

Orange County Fire Authority

Irvine, California

Standards of Coverage and Deployment Plan

2014

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Table of Contents

Table of Contents	i
Table of Figures	v
Introduction	1
Executive Summary	3
Section A – OCFA Overview	10
Legal	10
Governance	10
Funding	10
Service Area	11
Insurance Services Office Regions	12
Section B – Review of Services Provided	13
Services Provided	13
Assets and Resources	16
Fire Stations, Location, and Deployment	16
Apparatus	18
Staffing	24
Administrative and Support Services	26
Emergency Services Staff	26
Cooperating Agencies	31
Current Service Delivery Objectives	33
Section C – Review of the Community Expectations and Performance Goals	35
External Stakeholder Input	36
Community Outcome Goals	37
Section D – Overview of Community Risk Assessment	39
Geographic and Weather Related Risks	39
Weather Risk	39
Wildfire Risk	41
Landslide	44
Elevation Changes	44
Transportation Risk	45
Major Highways	45
Roads	45
Rail	47
Airports	49
Waterways	51
Physical Assets Protected	53
Government Buildings	53
Congregational	54
Schools	55
Hospitals	56
Congregate Care Facilities	57

Other Critical Infrastructure	58
Structural Risks	59
Community Risk Reduction Strategies	69
Development and Population Growth	70
Current Population/Population Growth	70
Construction Limits/Limitations.....	74
Level of Service Classification	75
Historic System Response Workload	77
Temporal Analysis.....	79
Spatial Analysis	81
Station and Unit Workload Analysis	85
Fire Station Workload	85
Response Unit Workload	87
Incident Workload Projection	94
Section E – Critical Tasking and Alarm Assignments.....	95
Critical Tasking	99
Alarm Assignments	102
Section F – Review of Historical System Performance	104
Detection	104
Call Processing	104
Turnout Time	106
Distribution and Initial Arriving Unit Travel Time	107
Travel Time Performance by Region.....	111
First Arriving Unit Dispatch to Arrival Time	115
Dispatch to Arrival Time Performance by Region.....	117
Total Response Time: Received to Arrived Time	120
Received to Arrival Time Performance by Region	122
Concentration and Current Effective Response Force Capability Analysis.....	124
Second Unit Arrival Time	128
Reliability	128
Section G – Factors Influencing Incident Outcomes	131
Emergency Medical Event Sequence	133
People, Tools, and Time	134
Section H – Overview of Compliance Methodology	135
Section I – Recommendations	139
Recommendation One	139
Recommendation Two	143
Recommendation Three	144
Recommendation Four	145
Recommendation Five	146
Recommendation Six	150
Recommendation Seven	156
Recommendation Eight.....	163
Recommendation Nine	167
Summary of Recommendations and Proposed Response Resource Re-deployment Plan	169

Section J – Appendices, Exhibits, and Attachments..... 174

- Terminology 174
- The Basics..... 174
- Response Performance Definitions..... 175
 - Incident Types..... 175
- Cascade of Events 176
- Industry Standards 178
 - National Fire Protection Association 178
- Summary of Findings..... 180
- Implementation Timeline..... 182
- Exhibits Included on CD 183
 - Orange County Fire Authority Strategic Plan 2010-2015 183
 - OCFA Comparables Agencies Chart 183
 - OCFA Comparables Survey Report 183
 - OCFA Major Risk Sites..... 183
 - OCFA Standards of Cover and Deployment Plan 2014 183

Table of Figures

Figure 1: Budgeted Revenue 2013-2014.....	11
Figure 2: Five-Year Projected Revenue	11
Figure 3: OCFA Service Area.....	12
Figure 4: Response Services Summary.....	13
Figure 5: Orange County Fire Stations	17
Figure 6: Apparatus Assigned to OCFA Fire Stations	19
Figure 7: Organization Chart.....	25
Figure 8: Administrative and Support Personnel by Department	26
Figure 9: Emergency Response Personnel by Rank	27
Figure 10: Reserve Staffing by Classification	27
Figure 11: Minimum Staffing Complement	29
Figure 12: Immediate Area Automatic Aid Resources by Agreement	32
Figure 13: Community Outcome Goals.....	37
Figure 14: Risk-Based Response Matrix.....	39
Figure 15: 100-Year Flood Zone Map.....	40
Figure 16: Wildland Fire History, 1950 – 2011.....	41
Figure 17: Wildland Fires 10,000 Acres or Greater, 1958 – 2008.....	41
Figure 18: Wildfire Risk	42
Figure 19: Active Faults, Orange County.....	43
Figure 20: Arterial and Greater Roadways.....	46
Figure 21: Rail Lines	48
Figure 22: Orange County Airports.....	50
Figure 23: Waterways	52
Figure 24: Critical Government Facilities	53
Figure 25: Congregational Facilities.....	54
Figure 26: Public and Private School Facilities.....	55
Figure 27: Paramedic-Receiving Hospitals and Trauma Centers	56
Figure 28: Congregate Care Facilities.....	57
Figure 29: Natural Gas Pipeline Map	61
Figure 30: Petroleum Pipeline Map	62
Figure 31: Hazardous Materials Use and Storage Sites	63
Figure 32: High Rise Buildings (over 55 feet in height).....	64
Figure 33: Buildings 100,000 Square Feet and Larger	65
Figure 34: Unprotected Buildings Larger than 20,000 Square Feet.....	66
Figure 35: Needed Fire Flow Greater than 3,500 Gallons per Minute	68
Figure 36: Population Growth, 1993 – 2012.....	70
Figure 37: Population Density.....	72

Figure 38: Orange County Population by Age Group.....	73
Figure 39: Level of Service Areas	76
Figure 40: Total Fire Incidents by Year, 1993 – 2012	77
Figure 41: Total Emergency Medical Incidents by Year, 1993 – 2012	77
Figure 42: Total Other Type Incidents by Year, 1993 – 2012.....	78
Figure 43: Total All Incidents by Year, 1993 – 2012.....	78
Figure 44: Responses by Type of Incident – 2012.....	79
Figure 45: Monthly Workload.....	79
Figure 46: Daily Workload.....	80
Figure 47: Hourly Workload.....	80
Figure 48: Incidents per Square Mile – 2012	82
Figure 49: Structure Fire Locations.....	83
Figure 50: Emergency Medical Incident Density.....	84
Figure 51: Responses by Fire Station Area – 2012.....	86
Figure 52: 2012 Response Unit Workload – Battalion Chiefs.....	87
Figure 53: 2012 Response Unit Workload – Engines.....	88
Figure 54: 2012 Response Unit Workload –Trucks.....	89
Figure 55: 2012 Response Unit Workload – Medic Vans.....	89
Figure 56: 2012 Response Unit Workload – Patrols	90
Figure 57: Unit Hour Utilization – Engines.....	91
Figure 58: Unit Hour Utilization – Trucks.....	92
Figure 59: Unit Hour Utilization – Medic Vans.....	92
Figure 60: Unit Hour Utilization – Patrols	93
Figure 61: Unit Hour Utilization – Battalion Chiefs.....	93
Figure 62: Population and Incident Forecast	94
Figure 63: Staffing Recommendations Based on Risk.....	96
Figure 64: Call Processing Performance.....	105
Figure 65: Call Processing Time by Hour of Day	106
Figure 66: Turnout Time Performance.....	106
Figure 67: Turnout Time by Hour of Day	107
Figure 68: Initial Unit Travel Time Capability – Urban	108
Figure 69: Urban Incidents Within Five Travel Minute Coverage.....	108
Figure 70: Initial Unit Travel Time Capability – Rural.....	109
Figure 71: Overall Travel Time Performance – First Arriving Unit	110
Figure 72: Overall Travel Time by Hour of Day – First Arriving Unit.....	110
Figure 73: Travel Time Performance by Region.....	111
Figure 74: Travel Time Performance by Region – North.....	112
Figure 75: Travel Time Performance by Region – South.....	113
Figure 76: Number of Units within Five Minutes Travel by Area.....	114

Figure 77: Dispatch to Arrival Time Performance – First Arriving Unit	115
Figure 78: Hourly Dispatch to Arrival Time Performance	116
Figure 79: Dispatch to Arrival Time Frequency.....	116
Figure 80: Dispatch to Arrival Time Performance by Region	117
Figure 81: Dispatch to Arrival Time Performance by Region – North.....	118
Figure 82: Dispatch to Arrival Time Performance by Region – South.....	119
Figure 83: Received to Arrived Time.....	120
Figure 84: Received to Arrived Performance by Hour of Day.....	121
Figure 85: Receive to Arrival Time Frequency	121
Figure 86: Received to Arrival Time Performance by Region	122
Figure 87: Received to Arrival Time Performance by Region – North	123
Figure 88: Received to Arrival Time Performance by Region – South	124
Figure 89: Number of Units within Ten Minutes Travel by Area	126
Figure 90: Number of Ladder Trucks within Ten Minutes Travel	127
Figure 91: Reliability – 2012.....	129
Figure 92: Fire Growth vs. Reflex Time	132
Figure 93: Fire Extension in Residential Structures	132
Figure 94: Cardiac Arrest Event Sequence.....	133
Figure 95: Compliance Methodology.....	135
Figure 96: Response Time Performance by City	150
Figure 97: Response Time Performance by City	151
Figure 98: First-Due Units by Area	152
Figure 99: Effective Response Force Units by Area	153
Figure 100: Five Minute Travel Coverage – Current Fire Stations	157
Figure 101: Overlapping Coverage – Westminster.....	158
Figure 102: Santa Ana Area with Current Fire Stations	159
Figure 103: Locations of Proposed New Fire Station – Irvine Area Station 52.....	160
Figure 104: Locations of Proposed New Fire Station – South.....	161
Figure 105: Incidents by Hour	163
Figure 106: Incidents by Station and By Period of Day.....	164
Figure 107: Current and Proposed Response Unit Deployment.....	171
Figure 108: Proposed Implementation of Recommendations Timeline.....	182

Introduction

The following document serves as the Orange County Fire Authority's (OCFA) Standards of Coverage and Deployment Plan (SOC). The purpose for completing such a document is to assist the agency in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations in addition to homeland security issues. The national accrediting body, the Center for Public Safety Excellence (CPSE), Commission on Fire Accreditation International (CFAI) describes the Standard of Coverage as written procedures that determine the distribution and concentration of an organization's fixed and mobile resources. Done properly, an SOC should provide policy makers, the organization, and the community a body of information that will assist them in making service delivery and risk mitigation decisions.

