Communications System Performance During the 2007 Southern California Firestorm

California Public Utilities Commission
Communications Division
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MEMORANDUM

This report is prepared by the staff of the Communications Division. It evaluates the performance of the communications system during the 2007 Southern California Firestorm. It contains staff's analysis, findings and recommendations.

This report was prepared by Michael Aguilar, Tyrone Chin, Valerie Kao, Lisa Prigozen, and Eric Van Wambeke; supervised by Sazedur Rahman; managed by Robert Wullenjohn; and under the direction of Jack Leutza.

This report is also available at the Commission's website:
http://www.cpuc.ca.gov/PUC/telco/

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EXECUTIVE SUMMARY

Introduction

This report is an evaluation of the impact of the 2007 Southern California Firestorm on the communications networks in the area covered by the Governor's October 21, 2007 State of Emergency. This evaluation focused on communication networks in San Diego and San Bernardino counties, but it also includes information on network impacts in Los Angeles, Orange, Riverside, Santa Barbara and Ventura counties. Below is a summary of the major findings and recommendations of the California Public Utilities Commission's (Commission) Communications Division (CD) Staff.

Performance of County Emergency Notification Systems

San Bernardino and San Diego Counties' utilization of wireline emergency mass notification systems played an important role in their efforts to alert residents and disseminate critical emergency information. Between and within the two counties, however, call success rates varied significantly and Staff could not determine the cause of this variation. More importantly and directly related to the public safety objectives of the Commission's Consumer Protection Initiative (CPI), some residents in evacuation areas did not receive telephone alerts.

- **Major Findings.** In San Diego, teletypewriter (TTY) users that had not previously registered their phone numbers with their county's' mass notification systems did not receive emergency notification calls. Additionally, press reports revealed that emergency notifications did not reach people with nomadic Voice over Internet Protocol (VoIP) phones, such as Vonage customers. For several reasons, some of these people missed urgent messages to evacuate their homes since VoIP telephone numbers as well as wireless phone numbers are not included in the traditional 9-1-1 database utilized for emergency notifications.
    - **Recommendation.** The Commission should expand its CPI community and education initiatives to include workshops with local public safety entities on telephone notification protocols, to ensure that emergency calls reach TTY and other special needs populations. To reach nomadic VoIP and wireless users, the Commission should encourage local public safety entities to conduct public outreach campaigns to urge residents to register their non-wireline telephone numbers with these local entities, and keep the registration information current.

Performance of the Telecommunications Networks

When measured at the county and local level, increases in call volumes and blocked call rates during the Firestorm were much higher than those reported by carriers in January 2008 at the San Diego Workshop. Although carriers claimed that networks performed as designed, there is room for improvement in how carriers collect, analyze and report on network performance during emergencies, and respond to Staff information requests.

- **Major Findings.** Several carriers had difficulty retrieving call traffic data for the Firestorm period. Staff also had difficulty collecting the information necessary to fully analyze the network performance of all carriers. One cable-based service provider and one wireless carrier ignored Staff's information request, and the wireless carriers in general claimed that they were not subject to the Commission's investigative activities and reporting requirements. One wireless carrier asserted that its call traffic metrics could not

be compared to or aggregated with other carriers' data because each carrier engineers and captures traffic data differently. In addition, not one carrier performed an analysis of the large number of blocked calls observed in some areas, in order to identify specific causes and explain the unusual and random distribution of spikes in the number of attempted calls. The carriers' generally poor cooperation combined with the absence of a uniform reporting standard hindered Staff's attempt to assess the reliability of the telecommunications networks.

- **Recommendation.** Whenever the Governor declares a State of Emergency, the Commission should require each wireline and wireless carrier to collect and report on its hourly call volumes or minutes-of-use and attempted, completed and blocked call rates, for the time period and in the counties covered by the Governor's declaration. The required data should be reported separately for commercial and 9-1-1 traffic and by switch or trunk group, and the report should include the carrier's analysis, comparison to baseline traffic levels, and conclusions.

Network Congestion Issues During Emergencies

Telecommunications networks become congested during mass disasters and national emergencies because call demand can easily exceed the 'normal' busy hour demand for which networks are engineered. More importantly, the unprecedented high level of mass telephone notification calling during the Firestorm (1.5 million notification calls in San Diego County on October 22 alone), raise concern that these notification calls blocked residents' attempts to dial 9-1-1.

- **Major Findings (1)**. The network congestion and call blocking observed during the Firestorm was exacerbated by the very high volume of notification calling combined with the lack of coordination between the entities generating the notification calls and the carriers that manage the networks. Unfortunately, because the Incumbent Local Exchange Carriers (ILEC) did not collect data on volume and impact of these notification calls, Staff could not definitively measure their impact on the networks.
    - **Recommendation**. The Commission should require carriers to inform and educate local entities and notification vendors about the Public Utilities Code §2875 requirement to file written applications with local carriers prior to implementing emergency telephone notification systems, and to report back to the Commission on their efforts and results.

- **Major Findings (2).** ILECs reported that there was no central office (CO) overload during the Firestorm, which indicates that residents had dial tone and were able to dial 9-1-1 and make local calls. However, this prevention of CO overload was accomplished only when AT&T California implemented network management controls to prevent central office overload by blocking fifty percent of inward calls to some local exchanges. There is no assurance that other carriers have similar protocols in place to ensure switch capacity for 9-1-1 and local calling during emergencies.
    - **Recommendation.** The Commission should require wireline and wireless carriers to review their network management protocols to ensure that local switches will not be overloaded during emergencies so that residents have dial tone access to dial 9-1-1. The Commission should require carriers to report back to the Commission on their findings.

Carrier Response and Restoration Efforts

Wireline and wireless carriers' restoration efforts focused on temporary power utilizing backup generators and batteries, and temporary capacity utilizing portable cellular sites, microwave and satellite links, and spare T1 lines. Sports stadiums and fairgrounds used for evacuation centers provided critical network capacity that carriers utilized to handle the additional volume of the residents.

- **Major Findings.** Although carriers generally appeared effective at restoring their individual networks elsewhere, the lengthy six week restoration effort at Deerhorn Valley revealed a need for improved performance by the carrier of last resort -- AT&T California. The California Office of Emergency Services (OES) deployed four portable satellite-based emergency communication units there to provide temporary phone service so local residents could make 9-1-1 and medical related calls during the restoration effort. Although AT&T provided some portable capacity at a nearby evacuation center, it proved to be insufficient to allow release of the OES units. As the carrier of last resort, AT&T should assure that wireline service is restored in a timely manner, and it should have notified the Commission of the need for a joint restoration effort requiring mutual assistance from telecommunications competitors.
    - **Recommendation.** The Commission should require wireline and wireless carriers to review their policies and best practices on mutual-aid agreements and joint restoration efforts, and report back to the Commission on their findings. This review should document the type of situations where mutual aid and joint restoration will be implemented, and define the conditions and processes by which competitors will share information and network restoration assets. This review will help identify issues and problem areas, and determine the need if any, for further Commission action such as organizing a technical workshop on the subject.

Priority Telecommunications Service Programs

The federal priority communications services programs – Government Emergency Telecommunications Service (GETS), Wireless Priority Service (WPS) and Telecommunications Service Priority (TSP) – give first responders, public safety personnel, public health agencies, hospitals and other qualified parties, priority for call queuing and for restoration of damaged and destroyed telecommunications infrastructure.

- **Major Findings.** Federal law requires California's ILECs to offer TSP and GETS to qualified parties. Competitive Local Exchange Carriers (CLEC) generally do not participate, but there are two CLECs in the region that offer one or more of these services. Wireless carrier participation in WPS is voluntary, and only two of the five major wireless carriers operating in Southern California offer WPS. Unfortunately, carriers responding to Staff's survey did not maintain data on the use of priority services by their customers, and Staff cannot definitively determine the extent of the gap in coverage and participation.
    - **Recommendation.** The Commission should require wireline and wireless carries to inform all their customers that are eligible for priority telecommunications service programs, of the availability of and rate schedules for GETS, WPS and TSP, and to report back to the Commission as to how many of these customers subscribe to these programs. The Commission will then be able to determine the need for remedial action.

CHAPTER I: INTRODUCTION

Introduction

The following is a Staff report produced by the Communications Division (CD) of the California Public Utilities Commission (Commission). This report is an evaluation into the performance of the telecommunications system during the 2007 Southern California Firestorm (Firestorm).

The CPUC is the primary regulatory authority in California responsible for the oversight of telecommunications carriers. As the Division within CPUC with regulatory expertise and oversight of the private utilities that comprise the majority of the State's critical telecommunications infrastructure, CD holds a unique position in examining the impact of the Firestorm on telecommunications systems.

With a recognizable escalation in the regularity of natural disasters affecting California, the Commission is increasing its focus on emergency-related issues such as emergency preparedness, critical infrastructure protection and community alerting. CD finds it increasingly necessary to assess how the telecommunications system is affected by and how it responds to such emergencies. The goal of these endeavors is to assure public safety by ensuring that effective and reliable telecommunications are available in future emergency events.

The assurance that telecommunications services are available under any circumstance is essential when one considers that California faces, on average, a major natural disaster every three years. Although each disaster may pose a unique challenge, an analysis of the Firestorm offers a unique opportunity for the Commission to conduct an analysis and offer recommendations to prepare the State for the next event.

CD was able to provide the information and analysis contained in this report due to the cooperation of the Federal Communications Commission, California Office of Emergency Services (OES), California Department of General Services (DGS), San Bernardino and San Diego Counties and their respective community alerting vendors, and telecommunications carriers operating in California.

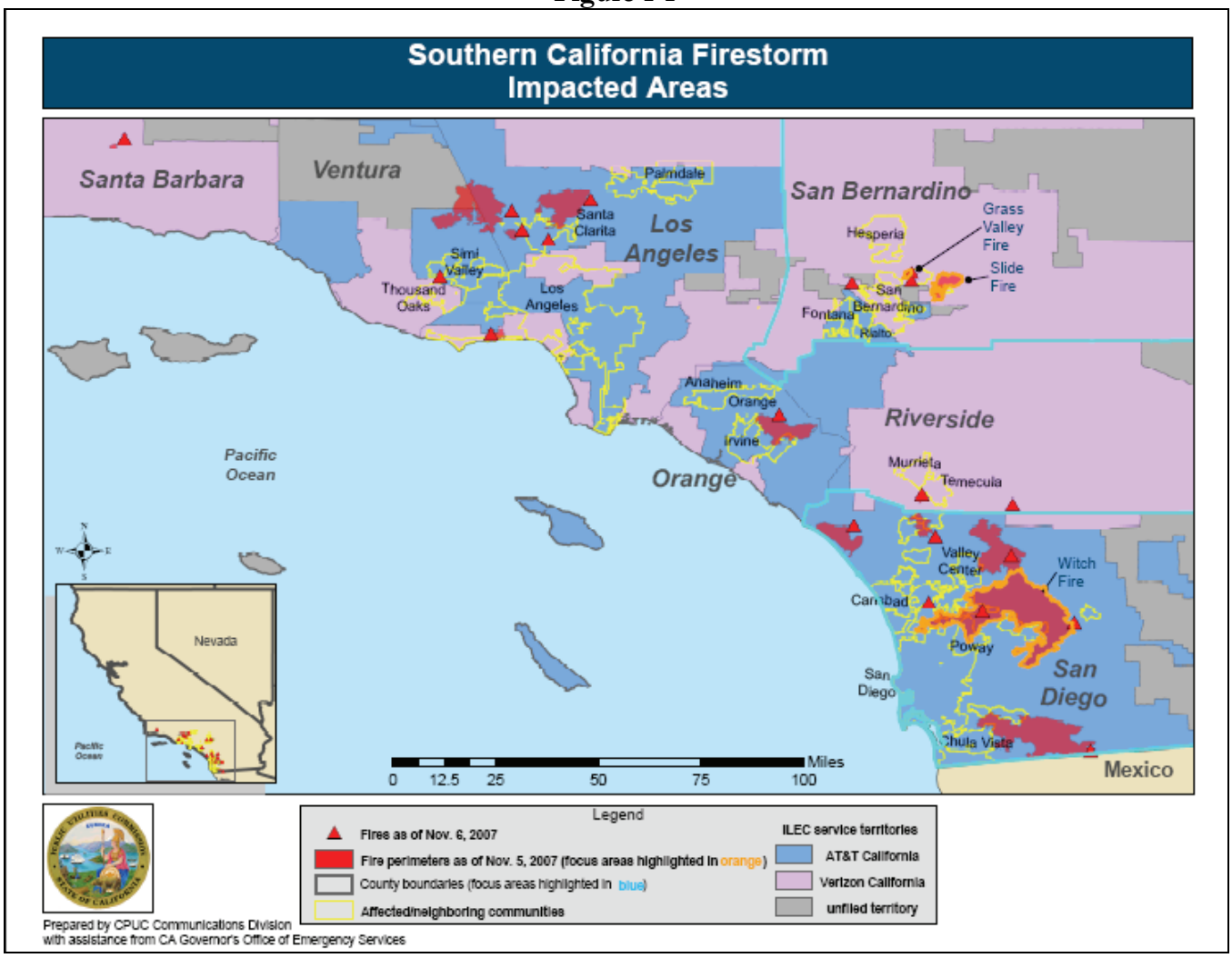
1.1 The 2007 Southern California Firestorm

The Firestorm began on the evening of October 20, 2007, as a single fire in the Angeles National Forest. On October 21, 2007, California Governor Schwarzenegger proclaimed a State of Emergency in the counties of Los Angeles, Orange, Riverside, San Bernardino, San Diego, Santa Barbara, and Ventura due to more than eleven major wildfires raging at the time. Following this proclamation, the OES deployed emergency personnel, equipment and facilities and provided local government assistance under the authority of the California Disaster Assistance Act. Following a request from the Governor, on October 23 President Bush declared a federal state of emergency in Southern California. This authorized the Department of Homeland Security (DHS) and Federal Emergency Management Agency to provide federal assistance to supplement state and local efforts and engage in various emergency response activities.

The Firestorm concluded and the last fire was 100% contained on November 9, 2007. According to the OES website, the 23 fires which made up the Firestorm caused ten fire-related fatalities and 139 injuries, burned 517,267 acres and destroyed 3,204 structures, including 2,233 homes. The fires resulted in the

largest evacuation in California's history, with more than 321,500 mandatory evacuees and nearly 200,000 voluntary evacuees.[1]

Figure 1-1



The Firestorm impacted the telecommunications system directly by destroying outside distribution plant and cell towers and disrupting commercial power deliveries. The Firestorm also indirectly affected telecommunications systems as residents responding to the event increased usage of services, which caused networks to experience huge spikes in call volumes, resulting in congestion and call blocking.

Further, the Firestorm compelled the largest telecommunications restoration effort in California's history. It represents the largest utilization of telephone emergency notification systems in California to date, and is recognized as having saved countless lives.

1.2 Scope of Report

On October 30, 2007, the Commission issued a press release on the Firestorm,[2] highlighting the importance of emergency notification systems in saving lives by providing nearly 350,000 people in the San Diego area

[1] CA OES, "Quick Facts for Southern California Wildfires," <http://www.oes.ca.gov/Operational/OESHome.nsf/ALL/8A7A41878BC9B726882573A20069BF4D?OpenDocument> (accessed December 14, 2007).

with information on the fires. The press release also described the efforts of telecommunications carriers to provide service to affected customers, and announced the Commission's intention to "evaluate the impact the fires had on network operations, issues of inter-operability, and the success of emergency notification systems, network recovery, and backup power efforts in order to identify areas of needed improvement."

In early December 2007, the Commission announced that it would hold a workshop in San Diego to discuss communications lessons learned as a result of the Firestorm, and that this workshop, entitled the Post Southern California Firestorm Workshop: Telecommunications Lessons Learned, would also contribute to the Commission's open proceeding on emergency backup power and standards for emergency notification systems per Assembly Bill 2393 (AB2393).[3]

The Workshop was held on January 9, 2008, and consisted of five panel discussions featuring panelists representing first responders, local and state government officials, telecommunications carriers and companies providing community alerting (notification vendors).

CD Staff has had extensive communications with affected and interested parties to learn more about the issues at hand and available data sources in order to refine the scope and focus of this analytical effort and resulting report. These parties included telecommunications carriers, federal agencies, California and county emergency management managers, notification vendors, 9-1-1 service providers, and the California 9-1-1 Emergency Communications Office.

In this report, Staff examines the performance of two county emergency notification systems, utilization of telecommunications priority services, performance of the telecommunication networks, network congestion issues, and carriers' response and restoration efforts. This report includes topics addressed in the AB2393 report and draws on issues and facts presented at the Post Southern California Firestorm Workshop: Telecommunications Lessons Learned (Workshop) held January 9, 2008.

This report is intended be the initial vehicle for refining and focusing efforts to fully understand how carriers manage their networks and balance the competing demands for emergency telecommunications services during times of distress and disaster.

1.3 Methodology

As seen in the map provided in Figure 1-1, the fires of the Firestorm were spread over several hundred miles in seven different county jurisdictions. Subsequently, as a practical solution to focus CD's work effort, Staff identified two fire areas based on their large size and the high number of structures destroyed, and varying in local jurisdiction and Incumbent Local Exchange Carrier (ILEC) footprints so that they might reveal different problems and solutions that would better inform strategies for future disasters.

Staff selected the Witch Fire in San Diego County, the largest fire in AT&T California (AT&T) territory, covering 197,980 acres and accounting for 1,125 structures destroyed. In Verizon California's (Verizon) territory, Staff selected the combined Slide/Grass Valley Fire area in San Bernardino County, which covered 14,000 acres and destroyed 450 structures. Chapter III presents an assessment of San Bernardino and San Diego Counties' emergency notification systems.

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[2] "PUC Contributes to Southern California Fire Recovery Efforts," CPUC press release, issued October 30, 2007 <http://docs.cpuc.ca.gov/published/NEWS_RELEASE/74472.htm> (Accessed June 19, 2008).

[3] Order Instituting Rulemaking on the Commission's Own Motion into Reliability Standards for Telecommunications Emergency Backup Power Systems and Emergency Notification Systems pursuant to Assembly Bill 2393 (R.07-04-015).

These two fire areas proved to be dissimilar in many aspects: the Witch Fire threatened large, densely populated suburban areas with year-round populations, while the Slide/Grass Valley Fire occurred in a low density, mountainous resort area with rural and seasonal inhabitants. Such differences are important to capture, given California's geographic and demographic diversity; as such, they present unique challenges for emergency management.

Staff further identified the impacted local exchanges in order to narrow the focus of CD's information requests for call traffic statistics from carriers. A list of the major fires of the Firestorm by ILEC, county, acreage burned, structures destroyed and local exchanges is provided in Appendix 1-A.

1.4 Report Organization

Chapter I: discusses the purpose of this report and includes a detailed description of the Firestorm and the methodology used to select the report's areas of focus.

Chapter II: provides descriptions of the area and population of the two fire areas which Staff identified for detailed analysis.

Chapter III: reviews how emergency management government is organized, and identifies the entities generating mass notifications in San Bernardino and San Diego Counties. A detailed examination of the emergency notification delivery systems used in each county is provided as well as an analysis of their performance during the Firestorm.

Chapter IV: discusses the telecommunications priority service programs managed by the federal government which are available to public safety agencies and other sponsored parties. The chapter also includes a review of who offers these services in California, what the rates are and whether they were in place prior to the Firestorm. It further identifies how these services were utilized during the event and the issues that may contribute to implementation rates.

Chapter V: analyzes the performance of the networks during the event, including customers affected, call volumes, network congestion and blocked call rates. The chapter examines in detail the commercial and 9-1-1 networks at issue, the call flow paths of each, the metrics and benchmarks used to measure network performance, and the performance results at the regional, county and local levels.

Chapter VI: reviews the traffic engineering techniques used by the carriers and public safety agencies to manage their networks throughout the call traffic surges that occur in response to emergencies. It further explores the extent to which notification calls can negatively affect the networks, and how congestion is managed on E9-1-1 networks.

Chapter VII: reviews the carriers' response and restoration efforts during the event: the deployment of emergency backup power, temporary capacity and customer assistance efforts designed to mitigate the effects of service outages and forced evacuations.

Chapter VIII: presents a conclusion.

CHAPTER II: DESCRIPTION OF FIRE AREAS

Introduction

This chapter provides two brief descriptions of US Census demographic data, which Staff used to determine the populations at risk in the fire areas. Particular attention was given to ethnicity since the Commission is particularly concerned with telecommunications issues involving populations with special needs, such as people with Limited English Proficiency (LEP). Staff chose to examine two Fire Areas -- the Witch Fire Area in San Diego County; and the Slide/Grass Valley Fire Area in San Bernardino County – based on variations in demographics. For this study, the "fire area" is defined as the group of census block groups within or intersecting the fire border as defined by the California Department of Forestry and Fire Protection (CalFire). A summary of the demographic data is provided in Table 2-1.

Table 2-1
Selected Fire Area Demographics

	Witch Fire Area	Slide and Grass Valley Fire Areas	California
Population 2000	84,036	12,919	33,971,648
Population 2004	90,605	13,559	35,841,254
Growth Rate 2000-2004	7.8%	5.0%	5.5%
Population Density 2004 per sq. mile	126.2	52.1	219.0
Percent Caucasian 2000	86.1%	89.2%	59.4%
Percent Hispanic 2000	10.4%	11.0%	32.3%
Household Median Income 1999	$ 72,385.77	$ 52,706.54	$ 47,493.00
Median Age 2000	39.2	41.2	33.3

Source: US Census[4]

2.1 The Witch Fire in San Diego County

Occupying the southwestern tip of California, San Diego County is exposed to the Santa Ana winds and therefore susceptible to wildfires during later summer and early autumn. The 2007 Firestorm began in San Diego County with the Harris Fire on October 21, 2007, spreading northward all the way to Camp Pendleton until the last fire (Poomacha) was fully contained on November 9. Approximately 369,000 acres were burned and an estimated 1,600 homes in San Diego County were destroyed as a result of the fires. A total of approximately 515,000 people were evacuated during the fires, including 321,500 mandatory evacuees and nearly 200,000 voluntary evacuees. [5]

The Witch Fire was by far the largest of the San Diego County fires of 2007, burning almost 200,000 acres and 1,125 structures. An OES Map of the fire area is provided below in Figure 2-1.

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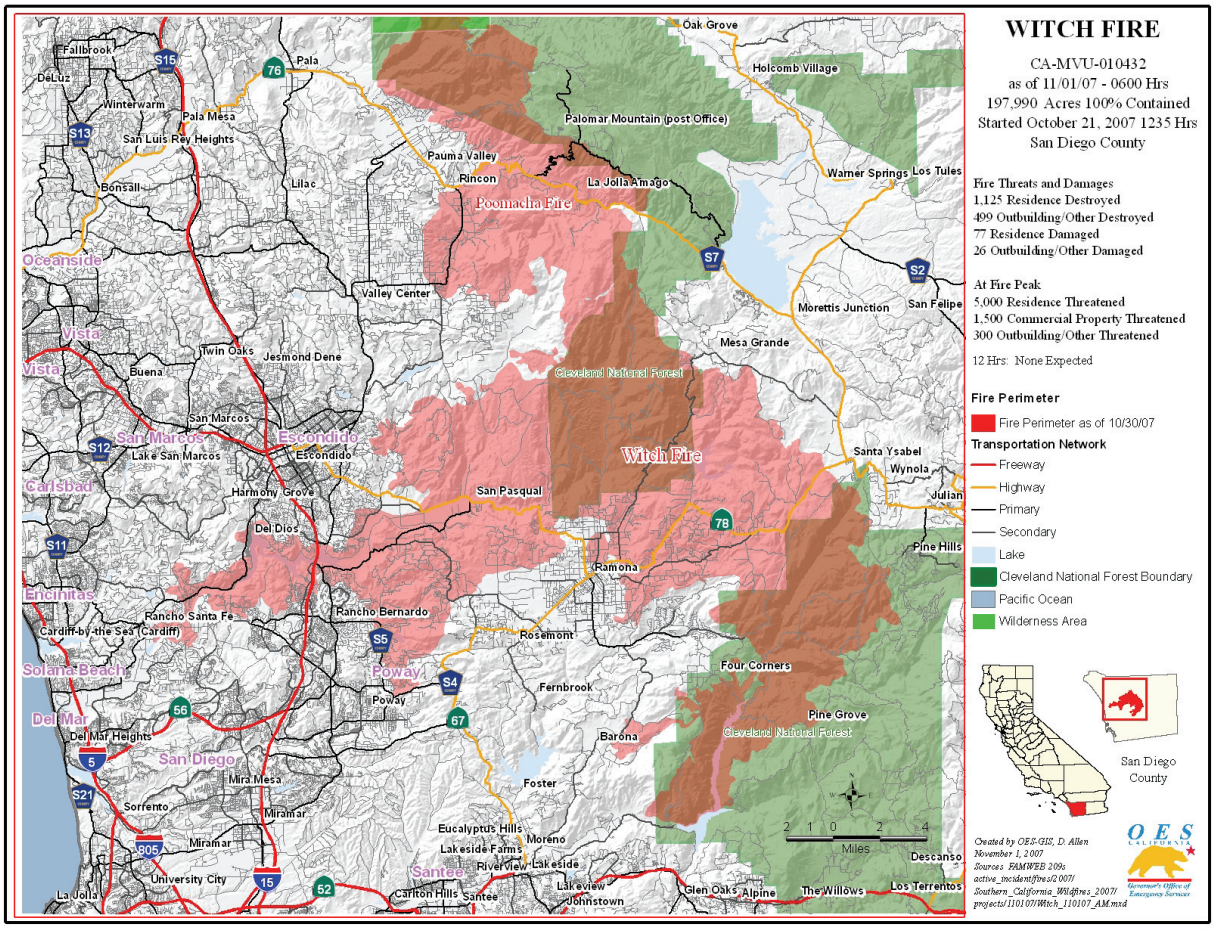
[4] Data is from the 2000 U.S. Census, except for data relating to the US Census 2004 population estimates. 2004 is the latest year for which population data is available at the Census blockgroup level. Median income data is also the latest available at the blockgroup level and is from the 2000 U.S. Census.

