origin area.

Witnesses: Interviewing witnesses is a key component to establishing the initial area of protection and general origin area and is very important to the investigation overall. Witness statements should be analyzed for reliability and tested against the fire behavior context, fire pattern indicators, and other witness statements before using as part of the empirical data/factual information to form a working hypothesis. Note that multiple witnesses may have seen the same event from different perspectives and that their understanding of a complex incident may be skewed by their personal experience, education and location.

Record the identifying witness information that may be used for investigative follow-up:

- Names and identifying information, such as date of birth, driver's license number, physical address, phone number.
- Make, license number, and description of vehicles at the scene.
- Note any remarks made by persons at the scene that are in any way related to the fire.

Civilian or suppression witnesses can provide information including:

- Size of fire on arrival.
- Specific fire behavior.
- Fire progression.
- Suppression strategy.
- Weather conditions.
- Evidence.
- Other witnesses.

Locating and Protecting Physical Evidence: Physical evidence can be almost anywhere. A reasonable search of the area in and around the heel of the fire and access routes or other areas of potential activity may produce physical evidence which will need to be protected and secured. This may include areas removed from the fire origin.

Evidence Protection Area: The area where a reasonable expectation that evidence may be found, based on experience, observation, location and specifics of that incident.

- Both outside and inside the burn.
  - Look up, down, and all around.
- Be cognizant of where you put your feet and where resources drive and park.
- Minimize the impact.

When walking around, look before you plant your feet inside and outside the black. Walk where you walked before when possible to minimize impact. Be mindful of where you and others park.

Minimize the impact of all activities whenever possible. While protecting the general origin area, look for such things as equipment, vehicles, tracks, discarded items, or any other objects or impressions that may have value as evidence. Do not disturb these objects until they have been properly documented. Flag or otherwise protect anything you find. Footwear impressions at or near the general origin should be protected and traffic should be re-routed around them.

Areas of the Fire

The *General Origin Area* may be anywhere from a few square yards to an acre or two in size. The wildland fire investigator should re-evaluate any area flagged by first responders to ensure that it includes the fire's likely Ignition Area.

Even with large areas, there is a systematic method for identifying the Ignition Area where the fire started. Fire behavior is controlled by weather, fuels, and topography, referred to as the fire behavior context. As a fire moves over an area, it leaves distinct fire patterns composed of individual fire pattern indicators that will show the fire's progression. The various fire pattern indicators, when taken together, analyzed within the fire behavior context, and compared with witness statements, can lead the wildland fire investigator to the Ignition Area.

The origin area of a wildland fire is broken down into the following components; overall fire area, General Origin Area, Specific Origin Area, and Ignition Area.

Overall Fire Area: Also referred to as the heel of the fire. This is the area which surrounds the General Origin Area. This area should be large enough to be sure that the General Origin Area is contained within it. The overall fire area is formed by the first major advancing vector of fire and the associated lateral transition zones. This area is often visible from the air on a large scale in the form of a larger macroscale V or U pattern. It continues well into the area of macroscale backing fire pattern indicators. This is the

area where the investigative team will begin its on-scene search for the General Origin Area.

General Origin Area: The area of the fire that the wildland fire investigator can narrow down based on macroscale indicators, witness statements and the fire behavior context. It may be a limited area or several acres in size but is typically less than one half acre in size.

The size of the General Origin Area is going to be dictated by what the indicators determine, not the potential ignition sources. Once the General Origin Area has been identified by use of macroscale indicators, witness statements, and the fire behavior context, a boundary may be determined and marked. The General Origin Area is recommended to be the smallest area to be protected during the scene investigation.

Specific Origin Area: The smaller area within the General Origin Area where the fire's direction of spread was first influenced by wind, fuel or slope. The Specific Origin Area is where the transition zone between advancing and backing indicators, comes together with the lateral indicators on the flanks. The Specific Origin Area is where the wildland fire investigator is primarily looking at microscale indicators and generally needs to be down on their hands and knees or stooping to observe the indicators and potential evidence.

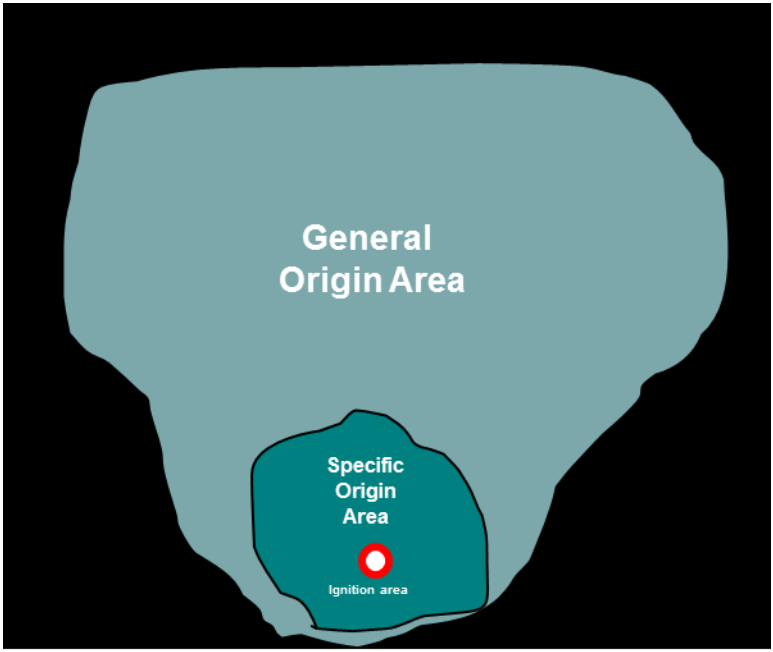
Generally this area is characterized by lower intensity burning and subtle microscale fire pattern indicators. It will usually be no smaller than about 5'x 5', and may be substantially larger, depending on indicators and other factors.

Ignition Area: Contained within the Specific Origin Area will be the smallest location which a wildland fire investigator can define, within the Specific Origin Area, in which a heat source and fuel interacted with each other and a fire began. This is the Ignition Area. The area near or in the Ignition Area is where the chances of any physical evidence of the actual ignition source increase. The Ignition Area should always be validated by fire pattern indicators no matter how obvious the ignition source is.

In most wildland fire investigations, an exact point where the first fuels ignited and came into contact with a heat source, a Point of Origin, cannot be determined. This is due to the fact that from the time that a fire originates, is ignited, to the time a wildland fire investigator arrives at the Specific Origin Area, decomposition of the fuels and other physical makeup of the scene has altered or destroyed portions of it, particularly on the microscale. Thus it is far more realistic to speak in terms of the smallest area able to be defined based on the fire pattern indicators.

Point of Origin: The exact physical location within the Ignition Area where a heat source and the fuel interact, resulting in a fire.

Figure 68. Drawing of an Ignition Area, Specific Origin Area, and General Origin Area.



Determining the General Origin Area

When working to identify the general origin area, it is recommended that the wildland fire investigator(s) first identify an advancing area of the fire consistent with witness statements and the fire behavior context. This is often identified by high intensity burning and higher consumption of fuels. Evaluating damage differential between areas of high fuel consumption and those of lower or low fuel consumption will assist in the identification of advancing, lateral, and backing fire spread on the large scale.

Frequently this will be the area which shows the cleanest burn, and may be characterized by a classic and larger scale V or U-shaped pattern. It is often bounded on both flanks by lateral fire pattern indicators showing less complete consumption of fuels.

Once an advancing area has been identified, macroscale fire pattern indicators and the fire behavior context should be used to follow the advancing fire back towards its source.

Care should be exercised in not starting the search for the general origin area too close to the transition of advancing and backing vectors. Multiple

ignitions that burned into one fire will have multiple advancing areas, some of which can be missed if the search for a single general origin area is started too close to the advancing and backing transition zone. If more than one advancing area is located within the heel area of the fire, all should be traced back to their source to determine if multiple ignitions took place or if all advancing areas can be tied through fire pattern indicators to a single origin. In the case of a single source of ignition, all advancing fire patterns should lead back to the same source, sometimes including areas of transition from advancing to lateral and/or backing fire spread.

General Origin Area Investigation Techniques

Once the general origin area has been narrowed down using macroscale indicators, considering the fire behavior context, and witness statements, it is then necessary to identify the actual general origin area boundaries. If other resources are there and available, for example, canine or man tracker, these other resources should be consulted about the plan of action and needs prior to entering the general origin area.

Walk the exterior perimeter. When transition zones, control lines, or other information indicates that it is safe to do so, walk the perimeter of the general origin area twice, once in each direction: once in a clockwise direction and once in a counter clockwise direction. Look at the unburned area as well as the burned area for evidence and comparison fuels. Examine and mark directional fire pattern indicators at the perimeter of the general origin with colored flags or other appropriate markers once they are located. If evidence is located, protect and mark it with white flags. Mark the boundary of the general origin area once it has been confirmed and re-assess security needs.

Identify advancing fire area. Identify the initial run that the fire made within the general origin area. Frequently, just as in the overall fire area, this will be the area which shows the cleanest burn, and may be characterized by a classic smaller scale V or U shaped pattern. This smaller scale V or U pattern may be part of the larger V or U pattern or a separate V or U pattern which leads towards the macroscale V or U pattern. It is often bounded on both flanks by lateral fire pattern indicators showing less complete consumption of fuels.

Enter the general origin area. The primary objective when entering the general origin area is to locate the specific origin area and ignition area. This process should be done in a manner which produces the least scene disturbance possible. Photograph the general origin area prior to entering. Once the initial run has been identified, the general origin area should be entered from the head or advancing side of the run; this is the side generally furthest from the suspected ignition area. The reason to enter from the advancing side is that the fire pattern indicators are more obvious in this

area and the wildland fire investigator is less likely to *overrun* the specific origin area than if the general origin area is entered from the heel or backing side of the fire.

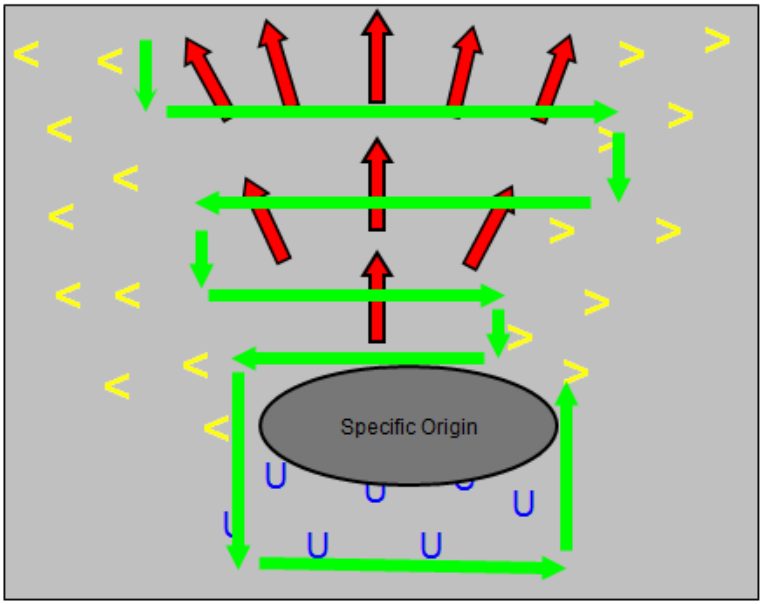
Each scene is unique. There may be exceptions to this recommendation such as fires that do not include advancing indicators. For example, a fire burning from a roadway into the wind or downhill may only demonstrate lateral and backing indicators; fires starting on a ridgetop or peak may only demonstrate backing indicators; fires on flat ground and no wind; fires burning during periods of high humidity and/or fuel moisture with no wind or slope influence. The recommended method for these situations is to follow the most demonstrative indicators back to where they come together. In addition, if the general origin area is on a steep slope where material and soil may be dislodged by the wildland fire investigator and roll down-hill and disturb the specific origin area, then the wildland fire investigator may choose to enter from the backing or heel side of the general origin area and work up-hill in an effort to protect the scene. Another example would be when features such as roads and other breaks in the fuel allow for access while still protecting the specific origin area. Wildland fire investigators are encouraged to use the technique which best provides for scene protection and to document reasons for selecting a given method.

While working the advancing fire pattern indicators within the general origin area, the wildland fire investigator should search a pattern from lateral transition zone to lateral transition zone while moving progressively closer to the location where the fire came from. Care should be used to inspect the ground where the wildland fire investigators place their feet prior to disturbance for the presence of evidence and or fire pattern indicators.

Work the General Origin Area

- Enter from the advancing area when appropriate.
- Work across the run until the lateral transition zone is reached.
- Move several feet closer towards the origin and re-cross the advancing run to the opposing lateral transition zone. Repeat above steps until specific origin area is reached (Figure 69).
- Walk around the specific origin area perimeter once in each direction taking care to stay well outside the initial backing area as shown in the figure below.

Figure 69. General Origin Area search pattern design to find the Specific Origin.



Identify fire pattern indicators: Mark the location of each fire pattern indicator located with a visible marker. Color-coded pin flags are the most visible and easiest markers to use (see Figure 70).

Recommended colors include:

- Red – advancing fire indicator.
- Yellow – lateral fire indicator.
- Blue – backing fire indicator.
- White – evidence only.
- Lime green – items or points of interest.

Use lime green flags for areas, items, or points of interest (for example, the four corners of the ignition area). Explain the lime green flags in the report. One suggested technique is to lean the indicator flags in the direction that the fire is spreading toward.

Figure 70. Example of general origin area with red, yellow, white, and blue pin flags identifying the fire pattern; and green pin flags identifying items of interest.

Work the Specific Origin Area

The manner in which you conduct the search of your specific origin area (SOA) will be dependent upon the specific conditions that exist on your scene. There are a number of suitable techniques available to conduct a search of a SOA. Whatever method is chosen should reflect a systematic approach that protects scene integrity as much as practical.

Three techniques for conducting a search will be discussed in this section that may or may not be applicable to your specific scene. There are common tools that may be employed as needed in all three of the search techniques which will be discussed following the description of the three techniques themselves.

Prior to applying any search technique to the SOA it is important that the wildland fire investigator(s) do the following:

Identify the specific origin area:

- Mark specific origin area boundary.
- Walk perimeter at least twice.
- Examine/photograph area prior to entering.
  - Indicators.
  - Visible potential ignition sources.
  - Other evidence.

The following three search techniques are not intended to limit or exclude the use of other applicable systematic search techniques:

- Perpendicular lane search technique.
- Parallel lane search technique.
- Grid search technique.

Perpendicular Lane Search Technique

- Walk the perimeter at least twice before entering and photo document prior to entry, being careful not to walk in the area of the backing fire transition. Consider using binoculars to identify and examine indicators, possible evidence, and visible potential ignition sources prior to entering the SOA.
- In most cases, start in the advancing area of the fire and work toward the ignition area.
- Establish lanes one at a time perpendicular to the fire run.
  - Use of colored twine and stakes recommended.
  - Uniform width: (12-18 inches apart).
  - Enter from the advancing side of the fire.
  - Continue to work towards origin.
- Systematically move twine and stakes forward to form the boundary of the next lane. Be careful to make sure that there is overlap in the examination of each lane to assure that gaps do not occur in the search coverage.
- When multiple wildland fire investigators work side by side searching each lane, make sure that there is overlap in search coverage between adjoining wildland fire investigators.

Figure 71. Perpendicular lane search technique.

Parallel Lane Search Technique

- Walk the perimeter at least twice before entering and photo document prior to entry being careful not to walk in the backing indicator transition zone. Consider using binoculars to identify and examine indicators, possible evidence, and visible potential ignition sources prior to entering the specific origin area.
- In most cases, start in the advancing area of the fire and systematically work toward the ignition area.
- Multiple lanes are laid out parallel to advancing fire progression, towards the suspected ignition area. Ensure that far lane ends are established in the green or well into the backing area. Do not disturb the specific origin area when laying out lanes.
- This technique works well with multiple wildland fire investigators and or when working a narrow specific origin area.
- When multiple wildland fire investigators are used to work side by side searching each lane, make sure that there is overlap in search coverage between adjoining lanes and wildland fire investigators.

Figure 72. Parallel lane search technique.

Grid Search Technique

- Walk the perimeter at least twice before entering and photo document prior to entry making sure not to walk in the backing indicator transition zone. Consider using binoculars to identify and examine indicators, possible evidence, and visible potential ignition sources prior to entering the specific origin area.
- Search process when using the grid will be dependent on the scene.
- Squares or rectangle size is dependent upon scene circumstances. Make sure that grids extend beyond the edges of the specific origin area. Use caution when laying out the grids to avoid disturbing the specific origin area prior to the search.
- This technique is useful when the locations of multiple pieces of evidence need to be documented or when you plan on collecting the debris for sifting/examination. Photo document the location of evidence within each grid and label by grid ID, such as “Grid 3A”.
- Grids should be numbered and lettered for documentation. Tie collected evidence and/or debris to each grid designation.

Figure 73. Grid search technique.

Tools for Searching a Specific Origin Area or Ignition Area

Whether using a perpendicular lane, parallel lane, or grid search technique, the following practices and tools may need to be applied.

Search each lane or grid as needed:

- Visually.
- Using magnification as necessary.
- Remove lightweight debris by brushing or blowing.
- Use straight edge to focus search pattern.
- Continue locating and marking indicators with flags.
- Employ magnet search for ferrous metals.
- Metal detector search for non-ferrous metals.
- Screen debris and/or bag debris for future analysis when appropriate.
- Continue until the ignition area is identified and/or ignition source is located.
- Document and secure any evidence.
- Continue searching past ignition area or evidence until clear backing indicators are encountered.
- Document the perimeter of the specific origin area.
- Document the location/perimeter of the ignition area.

In all cases, continue to work search pattern up to and through the ignition area.

Visual Search and Magnification: There are a variety of conditions that may exist at each specific origin area depending on the fire intensity, fuels present before and after the fire, and other possible variables. Variations within the fuel bed at the specific origin area may necessitate the use of magnification in some parts of the visual scan and not in others. Magnification can include a standard magnifying glass, high powered reading glasses, or other such devices.

Remove Lightweight Debris: There are many tools that can be used to carefully move lightweight debris during the visual examination. Gently blowing on the debris is often enough to move it and assist examination. Using a bulb syringe is another tool commonly used to carefully move lightweight debris. Hair picks and forceps can also be used along with any other tool which allows for the careful removal of the lightweight debris without causing contamination.

Straight Edge: The use of a straight edge or other such techniques to keep track of the area being visually searched, and in some instances to assist in focusing on an area, helps to conduct a complete visual search. The application of the straight edge or other technique should not disturb any

area not already searched and should not cause any contamination of the scene.

Mark Microscale Indicators with Flags: During the systematic search of the specific origin area, the wildland fire investigator(s) will also be searching for microscale fire pattern indicators which will help to narrow the specific area down to the ignition area itself. Microscale indicators should be marked with pin flags according to their directional vector and documented.

Magnet: The use of a pull-release type magnet to search for ferrous metals is recommended. Note the name and model of the magnet used along with the pulling strength of the magnet. Move the magnet just above the surface of the debris in a systematic pattern which overlaps to assure that the entire area is covered. It is recommended that the magnet surface be visually checked after each pass to identify any objects collected and the approximate location of where it came from.

One option for using a magnet is to place a plastic zip lock bag over the magnet turned inside out, which can then be turned right side out when an object is picked up. Thus the object is captured within the zip lock bag as evidence. Another way to collect the objects from the face of the magnet is to place a clean piece of paper underneath it when the pull-release handle is pulled, dropping the object onto the paper for photographing and/or placing into an evidence container.

In any case, photo documenting of the objects collected should be done as soon as it can safely be done, and may be done a second time under conditions more favorable for better quality photographs.

Metal Detector: Use a commercial grade metal detector to search for non-ferrous metals as needed. Use a systematic search pattern which overlaps to assure full coverage.

Screen Debris or Collect Debris: If a decision is made to screen the debris in each search area, it should only be done after all other search processes have been applied.

If a determination is made that the debris will be bagged, the grid search technique for conducting a search allows for more precise locating of where each bag of debris came from. Each grid can be marked and the debris in most cases from each grid put into a single bag. Grid sizes larger than 18 inches square are not recommended, and 1foot square grids are common. Photo documenting each grid prior to and after collection of debris is recommended.

Screening or collection of debris may be used as an option only in the ignition area as determined by the wildland fire investigator(s) dependent

on each scene's needs. It is better to screen/collect too large an area than too small an area.

Secondary Opinion: Consider the need for a secondary origin and cause investigation or second opinion. Situations which may indicate the need for a secondary origin and cause investigation include major cases and/or when no physical evidence of the cause is found.

If a secondary origin and cause investigation is planned, the origin should be kept secured and as undisturbed as possible. Scene integrity, contamination issues, level of security needed, and needs for long term security should be addressed depending on the individual circumstances.

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Chapter 3 - Fire Scene Evidence

Types of Evidence

Evidence is classified into two broad categories

Direct: Testimony of witness who sees the act. A witness observes the defendant at the scene, setting the fire. Other senses also apply.

Circumstantial: Tends to prove a fact in dispute indirectly. Tire prints that match the defendant's vehicle recovered at the scene, Deoxyribonucleic acid (DNA) recovered from an arson device, are both examples of circumstantial evidence. Eyewitnesses to the actual setting of a wildland fire are an infrequent occurrence and most cases will rest on circumstantial evidence.

Evidence is further categorized by type

- Testimonial: Testimonial evidence is that which is testified to by a witness having firsthand knowledge. This may be observed or experienced. For instance, a witness observed defendant light burn barrel, witness smelled smoke, witness heard fireworks, or witness saw tire tracks. Testimonials can be direct or circumstantial.
- Real: physical or documentary: Real physical or documentary evidence are tangible items which help to establish a fact. Examples of physical evidence could be footwear impressions found near the scene or remains of an ignition source. Examples of documentary evidence may include burning permits, ownership maps, and social media.
- Demonstrative and Judicial Notice: Models, charts and graphic aids are examples of demonstrative evidence. Judicial notice refers to certain facts which are already well established and are common and of verifiable knowledge.

Admissibility of Evidence

Relevance: Evidence must have some connection to the facts of the case and must be pertinent to the issues of the trial. It must also assist the trier of fact in proving facts in dispute.

Authentication and Identification: For evidence to be considered as reliable, it must be competent and authentication establishes that it is the same item as collected by the wildland fire investigator. Further, records and testimony must establish that the evidence item has not been tampered with, altered or contaminated.

Methods to Ensure Competent Evidence: To ensure competent evidence is provided to the trier of fact, exclusive custody and control in a secured area needs to be established through a complete written record of chain of custody.

Evidence may be admissible provided it was obtained legally under one or more of the following circumstances:

- Non-private area - Evidence in open fields or public lands.
- Plain view - Immediately recognized as incriminating, observed by an official who was legally present.
- Exigent Circumstances - Emergency circumstances exist that could cause destruction or loss of evidence.
- Consent - Where there is an expectation of privacy, a person who has a controlling interest in the area to be searched may give their consent to authorities.
- Abandonment - Abandoned by owner, not recommended, difficult to establish proof, consult with prosecutors.
- Warrant (Criminal or Administrative) - A court order directing the wildland fire investigator to search for and seize specific items. This is a preferred method. Some jurisdictions allow for an administrative warrant where legal justification needed is substantially less than a criminal warrant.

In most wildland fire investigations, the wildland fire investigator can expect to recover the majority of evidence from private areas under the Plain View Doctrine and/or exigent circumstances.

Legal References to Evidence

Michigan v. Tyler

In Michigan v. Tyler (U.S. Supreme Court, 1978) fire officials investigated a fire while it was still burning. They re-entered the building the following morning after temporary interruption due to safety and visibility concerns and found evidence of arson. They continued to re-enter over the next several weeks. The evidence was challenged on grounds that re-entry was unconstitutional. The court ruled that the first two mornings were legal entries. Subsequent entries were ruled illegal and evidence suppressed.

As a result, the U.S. Supreme Court established legal authority for wildland fire investigators to conduct a warrantless search for evidence of the origin and cause of a fire based on public safety concerns and exigent circumstances.

- Court held that while a fire is still burning and under control of fire department a warrantless entry to determine the cause of the fire is reasonable.
- Evidence in plain view may be seized.

- Temporary interruptions due to hazards, poor visibility, etc., allow for subsequent warrantless re-entry within "*a reasonable time period*" (no bright-line rule).
- Absent "*exigency of sufficient proportion*," re-entry must be by consent or warrant.

If a wildland fire investigator must come back the next day, it is recommended that you have the property owner sign a consent to enter form. Consult with local law enforcement or District Attorney regarding local practices and considerations concerning private and public lands, and curtilage issues.

Michigan v. Clifford

In Michigan v. Clifford (U.S. Supreme Court, 1984), investigators arrived five hours after fire suppression crews had left the scene of a fire in a private residence.

Investigators found evidence of arson at the origin area and additional evidence in an area well away from the origin. No warrant or consent to search was acquired by the investigators. The search was ruled unconstitutional and a motion to suppress was granted.

As a result of Michigan v. Clifford, the court further defined legal parameters regarding the legality of an origin and cause investigation conducted after an emergency or exigent circumstances cease. A search of a fire scene was ruled unconstitutional and motion to suppress granted when the court determined that exigent circumstances had no longer existed at the time that access to the scene was made.

Collection and Preservation Procedures

Whenever possible, clean latex gloves should be worn when handling or working with evidence items.

Non-fragile fire cause objects

Items that are less subject to damage from heat and flame when collected are:

- Metal fragments.
- Catalytic converter particles.
- Welding slag.
- Power line hardware.

Collection procedures

- Carefully pick up and place in folded paper bindle.
- Place into hard sided container.
- Pack in cotton to keep fragile edges from breaking off.
- Seal and tag.

Fragile fire cause objects

Objects that can be easily damaged or destroyed during the collection process are:

- Cigarette remains.
- Matches.
- Fusee slag.
- Fireworks remains.
- Incendiary devices.
- Exhaust carbon.

Collection procedures

Some items can be picked up carefully by hand.

- Place in a bed of cotton in a hard sided container.
- Seal and tag and hand-carry to lab.
- Consult with your laboratory if unsure how to properly package any item of evidence.

Basal area lift technique

Technique used to prevent damage to fragile items. Use clean shovel or trowel and thin piece of flexible sheet metal. Clean tools with approved cleaning materials between each collection.

- Score line through ash & duff, down to soil around the object
- Leave border of several inches surrounding the object.

- Work the shovel or trowel into the dirt, under the object, until the clod of dirt and ash with object has been freed.
- Slide sheet metal under it and lift the clod intact.
- Place the metal and clod into a cotton padded container of appropriate size.
- Seal, mark, and hand carry to lab.

Figure 74. Basal area lift technique.

Ignitable liquid residue

Indicators

- Obvious signs of trailers and pour patterns; puddling; deep seated burning; scorching and sooting.
- Strong odor of gasoline and/or diesel, but deodorized kerosene, lighter fluid, alcohol and others may not be detectable by smell.

Search techniques

- Search perimeter areas.
- Use a canine (K-9) trained team to detect ignitable liquids or a portable hydrocarbon detector.

Figure 75. Canine and handler.

Sampling locations

- Take samples where the K-9 or detector registers an alert.
- Take a comparison sample in an area that did not register a positive reading.

Areas more likely to have residual ignitable liquid

- Areas of lower intensity fire due to lighter vegetation and in areas where the liquid may have been shielded from the heat.
- Deep compacted duff, punky logs and stumps that have not consumed completely.
- Areas of sparse vegetation or bare soil.
- Detectable amounts of hydrocarbon residue may remain in the soil for lengthy periods after the fire; however, microbial action may degrade the sample quickly.

Collection procedures

- Pick up suspected charred wood, soil or vegetation and place in a clean metal can (no glass) or other approved container or wrapping material.
- Fill can no more than 2/3 full with material.
- Avoid direct and cross-contamination.
- Clean collection tools with approved cleaning materials between each sample.
- Have new, unused can or packaging materials available for comparison sample at lab.
- If delay of more than several hours in getting sample to lab, samples should be frozen.
- Any containers found near or at fire scene should be collected.
- If there is still liquid present, pour a small sample (203 ccs) into a clean container with an airtight, non-rubberized seal.
- Seal and mark the container and hand carry to lab. If it will be several hours, store in a cool environment.
- Most crime labs will be able to isolate ignitable liquids by means of gas chromatography/mass spectrometry (GC/MS) analysis and other tests.

Firearms

- Never submit a loaded firearm to a lab unless it is delivered in person and then with advance approval of the lab.

Projectile evidence

- If lodged in wood or other material, it is advisable to leave it there.
- If a projectile is recoverable, do not attempt to clean it.
- Wrap it separately in a paper bindle, place on cotton padding in a hard sided container, seal and mark.

Cartridge cases

- Wrap each case in a separate paper bindle and seal in separate hard sided container.
- Seal and mark accordingly.
- If comparison to a firearm is necessary, submit both to lab.

Footwear & Tire Impression

Collection procedures:

- Photograph using a tripod to position the camera directly over the impression. Use a normal lens (50 mm).
- Place a linear scale next to and on the same plane as the impression.
- Set the f-stop on f/16 or f/22 for a greater depth of field.
- Photograph with the flash at different angles, between 15 and 45 degrees.
- Shoot several photos, move the flash two or more angles to the impression.
- Cast with dental stone.
- Once a cast is made, do not clean it off.
- Wrap it in tissue, dirt and all, and place in a cotton padded box, pack securely, seal and mark accordingly.
- **Shoe impressions should usually be cast.**
- **Casting of a tire impression is problematic:**
  - Difficult to match impressions to an individual tire.
  - Effort involved is significant.
  - Many crime labs prefer photographic documentation of tire impressions.

Figure 76. Casting of shoe impression using dental stone.

As with all types of evidence, collections that will be submitted to a lab for analysis, contact the lab prior to the need and get an understanding of their preferred methods.

Fingerprints

Latent fingerprint evidence may remain after a fire. Prints have been recovered from beverage containers, food wrappers, cigarette packages, vegetation and incendiary devices. Labs have also successfully recovered DNA (Deoxyribonucleic acid). from fingerprints. Do not assume that the fire has rendered latent print evidence unrecoverable.

Collection procedures:

- Handle object in such a manner as not to add extra prints to it; latex or nitrile gloves should be used.
- Package objects in a box in a manner that they will not break or roll around.
- Do not package fingerprint evidence in plastic bags.

DNA evidence

Never overlook the possibility of DNA evidence. Recent advances in DNA recovery and analysis have increased the likelihood of obtaining identifiable DNA, even on heat damaged items. Hair, blood, semen, epidermal oils and saliva are all potential sources of DNA evidence. Consider anything that may have been contacted, such as beverage containers, clothing, cigarette match device, or food.

Collection procedures:

- Collect items believed to contain DNA evidence with a gloved hand or clean tools, using fresh gloves and cleaned tool for each sample collected.
- If the item has wet blood, semen, or saliva, air dry the item prior to packaging.
- Package item in clean paper or envelopes with sealed corners: do not use plastic.
- Submit to local crime lab as soon as possible.
- If there are questions, contact your local crime lab for directions on correct collection and packaging procedure.

Miscellaneous evidence

Other types of evidence may include:

- Paint transfers.
- Blood stains.
- Hair and fibers.
- Glass fragments.
- Soil.
- Tool marks.
- Trace evidence.
- Trailing K-9 (scent evidence).

Trace evidence - found in small, but measurable amounts. Examples include hair, fibers, blood, or soil. Scent evidence includes where subjects have been at or around the scene.

Photography

Photographs provide visual representation of a fire scene.

Photographs must be a fair and accurate representation of the scene.

Photographs are the best method of reproducing any scene and can record facts more accurately than a word description. Photo documenting the scene will be further addressed in Chapter 5, Documentation. Photographs can provide the following advantages:

- Present facts and physical circumstances visually.
- Pictorially preserve perishable evidence.
- Permit consideration of evidence which cannot be transported into a courtroom, because of immobility, size, weight, etc.
- Verify your testimony.
- Reveal facts or evidence that you may have overlooked.

Camera Kit

- Digital Camera (back-up camera is recommended).
- Macro lens.
- Wide angle lens.
- Zoom lens.
- Tripod.
- Removable flash.

Photography Guidelines

Prior to moving: Evidence should be photo documented in place as it is found. This should include photos which show the location where the evidence is in relationship to other key features of the scene and close-up photographs that show the details of the item to be collected and the area immediately around it. The evidence should then be photographed with a scale in close proximity, being careful not to touch or contaminate the evidence item.

Figure 77. Evidence with scale to show size of object.

During collection: It may be useful to photo document the evidence recovery process, this can be accomplished both using photography and videography. This documentation may include the methods used for collection, the tools used, and the container used, including markings on the container identifying the evidence item.

After collection: When it is safe to do so, and when it is necessary, better quality photographs of an evidence item may be taken once the evidence has been moved to a safe location. Blue background paper may be used to place the evidence item on for better contrast. These photos may include comparison evidence items as long as cross contamination is avoided.