Creating a Standards of Coverage and Deployment Plan requires that a number of areas be reviewed, studied, and evaluated. The SOC provides a tool to assess community risk, develop baseline emergency response performance standards, assist in planning future station locations, helps determine apparatus and staffing levels and patterns, evaluates workload and unit utilization, measures service delivery performance, and provides input into strategic planning and policy development processes in the form of findings and future deployment options and considerations.

The data and information herein for which ESCI bases recommendations was provided by OCFA and is accurate and true to the best of the consultants' knowledge and ability. Due to human activity, it must be noted that data is constantly in flux and varies throughout any given year.

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Executive Summary

This document identifies the Orange County Fire Authority's (OCFA) Standards of Coverage and Deployment Plan. Response resources, deployment strategies, operational elements, and overall community risks have been reviewed in the document. Using data provided by OCFA and others, Emergency Services Consulting International (ESCI) completed an analysis to determine current levels of response performance. From this analysis, ESCI also identified factors influencing response performance and opportunities for delivery system improvement. This document establishes response time objectives, standards for measuring the effectiveness of department resources, and the deployment of those resources. The document is segregated into sections generally based on the format recommended by the CFAI, *Standards of Cover 5th Edition*.

The OCFA provides fire suppression, emergency medical services, hazardous materials response, wildland firefighting, technical rescue, and airport rescue firefighting services.

The OCFA serves approximately 1.75 million residents (projected to be 1.9 million in 2020 and 2.23 million in 2035) in a service area of approximately 575 square miles. This service area has a real property assessed valuation in excess of \$230 billion. The OCFA provides services to 23 partner cities and the unincorporated areas of Orange County.

OCFA operates from a total of 71 stations and utilizes 491 response vehicles. Front line apparatus (those units staffed for immediate response) include 63 fire engines, 15 paramedic vans, and 15 aerial trucks. OCFA's Emergency Command Center provides dispatch services for all of the department's emergency calls.

It is critical for an organization to have foundation documents to guide the organization to achieving intended future outcomes, identifying how those outcomes are to be accomplished, and determining how success is to be measured and evaluated. Once the SOC is completed, the strategic plan should be updated to address specific performance objectives and future performance goals identified in the SOC process. This will ensure appropriate measures are taken to meet current and future service demands of the community. The integration of the two documents will provide necessary policy and administrative guidance moving forward.

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Community Fire Protection Rating system from which insurance rates are often based. OCFA is divided into six ISO regions and rating areas (OC Central, East, North, South, West, and Santa Ana). The majority of the populated areas of OCFA enjoy a Class 3 rating. A portion of the Eastern Region is a Class 4 rating. The canyon areas and Cleveland National Forest are rated a Class 9. Santa Ana is rated Class 1.

The various city and county stakeholders generally hold the Fire Authority in high regard. The majority of stakeholders indicated they were satisfied with the services currently being provided by OCFA and their expectations were being met. Financial sustainability was a high priority with the vast majority of member agencies. Other expectation "themes" included quick response, the importance of

incorporating efficiencies and innovation into the delivery system, and the need to maintain community presence and involvement.

A critical step in the SOC process is to identify and categorize the types of risk that exist within the area served. Once risk categories are identified, resources can be deployed to protect the risk in the best possible manner. The goal is to ensure sufficient resources are distributed throughout the community in such a manner as to provide adequate response without over committing valuable resources that could be used elsewhere.

An analysis of the OCFA's population density reveals that it is primarily of two classifications; urban and rural. Small areas of suburban density exist in close proximity to urban densities and have been classified as urban. There are areas of wilderness in the outer reaches of unincorporated territory that are discussed separately.

Three planning zones (based on population density) have been identified for the purpose of the SOC and deployment process, they are as follows:

- **Urban** – geography with a population of over 30,000 people and/or a population density of over 2,000 people per square mile.
- **Rural** – geography with a total population of less than 10,000 people or with a population density of less than 1,000 people per square mile.
- **Wilderness/Frontier/Undeveloped** – geography that is both rural and not readily accessible by a publicly or privately maintained road.

The following are the OCFA’s current baseline performance objectives measured at the 90th percentile for 2012 incident data. These describe the level of emergency response service OCFA can currently provide with its resources.

Incident Type	Performance Area	Performance at 90 th Percentile
Call processing	All	91 seconds
Turnout	All	120 seconds
Core Incident (Fire, EMS, Rescue – First Unit)	Urban Area	08:46
	Rural Area	16:45
	Wilderness Area	As soon as practical
ALS (First Unit)	Urban Area	09:54
	Rural Area	23:00
	Wilderness Area	As soon as practical
Full First Alarm Assignment – Moderate Risk Structure Fire	Urban Area	15:53
	Rural Area	No data
	Wilderness Area	As soon as practical
Full First Alarm Assignment – Moderate Risk Rescue Incident	Urban Area	16:32
	Rural Area	16:32
	Wilderness Area	As soon as practical

In the 2006 edition of the OCFA’s Standards of Cover, response time performance objectives were set based upon the 80th percentile for OCFA Benchmark performance and the 80th percentile for OCFA’s baseline performance. In order to more accurately evaluate the OCFA’s performance, and to be more in line with national standards, and OCFA comparable agencies, all response objectives are being proposed at the 90th percentile in this document.

The analysis conducted during the evaluation phase of this process identified a number of system recommendations to improve service. Assumptions were made based on what the organization and member agencies believe to be true at the time the evaluation phase took place.¹ These assumptions and system recommendations are listed below. Each recommendation is described in more detail at the end of this report (Section I).

Assumptions

- Funding is not available in the five-year budget forecast to add additional personnel within the delivery system.
- There is limited capital funding available in the five year budget forecast to spend on facilities, apparatus, and equipment

¹ The two assumptions identified and applied to the SOC and deployment strategies were confirmed by the executive staff and the Technical Advisory Committee (TAC).

System Recommendations

The following is a summary of all recommendations offered:

Recommendation One: Formally adopt response performance goals to establish clear service level expectations to guide the allocation and distribution of response resources and development of service delivery practices.

It is recommended that the OCFA Board of Directors adopt response performance goals describing its future desired level of response performance. Recommended future performance goals for priority (core call) incidents are:

1) Dispatch call processing time

Response resources shall be notified of a core incident within 60 seconds from receipt of the call at the dispatch center until notification of response personnel 90 percent of the time.

2) Turnout time

Response personnel shall initiate response within 90 seconds from notification 90 percent of the time.

3) Total response time for arrival of the first arriving response unit at a core incident

The first response unit capable of initiating effective incident intervention shall arrive at a core emergency within the time specified for each performance area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 7 minutes 30 seconds

Rural Area – 12 minutes

Wilderness Area – As soon as practical

4) Total response time for arrival of the first arriving ALS response unit at a core medical incident

The first ALS response unit capable of initiating effective incident intervention shall arrive at a core emergency within the time specified for each performance area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 10 minutes

Rural Area – 14 minutes 30 seconds

Wilderness Area – As soon as practical

5) Response time for arrival of the full first alarm assignment at a moderate risk structure fire incident

For moderate risk structure fires the full effective response force² shall arrive within the time specified for each performance area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 12 minutes 30 seconds

Rural Area – 16 minutes 30 seconds

Wilderness Area – As soon as practical

6) Response time for arrival of the full first alarm assignment at a moderate risk rescue incident

For moderate risk rescue, incidents the full effective response force³ shall arrive within the time specified for each performance area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 12 minutes 30 seconds

Rural Area – 16 minutes 30 seconds

Wilderness Area – As soon as practical

Recommendation Two: Improve call processing performance through improvement of dispatch protocols and procedures, early initiation of response resource notification through pre-alerting, and through personnel performance management.

Recommendation Three: Improve turnout time performance by incorporating assistive technology and through personnel performance management.

Recommendation Four: Improve response system reliability by minimizing response unit movement away from primary service areas for non-emergency purposes and by moving resources to stations that must be vacated for training and other reasons.

Recommendation Five: Improve the delivery of emergency medical service by implementing criteria based dispatch and staffing all engines and ladder trucks with at least one paramedic.

Recommendation Six: Redistribute available resources to provide more consistent levels of service across the entire OCFA service area.

Recommendation Seven: Consolidate fire stations in areas of significant overlapping coverage. Continue to plan and develop new fire stations as needed.