[5] "2007 San Diego County Firestorms After Action Report", County of San Diego, February 2008.

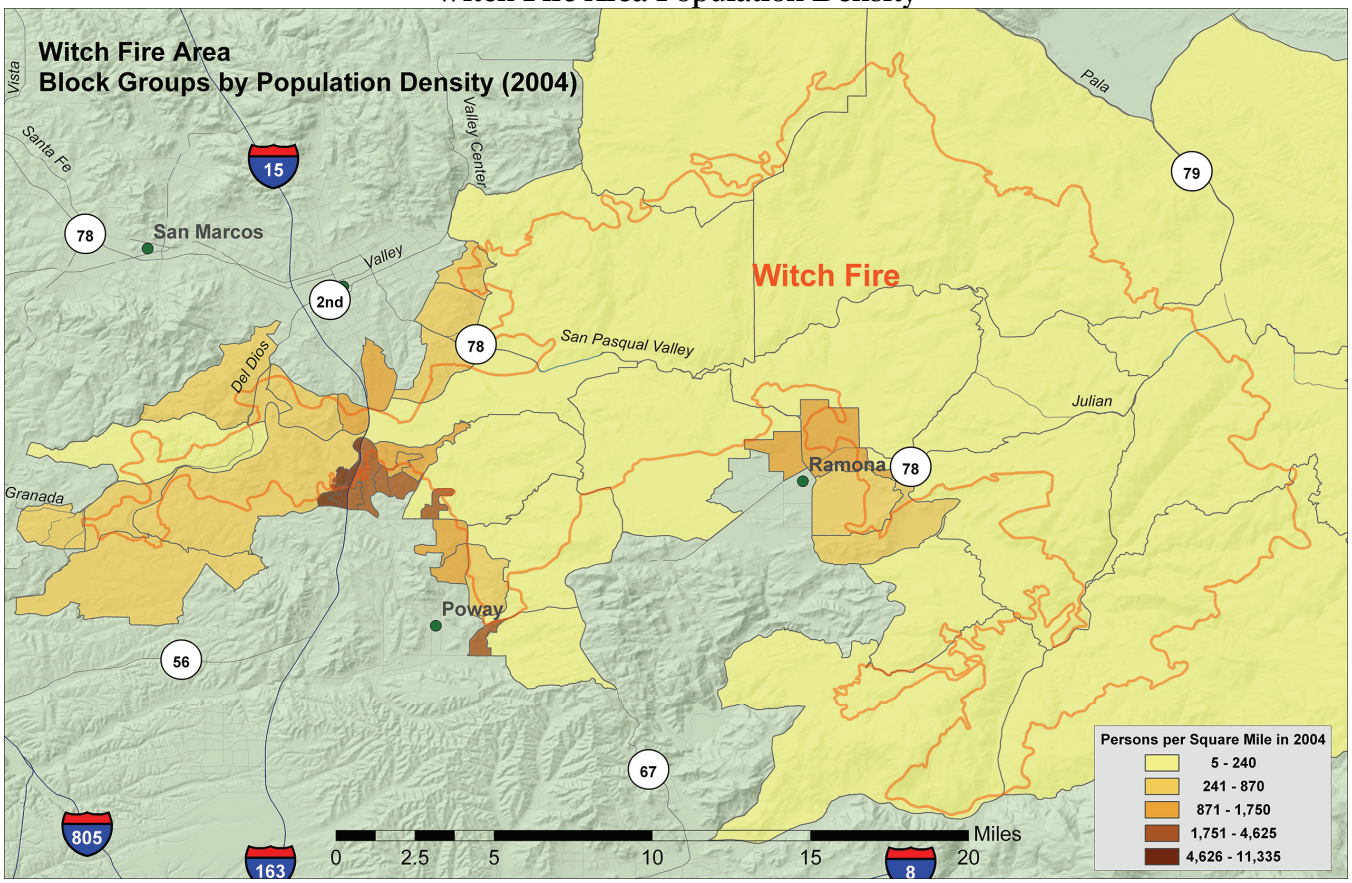
Figure 2-1
California OES Witch Fire Map



Source: CA OES

The Witch Fire Area is suburban in nature with rapidly expanding populations in its western sections. There were 90,605 residents as of 2004 Census estimates. This represents a 7.82% growth rate from 2000 to 2004, higher than California's 5.5% growth rate during the same period. There are approximately 126 persons per square mile in the Witch Fire Area, as shown in Figure 2-2. There are over 32,000 housing units, of which 94% were occupied as of the 2000 Census. The 1999 median household income for the Witch Fire Area was $72,386, much higher than the median household income of San Diego County ($47,067) and California's 1999 median income of $47,493.

Figure 2-2
Witch Fire Area Population Density



Source: US Census

As of the 2000 Census, residents of the Witch Fire Area were 86.1% Caucasian, 1.01% African American, 1.46% American Indian/Eskimo, 4.64% Asian, 3.8% "other race," and 2.79% Multi-Racial. Respondents identifying themselves as Hispanic numbered 8,752, or roughly 10.4%, compared to 26.7% for San Diego County. Due to the low levels of ethnic/racial minority population concentration, Staff has little evidence to conclude that persons with LEP were disproportionately affected in the Witch Fire Area.

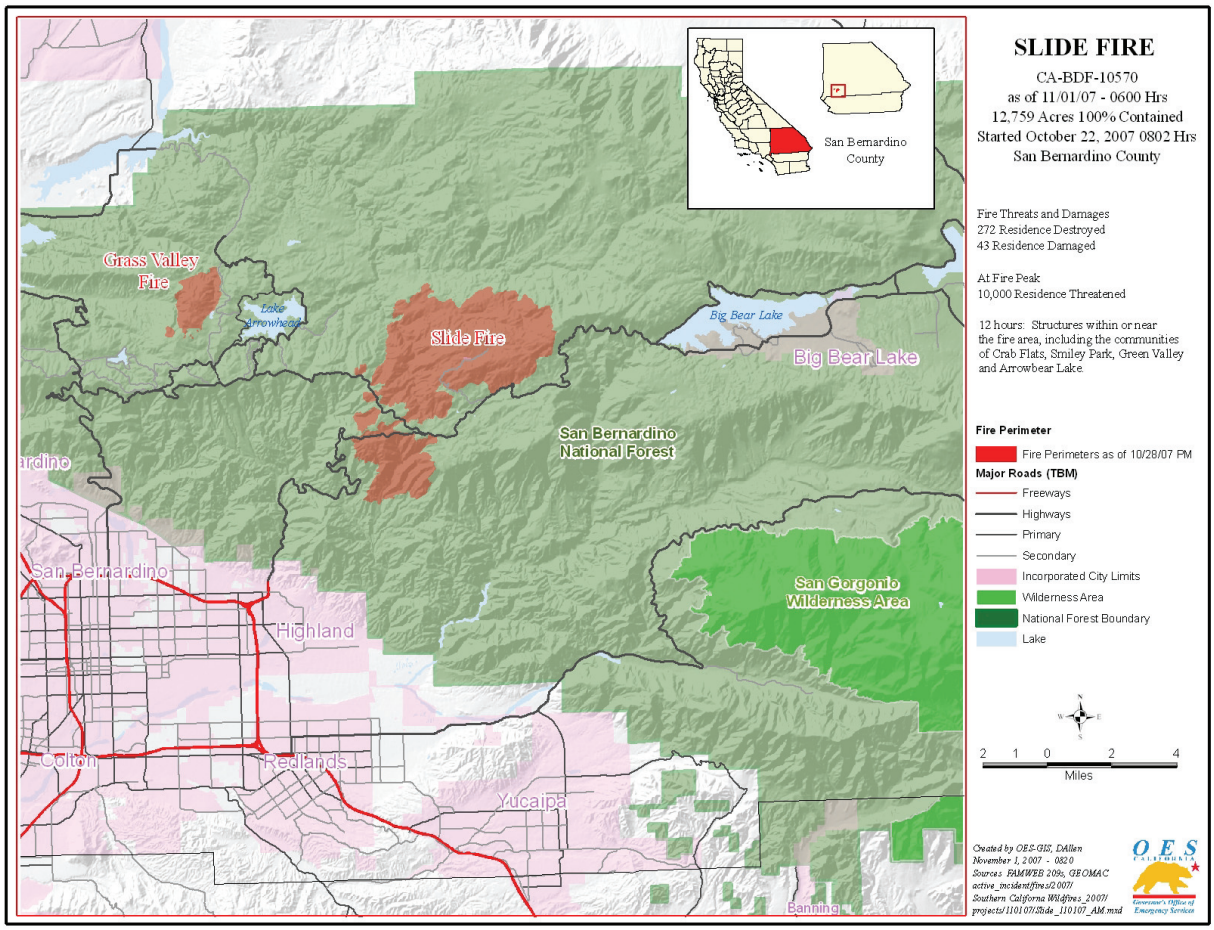
2.2 The Slide/Grass Valley Fires in San Bernardino County

The Santa Ana winds blow west across the Mojave Desert, making the San Bernardino National Forest particularly vulnerable to wildfires during the late fall and early winter months.[6] The most densely populated part of the county lies just southwest of the mountains and includes the cities of San Bernardino, Fontana, Ontario, Rancho Cucamonga, Rialto, Chino, and Redlands.

The Grass Valley and Slide Fires both began on October 22, 2007, and were closely situated in the San Bernardino National Forest near Lake Arrowhead. Among those fires that affected San Bernardino County, these two fires caused the greatest damage: the Slide Fire swept through 12,789 acres and destroyed more than 260 homes, damaging 53 others. The Grass Valley Fire burned 1,247 acres, destroyed 178 structures and damaged 22 others. Because of their close proximity to each other, for this study's purposes, the Slide and Grass Valley Fire Areas were evaluated together, as can be seen in the OES Fire Map shown in Figure 2-3.

[6] US Forest Service San Bernardino National Forest webpage, <http://www.fs.fed.us/r5/sanbernardino/fire/index.shtml> (Accessed June 17, 2008).

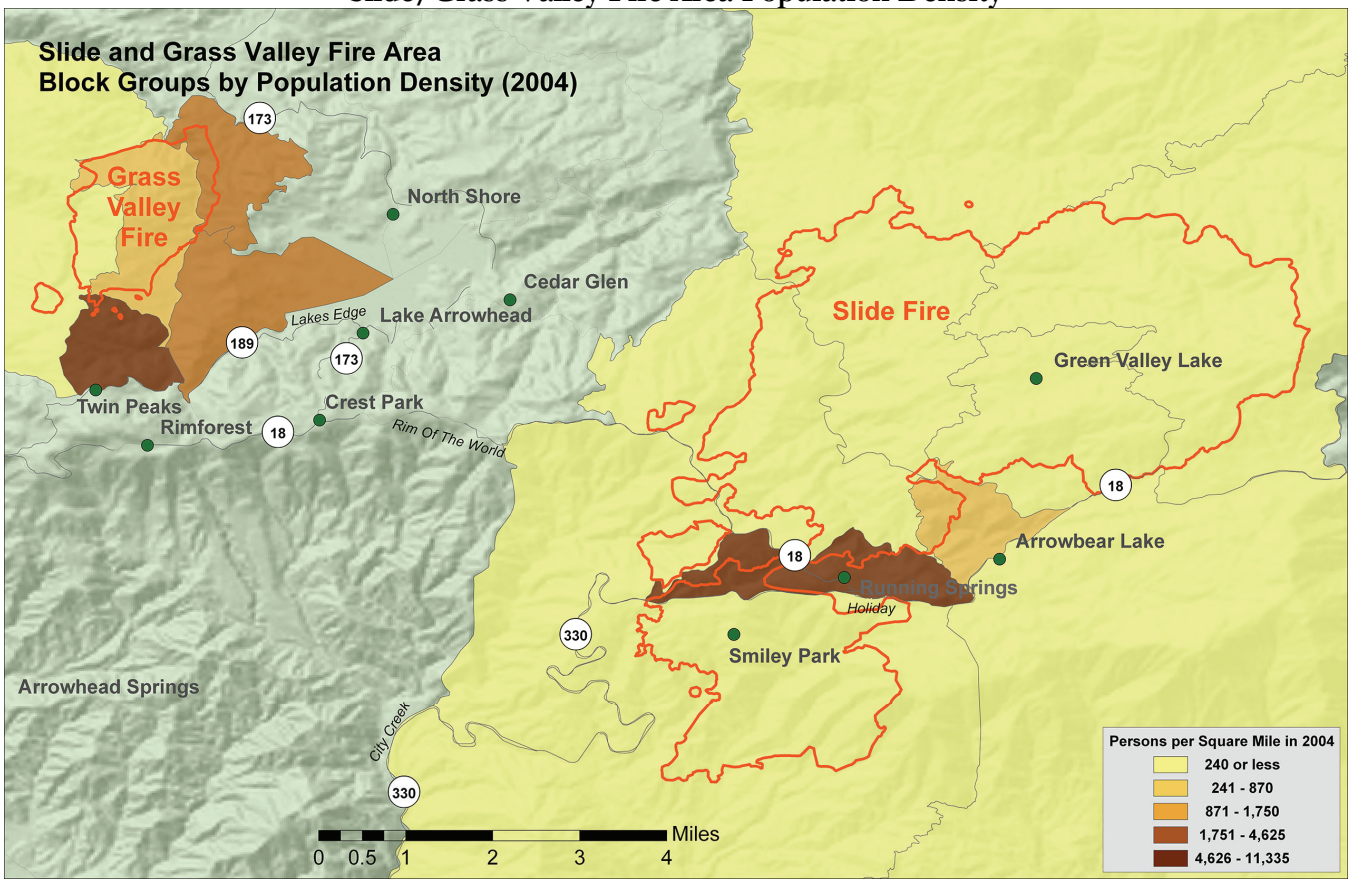
Figure 2-3
CA OES Slide/Grass Valley Fire Map



Source: CA OES

The Slide/Grass Valley Fire Area has 13,559 residents as of 2004 census estimates. The terrain is rugged and mountainous, with development confined to a few small areas. The Area is sparsely populated, with only 52 persons per square mile as shown in Figure 2-4. Additionally, of the 10,790 housing units, only 44% were occupied as of the 2000 Census. The 1999 median household income for the Slide/Grass Valley Fire Area was $52,707, higher than the median household income in San Bernardino County ($42,066), which is lower than the 1999 state median income ($47,493).

Figure 2-4
Slide/Grass Valley Fire Area Population Density



Source: US Census

As of the 2000 Census, residents of the Slide/Grass Valley Fire Area were 89.2% Caucasian, 0.84% African American, 1.18% American Indian/Eskimo, 1.04% Asian, 3.6% "other race," and 3.97% Multi-Racial. Respondents identifying themselves as Hispanic numbered 1,418, or roughly 11% of the Fire Area population, compared with 39.2% self-identifying as Hispanic in San Bernardino County for the 2000 Census.

2.3 Findings and Conclusions

- The Witch and Slide / Grass Valley fires threatened mostly suburban and vacation homes on the periphery of the urban/wildland interface, in sparsely populated areas.
- There were other fires that affected some Native American reservation lands in the eastern, more rural areas, but those fires were among the smallest of the Firestorm in terms of size and damage.
- One rural area of San Diego County – Deerhorn Valley – was identified at the Workshop as needing special Commission analysis. Accordingly, Chapter VII discusses the performance of the carrier of last resort and the consequences of the delayed restoration of service in that community.

CHAPTER III: PERFORMANCE OF COUNTY EMERGENCY NOTIFICATION SYSTEMS

Introduction

This chapter reviews the Firestorm from the perspective of San Bernardino and San Diego Counties, namely their respective Offices of Emergency Services. Specifically, Staff examines the structure of emergency response and management within each county, and the methods each county used to collect and disseminate critical emergency information to residents, most notably those notifications sent via the wireline phone network.

3.1 Use of Community Alerting Systems

Many counties and cities in California employ systems of emergency notification to the public. Often provided as part of a community service program, a community alerting system delivers messages to members of a group, company, or to an entire community to announce emergencies (alerts), or issues a warning to a community such as a forest fire evacuation order. These messages are most commonly sent via automatically dialed wireline phone calls, but can also be sent via technologies such as wireless voice, text message, pagers, fax machines, and email.

Counties may choose to operate these systems themselves, and thus house the hardware and software necessary to manage them, or pay a fee based on usage, the number of users, or some other criteria, to a vendor to operate the system. Most counties and other jurisdictional entities contract with private-sector emergency notification vendors to deliver these messages to residents within their jurisdiction. Alerting systems provided by a third party vendor appear to be the arrangement most commonly utilized in California.

For this chapter, Staff analysis of the performance of the telecommunications system is focused on an evaluation of the wireline mass notification systems utilized by San Diego and San Bernardino Counties during the Firestorm. These systems enabled each county to initiate outbound emergency calls to a designated group of telephone subscribers, instantly notifying those in a predetermined geographical area of a hazardous situation. These systems deliver a recorded voice message to landline phones included in a database, and can redial any "no answer" or busy lines for a designated number of attempts.

Staff focused its analysis of community notification systems on wireline emergency alerting for two key reasons. One, wireline notifications have become the most common means of alerting residents for most counties in California. Given the Governor's grant for counties to implement community alerting systems and the relative ease of implementing wireline notification systems, nearly all California counties should have wireline systems in the near future[7]. Two, CD wanted to verify statements made at the January 9 San Diego Workshop, where community alerting vendors stated significantly high success rates for these calls, which CD believes may be overly optimistic.

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[7] "Governor Schwarzenegger Announces Funding for Telephone Emergency Warning Systems", December 28, 2007, <http://gov.ca.gov/index.php?/press-release/8396/>.

In addition, CD wanted to examine whether there were any issues with alerts reaching disabled and other special population groups. Non-discriminatory access to emergency communications is a key component of the public safety objectives of the Commission's Consumer Protection Initiative (CPI). CPI Community and Education Initiatives include workshops with government agencies and other stakeholders on 'best practices', consumer education programs and educational materials on telephone use in emergencies which are available through the CPUC and CalPhoneInfo websites.

Considering these factors CD recognized the benefit to the State and those counties utilizing these systems of providing an independent analysis of call success rates when these systems are utilized during an actual disaster. Additionally, CD sought a better understanding of the effects of these potentially many thousands of calls on the telecommunications network.

3.2 Use of Notification and Alerting in San Bernardino County

Along with disaster recovery planning, and the coordination and implementation of emergency response, alert and warning during any emergency situation in San Bernardino County is a function of the County's Office of Emergency Services (SBOES).

3.2.1 San Bernardino Office of Emergency Services

SBOES, a division of the San Bernardino County Fire Department, serves as the Lead Agency for the San Bernardino County Operational Area (OA). The OA coordinates disaster preparedness efforts with 24 cities and towns, over 40 County departments, the private sector, and volunteer organizations.[8] SBOES also facilitates multi-agency and interagency coordination at the local, state, and federal levels, including development and coordination of Emergency Alert System (EAS) notifications for countywide distribution, such as Evacuation Orders. The EOC is activated when a major emergency or disaster is anticipated or occurs, with staffing levels dependent on the specific emergency situation. Specifically, Twenty First Century Communications (TFCC) cited an unverified average success rate of around 70%,[9] while NTI Group stated a 96% success rate.[10] These call success rates far outpace the data shown for San Bernardino County TENS calls (Figure 3.1, below) and San Diego County Reverse 911/AlertSanDiego calls (Figure 3.3, below).

During the course of the Grass Valley and Slide Fires, the EOC maintained an average of 71 EOC Responders on a daily basis; issued five Emergency Orders; coordinated the establishment of a Fire Emergency Local Assistance Center (FELAC); and facilitated the re-entry process for evacuees after fires had been contained. Overall, County/OA EOC accommodated over 1,000 people and evacuated over 34,000 people.[11]

3.2.2 Community Information and Notification During the Firestorm

In the last half of 2007, SBOES implemented several new public information tools, including a Disaster Information Website. In conjunction with the County Administrative Office, SBOES created a website

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[8] Under the State's Standardized Emergency Management System (SEMS), the OA is an intermediate organizational level consisting of a county and all political subdivisions within the county, including special districts. The OA serves as the communication link between the local government and regional agencies. CA Governor's Office of Emergency Services SEMS Guidelines webpage, <http://www.oes.ca.gov/Operational/OESHome.nsf/Content/B4943535210895448825 6C2A0071E038?OpenDocument> (Accessed June 17, 2008).

[9] "2007 San Diego County Firestorms After Action Report", County of San Diego, February 2008, p.104 line 20.

[10] Ibid, p.111 lines 17-18.

[11] "San Bernardino County Fire Department Annual Report 2007", page 27.

with real-time disaster information during the Butler Fire[12] to provide residents with access to the most current information. Once the fires were contained, the county set up a Disaster Recovery Website to complement the FELAC.[13] The website received more than 56,000 hits in the first three weeks of its activation.

During the Grass Valley and Slide Fires, SBOES also utilized 2-1-1 as an emergency phone bank. Call takers provided the most up to date information that was simultaneously broadcast on the website and the Fire Department's Incident Information Line. Through 2-1-1, SBOES answered more than 7,000 calls from San Bernardino residents seeking information about the fires.

3.2.3 The Telephone Emergency Notification System (TENS)

SBOES manages the County's Telephone Emergency Notification System (TENS) for mass emergency notifications. In 2004, San Bernardino County implemented the TENS as part of an effort to confront the dangers related to wildfires in the San Bernardino and San Gabriel Mountains. TENS implementation followed the devastating Grand Prix and Old Fires in 2003, which resulted in more than 150,000 acres burned and 1,000 houses destroyed.[14]

The TENS system is a mass calling system that utilizes the 9-1-1 database and is updated quarterly. The TENS has the capability to simultaneously call 500 wireline phone numbers. Each TENS call allows a phone to ring up to six times before hanging up.[15] Unanswered calls are returned to the queue for redialing.

In San Bernardino County, the Sheriff's Department has the authority to activate the TENS system at the request of the incident commander for a particular emergency. Those County agencies involved in use of the TENS system include the Sheriff's Department, Fire Department, Department of Public Works/Flood Control, Department of Public Health, and the California OES.

SBOES provided TENS calling data to the Commission for over 45,000 calls placed by the mass notification system to affected communities during the Firestorm. Table 3-1 and Figure 3-1 depict the number of mass notification calls made to each community, broken out by the number successfully completed and the number failed. At the time of the firestorm, the TENS system did not have the capability to provide alerts to technologies other than wireline telephones.

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[12] The Butler Fire, west of Big Bear Lake, occurred from September 1-4, 2007. Butler Fire Incident Information webpage <http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_id=211> (Accessed June 17, 2008).

[13] "San Bernardino County Fire Department Annual Report 2007" <http://www.sbcfire.org/admin/AnnualReports/20080407_sbcfire_2007_annual_report.pdf>; San Bernardino Disaster Recovery Assistance website <http://www.sbcounty.gov/evocRecovery.asp> (Accessed June 16, 2008).

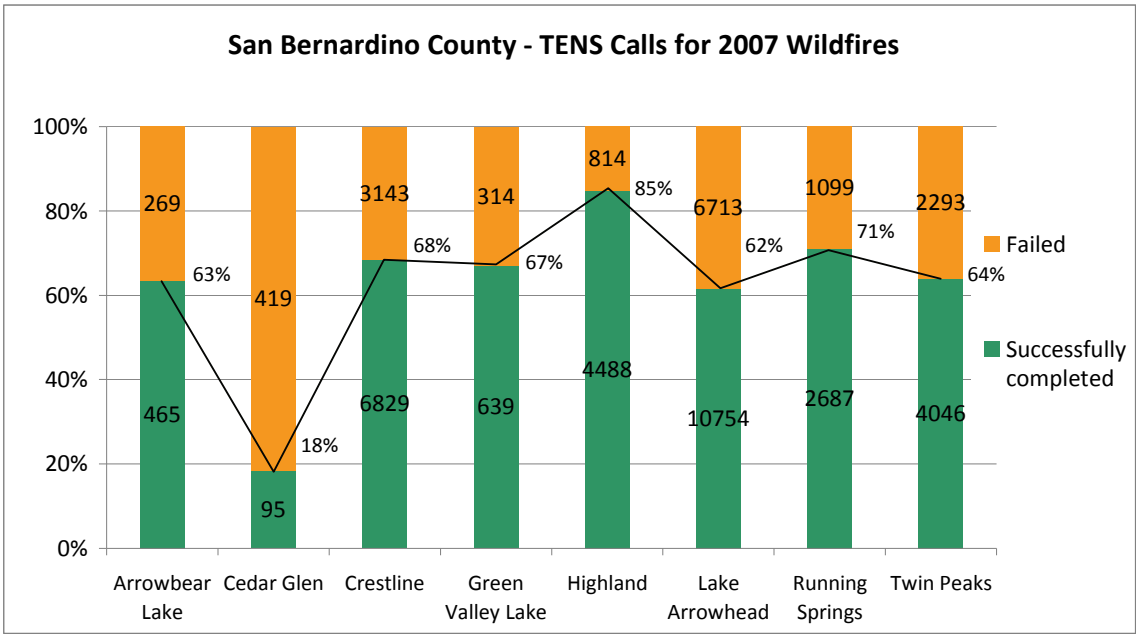
[14] "County Emergency Notification System Scheduled for Test in San Bernardino & San Gabriel Mountain Communities," Mountain Area Safety Taskforce (MAST) News Release, June 25, 2007.