Photographs should appear natural to the eye by taking them at eye level for a general view of the whole scene; the camera should be positioned as an eyewitness would observe the scene. The photograph should give a fair and accurate representation of the scene or the subject matter. Unless taking close-up photographs of small evidence or of indicators, generally a 50mm lens, which is closest to the human eye, should be used. This is important if the photographs are later used in court proceedings.

- Begin photographing as soon as possible.
- Create a photo log.
- Record the type of equipment, film and/or storage medium used.
- Number and describe each photograph.
- Taking more pictures is better than not enough.
- Do not write on the pictures.

- Photos should be an accurate and fair representation of the scene.
- Establish the positional relationship between the wildland fire investigator taking the photo and item(s).
- Document photo points on a photo diagram with the appropriate symbols.

Types of photographs, photo logs, and general scene photography will be discussed in Chapter 5, Documentation.

Videography

Videography can provide overall fire scene footage, supplement photographs, document interviews and interrogations, and document surveillance operations. Using video exclusively without accompanying still camera photographs is not recommended. Be aware of comments you make during the video recording of any aspect of the investigation.

Subjects to be videotaped

- The fire in progress in early stages.
- Bystanders and vehicles at the fire area.
- Fire suppression activities relevant to the investigation.
- Aerial views documenting direction of fire spread from general origin area.
- Witness viewpoints.

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Chapter 4 - Witness Statements and Interviews

Overview

Physical evidence can only provide part of the overall investigation. At some point, it may be necessary to interview witnesses, victims, or suspects. Interviews can add weight and meaning to evidence. The wildland fire investigator should conduct interviews in a professional manner.

Poor interview techniques may compromise the investigation.

As a wildland fire investigator, you may interview witnesses.

Know your agency policy regarding the conducting of witness interviews.

The quality of the interview techniques govern the quality of the information that will be obtained. The interview can be an important tool in conducting the overall investigation. You may only get one chance to do it right, so do it right the first time! PLAN AND PREPARE FOR THE INTERVIEW. Additional classroom training specific to interviewing techniques should be sought by wildland fire investigators who conduct interviews.

Typically, poor or incomplete interviews will require a follow-up interview which requires finding and contacting the person to re-interview, and in the end, more work than if it is done right the first time.

The wildland fire investigator should develop and maintain a witness list. Follow agency guidelines and format. The witness list will provide information for inclusion into and formation of tasks for the overall investigative plan.

Interview vs. Interrogation

An interview can be described as "*a conversation with a purpose*". In the case of a wildland fire investigation, the purpose is the collection of factual data to assist in the formation and selection of a hypothesis which explains where the fire started (ignition area), what started it (ignition source), and how it started (ignition sequence), including identification of the responsible party or parties. Interviews are a detailed questioning of a subject which elicits statements concerning the investigation. Most witness interviews will not require an advisement regarding the right to avoid self-incrimination, such as a Miranda Warning.

The Miranda v. Arizona ruling generally defines interrogation as any direct questioning about the crime under investigation or any words or actions on

the part of the police that the police should have known were reasonably likely to elicit an incriminating response from a person who is considered a suspect.

The legal requirements for Miranda include the questioning of a suspect by law enforcement regarding a crime they may have committed, AND the subject is or could reasonably perceive they are in custody.

Wildland fire investigators who are not peace officers are generally exempt from giving the Miranda Warning as long as they are not working at the direction of or as an agent for a peace officer.

Witnesses do not normally need to be given a Miranda Warning if they do not meet those conditions. Wildland fire investigators should follow their agency guidelines regarding the questioning and interrogation of subjects.

The main responsibility of a wildland fire investigator is to establish the origin, cause, and ignition sequence of the fire. The need for interrogation may arise during this process. Each wildland fire investigator should consider requesting a qualified law enforcement investigator when the situation dictates a higher level of expertise is needed. Consider the legal and strategic complexities involved that may fall beyond the scope of your training and experience.

If for various reasons you believe your witness is now a suspect, follow agency policy on referring this information to law enforcement for follow-up.

Witnesses

In most cases witnesses consist of:

- Voluntary witness (reports the incident).
- Unknowing & voluntary witness (saw/heard something but did not realize there was any offense).
- Reluctant witness (doesn't really want to be involved for variety of reasons).
- Hostile witness (won't speak to you).
- First responders (fire, medical, law enforcement).
- By-standers.
- Reporting party.
- Local residents.
- Property owners.
- Recreationists.
- Local resource users.
- Workers in area.
- Airborne personnel, lookouts.
- Dispatchers.

Witnesses are affected by numerous physical and emotional factors which can color and question the information given to the wildland fire investigator. Among these is the visual attraction of flames rather than the burned area to many witnesses. Emotions may cause a person to give prejudicial information, to lie or to forget events. Lighting, distance from the incident or physical limitations may result in an inaccurate interpretation of the events observed. Explore all the circumstances surrounding their evidence/recollection without leading and prompting the witness. Be aware that the witness may have seen something that they cannot explain since they do not know the precise terminology of a wildland fire investigation, or they may apply terms differently. Seeing fire in their perspective may mean only smoke seen in the distance, as opposed to smoke or flame specifically. You want it to be their story not influenced by you.

Voluntary Statements

Generally, persons at the scene will give a written statement voluntarily, but may be reluctant to do so at a later date. In some instances they will make unprompted voluntary verbal statements. These should not be confused with an actual witness interview; the wildland fire investigator should ask these persons to record any observations or other knowledge they are willing to give in their own handwriting.

The wildland fire investigator may assist the subject in drafting the written statement. Have the witness review and acknowledge (initial) corrections. Include the start and end times of the interview. When writing or drafting a

witness statement for them, make sure that they can read and write what you have written. Have the witness sign the written statement. Signing of a statement shows personal ownership. The original statement should be maintained in the lead wildland fire investigator's file.

The following guidelines can be used when obtaining voluntary statements:

- Have the person write the facts in detail.
- If possible, provide the person with some degree of privacy, so this can be accomplished uninterrupted.
- The statement should be read back to the witness.
- Have the person number, date, and sign each page.
- The wildland fire investigator should initial each page.
- Ensure that all identifying information is obtained from the witness.

Interviews

Definition: An interview is the consensual questioning of a witness. It differs from a voluntary statement in that the wildland fire investigator is asking the witness specific questions about the incident rather than having the witness write a voluntary statement. A pure version statement should be the first step in an actual interview.

A pure version statement is getting the witness' statement without contaminating them with your words. Let them tell their story without influence from the interviewer. The subject should be doing 70 – 90 percent of the talking during this information-gathering phase of the interview. This is the art of active listening.

The purpose of an interview is to establish in a non-accusatory way, a permanent record of the witness' recollection. This can come from witnesses, victims, informants (and sometimes suspects) or any person who may have evidence surrounding the circumstances of the fire with the ultimate objective being to elicit usable information. This is the Who? What? Why? Where? When? How? of the incident. This is an opportunity to find out what each witness has to contribute to the investigation.

Interviews can take place in a number of environments. In the field, in a vehicle, in an office, at the witnesses' home, all are potential sites for an interview. The wildland fire investigator should attempt to conduct interviews in private and in locations with the least amount of distractions and best conditions for recording if applicable. Discuss with the witness where the interview will take place to ensure it will meet his/her needs of privacy. You may in these cases phone ahead and decide to meet at a time and location where the witness's anonymity is ensured.

The witness should not be inconvenienced if at all possible. If the witness wants to have an early morning meeting because it suits them and their schedule, do so. This will also demonstrate that you are interested in their information and that you respect their wishes thereby establishing some trust and confidence. The end goal is to reinforce to the witness the importance of co-operating and the fact that he or she may have critical information that is important to solving the crime.

The interview may be short or take hours, depending on the extent of the information the person may have. Initial interviews typically take 20-40 minutes but the wildland fire investigator should take the time needed to get all the information that time will allow. Interviews should be conducted by wildland fire investigators who understand fire investigation and fire behavior, whenever possible, or in combination with other wildland fire investigators. The wildland fire investigator should brief interviewers that do not have a working knowledge of fire investigation as to what questions to ask, and key statements to listen for.

The wildland fire investigator should control the interview but avoid being authoritative or overbearing and should seek to reduce distractions. The wildland fire investigator should seek to establish rapport/trust, and avoid rushing when possible. Witnesses may provide estimates but should not be encouraged to guess.

Witnesses should be interviewed as soon as possible. If possible, prevent witnesses from discussing what they saw or heard with other witnesses.

Interview privately and separately (no group interviews). Information obtained from a witness should not be discussed with anyone other than persons who have a legitimate right to know. Information obtained from witnesses should be recorded by:

- Notes of the interview made by the wildland fire investigator which are later reduced to a formal record of the interview, or
- A statement prepared by the witness or interviewer and signed by the witness and interviewer, or
- A tape or digital recording which is transcribed at a later date, or
- A combination of these methods is advisable in some situations.

Regardless of how the information is recorded, the final interview report should contain the name, address, identifying information, and phone number(s) of the witness. Follow your agency's policy regarding forms, format and use of recording devices.

If there is a need to interview minors, a parent or guardian should be present during the interview. The wildland fire investigator must follow the law in the jurisdiction and his/her agency policy regarding interviews of minors. It

is also a good policy to have another person present as a witness during the interview of a minor.

Witnesses impaired by alcohol or drugs should be interviewed later. Angry or hostile subjects may escalate the interview into a more aggressive encounter. Have an additional wildland fire investigator or law enforcement officer accompany you during such contacts.

Non-English speaking subjects will require a translator. Mentally challenged individuals may require special interview techniques and assistance. Consider getting assistance.

Know your agency protocol for interviewing persons of the opposite gender. Generally for men interviewing a female witness, have another male or female investigator present.

Interview guidelines

- Identify yourself.
- Explain purpose of the interview.
- Record identification and contact information, physical and mailing address, contact phone number, use legal name.
- If they have no phone, ask if there is a person and phone number you can leave messages with.
- Ask the subject to tell you what they saw.
- Ask witness to mentally recreate circumstances, chronological timeline is best.
- Allow the subject to tell their story without interruption, from start to finish. Don't take any notes and don't ask any questions, just listen to the story and watch the witness.
- Do not lead the witness in any direction or force them to stay on one subject.
- If the witness gets off track of the investigation, short questions may be interjected to get them back on the subject.
- Ask the witness if they have photographs or video of the incident. (Particularly on their phone).
- Have the witness tell the story a second time.
- Take notes (even if you are recording the interview).
- Ask them to pause or repeat if you need to catch up in note taking or you did not understand a comment.
- Ask specific questions on key points the witness did not voluntarily provide or if you don't understand a point.
- Use open ended questions.
- Avoid negative questioning, such as "*I don't suppose you recall what he was wearing, do you*?"
- Do not lead the witness, such as "*Was he driving a red pickup*?"

- Questions may be interjected to get the witness back on track.
- Record visual and audible expressions.
- Make a note of questions the subject asks the interviewer.
- Summarize and review important points.
- Consider taking witness back to scene.
- If the witness is capable and willing, have them prepare a written statement.
- The wildland fire investigator may write the statement for the subject, if necessary.
- Have the witness review, correct, sign and date the statement. Assure that they can read.
- Make sure the witness initials any corrections.
- The wildland fire investigator should also initial each page.
- Where applicable, have witness draw a sketch showing where they were in relation to what they observed. Follow this up with witness viewpoint photographs.
- Thank the witness for their assistance.
- Give them contact information in case they remember any other important information.

Avoid

- Being in a rush.
- Being authoritative or overbearing.
- Using leading questions.
- Asking compound questions.
- Using questions that elicit short answers.
- Interrupting the subject.
- Negative questioning.
- Leading the witness in any direction or force them to stay on one subject.

If the witness saw the wildfire itself, ask specific details such as; fire behavior upon arrival, fire perimeter size, exact location, wind direction and any changes in direction, color of smoke and changes in color, material fire was burning in (for example, grass, brush, timber). Be aware that very often witnesses will tell you the location where they saw flames, and they'll strongly believe that's where the fire started. Keep in mind when questioning about fire size to be specific, otherwise witness will likely discuss smoke plume size, flame size. If there were multiple fires, question the size of the smoke columns to help determine sequence of ignition.

At the end of the interview ask "*Is there anything else important that we've missed or that you haven't told me about?"* or "*What else should I have asked you about that I haven't asked*?" and "*Who else may have additional*

knowledge?" Summarize the statements of the witness for them, review, and re-affirm key responses. Ask specific questions on key points witness did not voluntarily provide. Leave your contact information and encourage them to call if they have further information.

The wildland fire investigator should summarize key points of each witness interview in field notebook and provide a briefing to the lead wildland fire investigator concerning the information gathered.

If for various reasons you believe your witness is now a suspect, follow agency policy on referring this information to Law Enforcement for follow-up.

Potential sources of information

Reporting parties: The reporting party may have seen the fire at an early stage and may be able to provide valuable information that will assist in determining the general origin area. Their observations are important because the origin investigation can be narrowed to the area burned at the time of the report. They may also be able to corroborate the information obtained from other witnesses. Keep in mind, however that occasionally, the reporting party may also be the person responsible for causing the fire.

Initial attack crew: The initial attack crew plays a vital role by making observations while en-route and upon arrival on the scene. Crew members may be able to provide valuable information pertaining to the general origin area, the area that had already burned prior to their arrival, fire behavior conditions, identification of people and vehicles in the area, weather, damaged locks and gates, items of potential physical evidence and other abnormal conditions. Also, initial attack resources can document initial suppression tactics, including water and retardant drops, hand line and/or hose lay locations and most importantly, any backfire or burn out operations. Anyone involved in the suppression of the fire may have a camera or phone/camera and may have taken photos or video. Contact initial attack resources early and ask for photos along with the actual time and date stamp for the photos. Note if the time and date stamp are accurate or what amount they are off.

Air resources: Air crews can make the same types of observations as ground crews regarding the potential area of origin, direction of fire spread, and people or vehicles leaving the area. Photographs of the fire taken by the air crew personnel often prove invaluable in showing areas burned, direction of spread, and intensity. Check with first responder air resources to see if they did take photographs.

Civilian witnesses: Witnesses can provide information about unfamiliar vehicles or people that may have been in the area. They can also provide

information on the condition of the fire, such as smoke conditions, intensity, rate of spread, and weather. They may have also taken photographs.

In a situation where there is a need to conduct multiple interviews in a short period of time, for example, a fire has started adjacent to a full campground, strongly consider requesting additional resources to assist with the interviews. At a minimum, obtain basic identification and contact information before potential witnesses leave the area so that they may be interviewed at a later time.

Do not share your opinions of what you have seen at the fire or information about the person or thing that may have started it to anyone other than officials who need to have the information. Remember, your job is to gather information, not to give it.

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Chapter 5 - Documentation

The purpose of documentation during a wildland fire investigation is to produce a true and accurate representation of the investigation with sufficient detail to describe findings and explain conclusions. Simply put, it is memorializing the facts, allowing wildland fire investigators to recall and communicate their observations at a later date.

The data and documentation from the field, forms the foundation for the investigative case file. The major point of emphasis is the need to document what is observed, heard or done, and maintain the documentation in a readily available location for reference and production later.

Civil and criminal fire cases can span a period of many years. Documentation is a critical process that enables the wildland fire investigators to refresh their memory and provide testimony. Documentation allows for subsequent wildland fire investigators to follow-up on the work of others, for expert review of the investigation as well as defense, forensic and peer review of the investigation.

Prosecutors rely on the documentation of the investigation for almost all of their actions in a case. Third party interests, including citizens who may have been damaged or harmed by the fire may rely on the documentation of the investigation to recover their damages. Administrators use documentation of fire cause and ignition sequence to take administrative, fire prevention, or collection actions.

Documentation - Terminology

It is recommended that wildland fire investigators use the terminology provided in this guide, such as General Origin Area, Specific Origin Area, and ignition area be consistent with the meanings taught in this guide, including in notes, sketches, diagrams, and reports. If a term is not being used in the recommended context, or if another term is being used which readers may not be familiar with, the wildland fire investigator should define the term in the report for clarity.

Forms of Documentation

Documenting the scene falls under five main categories and can occur in various forms:

- Written field notes.
- Interview/statements (recorded and written).
- Photographs/video/metadata/photo log.
- Sketches/diagrams.
- Written reports.

The wildland fire investigator can use various combinations of these methods to document the scene.

The extent to which an investigation will need different types and levels of documentation is dependent upon the specifics of each fire scene.

All types of documentation used alone and in combination assist in tying the data and facts of the investigation together. Basic photography of all scenes is accomplished through the use of digital cameras widely available today. Photography includes the photos themselves, the attached metadata, and photo logs. Sketches are rough in nature and serve to orient the reader of the report and document locations of items of interest for later possible inclusion into a diagram. Sketch and diagram documentation can include photo points, directional fire patterns, fire progression vectors, evidence locations and measurements.

Measurements of features and items of interest can be documented by multiple methods including field notes, sketches, and photography. Field notes will form the basis for any final written report and can be supported through the use of photography, sketches, witness statements, etc. Evidence logs help to document details of evidence location, collection, and storage. Witness statements may be documented on agency specific forms.

Documentation – Field Notes

The taking of field notes is a continuous and ongoing process that includes information associated to all five categories of documentation. It begins with the receipt of the assignment and continues even past the field work itself, and may include a timeline of actions and events. Data collection generally begins at the point you receive your assignment.

Items that may be documented in field notes during the receipt of assignment include; when you were first called, who or how you were notified of the assignment and what they told you, when you responded, how long it took you to respond, what route you took in responding, and what the nature of your assignment was. Consider asking questions during this phase to begin the data collection process. For example, the time the

fire was first reported, reporting party name and contact information, witness information, and first responder resources at the scene.

Notes should be:

- Readable. Notes need to be readable not only by you, but also by anyone else who may need to read them.
- They should contain complete words to avoid misunderstanding.
- Brief. Use short sentences or phrases. Avoid long, rambling sentences that could confuse a reader.
- Descriptive. Use words that actually describe what you see. For example, write *burned match* rather than *burned object*. Often sketches will be valuable in supplementing written descriptions.
- Accurate. Notes need to be accurate as to times, dates, names, addresses, weather conditions, scene description, and physical descriptions of vehicles and property, including serial numbers and license plates. They should also include map locations and measurements.
- Factual. You should keep your personal opinions or conclusions not based on the factual data to yourself. It is not advisable to include them in your notes.
- Complete. Answer the questions: Who? What? When? Where? Why? How?

Upon assignment: Obtain as much background information as possible from the dispatcher. The location may dictate the need for specialized equipment. Record the day, date, and time of the fire. The age of the scene may have an effect on the planning of the investigation. Identify the reporting party and contact information.

Determine what your scope of work and authority is. Remain aware of your scope and authority and do not assume any authority beyond the required objective.

En-route to the scene: As practical, document radio traffic concerning fire location, access, behavior, size, direction of spread, and other pertinent data. Observations of suppression activity, condition of access and egress routes, gates, vehicles in the area, witnesses, activities in the area, smoke column, size of fire, color of the smoke, direction of smoke drift, wind conditions, evidence, and any changes that occur over time can be of importance to the investigation of the fire and should be documented. The wildland fire investigator may be questioned regarding initial observations and have to give testimony about them.

Upon arrival at the scene: There are several basic functions that are commonly performed in each wildland fire investigation. They include:

- Overall coordination of the investigation.
- Examining the fire pattern indicators.
- Searching the scene.
- Photography.
- Note taking.
- Mapping/diagramming.
- Interviewing witnesses.
- Evidence collection and preservation.

Each function may be assigned to an individual team member or a team member may be responsible for several functions, but everyone should be aware of who is performing each function. Functional assignments should be documented.

If an investigative team is established, a briefing that describes the objectives of the investigation and who will be responsible for completing the associated tasks should be held prior to the investigation. Personnel should be advised of the condition of the scene and safety precautions required. Safety of wildland fire investigators is paramount, document the safety briefings.

As soon as practical, the wildland fire investigator should document their arrival time and where the fire is actively burning, this may later help determine the general origin area. This may include the size, active fire area, location/boundary, suppression activities, direction of spread, fire intensity, fuels, topography, weather, and other observations which will assist the wildland fire investigator in establishing the fire behavior context needed to determine the general origin area.

Do not assume that someone else has taken down this information prior to your arrival. Don't rely on suppression crews to provide you with this information because most suppression resources will be focused upon their assignments and may not see the overall picture.

As soon as possible, the wildland fire investigator should take weather readings. The purpose of taking weather readings is to provide the most accurate weather conditions at or near the origin of the fire, nearest to the time of ignition. Readings should be taken as close to the origin time and location as possible. It may be helpful to also take wind and other weather readings along ridgelines near the origin to provide data for large scale progression of the fire and ridge wind conditions.

The wildland fire investigator should document the location where weather readings are taken using GPS or other means. The value of on scene weather readings may diminish as time passes after the fire's ignition.

However, the wildland fire investigator should take weather data on scene even when they arrive later. This later data may be representative and/or may be used to compare to Remote Automated Weather Stations (RAWS) to determine which station may be most representative of conditions occurring at the scene.

Arrangements should be made to secure and preserve the scene until the scene is released. The wildland fire investigator should know his or her legal authority to access the scene if it is not on public property. There are a variety of scene security measures which can be utilized. The wildland fire investigator should select the method which best fits the specific conditions of each fire scene.

Field notes should include documentation of the measures employed to provide scene security. This should include any actions to protect an area larger than the general origin area and/or restricted access to an area larger than the general origin area. Various methods of securing the area may apply – dependent on the scene the wildland fire investigator may need to run barrier tape, position security personnel, or institute closures that restrict access. Each action should be documented as to time and location.

Once the wildland fire investigator, using fire patterns, the fire behavior context, and witness statements, has determined a reasonable area that likely has within its boundaries the general origin area, the wildland fire investigator should arrange for scene protection needs and document them in field notes. At the least, this documentation should include the method, time, and area secured. The wildland fire investigator, when appropriate, may want to maintain a scene log that records all personnel who enter the scene.

Determine and document what types of fire suppression actions and other activities have already taken place within the area to be protected to determine what alteration or disturbance exists or what influence fire suppression actions had on fire progression and fire patterns.

Once the general origin area has been identified, the methodology for examining it should be documented in field notes and may include details of precise procedures used to find indicators and search patterns used. This will continue to be documented as the specific origin area and ignition area are identified and processed. Field notes for the general origin area, specific origin area, and ignition area, should include indicator categories identified, exemplar indicators used, evidence located, and localized fire behavior signs or indications. These notes should be complete enough to demonstrate that the indicators used were reliable and allow the wildland fire investigator to testify to them during later proceedings.

There is no set sequence of when the general origin area is to be documented. Some wildland fire investigators may prefer to document

(photo, measure, sketch, etc.) the indicators as they find each one, some prefer to locate all the indicators then go back and systematically document the indicators. This second sequence allows for the selection of the best indicators once all the indicators have been identified and allows for reaching and protecting the ignition area sooner.

The first sequence should be considered if there are specific concerns about potential destruction of the indicator(s) and there is no reason to believe that the ignition area will be disturbed during the delay caused by the documentation process. The wildland fire investigator may also want to take into consideration the angle of the sun when taking photographs of indicators and time the sequence of photo documentation when the best sunlight is available or take more than one set of photographs.

When practical, start writing things down immediately rather than trying to recreate what happened.

Maintenance of field notes is an agency policy specific practice. Check with and follow your agency protocols for retention of notes.

Documentation – Interviews and Statements

Forms of documentation for interviews and/or statements include:

- Notes.
- Written statement (signed).
- Recorded interviews.
- Memorandum of Interview.
- Video tape.
- Supporting documents.

Notes pertaining to an interview, along with any audio and video should be maintained per agency policy.

Wildland fire investigators may take a written statement created by the subject, which can be combined with a Memorandum of Interview to document the wildland fire investigator's recollection of the interview.

Any or all of the items referenced above become part of the investigative case file.

Documentation – Sketches

Sketches are created in the field as part of the scene documentation. As appropriate, sketches may be the only *drawing* in your report. Sketches are used to enhance and illustrate field notes to better refresh the wildland fire investigator's memory when preparing the final report and when and if subsequent litigation or administrative processes take place. For that reason, the wildland fire investigator should be clear as to what they are portraying on the sketch and that it is reasonably accurate.

Multiple sketches are often appropriate and recommended. It can be difficult to capture all the data needed on one sketch without overcrowding the sketch. It is recommended to create separate sketches for the fire progression or fire pattern indicator map, or both, another for photo points, another for the general origin area, and a separate sketch for the specific origin area and/or ignition area. The complexity of the scene and investigation will influence the number of sketches which may need to be created in the field.

Diagrams (when needed) are created from the information in the field sketches and other data. Sketching is part of the field note and follow-up office process.

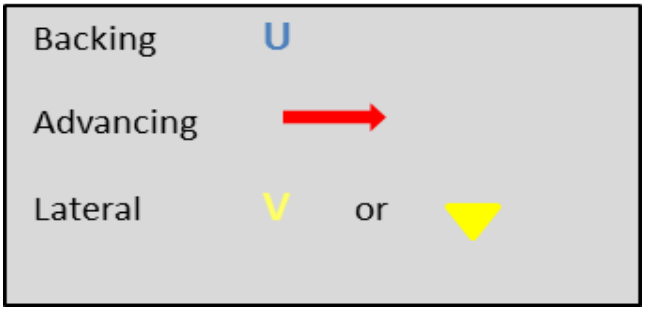
Sketches are not to scale and represent only a general overview of the area.

Consider using a scene sketch during witness interviews to help understand and document the witness's explanation of what was observed. The sketch

used or created during the interview should be initialed, dated, and kept as an attachment to the statement.

Sketching fire progression should include an outline of the General Origin Area, landmarks for orientation and to refresh memory, and a mapping of general fire progression using recommended symbols. The recommended symbols for showing fire progression are identified in Figure 78.

Figure 78. Fire progression symbols.



Sketching should be done while at the scene, during the investigation, not back at the office. Symbols do not necessarily need to be in color on the sketch.

Fire Progression Sketch

The field sketch does not need to have a symbol at each fire pattern indicator located, and symbols on a sketch map do not necessarily represent a specific fire pattern indicator on the ground, but rather portray a general progression of the fire spread. Orient the symbols as near as possible according to map compass orientation.

Indicate on a separate sketch where the General Origin Area boundary is. It is recommended that the boundary measurements of the specific origin area be shown on the fire progression sketch. Continue to show fire progression based on the fire pattern indicators, for example, microscale indicators. Locate and plot the boundaries of the ignition area. The ignition area boundary should be accompanied on the sketch with the dimensions of the area and be approximately the same shape and size as the ignition area on the ground.

Photo point sketch

Photo point symbols establish the positional relationship between the wildland fire investigator taking the photo and item(s) being documented. It is recommended that a separate photo point sketch be created to avoid crowding the fire progression sketch. The photo point sketch is often combined with the plotting of the representative fire pattern indicators to create a link between the photo points and the location and alignment of the fire pattern indicators.

There is no standard addressing how many photos should be taken to document a scene. The wildland fire investigator should consider how photos are intended to be used and how many photos are needed to reproduce for others the items being portrayed.

Photo points may be portrayed using the following symbol on both sketches and diagrams.

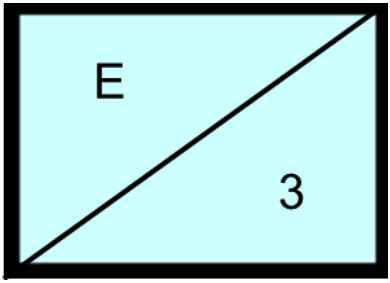
Figure 79. Photo point sketch/diagram symbol.

Photo numbering on sketches and the photo log should link digital photo metadata with the photo point number. On investigations which have multiple wildland fire investigators taking photographs, one option is to add the wildland fire investigator's initials to the front of the photo number on the photo log and electronic title, to link photos to individual wildland fire investigators.

Evidence

Depending on the number of evidence items, there may be a need for a separate sketch just for evidence. Shooting range fires and roadside fires are examples of areas where multiple evidence items are likely to be present and which may require a separate sketch for evidence. The suggested symbol for evidence on sketches and diagrams is identified in Figure 80.

Figure 80. Evidence symbol.



Document evidence locations both inside and outside the general origin area. Document relevant items, not just what you think started the fire. Ensure proper evidence handling both during the documentation phase and the collection phase. Whenever possible, document the evidence in place prior to collection using photographs, sketches, and notes.

Reference Points

Reference points should be documented on each sketch. Reference points are used in correlation to field measurements to show relationships between items of interest on the scene. They may also be used to recreate the scene at a later date.

Reference points should be marked in such a way that their location can be found at a later date. This can be done by taking a GPS reading and photograph for each reference point and placing a metal object, such as a large nail, into the ground which is less likely of being disturbed over time and can be detected later by the use of a metal detector. Figure 81 is the suggested symbol for reference points on sketches and diagrams.

Figure 81. Reference point symbol.

Measurement techniques – Sketch

There are three suggested basic methods of measurements

- Right angle transect.
- Azimuth.
- Intersecting arcs (triangulation).

The technique a wildland fire investigator uses will likely be case specific, dependent on slope, size of the area, vegetation, and obstacles. The measurements themselves may be printed right onto the sketch map or on a measurement log and keyed to a point on the sketch map. This process is often done with two tape measures but can be done with one tape measure and colored twine.

Consider placing the measurement method used on the legend of the sketch map for clarity and as a reminder later on.

Right Angle Transect

- Mark reference points on ground with locatable marker, for example nail, rebar, paint-mark.
- Recommend use of N/S and E/W bearings.
- Utilize the units shown on your measuring tape, for example feet/inches, meters/centimeters.
- Use multiple steel tapes.
- Can use multiple reference points.

Step 1. Select and mark two reference points on either a north-south, or east-west axis. Label them RP-1, and RP-2 as appropriate.

Step 2. Measure and document the distance between the two reference points.

Step 3. Standing at RP-1, take and record the compass bearings to the other reference point(s).

Step 4. Lay one tape measure out between the two reference points, on a N/S or E/W bearing. You may also elect to run a piece of colored twine between the two reference points.

Step 5. Deploy a second tape measure from the object to be plotted back to the first tape measure ending at a point where a right angle is made by the intersection of the two tapes. (The right angle will be formed at the shortest distance that can be measured between the object and the first tape.) If you are using twine between the two reference points, measure from the object to be plotted to the nearest point on the twine and mark that location.

Step 6. Take a measurement along the first tape from one of the two reference points to the intersection of the second tape, for example, RP-1, 18’ 4” W. When using twine between the reference points, measure along the twine to the point marked in step 2.

Step 7. Document the direction the measurement is taken. For instance, using two reference points on an E/W axis, with RP-1 being at the east end and RP-2 being at the west end, a measurement from RP-1 towards RP-2 of 18 feet 4 inches would be recorded as 18’ 4” W. If RP-2 were used, the measurement may look something like 5’ 6” E. Only one measurement on this axis is necessary.

Step 8. Document what side of the east-west axis the object is on in relationship to the transect between the two reference points. In the case of reference points on an east-west axis, the two sides can only be north or south. In the case of this example, it is on the south side of the east-west axis between the reference points.

Step 9. Combine the two measurements and the cardinal direction as the coordinates for this object (18’4” W/10’6” S). The entry of this coordinates on a measurement log may include the following information and look like:

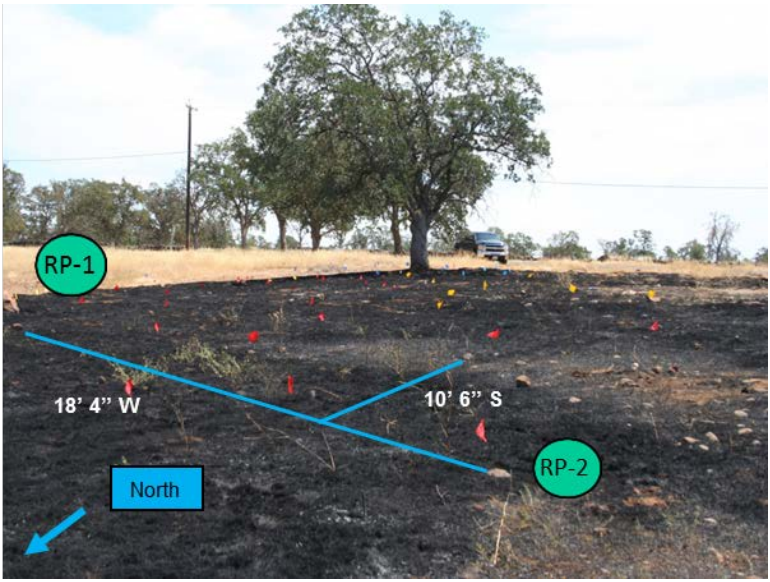
Indicator 12 Right Angle Transect RP-1 18’4”W/10’6”S

Using a measurement log may take the place of having to place each indicator or item of evidence on the sketch map. By using the measurement log technique, the wildland fire investigator will have all of the necessary data to create a diagram showing indicators or other pertinent points as long as the reference points can be accurately located.