Recommendation Eight: Implement dynamic staffing practices to ensure sufficient resources are available to serve incident demand as it varies by time of day. A staffing plan that provides resources to provide a minimum level of protection based on community risk, augmented during higher workload periods with additional resources, should be implemented.

Recommendation Nine: Utilize available technologies to enhance service delivery. Implement closest-unit dispatch technology to ensure the closest appropriate response unit is sent to an emergency. Implement technology that ensures response resources are moved as needed to maintain consistent levels of service. Implement citizen alerting technology (CAD to mobile device).

2 The effective response force for a moderate risk structure fire is currently defined as three engines, one truck, one medic unit, and one battalion chief (15 personnel total).

3 The effective response force for a rescue incident is currently defined as one engine, one truck, and one medic unit (8 personnel total including 2 paramedics).

Using these recommendations ESCI has prepared a proposed redeployment plan for consideration. The plan makes several changes to current deployment practices. These include:

1. All fire stations have at least one fire engine except airport stations.
2. All fire engines are staffed with at least three personnel, one of whom is a paramedic.
3. All ladder trucks are staffed with four personnel, one of whom is a paramedic.
4. Medic vans are transitioned to squad-type vehicles. Each is staffed with two personnel, one of whom is a paramedic.
5. The number of fire engines and ladder trucks is static throughout the 24 hour day. These apparatus are deployed to ensure adequate response to fire type incidents.
6. The number of squad type vehicles (formerly medic vans) increases during day time hours and decreases during night time hours.
7. Criteria based dispatch is implemented reducing response to emergency medical incidents to a single vehicle for all incidents other than those triaged at the dispatch center as potentially life-threatening.

This redeployment plan improves the overall performance of the service delivery and takes a more “dynamic approach” to managing service demand. More units and personnel are deployed during higher service demand periods (daytime hours) and less units and personnel are deployed during lower service demand periods (nighttime hours). In all cases the overarching philosophy is to maintain a basic service delivery model of getting the right resource with the right staffing delivered to the right call at the right time.

Current deployment provides 840,960 total unit hours per year. The proposed deployment totals 915,420 total unit hours per year, an 8.8 percent increase. Probability of wait is reduced to at or below 10 percent in all but three station areas during daytime hours and all but three station areas during night-time hours. The greatest probability of wait is 11.9 percent, much less than current at 21.9 percent.

Currently OCFA staffs apparatus with a minimum of 311 personnel 24 hours per day. The proposed deployment requires a minimum of 327 personnel during daytime hours and 285 personnel during night-time hours. The estimated cost difference between current deployment and the proposed plan is nominal.

The total number of employed line personnel remains constant. The proposed re-deployment plan is designed to provide the correct number of response resources to ensure a reliable and effective response for the expected incident workload by period of day.

The recommendations and redeployment plan will take time to implement. Agreements must be reached between both internal and external stakeholders of the OCFA in order to provide legal and operating authority for some initiatives. In other cases funding will need to be provided for apparatus acquisition and fire station remodeling or reconstruction.

This Standards of Coverage and Deployment Plan offers OCFA recommendations to improve the effectiveness and efficiency of its emergency response services.

Section A – OCFA Overview

Legal

The OCFA was formed on March 1, 1995, when the organization transitioned from the Orange County Fire Department to a Joint Powers Authority (JPA) as allowed by California State Government Code 6500 et seq. The OCFA is an independent organizational entity similar to a special district.

Governance

A 25-member Board of Directors governs the OCFA. This Board includes an elected official appointed to represent each of the 23 member cities, and two representatives from the County Board of Supervisors. The OCFA is managed by an appointed Fire Chief who reports to the Board of Directors.

Funding

Financial oversight of OCFA is the responsibility of the Assistant Chief of Business Services. Policy direction and decision making is provided by the OCFA Board of Directors. The OCFA has an active Budget and Finance Committee that advises staff and makes recommendations to the Board of Directors on matters related to financial and budgetary policies.

The OCFA uses an annual budget cycle to prepare the operating budget and capital improvement plan based on a July 1 through June 30 fiscal year. The total consolidated OCFA budget for fiscal year 2013-2014 is \$323,773,264.

Property taxes are OCFA's largest source of revenue in the General Fund budget and in the 2013-2014 fiscal year account for \$186,998,721. Charges for current services (contracts) account for \$94,325,831. The current five-year financial forecast prepared by the OCFA projects a balanced General Fund budget. The General Fund budget forecast meets all of the Authority's policy reserve requirements and reflects its efforts to sustain the current level of emergency response service.

The following figures list the sources and amounts of revenue for OCFA for fiscal year 2013-2014 as well as the five-year projected revenue for fiscal years 2014/2015 through 2018/2019.⁴

Figure 1: Budgeted Revenue 2013-2014

Revenue Source	FY 2013-2014
Taxes	\$186,998,721
Intergovernmental	11,443,286
Charges for Services	94,325,831
Use of Money & Property	221,379
Miscellaneous	832,000
Total	\$293,821,217

Figure 2: Five-Year Projected Revenue

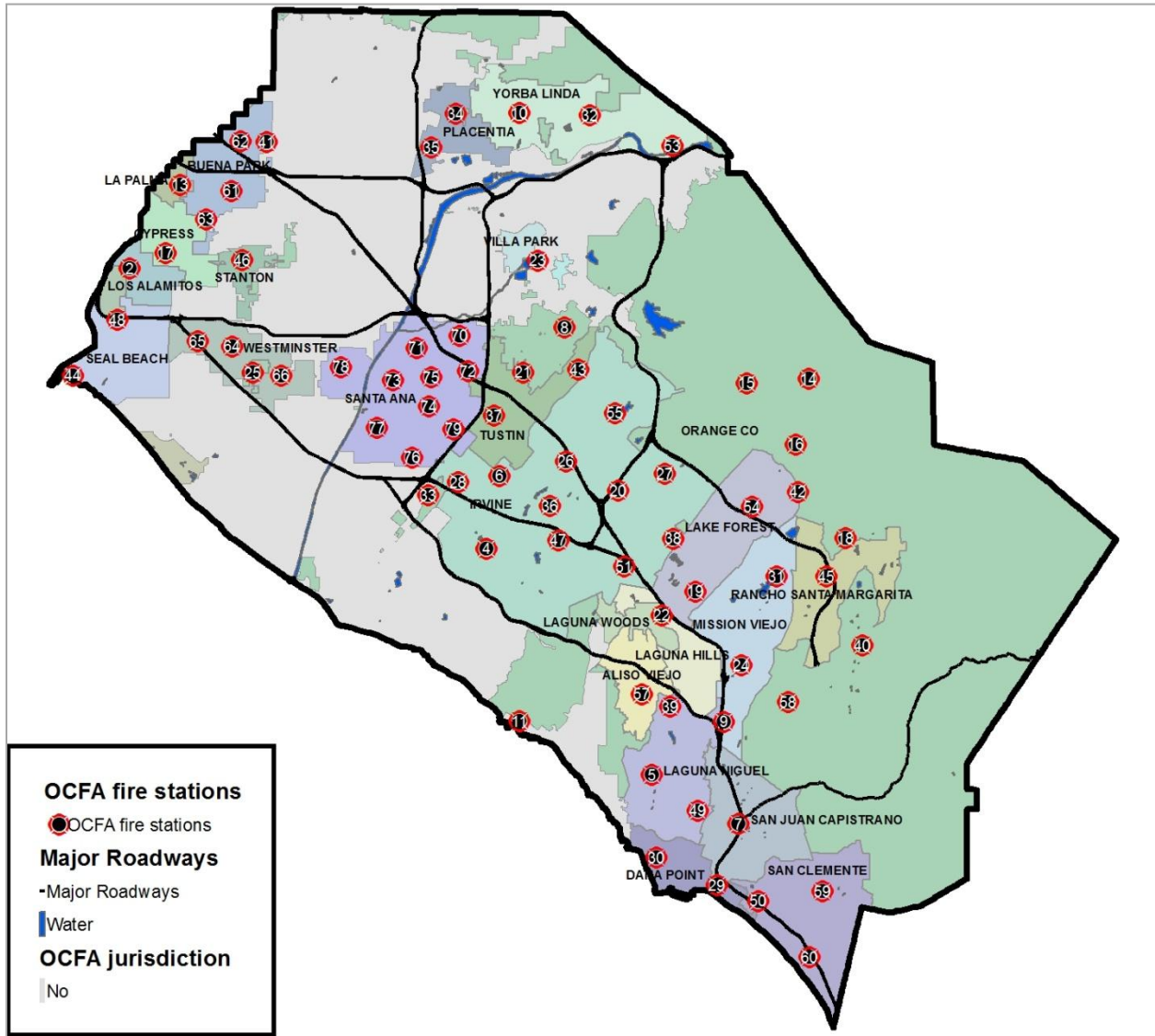
Fiscal Year	Total Projected Revenue
2014/2015	303,480,295
2015/2016	313,983,574
2016/2017	324,993,617
2017/2018	335,886,991

Service Area

The service area includes 23 member cities and the unincorporated areas of Orange County, California. The OCFA serves approximately 1.75 million residents; projections anticipate the service population to be 1.9 million in 2020 and 2.23 million in 2035. This service area has a real property assessed valuation in excess of \$230 billion.

⁴ Information provided by OCFA.