[15] Michael P. Neufeld, "Emergency Notification Systems Expanding," rimoftheworld.net, December 31, 2007. <http://rimoftheworld.net/columns/neufeld/emergency_notification> (Accessed June 16, 2008).

Table 3-1
San Bernardino County Mass Notification Calls

Called Area	Number attempted	Number failed	Number successfully completed	Success percentage
Arrowbear Lake	734	269	465	63%
Cedar Glen	514	419	95	18%
Crestline	9,972	3,143	6,829	68%
Green Valley Lake	953	314	639	67%
Highland	5,302	814	4,488	85%
Lake Arrowhead	17,467	6,713	10,754	62%
Running Springs	3,786	1,099	2,687	71%
Twin Peaks	6,339	2,293	4,046	64%
Total	**45,067**	**15,064**	**30,003**	**67%**

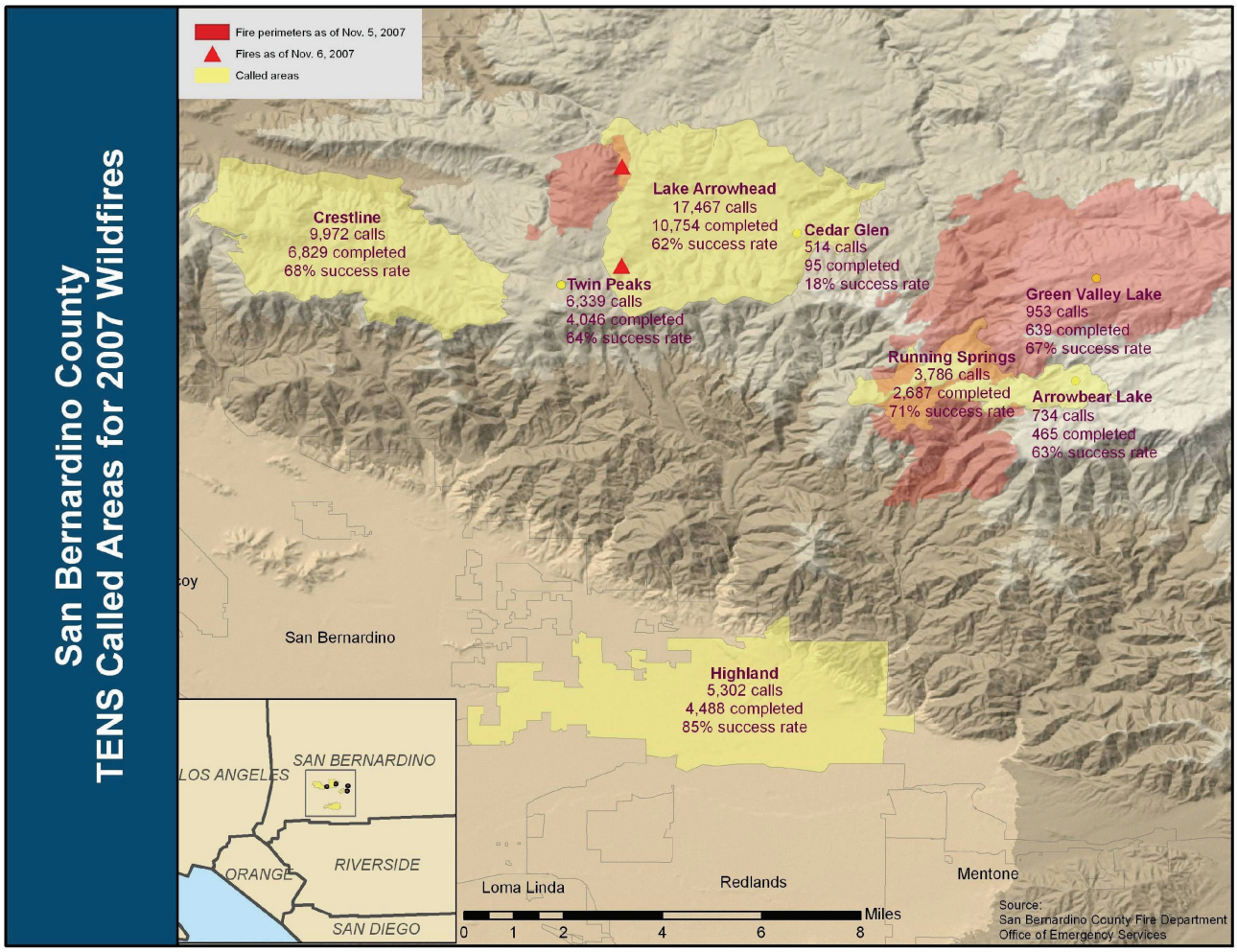
Figure 3-1



From the above two charts, Staff find that the call success rate varied greatly from one set of call attempts or one calling area to the next. For the reported calling areas, the average success rate was 67% complete for all calls made, yet Cedar Glen had a success rate of only 18% while Highland had a very high success rate at 85% of calls completed. Staff does not know the cause of this variation, although it may be the result of a few factors such as residents having already evacuated, telephone lines being down or network congestion in areas with limited capacity.

Figure 3-2 shows the locations of alerted communities in San Bernardino County (shaded yellow areas for cities/towns, and dots for unincorporated places), along with the general locations of fires as of November 6 (shaded red areas and red triangles).

Figure 3-2



3.3 Use of Notification and Alerting in San Diego County

As in San Bernardino County, public information and alert and warning are functions performed by the San Diego County Office of Emergency Services (SDOES).

3.3.1 San Diego Office of Emergency Services

The San Diego Office of Emergency Services (SDOES), under the direction of the San Diego County Sheriff's Department, coordinates the overall county response to disasters. SDOES develops plans and procedures for response to, and recovery from, both natural and man-made disasters. SDOES is responsible for developing and providing preparedness materials for the public; alerting and notifying appropriate agencies when disaster strikes, coordinating all responding agencies, and ensuring adequate resources are available and mobilized in times of disaster.

SDOES staffs the County's Operational Area Emergency Operations Center (OAEOC). This is the central facility that provides regionally coordinated emergency response. SDOES staff also acts as staff to the Unified Disaster Council (UDC), a joint powers agreement between all 18 incorporated cities and San Diego County. The UDC provides for coordination of plans and programs Countywide to ensure the protection of

life and property.[16] The Joint Information Center (JIC), located adjacent to the SDOES, is the primary coordination hub for collection and dissemination of public information during an emergency. The JIC works in coordination with the OAEOC, 2-1-1, subject matter experts, and the media to ensure accurate and timely information is provided to the public.

3.3.2 Community Information and Notification During the Firestorm

Based on lessons learned and identified after the 2003 Firestorm, significant adjustments and improvements were made in San Diego County. [17] The County developed a protocol to use the mass notification system Reverse 911(©) in conjunction with the Emergency Alert System (emergency vehicles, media, television, radio, and manual notification).[18]

The County emergency information website contained all press release information in addition to field reports, incident maps, health information, power outages, evacuation orders, and other critical emergency information.[19] On October 22nd, the website received approximately 10 million hits.

Throughout the disaster, 2-1-1 functioned as an interactive communications asset with personnel gathering information from the JIC, WebEOC[20], private sector corporations, and other resources to get information to county officials and to the public. By the end of the fires, 2-1-1 had answered approximately 140,000 calls.

Technology and automation played a major role in the successful response to the fires and delivery of evacuation notifications in San Diego. Reverse 911, AlertSanDiego, and 2-1-1 allowed the county to quickly notify residents of the need to evacuate and provided other emergency information to the public.[21]

3.3.3 Reverse 911 and AlertSanDiego

San Diego County currently utilizes two mass notification systems: Reverse 911, which the San Diego County Sheriff's Department operates, and AlertSanDiego, which SDOES operates. Together, these systems cover all 18 incorporated cities and the County under the UDC.[22]

The San Diego County Sheriff's Department personnel were 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. Reverse 911 effectively delivered 415,188 emergency notification recorded voice messages classified as either advisory or mandatory evacuation orders.[23] In addition to delivering mass notifications, AlertSanDiego also notified emergency

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[16] County of San Diego Unified Disaster Council webpage <http://www.sdcounty.ca.gov/oes/emergency_management/oes_jl_UDC.html> (Accessed June 17, 2008).

[17] "San Diego County Emergency Operations Center: Seeking Better Communications", San Diego County Grand Jury report filed May 25, 2004. <http://www.co.san-diego.ca.us/grandjury/reports/2003_2004/EmergencyOperationsReport.pdf> (Accessed June 17, 2008).

[18] The Emergency Alert System (EAS) is a national public warning system that requires broadcasters, cable, and satellite service providers to provide communications capability to the President during a National emergency. The system may also be used by state and local authorities to deliver important emergency information. Federal Communications Commission EAS webpage <http://www.fcc.gov/pshs/services/eas/> (Accessed June 17, 2008).

[19] <www.sdcountyemergency.com> (Accessed June 17, 2008).

[20] WebEOC is a web-enabled crisis information management system and provides secure real-time information sharing for public safety and emergency management officials. WebEOC webpage <http://www.esi911.com/home/index.php?option=com_content&task=view&id=14&Itemid=42> (Accessed June 17, 2008).

[21] "2007 San Diego County Firestorms After Action Report", County of San Diego, February 2008.

[22] Email message from Ron Lane, San Diego County Sheriff's Department, February 28, 2008.

[23] The community of Warner Springs in northeastern San Diego County did not receive Reverse 911 calls. It was discovered that there are several relatively small anomalies in the 9-1-1 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 have a post office

management personnel to respond to the OAEOC. AlertSanDiego and Reverse 911 combined to place nearly 587,000 calls to inform residents in nearly 100 different communities of evacuation and boil water orders during the firestorm.

SDOES provided Reverse 911 and AlertSanDiego calling data to the Commission for over 163,000 calls placed by the mass notification systems to affected communities during the Firestorm. Table 3-2 and Figure 3-3 show the total calls and success/failure rates for a number of alerted communities.

Table 3-2
San Diego County Mass Notification Calls

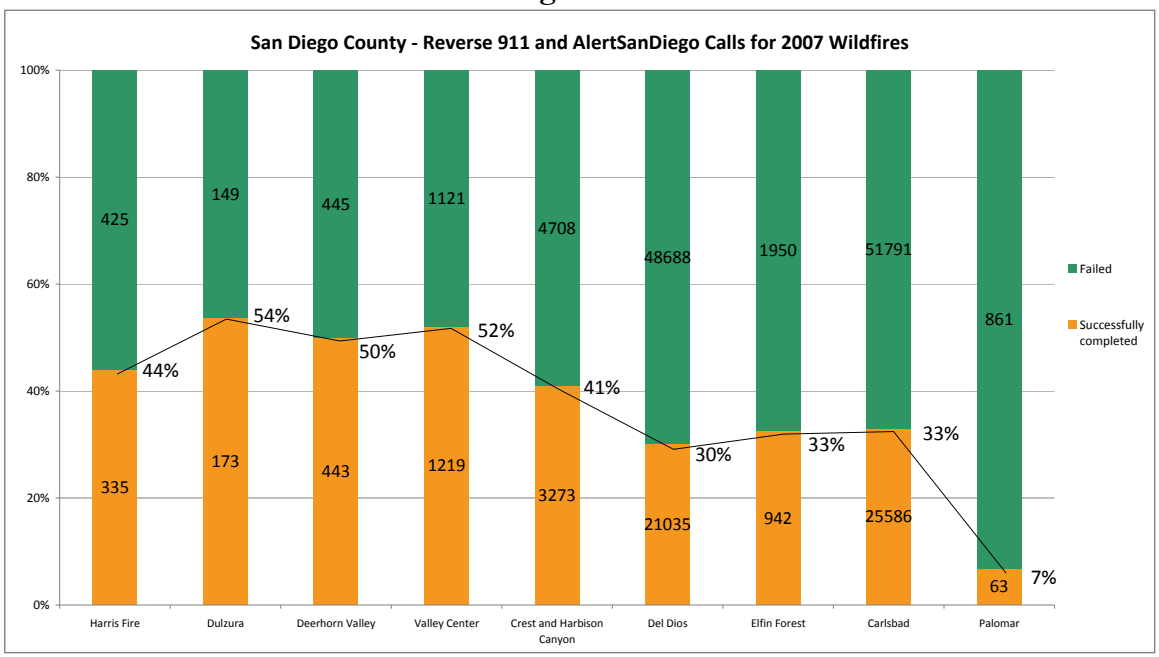
Called Area	Number attempted	Number failed	Number successfully completed	Success* percentage
Carlsbad	77,377	51,791	25,586	33%
Crest and Harbison Canyon	7,981	4,708	3,273	41%
Del Dios	69,723	48,688	21,035	30%
Deerhorn Valley	888	445	443	50%
Dulzura	322	149	173	54%
Elfin Forest	2,892	1,950	942	33%
Harris Fire	760	425	335	44%
Palomar	924	861	63	7%
Valley Center	2,340	1,121	1,219	52%
Total	**163,207**	**110,138**	**53,069**	**33%**

*Communities shown in green received alerts through AlertSanDiego, while those in black were alerted through Reverse 911.

* San Diego County provided a detailed breakdown of the types of "success" and "failure" calls made. "Success" includes "call answered" and "answering machine," while "failure" includes "network error," "TDD/TTY Device," "Expired/Cancelled," "Busy Signal," "Fax Machine," "No Answer," "Invalid Contact Number," "Hung up," and "Operator intercept."

address 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.

Figure 3-3



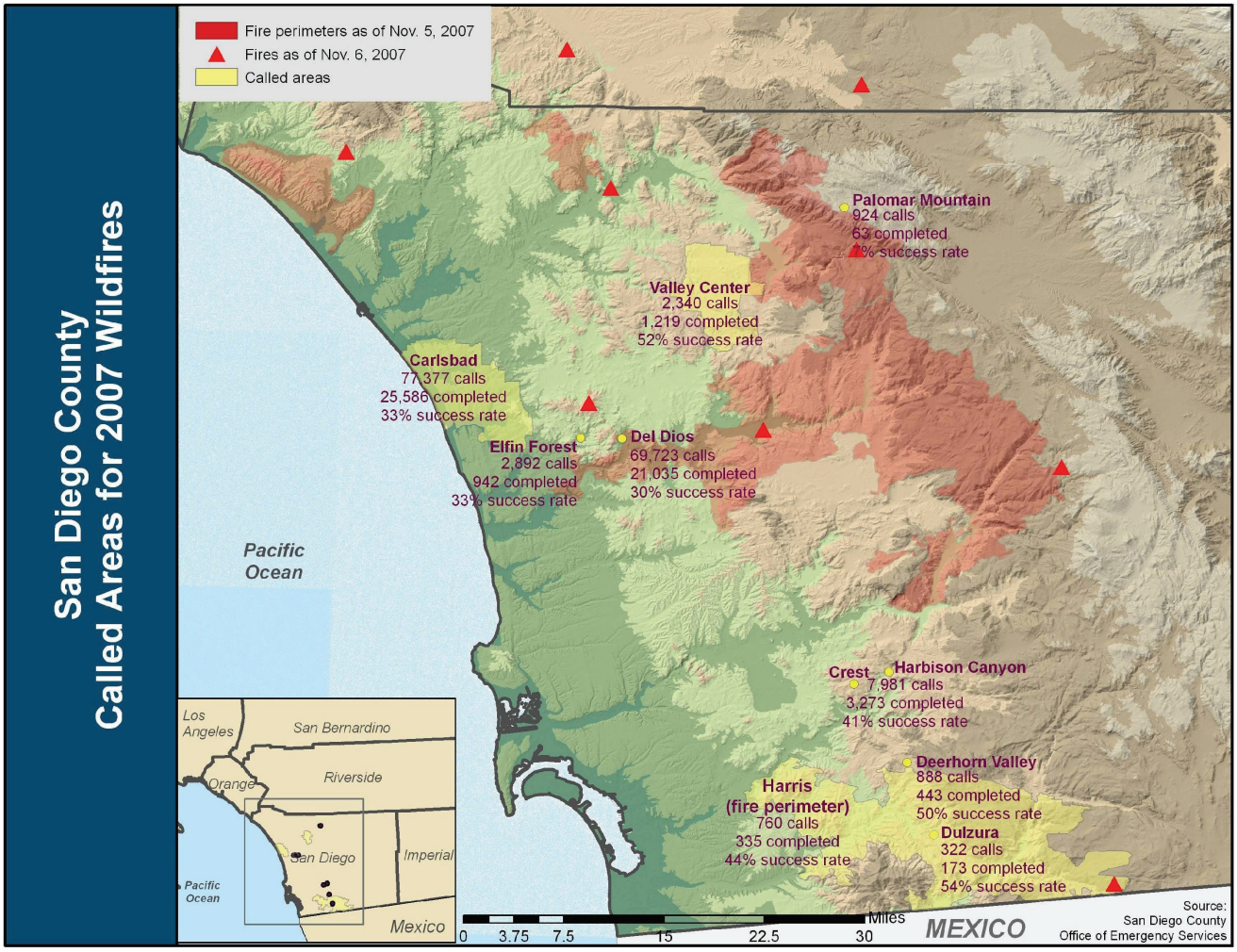
From the data above, Staff finds that the call success rate varied from one call attempt or calling area to the next, but the differences were not as great as those found in San Bernardino County. For the reported calling areas the average success rate was only 33% complete for all calls made, which is a substantially lower success rate than that reported by San Bernardino County. Completion rates in San Diego County varied from a success rate of only 7% for Palomar to a high of 54% of calls completed for Dulzura. Although success rates on average were noticeably higher in San Bernardino County, the total number of calls placed was substantially higher in San Diego County.

Some of the lessons learned in San Diego County were:

- The larger the calling area, the greater the likelihood that phone line capacity issues will be a prohibitive factor, resulting in a high level of "call intercept" or "network error". Thus, the second and third attempts will be more successful.
- To solve phone line capacity issues, setting the repeat calls at 15 minute intervals, instead of 5 minutes, may be beneficial.
- Trying to limit the calls to less than 30 seconds can also help.

Figure 3-4 shows the locations of these alerted communities in San Diego County (shaded yellow areas for cities/towns, and dots for unincorporated places), along with the general locations of fires as of November 6 (shaded red areas and red triangles).

Figure 3-4



3.4 Network Limitations

One reason for lower notification call completion rates is the disparity between the number of alert calls a vendor can initiate and the capacity the telecommunications system has to complete these calls. This is highlighted by a Verizon study of network capacity for emergency alerts. Verizon conducted network capacity tests in Santa Barbara and at Carnegie Mellon University in Pennsylvania. In its tests, Verizon determined that, even though a notification vendor has the ability to place hundreds or even thousands of calls per minute, the network could only complete a substantially smaller number of calls before call blocking occurred[24].

The following quote from Tim Fuller, CEO of notification systems vendor PlantCML, further expresses this disparity: *"There is no limit on the number of calls this system can make…it really depends upon the size of the telephone system it is serving."*[25]

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[24] Information from NRRI call on emergency alerting in which a Verizon technical employee explained recent efforts by Verizon in regards to network capacity testing.

[25] Chris Preimesberger, "Fire Emergency Puts Stress on Telecom," Smart Device Central, October 25, 2007 <http://www.smartdevicecentral.com/article/Fire+Emergency+Puts+Stress+on+Telecom/218048_1.aspx> (Accessed June 16, 2008).

The above quote and this report underscore the need for carriers and vendors to communicate effectively with each other. Without an understanding of network limitations, vendors may make more calls than are manageable by the network, thus causing further congestion. Carriers, on the other hand, need to notify vendors of network limitations so that the latter can plan their operations more effectively by sending calls in manageable bursts or using other mitigating techniques.

This fact is even more important when one considers the calling capacity San Diego asserts it possesses in its after action report. San Diego County asserts that its AlertSanDiego system can call every household in San Diego in less than 3 hours.[26] Without preliminary communications between the alert vendor and telecommunications carrier, an influx in call volume could result in delays and blockages of all calls, not just those being initiated by the alert vendor.

3.5 Persons with Disabilities

According to Richard Ray, chair of the National Emergency Number Association (NENA) Accessibility Committee, and president of the California Association of the Deaf (CAD), emergency notification systems historically have not fully addressed the needs of Teletypewriter (TTY) users from the standpoint of functional equivalence. In the case of the San Diego wildfires, two discrete mass notification systems were used in San Diego to notify wireline users about the fires; the City of San Diego employed one system while the County of San Diego employed another. In both instances, however, landline TTY users did not receive any announcements. Although the two systems are compatible with TTYs, current procedures require TTY users to register their number(s) with providers of mass notification systems in order to receive notifications or warning messages via TTY. Conversely, voice wireline users need not sign-up or perform any action in order to receive such announcements.

Mr. Ray first became aware that San Diego County's mass notification systems failed to disseminate warning messages to landline TTY telephones when deaf and hard-of-hearing people complained to their local community organizations. Consequently, the California Association of the Deaf, San Diego Chapter, and Deaf Community Services of San Diego, Inc. hosted a public forum to address their complaints. At the forum, some 100 to 200 deaf and hard-of-hearing individuals appeared and expressed their concerns with mass notification systems. Specifically, forum participants reaffirmed that TTY users had not received any warnings regarding the raging fires in their vicinity.

In an effort to ensure that members of the disability population who rely on TTYs receive emergency alerts, Mr. Ray and other representatives of the deaf and hard-of-hearing community approached TFCC, the mass notification systems provider for the County of San Diego. TFCC apparently acknowledged that TTY users did not receive any warning messages, and has since worked cooperatively with Mr. Ray and others to implement procedural changes. In particular, the company has modified it's software such that TTY users no longer need to manually register with TFCC to receive notifications. The system, however, is still being tested to make certain that TTY users will be able to receive emergency notifications going forward.

3.6 Voice over Internet Protocol (VoIP)

Voice over Internet Protocol (VoIP) presents unique challenges to public safety because the location of the caller cannot be automatically determined as with conventional landline phones. Federal Communications Commission (FCC) rules require VoIP customers to register their physical location before VoIP providers may commence service. Customers must update their location information each and every time it changes. The California 9-1-1 program office reported that a major issue with VoIP is that many customers are not

[26] "2007 San Diego County Firestorms After Action Report", County of San Diego, February 2008.

updating or entering their location accurately. For this reason, there exists a need for public outreach and consumer education efforts to ensure that VoIP users will receive alert warnings. Press reports following the fires revealed that emergency notifications did not reach people with nomadic VoIP phones, such as Vonage customers.[27] As a result, some residents missed urgent messages to evacuate their homes.

3.7 Findings and Conclusions

- Notification system vendors stated significantly higher success rates than those found in Staff's review of San Bernardino and San Diego Counties' mass notification calls. However, Staff could not determine the cause of this variation, and this discrepancy may lead to unrealistic expectations in future events.
- In San Diego, teletypewriter (TTY) users that had not previously registered their phone numbers with their counties' mass notification systems did not receive emergency notification calls. Additionally, press reports revealed that emergency notifications did not reach people with nomadic Voice over Internet Protocol (VoIP) phones, such as Vonage customers. For several reasons, some of these people missed urgent messages to evacuate their homes since VoIP telephone numbers as well as wireless phone numbers are not included in the traditional 9-1-1 database utilized for emergency notifications.

3.8 Recommendations

- The Commission should encourage local entities with telephone mass notification systems to review call delivery rates and network limitation issues with their notification vendors and telecommunications carriers.
- The Commission should expand its CPI community and education initiatives to include workshops with local public safety entities on telephone notification protocols, to ensure that emergency calls reach TTY and other special needs populations. To reach nomadic VoIP and wireless users, the Commission should also encourage local entities to conduct public outreach campaigns to urge residents to register their non-wireline telephone numbers and keep the registration current.

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[27] Jennifer Doyle, "Cooperative effort among agencies ensures seamless EMS response," *Journal of Emergency Medical Services* Vol. 32 No. 12, December 2007 <http://www.jems.com/news_and_articles/articles/jems/3212/san_diego_firestorm_2007.html;jsessionid=50AA40F2814218E95C2D39D8AFD7945E> (Accessed 18 September 2008); Pamela Scanlon, "Information Sharing during the San Diego Wildfires of 2007," *The Police Chief* April 2008 <http://policechiefmagazine.org/magazine/index.cfm?fuseaction=display_arch&article_id=1468&issue_id=42008>. See also City of San Diego Response, "Firestorm After Action Report", p. 13 <http://www.sandiego.gov/mayor/pdf/fireafteraction.pdf> (Accessed 18 September 2008).

CHAPTER IV: PRIORITY TELECOMMUNICATIONS SERVICES AND PROGRAMS

Introduction

The federal priority telecommunications services programs are meant to be a critical element in national, state and local emergency preparedness planning, response and recovery efforts. Priority telecommunications services provide priority call queuing, as well as priority restoration and provisioning of telecommunications infrastructure.

The priority programs available are the Government Emergency Telecommunications Service (GETS), Wireless Priority Service (WPS) and Telecommunications Service Priority (TSP). All are administered exclusively by the National Communications System (NCS), which was formed in 1963 in response to communications deficiencies during the Cuban Missile Crisis, and was transferred to the federal Department of Homeland Security (DHS) in 2003.