Compass declination – you can set your compass to the scene declination or to zero declination, just record in your field notes the declination of your compass.

Measurement detail should be to the increment of your tape measure. If your tape is divided only to ¼ inch marks, measure to the nearest ¼ inch (not smaller to the 1/8 inch).

Figure 82. Example of a right angle transect.



Azimuth

The azimuth method of measurement is useful for short distance measurements at a scene that does not have many obstacles. This method may be difficult on steep ground and in heavy brush or timber.

A single reference point is used in this method and should be marked in a way that it can be identified and located years later, for example nail, rebar, or paint. The wildland fire investigator will need to record the compass declination used. Utilize the units shown on your measuring tape, for example feet/inches, meters/centimeters. This method relies upon the ability of the wildland fire investigator to take generally accurate compass bearings. If the needs of the investigation require higher accuracy, another measurement method may be more appropriate.

Step 1. Select and mark reference point to be used. More than one can be used as long as they are clearly identified. Note the reference point used in your notes. Example: RP-2.

Step 2. Measure and document the distance between the reference points.

Step 3. Standing at RP-1, take and record the compass bearings to the other reference point(s).

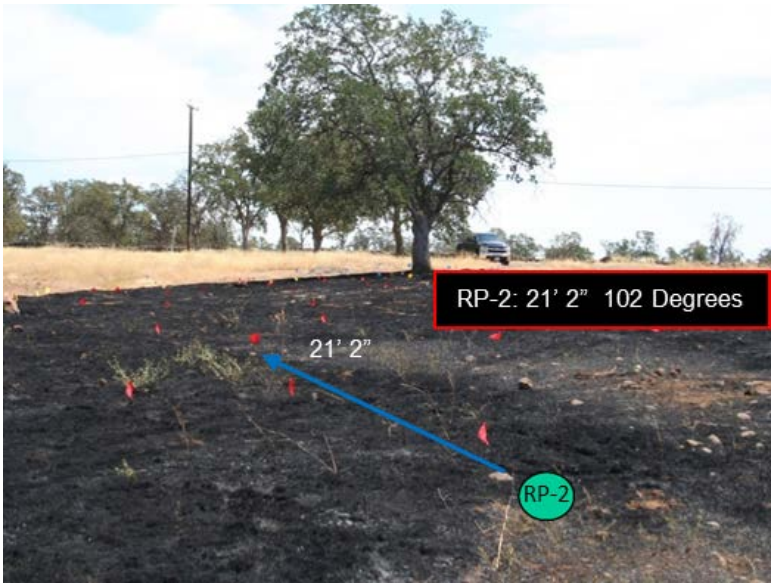
Step 4. Set your compass declination or set at zero and so note the declination used in your field notes.

Step 5. Take a position over the reference point to be used.

Step 6. Take and record the compass bearing from the reference point to the point being documented, for example: 102°.

Step 7. Measure from the reference point to the point being documented and enter measurement into field notes, for example: RP-2: 21’ 2”, 102°.

Figure 83. Example of a measurement taken using the azimuth method.



Intersecting Arcs (Triangulation)

The intersecting arcs method can be difficult on steep ground and in heavy brush or timber. It can be done with a single tape measure.

As with the other two methods, the wildland fire investigator should utilize the units shown on their measuring tape, for example, feet and inches, meters and centimeters.

The method relies upon a measurement from each of the two reference points forming two sides of a triangulation. The known distance between the two reference points is the third side. The two measurements from the reference points to a common point can only exist in two locations, one on each side of the line between the two reference points. Therefore, it is important that the wildland fire investigator specify the cardinal side of the reference point axis.

Step 1. Select and mark, with nail, rebar, paint-mark, two reference points on either a north-south, or east-west axis. Label them RP-1, and RP-2 as appropriate.

Step 2. Measure and document the distance between the two reference points.

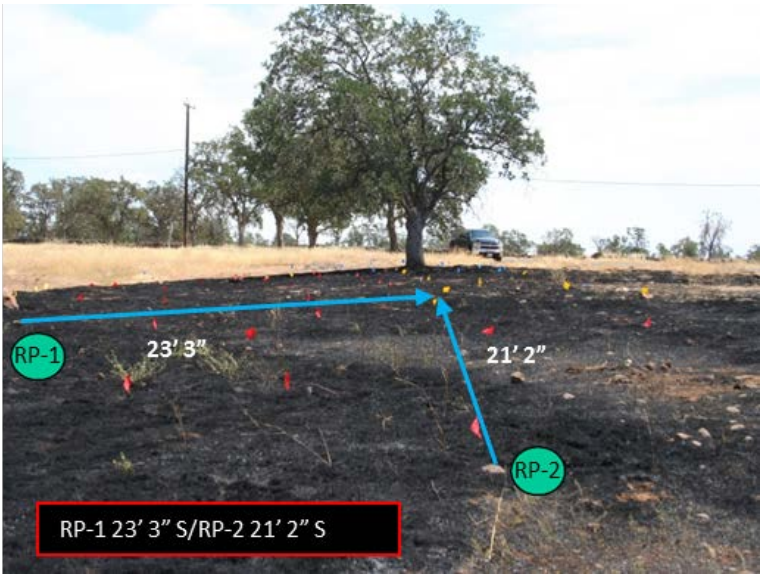
Step 3. Standing at RP-1, record the compass bearings to other reference point(s).

Step 4. Measure from one of the reference points to the point of interest and document the distance in your notes, for example, RP-1 23’ 3”.

Step 5. Measure from the second reference point to the point of interest and document the distance in your notes, for example, RP-2 21’ 2”.

Step 6. Document which side of the reference point axis the point of interest is located. Example: If the reference point axis runs from east to west and the point of interest is located to the south side of that axis, enter S behind the measurements in your notes.

Figure 84. Measurement taken using transecting arcs.



Documentation - Diagrams

Not every fire investigation requires a formal diagram(s). It is up to each wildland fire investigator and agency practice to determine if and when a diagram is needed in support of an investigation.

Diagrams may contain some or all components of the sketch:

- Final diagram is to *near* scale.
- Contains a legend.
- Can be hand drafted or computer generated.
- Has a scale.
- Orientation to north.
- Signature of person who created it.
- Date it was created.
- Incident name or other reference.
- Symbols and their meaning.

Separate diagrams may be created as necessary, such as one for fire progression, one for photo points, one for evidence.

Diagrams can be created using software available to the wildland fire investigator or may be created by experts in the area of surveying and mapping. The wildland fire investigator should be aware of the

diagramming resources available to them and the appropriate resource request process.

It is suggested that the representative fire pattern indicators (those documented by photographs and measurements) located within the diagramed area be accurately plotted and direction of fire spread symbols used to establish actual rather than approximate fire direction spread.

Documentation – Global Positioning Satellite

Global Positioning Satellite (GPS) technology and accuracy has greatly improved in the last ten years and may be considered for recording certain types of data. This improvement includes both the accuracy of professional models and those hand held models used by many wildland fire investigators.

Positional accuracy of hand held models is affected by such things as model, post processing of data, satellite availability, and canopy cover. The range of accuracy on a typical hand held GPS model can vary from +/– 9 feet to over +/– 20 feet. Most newer hand held models will provide an accuracy reading for each position. It is recommended that these accuracy readings and the datum setting be documented.

When considering the use of a hand held GPS unit, the following recommendations should be considered:

- Specific Origin Area: GPS units with accuracy of more than + or - 1 foot are generally not recommended.
- General Origin Area: GPS units with accuracy of more than + or – 5 feet are generally not recommended.
- General Fire Area: The use of GPS units in the area outside the General Origin Area, to position macroscale indicators, transition zones, etc. may be an effective tool for plotting those features on the larger scale.

The use of hand held GPS units (those with error rates of + or – 5 feet or more is generally not accurate enough in the smaller areas of the general origin area and the specific origin area. Based on the specific conditions and need for accurate plotting of key features, the wildland fire investigator may use a hand held GPS unit within these areas. In that case, it is recommended that the GPS readings be backed up with measurements to points for validation and orientation.

Exception: The use of a reasonably accurate GPS unit (+ or – 20 feet) for taking coordinates for photo points is generally appropriate for helping someone to go back to the same location using both the GPS reading and the photo to compare to on the ground and for photo diagram preparation.

In this case, the photo diagram legend or attached spreadsheet should provide such information on how accurate the coordinates are, including the possible deviation for each coordinates, for example, Photo AWC1056, N45 168.124, W170 152.344 + or – 9 feet.

Hand held or other models of GPS units with accuracies of less than + or – 5 feet may be available through agency or contract resources.

The GPS area calculation function may be helpful in documenting the size of the area that the wildland fire investigator walked to determine the general origin area size.

Documentation – Photography

It is recommended that wildland fire investigators take additional training in photography; you will need to understand the operations and limitations of your photography equipment.

Recommendations:

- Consider formatting the secure digital (SD) card before beginning investigation photos. Formatting the SD card eliminates the possibility of unrelated photos being on the card and causes the first photo to be *0001* rather than *0023* etc., and ensures the SD card is compatible with the camera sd card.
- Confirm the correct date and time on the camera(s) used. Consider taking the first photograph of your cell phone showing the correct time and date. Note any difference in time settings, particularly if you have traveled across time zones. (PST, MST, CST, etc.) Check the dates and times of other team member cameras to be used.
- Check the picture format (jpeg, RAW, etc.) It is recommended that jpeg or RAW format be used for picture quality, file size, ability to enlarge and show sufficient detail. Be aware that RAW formats will take considerable more memory space and can only be viewed with proprietary software.
- With digital photography, it is easy to take lots of photographs. Make sure that you carry enough secure digital (SD) cards and batteries to get the job done.
- It is suggested that wildland fire investigators carry more than one camera with them. In the event that one fails, is lost, or is damaged, the backup camera may save the day.

Consider adding your initials to the photo number to reduce the confusion of multiple wildland fire investigators taking photographs starting with the photo number of 0001. This typically can be done as a batch process during downloading of images. Example *0001* would become *AWC0001*. Using this systematically will facilitate explaining how the photos were tracked

during later testimony. The lead wildland fire investigator should make it clear to assisting resources what systematic numbering system is expected in order to track photos from multiple sources.

Storing Digital Photos to CD or DVD

- Be aware of *Auto-load* software effects on the image files.
- Do not open or delete original photo files.
- If possible, copy files directly from camera card to CD or DVD.
- Mark and secure 1st downloaded copy.
- When appropriate, store a 2nd copy as your backup.
- Copy a set of working files to PC hard drive.

Secure an untouched image file on a CD or DVD. This can be done by copying and pasting the entire image folder from the camera card directly to the CD or DVD without opening any specific file/image. Then a second working copy can be created and used during the investigation.

Do not delete any photo files taken during the investigation, even if they are of poor quality. Work off copy on your hard drive.

Marking Photo CD or DVDs:

- Permanent marker.
- Write in spindle area.
- Labeling.
- Case/incident number.
- Date photos taken.
- Brief identifier or fire name.
- Name of photographer.

Be careful about writing on the silver or gold face of a CD or DVD, even with markers that are supposed to be safe for CD or DVDs. Eventually the dyes and chemicals from the marker will deteriorate the coating and corrupt the data on the disk.

Photo Log – start a photo log early.

- Use an image (photo) numbering system you can understand when you download the images later.
- May use image number.
- Include a description of each photo in your log.
- Can be brief in your notes, more detailed on final log.
- Photo number is documented on sketch with photo points.

Fire Direction - Photo log components.

- Incident identifying information.
- Camera used and time stamp corrections.
- Photo identification number.
- Date photo taken.
- View direction (N, NW, ENE, etc.).
- Person taking the photo.
- Vector (advancing, lateral, backing) If more than one vector is present in a photo, explain.
- Category of indicator (staining, angle of char, protection, etc.).
- Direction of fire travel in the photograph. The direction that the fire is traveling in the photograph will help others to understand the progression of the fire in the photographs. For example, fire is moving left to right in photo. Or, fire is moving from lower right corner to upper left corner in photo.
- Photo point coordinates are needed if a reasonably reliable point diagram is to be created. With rare exception, these coordinates need not be precise and the use of a GPS device with accuracy better than + or – 20 feet may be acceptable. This may need to be reconsidered as the photo points get closer together, such as near the specific origin area.
- The general description of what is shown by the photo will assist the wildland fire investigator, sometimes years later, to recall why the photo was taken and what was being portrayed. Be as complete as possible. If multiple photos in series have the same subject matter, repetitive photos can be described by referring to the description in the first photo of the series. Example: Same as photo AWC1056, etc.

Investigative Photographic Documentation:

The demands of each individual fire scene will dictate to some extent when photographs can or should be taken. The important thing to remember is that some opportunities may be lost while others can be put off until later. Prioritizing and staffing is the responsibility of the wildland fire investigator.

As each fire investigation is unique, there will be opportunities for taking a variety of photographs or video during various times, this includes:

- En-route.
- Arrival.
- Scene orientation/overview.
- Relationship.
- Identification.
- Examination.
- Other considerations, for example witness perspective.

En-route photographs: Wildland fire investigators should consider the need to take photos while en-route, this may be dependent on the time of response and purpose of the photograph. For example, if the wildland fire investigator is responding promptly the en-route photos may show fire progression, evidence, condition of access (open or closed gates), and activity in the area.

Arrival photographs: Persons and man-made objects in the area of the fire scene are generally mobile in nature. Powerline equipment can be burned up or removed by power company crews. Heavy equipment can be moved to other sites or parts removed from them. Witnesses may walk or drive away. Photos may assist the wildland fire investigator in quickly documenting the presence of certain persons and things during a period when time is short and workload is heavy. Identifying the presence of equipment, persons, and actions during the first arrival on scene is part of the data collection process that will be used later to develop hypotheses.

Upon the arrival of the wildland fire investigator, he/she may need to document current fire behavior, both near the heel of the fire and overall. Macroscale fire pattern indicators may be photo documented. Suppression actions taking place may be photographed. Physical evidence subject to degradation should be photo documented upon arrival as they are observed.

Scene Orientation/ Overview: These types of photographs serve as big picture documentation of the scene or other points of interest and are generally taken from a distance, either from a ground vantage point or from the air. They are meant to portray the integrity and relationship of the scene to the overall environment and terrain.

These overview photographs can be used during testimony either unchanged or with explanatory symbols as exhibits. They may form the basis for visually showing the macroscale fire pattern indicators and their relationship to the specific origin area, physical evidence or other points of interest.

These types of photographs are often overlooked but are generally easy to take.

In addition to documenting the overall scene orientation, general orientation photographs of the general origin area should be taken.

When the general origin area has been identified, photo document the area immediately surrounding it and the general origin area itself looking in from the outside, prior to entry.

This process may be incorporated into the walk around and may include multiple views of the entire surrounding area and views into the general origin area from the perimeter. This will also serve to document the date and time of the walk around through the camera metadata.

The wildland fire investigator should attempt to cover the area with photographs so that multiple perspectives of most areas can be reviewed to compare opposite sides of larger objects.

Relationship or Comparison Photos: Relationship photographs show the relationship between various items, normally taken at medium range, and show specific views of the subject matter. This is just as the wildland fire investigator is beginning to focus on specific portions or objects in the area of the fire scene.

As the wildland fire investigator is working the scene, he or she should take relational photographs to document features and activities that are near to the general origin area. This can include the location of highways, railroads, trails, dirt roads, skid trails, structures, lookouts, etc. A single photo which shows train tracks and the fire near the tracks would be preferable to two photos, one showing the tracks and the other showing the fire. Remember, you are trying to show the relationship between the two subjects.

The wildland fire investigator should photo document fuels in and outside the burn area. If possible, get photos which portray both the burned and unburned fuels in a single photograph. Taking photos of actively burning areas which are representative of the general origin area is also helpful. Remember, you are trying to document a representation of the fuels in the specific origin area, general origin area, and the heel of the fire. This may require multiple photographs and some analysis to do properly. If the general origin area is well within the burned area, photos of representative fuels may be taken at a distant location which has similar vegetation type, vegetation density, aspect, and slope.

Consider using evidence markers to show locations of evidence and other important items in relationship to the overall scene and other items. Evidence markers provide better visibility of smaller items when taking orientation photos of the area. Further detailed close-ups should follow.

Take a photo both with and without evidence markers. Be careful that the evidence markers are correctly documented with the feature being portrayed

and the marker does not disturb or place a shadow on the item being photographed.

Identification Photos: Shows the details of a specific item of evidence, such as tire or shoe impressions, sources of ignition, samples and comparison samples (controls), fire pattern indicators, or other important item. These photographs are taken close up for detail and are supported by the orientation photographs of the same items.

Documentation and collection of samples and comparison samples should be clearly documented in writing and photographs.

A sample is: A portion of an item which is suspected of being contaminated with an additional substance, (typically an ignitable liquid) which has been collected for testing in an effort to identify its component parts and any contaminating substances.

A comparison sample: Taken from the same type of material that it will be compared to and is recovered from an area where the wildland fire investigator believes there is no contamination relevant to the testing, and testing shows no relevant contamination, only its base components.

A control sample, also known as a check sample or comparison sample, is an item of known composition used to check the samples themselves. This often requires that the actual control sample itself be tested to determine its components. The components of the control sample are then compared to the samples taken from known locations or items of evidence.

Exemplar sample: When dealing with items such as rocks, fuel, or other items needed to compare by testing to a sample taken from a scene. Items are referred to as exemplar samples and should be taken from as near the same location as the sample being tested against for which the wildland fire investigator does not suspect relevant contamination. Effort should be made to make the exemplar sample consistent with the specific sample or area to be compared. Exemplar samples are collected specifically for the purpose of having samples on which testing can be conducted without the dangers of conducting destructive testing on actual evidence samples collected. Exemplar samples may be analyzed for comparison properties to the sample being tested against, but generally are not used to determine contamination issues, but rather ignition probability issues.

Documentation – Fire Pattern Indicators

As with any area of the fire, potential directional fire pattern indicators within the general origin area may number into the thousands. The job of the wildland fire investigator is to identify and document enough of these indicators to provide for reliable and consistent vector data which establishes the progression of the fire.

While the wildland fire investigator may observe many fire pattern indicators within a small area, selection of the best of these indicators for documentation through flagging/marking will include a selection based on a variety of indicator types, reliability of indicator within the given conditions, and consistency. Subtle indicators, while more difficult to photo document, should be included. These subtle indicators may support lower intensity burning consistent with areas closer to the specific origin area.

Document a representative sample of those that you mark/flag. There is no minimum or maximum number of representative samples required to be documented. It is however recommended that at least one of each category of fire pattern indicator used in a given area be documented.

For example, the wildland fire investigator may have placed pin flags on 250 individual fire pattern indicators. Clearly, documenting all of these indicators is unnecessary; however, a representative sampling sufficient to illustrate overall fire progression should be documented. Of the 250 fire pattern indicators flagged, they may represent 6 of the 11 indicator categories. Document at least one representative indicator from each of the available indicator categories. It is further recommended that these indicators include examples within each of the fire progression vector zones, starting in the advancing zone within the general origin area, working across into the lateral zones and moving in towards the specific origin area and ultimately, if possible, the ignition area. Following this methodology typically results in the documentation of 10-25 total indicators, however it can be less or more, depending upon the circumstances. It is always better to document too many representative samples of fire pattern indicators rather than too few.

The wildland fire investigator should use their experience and judgment to determine how many fire pattern indicators need to be documented to reflect the methodology relied on and illustrate the scene for others at a later date. Ultimately, the fire pattern indicators will need to be documented in such a way that a qualified individual will be able to review the report, observe enough of the indicators documented, and be able to see that the wildland fire investigator was appropriately interpreting each indicator. While there will always be times when indicators are very subtle and need an expert to explain them, most of the indicators documented should be

easily identified once the wildland fire investigator has documented them and explained them in the notes.

Documentation of Fire Progression: Photographs of fire pattern indicators showing fire progression are enhanced through the use of visual aids including flags and vector symbols. There are additional aids available on the market or that can be made at home which can help to present the message in each photograph. Many of these aids assist in the photo documenting of fire pattern indicators and can provide information such as direction of advancing, lateral, backing fire spread, the orientation of north in each photo, the fire pattern indicator evidence reference number.

There are a number of ways wildland fire investigators have shown vector direction in their photographs. No matter which method is used, consistency is critical and the wildland fire investigator should explain the method used and/or meaning in their report or attachments. Any method should visually identify the vector of the individual fire pattern indicator being relied upon. The wildland fire investigator should avoid using symbols or methods which may contaminate or damage the fire pattern indicator.

This guide recommends the use of colored pin flags, a method which is designed to provide an educated and trained reader of the report with graphic information documenting the progression of the fire.

Photo documenting fire pattern indicators: Identification photographs show the detail of the specific fire pattern indicator. They are generally close up photographs, with the possible exception of macroscale indicators. When taking identification photographs of fire pattern indicators, it is recommended that the wildland fire investigator choose the most reliable and clearly discernible indicators to document within each category.

Sometimes, a single photograph may be sufficient to document a fire pattern indicator, for example, in Figure 85. It is always a good idea to confirm the fire pattern indicator reliability prior to photo documentation. In Figure 85 the gourd may have rolled or moved. However, the area of protection in the lower right corner of the photograph is consistent with the fire vector indicated by the gourd and therefore both indicators support the reliability of the indicator.

Figure 85. Detailed photograph which indicates fire pattern.

Some indicators will take two or more views to properly document photographically. Any indicator which is based on *compare and contrast* of burn damage should be considered for multiple views and focal length. Exceptions to this rule may be small objects which are lying in such a position that the two sides can clearly be documented with one overhead photograph. Any other time, multiple views, contrasting opposing sides, may need to be taken.

Examination Photos: When done correctly, examination photographs will assist the wildland fire investigator by providing detailed images of items that many times are packaged and stored in an evidence facility. The ability to examine good quality images may prevent the need for opening evidence packages, documentation of chain of custody, and repackaging.

Examination photos are taken close-up, with a scale that is designed for evidence photography.

After taking examination photographs of evidence in place, the evidence should be collected, packaged, marked, and secured. Due to the risk of contamination and or loss of the evidence, further detailed photographic documentation and measurement of these evidence items should be saved for a safe environment. Comparison photographs may be taken, but care should be exercised to avoid cross contamination of the evidence or mixing

of different evidence items. Consider having blue background paper for high contrast photographs of ignition evidence or other important items.

It may be useful to photograph key distances as they are being measured. This will assist in putting those measurements into perspective and will also assist in refreshing the memory of the wildland fire investigators during later testimony while providing visual evidence of the methodology used.

Photo documentation – Origin Areas: The wildland fire investigator will often be asked to describe the Ignition Area, Specific Origin Area, or General Origin Area boundaries. The simple use of flagging or other reference material can enhance photographs of such boundaries and save a lot of time during testimony.

Photo documentation – Exhibits: Photo exhibits can play an important part in the documentation and presentation of the fire investigation. When taking photographs, think long term needs. Such as, *What photographs could I use during my testimony to better explain the investigation*? Thinking about this ahead of time allows for the taking of deliberate photographs for use as exhibits rather than settling for a photo taken for another purpose that may not completely serve your needs.

There are a wide range of subjects which can be documented through photo exhibits. Typically, the best time to take photographs for use as exhibits is when the scene is fresh. Larger scale photographs and aerial photos should be taken as soon as someone is available to take them.

Aerial photos may be taken to document both the larger scale origin scene and fire damages and threats to homes or other property. These photos can support the serious nature of the fire and may be used both in the judicial system and in the administrative role of fire prevention presentations. These photos may come from the wildland fire investigators themselves or may be collected from others who have taken photographs of the area.

Documentation – Report

As a Wildland Fire Investigator (INVF), your job may include only the issues directly related to the origin and cause of the fire. This may be focused primarily on reading and following fire pattern indicators, documenting the scene, on scene interviews, weather data, and photographs. You will gather and document this data and provide it to the case agent or case manager. The INVF prepares an *origin and cause* report containing this data, that often becomes the lynch pin to the final fire investigation report.

The role of the INVF is agency dependent and may change by incident. Make sure you are clear about your responsibility and authority for each assignment.

The role of an INVF during an investigation may change over time. Ask questions and get clear instructions. The INVF is the first line of investigation.

Regardless of your role, you will generally have an investigative case file which includes both hard and electronic copies. The contents and extent of the file will be role dependent. The file may include, but is not limited to:

- Origin and Cause report(s).
- Reports of interview.
- Sketches, diagrams, measurements.
- Maps.
- Weather data.
- Miscellaneous reports and documents; for example forensic, expert, other agency.

Evidence logs should be up to date at the time of inclusion into the case file and/or report. Investigative notes should be included into the case file or report per agency policy. Correspondence, including emails, should be retained per agency policy and included into the case file for later discovery. Supporting documents which assist in the understanding of the investigation, origin location, cause, or other important facts of the case should be attached to the case file by reference and copy, including all photographs, videos, recordings, etc.

Origin and Cause Report: The format of origin and cause reports is agency or prosecutor specific. It forms the basis for INVF testimony and becomes an attachment to the final case report.

All wildland fire investigators should remain open to any new pertinent data that is subsequently developed, even after the investigation report is submitted. This new data may change your opinion or it may not. The new data may strengthen the final hypothesis or it may call it into question. You as a wildland fire investigator are providing opinions based on the data that you have at the time you write your report. With new data, you will need the latitude to adjust your opinions based on your review of it.

The placement of a disclaimer into a report is common practice by many experts. It simply reflects the realities of a systematic scientific investigation. Check with your agency legal staff if you have any questions about the inclusion of such a disclaimer or the preferred wording for such a disclaimer. The example shown below is a common version of such a disclaimer. (However, the utilization of the scientific method will innately have as part of the methodology the same *unwritten* disclaimer. Opinions

are developed with only the data available at the time the opinion was developed tested and concluded.)

I reserve the right to change my opinion or conclusions based on any additional data received.

The origin and cause report is recommended to:

- Use a narrative format.
- Proceed in a chronological order of the fire event.
- Tell the story from start to finish in the order in which the fire events occurred.
  - What was the fire behavior context?
  - What fire pattern indicators were relied upon?
  - What evidence of the cause was located and collected?

Narrative Section: The narrative section explains:

- Facts from witnesses and other data sources.
- How data was used to develop hypothesis(es).
- How each hypothesis was tested and final hypothesis was selected.
- Conclusions.
- Attachments and supporting documents/photos.

The wildland fire investigator is documenting in the narrative report the basis for his/her expressed opinions. By the time the reader gets to the end of the narrative, he/she should have a good foundation of what the opinions expressed are based on.

The narrative section of the report can be organized in the following format to aid in the chronological documentation of the complete investigation:

1. Call and Response.
2. Arrival on Scene.
3. Methodology/Data Collection.
4. Data Analysis and Application.
5. Working Hypotheses Development.
6. Hypotheses Testing.
7. Conclusion/Selection of Final Hypothesis.

This is the section of the report where the INVF articulates the methods used within the framework of the scientific method resulting in the overall *methodology* applied for the specific conditions of the specific investigation.

Wildland fire investigators are cautioned against using cut and paste language within their report which detracts from the uniqueness of each fire investigation and report.

1. Call and Response.

   - Time of call, time of response, who requested you, information/data gained.
   - Assignment/instructions.

   Example: At 2:35 PM I was contacted by the Wildfire Dispatch center and assigned to investigate the origin and cause of the North Fork fire. I responded from my office at 2:47 PM. I traveled to the fire scene by way of … The dispatch center provided me with the following information… I observed the following en-route.

   This portion of the narrative section serves to introduce the reader to how and when the wildland fire investigator became involved in the specific fire investigation and the responsibility and authority of the wildland fire investigator. It also provides initial information about the fire received during the dispatch and/or response which can include the size of the fire, location of the fire, other resources being assigned, initial reports from the reporting party and first arriving responders, etc.

2. Arrival at Scene.

   - Describe the scene on your arrival:
     - Time of arrival and location.
     - Location and perimeter of fire.
     - Surrounding area.
     - Activities taking place.
     - Observed fire behavior.
     - Security in place (or not).
     - Witnesses, reporting party present.
     - Data collected (weather, statements etc.).

   Defining the problem more specifically allows for the construction of a more specific investigative plan and thus more organized efforts at data collection leading to a more complete narrative report. Once the wildland fire investigator has arrived at the fire scene more data becomes available upon which an investigative plan can be further established. It is recommended that this data be documented in the narrative report in the chronological order it occurs. Tasks completed will generate more data which should be documented for the report in field notes and then transferred to the narrative section of the report.

   This process of developing an investigative plan and the tasks which are accomplished through it will provide the data which will allow the wildland fire investigator to compose a complete narrative report. Poor narrative reports are often the result of poor planning and data collection.

3. Methodology or Data Collection.

   - Witness statements and interviews.
     - Suppression personnel, Law Enforcement personnel, reporting party, civilian witnesses.
   - Fire behavior context.
   - General Origin - describe your actions in detail.
   - Specific Origin - describe your actions in detail.
   - Ignition Area – potential ignition sources.
   - Documentation – evidence, sketches & photographs.
   - Other observations and sources of information.
     - Weather, lightning data, 911 call logs, etc.

   Both the process (methodology) for carrying out the tasks of the investigative plan, and the data collected should be documented in the narrative report.

   Because witness observations and the fire behavior context are often key components to establishing the general origin area, data collected during initial witness interviews and a description of the fire behavior context as observed by the wildland fire investigator will often be the next items to be documented in the narrative section.

   Once any initial witness information has been gathered, and the fire behavior context is understood and described in the report, the reader of the report is prepared for the description of how the wildland fire investigator found and determined the general origin area. Typically the logical progression of the narrative section will include the establishment of an advancing area, identification of lateral transition zones, and the subsequent reading of macroscale indicators within the fire behavior context.

   Written documentation of macroscale indicators can be linked to photo documentation in the narrative section, helping the reader to visualize the actual items themselves as the narrative unfolds. Once the methodology and data associated with determining the General Origin Area are documented in the narrative section, the same process generally can be repeated in documenting the specific origin area and ignition area.

   The narrative section should describe the methodology used and data collected in searching the specific origin area and the ignition area. Describing both in the narrative section in reasonable detail so that the reader may understand what took place and what was found.

   During the search for the General Origin Area, specific origin area, and ignition area, the wildland fire investigator may be provided with an opportunity to gather additional witness information or other data

which may decay over time. There is nothing wrong with putting the search for the ignition area on hold while such additional data is gathered. Such information may include data which will assist in the location of the ignition area, or shed light on potential activities and causes in the area. If the wildland fire investigator needed to leave the scene for any reason, the narrative section of the report should reflect the time period of absence along with an explanation as to how the scene was secured in their absence and why.

4. Data Analysis and Application.

   At this point in the narrative report, most if not all of the pertinent available data has been documented and the process of analysis has begun.

   - Document why certain data was rejected.
   - Document why certain data was relied upon.
   - Describe the meaning applied to the data during the analysis process.

   Once the methodology and pertinent data has been documented in the narrative section as it was chronologically collected, the wildland fire investigator should now describe the process and result of data analysis. This will include the validating of data as reliable; not rumor, conjecture, or speculation, and providing meaning to the data.

   During this step of the report writing, it may be important to document why certain data was rejected and why other data was determined to be pertinent and reliable.

   The narrative report may document at this point the meaning applied to the data. For example, data indicating a wind out of the northwest at 5 mph and a slope aspect facing southwest would indicate that both the wind and slope combined to influence the spread of the fire. Another example may include a macroscale U fire pattern indicator which when analyzed indicated a general fire spread from the northwest to the southeast.

   In the example above, there may or may not have been other ignition sources. If other ignition sources were present and analysis of the pertinent and reliable data indicated that they were reasonably possible sources of the fire ignition, an alternate working hypothesis should be described in the narrative section. This documentation should be repeated for all reasonably possible hypotheses based on the pertinent and reliable data.

5. Working Hypotheses Development.

   Document a hypothesis for each reasonably possible origin/cause supported by the data/fact analysis.

   EXAMPLE:

   Smoking: The fresh cigarette butt found adjacent to the specific origin was discarded while still burning and ignited the surrounding dry grass.

   At this point, the wildland fire investigator should be able to describe the working hypothesis or hypotheses which were developed based on the meaning applied to the reliable data.

6. Hypotheses testing

   Describe how you *tested* each hypothesis.

   EXAMPLE:

   Smoking: The relative humidity measured at the scene at the time of the fire was 37%. Scientific research has shown that discarded cigarettes will not ignite dry grass at humidity levels above 22 to 25% (Countryman, 1983). Therefore, smoking is excluded as a potential cause of the North Fork fire.

   Once the working hypotheses that can reasonably be proposed, based on the data/facts available at the time, have been identified in the report, the narrative section should reflect the process, including the specific data/facts which rejects each hypothesis and which hypothesis is best supported by all the data or facts.

   In the case where only one working hypothesis was supported by the data or facts, the narrative should reflect why the lone hypothesis was or was not rejected by any part of the data or facts.

   If the lone working hypothesis does not explain all of the pertinent data or facts, the report may reflect the data or facts which resulted in a finding of undetermined, or actions taken, to gather further data or facts for consideration of other alternative hypotheses.