Figure 3: OCFA Service Area



Insurance Services Office Regions

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Community Fire Protection Rating system from which insurance rates are often based. The rating system evaluates three primary areas: the emergency communication and dispatch system, the fire department capabilities, and the community's pressurized hydrant or tanker-based water supply. The overall rating is then expressed as a number between 1 and 10, with 1 being the highest level of protection and 10 being unprotected or nearly so. The OCFA is divided into six ISO regions and rating areas (OC Central, East, North, South, and West and Santa Ana). The majority of the populated areas of OCFA enjoy a class 3 rating. A portion of the Eastern Region is a class 4 rating. The canyon areas and Cleveland National Forest are rated a class 9. The City of Santa Ana is rated Class 1.

Section B – Review of Services Provided

Services Provided

OCFA provides a variety of services, including fire suppression, emergency medical services, hazardous materials response, wildland firefighting, and technical rescue services. The following figure provides basic information on each of OCFA’s response services, its general resource capability for that service (at typical staffing levels), and information regarding staff resources for that service.

Figure 4: Response Services Summary

Response Services Summary		
Service	General Resource/Asset Capability	Basic Staffing Capability per Shift
Fire Suppression	63 Engines-frontline 15 Trucks 9 Battalion Chief Vehicles 1 Safety Officer ⁵ 4 Type 2 Helicopters (one on-duty per day) 2 Air Utilities 1 Hand Crew	79 Fire Captains 123 Firefighters 78 Fire Apparatus Engineers 9 Battalion Chiefs 1 Safety Officer 1 Pilots 1 Crew Chiefs 18 Hand Crew Members 170 Reserve Firefighters*
Emergency Medical Services	63 Engines 25 Paramedic Engines 26 Paramedic Assessment Engines 3 Paramedic Trucks 3 Paramedic Assessment Trucks 15 Medic Vans 1 Emergency Transport Unit ⁶	78 Fire Captains 153 Firefighters 78 Fire Apparatus Engineers 9 Battalion Chiefs 1 Safety Officer 170 Reserve Firefighters 2 EMTs
Hazardous Materials Response⁷	2 Type 1 Hazardous Materials Response vehicles 1 Haz-Mat Support Truck Vehicles equipped with personal protective equipment, gas and radiation monitoring equipment, containment supplies, and non-sparking tools. In addition: 2 Hazardous Response Vehicles available via Mutual Aid	3 Fire Captains 3 Fire Apparatus Engineers 6 Firefighters 1 Battalion Chief 1 Safety Officer 3 Haz-Mat Spec. Officer 6 Haz-Mat Tech Fire Fighter In addition: 9 Haz-Mat Technicians are available via Mutual Aid

⁵ Safety officers are assigned from the Training Section and there is one assigned 24 hours a day for the county and additional safety officers can be called back as needed.

⁶ Unit 50 is an OCFA unit staffed by EMTs. In addition to Unit 50, two private ambulances are housed in OCFA stations (64 and 65).

⁷ Haz-Mat 4 and 79 are crossed staffed by the personnel in Stations 4 and 79.

Response Services Summary		
Service	General Resource/Asset Capability	Basic Staffing Capability per Shift
Airport Rescue Fire Fighting⁸	1 Rapid Intervention Vehicle 1 1500 Med. Crash unit 2 3000 Heavy Crash Unit 1 40 Ton Crane 1 Aircraft Recovery Dolly	1 Station officer 2 Driver/Operators 3 Firefighters 1 Admin. Battalion Chief ⁹
Wildland Fire Fighting	8 Wildland Interface Engines 11 Type 3 Engines ¹⁰ 10 Type 1 Engines ¹¹ 12 Patrol/Squad CAFS Units ¹² 5 Water Tender ¹³ 2 Hand Crew 3 Dozer	Type 2 WUI are first line engines Type 3 and Type 1 engines are crossed staffed and utilized for in and out of county assignments (Staffed w/3-personnel). Hand Crew – 18 personnel and 1 crew supervisor Patrol and Water Tender units are cross-staff or reserve staffed. 1 Dozer operator
Technical Rescue -Vehicle Extrication -High Angle Rescue -Confined Space Rescue -Trench and Collapsed Rescue -Swift Water Rescue	15 Trucks equipped with full extrication capabilities including cutters and spreaders or a combination tool, cribbing, rescue struts, hand tools, and battery powered tools and air bags. 4 Urban Search & Rescue (USAR) Trucks 1 Heavy Rescue (cross-staffed) ¹⁴ 1 Engine company (Station 7) considered light rescue, complemented with power unit and combination tool.	16 Station officers 16 Driver/Operators 32 Firefighters 1 Battalion Chief (per Battalion) 1 Safety Officer (as needed) (All are trained in vehicle extrication)
FEMA Task Force 5 Cache (Multi-jurisdictional cross-staffed, 70 members)	Available USAR Equipment (Station 54) can be utilized for in-county incidents if requested	1 Station Officer 1 Driver/Operator 1 Firefighter
Reserve Firefighter Program	7 combo stations 3 standalone (11, 14, & 16)	170 total Reserve personnel 38 Reserve Officers 44 Reserve Driver/Operators

⁸ OCFA staffs 15 truck companies each day, of those, four (6, 9, 34, & 61) are equipped and meet the standards of medium USAR trucks.

⁹ 'C' Shift Battalion Chief; primary duties include airport.

¹⁰ All Type-3 engines are crossed staffed by the station personnel in their respective stations.

¹¹ The 10 Type-1 engines under Wildland Firefighting are crossed staffed and are utilized for Mutual Aid request (Type-1 Strike Teams).

¹² The Patrol-CAFS units at stations 10, 21, 48 and 57. Water Tenders at stations 10 and 32 cross-staffed by station personnel.

¹³ Water Tenders at stations 10, 20, and 32 cross-staffed by station personnel (Engineer/Firefighter).

¹⁴ OCFA has one Heavy Rescue Unit at Station 6 and is crossed staffed by personnel from the Truck at Station 6.

Response Services Summary		
Service	General Resource/Asset Capability	Basic Staffing Capability per Shift
Air Operations (Station 41)	4 Type 2 helicopters 1 Fuel Tender (reserve operated) 1 Support Vehicle 1 Helo Mech Vehicle	1 Pilot 1 Crew Chief 1 Helo Mechanic

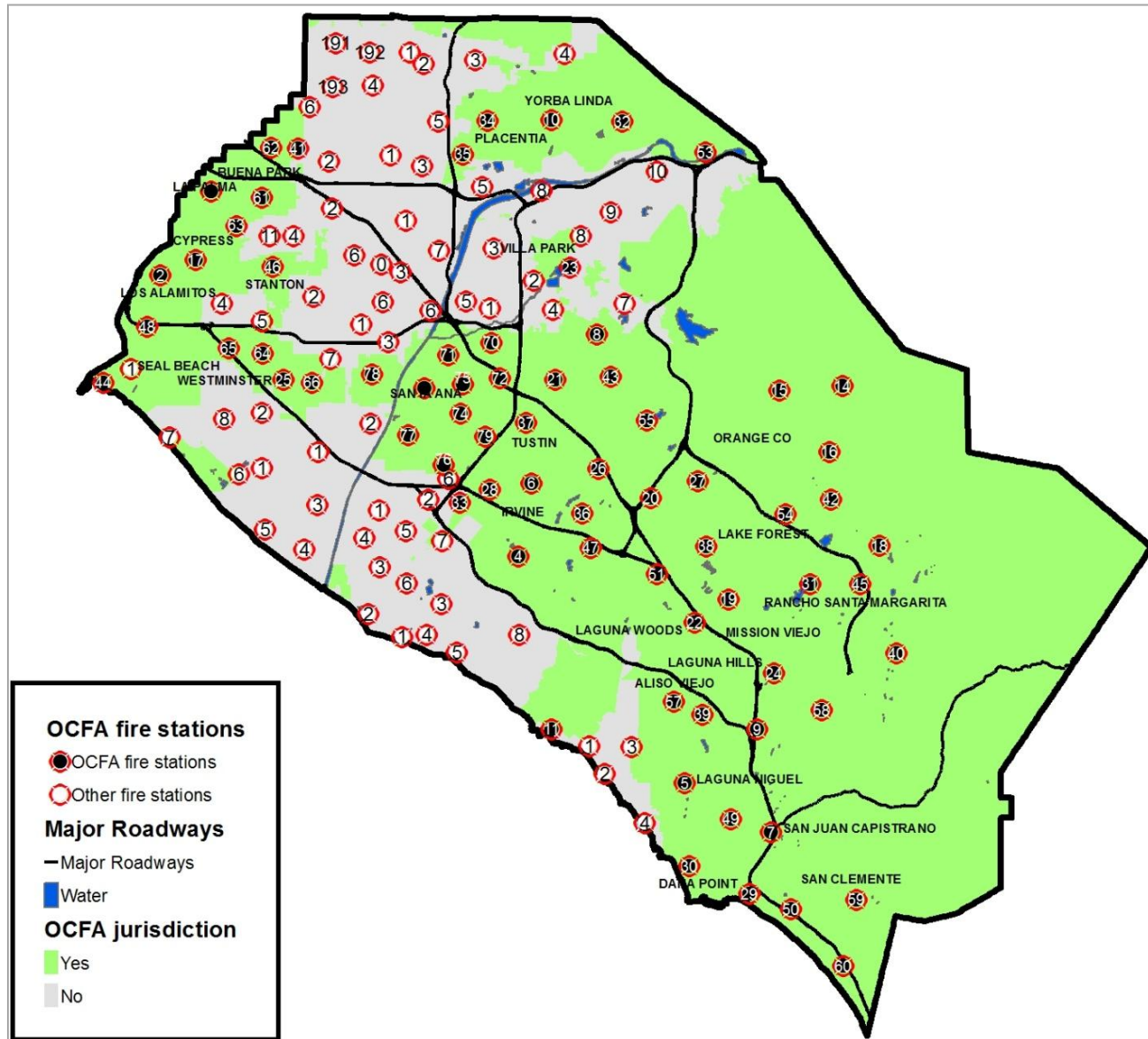
Assets and Resources

Fire station locations play an integral role in the delivery of emergency services. To a large degree, strategic placement of station locations will dictate travel time to emergencies. Consideration should also be given to the facility's physical ability to support the department's function, as it exists today and into the future.