4.1 Eligibility for Priority Services

Organizations that support one or more of the following listed National Security and Emergency Preparedness (NS/EP) mission areas qualify to use priority telecommunications services:

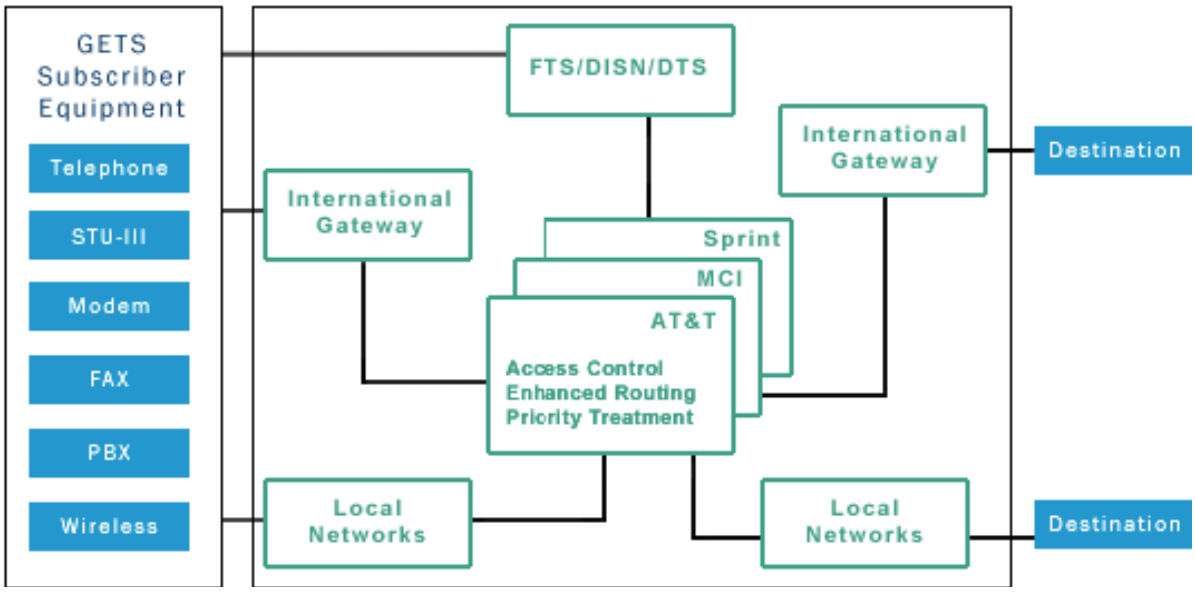
- National Security Leadership
- National Security Posture and U.S. Population Attack Warning
- Public Health, Safety and other Maintenance of Law and Order
- Public Welfare and Maintenance of National Economic Posture
- Disaster Recovery

Qualifying organizations include federal, state, local and tribal government entities, industry, and non-profit organizations, and other entities which perform a national security or emergency preparedness mission.

4.2 Government Emergency Telecommunications Service (GETS)

NCS developed GETS in response to a White House directive to provide NS/EP users with priority processing when making local and long distance calls. Through a series of enhancements to the Public Switched Telephone Network (PSTN), GETS increases the probability of call completion during periods of severe network congestion or disruption. GETS users may access the service by dialing the universal GETS number (1-710-NCS-GETS) on their calling card, and subsequently entering their 12-digit Personal Identification Number. Once authenticated, the call receives priority treatment.

Figure 4-1
GETS Architecture



Source: http://gets.ncs.gov/program_info04.html

The charge for using GETS is 7¢ or 10¢ per minute (depending on the carrier and other factors) for calls within the United States and its territories, Canada, and most of the Caribbean; there is no activation fee. International calls are billed at commercial rates. Moreover, federal government organizations are exempt from billing until an annual threshold for GETS calls has been exceeded. In fact, many parties claim that the federal government does not bill at all for GETS unless abuse is suspected.

According to NCS, GETS is designed to provide 90% call completion rates when call volume is eight times greater than normal capacity. In actual emergencies, GETS has consistently met or exceeded this completion rate. In a report issued by GSA (General Services Administration) titled *National Security/Emergency Preparedness Telecommunications Applications Study*, call completion rates for GETS users were found to have surpassed 95% during the terrorist attacks of September 11, 2001.[28] GETS has thus far proven to be an effective and reliable priority telecommunications service.

The notably high call completion percentage may be attributed to NCS's commitment to the continuous improvement of GETS. For example, whenever a GETS call fails to arrive at its intended destination, the Office of the Manager of the National Communications System (OMNCS) opens an investigation to ascertain the cause(s) of a non-complete call.[29]

4.3 Wireless Priority Service (WPS)

On July 13, 2000, the FCC issued a Report and Order,[30] which established the regulatory, administrative, and operational framework that enables cellular service providers to offer WPS to national security and emergency preparedness staff. Carrier participation in the WPS program is voluntary.

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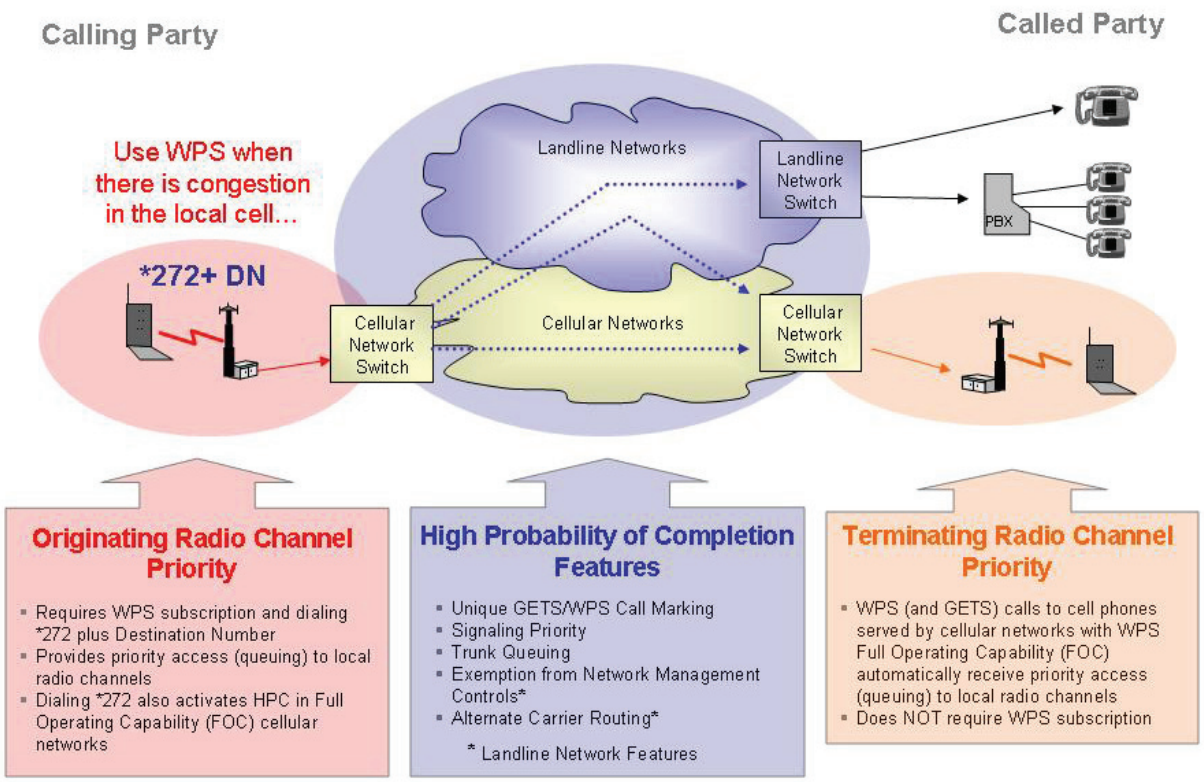
[28] National Security/Emergency Preparedness Telecommunications Applications Study, GSA, July 2002, <http://www.gsa.gov/gsa/cm_attachments/GSA_DOCUMENT/NSEP%20Applications%20Study%20Final%20July%202002_R2-z96K_0Z5RDZ-i34K-pR.pdf> (accessed August 20, 2008).
[29] ibid.
[30] FCC 00-242.

WPS is a priority calling capability that greatly increases the probability of call completion when a national security and emergency preparedness user is unable to complete an emergency call while using their mobile phone. To make a WPS call, the user must first have the WPS feature added to their mobile service. Once the service is added, the caller simply dials *272 plus the destination telephone number.

Figure 4-2
WPS Architecture



Source: http://wps.ncs.gov/program_info.html

The costs for WPS include:

- A one time WPS activation fee of no more than $10.00
- A monthly WPS service charge of no more than $4.50
- When WPS is invoked, a maximum 75¢ per minute usage fee will apply

All WPS charges are in addition to the commercial service plan subscribed to.

4.4 Telecommunications Service Priority (TSP)

On November 17, 1988, the FCC issued a Report and Order[31] establishing the TSP Program. The FCC designated as administrator of the TSP Program the Executive Office of the President, which in turn delegated its responsibilities to the OMNCS. TSP participation is mandatory for all telecommunications companies.[32]

[31] FCC 88-341.
[32] Telecommunications Service Priority presentation, NCS, <www.ncs.gov/tpos/docs/022405/Tab%206%20-%20TSP.ppt> (accessed August 20, 2008).

Public and private organizations may participate in TSP to ensure that their critical telecommunications services are restored and/or provisioned on a priority basis. Non-federal users (e.g., state public utility commissions, local first responders, businesses with critical physical or economic infrastructure) require a federal sponsor (e.g., FCC) in order to enroll in TSP.

The TSP program has two components: restoration and provisioning. To request priority restoration of essential telecommunications services, a qualifying organization must first register those services with the TSP program. Once those services are designated as TSP, if for any reason (e.g., a natural or man-made disaster) any of those TSP services become inoperable, the telecommunications service provider must restore them on a priority basis before it restores any non-TSP services.

After TSP coverage has been established, eligible organizations can also use TSP for vital telecommunications services provisioning (i.e., installation) on a priority basis. For example, if during an emergency, an organization finds that its facilities are inadequate to accommodate all of the incoming call traffic, the organization's administrator can request priority provisioning of additional lines through the TSP program to avert dropped emergency calls.

The cost to request TSP service varies among service providers and from state to state. Some carriers have tariffs on file for TSP, but these tariff rates vary widely depending on the locality of the service, the state's allowable tariff rates, and the carrier's designated service price.

Roles and responsibilities of entities participating in TSP are accessible online at the NCS website. The *Service User Manual for the Telecommunications Service Priority System* provides users with procedures and responsibilities for participating in the TSP program, including activities relating to identifying critical circuits, priority level assignments, customer premise equipment considerations, and points of contact. [33]

4.5 Use of Priority Telecommunications Services in California

Staff contacted several entities in order to assess the use of priority services in California. In all, Staff contacted fifteen service providers, five Public Safety Answering Points (PSAP), the FCC, the DHS's NCS, and 9-1-1 service providers[34] in order to gain a broad understanding of the issues involved in priority services. Staff found that, while call queuing (prioritization) services are utilized to some degree, the usefulness of TSP is a matter of some debate, and its rate of use in California by emergency services personnel and other qualified entities is quite low in comparison to other states.

4.5.1 Telecommunications Service Providers (Carriers)

In order to determine the level of priority services utilization, Staff conducted a survey on priority services among the majority of Southern California voice service providers. Staff sent data requests to three Incumbent Local Exchange Carriers (ILEC), five wireless services providers, six Competitive Local Exchange Carriers (CLEC) including cable companies offering voice service, and one VoIP provider. All providers responded to CD's survey, with the exception of T-Mobile. A matrix of these responses and carriers contact, as well as the questions asked in the data request, can be found in Appendices 4-A and 4-B.

As required by federal law, all ILEC respondents offer TSP and GETS to any entity with a valid access code. Of the wireless providers, only two offer priority services. One offers only WPS, one offers TSP, WPS and GETS; and a third wireless carrier responded that they are currently in the process of developing

[33] Service User Manual for the Telecommunications Service Priority (TSP) System, NCS, May 5 2000, <http://tsp.ncs.gov/forms/TSPServiceUserManual.doc> (accessed August 20, 2008).
[34] The term '9-1-1 Service Provider' is used to describe a carrier that provides 9-1-1 service.

priority access capabilities. CLECs generally do not offer any priority services with two exceptions: Cox and MCI Metro/Verizon Business. MCI Metro/Verizon Business offers all three federal priority services, while Cox offers only TSP. The VoIP provider surveyed offers no priority services at all.

Several carriers offer their own priority services in addition to (or, for non-wireline CLECs, in lieu of) the federal priority services from NCS. These programs include a Platinum Customer designation that includes expedited and selective routing, packet priority treatment for packet-switched voice service, Special Routing Access Service for federal government entities, "Essential Service" for periods of central office overload, and "Priority Connect" preemptive voice calling. For emergency situations requiring restoration or provisioning services, however, TSP enrollees must be serviced before enrollees in any of these additional priority services.

Additionally, many carriers reported that they have policies in place to determine the priority of restoration in the event of an emergency. These policies vary in terms of specificity, ranging from "generally known procedure" to one carrier's encoded *Emergency Dispatch Priority Matrix* governing restoration order. Emergency responders, government entities, hospitals, critical infrastructure facilities, universities, and "high revenue customers" were listed as some of the groups that would receive priority treatment in restoration of facilities. Payphones were also noted by one carrier as a priority for circuit restoration.

As described above, eligibility for federal priority programs is established by the DHS's NCS. As such, all responding carriers offering TSP reported that they offer this service to any entity meeting the NCS requirements. Eligibility criteria for non-federal priority services are developed by the carrier offering the service. Among the responding carriers offering additional services, a mix of eligibility requirements were reported, ranging from programs designated only for emergency providers to programs open to any subscriber who wishes to enroll and pay for the service.

None of the responding carriers maintained data on the use of priority services by their customers.

4.6 Rates and Charges

TSP rates are usually governed by state filed tariffs with fees and charges seeming to vary widely from state to state. Almost all parties contacted for this report agreed that, in California, the activation fee is perceived as an effective barrier to TSP utilization. While AT&T's monthly rates approximate the national average and one-time charges such as priority level change and installation fees are even lower than the national average, AT&T's initial TSP enrollment cost is more than three times the national average (see Table 4-1 below). This higher rate for deploying TSP appears to have made AT&T's TSP service uneconomical and underutilized.

Verizon's enrollment cost is lower than the national average and significantly lower than AT&T's, but the majority of California PSAPs are in AT&T's service territory.

No carriers included data on TSP enrollment in response to the data request. Almost all carriers responded that they do not maintain any data on priority service enrollment. Therefore, it is unknown whether Verizon's TSP enrollment was higher than AT&T's at the time of the Firestorm. It is possible that lack of awareness about priority programs is the biggest factor contributing to the lack of enrollment, although the general perception is that cost is the prohibitive factor.

As a result of this evaluation, AT&T has dramatically reduced its tariffed TSP rates. On July 1, 2008, AT&T filed a reduced tariff for TSP rates (Advice Letter 33066). While monthly recurring fee rates and change fee rates were reduced slightly, the major reduction is the restoration rate payable to the prime

service vendor, which AT&T lowered significantly from $345 to $30. The rates in Table 4-1 below reflect AT&T's TSP rates at the time of the Firestorm.

Table 4-1
Reported AT&T Tariff Rates for TSP 2007[35]

	National Averages	CALIFORNIA
Provisioning/Installation	$ 80.31	$ 47.41
Restoration/Activation	$ 105.39	$ 345.00 *(Revised July 1, 2008 to $30.00)*
Monthly Recurring Fees	$ 3.99	$ 5.00
Priority Level Change	$ 50.93	$ 30.00

Source: TSP tariffs filed with FCC: http://serviceguide.att.com/servicelibrary/business/ext/index.cfm

4.7 Protection of 9-1-1 Circuits

For the protection of 9-1-1 circuits, some carriers reported conducting outreach efforts to raise enrollment levels among PSAPs. One carrier reported that they 'strive to activate and pay for TSP … on high priority circuits like 9-1-1." Another carrier reported that they offer sponsorship for TSP on 9-1-1 circuits. However, the majority of providers do not engage in non-required efforts to augment priority program usage.

Several carriers insist that they have verbal agreements to restore 9-1-1 circuits quickly and before other circuits, and therefore do not need to encourage TSP enrollment among PSAPs. Carriers maintain that TSP is underutilized in California because they already provide this de facto priority restoration for 9-1-1 and other emergency telecommunications circuits. PSAPs also rely on this promised priority treatment. However, it is important to note that these informal agreements are largely untested, and therefore not a guarantee of priority restoration in the event of a major emergency.

4.7.1 Survey of Representative PSAPs and Public Safety Agencies

For this report, Staff surveyed representative PSAPs and county emergency management agencies regarding their use of TSP, GETS, and WPS in order to learn whether these programs were utilized during the Firestorm, and to determine if greater use of these programs would enhance emergency services. Staff found that California PSAPs are unlikely to have 9-1-1 circuits enrolled in the TSP program. Staff has subsequently learned that only 396 of the 3330 or 12% of 9-1-1 circuits used by California's 475 PSAPs are enrolled in TSP.[36] In addition, emergency management agencies reported limited use of WPS and GETS. Wireless priority call queuing is an important method that PSAP personnel use to communicate with each other

[35] TSP tariffs filed with FCC <http://serviceguide.att.com/servicelibrary/business/ext/index.cfm>. This data represents state TSP tariffs in the 22 states in AT&T's service footprint.
[36] The number of 9-1-1 circuits was provided by the California 9-1-1 Emergency Communications Office.

without tying up any of their limited landline circuits. If the PSTN and wireless networks are congested, WPS enables critical communications.

A representative list of San Diego County public safety agencies and the number of circuits employing GETS and WPS is available in Appendix 4-C. San Diego County is seen as a leader among California counties in terms of adopting and implementing comprehensive emergency management concepts and systems. Still, San Diego County PSAPs utilize GETS primarily, and WPS to a lesser extent. Data on TSP use was not provided.

Five California PSAPs were contacted individually regarding their use of federal priority services. Four of the five contacted PSAPs responded: Los Angeles County Police Department (LAPD), San Bernardino County Fire Department, San Mateo County Emergency Services, and County of Monterey Emergency Communications. The City and County of San Francisco Department of Emergency Management did not respond.

LAPD currently uses no priority services, citing that they did not need TSP because their service provider has assured them that 9-1-1 circuits will be the first to be restored in the event of an emergency. Additionally, LAPD noted, and a 9-1-1 service provider confirmed, that priority restoration of 9-1-1 circuits is a feature inherent in the 9-1-1 services offered by the telecommunications carriers. LAPD is currently investigating the use of WPS but has yet to determine whether it will utilize this service.

San Bernardino OES replied that, before the Firestorm, none of the priority programs were in place. However, SBOES is now equipped with GETS and is examining the possibility of obtaining TSP and WPS.

San Mateo County was unaware of any of the federal priority programs, but is interested in learning more about TSP for its backup circuits. Monterey County was familiar with GETS and WPS but was not aware of TSP. Monterey and San Mateo's responses indicate a need for outreach, possibly through the DGS, should California decide to take a more pro-active role in utilizing these services.

4.8 National Efforts to Increase Priority Program Utilization

Staff also contacted the FCC and NCS in order to understand the use of priority services from a national perspective. Staff at both agencies expressed interest in exploring ways to increase enrollment in TSP in particular, as well as enhancing their own data collection efforts.

The FCC and the NCS have undertaken a joint outreach effort to inform PSAPs about the TSP program and to help them through the enrollment process. Some financial assistance is possible through the Homeland Security Grants program. Three prominent national organizations in the 9-1-1 community are also supporting this effort.[37] FCC staff members are currently undertaking an effort to gather TSP tariffs into a central clearinghouse. Tariffs for TSP are inconsistent, difficult to find, and seemingly arbitrary in their varying rate levels from state to state.

In 2003 the National Association of Regulatory Utility Commissions (NARUC) recommended, in recognition of the high cost of enrolling in TSP, that state public utility commissions review, and revise as necessary, their respective TSP tariffs to ensure that those tariffs are fair, reasonable, and affordable. California has not yet adopted this recommendation.

[37] The National Emergency Number Association (NENA), the National Association of State 9-1-1 Administrators (NASNA) and the Association of Public-Safety Communications Officials (APCO).

One recurring comment from FCC and NCS staff was that TSP enrollment was quite high in only a few states, and so low in others that these few states account for the majority of enrolled circuits. An active role by the State to assure lower fees and charges in combination with increased levels of awareness would positively affected enrollment in TSP.

NCS staff were unable to provide complete data points on the use of priority programs in California or nationwide. However, the following data on TSP for 9-1-1 circuits were reported by the FCC's Public Safety and Homeland Security Bureau[38]:

- Less than 10% of the nation's nearly 8,000 PSAPs are enrolled in TSP
- Twenty-three states have zero 9-1-1 circuits protected
- Three states—MA, TX, and WA—account for more than 70% of all TSP 9-1-1 circuits
- Almost 88% of all TSP 9-1-1 circuits are within ten states
- The District of Columbia has more TSP 9-1-1 circuits than 45 states

Conversations with FCC staff confirmed that California's overall TSP enrollment is lower than many other states. This is especially true for 9-1-1 circuits. However, because just a few states account for the majority of TSP 9-1-1 circuits, this is also true for most other states.

4.9 Other States

Some states, most notably New York and Texas, have revised their allowable TSP tariff rates in order to encourage greater utilization of these programs.

In Texas, TSP fees are waived for any entity designated with a priority level 1, 2 or 3.[39] These designations are assigned by the federal sponsoring agency and can be changed via request from the subscriber. Texas TSP subscribers at priority levels 4 and 5 are still responsible for accompanying service charges. As a consequence of making TSP affordable for emergency services, Texas has 4,000 TSP circuits.[40] Moreover, some 350 Texas PSAPs are enrolled in TSP. One carrier in Texas, Sprint, provides TSP to all of its PSAP customers. Texas also attributes its success with TSP to the Commission for State Emergency Communications' efforts through Regional Planning Commissions to actively encourage participation in TSP.

In New York State, the Public Service Commission opened Case 03-C-0922 in 2004 in response to the September 11 attacks. Case 03-C-0922 ordered several measures designed to employ TSP more broadly and to ensure critical infrastructure protection. Most importantly, the Commission's seven-point order included the following stipulations:

- All carriers are directed to file with the Commission cost support information relating to any state tariff charges for TSP services.
- Each local exchange carrier is directed to file with the Commission information certifying and detailing its inter-carrier methods and procedures for ensuring that TSP circuits involving more than one carrier can easily be identified in its record of TSP circuits, and that these circuits will receive appropriate priority treatment during an emergency.

[38] Presentation: "Communications Disaster Preparedness: Bureau Overview and Priority Services," Peterson, Tim, Chief of Staff, Public Safety and Homeland Security Bureau, FCC (2007).
[39] TSP Tariff Provisions, Public Utilities Commission of Texas, <http://www.texas911alliance.org/DED/TX-PUC%20TSP.pps#271,3, TSP Tariff Provisions> (accessed August 20, 2008).
[40] ibid.

It is important to note that this case required a current, cost-based analysis of TSP rates of telecommunications carriers serving New York State.

4.10 Findings and Conclusions

- The federal priority telecommunications services – GETS, WPS, and TSP – provide first responders and other public emergency management personnel with priority call queuing and the priority restoration and provisioning of telecommunications infrastructure.
- California's ILECs are required by federal law to offer TSP and GETS, but WPS is voluntary, and only two of the five major wireless carriers operating in Southern California offer it. CLECs generally do not participate, but there are two CLECs in the region that offer one or more of these services. Unfortunately, carriers responding to Staff's survey did not maintain data on the use of priority services by their customers, and Staff cannot definitively determine the extent of the gap in coverage and participation.
- Staff's sampling of PSAPs and county emergency management agencies revealed a low rate of knowledge of and participation in these priority service programs. Respondents expressed doubt about the overall usefulness of TSP as it is currently structured, and only 12 percent of California's 9-1-1 circuits are registered with TSP. Carriers assert and PSAPs assume that 9-1-1 circuits will receive priority restoration in any emergency, but these understandings are generally 'handshake agreements,' signaling a critical vulnerability since very few of these agreements are contractual or even documented.
- Only one of the five public safety agencies contacted was familiar with the WPS program, revealing a critical need for more participation in the program. First responders often rely on wireless phones to communicate with each other when the public safety radio networks are congested during emergencies. Greater use of WPS will also help prevent first responders from calling 9-1-1, which will in turn conserve the call volume capacity of 9-1-1 for the civilian population. Because carriers do not maintain data on the use of priority services by their customers, Staff cannot definitively determine the extent of the gap in WPS participation.

4.11 Recommendations

- The Commission should require wireline and wireless carries to inform their public safety and first responder customers of the availability of and tariff rates for GETS, WPS and TSP, and report back to the Commission as to how many of these customers subscribe to these programs. The Commission will then be able to determine the need for remedial action.
- The Commission also should conduct outreach to California's public safety agencies and provide information on the value of and need for GETS, WPS, and TSP.
- The Commission should adopt the 2003 NARUC recommendation that state public utility commissions review, and revise as necessary, their respective TSP tariffs to ensure that those tariffs are fair, reasonable, and affordable.

CHAPTER V: PERFORMANCE OF THE TELECOMMUNICATIONS NETWORKS

Introduction

This chapter presents the results of CD's independent appraisal of network availability and congestion levels of the commercial and E9-1-1 networks, for the Southern California region as a whole and for the specific areas that were more directly threatened by the fires. It further documents the network-wide increase in call volumes and blocked call rates observed during the event and the more dramatic hourly spikes seen in some of the fire areas.