   While the wildland fire investigator or investigative team may conduct initial testing of the working hypotheses, further documentation of additional hypotheses testing may be included into the case file at a later date when appropriate. In that case, the wildland fire investigator may submit an amended opinion and report addressing the further testing of the hypotheses.

   In some cases, the narrative section may reflect that the data or facts support multiple working hypotheses. In such a case the report should address the data or facts relied upon which raises one of the hypotheses

to the level of probable over other alternative hypotheses which only reach the level of possible. If no working hypothesis is supported by the data or facts to the level of probable, the report should reflect the conclusion that multiple hypothesis are possible and that until further data or facts can be reviewed, no conclusion as to origin or cause (or both) can be made.

7. Conclusion or Select Final Hypothesis.

   Describe in the conclusion section, the ignition source, material first ignited, and the ignition sequence.

   EXAMPLE:

   On August 14th, 2011 Mr. Smith lit a fire in his burn barrel. He did not place a screen on the barrel to prevent the escape of embers, and he had not cleared flammable grass and vegetation from around the barrel. In addition, Mr. Smith did not stay to watch the fire and he did not have tools or water available to put out the fire. A burning ember was lofted out of the burn barrel by hot gasses and landed in the dry grass, igniting it. The fire then spread from Mr. Smith's property to the surrounding forest causing the West Canyon Fire.

   The conclusion of the report should be based upon the data which has been articulated in the previous narrative, including references to attachments and supporting documentation. Once the wildland fire investigator writes his/her conclusion in the narrative report, he/she should review the narrative report to see that by the time the conclusion is reached, the reader has an understanding of the methodology used, data/facts collected and analyzed, working hypotheses considered, and the data or facts which support the conclusion and opinion of the wildland fire investigator(s).

   Remember, the wildland fire investigator is being asked for their opinion based on the data or facts of the investigation and that data/facts should be understood by the reader of the report by the time the conclusion is reached.

Summary

The person responsible for the case file will include the Origin and Cause report into the case file along with all other pertinent information.

The investigative case file is the compilation of all investigative documentation not just the Final Report or Origin and Cause report.

Chapter 6 - Ignition Factors and Sources

Fire Cause Determination - General

The objective of every fire investigation is to establish the cause of the fire and determine the ignition sequence of how the fire started.

Because the investigator will be looking for something that is usually very small, and black, and is located in the middle of a lot of other black material, a systematic approach as recommended in Chapter 2, Methodology, of this guide is very important for success.

Meeting the challenge can be difficult if the origin has been incorrectly identified or the ignition source has been destroyed by suppression activities. If the ignition source is small and not readily visible or buried under ash and debris, a thorough examination will be necessary to locate it. Ignition sources can also be unfamiliar and therefore overlooked by the wildland fire investigator if a systematic method is not applied. An arson *hot set* with the ignition device removed or if the remains of the ignition device are consumed by the fire will make it a tougher job to determine a cause, but not an impossible one.

Under normal conditions, forest fuels will ignite and burn when exposed to a heat source that is capable of raising them to a temperature of between 451 and 750 °F. Research places the average ignition temperature at about 500-600 °F. This relatively low ignition temperature creates an extensive list of potential **competent ignition sources**.

A **competent ignition source** is any item which can produce sufficient heat over a sufficient duration of time capable of bringing forest fuels, to their ignition temperature to sustain open flame combustion. This means that the ignition source must produce enough heat to raise the fuel to its ignition point under the conditions present at the time and location of ignition.

Figure 86. Photo of a match used as an ignition source.

The **ignition sequence** is the existing conditions, subsequent actions and sequence of events that bring a competent ignition source into contact with the materials first ignited, also known as the cause of the fire. The ignition sequence is made up of three ignition factors:

- Competent Ignition source.
- The type and form of first fuel ignited.
- The circumstances or human actions or natural events that allowed the factors to come together.

For example, in Figure 87, the conditions are; a burn barrel without a screen or clearance, adjacent vegetation, dry vegetation consistent with warm and dry weather, and slope.

The sequence of events or actions include ignition of the material in the barrel, airborne embers, and failure to attend.

Figure 87. Photograph of a burn barrel ignition source.

Ignition Source Location

Ignition sources may tend to rest on top of the ash surface or burrow and/or settle due to weight, temperature, velocity, or degradation of the fuel bed. Typically but not always, ignition sources such as matches, cigarette remains, and flat metal fragments will tend to remain on the surface of the ash while ignition sources such as welding slag, exhaust particles, and large metal fragments will be found under the ash. The primary point is that an ignition source may be found at any level and any search for such ignition sources should take this into account.

The **material first ignited** is the host fuel bed that the ignition source first comes into contact with and sustains combustion in the ground or surface fuels. These are generally made up of one hour fine dead fuel moisture

(FDFM) category fuels (0-1/4 inch diameter) with high surface area-to-volume ratio (for example, duff, grass, chaffs, etc.)

Fire Cause Categories

General cause: Classify the fire cause according to the ignition source or to the general human related activity which started the fire. The following categories are used to describe various causes. If applicable, use the agency's cause category as appropriate.

- Lightning.
- Campfire.
- Smoking.
- Debris burning.
- Incendiary (arson).
- Equipment use.
- Railroad.
- Children.
- Miscellaneous.
    - Power lines.
    - Fireworks.
    - Cutting, welding, and grinding.
    - Firearms use.
    - Blasting.
    - Structures.
    - Glass refraction/magnification.
    - Spontaneous combustion.
    - Flare stack/pit fires.

Categories may vary by agency. Wildland fire investigators should be familiar with their agency cause categories.

This section of the guide will cover these fire cause categories and include a discussion on:

- **Ignition sequence**: The conditions, actions and events.
- **Circumstances**: Evidence or things typically associated with the cause, including potential ignition source remains.
- **Investigation techniques**: Specific investigation methods that may assist in establishing evidence of the cause.

Lightning

Definition: Any wildland fire started as a result of lightning activity. Lightning occurrence maps are a significant tool to be utilized in suspected lightning caused fires.

Ignition Factors: Lightning is discharged static electricity associated with thunderstorm activity. Lightning is typically a series of short bursts approximately two inches in diameter, lasting for about one-half second. These lightning discharges include cloud-to-ground strikes which are in the range of 100 million volts, 200,000 amperes, and 54,000 °F.

Lightning strikes can possess either positive or negative charges with positive charges making up 10% of all strikes and negative charges making up 90% of all strikes. It is recommended that when checking lightning data that the different positive and negative strokes be noted in the investigation report. Positively charged strokes have greater fire starting potential creating long single strokes with continuing current. Damage on the ground is the result of electrical resistance. Stroke duration influences the likelihood of ignition in forest fuels.

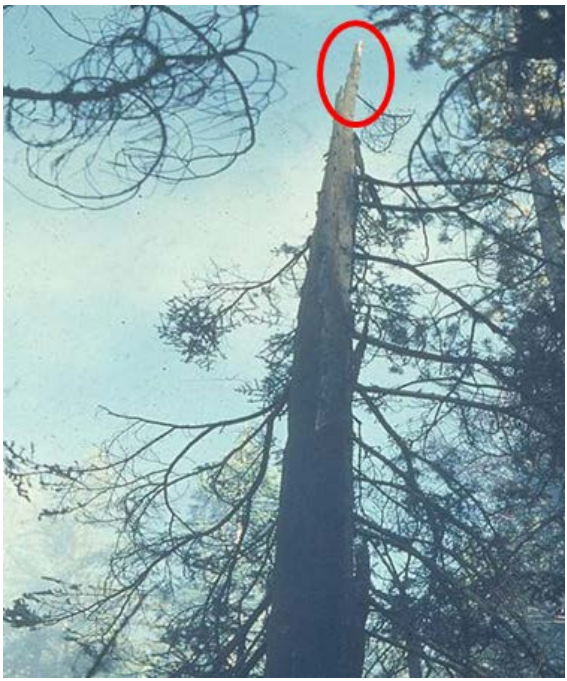
Circumstances: The circumstances indicating a possible lightning strike as a cause includes recent electrical storm (hours/days/weeks) activity in the area, the presence of indicators of *sleepers* and *holdovers*, scarring on trees or snags, precipitated sap, *needle shower*, ballistic penetration of adjoining vegetation by needles and small twigs or splinters, *blow-holes* at base of tree, fulgurites, and splintered wood or vegetation.

Figure 88. Examples of lightning activity as possible ignition source.

After a fire, lightning struck trees may no longer be standing, and wildland fire investigators will need to examine tree remains on the ground along with those still standing.

Indications of a lightning strike in the tops of a tree include a spike top or blunted snags with no visible scar, tops of trees which are blown off and scattered, and charring in the top of the tree or other visible damage. In some instances, some or most of these remains will be consumed in the fire.

Figure 89. Example of lightning strike in the top of a tree.



Lightning striking low vegetation and small trees can result in splintered limbs such as in Figure 90. Strikes directly into the ground may result in blowholes and fulgurite formation.

Evidence of a lightning strike on the ground may include needle showers, disturbed soil, and shattered rocks.

Figure 90. Example of lightning strike on low vegetation.

A lightning caused fire may smolder undetected for as long as several days and/or weeks after a lightning strike before transitioning to a sustained flaming front. For this reason, the wildland fire investigator should look for the presence of fuels capable of holding smoldering fire for an extended period and evidence of a long term smoldering fire.

Look for blowholes or disturbed soil at the base of trees such as in Figure 91.

Figure 91. Example of lightning caused blowholes or disturbed soil.

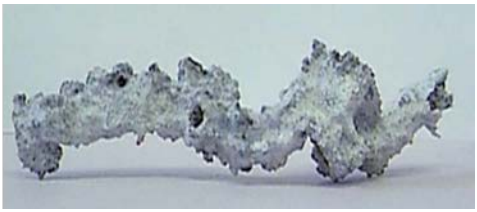
Fulgurites generally take place in soils with a sandy component to them. There is some evidence of them forming in sandstone rock. They can be created both by electrical discharges during a lightning strike or through contact between an electrical conductor and the ground or rock. Much like the process of using heat to make glass out of sand, the heat of the lightning strike heats the sandy particles and fuses the soil or rock at the location that the strike discharges to the ground.

Fulgurites generally resemble fused glass but may have a sandy or rough exterior. Fulgurites are usually hollow and branch like. Careful recovery is necessary, as they can be fragile.

Figure 92. Size of fulgurates compared to a quarter.

Fulgurites generally resemble fused glass, but may have a sandy or rough exterior. They are usually hollow, branch like and fragile.

Figure 93. More examples of fulgurates.



Investigation Techniques

- Lightning should only be considered as a working hypothesis, when you have data that supports it. Data should be collected and analyzed to determine if a working hypothesis of lightning can be formed. Document how the investigation tested lightning against the facts of the case and eliminated it or did not eliminate it.
- Interview available local area witnesses as to whether they observed lightning or storm activity in the fire area. Have them recall dates and location of sightings.

- Obtain and review lightning detection maps and data for the last 15 days. Extend this analysis to 30 or more days if weather or fuel conditions warrant. Obtain data through dispatcher. Lightning data should not be completely relied upon. Accuracy is approximately to 500 meters with an 80% to 90% detection rate.

  Sources of lightning detection networks include:
  National Lightning Detection Network, Vaisala:
  - www.vaisala.com, 520-806-7300.

  Total Lightning Network, Earth Networks:
  - www.earthnetworks.com, 800-544-4429.

  US Precision Lightning Network, WSI:
  - http://www.uspln.com/, 978-983-6648.
- Examine physical evidence within or close to the origin area that may support witness statements or be suspect as a source of electrical contact.
- Use binoculars or spotting scope to examine tops of tall trees.
- Examine all old lightning damage pathways for signs of recent pathway activity. Charred or discolored surface splinters in the old pathway may indicate recent activity.
- Conduct searches for macro effects and micro effects of lighting pathway activity, for example, spiral bark rips, freshly precipitated sap, and needle showers.
- Examine tree species that are prone to center-rot decay and subsequent lightning pathway effects, for example, white fir. If necessary, fell and open suspect tree boles. Follow evidence procedures and avoid unnecessary cutting of trees.
- On suspect trees, inspect the root collar area and the integrity of roots near the surface and in shallow soil. Look for discolored tissue, swollen girth, or separated structure.
- Examine suspect contact points for fulgurites or other similar effects related to the fusing of soil particles or rock by lightning.
- Fully document and locate lightning damage by photographs, sketches and diagrams, as appropriate.

Campfires

Definition: Any fire kindled for warmth, cooking, light, religious or ceremonial purpose. Campfires may occur at any location. Responsible parties may include hunters, campers, anglers, hikers or transients (homeless). Regulations often address attendance, clearance, and periods of use, suppression tools, and proper extinguishment. Violations of these regulations often result in escaped fires.

Ignition Factors: Campfire escapes can be caused by a number of factors, here are a few of them:

- Failure to properly extinguish.
- Lack of attendance.
- Improper clearance or construction.
- Careless placement.
- Fire play.
- Improper discarding of coals/ash.
- Improper use of accelerants.
- Careless discarding of matches.
- Camp stove malfunction.

The primary ignition mechanisms for an escaped campfire can include direct flame impingement due to construction of too large of a fire or addition of too much fuel, aerial sparks or rolling materials leaving the campfire pit or area, creeping fire under or around campfire barriers if they exist, overly heated rocks which contain moisture shatter (explode) blowing burning wood embers out of the fire pit area.

Sparks or rolling material typically result in an origin downwind/downhill of the campfire and are typically fairly close to it. Paper or cardboard is a prime aerial firebrand material which may still be present in the remains. The fire origin may be in punky material or fine fuels. Origins from sparks that emanate from rapid vapor expansion in wood will be close to the campfire.

Creeping campfire escapes may result from un-cleared duff around the edge of the campfire often resulting in a smoldering type escape. This type of campfire escape may appear as a *finger* or *fingers* fire pattern. Underground root systems may transmit smoldering or creeping fire to the exterior of the campfire. Unattended, abandoned or improperly extinguished fires are common factors in creeping campfire escapes.

Discarded coals or ash placed on forest fuels prior to total extinguishment will generally result in an origin near the original campfire. Coals and/or ash will be present at the origin. The coals or ash may be exposed or buried under soil. Heat within a pile of ash or buried coals may be retained for hours to days. Ashes discarded from home woodstoves, outdoor wood burners, or home heating furnaces would have similar ignition factors to discarded coals or ash at campfires.

Circumstances: The typical circumstances leading to a campfire escape include a recently used campfire at or near the origin of the fire. Signs of human activity at or near the origin, if recent in nature, may help to determine the sequence of events which took place. Residual heat in the campfire may remain for days. It should be noted that not all campfires will be within rock rings.

Circles of rocks or pits with a large amount of ash and coals, or a pile of wood are good indicators of a campfire. Signs of recent camping activity, including discarded food containers, and the presence of metal tent stakes or metal grommets from a tent may indicate the possibility of a campfire nearby. Wet ash and/or ash mixed with soil in a failed effort to extinguish the fire may be present.

Figure 94. Campfire escape.

Improper extinguishment of a campfire may be due to inadequate amounts of water used to put the campfire out. Fresh campfires will form white ash on the surface if not disturbed by extinguishment efforts. Campfires will form a crust of ash on top when mixed with water. Fire will sometimes smolder under the crust and the residual heat will be insulated from the cooling exterior environment. Hot embers insulated by the crust of ash may burn their way to the edge of the campfire and beyond or become exposed to surface winds and blow out of the campfire area.

Campfires smothered with soil/rocks may smolder for hours or days under an insulating layer of the soil and rock. Look for the presence of hot coals and vent fumaroles (a fumarole is a hole in the ash in which hot gases and vapors have escaped) on the surface of the ash. Organic matter may contribute to smoldering and should be looked for and documented. Soil moisture and mineral content may extend the smoldering period and should be noted.

No extinguishment efforts may be an indication that the campfire has been abandoned. When no extinguishment efforts take place, fine, and fluffy

white ash may be present on the surface with a fragile appearance. An odor of fresh burning may be detectable.

Wildfires burning over old campfire rings will not likely re-ignite coals.

Investigative Techniques: During the investigation and documentation of an escaped campfire, factors will center on the origin determination itself, construction of the campfire, violations of regulations and failure to extinguish the campfire.

- Determine if the use of the campfire was in violation of any fire regulation and document what enforcement action and subsequent disposition took place.
- Determine who was responsible for the construction and use of the campfire before the escape took place.
- Determine what safety precautions and tools were used to safeguard against an escape during use of the campfire. Determine when the fire was constructed and how long it was used. Take pictures of the fire ring up close and from a distance, showing proximity to ignition area and spread direction.
- Determine what materials were burned during the use of the campfire. Collect samples, if necessary. Examine the interior of the campfire to determine if there is any residual heat. Measure the ring dimensions, including the average ash depth, making note of color, size and condition of ash/charcoal.
- Determine what actions, if any, were taken to extinguish the campfire. Be specific with details and persons that took such actions. In cases of juveniles involved with an escaped campfire, determine what parental supervision was involved. If there was prior parental knowledge, did the parents oversee the use and subsequent extinguishment of the campfire?
- Examine the construction of the campfire ring and the clearing of ground to mineral soil and the continuity of fuels around and above the campfire. Char and ash residue often reveals if the construction was fire safe. Document the fire ring condition. Examine organic soil layers surrounding the fire ring for ground fire transmission to surface fuels.
- Review weather records for conditions that would be consistent with holdover of smoldering material in the campfire bed.
- Thoroughly examine the ashes in the campfire bed for signs of proper extinguishment or material involved with slow smoldering combustion.
- Determine if the campfire users left the fire unattended at any time or allowed it to spread from the fire ring at any time, regardless of whether the escape took place at that time or not.

- Document the purpose of having the campfire and include identification information of all persons at or near the campfire during its use.
- Interview witnesses who observed people at the campfire and their actions.
- Contact the landowner to verify the campfire user had permission to have a campfire on the property.
- Campfire site - search for and note:
  - Bottles, cans or other consumer debris.
  - Circle of rocks (fire retainer) within burned area.
  - Seating, such as logs around *circle of rocks*.
  - Pile of unused firewood.
  - Campsite registration information.
  - Accessibility.
  - Ashes from firewood in definite pattern.
  - Abandoned camping equipment.
- Exclude or analyze other reasonable potential causes.
- If hot ash or coals are present, use a high temperature thermometer or other method to establish residual heat levels. Do not introduce paper or other flammable materials to the ash/coals to demonstrate their ignition potential as this will contaminate the remains of the campfire.
- Check trail registers, campfire permits, campground logs, and registration.

Smoking

Definition: Wildfires caused by smoking activities or accoutrements, including matches, cigarettes, cigars, pipes, illegal substances, etc.

Cigarette remains may be hard to see as shown in Figure 95.

Figure 95. Burned remains of cigarette and match.

Redsicker and O'Connor observed in *Practical Fire and Arson Investigation*, "*Cigarettes have long been the scapegoat in cases where no other cause could be determined*" (Redsicker, 1997). To effectively assess the probability of a cigarette as a competent ignition source, consider the following:

- Physical characteristics of the cigarette.
- Environmental factors.
- Physical placement factors.

The physical characteristics of manufactured cigarettes generally include:

- Chemically treated tobacco wrapped in paper.
- Cellulon, plastic or charcoal filter.
- Weight: 2/3 gram.
- Length: 45-90 mm.
- Interior core temp. of 1361-1541 ^{o}F.
- Exterior tip temp. of 572-1200 ^{o}F.

Fire Safe cigarettes are designed primarily for safety with interior upholstery. Informal research shows they may continue to burn in a wildland environment. The tobacco itself is not chemically treated; however, the paper has two thicker bands to retard burning unless actively being smoked. Even if the cigarette is considered a *fire safe cigarette* (FSC), in testing 30% are allowed to fail and the cigarette can still meet the safety standard.

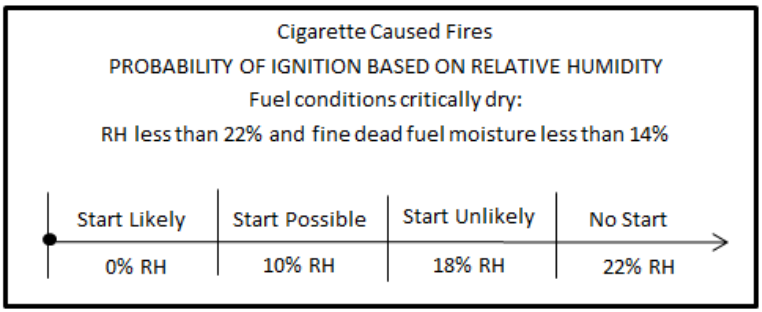
Ash content in cigarettes varies and will affect the exterior temperature of the tip. There is up to 20% shrinkage of the tobacco during burning. As the tip burns, it lifts up and away from the fuel bed. Heat transfer is primarily by conduction and radiation unless suspended in fuel.

Linear burning progression limits exposure to any one point to one to two minutes.

Total burn time of a cigarette is approximately 12-15 minutes (1 inch in four minutes). Most people discard a cigarette that is almost totally consumed, therefore, the fuel bed's typical exposure to heat is approximately one to two minutes.

Ignition Factors:

Figure 96. Cigarette ignition factors.



Environmental factors include:

- Finely particulated fuel bed.
- Loose fuel arrangement.
- Fine dead fuel moisture (FDFM) less than 14%.
- 80 ^{o}F + ambient temperature
- Microclimate location (temperature at ground level vs. temperature at higher level).
- Relative Humidity (RH) of 22% or less.

Because cigarette caused fires ignite at or near ground level, weather readings should be taken as near to the location on the ground and as near to

the time of ignition as possible. Microclimate conditions at ground level can vary significantly from those taken at eye level or 20-foot levels.

Circumstances: Physical placement of the cigarette is an important factor. It should be noted that what is important is what the cigarette position was when it ignited the fuels, not its final resting place after the fuels ignited and burned. In many instances, this may not be possible to precisely determine. To increase the chance for a cigarette ignition, 30% + of the glowing tip needs to be in contact with the fuel bed. The tip should be oriented into the wind and may be burrowed or downslope of the non-burning end.

Smokers normally do not discard full-length cigarettes. The length of the ash remains should be examined and consideration given to being part of a time delay incendiary device. Consider altered cigarettes such as a matchhead device, cut back behind suppressant rings.

Figure 97. Cigarette evidence.

When considering the circumstances related to a possible cigarette caused fire, the weather and fuel bed conditions should be compared to the requirements provided in this field guide. Besides the physical placement of the cigarette remains, signs of human activity may be present in or near the origin area.

Rounded or pointed tips may indicate active smoking. A flat tip may indicate extinguishment prior to being placed. Exploded appearance on ash column may indicate a lit cigarette. Old remains may have a bent, weathered or mangled appearance.

Figure 98. Examples of cigarette tips.

Investigative Techniques:

- Carefully examine all cigarette butts located at or near the Point of Origin before touching or moving them. Use a hand lens to determine if any alteration or modification has occurred that may indicate the cigarette was used as a fuse component in a time delay incendiary device. If so, proceed with the investigation as a suspected arson.
- Before moving the remains, measure its location in reference to the ignition area or other relevant points including distance from any nearby roadway. Measure length of ash and unburned product. Note distinguishing markings and whether a filter is present and if product is hand rolled. Examine condition of remains for indications of crushing. Photograph and collect the cigarette residue and butt from the origin using a basal-area lift technique.
- Carefully examine and gently remove ash layers to reveal their structure. Size and weight ratios of cigarettes (and matches) usually prevent them from burning to the ground surface; however, surrounding ash may obscure them.
- Package, label and store the sample for future use as evidence.
- Determine the specific weather conditions at the suspected time the cigarette butt was delivered to the fuel bed. Document wind speed and direction, relative humidity, temperature and state of weather (percent sunshine).
- Determine what the fine dead fuel moisture would have been at ignition time.
- Determine what the depth, arrangement and cure state of the *fine* (1 hour time lag) fuel bed would have been at time of ignition. Examination of unburned fuels near the general origin area may give you an idea of the fine fuel factors.

- Contact witnesses who may have been near the ignition area at the time the cigarette may have been discarded. Do not overlook residents that may have observed someone walking or driving by at the time. Generally, focus on the time period from one hour before ignition up to the time the fire was reported. (Extend this time as needed based on fire behavior conditions).
- Using interview and scene information, attempt to estimate the source from which the cigarette butt came and the estimated trajectory it may have taken when discarded.
- Determine if any fire prevention regulation was violated and what enforcement action and subsequent disposition took place.
- Exclude or analyze other reasonable potential causes.

Debris Burning

Definition: Wildland fires caused by debris burning activities including residential (pile, barrel, hazard reduction) and industrial (logging operations, land clearing, agricultural, forestry, right-of-way hazard reduction, or other controlled burning). Debris burn escapes are one of the leading specific causes of wildland fires.

Ignition Factors: Factors are similar to escaped campfires. Windblown embers or fire creeping from the control burn area into un-cleared vegetation are the primary ignition mechanisms.

Circumstances: Discernible spread pattern originating from the perimeter of the debris burn. Windblown embers generally land within 40 feet of their source. Cardboard and paper form competent aerial firebrands and are often present in residential debris burning activities. The debris pile or burn barrel will be present and discernible at or upwind of the ignition area. When burning is being done in a barrel, defective screens (burnt out, too small for size of barrel, or mesh that is too large) or no screen is present. The barrel itself may be defective and have holes not covered by a screen either deliberately cut into the barrel or simply from rust or burn through. Inadequate clearance is often a primary circumstance associated to both residential and industrial debris burning escapes. The failure to have suppression tools present can play a role in establishing possible negligence. Signs of suppression efforts by the property owner or others may be present.

Figure 99. Debris burning burn barrel escaped fire.

Lack of attendance is a common circumstance in debris burning escapes. This includes both residential and industrial debris burning activities. Failure to attend a residential debris burn typically can result in a delayed escape of minutes to days.

Escaped fires originating from large slash burning operations should be treated generally the same as other debris burns. Their size, and the fact that they may hold over for an entire winter do create additional considerations. Industrial debris burning, such as logging slash or other forest industry pile burning, can develop ash crusts similar to that described in the section on campfires, creating residual heat for months. Often, by the time these larger industrial burn piles are exposed and become active again, forest debris such as leaves and needles have covered any attempts at control lines around the piles, allowing the fire a path of escape by direct burning or windblown ember.

Fires may surface from clearing and brushing activity well after the original materials were burned. They may also surface from burning in the ground where no brush pile exists. There are numerous documented instances where these fires having escaped the following spring after being originally burned the preceding fall. This may be due to a mixture of dirt and ash which insulates the hot embers within the debris that is piled by these activities.

Investigative Techniques - General

- Determine if the ignition area or source of ignition is the burn pile, and if burn patterns support the determination.
- Conduct thorough interviews of subjects that may have observed the burning or were involved in the burning.
- Examine the residual pile material for size, depth and composition. Fully document what materials were burned and if any residual heat was retained in the pile.
- Determine what control barriers were constructed, what tools and water source were relied on, and if the subject attended the burn at all times. Fully document all conditions and deficiencies that existed.
- Determine the time frame from ignition of the pile to escape; often this is measured in days. Be specific on dates and times.
- Determine what the weather conditions were during the entire burn time and specifically at time of escape.
- Determine the proximity of the burn pile to surrounding fuels or near-by fuel hazards. Include slope, aspect and proximity to fuels.
- If an incinerator or burn barrel was used, document the amount of vegetative clearance around the unit, integrity of the screen and barrel container, proximity of the unit to near-by fuel hazards, and whether the user monitored the burning and had sufficient tools on hand.
- If juveniles were involved, determine if they acted as the parents' agent to burn the material.
- Was burning conducted during times of restriction or closure? Document any permit or prevention violations that were involved, enforcement actions taken and subsequent dispositions.
- Collect samples of burn material, if necessary, and always take several photos of the burn pile or barrel from various angles and distances. Photographs should show proximity to surrounding fuels, the subject's residence, control lines, tools and water, suppression attempts, other piles and material burned.
- Summarize all refuse or yard debris burning evidence, validated and/or eliminated, in the investigation.
- Exclude or analyze other reasonable potential causes.

Investigative Techniques – Slash Piles

- Document the type and extent of fuel material burned, expressed in species, fuels, sizes, acreage, pile sizes or tons per acre.
- Determine the extent of broadcast and pile burning, and diagram perimeters of burn areas. Transcribe this information on to topographic maps. Take aerial photos when necessary.

- Document the extent of pre-planning, site preparation and proper burn execution for the burn operation. Extent of control barriers planned and appropriately constructed, fuel hazard reduction near control lines (both sides), personnel and equipment for control, emergency contingencies, weather monitoring, ignition and lighting equipment and techniques, communications, supervision and training. Fully document all commendations and deficiencies.
- Document the ignition method employed and its sequence. Document any situations where ignition sequences failed or were partially successful. Record the extent of unburned fuel from these actions and the extent of subsequent re-burn, follow-up actions as they related to escape or hampering control efforts.
- Document the extent of agency involvement in the approval of burn plans, pre-burn, burn and post-burn inspections, follow-up on non-compliance issues, permits, record of fire and district control actions. Fully document all conditions and deficiencies.
- Document weather information 30 days in advance of the fire, during the escape and the suppression period. Determine fuel moistures for all size classes of fuels involved. Obtain copies of any pre-planned fire behavior prediction estimates.
- Document the areas or points of fire escape and any situations where spotting may have occurred. Document all physical evidence and relevant human actions related to the escape or ignitions.
- Document all relevant human actions that took place after the escape was discovered. Document the extent of control resources available and the extent of which it was effectively used.
- Document the timeline of large piles burned or broadcast burns that included piles. Include time of year ignition took place, extent of monitoring, patrol or mop-up efforts. Fully document all conditions and deficiencies.

Investigative Techniques – Holdover fires

The investigation should include (if the brush pile has not been scattered during suppression):

- Photograph, video, and measure the brush pile and commence sketch initially during examination.
- Probe the pile to identify hot spots.
- Obtain a detailed statement from the landowner or property holder, including the date the location was brushed, burned, and re-piled.
- Commence examination at an identified location of the brush pile.
- Have the landowner present if possible.
- Use a skidder, tractor, or cat to dissect the pile.
- Measure each *cut* into the brush pile.

- When dissecting the pile, examine and document not only the *hot* core of the pile, but look for areas of cold charcoal and determine if they connect to the burning core. Debris color as this can determine intensity of heat.
- Video and photograph the procedure.
- Sketch the scene with appropriate measurements.
- If initial burn was within the fire season, obtain a copy of the fire permit.
- Confirm the permit conditions with the issuing agency.
- If a ground fire, a careful examination of the area to determine depth of burn and fire movement will be necessary to confirm cause.

Arson/Incendiary

Definition: Wildfires deliberately or maliciously set with the intent to damage or defraud. Refer to your jurisdiction's legal definition of arson.

Arson/Incendiary caused fires will be addressed in Chapter 7.

Equipment Use

Definition: Wildland fires resulting from the operation of mechanical equipment excluding railroads. Types of mechanical equipment range from heavy construction to small portable engines. Equipment use caused fires will be discussed in this section in five parts:

1. Exhaust system particles.
2. Friction and sparks.
3. Fuel, lubricant, fluids.
4. Mechanical breakdown or other malfunction.
5. Radiant or conductive heat transfer.

1. Exhaust System Particles: Ignition Factors

Exhaust system particles can originate from any internal combustion engine. The particles include carbon, catalytic converter and metal fragments. These particles are common ignition sources along roadways and areas of off road vehicle use.

An exhaust system is made up of components, including a header, converter, exhaust pipe or pipes, muffler, and tail pipe.

Exhaust carbon particles are materials that are created by incomplete combustion of hydrocarbon fuels. They are made up of engine carbon, trace

metals, and lubricants as a binder. Carbon particles can have the heat content equivalent to a similar sized piece of hardwood. Volatile hydrocarbons contained within the particle may extend the time the particle is thermally active. Larger particles may auto-ignite upon ejection and contact with the air. Diesel engines are generally more prone to ejecting competent ignition sources than are gasoline engines.

Figure 100. Examples of carbon exhaust particles.

Gasoline carbon particles generally come in smaller particles than diesel carbon particles. Gasoline carbon is typically granular or in flakes, and may be either shiny or dull, but will usually be sooty. Gasoline carbon particles may be recoverable with a magnet if sufficient ferrous material is present in their composition.

Diesel carbon particles generally are larger than gasoline carbon particles. Diesel carbon particles are granular, spongy, or pumice-like chunks. Diesel carbon particles may appear shiny or dull but are usually black and sooty. Experience has shown that they are rarely recoverable with a magnet.

Diesel carbon particles pictured below are generally larger than gasoline carbon particles. Note the black sooty appearance.

Figure 101. Examples of diesel carbon exhaust particles.

Exhaust system particles originate from the combustion chamber where temperatures are commonly 3,000 ^{o}F, and ports or manifolds which reach temperatures of 1,600 ^{o}F. Generally, the maximum horizontal flight distance from the exhaust source to the ground is about 45 feet. Most fires ignited by exhaust particles will be much closer to the source of the particle.