Fire Stations, Location, and Deployment

OCFA personnel staff a total of 71 stations throughout the jurisdiction: 66 career and combination fire stations, 3 reserve firefighter (stand-alone) stations, and 2 support stations (Airport ARFF and Helo air operations). The following map identifies the location of OCFA fire stations as well as the fire stations of other jurisdictions within Orange County.

Figure 5: Orange County Fire Stations



Apparatus

Front line apparatus (those units staffed for immediate response) include 63 fire engines, 15 paramedic vans, and 15 trucks. Of these apparatus, 43 are paramedic advanced life support (ALS) units, 29 are paramedic assessment units (PAU) and 21 are basic life support (BLS) units. The OCFA emergency response fleet also includes helicopters, a hazardous materials response unit, airport crash rescue units at John Wayne Airport, fire dozers, swift water rescue units, hand crew, heavy rescue, hose tender, foam tender, mass casualty/deacon, communications/technical trailer (Comtec), mobile command post and a federally sponsored urban search and rescue task force. Reserve personnel staff and operate four fire engines, seven patrols/squads, four air utilities, and four water tenders. As will be noted in the following figure, apparatus that is not considered front line (e.g., water tenders, heavy rescue, mass decontamination unit) is often cross-staffed depending on need.

Figure 6: Apparatus Assigned to OCFA Fire Stations

Station	Apparatus	Year Built	Condition	Station	Apparatus	Year Built	Condition
Station 2	Engine-PAU	2007	Good	Station 18	Engine-PAU	1999	Fair
	Engine-Type I	2000	Fair		CAFS/Patrol	2003	Good
Station 4	Engine-BLS	2005	Good		Engine-Type III	2008	Good
	Truck-BLS	2007	Good		Dozer-3	1980	Good
	Paramedic Van	2009	Good		Hand Crew	1990	Fair
	HazMat	2005	Good	Station 19	Engine-ALS	2005	Good
Station 5	Battalion Chief	2006	Good	Station 20	Engine-ALS	2009	Good
	Engine-BLS	2007	Good	Water Tender	1990	Fair	
Station 6	Paramedic Van	2009	Good	Station 21	Engine-BLS	2007	Good
	Engine-Type I	2000	Fair		Paramedic Van	2009	Good
Station 7	Engine-ALS	2007	Good		CAFS/Patrol	2003	Good
	Truck-BLS	2007	Good	Engine-Type I	2003	Good	
	Heavy Rescue	2007	Good	Station 22	2 Engines-ALS	2009	Good
	Swift Water Unit	2008	Good	Truck-BLS	2007	Good	
Station 8	Investigator	2008	Good	Battalion Chief	2009	Good	
	Engine-BLS	2003	Good	Station 23	Engine-ALS	2007	Good
	Paramedic Van	2009	Good	Station 24	Engine-ALS	2009	Good
Station 9	Water Tender	2001	Good	Station 25	Engine-PAU	2005	Good
	CAFS/Patrol	2003	Good		Engine-Type I	1999	Fair
	Engine-Type III	2008	Good	Station 26	Engine-BLS	2005	Good
	Engine-PAU	2009	Good		Paramedic Van	2009	Good
Station 10	Engine-ALS	2007	Good		CAFS/Patrol	2003	Good
Station 11	Truck-BLS/USAR	2010	Excellent	Engine-Type I	2003	Fair	
	Engine-PAU	2009	Good	Station 27	Engine-ALS	2007	Good
Station 13	CAFS/Patrol	2003	Good	Engine-Type III	1992	Fair	
	Engine	2000	Good	Station 28	Engine-PAU	1999	Good
Station 14	CAFS/Patrol	2003	Good	Station 29	Engine-ALS	2009	Good
	Engine-PAU	1999	Good		Battalion Chief	2007	Good
Station 15	Engine-Type III	2008	Good	Station 30	Engine-PAU	2007	Good
	Engine	2009	Good		CAFS/Patrol	2003	Good
Station 16	Water Tender	2003	Good		Engine-Type III	2008	Good
	CAFS/Patrol	2003	Good	Station 31	Engine-BLS	2005	Good
	Engine-BLS	2005	Good	Paramedic Van	2003	Good	
Station 17	Paramedic Van	2009	Good	Engine-Type I	1999	Fair	
	Engine-Type I	1999	Good	Station 32	Engine-BLS	2007	Good
					Paramedic Van	2009	Good
			Water Tender		2001	Good	
			CAFS/Patrol		2003	Good	
			Engine-Type I		1999	Fair	

Station	Apparatus	Year Built	Condition	Station	Apparatus	Year Built	Condition
Station 33	Crash 1	2012	Excellent	Station 50	Engine-PAU	2009	Good
	Crash 4	1996	Excellent		Transport	2009	Excellent
	Crash 5	2003	Excellent		Engine-Type III	2008	Good
Station 34	Engine-ALS	2009	Good	Station 51	Engine-ALS	2009	Good
	Truck-BLS/USAR	2010	Excellent	Station 53	Engine-PAU	2005	Good
	Battalion Chief	2009	Good		Engine-Type III	2008	Good
Swift Water Unit	2003	Good	Dozer-2		2000	Good	
Station 35	Engine-PAU	1997	Fair	Station 54	Engine-PAU	2007	Good
Station 36	Engine-ALS	2007	Good		USAR	2005	Good
	Foam Tender	1970	Good		USAR	2008	Excellent
Station 37	Engine-PAU	2000	Fair		USAR	2005	Good
Station 38	Engine-BLS	1997	Fair		USAR	2006	Good
	Paramedic Van	2009	Good	Station 55	Engine-PAU	2005	Good
Station 39	Engine-PAU	2005	Good		Engine-Type III	2008	Good
	Engine-Type III	2008	Good	Station 57	Engine-BLS	2007	Good
Station 40	Engine-PAU	2009	Good		Paramedic Van	2003	Good
Station 41	Helicopter 1	2009	Excellent		CAFS/Patrol	2003	Good
	Helicopter 2	2009	Excellent		Engine-Type I	2003	Good
	Helicopter 3	1966	Good	Station 58	Engine-ALS	2003	Fair
	Helicopter 4	1966	Good		Engine-Type III	2008	Good
	Water Tender	1990	Good	Station 59	Truck-ALS	2006	Excellent
Station 42	Engine-PAU	2009	Good	Station 60	Engine-ALS	2007	Good
Station 43	Truck-PAU	1995	Good	Station 61	Engine-ALS	2007	Good
	Battalion Chief	2009	Good		Truck-BLS	2007	Good
Station 44	Engine-PAU	2003	Fair		Battalion Chief	2006	Good
Station 45	Engine-BLS	2005	Good		Swift Water Unit	2003	Good
	Truck-BLS	2011	Excellent	Station 62	Engine-ALS	2005	Good
	Paramedic Van	2007	Good	Station 63	Engine-PAU	2005	Good
	Battalion Chief	2007	Good		Engine-Type I	1999	Fair
	Engine-Type III	2008	Good	Station 64	Engine-ALS	2007	Good
Station 46	Engine-PAU	2009	Good		Truck-BLS	1995	Fair
	Paramedic Van	2007	Good		Battalion Chief	2006	Good
Station 47	Engine-PAU	2005	Good	Station 65	Engine-ALS	2009	Good
	Engine-Type III	2008	Good	Station 66	Engine-ALS	2007	Good
	Dozer-1	1980	Good	Station 70	Engine-PAU	1997	Poor
Station 48	Engine-BLS	2005	Good	Station 71	Engine-Type III	2013	Excellent
	Paramedic Van	2009	Good		Engine-ALS	2010	Excellent
	CAFS/Patrol	2003	Good		Truck-ALS	1994	Poor
Station 49	Truck-PAU	1996	Fair		Mass Decon Unit	2005	Good

Station	Apparatus	Year Built	Condition		Station	Apparatus	Year Built	Condition
Station 72	Engine-ALS	2005	Good		Station 77	Paramedic Van	2007	Good
Station 73	Engine-ALS	2010	Excellent		Station 78	Engine-PAU	1997	Fair
Station 74	Engine-ALS	2006	Good			Paramedic Van	2009	Good
	Battalion Chief	2005	Good		Station 79	Engine-PAU	2001	Fair
Station 75	Engine-ALS	2002	Good			HazMat	2005	Good
	Truck-ALS	2004	Good					
Station 76	Truck-PAU	2000	Fair					
	Engine-PAU	2005	Good					

OCFA uses several types of apparatus, including those identified in the previous table. Each type is described as follows:

Engine – The engine company’s basic mission is to respond to fires, rescues, and medical emergencies. OCFA engines are equipped with various diameter fire hoses, a 500 gallon water tank, and a 1500 GPM (gallons per minute) pump. Personnel are trained to quickly deploy attack lines into structures to gain a quick knockdown on the fire. The apparatus is supplied with a full complement of tools, equipment, fire hoses, and emergency medical equipment.