There are two networks at issue for this discussion: the commercial wireline and wireless networks that offer inbound and outbound voice telecommunications and connect with the PSTN, and the separate inbound E9-1-1 networks dedicated to delivering 9-1-1 calls to the PSAPs. There were two major sources of information on network call traffic and performance:

- The network impacts described by carriers at the San Diego Workshop in January, 2008
- Staff information requests sent to the major wireline, wireless and cable-based service providers operating in the seven-county Southern California region

5.1 Network Impacts Described at the San Diego Workshop

Panel Two of the Workshop focused on the wireline, wireless, and cable-based service providers serving the region. The panel included the two dominant wireline ILECs (AT&T and Verizon), three wireless carriers (AT&T Mobility, Verizon Wireless and Sprint/Nextel), and one CLEC (Cox). The individual carriers' responses are shown in Appendix 5-A.

All carriers reported damage to and destruction of outside distribution facilities, which included remote terminals, copper wire and fiber cable, cell towers, cell sites, poles and other support structures. Loss of commercial power affected many COs, remote terminals and cell sites, but carriers reported that backup power generators and batteries functioned as intended. However, the carriers did not report the extent to which cell sites had backup power. Due to unsafe fire conditions, carriers reported that some cell sites lost power when batteries depleted and temporary power or fuel supplies could not be safely delivered to the site.

The wireline carriers reported that no COs were damaged or destroyed by fire, due to the priority protection provided those facilities by the fire fighting authorities. However, AT&T reported that in coordination with SDG&E, it took nine COs off commercial power and onto backup power so as to help reduce the need for rolling blackouts in San Diego County. Wireless carriers characterized effects as minor and short-lived, with 96% or greater network accessibility on the worst day – Monday, October 22 – and accessibility returning to 99% or better by October 23.

Only the wireline and cable service providers gave estimates of the number of customers that lost service, ranging from 2,900 to 14,000 customers. Based on these responses, the highest percentage of customers affected in a single day ranged from 2% for Cox, to significantly less than 1% of the two ILECs' customer base.

Carriers reported large increases in call volumes and minutes of use – from 30 to 60 percent – during the first two to five days of the Firestorm. Call blockage and drop rates as a result of network congestion were described as lower than 3% during this period. AT&T further reported that 90% of blocking was between its network and the networks of other carriers. Verizon Wireless characterized blocking as only a temporary problem since calls that were blocked on the first attempt were usually completed on the second.

Sprint/Nextel pointed out that local impacts did spill over into adjacent communities, as large numbers of evacuated customers roamed outside of their normal usage area. This spillover affected not only carriers with service outages, but also competitors with roaming agreements. Thus, increased call volumes and congestion seen on one carrier's network may be due to calls shifting between carriers. Wireline carriers also reported similar impacts on neighboring communities outside of the immediate fire zone. These facts confirm that the telecommunications network should be viewed holistically as one network rather than separate wireline and wireless networks with localized impacts.

5.2 Commission Information Requests and Benchmarks

Public Utilities Code § 2889.8 states: "The Commission periodically shall assess the reliability of the public telecommunications network, and, if necessary, develop recommendations for improvement'. Pursuant to this mandate and the need to perform an independent assessment of the network as part of its public safety oversight responsibilities, Staff sent out detailed information requests to the ten major wireline, wireless and cable-based service providers operating in the seven-county Southern California region, as shown in Appendix 5-B. The information request[41] expanded upon the questions and answers provided during the San Diego Workshop in January by asking carriers for more detailed and specific network performance benchmarks.

Of the ten carriers contacted, Charter Cable and T-Mobile did not respond, but the two ILECs complied with the information requests. The remaining four wireless carriers objected to the requests on the basis that they were not subject to the Commission's jurisdiction, but nevertheless did provide some of the requested data. One wireless carrier maintained that its call traffic metrics could not be compared to or aggregated with other carriers' data because each carrier engineers and captures traffic data differently. Several carriers had difficulty retrieving call traffic data for the Firestorm period because some switch data was maintained for only 30 days. In view of these issues, the Commission needs to be aware of the lack of a common reporting standard, and that future data requests should be made shortly after the event in question.

The network summary information published in this report consists of simple averages derived from the individual carrier responses for the counties at issue. The actual number of calls or minutes of use reported by each carrier has been compared to its baseline traffic and then averaged with other carriers' data, in order to avoid any proprietary information being divulged.

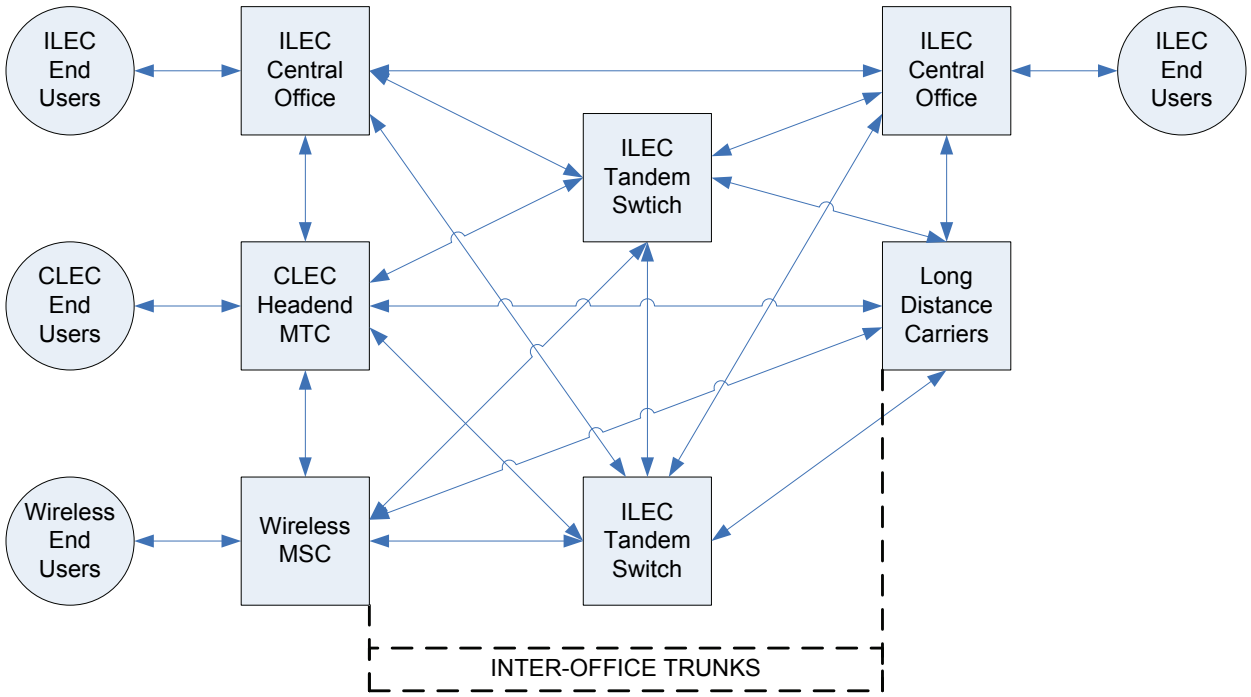
5.3 The Commercial Networks

[41] In order to identify and compare impacts between the different networks in different fire zones, CD organized its information request in three parts, as follows:

1. Call traffic data for the 7-county region as a whole
2. Call traffic data for the local exchanges in the area encompassed by the Witch Fire or the Slide/Grass Valley Fires, depending on the service territory of the service provider responding
3. Call traffic data for the dedicated 9-1-1 trunks, which each service provider is required to maintain for the 9-1-1 calls originating on its network

The commercial networks are characterized by redundant and overlapping call routing paths. Although this attribute results in a highly available and reliable network during normal conditions, it does present difficulties when measuring network performance due to the redundant paths that a call can take and the possibility that the call can be counted twice.

Figure 5-1
COMMERCIAL TELECOMMUNICATION NETWORKS



The diversity and multiplicity of call routing paths can be observed in the generalized network diagram provided in Figure 5-1. This diagram shows that end-users or callers are connected to the network through a local network switch:

- ILEC end users or callers are connected to a central office (CO)
- CLEC callers are connected to a CLEC switch or headend[42]
- Wireless calls are routed through a cell tower to a Mobile Switching Center (MSC)

Once a wireline call leaves the local exchange served by the local switch, it is usually routed to a tandem switch that operates like a hub with spokes to switches serving other destinations. Thus, this hub permits switching to (1) another CO, (2) another tandem, (3) a long distance carrier, or (4) competing carriers within the Local Access and Transport Area. Some interconnection agreements between carriers may require the carrier to bypass the tandem switch and provide a direct connection to the local switch, if and when traffic levels reach a specified minimum. CLEC and wireless calls have comparable routing paths.

Staff selected inter-office trunk traffic moving to and from the tandem switches as the benchmark of network performance. This proved to be the most practical solution as carriers reported that providing more detailed call data by origin and destination was burdensome. When these trunks are congested, a 'fast busy' tone may be heard during the call attempt, which means the call is being blocked.

[42] A headend is the control center of a cable television system that originates and transmits cable modem telephony services to subscribers.

Wireless carriers use Minutes-of-Use (M-O-U) to measure traffic, in contrast to the number of calls metric used by wireline carriers. This basic difference in benchmarking prevented the aggregation of wireline call data with M-O-U data from wireless carriers.

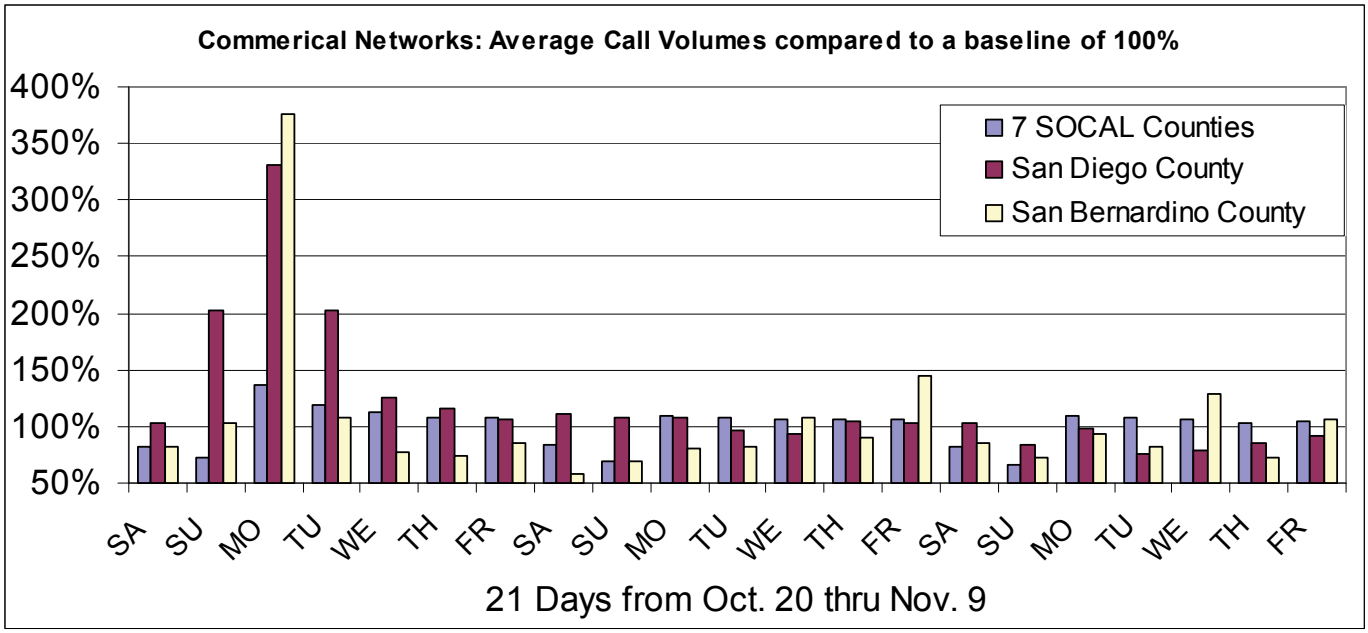
However, since Staff's objective was to describe Firestorm impacts in comparison to non-disaster conditions, Staff used network data to calculate the variation in call traffic from a pre-Firestorm baseline on the same commercial network. As a result, this chapter describes network performance as a percentage of baseline traffic, and does not present the actual number of calls or M-O-U.

5.3.1 Network Impacts During the Firestorm

The spikes in call volume and blockage rates on wireline and wireless networks were at levels higher than those reported at the Workshop, based on the carriers' written responses to CD's information requests. However, carriers reported that networks performed as designed. Furthermore, detailed analysis revealed that spiking and blocking were even more dramatic and concentrated when hourly traffic data was examined at the local level, as discussed in detail below.

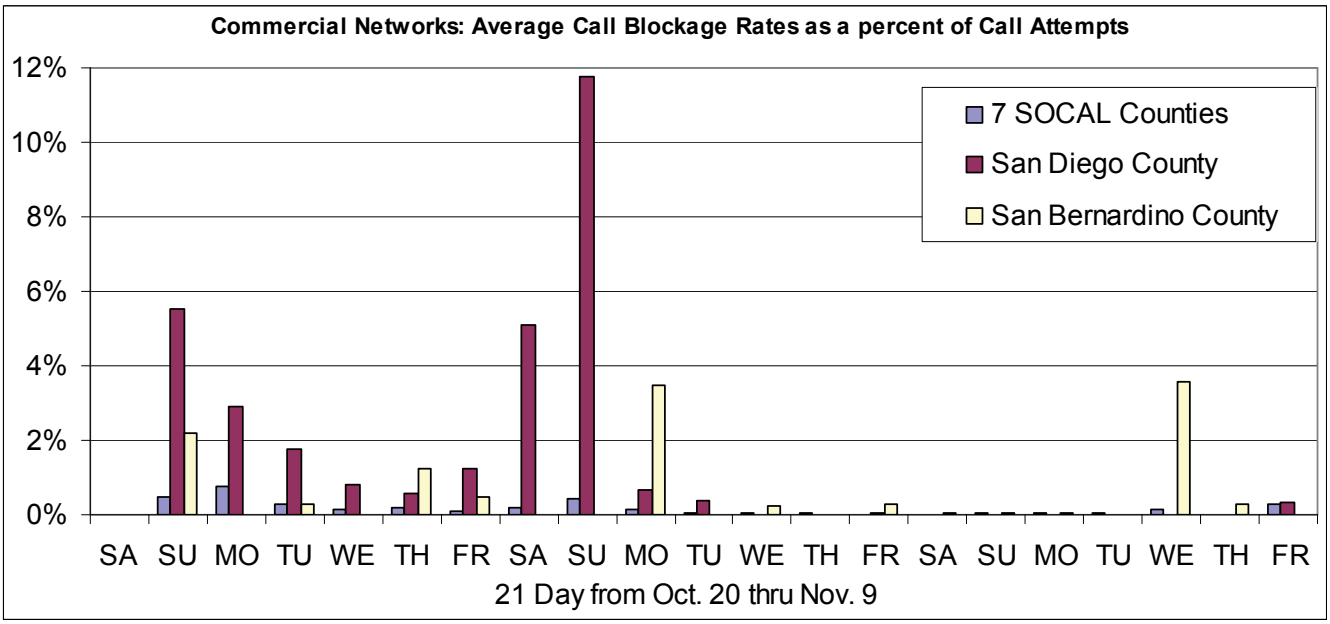
Call volumes spiked on the first weekday of the Firestorm, October 22, and ranged from 137% of normal call volume for the seven-county region, to 331% for San Diego County and 375% for San Bernardino County, as shown in Figure 5-2. Call volumes generally remained elevated and above baseline levels during the entire Firestorm period, although some areas returned to more normal levels by the first weekend day, October 27.

Figure 5-2



Blocked call rates first spiked on Sunday, October 21, and ranged from 0.5% for the seven-county region, to 5.5% for San Diego County and 2.1% for San Bernardino County, as shown in Figure 5-3 below. However, the highest blockage rate occurred on Sunday October 26, when San Diego County experienced a blockage rate of 11.8% for the day. San Bernardino County also experienced other albeit smaller spikes during the 21-day Firestorm period.

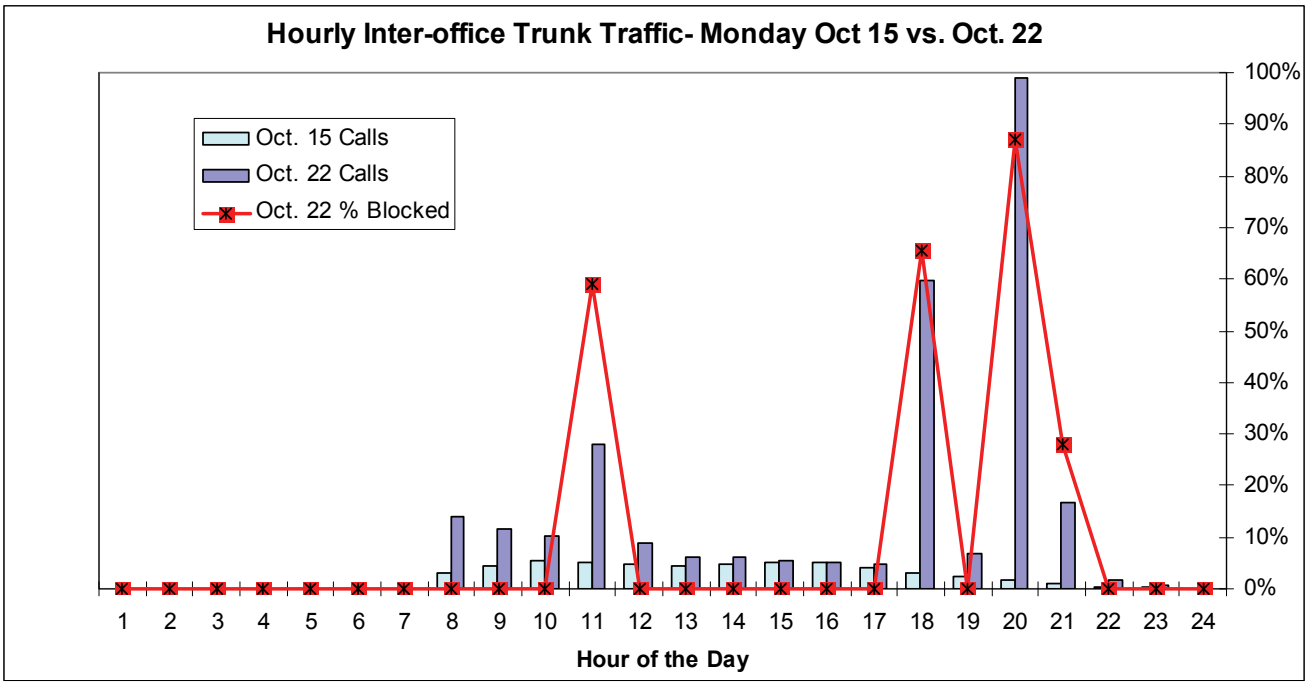
Figure 5-3



The daily and hourly impacts on commercial networks in some fire areas were even more pronounced when compared to impacts at the regional and county levels. Data for one carrier showed that its daily call volume in one county reached 633% of baseline values during one day of the time period. Another carrier's data showed that 35% of all calls in one county were blocked during a single day.

Hourly data on some network trunks showed an unusual and random distribution of spikes in the number of attempted calls, which resulted in a large percentage of blocked calls. For example, Figure 5-4 shows call volumes and blocked call rates by hour of day for one inter-office trunk in the fire zone on Monday October 22, and compares it to the same day of the prior week, before the Firestorm. There were several peaks during the day that resulted in significant blocking, but call attempts during the 20:00 hour were 18 times the volume of the traffic the week before, which resulted in 89% of calls being blocked.

Figure 5-4



These results are representative of the pattern seen throughout many fire areas, where call volume spikes were concentrated in a few hours but randomly distributed during the day and evening hours. When asked to explain these call volume spikes, carriers initially reported only that it was due to customers responding to the event combined with the alert and evacuation calls generated by the notification vendors. CD asked the carriers whether they had data on the number of these notification calls, but they did not and could not provide additional explanation. No carrier analysis was provided to explain this unusual and random pattern of calls. Thus, Staff cannot definitively attribute these call spikes to a single cause or source.

5.3.2 Call Blocking

To determine whether carriers had adequate capacity to deal with demand during emergencies, Staff first looked at call blocking levels during normal conditions. A review of carriers' performance statistics revealed that overall network baseline call blocking averaged about 0.1% of daily calls. Some carriers had slightly higher levels and some carriers had much lower levels. This confirms that carriers seem to have sufficient capacity to cover normal call demand.

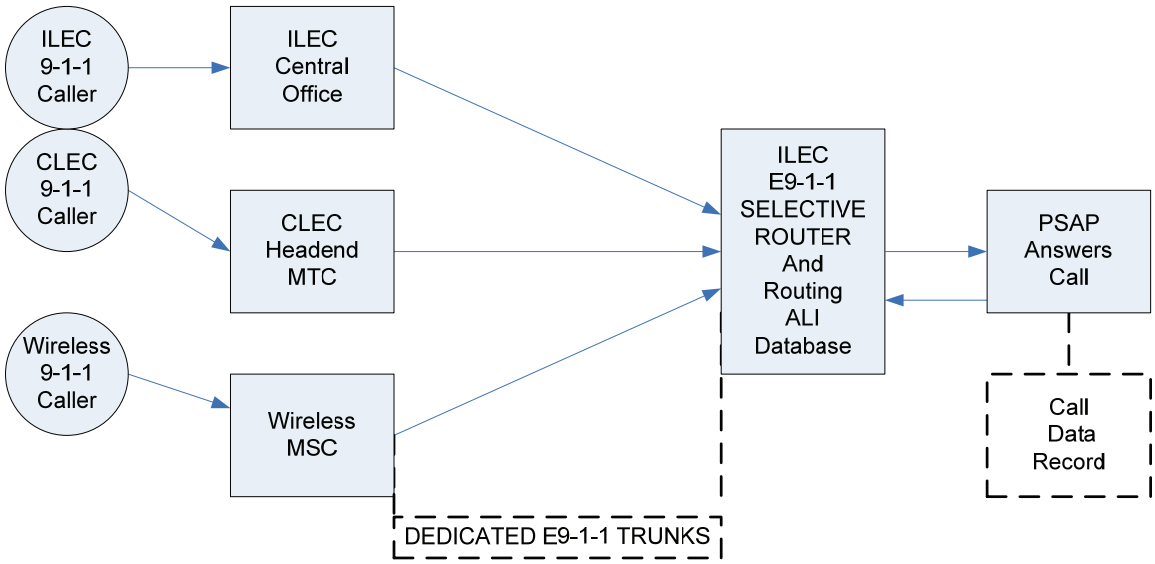
There remains the issue of capacity to meet demands on the network during an emergency. This is addressed in Chapter VI, where Staff review network congestion issues and in Chapter VII, where Staff review the deployment of temporary capacity to mitigate service outages during the response and restoration effort.

5.4 The E9-1-1 Network

Callers dialing 9-1-1 will have their calls switched at the local switch to a separate one-way network dedicated to routing and delivering 9-1-1 calls to the PSAP with jurisdiction for the caller's location. The Enhanced or E9-1-1 network means that the caller name, call back number and location are delivered along with the voice call to the PSAP. Thus, E9-1-1 is used when referring to the network, and 9-1-1 when referring to the call. A generalized overview of the E9-1-1 network is provided in Figure 5-5.

Figure 5-5

DEDICATED E9-1-1 NETWORKS



Once a 9-1-1 call reaches the local switch (ILEC CO, CLEC headend or wireless MSC), the call is switched to a dedicated E9-1-1 trunk, which connects to the ILEC selective router for that area. The selective router will then dip into the Automatic Number Identification/ Automatic Location Identification (ANI/ALI) routing database and retrieve the Emergency Services Number code for the caller's telephone number, which is used to route the call to the appropriate PSAP. Once the call is answered by the PSAP, the network will query the database and deliver the caller's location information to the call taker. Each carrier is required to provision E9-1-1 trunks from its switch to the selective router, and the ILEC E9-1-1 service provider is required to provision the E9-1-1 trunks to and from the PSAP.

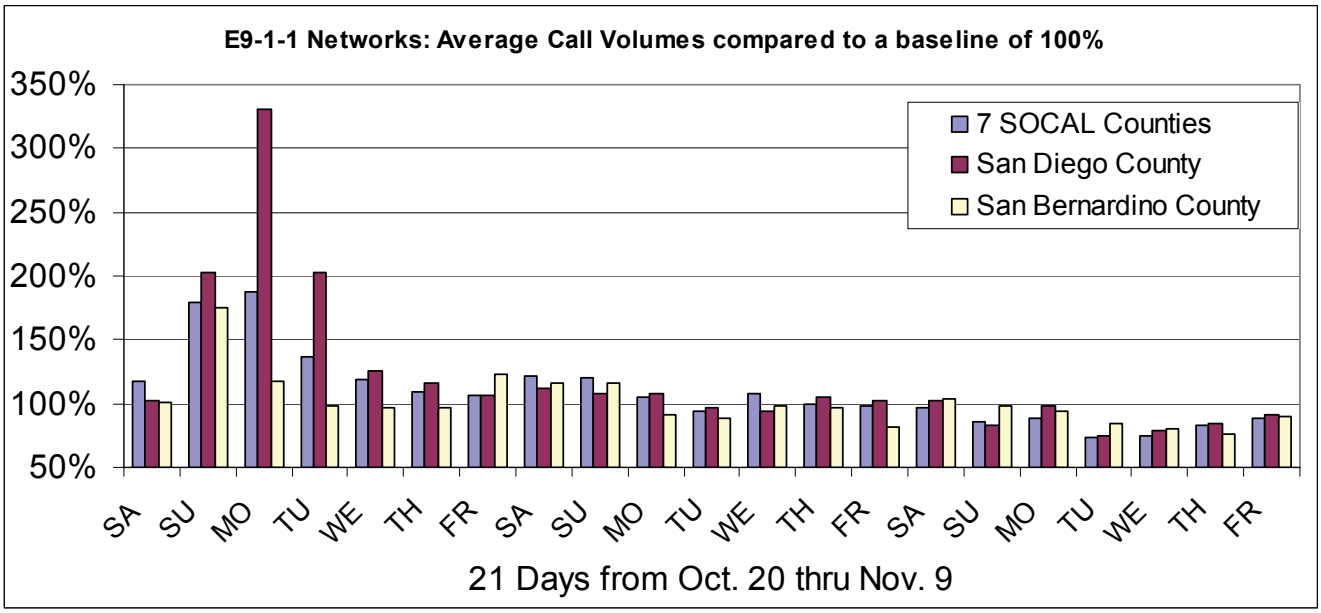
The approach used to measure the E9-1-1 network is similar to the methodology used for measuring the commercial network. CD requested call traffic data on each carrier's dedicated E9-1-1 trunks to the selective router, as shown in Figure 5-6. The wireline carriers were generally able to provide the 9-1-1 data requested, but some wireless carriers reported that they erased their 9-1-1 switch data after 30 days and so could not provide the data.