Exhaust particles are considered a competent ignition source when they are a minimum of .023 inch particle size (Fairbanks, July 1934). Particles which ignite fires are usually in the range of 0.06 to 0.08 inch or larger (Countryman, 1983). Particles up to 0.5 inch or larger are not uncommon when associated with diesel locomotives.

Exhaust carbon particles are usually ejected from the exhaust systems under conditions of idling prior to peak level operation, when engine is pulling a load, during piston ring or valve seal failures, engine overheating, jake brake operation, compression braking or at shift points.

Spark arresters and turbo-chargers are designed to limit carbon ejection. One or the other may be required by law. The presence of a spark arrester or turbo-charger does not preclude an ignition due to exhaust particles due to malfunction, modification, or wrong model being used.

The two categories of spark arresters and turbo-chargers:

- Attrition.
- Retention.

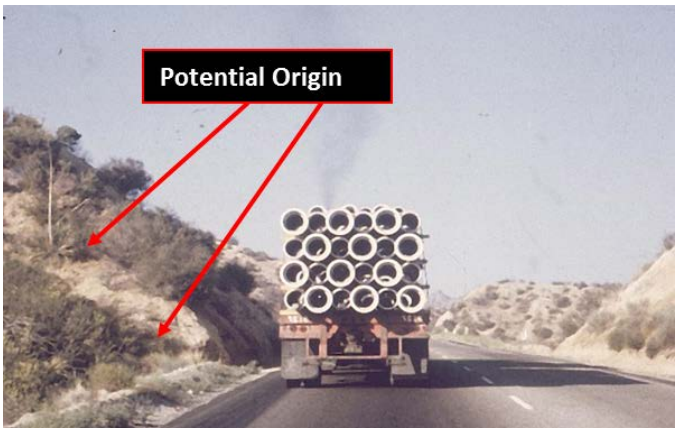
Spark arresters and turbo-chargers must meet pertinent standards. Spark arrester guides can be found at the Forest Service Technology & Development Program Web page at http://www.fs.fed.us/t-d/programs/fire/spark_arrester_guides.

Loose housing bolts, a loose or warped flange, or a separated exhaust port screen, all can be indications of an exhaust leak around the spark arrester. Some mufflers look like spark arresters and may need close inspection to determine if they include an arrester.

Conditions: Exhaust carbon particles are more likely to ignite fires in conditions which include low RH and high temperatures. Variations in particle size make establishing minimums difficult and large particles have been known to start fires in up to 80% RH (DeBernardo, 1980). The host fuel bed is typically finely particulated one hour fuels. Fine dead fuel moisture (FDFM) is generally low, but no known upper threshold has been established.

Locations where exhaust carbon particles may originate include cutbanks, slopes, tunnel portals, downgrades and at shift points on upgrades. Road conditions that contribute to thermal or mechanical stress can increase the potential for exhaust carbon particle ejection.

Figure 102. Vegetated cutbanks can form receptive fuel beds for exhaust particle fires.



Where small equipment is suspected as having been in use, such as chainsaws, ATV, lawn equipment, portable power equipment, evidence of use near the ignition area may be present.

Figure 103. Several types of small engine exhaust systems.

Heavy equipment, such as dozers, dump trucks, logging trucks, tractors, graders, skidders, etc., of more recent manufacture will typically be turbo-charged but may still pose a threat if the system is damaged. The conditions may be obvious.

Figure 104. Damaged exhaust systems.

Generally, conditions which apply to a fire scene that can be associated with exhaust carbon particles include the presence of the actual equipment or

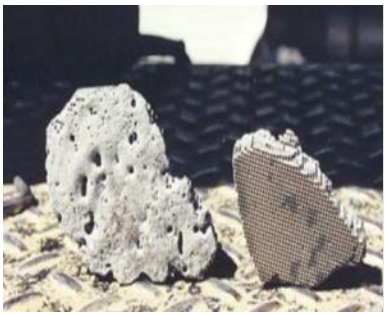
signs of any types of equipment use such as construction, logging, land clearing, harvesting, mowing, grading, etc.

Ignition mechanisms include: exhaust system particles, friction, fuel, lubricant, fluids, mechanical breakdown or other malfunction, rock strike, vegetation buildup on hot surfaces and radiant or conductive heat transfer. Charred material on the exhaust or other hot surfaces may be present and should be looked for.

Catalytic Converter Particles

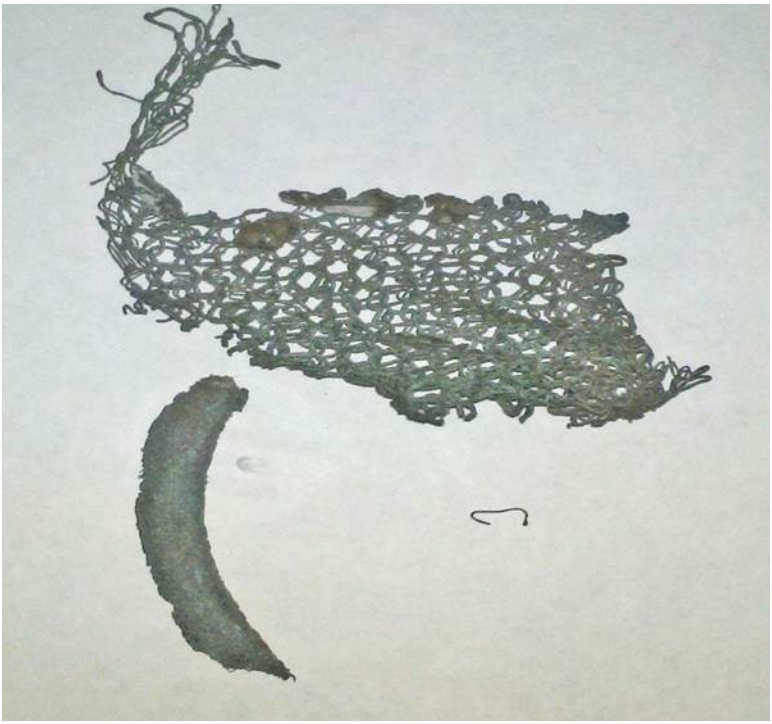
Catalytic converter particles are composed of a ceramic matrix and honeycomb monolith with small ceramic beads common in older vintage vehicles. The particles are generally grey in color, dull or have a metallic sheen. They may be scorched.

Figure 105. Catalytic converter particles.



Particles of wire mesh, a component of some catalytic converters may also be ejected and ignite a fire.

Figure 106. Wire mesh from catalytic converters.



Normally operating catalytic converters can reach up to 1,380 °F. Malfunctions are usually caused by an electronic ignition failure. During a malfunction, the converter overheats and the matrix degrades and breaks apart at temperatures of 2,400 to 2,800 °F. Hot ceramic particles discharge from the exhaust system either through the tail pipe or through failures in the outer shell of the converter itself.

Conditions: Fires ignited from the ejection of catalytic converter particles generally have a maximum horizontal trajectory of approximately 35 feet. The tailpipe height limits the trajectory.

The height and consistency of ground vegetation, such as grass, will also form a barrier to particle travel. Most origins are close to the road shoulder and there is no correlation to cutbanks or grades. Multiple ignition areas or multiple fires along the same road system are common.

The ignition area of each fire will typically have a particle(s) within it which may vary in size, up to the diameter of the tailpipe, or the hole in the catalytic converter shell. Catalytic converter particles are considered lightweight ignition sources and most often rest on top of the ash. The

particles are non-magnetic and resemble melted plastic. A ricochet effect set up by particles exiting a low exhaust pipe may cause the particle to bounce at odd angles, but most particles come to rest in the general direction that the exhaust pipe is angled.

Figure 107. Catalytic converter particle.

Investigative Techniques: Catalytic Converter

Look for multiple ignition areas. Walk the roadside and look for additional particles which did not start fires. Search up and down the road for a disabled vehicle. Experience has shown that approximately 33% of vehicles with catalytic converter problems will stop running within a few miles of the fire(s). Inspect the converter looking for holes, rust, cracks, and loose mounts. Tap on the shell and listen for the sound of loose particle within the shell. Consider having a mechanical or automotive engineer examine the system to determine if there has been tampering or illegal modifications.

2. Friction: Ignition Factors

Heat generated by moving object(s) may cause sparks or high temperature particles (or both) and can be associated with mechanical malfunctions. This heat may be created as a result of objects rubbing together or as a result of one object impacting another.

Figure 108. Examples of rubbing and impact friction ignition.

Sparks or metal fragments may be torn from the host metal by the force of impact when a hard object, such as a rock or pavement is struck. Sparks are typically metal fragments which have been heated to their ignition temperature and are actually combusting. Heated metal particles are those which have not generally reached their ignition temperature but have absorbed heat which may be sufficient to ignite the forest fuels nearby. The spark or heated metal fragment temperature may reach several thousand degrees. Larger particles shear off and can be 700 to 1500 °F or higher. The ignition potential of each particle is dependent upon its total heat energy, the actual temperature of the particle, the ignition temperature and conditions of the specific fine fuel which the particle comes into contact with.

Examples of potential friction ignition sources include cable rub, tracked equipment, roller pins binding, slip or spin on rock(s), grader blade strikes, rotary saws, hydro axes, lawn mower and metal blade weed trimmer blade strikes, misaligned shafts, and vegetation buildup.

Rock strikes by heavy equipment and or by rotating metal blades or discs are common sources of friction sparks and heated metal particles. Testing of metal blade equipped weed trimmers has shown that the metal blade contacting rock can ignite both cured and partially cured annual grass.

Figure 109 is an example of a rock strike by heavy equipment. Notice the fresh chalky look to the chip on the rock.

Figure 109. Rock stuck by heavy equipment.

Investigative Techniques – Friction

Look for evidence of equipment use in or near the ignition area. Use a magnet to search for the remains of metal particles within the specific origin area. Fires caused by sparks and hot metal fragments may smolder for minutes or hours and only transition to open flame and steady state flaming front after equipment operators have left the area. Signs of over-aggressive operation of the equipment may be present and should be looked for such as lawn mowers being used to clear dry vegetation in rocky soils or heavy equipment being used in rocky terrain during periods of high fire danger. When examining rotary blade equipment examine the cutting teeth or blade for damage. Collect the blade or teeth as evidence. Friction charring on stumps or trees from operation of equipment such as feller bunchers, cable logging yarders, etc. should be documented and collected as evidence when possible. Submit metal particles or control samples for forensic evaluation.

Figure 110. Friction particles found by using a magnet.

3. Fuel/Lubricant/Fluids: Ignition Factors

Combustible liquids used for the operation of equipment in the wildland can be ignited by a heat source and spread to the wildland when not properly maintained.

These fluids can be exposed to a heat source during refueling, as a result of fuel line leaks or hydraulic line leaks.

In addition to fluids igniting by hot surfaces, combustible debris accumulations, such as leaves, dry grass, and pine needles may come into contact with heated surfaces within the engine compartment or the exhaust system.

Conditions: Conditions present may include hydrocarbon or fluid residue, trails of burned vegetation or spotting where equipment has traveled, failed or leaky fuel or hydraulic lines and fittings. Burned equipment at the origin, witness statements indicating a failure in the area of a fuel or hydraulic line, engine compartment fire or near exhaust system with remains of burned vegetation accumulations.

Figure 111. Examples of fuel, lubricant or fluid ignition factors.

4. Mechanical Breakdown: Ignition Factors

Mechanical breakdowns include tire, wheel, or bearing failures; brake failure, transmission failure, electrical system failure, dragging objects (friction), driveline failure, failed turbocharger, seized bearings, misaligned axles, etc. Each failure has the potential of creating heat.

Figure 112. Log truck mechanical breakdown ignition factor.

Conditions: Conditions include evidence of equipment use near the ignition area, metal particles, burned tires or tire fragments, gouge or drag marks on the road surface (friction). Often the operator of the vehicle will state that they suffered some type of failure, heard some type of different noise, or saw smoke coming from a particular area of the vehicle or part. When trailers or trucks are involved, overloading of the vehicle may cause the failure. When tires fail, the condition of the tire is often poor prior to the failure unless a road hazard had been run over, in which case the operator of the vehicle may make statements to that effect, or the road hazard may be located nearby.

5. Radiant or Conductive Heat Transfer: Ignition Factors

Contact between dry vegetation and a radiant or conductive heat source can cause the vegetation to be ignited. This typically takes place when hot surfaces on equipment or vehicles come into contact with the dry vegetation. This can take place as a result of dry vegetation being caught up or deposited on the vehicle or equipment and coming into contact with such items as the exhaust surfaces or hot engine areas. It can also take place when a vehicle or equipment is parked over and in contact with dry vegetation.

Conditions: Conditions include the burnt remains of dry vegetation accumulated on hot surfaces of the vehicle or equipment. This is often on the underside of the vehicle. Tire tracks going through the specific origin area and the presence of tall grass or other vegetation is also an indicator of this type of fire cause. Burned equipment may be present in the area.

Figure 113. Conductive heat transfer ignition factor.

Investigation Techniques - Equipment General

- Make a thorough listing of all equipment that is believed to have been near the area of origin at or about the time that the ignition took place. Expand this time period for the duration it is believed a fire could have held over. When listing equipment, include make, model, serial number, age and general description. Isolate problem equipment.

- Identify who owns each piece of equipment and who was operating it at the time. Determine dates and times of operation and any change of operators. Sketch on a map the location and time of operation.
- In addition to listing the equipment, be sure to photograph each item near the origin area at the time of ignition, prior to being moved or inspected.
- Identify and document any tracks leading from the origin to the equipment.
- Interview each operator and each person that performed maintenance on the equipment. Obtain detailed witness statements from each subject.
- Inspect each piece of equipment with a qualified equipment mechanic if necessary. Examine the fuel system, electrical system, exhaust system and any friction contact surfaces and bearings. Photograph and fully describe any and all parts that appear to be deficient or show excessive wear or damage. Obtain written reports from assisting mechanics. Look for debris around the exhaust system or other hot engine surfaces.
- Follow up equipment inspections with professional service centers or distributors for details of maintenance schedules or specific hazards or problems associated with operation of a specific piece of equipment. Obtain witness statements from representatives that offer information on cause and effect.
- When evidence collection is not possible or practical, obtain photographs of the item and close-ups of the area of deficiencies or damage.
- Check all internal combustion engines for spark arrester compliance. Inspect spark arresters and document any deficiencies.
- Document any deficiencies in maintenance, including buildup of debris on hot surfaces.
- Document all deficiencies for fire protection requirements relating to use of such equipment, such as fire extinguishers, water source, and watchman service.
- Determine the terrain over which the equipment was used.

Railroad

Definition: Fires caused by any railroad operations, personnel, rolling stock and can include track and right-of-way maintenance. Historically, railroad fires were significant problems, but aggressive prevention has reduced present day occurrences in many areas.

Railroad structures such as trestles, bridges, and ties, are included in this category of fire cause.

Figure 114. Railroad trestle fire.

General Railroad Ignition Factors

Ignition factors include:

- Exhaust carbon.
- Brake shoe particles.
- Track maintenance.
- Right-of-way maintenance.
- Dynamic grid failure.
- Signal flares.
- Wheel slip.
- Wheel bearing failure (hotbox).
- Transients.

Railroad Exhaust Particles Ignition Factors

Exhaust particles from railroad equipment is a highly competent ignition source. Diesel carbon is bound together with polymeric lubricant resins and form particles with pumice-like, granular or flaky appearance which is often sooty or oily.

See Figure 115 for pumice-like appearance of railroad exhaust particle on the left, and sooty and oily looking railroad exhaust particle on the right.

Figure 115. Types of railroad exhaust factors.

Railroad exhaust particles range in size with larger particles more likely to start fires. Particles are rarely retrievable with a magnet. Super-heated particles can auto-ignite when exposed to the air upon ejection.

Exhaust particles emitted from a point in the exhaust stack may range from 900 to 1,200 °F. Under fanned conditions, which simulate an in-flight environment, exhaust particles have been observed as low as 690 °F. Depending upon their size, structure, and surrounding environment, they could be either cooled or have their temperature significantly raised from increased thermal activity. As the hot exhaust particle passes from an oxygen-depleted environment to the atmosphere, glowing or flaming combustion can occur. (DeBernardo, 1979)

Figure 116. Sizes of railroad exhaust particles.

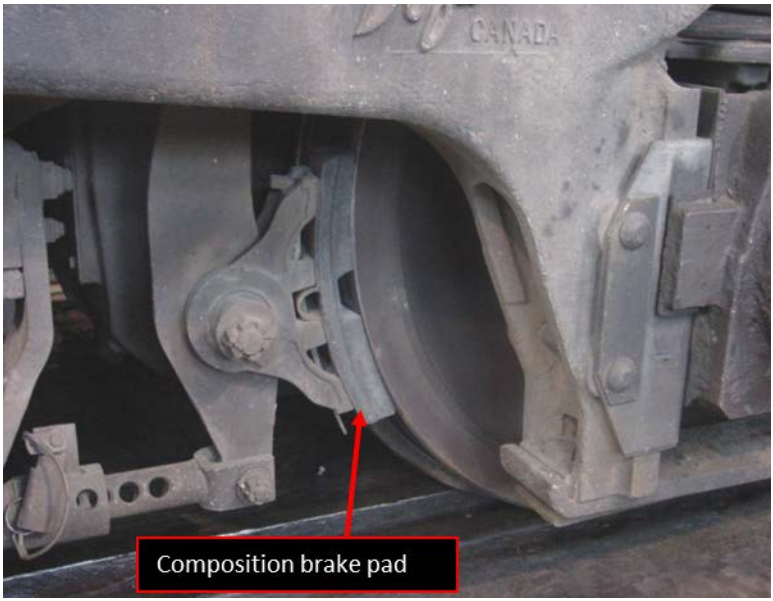
Auto-ignition of particles creates flaming projectiles that may remain thermally active for 30 seconds or longer. Swirling air from the passing train aids in the ignition of the vegetation. Research puts maximum in-flight distance at approximately 45 feet in still air with the average being 28 feet from the track centerline. (DeBernardo, 1979)

Exhaust particles from railroad equipment commonly will cause multiple ignition area s with origins generally within 45 feet of the downwind side of the tracks. Tunnel portals and cutbanks experience an increased incident of fire ignitions. Speed transition zones or other locations where full power is applied are typical locations where particles are ejected, especially if the locomotive has been idling for a period of time prior to pulling a grade. Deadhead locomotives and yard locomotives started up after a period without use or low power use have an increased potential for ejecting particles.

Brake Shoe Particles Ignition Factors

Railroad brake shoe fires occur when brakes are applied over long periods and heat up. This particularly happens on downgrades and sharp turns. Particles shear off and land on the ties or in the vegetation. Malfunctioning brakes can start fires at any location. This includes stuck brakes and set brakes.

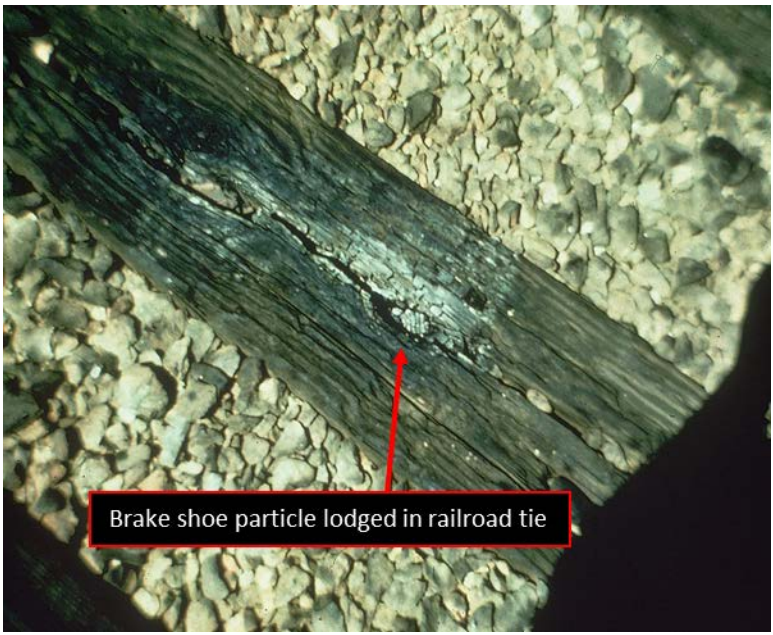
Figure 117. Railroad car brake pad.



Brake shoe particle ignition areas can be on the ties or close to the tracks in vegetation or other debris. A brake shoe particle will typically be found in the ignition area but may have rolled past or moved, particularly on steep slopes. The ignition area may be at a location associated with brake use and there may be multiple starts in a short distance.

Figure 118 is an example of a brake shoe particle lodged in railroad tie. Fires starting on ties often occur where rotten wood exists and may raise questions of maintenance issues.

Figure 118. Brake shoe particle in railroad tie.



The majority of trains are diesel-electric combination and may have air brakes with dynamic braking (electrical) or non-metallic composition brake show pads. Some trains now use disc brakes. Some older equipment may be equipped with metal shoes. Metal backing plate particles may shear off and land on ties or vegetation. The use of composition brake pads will lead to wear down. Brake shoes must be regularly maintained.

Track Maintenance Ignition Factors

Track wear requires regular maintenance and includes standard welding and cutting, thermal chemical catalyst welding, grinding, and rail stretching.

Catalyst welding exposes the fuels to an open flame and sparks. Hot ceramic molds may be carelessly discarded or buried in the fill.

Look for the remains of ceramic molds such as depicted in Figure 119. These can be near the rails, or may have been dropped or discarded a distance from the rail.

Figure 119. Ceramic molds along railroad track.

Track grinding can include manual grinding and machine grinding. Grinding emits sparks and hot grinder residue. It is possible to recover metal particles using a magnet or metal detector. Grinders may be portable and brought to the site by maintenance crews or may be mounted on a maintenance train itself that moves as it grinds.

Track grinding slag which accumulates on the underside of the maintenance rolling stock can fall off and may look like Figure 120 below.

Figure 120. Track grinding slag.

Dynamic Brake Grid Failure Ignition Factors

When a dynamic brake is applied, the traction motors convert to generators which produce electrical current that is routed to a resistor grid on the locomotive. This resistor grid resembles a large toaster element and its location on an engine varies but is typically vented out the top of the locomotive car body. Excess heat created by this braking is vented through cooling fans which may result in overheating and failure with spectacular arcing and violent ejection of hot metal fragments. This failure is often accompanied by a loud noise that may be noticed by the train crew. The grid material may or may not be picked up by a magnet due to some of the non-ferrous material of the brake grid. Brake grids can produce 600 volts and extreme caution should be used around them.

Figure 121. Dynamic brake grid exhaust outlet.

Signal flares are used by crews to warn railroad traffic of possible hazards. The remains are consistent with those of highway flares and may be found near locations where maintenance work had been going on or other train related hazards had been present.

Figure 122. Signal flare debris.

Right-of-way maintenance along railroads include burning, mowing, spraying, tree trimming, and brush removal. Activities can be crew based from vehicles and/or maintenance train based.

Figure 123. Right-of-way maintenance burning.

Wheel slip/slide Ignition Factors

Train wheel slip and slide may occur when a train brakes or accelerates allowing the wheels to spin in place (slip) or brakes causing the wheels to slide. While wheel slip or slide can cause hot metal particles to fall into the ties or vegetation, it is not a common ignition source.

Conditions: Wheel slip or slide may cause thin, heated, elongated metal shavings to fall into the ignition area fuel bed. They are most likely to be found where a train accelerates or decelerates. The track may have a *welded* appearance adjacent to the ignition area, which is often a tie, particularly if there is rot present on the tie.

Investigative Techniques: Recover metal fragments with a magnet or metal detector. Photograph the rail near the ignition area. Identify the train through dispatch records and interview the crew or engineer (or both).

Figure 124. Train wheel slip on train track.

Rail Car Axle Bearings Ignition Factors

Roller bearing within the hub and axle assembly can overheat and fail. The wheel roller bearings can be ejected out from the assembly and land either on the wooden ties or on vegetation while still hot enough to ignited the combustible materials upon which it lands.

Figure 125. Railroad wheel roller bearing hub assembly.

Figure 126. Roller bearing assembly which has been detected by a hotbox as being defective and tagged as *bad order*. Bad order is a railroad term for a defective item or items.

Figure 127. Roller bearing thrown from wheel assembly which was hot when it landed in the vegetation as exhibited by the burned area around it and under it.

Investigative Techniques Railroad – General

- Examine track and ties for indications of ignition source.
- Document condition of the rails, track, vegetative clearance, and other railroad structures.
- Sweep ignition area with magnet.
- Determine if a train has passed recently or if any recent track maintenance has occurred.
- Obtain track elevation and topography maps.
- Identify the train number, locomotive engine(s) numbers, train crew, train schedule including time, direction of travel, and railroad milepost marker numbers.
- Have the train inspected by a qualified inspector for any suspected deficiencies.
- Interview the train crew and maintenance crew.
- Use the nearest milepost marker as a fixed reference point from which to base measurements and identify photo locations.
- Rolling stock may ignite multiple fires in close proximity, so ensure the examination includes a search for more than one ignition area.
- Search the nearby area on both sides of the track for ignition mechanisms that may not have started a fire. This includes carbon exhaust particles (Figure 100), brake shoe particles, grinder residue, burn piles, track heating, flares, metal fragments, dynamic grid fragments, track damage, etc.
- At the origin, search for, document and collect the actual remains of any of these ignition sources. These are usually recoverable.
- Check records for earlier fires along the track at different locations. These may be in another agency's jurisdiction.
- Obtain train maintenance records as necessary.
- Obtain train data recorder and infrared detector information as soon as possible, as these files are often automatically purged from the equipment.
- Obtain video recordings that may have been taken from the lead and trailing units. These are becoming commonplace within the railroad industry.

Safety

Safety practices around railroad equipment and operations are a critical element of the investigation of a railroad caused fire. Always wear a hardhat, use eye and hearing protection, approved footwear such as a heavy boot and gloves, along with a high visibility reflective vest.

Blue flags/signal protection are applied and removed by railroad personnel and signifies that workmen are on, under, or between rolling equipment that

is being repaired, serviced or inspected. An approved blue light must accompany a blue flag at night.

Never step on or stand inside the rails.

Switches are used to change the path of travel of railroad equipment from one track to another. On the main line, switches are used to put a train into a siding so another train can pass. If the incident involves a siding area, be careful when working around the switch areas, the switches move quickly and silently so it is easy to catch a foot. The person moving the switch may be hundreds of miles away, possibly in another state.

The area within one arm's length of the track is considered to be the *Red Zone* due to the hazards associated with work within that area.

Summary

The National Wildfire Coordinating Group (NWCG) course *Investigating Railroad Caused Wildfires* is available on CD or online at the NWCG Training Development Program site at http://training.nwcg.gov/courses/IRCW/index.htm.

Figure 128. Railroad Fire Investigation Training Material.

Children

Definition: Wildfires started by persons 12 years of age or younger. The child may be motivated by normal curiosity and use fire in experimental or play fashion. Matches or lighters are the most frequent ignition source. It often involves multiple children.

Ignition Factors: Children frequently use easily accessible ignition devices including both paper and wood matches, and lighters. Children may combine the ignition device with other fuels brought to the scene such as paper and cardboard. In other cases, the fuel bed may be prepared in a make believe fire pit or in a pile. Ignition devices may also be used to play with other ignition devices such as fireworks.

Circumstances: Children caused fires may have the appearance of fire play, including numerous matches or matchbooks, burned toys, cigarettes, paper, and boxes. The origins are usually away from adult supervision in hidden or *secret* areas such as forts and locations frequented by children such as fields. These may be accessed by dirt roads and dirt paths or worn paths through dead vegetation such as dry grass.

Children responsible for igniting fires will often flee the scene but may return later to watch suppression activities. Uninvolved children are curious and sometimes will go towards the fire scene.

Fires associated with children may have a corresponding pattern of fires involving structures, schools, or playgrounds. Children or neighbors and parents may attempt to suppress the fire in the early stages or by other civilians. Burned clothes or shoes on children in the area may be the result of attempted suppression actions.

Wildland fires which are associated to children often take place during times when children are available, such as before or after school or during the weekends or summer vacation or other school holidays. Fires may be timed with release from school and in some cases, during recess periods if the child has access to a nearby field.

Child size footprints or bicycle tracks (or both) may be present at or near the scene and in some cases may lead back to the child's residence.

Children acting out due to family turmoil such as divorce, remarriage, lack of a two-parent environment, etc. may set fires in the wildland and structures; including closets, bedrooms, crawl spaces under the home, and the garage of their homes.

Figure 129. Match evidence.

Investigative Techniques

- Look for an origin away from adult supervision, but likely close to home, school, campgrounds, footpaths or playgrounds. Check for hidden *secret* areas or play forts and in locations normally frequented by children.
- Look for signs of fire play such as numerous matches, burned toys, stuffed animals, etc.
- Look for signs of any attempt to suppress the fire, these will typically be unsophisticated.
- Do a neighborhood canvas for witnesses.
- Determine if there have been other similar fires nearby.
- Contacts and interviews of children must be conducted in accordance with appropriate legal process.
- Interview children separately from their playmates.
- Look for and identify children watching the fire.
- Interview children in the area; even if not suspects: they may have information about other children.
- Determine if the actions are due to normal curiosity or a pathological behavior.
- Consider referral to juvenile authorities and/or an intervention program.

Miscellaneous

Definition: Wildfires that cannot by properly classified under other standard causes. Some of these are listed below but can include other ignition sources that are not listed.

- Powerlines.
- Fireworks.
- Cutting, welding, and grinding.
- Firearms use.
- Blasting.
- Structures.
- Glass refraction/magnification.
- Spontaneous combustion.
- Flare stack/pit fires.

Definition - Powerlines. The category of powerlines includes all electrical equipment associated with the production, transmission, and use of electricity. The electrical grid or system for the transmission, distribution, and service of customers forms a complex web and is governed by regulations. The transmission of electricity has long been recognized as having an inherent danger above and beyond typical hazards. Early electrical distribution systems caused numerous fires, better engineering and prevention efforts have reduced the number. Powerlines are an ignition source that can lead to major fires, as many of the conditions that contribute to system faults and failures coincide with extreme fire behavior.

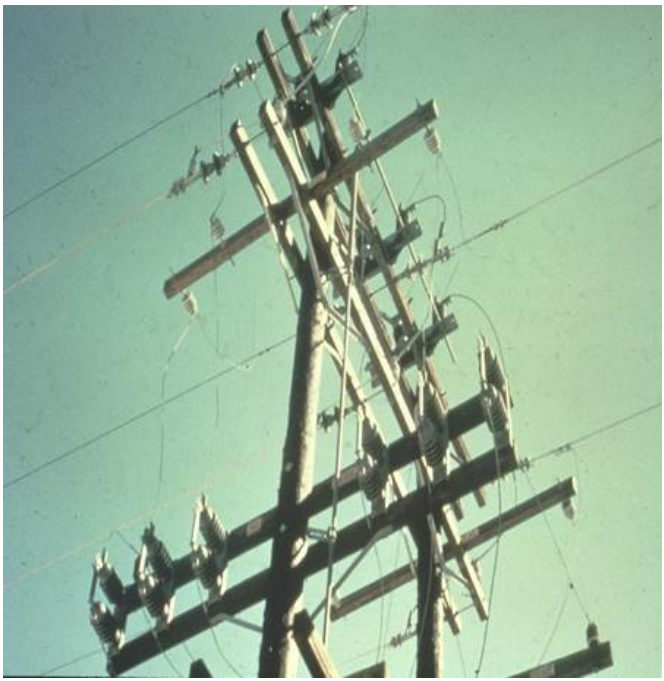
Powerline Ignition Factors: The ignition of a powerline fire often occurs due to high winds, contact with vegetation, equipment failure, or human or animal contact. Sometimes several of these factors may work to cause a fire, such as wind blowing vegetation into contact with the electrical equipment. Fires from powerlines can start as a result of conductor contact with standing vegetation due to inadequate clearances or with wildland fuels on the ground when electrical equipment, such as a conductor, falls to the ground and comes into contact with dry fuels. Sparks or molten metal from conductors or transformers can fall to the ground and ignite fires. These fires may occur in remote areas where fire suppression access is limited.

Most wildland fire investigators will be dealing with transmission, distribution, or service lines. **Transmission lines** are those towers or poles, conductors and equipment, which move electricity from the generation facility to a sub-station. These are generally of higher voltage relying on larger towers and generally transmit between 138kv – 765kv, but may also be as low as 69kv. **Distribution lines** carry power from sub-stations to the transformer. Distribution lines carry lower voltages than transmission lines. Statistically, the distribution network is more likely to cause fires than

transmission lines. The distribution network contains more fire starting hardware and five to ten times more line.

Distribution pole structure and equipment is closer to vegetation than transmission lines increasing the chance of fire by distribution lines.

Figure 130. Transmission line.