- ALS – units equipped with two certified paramedics and advanced medical gear.
- PAU – units equipped with one paramedic and advanced medical gear.
- BLS – units equipped with basic lifesaving support medical gear.

Engine Type I – OCFA cross-staff’s ten type-I engines to assist in the state mission of rapidly deploying engines to protect homes in the interface areas. These engines are rapidly deployed leaving the front-line engines available in quarters for back-fill personnel. They are also considered as “Surge Engines” for local response to larger in-county incidents.

Wildland Urban Interface WUI – OCFA staff’s 13 type II engines across the county. These engines are specifically designed to work in the wildland areas to extinguish brush fires. They have hose, pumps, and tools on a 4-wheel raised chassis, which allows them to travel off the pavement and into areas otherwise inaccessible to other apparatus. These units are also used for out-of-county response to assist the state mission.

Brush Engines (Type III) – This unique piece of apparatus is used in the brush areas of Orange County. Its mission is for initial attack on all fires in the wildland areas. It is outfitted with a complement of specialized equipment such as chain saws, drip torches, and light-weight fire hoses. This unit carries 500 gallons of water and has the ability to pump and move at the same time.

Truck – OCFA has 75', 90', and 100' aerial ladder trucks. These trucks are equipped with multiple ladders that can access roof tops and balconies for firefighting and ventilation purposes. The trucks primary role on structure fires is to provide search and rescue, roof ventilation, elevated streams, and salvage and overhaul. The trucks also carry auto-extrication tools to gain access to damaged vehicles involved in traffic collisions. OCFA trucks are equipped with a wide variety of hand tools, lighting and salvage equipment, and rappelling gear. Truck companies with the exception of T71 and T75 have various sized hoses, a 300-gallon water tank, a 1500 GPM pump, and aerial ladders. T71 and T75 are equipped with a CAFT foam unit with an 80-gallon tank.

Paramedic Van – A specialized piece of equipment carrying two personnel with Advanced Life Support (ALS) equipped who have medical knowledge, experience, and the necessary equipment to assess patients, deliver appropriate treatments and escort patients to specialty receiving centers. Paramedic van personnel also carry appropriate firefighting gear and assist engine companies on rescues and fires.

Battalion Chief Vehicle – The battalion chief's Suburban is a command vehicle that responds to the more complex and sensitive incidents where the command and control is paramount; to organizational set-up and decision making processes which results in the rapid resolution of cascading events.

Investigator's Vehicle – The investigator's vehicle is a utility truck equipped with all the tools and equipment necessary to conduct a thorough investigation at a fire incident.

Foam Tender – The foam tender is another specialized piece of apparatus that brings with it 1,000 gallons of 3 percent and 6 percent foam concentrate and 100 gallons of high expansion foam concentrate. Foam tenders are used at aircraft incidents and large flammable liquid fires.

Haz-Mat – The HAZ-MAT unit is a specialized apparatus that carries state-of-the art diagnostic equipment, monitoring tools, and high-tech protective equipment for the dedicated personnel who respond to hazardous materials incidents.

Hose Tender – This unit is a special call apparatus equipped with a 1,500 GPM pump. It also has 5,000 feet of 4-inch hose and an array of miscellaneous adaptors, appliances, and portable monitors. This piece of apparatus is most useful in bringing large amounts of water to engine companies at major fires.

Squads/Patrols – These four-wheel drive vehicles will allow firefighters to gain access and mobility in the wildland area. They can be utilized to put out small fires, are equipped with a 150-gallon water supply, a 50-gallon-per-minute pump, and a winch with a rated capacity of 8,000 pounds. During the rainy season, these units are deployed as part of the Urban Search and Rescue/Swift Water Rescue Team. Staffed with a paramedic and proper medical equipment it can be used to respond to EMS calls in lieu of a paramedic van.

Air Utilities – This apparatus brings to fires a cache of self-contained breathing apparatus and air cylinders and provides on-scene lighting. The Air Utility unit has a built-in compressor that can fill the self-contained breathing apparatus cylinders at the emergency scene.

Mass Decon – This Unit is a specialized piece of equipment used for those rare situations where multiple people need rapid decontamination. The unit works in conjunction with an engine company to supply water to a multitude of low flow nozzles located inside of a privacy tent where the run-off water can be contained. Personnel are equipped with level-B suits, respiratory protection, and backboards for the non-ambulatory.

Water Tenders – This unit has the responsibility of supplying all engines companies with water where water sources are non-existent or inaccessible. The water tender is a tank truck with a water capacity of 3,500 gallons and a mid-ship pump of 500 GPM.

Helicopters – The helicopter is staffed by a pilot and crew chief and has seating for 9 firefighters and their equipment. The helicopter has a tank capacity of 360 gallons that allows for an average of 4,000 gallons an hour of water delivery. The role of the helicopter is to provide initial air attack on all brush fires within the boundaries of Orange County. Helicopters are equipped for aerial water drops, to transport firefighters, hand crews, and their equipment to remote areas in the wildland interface, and to provide aerial reconnaissance and photographing for incident commanders. The helicopter is equipped with a hoist for inserting and extracting personnel and patients. For night operations, the pilots, and crew chiefs are trained and equipped with night vision goggles.

Helicopter Tender – The helicopter tender is a support unit for helicopter operations at emergency incidents. This unit carries a 1,000 gallon tank of Jet A fuel and other support equipment for the helicopter and crew.

Fire Dozer and Transport – The mechanized wildland fire suppression attack is provided by the dozer and transport truck. The role of the dozer is to eliminate combustible brush and trees from approaching fire by creating firebreaks. The transport can also be used to haul disabled fire apparatus.

USAR Task Force – The Task Force transports the multi-million dollar cache of sophisticated state-of-the-art rescue equipment of the Orange County Fire Authority's Urban Search and Rescue California Task Force Number 5. The task force is comprised of 60 to 80 firefighters and can be called upon to deploy to any emergency within the United States.

Fire Command Vehicles – The fire command or fire logistics vehicles may be used at all major fires and emergency incidents within the jurisdiction of the Authority. This mobile command post is equipped with radios, phones, computers, and all equipment necessary for the command staff.

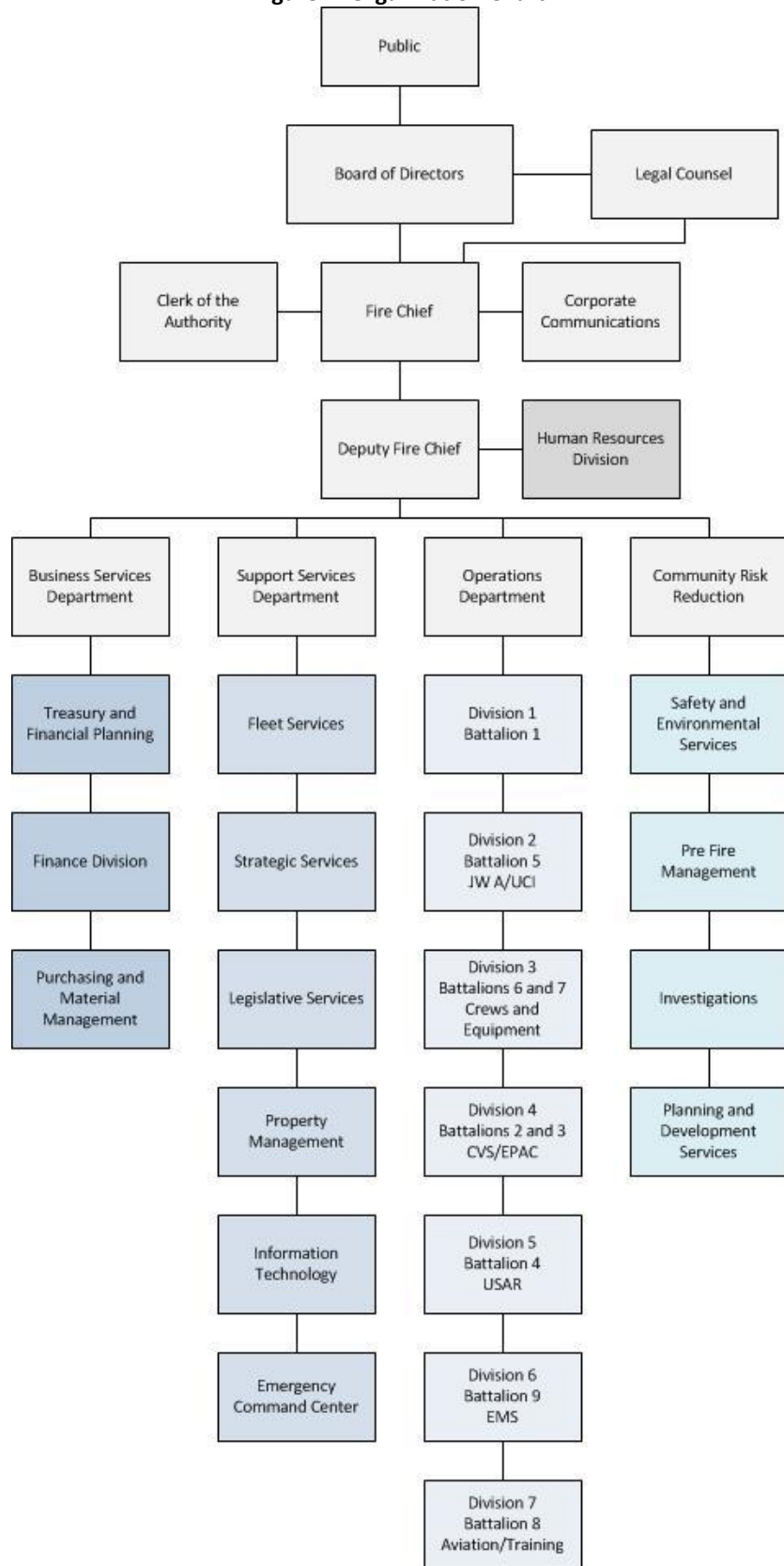
Service Support Vehicle – This unit is operated by qualified Service Center personnel 24 hours a day, 365 days a year. It responds to all 2nd alarm fires and other larger emergencies that require personnel rehabilitation supplies, lighting, and additional air bottles. This unit has a built-in air-compressor that can fill multiple air cylinder bottles simultaneously at the scene.