Staff employed another data source to provide insight on the 9-1-1 calls generated during the Firestorm. The ILEC 9-1-1 service providers collect detailed statistics for 9-1-1 calls that are completed and answered by PSAPs. That data source is the Call Data Record (CDR) database which has call volumes by the type of call: wireless, residential, business, payphone, etc. In cooperation with the California 9-1-1 Emergency Communications Office, the ILEC E9-1-1 service providers supplied the CDR data by county for the seven-county Southern California region.

5.4.1 Firestorm Impacts on the E9-1-1 Network

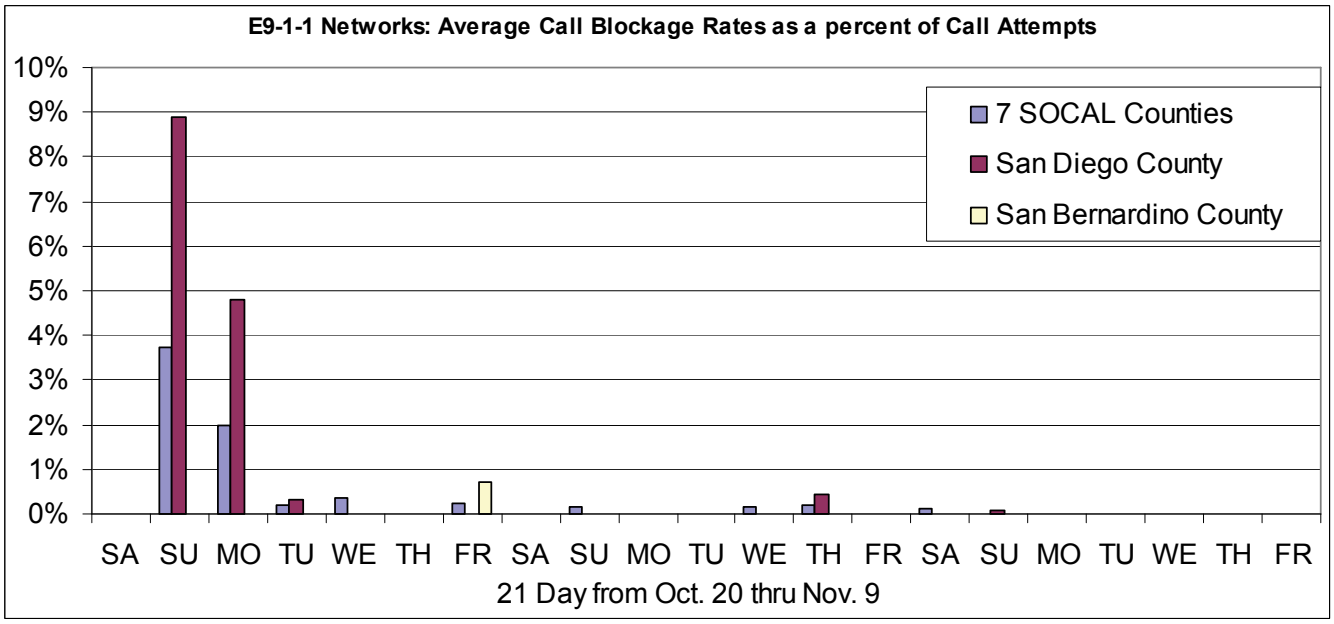
E9-1-1 network impacts were comparable to those observed on commercial networks. 9-1-1 call volumes on dedicated trunks operated by carriers spiked on Sunday, October 21, at 176% of baseline for San Bernardino County, and on Monday, October 22, at 187% and 331% for the seven-county region and San Diego County, respectively. It was not until Sunday, November 4, that 9-1-1call volumes in most areas returned to levels at or below the baseline, as shown in Figure 5-6 below.

Figure 5-6



These dedicated 9-1-1 trunks also experienced congestion during the Firestorm, although this congestion was short-lived. Blocked call rates spiked on Sunday, October 21, at 3.7% for the seven-county region and 8.9% for San Diego County. Call blockage rates returned to the baseline average of less than 0.1% by Tuesday, October 23. The only day when any 9-1-1 calls were blocked in San Bernardino County was Friday, October 26, when 0.7% of calls were blocked. This data is shown in Figure 5-7.

Figure 5-7

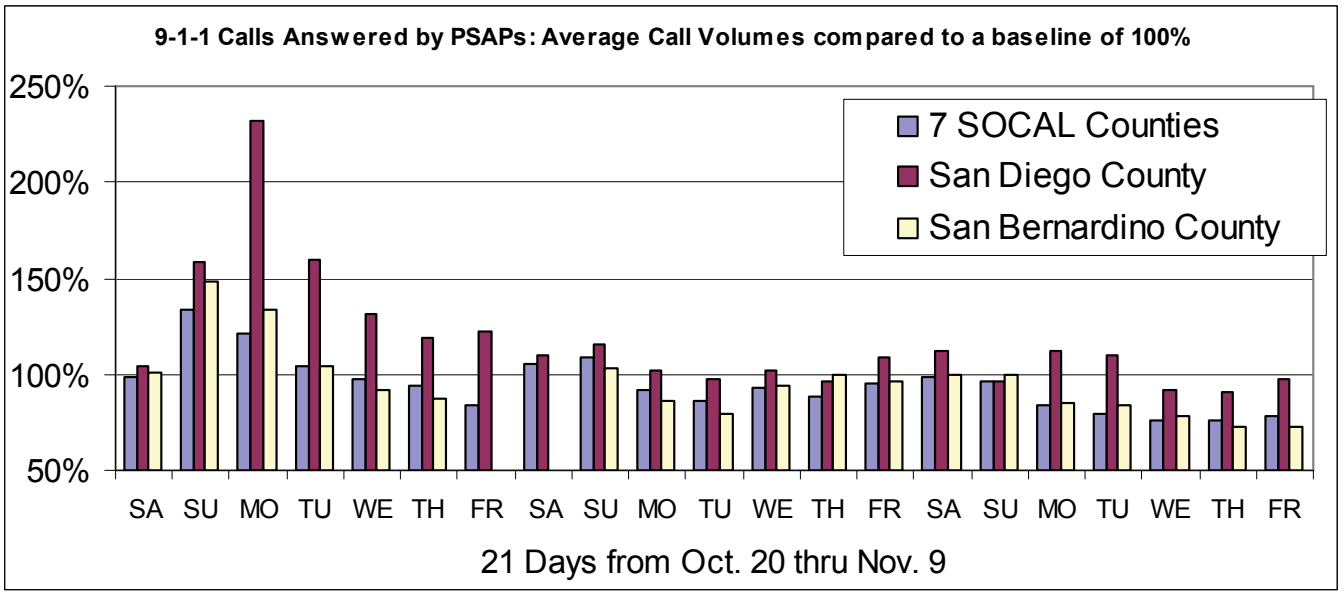


5.4.2 9-1-1 Calls Answered by PSAPs

9-1-1 calls that were not blocked on carriers' trunks but instead were answered by PSAPs are shown in Figure 5-8. Those calls spiked on Sunday, October 21, at rates of 133% and 147% for the seven-county region and San Bernardino County, respectively. San Diego County experienced a spike of 231% on October 22. Although call volumes for the entire region and for San Bernardino County appear to have returned to normal or below-normal levels by Monday, October 29, calls in San Diego County remained

elevated for an additional nine days and did not seem to return to normal levels until Wednesday, November 7.

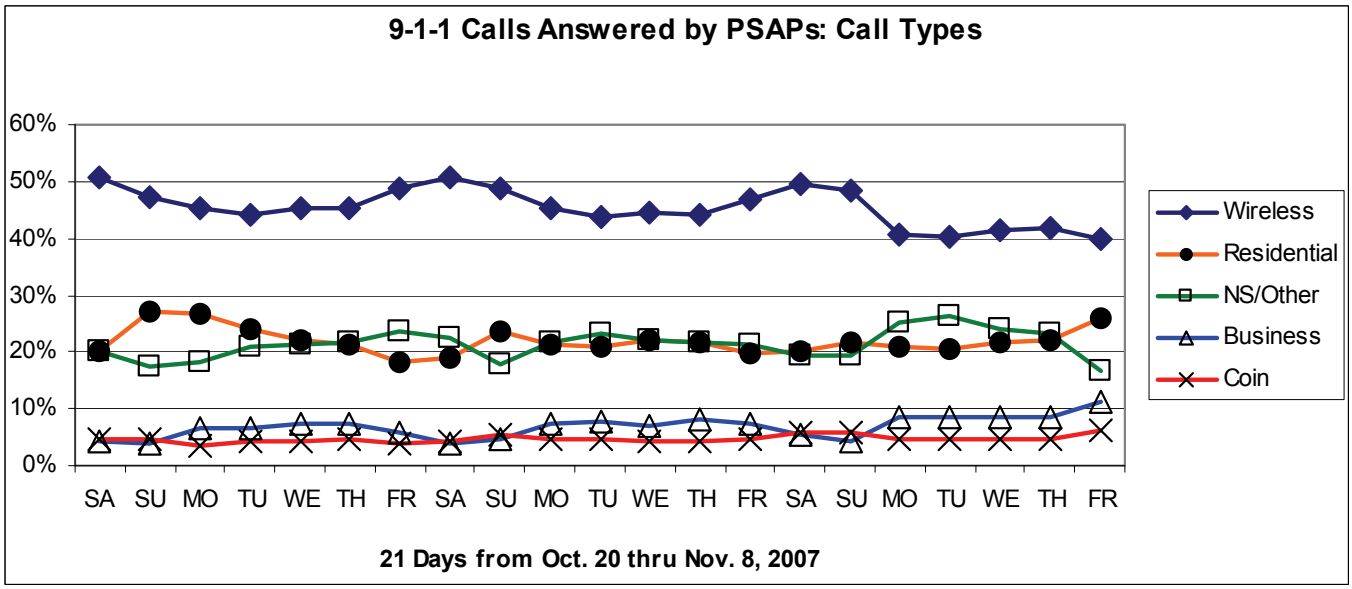
Figure 5-8



5.4.3 Wireless 9-1-1 Calls

9-1-1 calls answered by PSAPs by type are shown in Figure 5-9. Wireless calls accounted for 40% to 50% of all 9-1-1 calls answered in the seven-county region. Residential wireline calls were the second largest category of 9-1-1 calls, ranging from 18% to 27% during the period. 9-1-1 calls from business represented 4% to 11% of calls, while coin calls (payphones) averaged 4% to 6% of all 9-1-1 calls answered by PSAPs. Non-specified (NS) and other types of calls accounted for 17% to 26% of calls answered by PSAPs during the Firestorm period. Non-Specified calls are those call records where the call type was not recorded.

Figure 5-9



The types of 9-1-1 calls generated during for the Firestorm were similar to the pattern seen for the State as a whole. Of the 23.3 million 9-1-1 calls placed in California during 2007, 50% were wireless[43].

5.5 Network Performance at the Local Exchange Level

Staff's original methodology called for conducting separate case studies of the Witch Fire and Slide/Grass Valley Fires through a detailed examination of traffic statistics for the local exchanges in those fire zones.

However, most carriers reported that providing data at that detail would prove burdensome as they did not normally record traffic by local exchange. Only the ILECs delivered data for the requested local exchanges. CD analysis of the ILEC data showed comparable spikes in call traffic and blocked calls as seen at the summary county level. Due to these findings, Staff decided not to report the detailed local exchange findings since they would not reveal any new information.

5.6 Findings and Conclusions

- Local fire impacts will spill over into adjacent areas and affect competitors as displaced customers roam on neighboring networks and call demand is shifted to evacuation centers -- proving that telecommunication networks should be viewed holistically as one network and not as separate wireline and wireless networks with only local and carrier-specific impacts.
- Several carriers had difficulty retrieving call traffic data for the Firestorm period, one CLEC and one wireless carrier ignored Staff's information request, and the Wireless carriers in general claimed that they were not subject to the Commission's investigative activities and reporting requirements. One wireless carrier asserted that its call traffic metrics could not be compared to or aggregated with other carriers' data because each carrier engineers and captures traffic data differently. These carrier responses and the absence of a uniform reporting standard hindered Staff's attempts to assess the reliability of the telecommunications networks.
- When measured at the county and local level, increases in call volumes and blocked call rates during the Firestorm were much higher than those reported by carriers in January 2008 at the San Diego Workshop. However, carriers claimed networks performed as designed.
- Network accessibility was more limited and network congestion was greater when call traffic is examined by the hour and at the local level. No carrier analysis was performed to explain the unusual and random distribution of spikes in the number of attempted calls observed on some trunks, which resulted in a large percentage of blocked calls. Carriers were not able to identify the specific causes of these occurrences.
- E9-1-1 network impacts were comparable to those observed on commercial networks.

- Wireless 9-1-1 calls accounted for 40 to 50 percent of all 9-1-1 calls answered by PSAPs during the event, reaffirming the critical importance of wireless networks to emergency telecommunications.

5.7 Recommendations

- Whenever the Governor declares a State of Emergency, the Commission should require each wireline and wireless carrier to collect and report on its hourly call volumes or minutes-of-use and attempted, incomplete and blocked call rates, for the time period and in the counties covered by the Governor's declaration. The required data shall be reported separately for commercial and 9-1-1 traffic and by switch or trunk group, and the report should include the carrier's analysis, comparison to baseline traffic levels, and conclusions.

[43] California Wireless E9-1-1 Statewide Deployments, February 2008, California 9-1-1 Emergency Communications Office.

CHAPTER VI: NETWORK CONGESTION ISSUES DURING EMERGENCIES

Introduction

The fact that telecommunication networks become congested during disasters and emergencies has been well documented. A widely known example prior to the Firestorm was the I-35W Mississippi River bridge failure in Minneapolis which occurred on August 1, 2007, when mobile phone users reported that they were unable to call 9-1-1 or place calls to alert loved ones as to their status or whereabouts. Similarly, much of the increased call demand during the Firestorm was due to callers trying to contact family and friends to determine their safety or location, or to report the impending approach of fires in their neighborhoods.

Each natural disaster and emergency is unique, and the cause, extent, and duration of network congestion vary by event. For example, Staff analysis in this chapter will show that a factor contributing to network congestion during the Firestorm was the use of wireline mass notification systems[44]. The Firestorm impacts were longer than that of the Mississippi River bridge failure, but shorter than impacts historically caused by hurricanes, floods and ice storms. However, these examples share a single underlying factor: call demand exceeding the engineered capacity of the affected network.

6.1 The 'Busy Hour' Standard for Commercial Networks

Networks get congested during emergencies because carriers engineer their networks to meet 'normal' busy hour demand. Wireline and wireless carriers use call traffic studies to measure demand levels during the busiest hours, and then configure capacity to meet that demand plus some reserve capacity. This combined capacity varies by carrier and reflects its commercial and marketing goals. When high call volumes threaten to overload switches, call blocking is instituted pursuant to each carrier's network management protocols. These protocols are reported to vary widely among carriers.

The problem with engineering to the busy hour standard is that emergencies often generate five to ten times more call traffic than normal. Canadian wireless service provider TELUS reported that the 2006 shootings at Dawson College in Montreal led to eleven times the amount of normal cell phone traffic.[45] During the 2007 Virginia Tech Shootings, Verizon Wireless reported that traffic levels reached four times normal and T-Mobile measured a ten-fold increase in traffic.[46] This type of spike in call demand was also seen during the Firestorm as described in Chapter V. In some of the fire-threatened evacuation areas, call demand exceeded eighteen times baseline levels during certain hours.

6.2 Carrier Congestion Management During the Firestorm

Carriers cannot engineer their networks to meet all call demand during emergencies due to the simple fact that there is no way to predict when an emergency will occur, what will be the cause, how much demand will

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[44] See section 6.4 Public Concern About Mass Notification Calls, for carrier comments that mass notification systems can have negative impacts on telecommunications networks.

[45] Thomas Wailgum, "Minneapolis Bridge Collapse: Why Cellular Service Goes Down During Disasters," CIO, August 03, 2007.

[46] Wayne Rash, "Wireless Problems Played Part in Chaos at Virginia Tech", eWeek,, <http://www.eweek.com/c/a/Mobile-and-Wireless/Wireless-Problems-Played-Part-in-Chaos-at-Virginia-Tech/> (accessed April 4, 2007).

result, and how long it will last. However, Staff's objective in this evaluation was to achieve a better understanding of the protocols used by carriers to handle congestion and the criteria used to selectively block calls. Accordingly, Staff requested ILECs describe the load control methods they used to manage network congestion during the Firestorm. Specifically Staff asked whether carriers reconfigured trunks to favor outbound calls over inbound calls, reduced the audio quality of calls, or restricted calls from distant areas to minimize overload on the network.

The ILECs initially reported that they did not employ such load control actions since they characterized them as more appropriate for massive events affecting very large areas for long periods of time. Verizon characterized the Firestorm not as a single event, but as highly localized and short-lived events meriting different levels of response handled by 'standard network management'. AT&T's response was that "*Blocking was a result of the normal traffic engineered for the trunk group plus the increased load generated by callers responding to the event and also calls generated by the notification vendors*".[47]

However, AT&T subsequently reported that it did restrict inward bound calls on October 22, for peak periods averaging one to two hours each, on trunks from the San Diego Tandem to some of the local exchanges. The carrier referred to these actions as "standard network management" as opposed to "load control".

These responses indicate that although there is a high degree of sophistication there also exists ambiguity as to what is meant by "standard network management." As a result of Staff's concerns about this ambiguity, AT&T invited Staff to meet with its Network Control Center personnel to explain the specific concepts and tools that AT&T used to ramp down traffic in areas that were suffering from congestion. As a result of this meeting, Staff achieved a better understanding of the systems, processes and tools used by AT&T to manage its network during the Firestorm.

6.3 Impact of Mass Notification Calls on the Networks

What makes the Firestorm unique as an emergency telecommunications event is the unprecedented high volume of geo-targeted notification calls. The San Diego County Sheriff's Department issued evacuation orders for an estimated 515,000 County residents through the use of the County's two mass notification systems.[48] One of the County's vendors, TFCC, reported that it sent over 200,000 evacuation messages on October 22 alone[49]. On that same day, The NTI Group -- the notification vendor for schools and universities in the County -- reported that it sent out an additional 1.3 million automated calls in San Diego County[50] Based on these reports, notification vendors generated at least 1.5 million notification calls in San Diego County on October 22 alone.

To better understand the impact of these calls on the local networks, Staff asked the ILECs to describe how they worked with the notification vendors and what data they had on the number of emergency notification calls during the event. Because some notification vendors originated calls from out-of-state locations, Staff was also interested in the routing used to deliver calls to the local exchanges, whether the ILECs gave preference to these calls, and how those calls were impacted by blocking.

AT&T and Verizon reported that they did not have data on mass notification calls during the Firestorm. Nor did the carriers have in place any pre-established plan or procedure with any public safety agency or notification vendor in regards to these mass notification calls. Neither carrier was informed by any public

[47] Email from AT&T California dated April 14, 2008.
[48] "2007 San Diego County Firestorm After Action Report", page 5.
[49] Email correspondence from Ellen Grevey on December 14, 2007.
[50] Presentation of NTI Group at San Diego Workshop, January 9, 2008.

safety agency or its notification vendor that it would be generating mass warning and evacuation calls during the Firestorm. Nor did any local entity or notification vendor submit a written application to the ILEC pursuant to California Public Utilities Code § 2875, prior to implementing its telephone notification system.

We conclude that the network congestion and call blocking observed during the Firestorm was exacerbated by the very high volume of notification calling combined with the lack of coordination between the entities generating the notification calls and the carriers that manage the networks. Unfortunately, because the ILECs did not collect data on these notification calls, Staff cannot definitively measure their impact on the networks.

6.4 Public Concern About Mass Notification Calls

Although the ILECs did not collect actual data on mass notification call flows during the event, both carriers had publicly warned of the potential negative impacts of emergency notification systems in comments submitted in Commission Rulemaking 07-04-015. Verizon's comments seem particularly prescient:

> When a carrier does not expect a mass notification or the mass notification is not programmed in a way to avoid system congestion, the carrier is forced to block calls to prevent switch overload and a potential widespread outage. The Commission should take note of this problem, because if a carrier is forced to block calls in order to address an unexpected massive spike in traffic, some truly critical calls like an AMBER Alert or a homeland security related call may not reach the entire intended audience for the first time.[51]

In addition, the California 9-1-1 Emergency Communications Office[52] (911 Program Office) wrote a letter to Staff during this investigation, stating that it is concerned about the potential impacts on the 9-1-1 network during mass emergency notifications:

> We are concerned that network congestion in the PSTN (Public Switched Telephone Network) may not only delay delivery of the emergency notification, but may block individuals attempting to access the California 9-1-1 Network for emergency assistance.[53]

To address these serious concerns, Staff expanded its analysis to examine factors that can affect the public's ability to access 9-1-1 services.

6.5 Access to 9-1-1 During the Firestorm

Although the E9-1-1 Network is separate from the PSTN, access to it is provided through the PSTN for landline and wireless calls. As shown previously in Figure 5-5, when a caller dials 9-1-1, the call is sent to the caller's serving end office or local switch, just as any originating call would be. Generally, § 2883 of the Public Utilities Code requires wireline carriers to provide 9-1-1 access to residences if existing technology and facilities and a telephone connection are in place, even if service has been disconnected. Access to 9-1-1 over a disconnected service is usually referred to as 'warm line service.'

However, in cases of central office overload, regular callers will not have dial tone or access to 9-1-1. Central office overload occurred during the 1989 Loma Prieta Earthquake when an influx of local calls resulted in a

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[51] Supplemental Response to Workshop Data Requests of Verizon California Inc. (U 1002 C) and its Certificated California Affiliates, June 12, 2007.
[52] The California Department of General Services, Telecommunications Division, California 9-1-1 Emergency Communications Office.
[53] These comments are provided in their entirety in Appendix 6-A.

loss of dial tone for varying periods of time. On wireless networks, the comparable condition would be a 'system busy' tone or message when local cell sites are congested.

The ILECs reported that there were no central office overloads during the Firestorm, which indicates that residents had dial tone and were able to dial 9-1-1 during the event. Verizon reported that this was not an issue for them because the Malibu and Slide/Grass Valley Fires occurred in sparsely populated mountainous regions. AT&T serves several more densely populated suburban areas, and reported that it blocked half of all inward calls during some hours to a few local exchanges when the local switch approached overload conditions. AT&T reported that it took this action of blocking some inward calls to ensure that there would be central office capacity for 9-1-1 and local calling. However, there is no assurance that other carriers have similar protocols in place to ensure switch capacity for 9-1-1 and regular local calling during emergencies.

6.6 Dial Tone Issues

If the wireline caller does not have dial tone, the ILECs advise callers to wait 10 to 15 seconds for dial tone to return. When dial tone returns and upon dialing 9-1-1, the central office will immediately switch the call to the dedicated 9-1-1 trunk and route the call to the selective router. Although there are no California standards on the amount of time it takes for the 9-1-1 call to be delivered to the PSAP, the 9-1-1 program office believes that calls are delivered within 5 seconds.[54]

Wireless callers are also advised to wait 10 seconds before redialing a call, according to the FCC Public Safety and Homeland Security Bureau's *Tips for Communicating in an Emergency.*

> On many wireless handsets, to re-dial a number, you simply push "send" after you've ended a call to redial the previous number. If you do this too quickly, the data from the handset to the cell sites do not have enough time to clear before you've resent the same data. This contributes to a clogged network.[55]

However, because many callers do not understand that dial tone may take as long as 15 seconds to return, there remains a great deal of public concern about the ability to make calls during emergencies. It is common practice for distressed callers to repeatedly hang-up and re-dial. Fortunately, the Commission will consider a consumer education program on 'Preparing for Emergencies' in its investigation in Phase II of CPUC Proceeding R.07-04-015[56]. Such a program through the Commission website CalPhoneInfo.com and through carrier telephone directories and billing inserts will help educate customers on the limitations of the telecommunications networks, and alternative methods for communicating during emergencies

6.6.1 Priority Dial Tone Service

Essential Service is a priority dial tone service that AT&T voluntarily provides only during periods of central office overload. This is not to be confused with the federal telecommunication priority services for call queuing and provisioning called TSP and described in Chapter IV.