A **service line** transmits the electrical power from the transformer to the weather head at the customer. Service lines are close to the ground and often in contact with standing vegetation such as tree limbs. Generally, they are enclosed in an insulating cover which protects it from arcing with other objects.

Powerline fires normally result from conductor failure or faulting, insulator failure, hardware failure, birds, small animals, and mylar balloons. Other factors such as poor cleaning and maintenance of the equipment can contribute to equipment failure.

Figure 131 is an example of a mylar balloon shorting out high voltage transmission lines, which resulted in a wildland fire. The metallic balloon crosses two conductors.

Figure 131. Mylar balloon stuck on transmission lines.

Various hardware is used including switches, fuses, connectors, splices, insulators and reclosers. A general familiarity with this hardware is important for wildland fire investigators. For more information, refer to *Powerline Fire Prevention Field Guide* on the California Wildland Fire Coordinating Group site at http://www.preventwildfireca.org/Field-Guides/.

Arc tracking on the insulator below is due to voltage tracking across a damaged insulator.

Figure 132. Arcing on a damaged insulator.

Conductor failure or faulting results when the conductor breaks, falls to the ground, arcs, and starts a fire. In some cases, a splice or connector may fail causing the line to fall. Faulting occurs when a line contacts or comes close to an adjacent phase or vegetation and faults or arcs. Line sag, high winds, and birds may also cause conductor failure or faulting. In some cases, the initial fault may not start a fire but one may ignite when an automatic or manual reclosing of the circuit takes place and the line is energized once again.

Line sag typically takes place when the conductor is subjected to increased load or solar heating, causing the line to *sag* lower towards the vegetation than normal. Lines experiencing sag may return to their normal position prior to the arrival of the wildland fire investigator. Regulations exist which require utilities to take into account during the construction of powerlines the potential of line sag during a certain range of temperatures. Line sag contact or proximity arc to adjacent vegetation includes arcing of 1 inch per 10kv.

Conductor failure or faulting is usually obvious and often includes charred vegetation, line down or intact, pitting and staining on the conductor, blowholes at the base of the tree, resistance scarring on the tree, and fulgurites at the point of discharge to the ground. Trees contacted in their crowns may exhibit damage similar to a lightning strike and/or scorching or charring of the crown and fire scorching nearer the ground with green foliage and an unburned tree bole in between these two areas of separate heat damage.

Figure 133. Arrow pointing to a limb damaged by contact with an electrical conductor with fire effects similar to lightning.

Figure 134. Staining and sooting on a wire conductor.

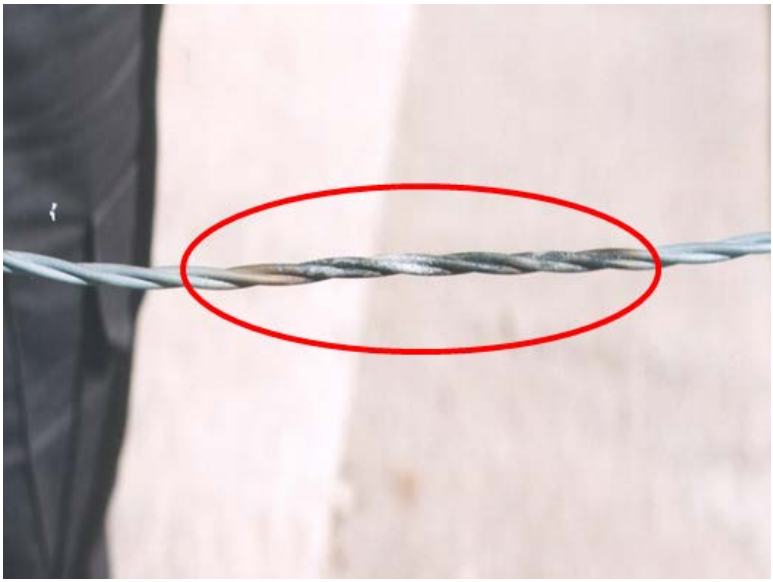


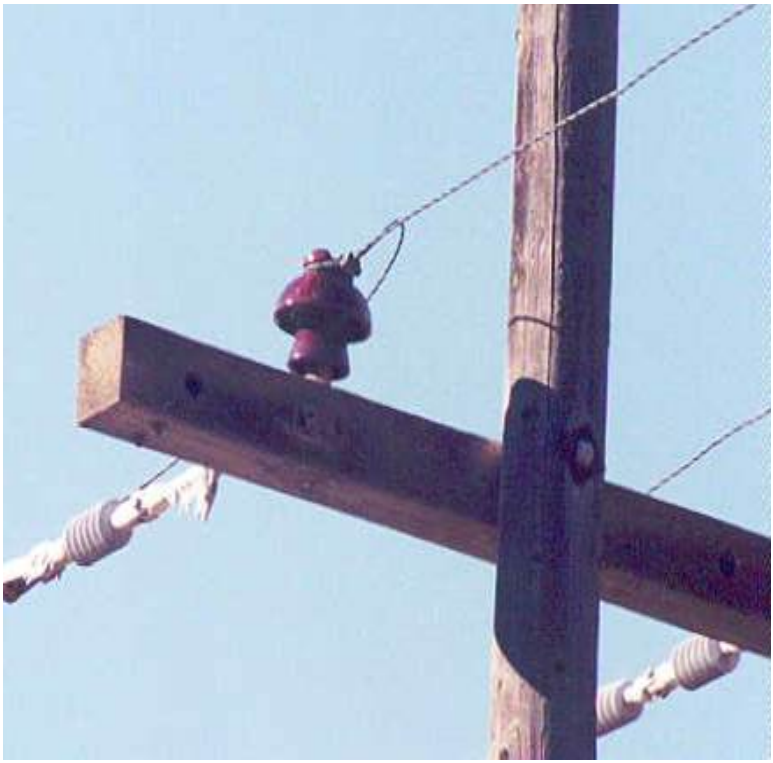
Figure 135. Blowhole near tree from electrical grounding.

Figure 136. Electrical resistance scar on tree trunk.

Circumstances: Powerline discharges to the ground may leave fulgurites. The shape and size of fulgurites created by powerlines may not be the same as those created by lightning. They will typically be solid and on or very near the surface of the soil and may include glass bubble looking formations on the surface.

A **failure of an insulator** may lead to a fire ignition. There are a variety of insulators but all of them are designed for the purpose of keeping the conductor from making grounding contact. A failure of an insulator can result in arcing to the pole or other hardware. Fire is often on the cross-arm or pole in addition to dropping to the ground in the form of burning wood.

Figure 137. Typical crossarm insulator on a wooden mounting peg.



Insulator failures can be a result of many factors, including:

- Dirt.
- Bird manure.
- High humidity.
- Salt deposits (sea air).
- Lightning strikes.
- Over-voltage.
- Deliberate damage.
- Current arcs.
- Insulators or crossarm fail and drop conductor.
- Tie down wire comes loose.
- Insulator comes off mounting peg.

In some States, certain equipment is required to have vegetative clearance due to their propensity for starting fires when they fail. These items may be referred to as non-exempt, meaning that they are not exempt from the law which requires the clearance. These items may include, fuses, disconnects,

lightning arresters, clamps, and connectors. The wildland fire investigator should be aware that these types of equipment have a higher propensity for starting fires when they fail.

Figure 138. Fuse in open position.

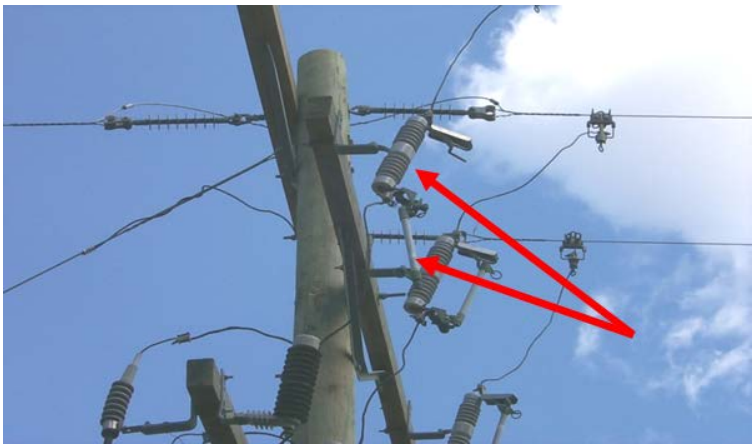


Figure 139. Solid blade disconnect.

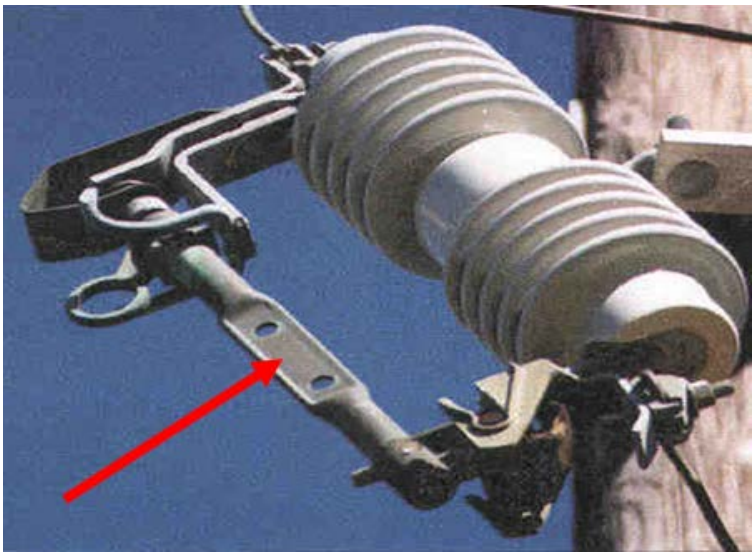


Figure 140. Inline disconnect.

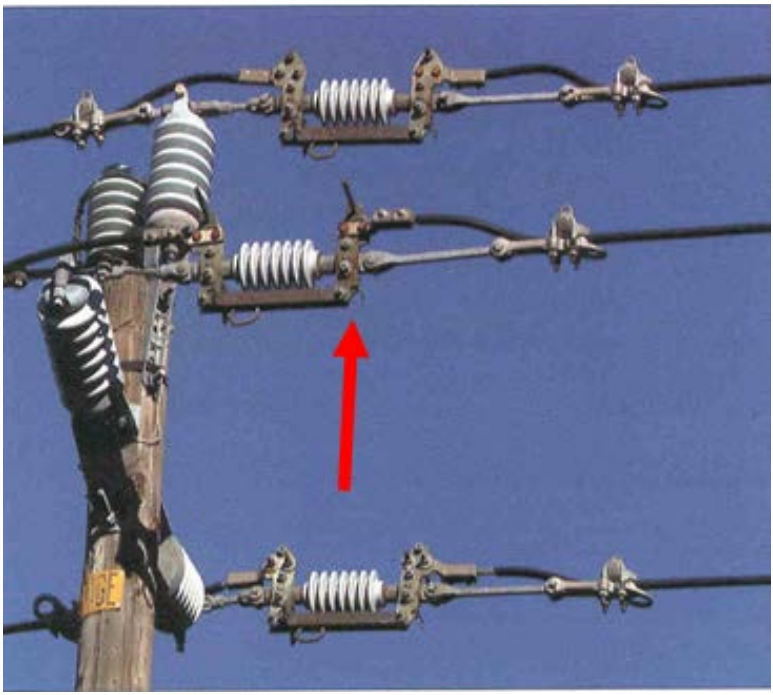


Figure 141. Lightning arresters.

Connectors and clamps connect conductors and jumpers. The potential for an arc increases when they are loose. They include hot tap clamps, split bolt connectors, LM connectors, and Fargo connectors.

Figure 142. Evidence of arcing.

Figure 143. Hot tap clamps.

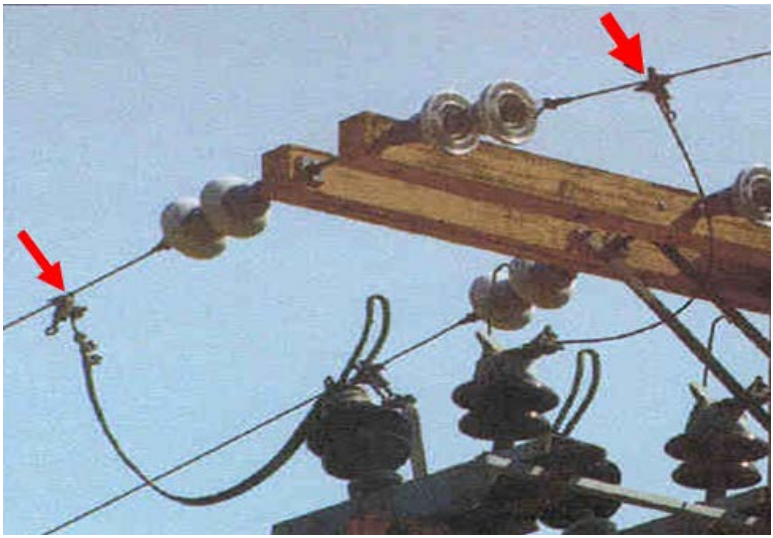


Figure 144. Hot tap clamps.

Figure 145. Split bolt connectors.

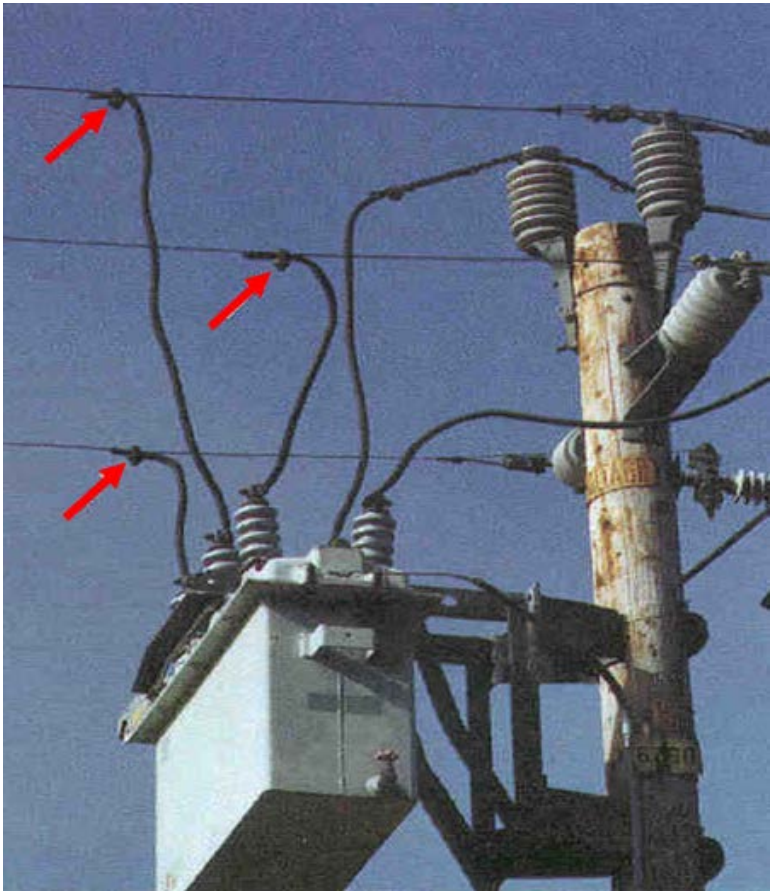


Figure 146. Split bolt connectors.

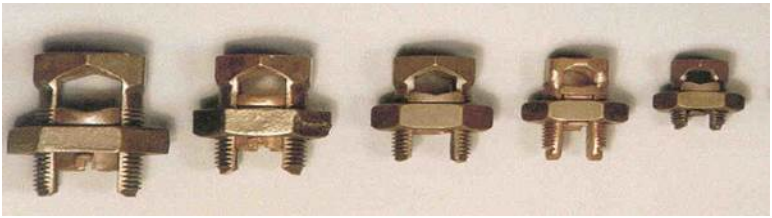
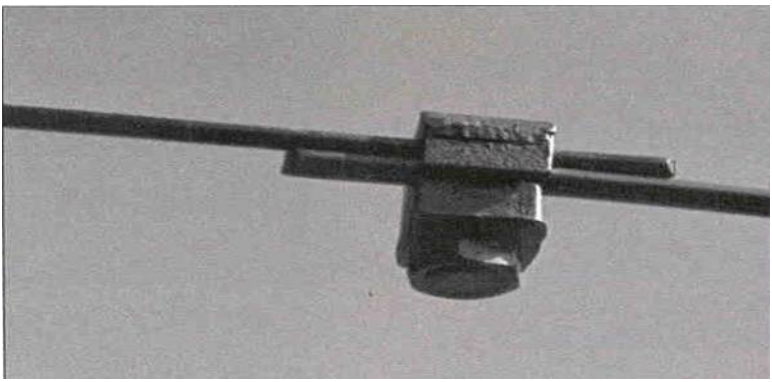


Figure 147. LM connector.

Figure 148. LM connector.

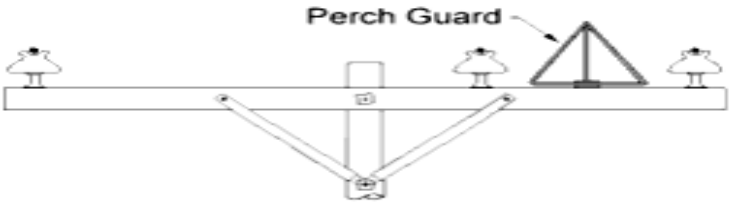


Birds and small mammals may come into contact with electrical equipment and contact two phases or transformer and jumper wires.

This can cause an arc and the bird or mammal often will catch on fire. While many wildland fire investigators may write this off to an act of nature, some consideration should be given to if the utility company had advanced warning concerning a bird or mammal problem. This may present in the form of perch guards or evidence of nesting material and the absence of perch guards.

Note that the perch guard in Figure 149 below is positioned between the two insulators or conductors which are close enough for the span of a bird's wings to contact both conductors. Contact with a single conductor will not usually result in an arc. Search the surrounding area for the fresh body of a bird or other small animal.

Figure 149. Drawing of a perch guard between insulators.



In Figure 150, below, the conductors on the crossarms where the nest is located have been removed in an effort to reduce the arc hazard. New crossarms were added further down the pole. The utility company is aware of this situation and may have some responsibility to check it periodically to make sure that nest debris does not build up and reach the conductors below.

Figure 150. Bird nest above wires.

In the case of a bird contacting the conductors, the contact may be short in nature and may or may not cause the line to open or an event to register.

Circumstances Continued

- Powerlines located in or near the specific origin area.
- Downed powerlines.
- Trees or other vegetation in contact with powerlines.
- Recently downed tree limb located on the ground under or near lines and the ignition area.
- Discoloration of the conductor, signs of arcing or other equipment failure.
- Circuit breakers in open position.
- Blown fuses.
- Recently dead bird or mammal found near the ignition area.
- High winds or high temperatures (or both) prior to the fire.
- Recent power outages or brownouts.
- Pole damage or vehicle accident.

Investigative Techniques

- Before entering the area under or near the powerlines, first determine if it is safe to do so.
- Determine origin area.
- Determine height of tree (if caused by tree falling on line).
- Search area for human activity such as shooting, vehicle traffic and/or recently dead birds or other animals etc.
- Examine powerlines and equipment for damage or failure in and near the area of origin. Look for remains of failed equipment on ground.
- Determine distance of nearby limbs to conductors.
- Determine if legal clearances are present or not.
- Determine general age, size, and condition of vegetation that has fallen on the line. Measure debris on the ground.
- Determine height of powerline.
- Determine height of surrounding forest canopy.
- Determine distance between powerline and vegetation.
- Determine ownership of powerline.
- Determine location of the right-of-way boundary for the power line near the area or origin of fire. Record the distance from the ignition area to the edge of the right-of-way, indicating whether it is inside or outside. Get copies of any use permits concerning the right-of-way.
- Locate and record the identification numbers and the dates of installation of power poles on both sides of the area near the origin.
- Obtain witness statements from power company maintenance crew regarding what caused the power line failure or ignition from the failure.

- Determine if the utility company has removed any potential evidence and recover it if they have.
- Tree samples:
  - Take into possession the parts of the tree that shows contact with the line. In some cases, consider taking the entire tree as evidence.
  - Sample of root – if deterioration or rot is noted.
  - Sample at germination point.
  - Circumference of tree at breast height.
- Video, photograph, and sketch all relevant areas.
- Note: The fire may not have started where the tree is on the line. For example, a fuse may have been activated or malfunctioned, causing a fire at a different location.
- Examine all poles, lines, fuses, transformers, insulators, splices, connectors, and grounding devices in the area of origin. Take photos and collect samples as needed. Request administrative warrant if needed.
- If a fuse or other mechanical malfunction, it may be necessary to obtain the services of an electrical engineer or powerline expert.
- Examine the scene with the powerline expert and take into possession all relevant evidence.
- If there is a direct short to the ground, examine the area for fulgurites.
- Obtain line data and maintenance records from the power company.
- Secure all relevant records from utility company.
- Consider sending preservation letter.
- Collect records concerning hazard reduction and past problems on the same circuit.

Powerline Safety: Use extreme caution when working around or under lines or near equipment. Always assume conductor is charged or may become charged until utility company provides assurances otherwise. Smoke and/or water spray can cause arcing which may reach to the ground. Never climb a pole. Wait for the arrival of utility crews to make the line safe. Look up, look out, and stay away. Wear proper protective equipment when working from bucket truck.

Fireworks

Definition: Fireworks may be classified in several different ways depending upon the jurisdiction. Most fireworks will fall into one of three categories, ground based and hand-held, aerial, or explosive.

Fireworks are known to cause major property damage annually including fires to both wildland and structures. Used in an unsafe manner, fireworks can discharge burning material into flammable vegetation.

Ignition Factors

Fireworks - Ground based and handheld: Emit flame and sparks which when set off adjacent to flammable vegetation can easily ignite a fire. Types include:

- Base fountains.
- Cone fountains.
- Sparklers.
- Roman candles.
- Wheels and spinners.
- Smokebombs.

Figure 151. Ground based fountains.

Fireworks – Aerial: Explode or create an aerial flash. The hot remains of an aerial firework may land in flammable vegetation and ignite a fire. The fire may also occur at or near the launch site or along the trajectory of flight for an aerial firework which has not been launched properly. Exploded remains may start a fire some distance from launch site and downwind of the trajectory. Fireworks include bottle rockets, parachutes, wings and various sizes of mortars.

Figure 152. Aerial fireworks.

Fireworks – Explosives: Flash powder charge which is accompanied by a boom or bang. Can start fires but conditions may limit the probability. Flaming paper particles may start fires immediately adjacent to the blast area. Strings or bricks of firecrackers are more likely to ignite dry fuels than a single firecracker with the burning fuse often the ignition device rather than the firecracker detonation itself. M-80 and cherry bombs are two common types of larger explosive fireworks. These types of fireworks may be illegal to possess or use in certain states.

Figure 153. Explosive firework.

Circumstances: Fireworks use increases before and after holiday periods, leading to an increase of fireworks related fires. Evidence may include the remains of spent or malfunctioned devices, residue, packaging material, matches or discarded lighters, remains of punks, witness statements of seeing a flash, hearing a bang or seeing sparks and fire. Fragments of a device may be buried in soil and may be due to attempted suppression actions by the responsible party. Unsupervised juveniles may be present near the scene and should be questioned according to agency policy. Handheld fireworks which have been thrown into dry vegetation should be looked at as a possible act of arson.

Figure 154. Firecracker paper remains.

Investigative Techniques

- Search area for launch site and packaging materials.
- Canvass area for witnesses who may have seen or heard recent fireworks activity.
- Document distance from discharge of fireworks and fire origin along with clearances around discharge area.
- If found off roadway, document distance and describe fuel configuration to determine if fireworks item was thrown.
- Photograph and collect fireworks evidence in such a manner to avoid adding fingerprints or DNA.
- Identify type of fireworks used and note any identifying markings.
- Determine if firework was of a legal type in jurisdiction.
- Consider a motive of arson.

Firearms and Ammunition

Definition: Black powder discharge, tracer, incendiary, solid copper and copper jacketed and various types of ammunition are capable of causing wildfires through the discharge of hot materials or mechanical sparks caused when a bullet strikes a hard object and fragments, creating hot particles which land in the dry fuels.

Ignition Factors: U.S. Forest Service research and tests in January, 2013, were conducted using fourteen different rifle rounds, including steel, lead, and copper bullet components (Maynard, 2013). The target used was a hardened steel plate with oven-dried peat moss fuel below it. Ignitions were consistently observed with bullets made from steel components (core or jacket) and solid copper. The tests found that bullet weight did not affect the likelihood of an ignition. Some bullet fragments exceeded 1,400 ^{o}F. Lead core/copper jacket rounds were found to be less likely to cause an ignition.

Key findings of the tests included:

- Rifle bullets striking hard surfaces can lead to ignition of organic material.
- Tests were performed under conditions simulating critical fire weather (100-110 ^{o}F, 7-10% relative humidity) and using highly receptive fuel bed (oven-dried peat moss with 3-5% fuel moisture).
- Very small fragments can cause ignitions and may be difficult to locate at the origin.
- Only rifle rounds, 7.62x54Rm 7.62x51 (.308 Winchester), 7.62x39, and 5.56x45 (.223 Remington) were tested.
- The probability of ignition increased with lower impact angles.

Find more information on rifle bullets ignition in the U.S. Forest Service National Technology & Development Program report *Ignition Potential of Rifle Bullets* at http://tmfire.us/Shooting_ignition_TechTips.pdf.

Figure 155. Rifle discharge at outdoor range.

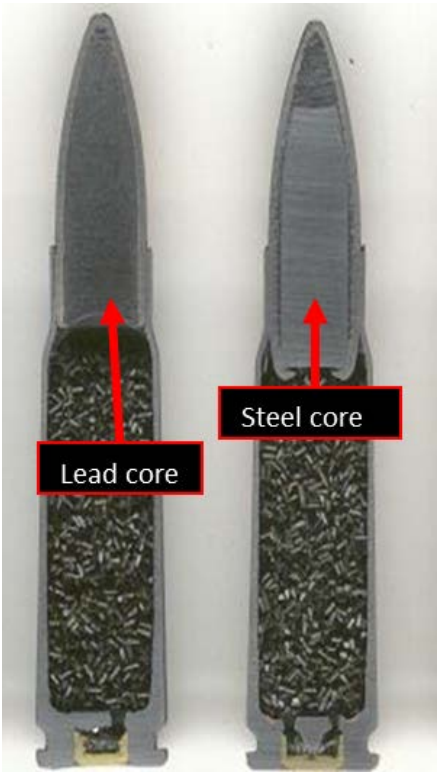
Black powder or flaming patch material directly discharged into flammable vegetation can cause fires. Projectiles such as steel core, steel jacket, steel component, copper, lead, lead core copper jacket, armor piercing (AP), incendiary, and tracer, are among those types of ammunition which can ignite wildland vegetation. Some manufacturers of shotgun shells have marketed shells which cause flame and sparks to be ejected from the barrel of the shotgun.

Any firearms projectile should be considered as a potential ignition source.

Steel core armor piercing (AP) rounds can be obtained from various sources including Chinese or Russian military surplus. The .223/5.54 and 7.62x39mm are the most common. These rounds have an interior steel shank which can start fires when it strikes hard objects such as steel and rocks. A true AP round will have a black or silver tip. Steel jacketed rounds can be recovered using a magnet and many outdoor shooting ranges that ban steel jacketed rounds use magnets to test the ammunition being brought onto the range. Copper plated steel jackets may not be detected by a magnet due to the copper plating.

An x-ray may need to be used to determine the internal components of a round.

Figure 156. Lead core and steel core rifle rounds.



Incendiary rounds may start fires upon impact. Phosphorous enclosed in the round auto-ignites upon exposure to oxygen. Incendiary rounds are considered to be competent ignition sources. Military incendiary rounds

may have purple or blue tip. Incendiary rounds are available commercially in some states and various calibers.

Tracer rounds include a chemical mixture that burns briefly when fired, allowing the user to see where the round is going. Often, tracer rounds are used among non-tracer rounds. Magnesium, strontium nitrate and oxidizer (calcium peroxide) traces may be found. Tracer rounds are available commercially in some states.

A military tracer round may have a red or orange tip. As with any of the markings on incendiary or tracer rounds, the paint can be sanded off or may not have been present if from foreign military surplus. Tracer rounds have a steel tip and hollow base and can be picked up by a magnet.

Figure 157. Tracer rifle round being fired at night.

Figure 158. Orange tip marking of tracer round.

Exploding Targets

Definition: Exploding targets detonate upon impact of the projectile, sending out hot particles. Exploding targets are typically a mixture of more than one compound which is generally not considered an explosive until combined. Exploding targets come commercially manufactured in either low or high velocity types. Homemade versions are also being used with similar effects.

Once mixed, the compounds form an explosive device. Wildland fire investigators working a scene which may include an exploding target should use caution when handling, collecting, packaging and storing residue or devices.

An example of a low velocity exploding target starting a fire can be viewed on YouTube at http://www.youtube.com/watch?v=HqxjgmYHQC0.

Figure 159. Exploding target at night.

Ignition Factors

Many of these products are binary explosives, meaning the individual components are not considered explosives until mixed. Once mixed, they are treated as explosives and cannot be transported. Exploding targets are not fireworks. The impact of a round to the container holding the mixed components detonates the mixture. Typical detonation includes a bright flash, sparks and flaming debris, a large volume of smoke which quickly rises and dissipates, and flying debris (shrapnel) which has in some incidents killed and wounded nearby spectators. Exploding targets are meant to be shot indicators but the use of exploding targets in many instances is done in an experimental environment in which the user simply wants to see how big an explosion they can get from using different amounts and types of components.

Circumstances

Examples of exploding target brand names that may be at the ignition area or in possession of shooters include Tannerite, Star Targets, Sure Shot, and Kick-Ass. For additional manufacturers, search the internet.

Fires caused from exploding targets can start far from the detonation site. There is documentation of persons putting together up to 250 pounds of explosives to detonate at one time, with material flying in excess of 100

feet. Most ignitions will be near the detonation point with most exploding target fires being at the site or within a short distance of the actual site of detonation. Many of these fires take place at locations used previously for target shooting.

Exploding targets often leave physical evidence at the scene. Depending on the type of device, whether it was commercially manufactured or homemade, the debris field may include:

- Tiny white pellets.
- Container fragments.
- Packaging material.
- Pieces of plastic.
- Blast damage.
- Shell casings.
- Duct tape.
- Plastic baggies.
- Soda bottles.

Figure 160. 0.5 lbs. of Tannerite detonated beneath the hood.

Other indicators at the scene of a firearms related fire may include:

- Metal appliances.
- Car bodies.
- Rocks near ignition area.
- Ammo boxes.
- Cartridge cases.
- Spent rounds.
- Bullet strikes.
- Targets.

Investigative Techniques

- Thoroughly search the origin area (impact site) and detonation point.
- Apply grid search technique when at range locations.
- Canvas area for witnesses.
- Collect evidence such as casings in such a manner to avoid adding fingerprints or DNA. Projectile may be buried in dirt or trees; use metal detector for recovery.
- Laboratory evaluation to attempt to match projectile and shell casing to firearm.

Cutting, Welding, and Grinding

Definition: These types of ignitions are normally caused by an industrial or agricultural operation, but may also result from an individual or residential activity.

Figure 161. Typical welding operation and cart construction used near residential and small business operations.

Ignition Factors

Fires result from cutting, welding, and grinding operations when hot metal fragments or sparks created by these activities land into a finely particulated fuel bed. Particles will often burrow and result in a smoldering fire prior to production of flaming combustion. The operator may be unaware of the smoldering fire. Welding particles generally land within 10 feet of the operation. Grinding particles are capable of starting fires at distances in excess of 40 feet. Larger particles form a more competent ignition source.

Circumstances

The physical evidence at or near the origin may include:

- Slag.
- Flux rods.
- Metal fragments.
- Discarded grinder discs.
- Welding cart wheel impressions.
- Fire extinguisher discharge residue or other evidence of attempted suppression.
- Location in relation to equipment or an equipment use area.

Figure 162. Slag located at the origin of a fire.

Fire extinguisher discharge residue or other evidence of attempted suppression relates to the Occupational Safety and Health Administration (OSHA) or other regulations that may apply to welding activities.

Figure 163. Welding by-products recovered from fire scene.

Investigative Techniques

- Document clearances, if any.
- Check permit compliance.
- Use magnet or metal detector.
- Exclude or analyze other reasonable potential causes.
- Evidence of welding.
- Interview witnesses, employees, operator.
- Document weather conditions.

Figure 164. Evidence of cutting operation.

Spontaneous Heating

Definition: Certain fuels will self-heat and ignite spontaneously when conditions support a combination of biological and chemical processes. This action is most likely to occur after periods of warm humid days in decomposing piles of organic material such as hay, grains, feeds, manure, sawdust, wood chip piles, and piled peat moss.

Ignition Factors. There are three categories of spontaneous heating.