Mechanic Vehicle – This unit is operated by the automotive section 24 hours a day, 365 days a year. It can respond to any location where there is a disabled OCFA vehicle. It has all the necessary tools and equipment to quickly trouble-shoot problems and complete in-the-field repairs.

Staffing

The ranks of the OCFA consist of 1007 career firefighters, 170 reserve firefighters, and 224 administrative and support personnel. While these numbers are currently accurate as of the date of this report, due to human activity they are also always in flux. OCFA is organized in four departments: Business Services, Support Services, Fire Prevention, and Operations. The following figure provides an overview of the OCFA organizational structure.

Figure 7: Organization Chart



Administrative and Support Services

The OCFA provides the support and administrative services that other cities and counties generally provide their fire departments. Civilian personnel staff the following functions: human resources, risk management, employee benefits, payroll, purchasing, accounts payable/receivable, treasury, automotive, planning and development, building and hazardous materials inspections, service center/warehouse, public information, audio visual, legislative analysis, property management-including maintenance and construction of new stations, clerical, and dispatch. These services, internal and external, are in addition to fire suppression, emergency medical services, hazardous materials response, wildland firefighting, and technical rescue and airport rescue firefighting services. The services these important sections provide are not within the scope of review for this deployment study. The following table identifies the number of administrative and support services personnel at OCFA.

Figure 8: Administrative and Support Personnel by Department

Department	Number
Business Services	50
Support Services	104
Community Risk Reduction	54
Clerk's Office	4
Emergency Medical Services	12
Total	224

Emergency Services Staff

Within the Operations Department, there are seven field divisions, with nine battalions. OCFA is one of the largest regional fire service organizations in California with a service area that includes urban, suburban, rural, and wilderness areas. At the time surveyed in regards to the 2012 service year, OCFA provided 0.56 firefighters per 1,000 population. When compared to the fourteen additional departments that participated in ESCI's Comparables Survey, OCFA ranked third in lowest firefighters per 1,000 population. Firefighters per 1,000 population ranged from .39 to 1.83 firefighters per 1,000 population with an average of .92 firefighters per 1,000 population.¹⁵

¹⁵ See "OCFA Comparables Survey Agencies Chart" and "OCFA Comparables Survey Report" on Exhibits CD.

Figure 9: Emergency Response Personnel by Rank

Position	Number
Assistant Chief	4
Division Chief	7
Field Battalion Chief	27
Staff Battalion Chief	9
Fire Captain	158
Fire Captain Paramedic	84
Pilot	3
Crew Captain	2
Fire Apparatus Engineer	210
Fire Apparatus Engineer Paramedic	24
Firefighter	216
Firefighter Paramedic	237
Crews and Equipment	26
Total	1007

* Total Paramedic Positions (FC, FAE, and FF) = 345

** 15 Emergency Response positions are postpositions and are covered by overtime.

Reserve Personnel

Reserve personnel are utilized for specific needs. Their training is based upon their assigned duties and unit type. The fire and medical first responders assigned to engines are fully trained. Squads are trained in medical first responder and structure fire support. Patrols are trained both in medical first responder and wildland firefighting. Reserve hand crews and helicopter support crews are trained on their specified task as well as basic life support.

Figure 10: Reserve Staffing by Classification

Station	Allotted	Current	Vacant
7	25	21	4
11	25	13	12
14	25	7	18
16	25	16	9
18	20	10	10
C18	35	21	14
26	20	16	4
30	25	16	9
32	25	22	3
41	35	28	7
Total	260	170	90

Methodology for Incident Staffing

This document will provide an analysis of how well the OCFA is doing at providing its own personnel for incidents within its primary service area. This data is important and can be an indicator for the department as to the effectiveness of its staffing efforts.

During larger incidents, the OCFA is typically acting together with one or more neighboring fire departments in providing fire and life protection through a coordinated regional response system of mutual and automatic aid agreements. This is particularly true for large structure fires, other high-risk incidents where staffing needs are high, and during periods of high incident activity. Therefore, the document will go on to provide an overall view of aggregate staffing in this department and the neighboring agencies.¹⁶

The prompt arrival of at least four personnel is critical for structure fires. Occupational safety and health regulations require that personnel entering a building involved in fire must be in groups of at least two. Further, before personnel can enter a building to extinguish a fire, at least two personnel must be on scene and assigned to conduct search and rescue in the event a fire attack crew becomes trapped. This is referred to as the two-in, two-out rule.

There are, however, some exceptions to this regulation. If it is *known* that victims are trapped inside the building, a rescue attempt can be performed without additional personnel ready to intervene outside the structure. Further, there is no requirement that all four personnel arrive on the same response vehicle. Many departments rely on more than one unit arriving to initiate interior fire attack. The OCFA staffs some fire engines with three firefighters; thus, it often must wait for a second unit to arrive before it can initiate interior fire attack operations in a non-rescue incident.

Some incidents (such as structure fires) require more than one response unit. The ability of the OCFA and its automatic aid agencies to assemble an effective response force for a multiple unit incident within the specific period of time, also known as *resource concentration*, will be analyzed in a later section of this document.

The following table lists each station, staffed unit, and the minimum staffing assigned to each. Cross-staffed means that firefighters assigned to another response unit in the station may transfer to the cross-staffed unit as needed.

¹⁶ See Figure 12 for automatic aid resources by agreement.

Figure 11: Minimum Staffing Complement

Station	Apparatus	Minimum Staffing	Station	Apparatus	Minimum Staffing
Station 2	Engine-PAU	3	Station 18	Engine-PAU	3
	Engine-Type I	Cross-staffed		CAFS/Patrol	Cross-staffed
Station 4	Engine-BLS	3		Engine-Type III	Cross-staffed
	Truck-BLS	4		Dozer	1
	Paramedic Van	2		Hand Crew	9 Reserve Crew
	Haz Mat	Cross-staffed			10 Paid Crew
	Battalion Chief	1	Station 19	Engine-ALS	4
Station 5	Engine-BLS	3	Station 20	Engine-ALS	4
	Paramedic Van	2	Water Tender	Cross-staffed	
	Engine-Type I	Cross-staffed	Station 21	Engine-BLS	3
Station 6	Engine-ALS	4		Paramedic Van	2
	Truck-BLS/USAR	4		CAFS/Patrol	Cross-staffed
	Heavy Rescue	Cross-staffed		Engine-Type I	Cross-staffed
	Swift Water Unit	Cross-staffed	Station 22	2 Engines-ALS	8
	Investigator	1		Truck-BLS	4
Station 7	Engine-BLS	3		Battalion Chief	1
	Paramedic Van	2	Station 23	Engine-ALS	4
	Water Tender	Reserves Cross-staffed	Station 24	Engine-ALS	4
	CAFS/Patrol	Cross-staffed	Station 25	Engine-PAU	3
	Engine-Type III	Cross-staffed		Engine-Type I	Cross-staffed
Station 8	Engine-PAU	3	Station 26	Engine-BLS	3
Station 9	Engine-ALS	4		Paramedic Van	2
	Truck-BLS/USAR	4		CAFS/Patrol	Cross-staffed
	Swift Water Unit	Cross-staffed	Engine-Type I	Cross-staffed	
Station 13	Engine-PAU	3	Station 27	Engine-ALS	4
Station 14	Engine	Reserves		Engine-Type III	Cross-staffed
	CAFS/Patrol	Cross-staffed	Station 28	Engine-PAU	3
Station 15	Engine-PAU	3	Station 29	Engine-ALS	4
	Engine-Type III	Cross-staffed		Battalion Chief	1
Station 16	Engine	Reserves	Station 30	Engine-PAU	3
	Water Tender	Cross-staffed		CAFS/Patrol	Cross-staffed
	CAFS/Patrol	Cross-staffed		Engine-Type III	Cross-staffed
Station 17	Engine-BLS	3	Station 31	Engine-BLS	3
	Truck-BLS	4		Paramedic Van	2
	Paramedic Van	2		Engine-Type I	Cross-staffed
	Engine-Type I	Cross-staffed			