Essential Service is a preferential dial tone feature in the local switch that is automatically activated when the switch is experiencing central office overload. Certain phones for eligible customers like doctors and senior public safety officers will have an Essential Service indicator at the local switch. During the Loma Prieta

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[54] However, if the local switch or remote terminal is out of power or the local loop to the central office has been severed, then dial tone will not return and there are no solutions available. "NENA Technical Information Document on Network Quality Assurance", TID03-501.

[55] "Tips for Communicating in an Emergency", Federal Communications Commission, <http://www.fcc.gov/pshs/emergency-information/tips.html> (accessed February 18, 2008).

[56] Order Instituting Rulemaking on the Commission's Own Motion into Reliability Standards for Telecommunications Emergency Backup Power Systems and Emergency Notification Systems pursuant to Assembly Bill 2393 (R.07-04-015).

Earthquake, public payphones had this indicator and were able to provide dial tone and access to the 9-1-1 network and the PSTN.

6.7 Managing Congestion on E9-1-1 Networks

Like the commercial networks, E9-1-1 networks are also designed and staffed for busy hour standards.[57] 9-1-1 trunks are engineered to the average busy hour of the average week during the busy season, and the number of call taker positions matches this traffic level. In addition, it is understood that typical E9-1-1 traffic can have large spikes in call volume, and trunk capacity is the primary means of managing call congestion.[58]

The goal of congestion management is to avoid overloading the E9-1-1 network and call-takers with calls reporting the same incident from the same location. For example, three or more carriers serving the same community may be sending 9-1-1 calls to the selective router for switching to the PSAP responsible for that community. But the trunks from the selective router to that PSAP may already be congested with calls reporting the same event. Although callers reporting that event may have their calls blocked, the important thing is that E9-1-1 circuits and other call takers will be available to handle calls reporting other 9-1-1 events.

This approach to 9-1-1 congestion management appears to be confirmed by the Firestorm data, which shows that the increase in 9-1-1 call volumes reported by service providers on their 9-1-1 trunks was higher than the increase in calls answered by PSAPs. For example, carriers reported a 331% increase in 9-1-1 call volumes for San Diego County on October 22, but only a 231% increase in calls answered by PSAPs.

6.7.1 Where Congestion Occurs on E9-1-1 Networks

Although carriers take actions to ensure that callers can dial 9-1-1, these emergency calls can experience network congestion and blocking at multiple points in the call path. As described previously, the call can be blocked on the E9-1-1 trunks operated by each carrier to the ILEC selective router, or on the trunks from the selective router to the PSAP. Finally, the call can reach the PSAP but not be answered. For example, the California 9-1-1 program office estimates that 42% of all wireless 9-1-1 calls in California went unanswered during 2007.[59] These wireless 9-1-1 calls were directed to California Highway Patrol communication centers.[60]

CD asked the ILEC 9-1-1 service providers for data on the number of calls that were blocked on the E9-1-1 trunks from the selective router to the PSAPs in the Firestorm counties. The service providers have data on the total number of 9-1-1 calls that reach the selective router because the 9-1-1 program office pays a per call rate each time the selective router dips into the ANI database to route a 9-1-1 call.

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[57] "NENA Technical Information Document on E9-1-1 Voice Circuit Requirements", TID 03-506.
[58] "NENA Standards for E9-1-1 Call Congestion Management", NENA-03-006, page 10.
[59] California Wireless E9-1-1 Statewide Deployments, February 2008, California 9-1-1 Emergency Communications Office.
[60] In its 2007 Report to the Legislature on An Analysis of Gaps in Statewide 9-1-1 Service, the California 9-1-1 Emergency Communications Office explained that wireless 9-1-1 calls exhibit a very different pattern than calls from wireline phones. For example, on a freeway during peak commute time, hundreds of drivers can witness an accident or its aftermath, over the course of 30 minutes. As "Good Samaritans", each of these drivers (or a passenger) may dial 9-1-1 from their wireless device to report the same incident. Within minutes, hundreds of calls can flood a PSAP to report an incident that under different conditions may generate only one or a few calls. By comparison, calls from wireline phones usually are from individuals at a residence or business who are personally involved in an incident or witnessed an incident that required emergency response. Because there is no public audience or witness, calls do not flood the 9-1-1 center.

However, because tariff rates for the 9-1-1 trunks from the selective router to PSAPs are set at a fixed amount per month, metering is not performed and there is no traffic data by call destination. As a result, the only data on 9-1-1 call blocking in the Fire zones are from the 9-1-1 trunks to the selective router, which was reported in Chapter V.

In summary, some 9-1-1 calls were incomplete due to congestion on some of the dedicated trunks, and some 9-1-1 calls were unanswered due to a flood of calls to the 9-1-1 call centers. Fortunately, E9-1-1 networks are designed to prevent overloading 9-1-1 call takers with calls reporting the same incident from the same location, as described above.

6.8 The Need for Carrier Cooperation on Network Management Issues

Carriers did not identify the high volume of notification calls on their networks during the Firestorm, and therefore did not perform a post-event analysis to identify sources, originations, routings and the extent to which these calls were blocked. This lack of carrier analysis limited Staff's ability to identify problem areas and issues that the Commission may have authority over and is able to address.

As discussed previously, there is ambiguity as to how carriers manage their networks during emergencies. In many carrier responses to CD information requests, Staff found carriers highly reluctant to provide details as to the Firestorm impacts on their networks, how they dealt with the traffic surges, and the protocols used to block calls. The carriers were quick to raise objections that this information is highly confidential, proprietary and competitively sensitive.

The wireless carriers in particular object on the grounds that this information is outside of the Commission's jurisdiction. It is crucial, however, to comprehend how wireless networks are managed, given the increasing use and outright substitution of wireless services for wireline phones. Additionally, as Commissioner Simon said at the San Diego Workshop, *"…the commercial wireless network provides services to the public as well as many emergency workers. We will learn how this network functioned in the emergency and seek to determine why."*

AT&T provides a good example of the cooperation that the Commission should expect from all of California's telecommunications carriers. As discussed, AT&T arranged a meeting between Staff and its network management personnel in order to explain what it does through 'standard network management'. As a result of this meeting, Staff achieved a better understanding of the systems, processes and tools used by AT&T to manage its network and ensure that dial tone was available for 9-1-1 and local calling. We would like other carriers to be as cooperative and assist the Commission in exercising its responsibility to assess the reliability of the public telecommunications network during emergencies.

6.9 FCC Summit on Network Surges During Emergencies

The FCC's Public Safety and Homeland Security Bureau recently convened a public meeting to address issues of network congestion during short-term emergencies.[61] Speakers included representatives from the FCC, local government, the deaf and hard-of-hearing community, and wireless carriers. The meeting focused on how cell phone networks perform during emergencies, and methods that carriers may be able use to increase call capacity during short-term emergencies.

In the opening remarks, the FCC identified some steps for quickly adding more efficiency and capacity to the network. These included:

[61] "Communications Network Surge Management in Emergencies Summit", Washington DC, September 25, 2007, <http://www.fcc.gov/pshs/summits/>.

- recognizing that there is an emergency and reacting accordingly
- remote adjustments to software to adjust call quality
- adding cards and radios to cell sites
- reorienting antennas to balance the load and improve capacity

These actions were characterized as being a 'build more inventory job' as opposed to an engineering job that would take hours or days to complete.

The FCC also identified some long-term developments that may help increase the ability of networks to handle more capacity during short-term emergencies. These developments include 'NGEN IP packet-based technologies that offer potential to build in more slack into the system', and G-3 and G-4 wireless technologies that may permit the temporary reallocation of broadband capacity to voice traffic. These solutions offer great promise in alleviating network congestion during emergencies.

6.10 Findings and Conclusions

- Telecommunications networks become congested during mass disasters and national emergencies because call demand can far exceed the 'normal' busy hour demand that networks are engineered for. For example, wireless carriers reported four to eleven times normal traffic levels during and after the shootings at Montreal's Dawson College and Virginia Tech.
- Based on their reports, notification vendors generated at least 1.5 million notification calls in San Diego County on October 22 alone.
- ILECs did not have in place any pre-established plan nor procedure with any public safety agency or its notification vendor, and no local entity or notification vendor submitted a written application with the ILECs pursuant to Public Utilities Code § 2875, prior to implementing its telephone notification system.
- The network congestion and call blocking observed during the Firestorm was exacerbated by the very high volume of notification calling combined with the lack of coordination between the entities generating the notification calls and the carriers that manage the networks. Unfortunately, because the ILECs did not collect data on these notification calls, Staff cannot definitively measure their impact on the networks.
- ILECs reported that there was no central office overload during the Firestorm, which indicates that residents had dial tone and were able to dial 9-1-1 and make regular local calls. However, this was accomplished only when AT&T California implemented network management controls to prevent central office overload by blocking fifty percent of inward calls to some local exchanges. There is no assurance that other carriers have similar protocols in place to ensure switch capacity for 9-1-1 and local calling during emergencies.
- Although there remains a great deal of public concern about the ability to make calls during these emergencies, the consumer education program included in Phase II of CPUC Backup Power Proceeding R.07-04-015[62] will help educate customers on the limitations of the telecommunications networks, and alternative methods for communicating during emergencies.
- The E9-1-1 network is designed and staffed for busy hour standards. During the Firestorm, some 9-1-1 calls were incomplete due to congestion on some of the dedicated trunks, and some 9-1-1 calls went unanswered due to a flood of calls to the 9-1-1 call centers. Fortunately, E9-1-1 networks are designed to prevent overloading 9-1-1 call takers with calls reporting the same incident from the same location.

[62] Order Instituting Rulemaking on the Commission's Own Motion into Reliability Standards for Telecommunications Emergency Backup Power Systems and Emergency Notification Systems pursuant to Assembly Bill 2393 (R.07-04-015).

- The 2007 FCC Summit on 'Network Surges during Emergencies'[63] identified software and inventory adjusting measures that carriers may be able to use to rapidly increase wireless capacity during short-term emergencies, compared to the hours or days usually needed to deploy engineering solutions.

6.11 Recommendations

- The Commission should require carriers to inform and educate local entities and notification vendors about the Public Utilities Code §2875 requirement to file written applications with local carriers prior to implementing emergency telephone notification systems, and report back to the Commission on their efforts and results.
- The Commission should require wireline and wireless carriers to review the protocols they use to ensure that local switches are not overloaded and that residents have the dial tone to dial 9-1-1, and report back to the Commission on their findings.
- The Commission should require wireless carriers to report once on their protocols for deploying software-based and inventory adjusting increases in network capacity during short-term emergencies.

[63] "Communications Network Surge Management in Emergencies Summit", Washington DC, September 25, 2007, <http://www.fcc.gov/pshs/summits/>.

CHAPTER VII: CARRIER RESPONSE AND RESTORATION EFFORTS

Introduction

As reported by the carriers at the January 2008 San Diego Workshop, network damage and destruction during the Firestorm was limited to outside distribution facilities, which included aerial and underground fiber and copper wire, poles and other support structures, remote terminals and switches, cell towers, and cell site equipment. Service outages were due to direct damage and destruction, to loss of power when backup power and batteries became depleted, and indirectly to loss of connectivity to the network caused by destruction of T1 and other landlines. Carrier response and restoration efforts addressed service outages through the repair and replacement of damaged facilities, the provisioning of temporary network capacity, and the establishment of customer assistance and other mitigation efforts.

7.1 Restoration Efforts

Based on the information presented at the San Diego Workshop, the carriers utilized their experience from the 2003 Firestorm and other national disasters to refine their emergency preparedness processes and procedures. Carrier responses concentrated on marshalling personnel and resources for repairing and replacing damaged and destroyed facilities. Restoration efforts focused on providing temporary power and temporary network capacity in areas of service outage.

7.1.1 Temporary (Backup) Power

Temporary power solutions included deploying batteries and portable generators at cell sites and other transmission facilities. A problem common to many disasters and not unique to the 2007 Firestorm involved safety issues related to the delivery of fuel for replenishing fixed and portable generators. Carriers worked closely with first responders to ascertain whether conditions permitted safe access to burn areas for delivery of fuel to cells sites and other facilities. There were several examples reported at the San Diego Workshop where fire crews were needed to escort the fuel truck to the cell site for the safety of the telecommunications workers.

7.1.2 Temporary Network Capacity

Temporary network capacity was provided by the deployment of Cell on Wheels (COW) and Cell on Light Trucks (COLT). The COWs and COLTs are essentially self-contained cellular sites, complete with portable antenna, transceivers, switches, rectifiers and base station controllers. These units can offer wireless functionality as long as a functional T1 line is available to provide connectivity with the main network switches. Carriers provided COWs and COLTs at many evacuation centers throughout the seven-county region, and at some temporary public safety incident command centers.[64]

The pre-staging of COWs, COLTs, satellite fly-away kits, mobile generators, and spare T1 lines was a necessary and critical element in the timely restoration of network service. Some carriers also reported bringing in equipment from neighboring states. When direct landline connectivity to the network could not be achieved, carriers deployed portable terrestrial microwave transport links and/or satellite backhaul T1

[64] For example, Verizon Wireless had installed a COLT at the Orange County command center and one at the Santa Clarita command center to increase cellular network capacity, Verizon News Release, October 24, 2007.

hubbing to support multiple cell sites. Carriers also added capacity by installing temporary mobile towers and cell sector faces, reconfiguring existing cell sites, and upgrading capacity at nearby network sites.

The use of stadiums as evacuation sites provided critical network capacity, as those locations were already equipped to handle large call loads. Carriers established customer service assistance centers at these locations, and encouraged customers to go there for additional services as described below.

7.2 Best Practices

Best practices in emergency response and restoration begins with preparedness.
Carriers at the Workshop were asked several relevant questions:

1. What best practices did you use to get your facilities restored?
2. How successful were communication efforts with local authorities in getting access to repair facilities?
3. What efforts were made to protect your employees from fire and unsafe conditions?

The individual carriers' responses are summarized in Appendix 7-A, but preparedness is the common thread. The best practices included proactive network monitoring, formalized plans and protocols on management functions and decision-making paths, mutual aid agreements and Memorandums of Understanding, and pre-established relationships with public safety and emergency management personnel. Carriers also stressed the importance of strategically placed inventories and staging areas for restoration equipment and emergency spares, credentialing for pre-screened critical employees, and regularly scheduled exercises and review sessions. Finally, redundant transport paths such as multiple cell sites with overlapping coverage in key areas were also emphasized as a best practice. Carriers appear to have been very effective in their execution of these best practices in response and restoration efforts.

7.3 Customer Assistance and Other Mitigation Efforts

For community assistance and displaced customers, carriers established assistance centers at evacuation centers and some retail locations. These included telephone banks for free local and long distance calling, high-speed internet stations, battery charging for wireless devices, and free calling cards. For displaced customers, some carriers offered free voicemail and call forwarding, and waived connection fees for temporary replacement service. Other carriers offered free cell phones and reduced prices on batteries, wall chargers and access cards. Carriers are permitted under Commission rules to offer free services to residents in disaster areas during times of emergency.[65] A listing of these efforts is provided in Appendix 7-B.

7.4 The Deerhorn Valley Restoration Effort

Deerhorn Valley is a rural area along Deerhorn Valley Road in Jamul, an unincorporated community in eastern San Diego County. The Jamul census-designated place has a population of 5920 as of the 2000 census.[66] This area of San Diego County was the location of the Harris Fire which in total covered 90,440 acres and destroyed 211 residences and 4 commercial structures. This location was cited by OES at the Workshop as being a very unusual case of an emergency management agency's provisioning local phone service for an extended period of time.

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[65] General Order 96-B, Rule 8.2.3 permits telephone corporations to provide service to a government agency or to the public for free, or at reduced rates and charges, or under conditions otherwise deviating from its tariffs then in effect. The utility may begin such service without Commission approval, but must promptly submit an advice letter detailing the provision of the emergency service.

[66] <http://en.wikipedia.org/wiki/Jamul>, (accessed June 16, 2008).

The OES Southern Region arranged for four OES portable satellite-based communication units – three Operational Area Satellite Information System (OASIS) trailers and one California National Guard Interoperability Communications Radio Unit -- to be deployed there to provide phone service so local residents could make 9-1-1 and medical-related calls. These units were linked to the OES headquarters at Mather, California. Because local phone service was not completely restored until early December, this caused considerable difficulty for OES as half of the State's fleet of emergency OASIS units was committed to a role that was supposed to be temporary. Furthermore, OES trailers are manned by volunteers during emergencies, and deploying 6 weeks beyond the date when fires were contained caused extremely difficult staffing problems.

In reviewing this experience, the OES manager asked the Commission to address the need for better coordination and information sharing among the utilities. He stated that the high level of competition in the telecommunications industry made individual carriers highly reluctant to share information about their networks and service restoration strategies with competitors. He suggested that had all the parties – OES, San Diego County, SDG&E, wireline, and wireless carriers -- met immediately after the fire was contained, they could have developed a survey team to assess the damage and crafted a joint restoration plan. A joint restoration plan would have identified roles, responsibilities and timetables for the rapid replacement of the State's emergency communications units with private sector COLTS, COWS and other network assets.

AT&T is the carrier of last resort[67] in this part of San Diego County, and as such has the primary responsibility to restore wireline service. In response to Staff's enquiry, AT&T identified several factors affecting its ability to restore service in a timely manner. It reported that the majority of the aerial cable was attached to SDG&E poles, which required AT&T to wait until SDG&E was finished with their restoration work before beginning to attach communications facilities. There were also multiple properties where poles are maintained by the customer/property owner, which delayed the effort. Although AT&T reported that it deployed a COW and microwave unit to provide temporary service at a nearby evacuation center, it proved to be insufficient to allow release of the OES communications units.

As the carrier of last resort, AT&T must assure that wireline service is restored in a timely manner, and is responsible for notifying the Commission if there are significant circumstances impeding the restoration of service. Because AT&T did not provide enough temporary communication units to release the OES communication units, AT&T should have notified the Commission of the delayed restoration, and of the need for a joint restoration effort requiring mutual-aid assistance from telecommunications competitors.

7.5 Mutual-Aid and Cooperation Agreements

The Deerhorn Valley restoration effort proved that there are situations where telecommunications carriers will need to share information and work together as an industry in responding to a wide-spread disaster like the Firestorm. Formalized mutual-aid agreements in which competitors confidentially exchange information with one another on the resources that can be shared was identified as one of the best practices at the San Diego Workshop. As one panelist declared,

> It is important for us to know what we have ahead of time so we don't run into the situation where on the fly we are deciding whether the government needs resources from the private sector or private sector needs resource from government..[68]

[67] A carrier of last resort is a public utility that is obligated to serve all the customers in a service area who request service. D.96-10-066 designated all ILECs as carriers of last resort.
[68] San Diego Workshop Transcript, page 195.

Competitors are naturally reluctant to share information with each other on their network strategies. However, it is in these circumstances that the Commission can play a unique role in facilitating communication and joint emergency preparedness planning among the private-sector firms that control most of California's critical telecommunications infrastructure. The Commission has a long tradition of organizing industry and public sector groups in technical workshops for purposes of crafting solutions to infrastructure reliability and public safety issues. And as NARUC noted in a recent technical report,

> State public utility commissions are uniquely situated to recognize and craft policies with respect to interdependencies among utility services, and between utility and non-utility services and functions. In this respect, state commissions can offer valuable assistance to emergency management and other state agencies.[69]

Since there is a direct relationship between telecommunication network reliability and public safety, any improvements to the coordination of emergency preparedness and restoration of the State's telecommunications infrastructure equates to increased safety for all Californians.

7.6 Findings and Conclusions

- Carriers' response and restoration efforts during the Firestorm focused on temporary power utilizing backup generators and batteries, and temporary capacity utilizing portable cellular sites, microwave and satellite links, and spare T1 lines.
- Stadiums used as evacuation sites provided critical network capacity as they were already equipped to handle very large call loads.
- Carriers' best practices emphasize preparedness in response and restoration.
- For community assistance and displaced customers, carriers established customer assistance centers offering free calling and other services.
- Although carriers generally appeared effective at restoring their individual networks, the Deerhorn Valley example revealed the need for improved performance by the carrier of last resort, in communicating its restoration plan and coordinating with government agencies and other utilities involved in the response effort, and in informing the Commission of the need for a joint restoration effort and need for mutual assistance from telecommunications competitors.

7.7 Recommendations

- The Commission should require wireline and wireless carriers to review their policies and best practices on mutual-aid agreements and joint restoration efforts, and report back on their findings. This review should document the type of situations where mutual aid and joint restoration will be implemented, and define the conditions and processes by which competitors will share information and network restoration assets. This review will help identify issues and problem areas, and determine the need for further Commission action such as organizing a technical workshop on the subject.

[69] "Technical Assistance Brief on Critical Infrastructure Protection", National Association of Regulatory Utility Commissioners, April 2005.

CHAPTER VIII: CONCLUSION

The Firestorm affected millions of California residents, with major impacts on the Southern California region's wireline and wireless telecommunications networks. While the Firestorm destroyed miles of outside distribution facilities and compelled the largest telecommunications restoration effort in California's history, it did not result in major damage to the more critical components of the telecommunications infrastructure, as is likely to happen in a major earthquake. Due to carriers' restoration efforts and limited destruction of critical infrastructure, the greater part of the Southern California population had telecommunications services available to them and the network functioned as designed throughout the majority of the Firestorm. Although most residents were able to get dial tone and most calls were completed, CD's analysis of the telecommunications network and notification data indicates that there were many instances when the network was overwhelmed and calls were not completed.

The Firestorm provided an excellent opportunity for CD to learn more about how California's telecommunications networks function under duress, and to provide the results of its findings to those that utilize the telecommunications system in times of disaster. As a result of this analysis, Staff has identified many opportunities for the State and local agencies to be better prepared for the next emergency. Although Staff offers many conclusions and recommendations in the preceding chapters, Staff considers the following issues to be of utmost importance.

As continued adoption of telephone alert and warning systems occurs, it becomes increasingly important that cities, counties, and the State are aware of their limitations. Most importantly, government agencies need to know that call capabilities and success rates of these systems may be substantially lower than those asserted by notification system vendors.

The effectiveness of current 'handshake agreements' between carriers and public safety agencies regarding priority restoration service has yet to be tested; and the lack of formal agreements will most likely prove to be inadequate in any catastrophic event such as an earthquake or flood that results in widespread damage to the telecommunications infrastructure, as well as competing demands for restoration services.

Carrier cooperation in responding to Staff's information requests is essential to public safety. Carrier refusal, reluctance or inability to provide the definitive call traffic data requested by Staff, have the potential for serious public safety consequences for the people of California.

The Commission should continue to undertake analysis of the performance of communications networks after natural disasters or other events that result in dramatic increases in the use of telecommunications services, especially in those cases in which the Governor has declared a State of Emergency. Finally, the Commission should continue its active participation in State, regional and federal efforts as they relate to emergency preparedness, critical infrastructure protection, and emergency notification.