1. Material with low ignition temperature that will ignite when exposed to air.
2. Material that undergoes rapid oxidation at normal temperatures and generates heat.
3. Organic materials that ignite as a result of biological and chemical reaction.

Ignition factors which are often present at the scene of a wildland fire caused by spontaneous heating include:

- Wood residue piled to 24 inches or greater.
- Moist/green material.
- Bacterial inoculation through soil mixing.
- Compacting.
- Bacteria processes raise core temperature to approximately 100 ^{o}F.

Different, dry materials may ignite at different depths.

Figure 165. Evidence of spontaneous heating.

Ignition factors also include:

- High air temperature.
- High relative humidity.
- Bacterial die-off raises core temperature to 160 ^{o}F.
- Chemical reaction.
- Thermal feedback causes pile collapse, oxygen intake.

Figure 166. Typical fire effects in sawdust or wood chips when spontaneous heating occurs.

Circumstances

Indicators may include a pile of green material at the ignition area, direct exposure to sun, witnesses reporting bad odors and/or steam, slime/mold/toadstools, or creosote-like substance oozing out of the bottom of a pile.

The presence of materials which may spontaneously combust, areas that exhibit outward burning from the interior of the pile (such as Figure 165), and vents (steam holes) present, are all clues of a possible spontaneous heating caused fire.

Spontaneous heating events may occur following a period of rain and or other water application to the fuel bed followed by a period of hot and dry weather.

Figure 167. Typical spontaneous heating fire effects in sawdust and wood chips.

Investigative Techniques

- Utilize photography and videotaping as much as possible when documenting suspect self-heating forest residue piles, including sawdust piles.
- Examine debris piles for species composition and particle size. Susceptible piles usually have a significant percentage of fines and the pile is compacted.
- Determine the process by which the piles were created. For example, grinding following a de-limbing process creates sufficient fines that will compact.
- Determine if live or dead foliage was involved during the process period and to what extent: the greater the live foliage, the greater the likelihood of the pile self-heating.
- Determine the time period from pile creation to present time. Document the time lapse.
- Determine the extent that machinery was used in pushing up the piles and the degree of soil mixing involved in this process. Usually a soil inoculation is consistent with strong bacterial levels in the piles.

- Document any venting (steam holes) present and any associated pungent odor. Document creosote leakage, fungal activity and any strong odors associated with the exterior of the pile.
- Attempt to locate any materials that have been involved with pyrolysis, yet have not been associated with open free burning.
- Determine if the pile burned from the inside out or the outside in. The degree of particle consumption, burned versus unburned material, type and distribution of ash or charcoal and general heat distribution within the pile, are elements to examine. Examine the interior of the pile for fused silica residue (clinkers).
- Record the weather leading up to pile ignition. Look for cool periods, followed by a significant change in weather that would suggest the pile experienced a strong exposure of exothermic heating. This element is thought to cause some form of thermal feedback that may quickly change pile conditions in favor of ignition.
- Make a determination if the piles were self-heating by examining unburned piles. If no unburned piles are available, make this determination by examining the residue of the burned piles and interviewing the operator and/or landowner.
- Document the operations that generated the residue piles and document other locations where suspect piles may exist. Inspect all associated piles and locations for evidence to support spontaneous combustion.
- Interview witnesses and workers, examine other unburned piles in area.
- Conduct a forensic evaluation.

Coal Seam Fires

Definition: Coal seams may be ignited by lightning, wildfires, or other ignition sources. Fires typically burn slowly along the seam and may resurface when seam nears the surface which cracks, and oxygen is introduced to the burning seam. These fires are dangerous to investigate as the burning coal seam may lie just under the surface. Coal seam fires may be visible in the winter with steam plumes and random bare patches in the snow from underground heating. Patches of dead vegetation may also be a tip that underground heating from a coal seam fire is taking place.

Figure 168. Smoke discharging from coal seam fire.

Figure 169. Flaming combustion as cool seam fire surfaces and mixes with oxygen.

Electric Fences

Definition: Fires originating from electric fences used to contain domestic animals. Rapid electric pulse cycle does not allow fuel to cool down.

Ignition Factors: *Weed-clipper* type electric fence systems are the most likely to ignite wildland fires. Underwriter Lab approved control heads are not as likely to start fires. Fires from this cause typically occur in the late-spring or early summer. Growing vegetation or vegetation which is just drying out may contact the fence wire and can be heated to its ignition temperature, causing a fire.

Figure 170. Grass residue is on the electric fence wire at point of contact in this photo. Burn marks may also be present and may be the only sign of fence contact.

In other situations, the fence wire is wrapped around or contacts a tree limb or wooden fence post.

Figure 171. Burn on small tree where electric wire was wrapped around it.

Fires can occur from both braided wire as well as solid wire.

Circumstances

Burned-off stubble, vegetation contact, vegetative transfer, intermittent char marks on the wire, are characteristics that should be noted. Conditions also include a fire origin along electric fence line, dry grass that has not been cut back from the fence, wires which are no longer mounted to insulators, and broken and failed insulators.

Investigative Techniques

- Determine if origin is near fence wire.
- Determine fence line condition and maintenance.
- Determine whether line was electrified.
- Observe and document power supply line from source to fence and document any contact with vegetation, lack of insulators, etc.

- Examine entire line and look for other areas where vegetation has charred, but not started a fire.
- Document any tripped circuit breakers.
- Identify manufacturer make and model.
- Evaluate vegetative maintenance along fence line.
- Examine fence wire for discoloration or presence of charred vegetation.
- Forensic evaluation at scene by qualified electrical engineers before dismantling.
- Additional lab testing.

Figure 172. Forensic examination at scene before system is dismantled.

Refraction (Reflection)

Definition: The sun's rays can be focused to a point of intense heat if concentrated by certain glass or shiny objects. This refraction or reflection process bends light rays, similar to that which occurs through a magnifying glass. The shiny, concave end of a metal-can may focus sunlight, but its short focal distance makes the potential as a possible cause highly unlikely. Fires started by these items are extremely rare occurrences; however, objects possessing these characteristics recovered from the specific origin

area may need to be carefully examined to determine their fire starting potential.

Ignition Factors

Objects known to have caused fires include cut crystal, clear glass bottles filled with a clear liquid, headlight lenses, mirrors, old window glass (bubbled), unfrosted aerosol can bottoms, polished metal, and clear plastic bags filled with water or other clear liquid.

Fires started by glass refraction or reflection are very rare occurrences. This cause may have to be considered due to the presence of an object at the origin with the potential for starting a fire. Flat broken glass, lacking magnification or reflective properties, as well as colored glass will not start fires.

Investigative Techniques

- Document ignition area in relation to object's location and orientation to the sun at the time of day that the fire ignited.
- Document degree and periods of shading, this may require the wildland fire investigator to take into account the day of the year and the specific sun position on the day of ignition.
- Identify reflective items or concave glass in ignition area.
- Collect and test under similar conditions, any reflective objects suspected of causing a fire.
- Determine amount of sunlight at time of ignition.

Blasting

Definition: Fires started by flaming debris associated with blasting activities.

Ignition Factors: Fires from blasting operations will generally be near or in the blast perimeter. In some instances, materials may be propelled by the blast a distance away. Fire start may be delayed due to smoldering combustion.

Investigative Techniques

- Document blasting activities prior to the fire.
- Consider potential of additional explosions and explosive devices in the area and take appropriate safety measures. Consult with persons using blasting materials.
- Look for blasting/burned material remains at ignition area.
- Determine if permits were obtained and conditions followed.
- Permits/fire suppression requirements.
- Attempt to recover foreign debris/material at ignition area.

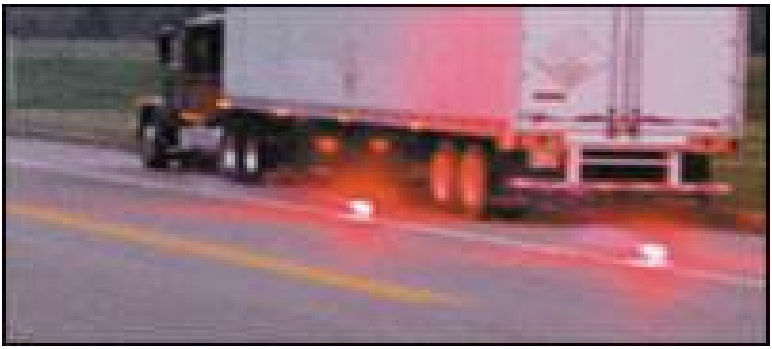
Flares

Definition: Fires resulting from commercial, industrial, or military flares. Compound is usually a mixture of sawdust, wax, sulphur, strontium nitrate, and potassium perchlorate. Flares burn at approximately 3600 ^{o}F.

Figure 173. Typical road flare with stand.

Ignition Factors: Mishandled or improperly placed flares are a highly competent ignition source. Flares are sometimes used as ignition sources by an arsonist. Hot cast-off material, chemical compound contained in cardboard tube, caps and strikers all are part of a flare caused fire ignition.

Figure 174. Typical deployment of roadside warning flares.



Aerial signal flares are sold as emergency signaling devices, some using standard caliber firearms, see example below.

Figure 175. Aerial signal flare device.

Flare guns, some sold as military surplus, flare guns used for boating, and those used for prescribed fire by some agencies can all send burning rounds into the wildland.

Figure 176. Flare gun and cartridge.

Circumstances

A scene with this potential cause may have multiple flares along a road's edge. Grayish-white slag may be present both on and off the road. ignition area is typically adjacent to the road edge when accidental cause is present but may be some distance from roadway if arson is a cause. Slag will test positive for strontium nitrates. Flare caused fires may also occur along or near military grounds or air operations routes. Flare debris present in the form of caps, strikers, and slag. Cap and striker may have rolled or blown away from origin.

Figure 177. Flare slag at scene of fire.

Investigative Techniques

- Submit slag residue to laboratory for possible content analysis of strontium nitrates or other suspected chemicals.
- Evaluate recent activities at this location.
- If an aerial flare, attempt to trace trajectory back to launch site.

Oil and Gas Fires

Definition: Fires associated with the recovery and pumping of oil and gas products in the wildland. Flare pit and stack fires are among some types of oil and gas fires which may be encountered in the wildland environment. Flare pit and stack operations are designed to burn off excess or unwanted petroleum by-products. Occasionally these will start fires from direct flame impingement, the igniter flare or stack particles.

Ignition Factors: Petroleum product flare stack/flare pit fires occur at both natural gas and oil well processing facilities. Flares fired to ignite gas during burn-off operations can start fires. Stack can *burp* and start fires. Flames and/or carbon particles ignite adjacent fuels.

Figure 178. Burning off gas by flare stack.

Crude oil storage tank fires, along with fires caused by static electricity during maintenance on or around polyethylene pipes can occur. Carbon particles ignite adjacent wildland fuels.

Figure 179. Oil storage tanks and exhaust pipe.

Circumstances

Indications of oil or gas fire include evidence of burning on the stack itself, an ignition area in adjacent vegetation, lack of clearance, carbon soot particles at and between source and origin, records of past fires, igniter flare residue, evidence or witness reports of recent flaring, and an Ignition Area often downwind.

Investigative Techniques Flare Pit Fires

- Identify if an H_2S battery/well.
- Determine when flare was last lit and how (electric igniter or flare gun).
- Determine distance from battery.
- Commence preparation of sketch.
- Shoot a close-up photograph of stem of the pipe at the flare pit.
- Determine when the battery was last shut down for repairs.
- Examine the well site *Daily Recorder* to identify specific/significant changes in flow.
- Interview the operators to determine history of the battery site, for example, similar incidents.

- Obtain a sample emission from the flare, if possible. This may be compared to the composition of material on the ground.
- Determine distance from stem of pipe in the flare pit to the berm surrounding the flare pit.
- Determine the distance from the edge of the berm and the stem of the pipe to vegetation.

Investigative Techniques Flare Stack Fires

- Identify if an H_2S battery or well.
- Determine when flare was last lit and how (electric igniter, flare gun, or other method).
- Was flare burning when first witness arrived?
- Is the flare monitored?
- Sketch site.
- Height of the stack.
- Base of stack to ground fuels (minimum 2½ times height of stack).
- Is there a *knockout drum* (a *sediment bowl* like tank to prevent condensate getting to the stack)?
- Close-up photograph of top of stack to identify carbon build-up.
- Examine the area for materials that may have *burped* from the flare stack or carbon dislodged from top of stack.
- Examine the well site *Daily Recorder* to identify specific/significant changes in flow.
- Interview operators to determine history of the battery site, for example, similar incidents.
- Obtain a sample emission from the flare, if possible. This can be compared to the composition of material on the ground. Determine weather conditions from site personnel.

Figure 180. Flare stack malfunction leading to ground fire.

Flying Lanterns

Description. Flying lanterns are miniature hot air balloons made from paper or plastic, bamboo or lightweight wood, and wire with a solid fuel package. Homemade lanterns may use plastic garbage sacks. Originating in Asia and called *happiness balloons* or *wish balloons* their use has spread around the world and they are commonly used during weddings or other celebrations. Experimentation by young adults or teenagers is commonly associated to fires caused by flying lanterns, particularly if homemade. Manufacturers claim that the paper is treated with a fire retardant but many are not.

Flying lanterns can travel miles away from release site and are capable of reaching several thousand feet in altitude. Multiple lanterns may be released at a single time. Releases typically occur during nighttime hours for full visual effect, but can also be deployed during daytime activities.

Note: Oregon has classified flying lanterns as fireworks and banned them from use within the state.

Figure 181. Typical flying lantern in package.

Physical evidence at the scene may include remains of the wire or wood frame, pieces of bamboo or balsa wood, paper remains or ash, melted plastic bag, and the fuel package.

Figure 182. Remains of flying lantern after burning.

Release site may be a significant distance from the location of the fire. Remains of the balloon may be suspended above ground in vegetation or on structures. Determine the wind direction and strength prior to the fire.

Wind Turbines

Definition: Wind turbines use wind flow to generate electrical energy and are increasingly being placed into the wildland environment. Where more than one wind turbine is located in the same area, the term *wind farm* may be used.

Ignition Factors: equipment failures caused by the following:

- Lightning strikes.
- Gear box failures.
- Brake failure.
- Bearing failure.
- Blade failure.
- Generator failure.
- Construction and maintenance.
- Bird strikes.

There are constant activities that occur around a wind farm, so the wildland fire investigator should not assume that the fire ignited from a turbine. Activities such as maintenance, welding, cutting, grinding, and vehicles driving through dry grass are all associated fire causes.

Figure 183. Wind turbine fire.

Due to the technical aspect of wind turbine operations, wildland fire investigators are encouraged to seek the support of a subject matter expert.

Home Outdoor Wood Burning Furnaces

Definition: Referred to as *outdoor wood furnaces* or *outdoor wood boilers*, these devices can be modern manufactured models or homemade. They can be used to heat a structure by way of connecting to a central heating unit and/or are used to provide hot water. Either way, the furnace operates by burning firewood and may be burning wood even in the warmer parts of the year if it is being used to heat water also.

Ignition Factors: Home outdoor wood burning furnaces tend to have two major causes of fires: 1) discarded hot ash from cleaning the furnace out and; 2) lack of maintenance, including cleaning out the chimney. Furnaces tend to receive less maintenance than indoor wood heaters.

Circumstances: These units are typically located separately from the structure and are often enclosed in a portable or constructed shed for insulation. Most fires will originate in or close to this location.

Investigative Techniques

- Determine if wood furnace was in use at the time of the ignition.
- Determine when wood was last added.
- Determine the type of wood being used.
- Determine if the wood furnace firewood door was open or closed at the time of the fire.
- Determine if there is fire on the interior of the wood furnace box.
- Interview witnesses and owners.
- Determine maintenance.
- Determine location of ash disposal.
- Determine temperature of ash pile.

Structures

Definition: Fire spreading to the wildland due to failures or activities associated with a structure.

Structure fire investigation is a specialized task requiring specialized training and skills. Consider the need for additional and/or specialized resources. Do not attempt to conduct an independent origin and cause determination of the structure unless you are trained and have the authority.

Circumstances:

- Burn indicators which show spread originated at or in structure.
- Smoke or flame coming from chimney.
- Power failure to structure or nearby area.
- Human activity in the area.

Investigative Techniques

- Identify need for specialized wildland fire investigator resource.
- Photograph burning structure early to document where and to what degree fire is burning in each portion of the structure.
- Conduct walk around of burning structure documenting degree of burn.
- Locate and document condition of gas service.
- Locate and document condition of electric service.
- Examine exterior for evidence of activity including containers or spill patterns which may indicate the use of an ignitable liquid accelerant.
- Interview occupant, reporting party, and other locals in the area to determined earliest sighting of fire, its location, and size.
- Examine doorway access for signs of forced entry.
- Examine windows for signs of forced entry and/or explosion indicators.
- Work from least burn to determine burn indicators and identify the room of origin.
- Examine room of origin for indicators of a specific area of origin.
- Examine specific area of origin for ignition sources.
- Identify ignition source and eliminate other ignition sources in room of origin and other rooms if need be.

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Chapter 7 - Arson Recognition

Definitions

Arson: The intentional and wrongful burning of someone else's property or one's own property (as to fraudulently collect insurance). (Garner, 2009)

Incendiary: Deliberately and unlawfully set fire to property. (Garner, 2009)

These terms are often used interchangeably, but it depends on the jurisdictional interpretation. Check with your prosecutor if you are not sure.

Arson is a felony, punishable by imprisonment of one year or more and/or a fine.

Figure 184. Arsonist escaping the scene.

Introduction

Arson may account for over 20% of all human-caused wildland fires, and up to 70%+ of fires in some jurisdictions. It is probable that many arson fires are going unrecognized. Fires classified as *Undetermined* should not be categorized as arson but may require repeated review to see if new evidence can assist in establishing a cause.

There is a mythology surrounding serial wildland fire-setting, much of which is based on anecdotal information not supported by research.

These myths have been institutionalized through *war stories* and training.

Serial Arson

Myths

- Numerous large fires that occur in rapid succession over short period.
- Elaborate and sophisticated devices.
- No physical evidence at the scene.
- Random and unpredictable incidents.
- Highly skilled and sophisticated offenders.

Reality

- Small fires that may escalate in both frequency and severity.
- No ignition source recovered or a single match.
- Physical evidence at the scene.
- Recognizable and predictable patterns.
- Unskilled and unsophisticated offenders.

The average serial arsonist is charged with 2.7 counts of arson and convicted on 2.5 counts and is suspected of setting an average of 35 fires before being apprehended. This high number of fires prior to apprehension can be related to poor origin and cause determinations, poor evidence collection, or *linkage blindness* (not recognizing the linking factors), and lack of sharing information between wildland fire investigators and affected jurisdictions.

The early identification of the arson series is critical because:

- Every fire set has the potential for tragic consequences.
- Fires may tend to escalate in frequency and/or severity.
- Fires increase resource drawdown.

Early detection may lead to additional charges which can increase sentences. Additional charges are more likely to result in plea bargains. Arson fires can tax the limited fire suppression resources and funding available, leaving less for other types of incidents.

Factors: Arson may be a challenging crime to solve and prosecute due to a number of factors.

Arsonists

- Work alone.
- Conceal their activities to avoid detection.
- Flee scene.
- Leave little obvious physical evidence.
- Rarely confide in others regarding their activities.
- Appear to function in a random and unpredictable manner.
- The commission of the crime is short in duration.
- Fire suppression activity may destroy or obscure evidence.
- Eyewitnesses to the crime are uncommon.
- Many prosecutors have little or no experience with wildland arson cases.
- Arson motives may appear to be unfathomable.

While these factors can make the apprehension of a serial arsonist difficult and time consuming, they can be caught in most instances.

As a Wildland Fire Investigator (INVF) certified by your agency, you will need to understand your role and authority when it comes to arson investigation. Check with your agency policy if you are not sure. Individuals certified by their agency as Wildland Fire Investigation Team Member (INTM) are typically trained in the investigation of wildland arson and involved in the development of an arson investigation case.

The role of the INVF is to link what may initially seem to be unconnected fires. This is done through physical evidence, pattern analysis, development of an investigation plan to identify the person responsible, forensic evidence, and behavioral evidence. These activities may lead to the observation of fire setting and subsequent arrest, charging, and bringing to trial the responsible party.

Figure 185. Arrest of arson suspect.

Role of the Wildland Fire Investigator

The role of the INVF is to examine and analyze the fires you respond to for an indication of arson; protect and secure the area of origin for further examination; provide timely notification to the appropriate level of wildland fire investigator according to agency policy or practice; maintain confidentiality of all aspects of the investigation and to assist as requested.

Do not assume or presume any law enforcement powers beyond those you are authorized to apply. Maintain strictest level of confidentiality.

Share information only with those who need to know. Do not release any information to the media without agency approval.

Many arson fires go unrecognized, often due to a lack of overt evidence or linkage blindness. The INVF is in the best position to detect an arson pattern in the early stages of development, often within two to three fires. It is important that the INVF have an awareness of arson indicators and be familiar with fire occurrence patterns.

Indications of an Arson Incident

Wildland arson fires are often set in multiples and may occur on the same day, during a single spree of arson setting, or over weeks or months and even years. Serial arson fires typically occur in close proximity to each other but can be a long distance apart. They can be set in the same or different agency jurisdictions. The pattern that is set up provides clues to the offender's mode of operation.

The majority of wildland arson fire scenes are accessed by motor vehicle, including roads, ATV trails, power line right-of-way, etc. Roadside fire sets are the most common.

Figure 186. Roadside arson caused fire.

This is often due to the low risk of access and egress. The offender will more than likely look for easy quick access, with a low risk of being observed. There can be exceptions to this but; the reason isn't always obvious. The level of risk that each offender is willing to take when setting fires may differ, but almost all arson offenders are looking for ways of managing their risks of apprehension.

Recent occurrence of undetermined cause fires in an area exceeding the normal fire history is one indicator that an arson series is taking place. Fires with no evidence of an ignition source is another. The discovery of delayed ignition devices at the fire scene is an important indicator of an arson series and method of operation. Many arson starts are *hot-set*, meaning the use of

an open flame device which is often carried away from the fire scene with them. An increase in the history of night time fire occurrence may also be a clue that an arson series is taking place, darkness providing a reduced risk of discovery for the offender. The wildland fire investigator must address other potential reasonably possible causes that the data supports in the area of the origin.

Patterns and Linkage: Wildland fires may be connected by common patterns. Linking patterns may be chronological times-of-days and days-of-week of fire setting or geographical, as in the same area or road system. Target selection can sometimes help to link fires if analysis can show a common theme of target selection. Mode of Operation (MO), can link fires if the way each fire is fueled, ignited or managed is similar.

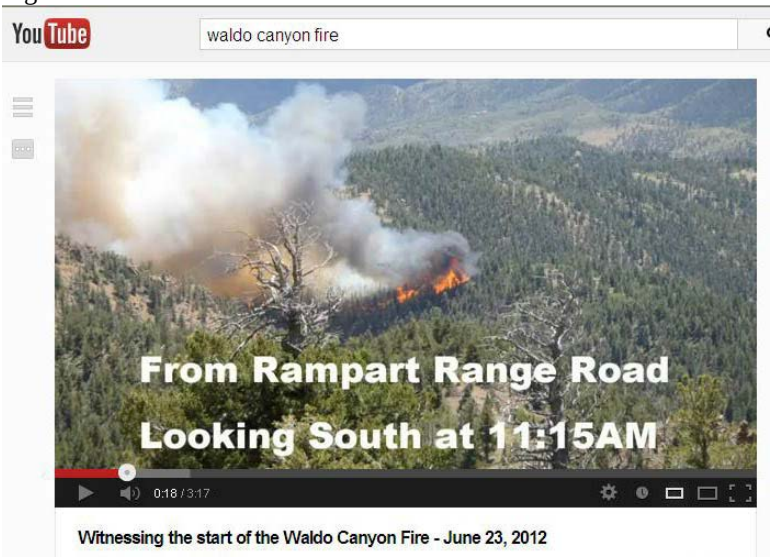
> **Example**: Five fires occurring on Tuesdays and Saturdays, between 1400 and 1600 hours, on the same road system, paper match recovered on two of them. In this example there is enough information to start to link the fires chronologically, geographically, and by mode of operation.

Arson Ignition Sources: Determination of the ignition source is an important aspect of the investigation. Wildland fire investigators should be aware of the various ignition sources that are commonly used.

Figure 187. Cigarette match device remains.

Sources of information on ignition devices include publications, the internet, and social media. Figure 188 is an example http://www.youtube.com/watch?v=hv9ZrJnHEF4.

Figure 188. Internet site for fire information.



Ignition sources may be characterized by how they are ignited:

- Electrical reaction.
- Chemical reaction.
- Mechanical reaction.

Electrical and chemical arson devices are relatively uncommon in wildland arson cases. Typically, electrical and chemical devices are used to ignite vehicles and structures which may spread to the wildland. The occasional use of chemicals to ignite a wildland fire may include the use of brake fluid and granular chlorine, a combination which provides a time delay which is somewhat unpredictable. Mechanical devices are much more common.

Ignition sources can be characterized by their ignition function including hot set and time delay or their delivery method, direct or remote.

A hot set is an open flame applied directly to available fuels. The device may be left at the scene or removed. Recent USFS research indicates that approximately 80 percent of offenders used a hot set device.

An offender may add to, rearrange or modify fuels to aid in ignition. They may also use available fuels in uncommon ways. This may become part of

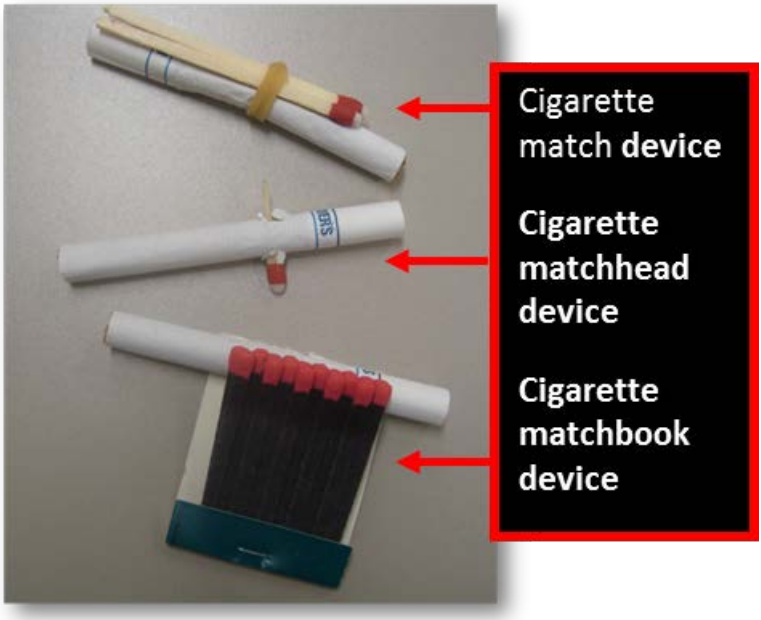
their mode of operation which helps to link fires to a single person or group of persons.

Draped moss can make an excellent host fuel for a hot set. A branch or moss can be lit well off the ground and still drop fire to the ground fuel.

Figure 189. Example of ignition of fuels off the ground.

Timed ignition sources incorporate a timer or delay mechanism which provides an opportunity for the offender to flee the scene and reduce the risk of being seen at the fire. Cigarette and match or matchbook (slow match) devices are two of the most common wildland time-delay devices used.

Figure 190. Examples of cigarette match device construction.



Each of these devices is based on the time delay achieved by the smoldering cigarette prior to it burning down to the matches themselves. Cigarette match devices can use either paper or wooden matches and may be attached using a unique or *signature* method which can help to link an offender. The cigarette match head device can also use either wooden or paper matches. In some cases the match head is cut completely off the match and is placed within the barrel of the cigarette so that it does not show up on the outside of the ash. Without close inspection, a wildland fire investigator can miss the match head within the ash and think that the fire was started by a discarded cigarette. The matchbook used to construct the cigarette matchbook device can yield valuable information on its cover and interior. This information should be documented. DNA can sometimes be recovered from the filters of cigarettes. Package the remains appropriately for sending to the lab if this is an option.

Timed ignition sources (devices) may be weighted to enhance the remote delivery with greater distance. The weight may be hidden under ash or lying nearby. Examine the ignition area carefully for objects which may have been used to weight the device. Objects used as weights can include: coins, rocks, nails, nuts, bolts, washers, or any other small, heavy object.

It takes a trained eye to find ignition devices in the ash and burnt debris. The remains may be on the surface or under the ash. A thorough and methodical scene inspection can increase the odds of locating these devices.

Remote delivery of a device includes launching it from a distance by hand or mechanical means. Hot set or timed ignition source can be included in this category. The method used to launch the device may help to link fires.

Direct delivery takes place when the device is hand-carried and placed in a specific location. Again, this can include both a hot set or timed ignition source.

Less Common Ignition Sources

Fireworks are used as ignition devices but it may be difficult to determine the intent of the offender. Hand delivered fireworks which are placed or thrown into dry vegetation should be looked at as a possible arson device. Fireworks which have been ignited on pavement or in a vegetation free area and move or jump about may prove harder to show motive. Pattern analysis and MO analysis will be crucial to determining arson when fireworks are being used.

Concave shaving mirrors may be placed to focus the sun's rays much the same way as using a magnifying glass. Multiple mirrors may be placed to set fires throughout the summer. Use of the mirrors will generally provide physical evidence at the ignition area and help to link similar fires.

Commercial slash burning or backfiring devices have limited availability. They may include a blasting cap and jellied gasoline. These devices leave physical evidence at the ignition area and may help to link fires.

A magnifying glass may be used to focus the sun's rays similar to a concave shaving mirror. Physical evidence will be present at the scene if it is used as a time delay device. Children may also be involved in using magnifying glasses to play with fire and they may leave the device behind.

A railroad or highway flare used as an arson device is often launched remotely from a moving vehicle. Telltale signs include white slag, the striker cap, and the remains of the flare itself. Similar flares may be found nearby or in a suspect's possession. Flares may be used as timed device by balancing it on a rock or setting one end in the soil.

Candles have been used as time delay devices. Regular candles or re-lighting trick birthday cake candles can be used. The candle can be enclosed in a flammable container to prevent extinguishment. Unburned container residue may be present at the ignition area. Candles may not melt entirely and a wax residue may be located below the ash or on the surface. The

metal wick tab may become black in color but will often be present in the ash.

Tracer or Incendiary bullets are available through military or commercial civilian sources. Some states have regulations banning the use or possession and transport of tracer and incendiary bullets. These rounds may be used at both developed and undeveloped ranges. Remote origins within sight of a road or trail should be looked at for this type of cause.

Accelerants may not necessarily be in liquid form. Crumpled up paper, staged fuel modifications such as concentrating pine needles near the origin, or any other items capable of accelerating the fire's spread, which were not naturally or ordinarily there prior to someone placing them or rearranging them there, can constitute an effort to accelerate a wildland fire.

While the use of ignitable liquids to accelerate the fire's spread and intensity is not common in the wildland, accelerants should be routinely looked for. In one limited study of U. S. Forest Service cases, 23% of convicted arsonists admitted to using accelerants at least once. Dark sooting, smell, and burn patterns consistent with an ignitable liquid can be a clue to its use. Consider taking soil samples or using an accelerant detection K-9, or both.

Other incendiary devices may include:

- Charcoal briquettes.
- Cotton rope.
- Incense sticks.
- Firework punks.
- Mosquito coils.
- Paper wrapped around a rock.
- Punky logs or stumps.
- Exploding targets.
- Ping pong ball/gunpowder.

Arson Motives

Motive is the reason why someone commits a crime. Motive is an emotional, psychological or material need that impels and is satisfied by a specific behavior, for example, setting fires. It does not need to be proven to convict the offender. Motive is often relevant to the investigation and prosecution and may provide direction for focusing the investigation once arson has been established. Most wildland fire setting is motivated by an emotional or psychological need.

Wildland fire investigators should be cautioned not to use motive to support a hypothesis of arson. Motive should be considered after arson has been

established as a cause and used to identify suspect(s) and potentially link fires.

The Federal Bureau of Investigation (FBI) classifies arson into six categories:

- Retaliation or revenge.
- Excitement.
- Profit.
- Vandalism.
- Crime concealment.
- Extremism or terrorism.

Retaliation or revenge motive relates to a perceived injustice or wrong against the offender. Subsets of this motive category include individual, societal, institutional, and group retaliation or revenge.

Excitement motive relates to fires set to satisfy an emotional need to create excitement. Subsets include thrills, attention, and recognition. Recognition is the primary motive for most firefighter arson offenders.

Profit may be related to a plan to maximize property damage and not hurt people or it may include insurance fraud. Fireline arson as a motive relates to firefighters making additional money by seeing that fire escapes the boundaries of control and extend the need for the firefighting effort. Fire-setting firefighter or contractor motive, *the blacker the forest, the greener the wallet* may be the direct result of a firefighter or of someone who does either support work or contracting during fire suppression activities.

Vandalism motivated fires are generally nuisance type fires, lit simply for destructive purposes. The offenders are usually young and male. The offender may have an accompanying pattern of nuisance or school related fires in a nearby town. Equipment in the woods may be targeted. Fires are less likely to be set directly to the natural resources themselves.

Figure 191. Arson to equipment.

Crime concealment motivated offenders set fires to destroy the evidence of a primary crime other than arson, such as homicide and vehicle theft. Scene security and evidence protection is particularly vital as well as cooperation with law enforcement.

Extremism or terrorism includes fires motivated by political or social agendas. In the U.S., radical environmentalists have been associated with this activity. The potential for non-domestic terrorism exists but is rare. Fires are typically targeted against logging equipment and related facilities along with other human improvements which exist in the natural resource environment.

Mixed motives: Serial arsonists may have a mixture of motives. Power maintenance and anger may be underlying motivations for many arsonists. Wildland fire investigators should consider both primary and secondary motives.

The following groups often act with consistent motives and indicators.

- Firefighter arsonists are often motivated by the desire to be considered the *hero* along with the excitement, recognition and/or profit.

- Juvenile fire-setters may act out of curiosity, *cry for help*, or delinquent fire-setting in older youths considered to-fall under the vandalism, excitement or attention motive categories.
- Mentally disturbed fire-setters may set fires as a symptom of a mental disorder.
- Female fire-setters have increased in the last few years with motives of retaliation, excitement or attention, often associated with relationships that have gone bad.
- Cultural firesetters may set fire based on historical land management practices. Do not assume that the fire is culturally based just because of past cultural practices. Most current cultural fires have roots in other motives such as vandalism, excitement, revenge, and intimidation.

Psychology of Arson

Many mental health experts disagree on the mental state of arsonists. *Pyromania* as a stand-alone mental disorder is essentially considered by many experts to be a myth. It is no longer in the DSM5 (American Psychiatric Association, 2013). These persons are more likely to be motivated by criminal intent or the fire setting is a manifestation of another underlying mental disorder. The wildland fire investigator should focus on identifiable criminal motives and should not attempt to diagnose the mental state of the offender.

Many offenders state they would have continued lighting fires even if they had known they were going to be apprehended. Fire setting may restore a feeling of power and control to an offender who has little of either in his or her life.

Excerpts from psychiatric evaluations or even statements from the offender may include:

- He is a loner who has maintained few friends and has never married.
- He describes himself as a wuss, stupid and feeling bad.
- He says, “I need some help. I have held so much inside for so long.”

Themes that consistently appear in psychological research and evaluations include:

- Poor social adjustment skills.
- Anger expressed as retaliation.
- Feeling of helplessness or lack of power (or both).
- Low self-esteem in general.
- Victimized by society.

- The fire-setting behavior is a response learned at an early age that provides emotional relief.
- Compulsive behavior.

Classification of Arsonists

Arson is divided into three classifications, single, spree, and serial.

- Single arsonist - an offender who sets a single fire then ceases.
- Spree arsonist - an offender who sets fires at three or more separate locations with no emotional cooling-off period in between the fires.
- Serial arsonist - a person who sets three or more fires, at the same or different locations, with an emotional cooling-off period between the incidents. The cooling-off period is the result of temporary psychological relief that results from the act of setting the fires.

Behavioral Characteristics

A wildland serial arsonist will normally set fires primarily to vegetation, but may set fire to vehicles and structures. 90%+ operate within their comfort zone, an area they are familiar with and feel that the risk of detection is acceptable. Serial wildland arson will often occur after a precipitating stressor prior to fires. Approximately 40% of serial wildland arsonist set fires exclusively in daylight. Most drive to the scene and may remain on scene to watch the fire or participate in fire suppression. Some serial wildland arsonists may remain nearby and watch from a vantage point or later return to the crime scene. (Steensland, 2004) (Sapp, et al., 1996) (Sapp, et al., 1994).

Role of the Wildland Fire Investigator

As a Wildland Fire Investigator (INVF), follow agency policy when determining your role on a suspected arson fire scene. Take scene security and protection measures. Request additional investigative resources as necessary. Conduct an origin investigation. Collect evidence in accordance with agency policy and determine the cause and the ignition sequence. Wait for the arrival of a more qualified wildland fire investigator while performing all of the normal activities associated with the location and protection of evidence, scene security and potential witness identification.

The following Figures show various ignition devices as they were discovered at a wildland arson scene, followed by photos of the pre-fire ignition device.

Figures 192 to 194 show the remains of a fusee device. Figure 195 shows the pre-fire fusee. Figure 196 shows burnt hole in pants from fuse.

Figure 192. Remains of a fusee ignition device.

Figure 193. Slag from fusee on rock.

Figure 194. Remains of cardboard base from fusee.

Figure 195. Pre-fire road flare/fusee.

Figure 196. Burn holes on pant legs of suspect from fusee slag.

Figure 197 shows the remains of a rope and match device, Figure 198 shows the pre-fire device.

Figure 197. Burnt remains of cotton rope with matches tied to it.

Figure 198. Cotton rope with matches tied to it prior to burning.

Figure 199 show remains of an incense stick and match device, Figure 200 shows the pre-fire device.

Figure 199. Burnt remains of incense stick with paper matches attached.

Figure 200. Incense stick with paper matches before being burned.

Figures 201 and 202 show the remains of a rock wrapped in paper device, Figure 203 shows the pre-fire device.

Figure 201. Rock at ignition area.

Figure 202. Paper remains protected under ignition device/rock.

Figure 203. Rock wrapped in paper prior to burning.

Determination of Arson

After a determination of arson is made, proceed within the limitations of your role and authorities. Make the necessary referrals according to your agency policy. Remember to maintain strictest confidentiality, *Need to know*. Do not release any information to the public, media, or non-assisting agency.

Chapter 8 - Court Preparation and Testimony

The Civil Process

Filing of the case: The civil legal process prior to trial typically begins with the filing of a complaint. In the complaint, the plaintiff presents their theory of the case and the hoped for remedy.

An answer is filed by the defendants as their response and outlining their affirmative defenses.

Discovery stage

During the discovery stage, both sides exchange all non-privileged relevant evidence. Over 90% of contested cases do not get past the discovery stage. A number of discovery processes will take place during this stage.

Interrogatories: lists of written questions served by each side on the other in an effort to get answers to key questions pertaining to the case.

Request for Production: a process in which one side or the other formally requests that all documentary and physical evidence be produced for examination.

Request for Admissions: a process in which each side will attempt to narrow the contested issues in a case by getting admissions from the other side so that they do not need to be contested.

In each of these stages, the wildland fire investigator may be asked to provide certain documents or answer questions about the case. It is important to emphasize that these discovery instruments have enforceable deadlines, with sanctions (possibly monetary) for failing to meet the deadlines.

Depositions (Examinations) Stage

Depositions are a form of the discovery process and include the examination of persons who have knowledge about the case. The questioning in a deposition is similar to that during trial. The person to be deposed will be given a notice by the side desiring to take their testimony. This notice may be served directly to the person or may be served to the legal representative of the person. During the deposition, direct questions will be asked by the noticing attorney(s) and cross examination may also take place. In some cases, where there are multiple defendants, multiple attorneys for the defendants will take turns asking the questions they each have.

A deposition is taken under oath and before a Court Reporter but there is no judge or jury (finder of fact) present. The counsel's objections are for the record only, requiring an answer to the question unless it is privileged and/or you are advised not to answer it by your legal representative. As it sometimes takes a moment for an attorney to voice an objection, it is recommended that after each question is asked, the person being deposed should pause a second or two before answering, allowing the objection to be lodged first, if there is one.

Remember, a Court Reporter will be taking your testimony down in a written transcript. In addition, a videographer may be present who is videotaping the testimony of the person being deposed. For these reasons, speak so that the Court Reporter can hear you, and not too fast. Most reporters will advise you if they are having a problem getting all of your testimony.

After the deposition a copy of the transcript will be provided for review. Corrections and answers can be modified during review of the transcript but subject to further questioning during the trial phase.

For this reason, always try to give a complete answer to specific questions during your deposition. If there are questions during the process, ask for clarification or to restate the questions.. If legal advice is needed, request a moment with the legal representative.

Subpoenas

A subpoena is a command by the court to present yourself for formal questioning at a deposition or for trial. A subpoena *duces tecum* (production of evidence) is a command by the court to bring all requested documentation for use at the hearing or trial. Know the agency's policy on responding to subpoenas.

Motions and Pre-Testimony Trial Processes

Pre-trial motions may include the following:

Summary Judgment: One or both sides will ask the judge to rule on the case prior to trial based on information presented to the judge by each party.

Motion to Dismiss: a motion by the defendants requesting that the case be dismissed due to some alleged failure to meet the burden of proof.

Motion to Suppress Evidence: a process used to exclude certain evidence from being admitted into court.

Daubert Hearing: an assessment by a trial court judge on the admissibility of *expert* testimony, scientific or technical. It is conducted out of the jury's presence and is usually based on a motion *in limine*, which occurs before the trial even begins and determines which evidence or testimony will be presented to the jury. It typically occurs after the discovery phase so the hearing is completed before the trial starts. *Daubert* applies to all federal courts and to courts in approximately half of the states.

Voir dire: a form of examination used to determine the qualifications of an expert witness and can be used to exclude the witness and/or limit their testimony. *Voir dire* is also used during the selection of a jury in the case of a jury trial to determine the qualifications of each juror. This may result in a juror being dismissed from serving.

Prior to any testimony during a trial, opening arguments will be presented by each side to the trier of fact.

Testimony at trial: begins with direct questioning of the witnesses for the plaintiff(s) first, as the burden of proof is on the plaintiff(s). The defendant's attorneys will have the opportunity to cross-examine each witness which may be followed by further questions by the plaintiff's attorneys called re-direct. Once the plaintiffs have put forward all of their witnesses and rested their case, the defendants will then present their defense witnesses and evidence. The plaintiffs will have the opportunity to cross examine each defense witness. Typically, these defense witnesses will be put forth to rebut the testimony of witnesses for the plaintiffs or to bring into question aspects of the plaintiffs case. Once the defendants have rested their case, the plaintiffs may call rebuttal witnesses to address issues brought up by the testimony of the defendant's witnesses. This could include the wildland fire investigator.

A civil trial will end with final motions and closing arguments by each side. After deliberation, the finder of fact (judge or jury) issue a verdict, also called a judgment.

Appeals may be filed after the trial which is generally limited to issues of law, not findings of fact.

The Criminal Process

In a criminal proceeding, an indictment is issued as a formal written accusation of a crime, made by a grand jury. An information is a formal criminal charge made by a prosecutor without a grand-jury indictment. An information is most often for misdemeanor charges but about half of the states allow it to be used for felony charges.

In a criminal proceeding in federal court, a Grand jury issues an indictment while at the state level and a prosecutor issues an information charging the crimes and stating the theory of the case. An arraignment hearing will take place before a judge to formally charge the accused of the crimes and in some cases, the accused will enter a plea. In some cases, an extension for entering a plea may be granted by the court. The accused may plead guilty, not guilty, or *nolo contendere*. *Nolo contendere* means, "I will not contest it", usually treated by a criminal court as a guilty plea. The difference is that in pleading *nolo contendere*, the plea cannot be used against the defendant in a subsequent civil proceeding.

If the accused pleads not guilty during the arraignment, some jurisdictions will proceed to a preliminary hearing in which the prosecutor will put on a condensed version of the case to show that there is enough evidence to support the charges and for a trial to take place. The right to a preliminary hearing can be waived by the defendant. The wildland fire investigator will likely be called to testify during the preliminary hearing, however, in some States a single sworn officer is allowed to testify to hearsay evidence only during this phase of the proceedings. This may negate the need for the wildland fire investigator to appear at the preliminary hearing. During the preliminary hearing, sworn testimony is taken which can be used during the trial itself.

Discovery will take place just as in a civil case but in the criminal case generally only the prosecutor has to share evidence and information.

Pre-trial motions to suppress evidence will be followed by the *Voir Dire* process of selecting a jury and/or qualifying expert witnesses. Just as in civil cases, in federal court and approximately half the state courts, the qualifying expert witnesses may take place prior to the trial in a *Daubert* hearing. In other state courts, the qualifying of expert witnesses is generally done during the opening of each expert's testimony. Daubert hearings are less common in criminal cases, but are used extensively in civil cases.

During the *Daubert* hearing, the expert will be asked questions concerning their qualifications, opinions, and expertise. This is done under sworn testimony before a judge.

In some State courts the qualifying of experts is often done before the judge and jury as the expert witness is called to the stand. The defense may or

may not challenge the expert witness or may ask only limited questions if the expert is clearly well qualified. This is often an effort by the defense to avoid bringing out the positive qualifications of the expert and building up their credibility in front of the jury or judge. The prosecutor can, and often will, question the expert witness about their qualifications in an effort to build credibility with the jury or judge. The judge will typically give the jury an instruction which advises them that it is up to the jury to determine how much weight each expert's testimony is given. This instruction is typically given prior to the testimony of the expert witness.

Opening arguments will take place just as in a civil case prior to any witness testimony. Testimony will follow the opening arguments with the prosecution presenting their case and witnesses first with cross-examination and re-direct questioning taking place. Once the prosecution rests its case, the defense will have the opportunity to present its case. This can be preceded by a motion to dismiss for lack of evidence by the defense after the closing of the prosecution's case. These motions are rarely approved and the defense will normally proceed with its case.

The wildland fire investigator can be called to the stand for the prosecution or the defense. The wildland fire investigator or other prosecution experts can be called following the defense case as a rebuttal to the testimony of defense witnesses and experts.

Closing arguments are given by the defense and the prosecutor, and the finder of fact (judge or jury) will deliberate and issue a verdict.

Following a verdict, appeals may be filed concerning the case. The prosecutor can appeal almost any issue of law (for example, Judge dismisses case without verdict, suppression of evidence), but cannot appeal a verdict of not guilty. The defense can appeal any issue of law.

Types of Evidence

Witness testimony is a type of evidence. A witness can provide what is called **direct evidence** in the form of statements like "I saw him do it". Direct evidence can include documents which establish a fact.

Circumstantial or indirect evidence: typically proof of a chain of circumstances pointing to the existence or non-existence of certain facts. *Footprints in the dirt near the origin area matched shoes worn by suspect* is an example of circumstantial evidence.

Judicial Notice: also known as judicial cognizance or judicial knowledge, is used to describe the court's acceptance without further proof of well-known and indisputable facts. Often these facts were the subject of previous rulings and acceptance.

Fact Witnesses: testimony based on factual observations that they made themselves. Hearsay information, opinions, and conclusions are generally not allowed from fact witnesses. Most cases require fact witnesses.

Expert Witnesses

Federal Rules of Evidence - RULE 702 (2013 revision)

Federal rule 702 provides guidance as to when expert witness testimony is allowed (2013). A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:

- The expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
- The testimony is based on sufficient facts or data;
- The testimony is the product of reliable principles and methods and;
- The expert has reliably applied the principles and methods to the facts of the case.

Many States have similar *Rules of Evidence*. The wildland fire investigator should be familiar with the relevant *Rules of Evidence* that your court may apply.

Daubert v. Merrell-Dow Pharmaceutical Company - US Supreme Court 1993

In the 1993 *Daubert v. Merrell-Dow Pharmaceutical Company* case, the U.S. Supreme Court ruled that expert testimony must be relevant; and reliable (1993 U.S.).

The Supreme Court ruled that the judge will serve as a gatekeeper and apply the following four part, non-exclusive, test to decide a proffered expert testimony's reliability.

- Can the theory or technique be tested;
- Has the theory or technique been subjected to peer review;
- Is there a known or potential rate of error associated with this theory or technique; and
- Does this theory or technique have a general acceptance in that particular discipline's community?

Michigan-Miller's Mutual v. Benfield - 11th circuit 1998

Michigan-Miller's Mutual v. Benfield involved a fire trespass case in Federal court (1998). During the appeal to the 11th circuit court in 1998, the court tendered the expert's testimony excluded because:

- Failure to meet FRE 702 (Daubert test) standard.
- Did not perform any tests or take any samples.
- No scientific basis for opinion.

Expert Witnesses are those who are qualified by education, knowledge, skill, or experience and are allowed to draw inferences, form conclusions, and testify as to their opinions. Most fire cases require expert testimony. The trial court judge determines expert witness qualifications, conclusions and methodology in a Federal court, during a hearing using FRE 702, often referred to as a *Daubert* hearing due to the name of the Supreme Court case which established the test to be applied to expert qualification and reliability.

Under *Daubert*, the Supreme Court has held that the trial court judge acts as the *gatekeeper* for the purpose of determining the admissibility of an expert's testimony. The Daubert process may or may not be followed by State, and/or crown courts. Where State courts do not apply the *Daubert* criteria they apply similar criteria and the judge or jury can be the gatekeeper.

***Voir Dire* - Qualifying Expert Witnesses:**

Voir dire is the first step in qualifying a proposed witness as an expert. It is similar to a trial within a trial. The prosecution/plaintiff and defense counsel have significant freedom to question the proposed expert's qualifications. The expert's qualifications must be established prior to giving expert testimony. A voir dire process is also used to select juries.

The prosecution, plaintiff and defense counsel establishes qualifications of their respective proposed expert witnesses.

Opposing counsel may cross examine the expert to reduce credibility of proposed expert witness. The expert's testimony is allowed by the judge if the minimum *Daubert* qualifications are met. Some state jurisdictions do not use *Daubert*. The trier of fact (judge or jury) decides weight and credibility given to each expert's testimony.

All proposed expert witnesses should possess an accurate and up to date curriculum vitae. The curriculum vitae should include relevant information to establish his or her expertise. It should include information in the following areas:

- Employment history.
- Training received (and passed).
- Training conducted.
- Professional affiliations.
- Papers or publications written.
- Professional resources used; and
- Additional qualifications.

It is important for wildland fire investigators who may be called to testify as an expert witness to communicate qualifications, training and experience. In a vitae (CV) or testimony, do not exaggerate qualifications. It is recommended that the wildland fire investigator keep a current CV.

During an investigation, use a systematic approach that meets the requirements for expert testimony. Document actions and findings in such a way that they can be clearly presented to the triers of fact. Ask, are the conclusions corroborated and supported scientifically? Have the other reasonable possible causes been addressed, if not why not?

Investigation Report and Effective Testimony

Prior to your testimony, review the case files, notes, documents, and evidence to refresh your memory. Obtain and review transcripts of your prior testimony to ensure consistency. While on the stand, use of the investigative report to refresh memory is allowed with permission from the judge. Be prepared!

For trials and depositions, come a little early in case there have been any legal or other developments. Wear proper attire. Check with your counsel concerning appropriate uniforms or dress clothes. Be physically and mentally prepared. While on the stand, sit comfortably, and erect without slouching.

Listen and respond carefully only to the question asked. Do not volunteer information. Avoid unintentional, non-verbal communications. Pause a second before answering to allow your counsel to object if necessary. Do not try to outsmart, or argue with, opposing counsel. Try to direct your responses to the attorneys, be sure to respond to the members of the jury, as they are ultimately the ones who will decide the case.

Provide responsive answers on direct examination (for example, answer the question asked). On cross examination, if the question cannot be answered with a yes or no, you may explain your answer. If the answer is incorrectly stated, correct it immediately or clarify it. Avoid police or fire jargon, acronyms, or legalese.

If you don't know the answer to a question, say, "I don't know". Do not exaggerate or make overly broad statements. Avoid absolutisms such as *never*, or *always*, etc. Be serious and avoid smiling or laughing. When an attorney objects to a question, allow time for the judge to rule. When questioned by opposing counsel do not look to your counsel for help.

Do not leave the stand until excused. Do not leave the courtroom or courthouse without consulting your attorney. Anything you look at while testifying can and will be examined by opposing counsel. Refer to reports rather than notes, if possible.

The most important principle is to always tell the TRUTH.

Opposing counsel may attempt to impeach you for seemingly conflicting deposition and trial testimony. Seemingly different answers can often be reconciled. Consider whether or not the questions were different or are the underlying facts different? Have you come upon new information which caused you to change or modify your testimony in some way? Clarify your answer without becoming defensive. If you cannot explain the difference simply state which response is correct.

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Appendix A: Investigation Checklist

At the Time of Dispatch:

- ☐ Date of dispatch call.
- ☐ Time of dispatch call.
- ☐ Caller.
- ☐ Call back #.
- ☐ Assignment.
- ☐ Order #.
- ☐ P Code/accounting code.
- ☐ Incident name.
- ☐ Incident #.
- ☐ Controlling agency.
- ☐ Agency unit.
- ☐ Incident size/acres.
- ☐ Fuels.
- ☐ On-scene contact.
- ☐ Contact radio frequency.
- ☐ Contact phone #.
- ☐ Incident location.
- ☐ Directions to the incident.
- ☐ Fire start date & time.
- ☐ Reporting party.
- ☐ Special equipment/personnel.

On-Scene

The following list is in the order that the tasks should be completed; however, circumstances at the scene may dictate a different order for some tasks such as photography, collection of evidence in danger of destruction, or taking statements from witnesses before they leave the area.

- ☐ Protect general origin.
- ☐ Take weather observations.
- ☐ Identify witnesses.
- ☐ Identify & protect evidence.
- ☐ Walk general origin perimeter (twice).
- ☐ Mark macro-scale indicators.
- ☐ Identify initial run.
- ☐ Walk initial run & mark indicators.
- ☐ Identify Specific Origin Area.
- ☐ Walk Specific Origin Area perimeter (twice).
- ☐ Grid lanes.
    - Visual.
    - Visual with magnification.
    - Magnet.
    - Metal detector (if needed).
    - Screened (If needed).
- ☐ Identify Ignition Area & source, if possible.
- ☐ Take photographs & complete photo log.
- ☐ Sketch & take measurements.
- ☐ Collect evidence.
- ☐ Take witness statements.

Post Scene

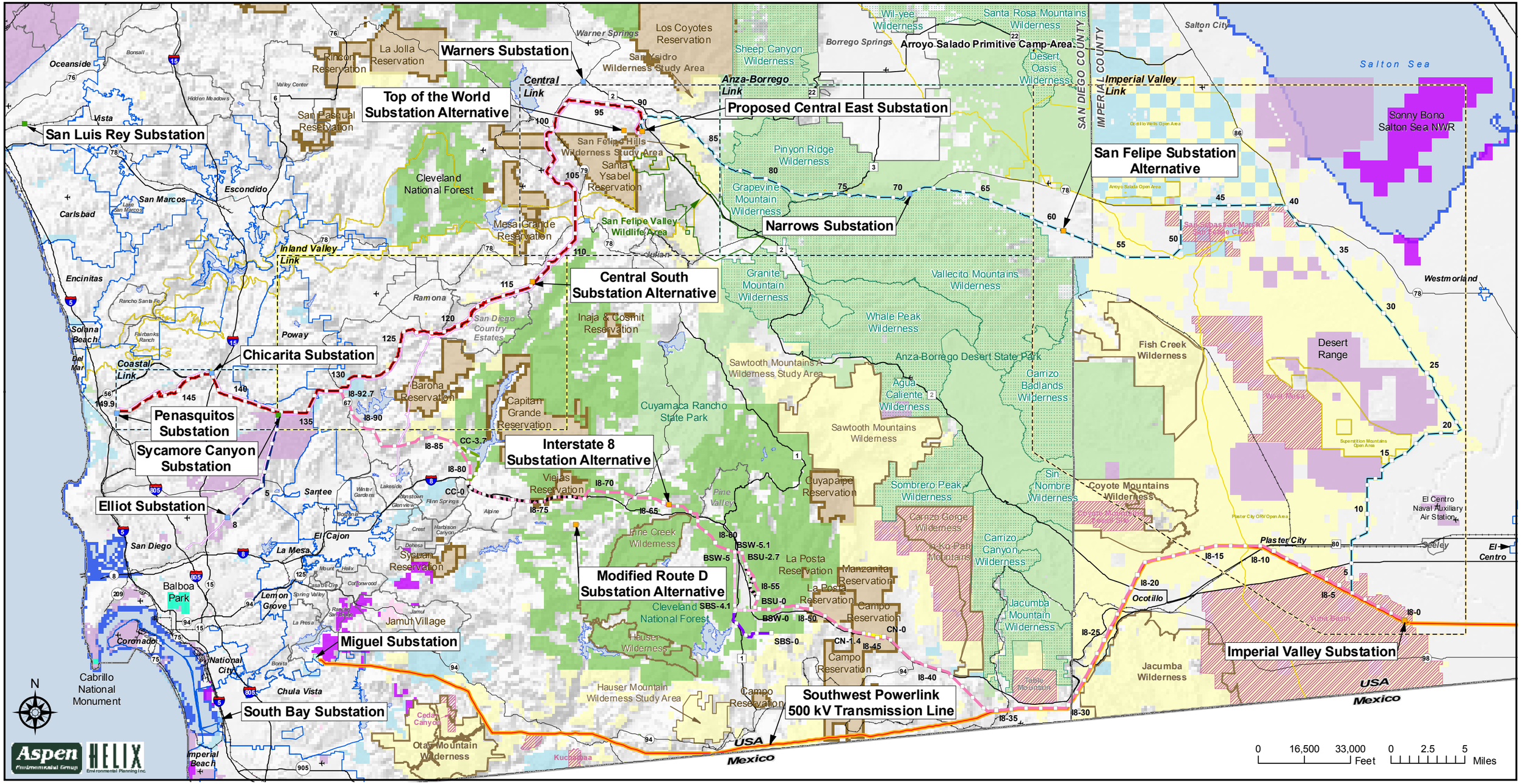
- ☐ Collect Other Data.
  - Lightning records.
  - Remote Automatic Weather Stations (RAWS) weather data.
  - Initial attack fire reports.
  - Dispatch logs.
  - Supplemental reports & lab reports.
  - Suppression cost estimates.
  - Damage & loss estimates.
  - Fire behavior input and output documents.
- ☐ Prepare vicinity map.
- ☐ Prepare location map.
- ☐ Prepare scene diagram with measurement table.
- ☐ Prepare evidence/ property log and secure evidence.
- ☐ Conduct follow-up interviews & prepare interview reports.
- ☐ Follow-up on any leads or tips.
- ☐ Write the origin and cause report. **(**The investigation is not completed until the report is written.)

Appendix B: Investigation Kit

Equipment
Items as outlined may be required for any wildland fire investigation. Additional items may be needed. A unique situation may require a phone call to Federal, State, or local crimes labs as to storage and transportation of the samples.

- Case or backpack.
- Compass.
- Clinometer.
- GPS.
- Digital camera, spare batteries and storage cards.
- Video camera, tapes and batteries (optional).
- Flagging.
- 100’ tape measure.
- Notebook/paper/clipboard.
- Forms.
- Pen(s), pencil(s), markers.
- Ruler.
- Latex and/or nitrile gloves.
- Plastic bags (clear).
- Paper bags (variety of sizes).
- Clean metal cans (quart & gallon).
- Pill tins/boxes.
- Cardboard boxes (variety of sizes).
- Evidence tape.
- Evidence tags.
- Tape recorder (optional).
- Grid lane pins & string.
- Flashlight.
- Paintbrush (fine).
- Probe.
- Magnet.

- Magnifying glass.
- Numbered evidence tents.
- Metal detector (optional).
- Binoculars.
- Tweezers.
- Scissors.
- Adhesive tape.
- Knife or multi-purpose tool.
- High temperature digital thermometer (optional).
- Traffic cones (optional).
- Clean trowel.
- Nails & washers for reference points.
- Knee pads.
- Coveralls.
- Hard hat and other personal protective equipment.
- Colored pin flags.
    - Red: advancing fire (head).
    - Yellow: lateral fire (flank).
    - Blue: backing fire (rear).
    - White: evidence.
    - Lime: areas/points of interest.



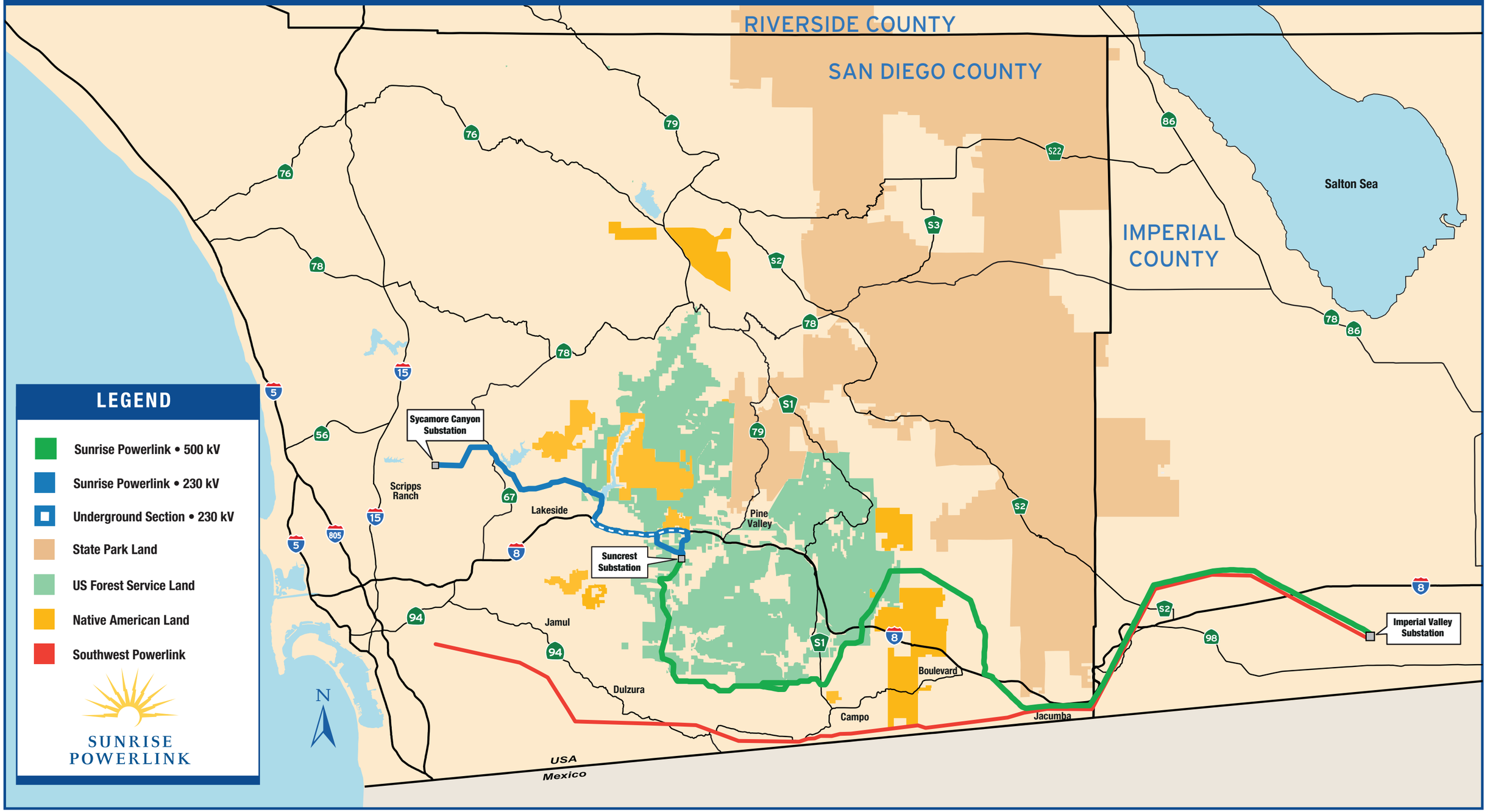
Proposed Project 500 kV
Proposed Project 230 kV
Sycamore Canyon - Elliot Substation Reconductor
Potential Future 230 kV Transmission Line
Existing 500 kV Transmission Line
Interstate 8 Alternative, Overhead Portion
Interstate 8 Alternative, Underground Portion
Interstate 8 Alternative: West Buckman Springs Option
Interstate 8 Alternative: Buckman Springs Underground Option
Interstate 8 Alternative: Campo North Option
Interstate 8 Alternative: South Buckman Springs Option
Interstate 8 Alternative: Chocolate Canyon Option
500 kV / 230 kV Substation
230 kV Substation
500 kV / 230 kV / Other Substation
138 kV / 115 kV / 69 kV Substation
Milepost
Recreation Area
Airport/Airfield
Major Road/Interstate
Railroad
Municipality
Unincorporated Town
Recreation Areas
BLM Area of Critical Environmental Concern
Major Water Body
Jurisdictional Land Ownership
Bureau of Land Management Land
State Land
State Park
Department of Defense Land
Tribal Land
U. S. Fish and Wildlife Land
National Park Service Land
U. S. Forest Service Land
Other Federal Land
Federal Wilderness Area
State Wilderness Area
(some roads within wilderness areas are excluded from wilderness designation)

Sunrise Powerlink Project

Figure Ap.1-27a
Existing Southwest Powerlink Transmission Line and Interstate 8 Alternative

SDGE
A Sempra Energy utility℠

Approved Route for Sunrise Powerlink



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