APPENDICES

Appendix 1-A: Major Fires of the 2007 Southern California Firestorm - by ILEC, County and Local Exchange

The following table provides a summary of the major individual fires that constituted the Southern California Firestorm of 2007, including the area and structures damaged, and the ILEC and local exchange(s) that each fire impacted. (See Section 1.3)

Ref	ILEC	County	NAME	NUMBER	Start Date	Acres	Structures	Local Exchanges
1	AT&T	San Diego	Witch Fire	CA-MVU-10432	10/21/2007	197,980	1,125	Ramona Julian Warner Springs Escondido Rancho Bernardo Poway Rancho Santa Fe
2	AT&T	San Diego	Harris Fire	CA-MVU-10427	10/21/2007	90,440	211	Dulzura Campo Harrison Alpine El Cajon Chula Vista La Mesa National City
3	AT&T	San Diego	Poomacha	CA-MVU-10643	10/23/2007	49,140	138	Pauma Valley Valley Center Warner Springs
4	AT&T	San Diego	McCoy Fire	CA-CNF-2786	10/22/2007	353	1	Julian
5	AT&T	San Diego	Rice Fire	CA-MVU-10502	10/22/2007	9,000	206	Fallbrook
6	AT&T	San Diego	Ammo Fire	CA-MCP1111	10/23/2007	21,084		Oceanside/Pendleton
7	AT&T	San Diego	Coronado Hills Fire	CA-SMC-5592	10/22/2007	250		Escondido
8	AT&T	Orange	Santiago Fire	CA-ORC-68555	10/21/2007	28,400	15	Silverado Irvine Saddleback Valley Trubuco Santa Ana
9	AT&T	Ventura	Nightsky	CA-VNC-51403	10/21/2007	30		Conejo
10	AT&T	Los Angeles	Ranch Fire	CA-ANF-4306	10/20/2007	58,401	1	Santa Clarita Piru Fillmore
11	AT&T	Los Angeles	Buckweed	CA-LAC-7232185	10/21/2007	38,356	21	Santa Clarita
12	AT&T	Los Angeles	Magic Fire	CA-LAC-7233077	10/22/2007	2,824		Santa Clarita
13	AT&T	Los Angeles	October Fire	CA-07232000	10/21/2007	25		Santa Clarita
14	Verizon	Los Angeles	Canyon Fire	CA-LAC-07231849	10/21/2007	4,500	6	Malibu
15	Verizon	Santa Barbara	Sedgewick Fire	CA-LPF-1783	10/21/2007	710		Santa Ynez
16	Verizon	San Bernardino	Slide Fire	CA-BDF-10570	10/22/2007	12,759	272	Running Springs
17	Verizon	San Bernardino	Grass Valley Fire	CA-BDF-10566	10/22/2007	1,247	178	Arrowhead
18	Verizon	San Bernardino	Cajon Fire	CA-BDU-11627	10/22/2007	250		Marshall
19	Verizon	Riverside	Rosa Fire	CA-RRU-92560	10/22/2007	411		Temecula
20	Verizon	Riverside	Roca Fire	CA-RRU-91948	10/21/2007	270		Hemet
Source: California Office of Emergency Services for Fire Names, Numbers, Start Dates, Acres and Structures Destroyed								

Appendix 4-A: Priority Communications Survey Responses By Carrier Type

The following matrix shows carriers' responses to each question that Staff included in its data request. Responses are organized by carrier type. The specific identity of each respondent is withheld to maintain confidentiality. (See Section 4.5.1)

	Wireless Carrier Responses				
CPUC Questions	**Wireless Carrier 1**	**Wireless Carrier 2**	**Wireless Carrier 3**	**Wireless Carrier 4**	**Wireless Carrier 5**
1. What priority services are you required to provide and to whom?	We are not required to provide priority access services to our customers.	We are not required to and do not currently provide priority access services to government agencies, but will continue to evaluate priority access services as a potential new offering.	We support TSP, GETS, and WPS priority communications services in accordance with regulations set forth by NCS. Our California state Long Distance tariff addresses TSP for private lines.	Commercial Mobile Radio Service (CMRS) Providers are not required to offer priority telecommunications services. However, we have decided to offer WPS.	Did not respond
2. What other services are offered beyond those required?	We are cooperating with Federal and other authorities in the development and availability of priority access capabilities, which is on-going.	n/a	"Priority Connect" and Pre-emptive voice calling on iDEN network; Public Sector Specific Features: Emergency Call Button (for Public Sector use only); Ability to move wireless capacity remotely and to stage portable assets, COW and COLT in areas requiring additional capacity.	We have voluntarily decided to offer WPS.	Did not respond
3. Do you offer priority telecommunications services to groups that are not required to be offered these services?	We object to this question on the grounds that it is worded in a confusing and vague manner; however to the best of our understanding the question the answer is "yes."	n/a	Because GETS and WPS are accessed directly, we are required to provide service for those who request it during an event.	We provide WPS in accordance with 47 CFR 64.402 and the policies and procedures set forth in Appendix B to this part.	Did not respond
4. Who is eligible for each priority service?	Eligibility is established by Federal protocols	n/a	Eligibility for GETS, WPS, and TSP is outlined per the NCS requirements. There are slight distinctions between eligibility for GETS and WPS (which are more restrictive) as noted by the NCS.	See Appendix B to Part 64 of Section 47 of the Code of Federal Regulations.	Did not respond
5. How often are these services used?	We do not have the information to respond to this question at this time.	n/a	Used only during emergencies by specified eligible user groups to overcome network congestion. WPS and GETS are manually implemented services. Starting first time call completion percentages of 90% or better.	The Commission should seek this information from : National Communications System, Mailstop 8510, 245 Murray Lane, Washington, DC 20528-8510	Did not respond
6. What is the cost and reimbursement structure (i.e. cost to provide, charges to customer, services tariffed?)	We do not have the information to respond to this question at this time.	n/a	1. NCS places constraints on WPS service charges. 2. There is a fee for each TSP circuit. Specific cost information for TSP circuits is not available at this time. 3. We do not bill the end user for GETS calls. Rather, to the best of our knowledge, all carriers bill the US Govt.	We charge: $10.00 activation; $4.50 per month and $.75 per minute of WPS use. We are not aware whether or not there is a reimbursement mechanism for these charges.	Did not respond

	Wireless Carrier Responses (continued)				
CPUC Questions	**Wireless Carrier 1**	**Wireless Carrier 2**	**Wireless Carrier 3**	**Wireless Carrier 4**	**Wireless Carrier 5**
7. What steps do you take to ensure that critical 911 circuits are registered with TSP to expedite restoration of service?	We strive to activate and pay for the TSP service feature on high priority circuits like the 911 circuits.	n/a	Recovery Prioritization for Circuits based on after-action review of Hurricanes Katrina, Rita and Wilma. Recovery Priority: 1. Our core network 2. TSP circuits 3.Critical to Life Circuits (i.e. hospitals, emergency services) 4. Mission Critical circuits 5.High priority customers 6. Others.	We take steps to ensure critical 911 transport circuits are registered with TSP for priority restoration by utilizing the TSP request process as outlined on the tsp.ncs.gov website.	Did not respond

	ILEC Responses		
CPUC Questions	**ILEC 1**	**ILEC 2**	**ILEC 3**
1. What priority services are you required to provide and to whom?	We provide TSP on any service for which priority treatment is possible and for which it is authorized by the National Communications System (NCS), Office of Priority Telecommunications (OPT).	We are in full compliance with the FCC's TSP mandate and offer priority provisioning and restoration services through Tariff A-10 (provided)	In an emergency, our first restoration priority is all FAA data circuits, circuits with a TSP Code, 9-1-1 circuits, voice and data circuits for local first responders, and circuits supporting local medical facilities. No tariff on file for TSP.
2. What other services are offered beyond those required?	Cooperating with the NCS to develop Emergency Telecommunications Service (ETS) for packet priority treatment; provide Special Routing Access Service to Federal Government entities as well as services with higher than standard Quality of Service (QoS) for an additional cost; In addition we offer Essential Service plans.	We do not offer other priority telecommunications services, but as a matter of internal policy have established a set of priorities for restoration of service in the normal course of business and during emergencies. See response to question 7 below.]	Our first priority is to restore all FAA data circuits, TSP circuits, 9-1-1 circuits, voice and data circuits for first responders, and voice and data circuits supporting local medical facilities. We do have a tariff on file for Telecommunications Service Priority System. See Attached tariff for details.
3. Do you offer priority telecommunications services to groups that are not required to be offered these services?	We offer the services described above in the Response to Question 2 to classes of customers that are not required to be offered these services.	We do not offer TSP to groups not required to be offered these services unless they acquire priority status by seeking sponsorship from a federal agency.	
4. Who is eligible for each priority service?	Eligibility for TSP and GETS is controlled by the Federal Government. Only government-authorized users have access to these services, including chiefs of law enforcement/fire, doctors, key elected officials, key military personnel, Red Cross officials, State Office of Emergency Services officials, critically ill on life support, key personnel and most payphone access lines.	Who obtains what priority is decided by the Office of Priority Telecommunications (OPT).	Eligible customers must receive TSP approval from Department of Homeland Security's National Communications System.
5. How often are these services used?	TSP is applicable at all times, but it only is used to install or restore service. We do not have data on GETS usage. Essential Service is used only during periods of central office overload.	We do not keep track of how many times a particular entity has requested priority restoration.	n/a
6. What is the cost and reimbursement structure (i.e. cost to provide, charges to customer, services tariffed?)	Rates vary by type of service and regulatory jurisdiction. As required by the FCC, our rates are designed to recover costs. We offer Essential Service at no charge.	Tariff A-10 governs TSP, includes $14.50 nonrecurring charge for provisioning per line, $4.90 monthly per line. We are unclear on what the reference to a "reimbursement mechanism" means.	The recurring and non-recurring rates for TSP Service are based on an Individual Case Basis; see attached tariff

	ILEC Responses (continued)		
CPUC Questions	**ILEC 1**	**ILEC 2**	**ILEC 3**
7. What steps do you take to ensure that critical 911 circuits are registered with TSP to expedite restoration of service?	Outreach efforts, account representatives inform clients of TSP provide program literature, refer customers to NCS OPT. However, customers generally don't get TSP because carriers already provide quick, reliable restoration.	Outreach to DGS on sponsorships for TSP for PSAPs. PSAPs do not seek sponsorship for TSP designation because, as a result of our internal policy to designate E911 with Tier 1 status in our Emergency Dispatch Priority Matrix, E911 circuits are generally restored quickly.	We work with the PSAPs to determine the cost of TSP. Upon receiving TSP authorization code from NCS, the PSAP administrator is required to notify us and request the TSP service.

	CLEC Responses						
CPUC Questions	**CLEC 1**	**CLEC 2**	**CLEC 3**	**CLEC 4**	**CLEC 5**	**CLEC 6**	**CLEC 7 (VoIP)**
1. What priority services are you required to provide and to whom?	We are required to provide priority provisioning and restoration of telecommunications services under the Telecommunications Service Priority ("TSP") Program. We have not yet filed tariffs in California for TSP services.	Our circuit-switched phone service is only about 8,000 customers and shrinking as we migrate to IP-based platform of digital voice through cable lines. No wireline subscribers have ever requested priority services.	We do not currently provide priority telecommunications services in California.	We do not provide any telecom services with TSP certification in the state of California.	The use and restoration of service during emergencies are provided *47 C.F.R. Pt. 64, App. A.* TSP is offered on all wireline voice and data services, except VoIP. However, we do provide TSP on the access portions of VoIP service.	None in CA. TSP is not required by CA PUC or FCC.	None required, but offer 9-1-1, 7-1-1, FCC-required services
2. What other services are offered beyond those required?	We do not offer other priority telecommunications services.	n/a	none	n/a	We offer services that are required by the FCC's regulations. In addition, other priority telecommunications services are available, including GETS and WPS.	We give priority to our Platinum customers (expedites, facility reservation, route diversity, spare redundant capacity). For 9-1-1 Trunking, connectivity to all LEC 9-1-1 Selective Routers is via Diverse T1 paths.	n/a
3. Do you offer priority telecommunications services to groups that are not required to be offered these services?	We do not offer other priority telecommunications services.	n/a	no	n/a		Based on previous restoration and facilities migration efforts, priority was given to hospitals, universities and mostly to high revenue generating customers.	n/a

	CLEC Responses (continued)						
CPUC Questions	**CLEC 1**	**CLEC 2**	**CLEC 3**	**CLEC 4**	**CLEC 5**	**CLEC 6**	**CLEC 7 (VoIP)**
4. Who is eligible for each priority service?	Telecommunications service users requesting TSP must certify that their telecommunication services support a NS/EP function listed in one of five TSP categories: National Security Leadership; National Security Posture and U.S. Population Attack Warning; Public Health, Safety, and Maintenance of Law and Order; Public Welfare and Maintenance of National Economic Posture; Emergency (applicable for provisioning requirements only).	n/a	n/a	n/a	We cannot offer TSP to groups that have not obtained TSP codes from the Office of Priority Telecommunications ("OPT"). The FCC requires that services with TSP will be restored before non-TSP services.	n/a	n/a
5. How often are these services used?	A restoration priority is assigned to new or existing telecommunications services to ensure restoration before non-TSP services. TSP restoration priorities must be requested and assigned before a service outage occurs.	n/a	n/a	n/a	We do not specifically track the number of times TSP is used. In any event, the Commission should be aware that our restoration efforts are not limited in time.	n/a	n/a
6. What is the cost and reimbursement structure (i.e. cost to provide, charges to customer, services tariffed?)	We have not performed cost studies and therefore cannot provide cost information on TSP services. The TSP program permits service providers to recover their costs in providing TSP services to telecommunications service users.	n/a	n/a	n/a	Our charges for TSP services are contained in our Commercial Pricing Guide. The guide is available on the company's website.	This is relatively new for us, so all of our trunking are not TSP registered at this point. Per our 911 requirements, this NCS TSP directive is fairly new. Also it is not a requirement so there's only a small percentage (< 10%) of CLEC trunking that are TSP registered.	n/a
7. What steps do you take to ensure that critical 911 circuits are registered with TSP to expedite restoration of service?	All PSAPs qualify for TSP authorization because they are engaged in activities essential to emergency preparedness and response. It is up to the individual PSAPs to enroll in the TSP program.	n/a	n/a	n/a	We and OPT are responsible for making agencies and companies aware of TSP. Not all 911 centers have TSP due to the expenses, nor do they need TSP on every circuit. We recommend that TSP be available on a limited number of circuits that the agency deems critical.	Our Priority Restoration and Provisioning procedures are integrated in our overall procedures. See answer to # 2	We connect through LECs to 911 so we have no trunks into 911 facilities

Appendix 4-B: Carriers Contacted for Data Request on Priority Communications Services

CD contacted the following carriers to obtain the information summarized in Appendix 4-A. (See Section 4.6)

ILECs	CLECs	Wireless	VoIP
AT&T	Charter	AT&T Mobility/Cingular	Vonage
Citizens	Comcast	Cricket	
Verizon California	Cox	Sprint	
	MCI Metro/Verizon Business	T-Mobile	
	Paetec	Verizon	
	Time Warner		

Appendix 4-C: San Diego County Registered GETS and WPS Emergency Communications Circuits

The following organizations in San Diego County have registered GETS and/or WPS circuits. (See Section 4.7.1)

Organization in San Diego County	**GETS**	**WPS**
Alpine Fire Protection District	1	1
Amwater Coronado District	2	0
Carlsbad PD	2	0
Chula Vista	2	0
El Cajon PD	1	0
Encinitas	77	14
Escondido Fire Department	108	0
Helix Water District	19	0
North County Dispatch & Joint Power Authority	2	0
National City	72	0
North County Fire District	1	1
Oceanside	6	0
Olivenhain Municipal Water District	23	23
Padre Dam Municipal Water District	16	0
Poway Safety Services Department	40	4
San Diego Blood Bank	2	2
San Diego County OES	101	13
San Diego County SD	2	0
San Diego DHS	121	0
San Diego Fire Department	21	0
San Diego Harbor PD	21	0
San Diego PD	41	0
San Marcos FD	19	0
San Miguel Consolidated Fire District	7	0
Scripps HC	33	1
Sempra Energy Utilities	2	0
Sharp Chula Vista Medical Center	14	0
Sweetwater Authority	61	0
University of California, San Diego (UCSD)	9	0
UCSD Medical Center	18	3
Viejas Tribe	2	0
Vista FD	10	0
Vista Irrigation District	6	4
33 Organizations	**862**	**66**

Appendix 5-A: January 9, 2008 Workshop Panel 2 Questions & Responses

Participants in the panel were asked to respond to the following four questions. 1. How many customers were affected? 2. How did the fires affect your operations? 3. Was there network congestion because of the fire? 4. What percentages of calls were not completed? (See Section 5.1.1) Carrier's responses as reported at the Workshop and in press releases, are summarized in the table below.

Commissioner Chong's Questions:	AT&T Wireline	AT&T Mobility	Verizon Wireless	Verizon Wireline	COX Cable	Sprint/Nextel
How many customers were affected?	14,000 customers affected in 235 distribution areas			3500 customers out of service	2900 customers had loss service; 2% of customer base	
How did the Fires affect your operations?	Primary impact outside distribution plant and 23 Central Offices (CO) - COs suffered loss of commercial Power, switch to Backup Power - 118 Remote Switches - 1.4 Million ft. copper wire lost - 496,000 ft. of fiber lost - 1425 poles lost Converted 9 COs to generator power to help SDGE avoid additional rotating blackouts	48 cell sites affected 96% accessibility on 10/22; but accessibility back to 99% on 10/23	65-70 cell sites affected: - 35-40 sites by loss of utility power but went to battery backup - 30 sites out of service - 3 sites lost due to battery depletion and unable to deploy generators to area	60,000 feet of cable lost 5 COs went to backup power	18,000 ft. of fiber lost	Worst case: 98% of networks still on air Adjacent communities impacted by roaming: Inland Empire MOUs up 6%
Was there network congestion because of the Fire? What percentage of calls were not completed?	30-50% increase in calls first 5 days 1.5% blocking; most blocking between AT&T and other networks	60% increase in Minutes of Use (MOU) on Monday 37% increase in M-O-Uon Tuesday 1.45 % Dropped calls on 10/22; 1.36% dropped calls on 10/23	30% increase in MOU, mainly in SD County Cell site blocking in hot spot evacuation areas If cell blocked, next time got through			CDMA Network: 52% increase in M-O-Uon Monday 1.14 % avg. block rate; .85% avg. drop rate IDEN Network: 38% increase in MOU Push-to-talk: 21% increase 2.2% avg. block rate; 1.45% avg. drop rate

Appendix 5-B: Carriers Contacted for Follow-Up Data Requests

CD contacted the following carriers following the January 9, 2008 Workshop to obtain further information regarding the Firestorm's impact on their customers and networks. (See Section 5.1.2)

ILEC	CLEC	Wireless
AT&T California	Charter	AT&T Mobility
Verizon California	Cox	Cricket
	Time Warner	Sprint/Nextel
		T-Mobile
		Verizon Wireless

CD requested the following information from the carriers contacted:

- Actual call volumes during the 21 days of the Firestorm
- Baseline call volumes during a representative period prior to the fires
- Number of calls blocked and dropped during the Firestorm
- Number of customers without service as a result of the fires

Appendix 6-A: Copy of Letter from California Department of General Services to CPUC

State of California • Arnold Schwarzenegger, Governor
State and Consumer Services Agency
DEPARTMENT OF GENERAL SERVICES
Telecommunications Division
601 Sequoia Pacific Boulevard • Sacramento, California 95811-0231 • (916) 657-9903 • www.dgs.ca.gov

April 11, 2008

Mr. Michael Aguilar
CPUC Communications
Public Decision and Market Analysis
505 Van Ness Avenue, Area 3D
San Francisco, CA 94102

Dear Mr. Aguilar:

The Telecommunications Division, California 9-1-1 Emergency Communications Office (9-1-1 Office), is grateful for the opportunity to comment on the potential impact emergency notification systems may have on the California 9-1-1 Network. The primary role of the 9-1-1 Office is to administer funding for the delivery of 9-1-1 calls throughout the State of California. This funding is used to support the 9-1-1 infrastructure that includes wireline and wireless network transport, the 9-1-1 databases that maintain caller location information, and related equipment at public safety answering points. The role of the 9-1-1 Office in these emergency network notification efforts is to provide assistance, where necessary, to ensure that the California 9-1-1 Network infrastructure remains robust and that 9-1-1 calls from the public continue to be delivered and processed unimpeded.

The 9-1-1 Office is concerned about the potential impact on the California 9-1-1 Network during emergency notifications in two areas:

- Impact on 9-1-1 network during an emergency notification: There is a finite limit as to the number of simultaneous calls that may be processed through a telephone central office switch, a cell-site, and a long distance network (many emergency notification system providers are located outside California). Access to the California 9-1-1 Network is through the Public Switched Telephone Network (PSTN) for landline and wireless and is engineered with provisioning for "normal" traffic and may implement "load control" during high usage (i.e., “Mothers Day Syndrome”).

  In the State of California, the 9-1-1 Network is separate from the PSTN and is not as susceptible to high traffic congestion. In addition, the network services providers recognize the California 9-1-1 Network as a high priority restoration if failures occur. Currently, there are no standards identified for the amount of time it takes for a 9-1-1 call to be delivered to a PSAP. However, because of technology improvements to the California 9-1-1 Network, it has become our expectation that calls are delivered within 5 seconds.

  We are concerned that network congestion in the PSTN may not only delay delivery of the emergency notification, but may block individuals attempting to access the California 9-1-1 Network for emergency assistance.

- Impact on the California 9-1-1 Network following delivery of the emergency notification: Of course, many people will instinctively dial 9-1-1 to report or verify what they have just heard. Public response to an emergency notification will depend greatly on the information provided in the message that directs the public to specific locations for more information.

The 9-1-1 Office respectfully requests that these issues be considered in activities currently being performed by the California Public Utilities Commission related to emergency notification systems.

If you have questions, please do not hesitate to contact me at gary.grootveld@dgs.ca.gov or (916) 657-9381.

Sincerely,

GARY GROOTVELD
Acting Deputy Director for Telecommunications

GG/DR:ja

Appendix 7-A: Carrier Best Practices in Response and Restoration, as presented at San Diego Workshop

The following table shows carriers' responses during the Workshop to questions regarding their Best Practices and responses to the Firestorm. (See Section 7.2.3)

Commissioner Chong's Questions:	What Best Practices did you use to get your facilities restored? How did it go interacting with local authorities in terms of getting in to repair damaged facilities? How did it go -- efforts to protect your employees from fire and unsafe circumstances?		
Sprint/Nextel	AT&T	COX Cable	Time Warner Cable
● Employee Safety is Number 1. ● Incident Command System (ICS) activated Sunday when we saw projected winds coming. ● ICS Management system for conducting restoration, benefits are: - Expedited decision making - Clear decision making path - Emergency management led locally ● Exercise Program: exercise particularly infrequent activities ● Pre-event stand-ups ● In source/Outsource decision: - Core personnel focusing on core competencies - Engage well established vendor network ● Reach out to public safety and customers ● First Responder Interface: - Research to provide consolidated list of available road closures, access restrictions - Liaison with CA OES to expand network coverage in some affected areas -Accessing sites: company IDs and marked trucks - National or standardized credentialing would be very helpful ● Switch Hardening at central switching locations: - backup standby and battery power - redundant transport paths, sonet rings - non-corrosive fire suppression systems - video monitored entry/exits - equipment redundancy, radios, GPS - Seismic earthquake zone 4 rating ● Multiple cell sites with overlapping coverage serving many key areas	● Southern California Emergency Operations Center: -The command and control center for both response and recovery. -The command and control center for both response and recovery. -- Response mode - protection of personnel, assets, buildings -- Restoration mode - assess damage, prioritize and move resources ● Due to experience from previous Fire: - Began inventorying facilities and moving equipment into the area - Began setting up staging areas ● Mobilizing personnel, two types for different types of response: -- Maintenance personnel to take care of minor issues -- Engineers and others required for heavy construction ● Redeployed personnel from new construction and preventive maintenance from non-affected areas and moved into immediate fire areas	● Business Continuity Plan (BCP) - Response protocol to ensure service continuity - Response protocol to ensure service continuity - Customer Care Center BCP to divert calls to telecommuters, other call centers and contractors - Free Services through customer support assistance programs - Accounting for all affected employees, responding to their needs - Community support at 8 evacuation and local assistance centers ● Proactive Network Preparedness - Ring-in-ring architecture provides redundancy in event of damage or loss of fiber backbone - Network Backup Power at Nodes and MTC ● Network monitoring during the event ● Dedicated employees	● Solid Well-established Set of Communication Protocols: - Need to be formalized, broad-based, institutionalized, leadership - Need to meet, be tested and updated regularly ● Formalized Alert System: participants are pre-screened - Quarterly Safety Forums: exchange information on all kinds of disasters - annual table-top exercises - key is private sector participation ● Recovery Issues: - access to site is secured - prescreen critical employees, have it formalized to avoid holdups on the fly ● Broad-based partnerships and mutual-aid: because you don't know what you may need from whom ● Confidentially exchange with one another what resources we have as a community ● Think creatively so that the net be broadly cast to include people who may not instinctively have a vested interest but ultimately do ● Best Practices need to be established, broadly distributed and broadly promoted ● Public -Private Partnerships: Because ultimately we all serve the same constituents, and we all have the same end result.

Appendix 7-B: Carrier Customer Support and Mitigation Efforts, as reported at San Diego Workshop and in Press Releases

The following table provides a summary of carriers' customer support and mitigation efforts during the Firestorm. (See Section 7.3)

AT&T	COX	Sprint/Nextel	Verizon
For displaced residents and small businesses:	Support at evacuation and local assistance centers:	Community Assistance:	For Evacuees and Responders:
- waived line connection fees for temporary local service - Free voice mail and call forwarding ● 2000 GoPhone devices with up to 90 mins of usage time ● Free WI-FI service at nearly 600 hot spots ● Free calls at its retail locations ● 5000 free calling cards at Local Assistance Centers	- telephone banks for free local and long-distance calls - high speed internet stations - large video screens to stay informed	- 2000 free universal wireless phone batteries - 50 % discount on wall chargers, cell chargers and batteries - free calls at retail stores ● Support tent at evacuation centers with free calling, wireless high speed internet access and calling cards.	- Free call forwarding to landline customers - Banks of toll free phones at evacuation centers - employee support at relief centers to allow free calls, check email and charge wireless devices ● Donated 260 cell phones and 25 Wireless access cards to local government ● Set up audio and net conference calls for state and local governments; kept as standing calls so emergency responders can dial in for updates

Appendix: Acronyms

Below is a list of the acronyms used in this report, and their associated terms:

ANI – Automatic Number Identification
ALI – Automatic Location Identification
CAD – California Association of the Deaf
CDR – Call Data Record
CLEC – Competitive Local Exchange Carrier
COLT – Cell on Light Truck
COW – Cell on Wheels
CO – Central Office
DGS – Department of General Services
DHS – Department of Homeland Security
EAS – Emergency Alert System
EOC – Emergency Operations Center
FCC – Federal Communications Commission
FELAC – Fire Emergency Local Assistance Center
GETS – Government Emergency Telecommunications Service
ILEC – Incumbent local Exchange Carrier
JIC – Joint Information Center
LAPD – Los Angeles Police Department
LEP – Limited English Proficiency
M-O-U – Minutes-of-Use
NARUC – National Association of Regulatory Utility Commissions
NCS – National Communications System
NENA – National Emergency Number Association
NS/EP – National Security/Emergency Preparedness
OA – Operational Area
OASIS – Operational Area Satellite Information System
OES – Office of Emergency Services
OMNCS – Office of the Manager, National Communications System
PSAP – Public Safety Answering Point
PSTN – Public Switched Telephone Network
SB OES – San Bernardino County Office of Emergency Services
SD OES – San Diego County Office of Emergency Services
SEMS – Standard Emergency Management Protocol
TENS – Telephone Emergency Notification System
TFCC – Twenty First Century Communications
TSP – Telecommunications Service Priority
TTY – Teletypewriter
UDC – Unified Disaster Council
VoIP – Voice over Internet Protocol
WPS – Wireless Priority Service