Station	Apparatus	Minimum Staffing	Station	Apparatus	Minimum Staffing
Station 32	Engine-BLS	3	Station 47	Engine-PAU	3
	Paramedic Van	2		Engine-Type III	Cross-staffed
	Water Tender	Cross-staffed	Station 48	Dozer	1
	CAFS/Patrol	Cross-staffed		Engine-BLS	3
	Engine-Type I	Cross-staffed		Paramedic Van	2
Station 33	Crash 1	2	CAFS/Patrol	Cross-staffed	
	Crash 4	2	Station 49	Truck-PAU	4
	Crash 5	2	Station 50	Engine-PAU	3
Station 34	Engine-ALS	4		Emergency Transport	2
	Truck-BLS/USAR	4		Engine-Type III	Cross-staffed
	Battalion Chief	1	Station 51	Engine-ALS	4
	Swift Water Unit	Cross-staffed	Station 53	Engine-PAU	3
Station 35	Engine-PAU	3		Engine-Type III	Cross-staffed
Station 36	Engine-ALS	4	Dozer	1	
	Foam Tender	Cross-staffed	Station 54	Engine-PAU	3
Station 37	Engine-PAU	3		USAR	Cross-staffed
Station 38	Engine-BLS	3		USAR	Cross-staffed
	Paramedic Van	2		USAR	Cross-staffed
Station 39	Engine-PAU	3	USAR	Cross-staffed	
	Engine-Type III	Cross-staffed	Station 55	Engine-PAU	3
Station 40	Engine-PAU	3		Engine-Type III	Cross-staffed
Station 41	Helicopter 1	2	Station 57	Engine-BLS	3
	Helicopter 2	Spare		Paramedic Van	2
	Helicopter 3	Spare		CAFS/Patrol	Cross-staffed
	Helicopter 4	Spare		Engine-Type I	Cross-staffed
	Water Tender Helitender	Reserves	Station 58	Engine-ALS	4
Station 42	Engine-PAU	3	Engine-Type III	Cross-staffed	
Station 43	Truck-PAU	4	Station 59	Truck-ALS	4
	Battalion Chief	1	Station 60	Engine-ALS	4
Station 44	Engine-PAU	3	Station 61	Engine-ALS	4
Station 45	Engine-BLS	3		Truck-BLS/USAR	4
	Truck-BLS	4		Battalion Chief	1
	Paramedic Van	2		Swift Water Unit	Cross-staffed
	Battalion Chief	1	Station 62	Engine-ALS	4
	Engine-Type III	Cross-staffed	Station 63	Engine-PAU	3
Station 46	Engine-PAU	3	Engine-Type I	Cross-staffed	
	Paramedic Van	2	Station 64	Engine-ALS	4
				Battalion Chief	1

Station	Apparatus	Minimum Staffing		Station	Apparatus	Minimum Staffing	
Station 65	Engine-ALS	4		Station 75	Engine-ALS	4	
Station 66	Engine-ALS	4		Station 75	Truck-ALS	4	
Station 70	Engine-PAU	3		Station 76	Truck-PAU	4	
	Engine-Type III	Cross-staffed		Station 77	Engine-PAU	3	
Station 71	Engine-ALS	4		Station 77	Paramedic Van	2	
	Truck-ALS	4		Station 78	Engine-PAU	3	
	Mass Decon Unit	Cross-staffed			Paramedic Van	2	
Station 72	Engine-ALS	4			Engine-PAU	3	
Station 73	Engine-ALS	4		Station 79	Haz Mat	Cross-staffed	
Station 74	Engine-ALS	4					
	Battalion Chief	1					

Cooperating Agencies

In addition to the OCFA, there are 12 other municipal fire departments and two military fire departments (Seal Beach Naval Weapons Station and the Joint Powers Training Center/Los Alamitos) in Orange County. Most of these departments participate in mutual/auto aid agreements with the OCFA; some of them also provide services to county islands under contract with the OCFA. The OCFA also maintains mutual and/or automatic aid agreements with Los Angeles, Riverside, San Bernardino, and San Diego Counties, Camp Pendleton Fire Department, and the U.S. Forest Service. Under contract, the OCFA protects approximately 175,000 acres of wildland in state and federal responsibility areas located within the county.

Figure 12: Immediate Area Automatic Aid Resources by Agreement

Department	Resources				
	Engines	Ladder Trucks	Medical Units	Brush Units	Total Available Staffing
Anaheim Fire Department	3	1	2	1	24
Brea Fire Department	2	0	1	1	13
Camp Pendleton – Marine Base	1	0	1	1	10
Corona Fire Department	1	1	0	0	8
Costa Mesa Fire Department	2	0	1	0	10
Fountain Valley Fire Department	1	1	1	0	11
Fullerton Fire Department	2	1	1	1	17
Garden Grove Fire Department	2	1	1	0	14
Huntington Beach Fire Department	2	1	2	0	18
Joint Forces Training Base	1	0	0	0	3
Laguna Beach Fire Department	1	0	1	1	10
Long Beach Fire Department	3	1	2	0	22
Naval Weapons Stn – Seal Beach	1	0	0	0	3
Newport Beach Fire Department	3	1	3	0	25
Orange (City of) Fire Department	4	1	2	1	27
Total	29	9	18	6	215

Current Service Delivery Objectives

The following are the current objectives for OCFA:¹⁷

1) Dispatch call processing time

Response resources shall be notified of a core incident within 91 seconds from receipt of the call at the dispatch center until notification of response personnel 90 percent of the time.

2) Turnout time

Response personnel shall initiate response within 120 seconds from notification 90 percent of the time for core fire incidents and within 96 seconds from notification 90 percent of the time for all other core incidents.

3) Total response time for arrival of the first arriving response unit at a core incident

The first response unit capable of initiating effective incident intervention shall arrive at a core emergency within the time specified for each level of service area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 8 minutes 45 seconds

Rural Area – 16 minutes 45 seconds

Wilderness Area – As soon as practical

4) Total response time for arrival of the first arriving ALS response unit at a core medical incident

The first response unit capable of initiating effective incident intervention shall arrive at a core emergency within the time specified for each level of service area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 9 minutes 54 seconds

Rural Area – 23 minutes 0 seconds

Wilderness Area – As soon as practical

5) Response time for arrival of the full first alarm assignment at a moderate risk structure fire incident:

For moderate risk structure fires the full effective response force¹⁸ shall arrive within the time specified for each level of service area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 15 minutes 53 seconds

Rural Area – 15 minutes 53 seconds

Wilderness Area – As soon as practical

¹⁷ Although performance objectives were reflected at the 80th percentile in its 2006 Standards of Coverage, the OCFA is required to shift to a 90th percentile measurement.

¹⁸ The effective response force is defined as three engines, one truck, one medic unit, and one battalion chief (15-16 personnel total).

6) Response time for arrival of the full first alarm assignment at a moderate risk rescue incident

For moderate risk rescue incident the full effective response force¹⁹ shall arrive within the time specified for each level of service area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 16 minutes 32 seconds

Rural Area – 16 minutes 32 seconds

Wilderness Area – As soon as practical

7) Regardless of level of service area, specialty units shall respond from time of dispatch to on scene of incident within the following time frames 90 percent of the time:

- a. Hazardous Materials unit
 - i. Urban – 41 minutes
 - ii. Rural – 41 minutes
- b. Helicopter – 45 minutes
- c. Hand Crew – 2 hours
- d. Swift Water Rescue – 45 minutes
- e. Rescue USAR Squad – 45 minutes
- f. MCU – 45 minutes
- g. Dozer – 1 hour and 30 minutes

The OCFA is currently achieving these objectives as will be demonstrated in a later section of this report. OCFA regularly reviews emergency response performance against its objectives. Doing so is of great value to the response organization.

¹⁹ The effective response force is defined as one engine, one truck, and one medic unit (8 personnel total including 2 paramedics).

Section C – Review of the Community Expectations and Performance Goals

Obtaining and understanding the desires and expectations of community stakeholders and member agencies is an important first step in the creation of performance goals. The OCFA is committed to incorporating the needs and expectations of community and policy makers in the service delivery planning process.

OCFA Member Agency Input

Interviews were conducted with representatives from each of the member agencies. Topics discussed during the interviews included, but were not limited to, service delivery expectations and satisfaction, challenges, concerns, critical issues, medical resources, communications system, response protocols, and planning efforts. The input received will help guide the OCFA vision, planning efforts, policy decisions, and service delivery.

The various city and county stakeholders generally hold the Fire Authority in high regard. The majority of stakeholders indicated they were satisfied with the services currently being provided by OCFA and their expectations were being met. Financial sustainability was a high priority with the vast majority of member agencies. Other expectation “themes” included quick response, the importance of incorporating efficiencies and innovation into the delivery system, and the need to maintain community presence and involvement.

Community Input

Community outreach occurred during May and June 2013. Members of the OCFA Fire Corps distributed approximately 1,000 copies of a focused community survey at multiple locations throughout the jurisdiction. This random sampling of community responses was designed to assess previous contact with the OCFA, satisfaction with the contact, overall satisfaction with the organization, prioritization of programs and services, and expectations regarding response time for emergency incidents.

A 57 percent of respondents reported contact with a member of OCFA during the past five years; of those, 75 percent indicated the contact was the result of an emergency. Of the respondents reporting contact with OCFA, 75 percent indicated they were ‘very satisfied’ with the contact; 20 percent reported being ‘satisfied’ with the interaction.

- Regardless of prior contact, 92 percent of respondents reported that the OCFA meets or exceed their expectations.
- Emergency Medical Service, Fire Suppression, and Technical Rescue were prioritized as the most important services offered by OCFA.
- Approximately 42 percent of respondents believe it should take between four and six minutes for help to arrive after they have reported an emergency (via 9-1-1); 31 percent believe it should take four minutes or less.

Follow-up comments provided by survey respondents were generous in their praise and appreciation for the efforts of the OCFA and its members.

External Stakeholder Input

In addition to member agencies and citizens, other stakeholder groups were asked to participate in a similar process. This group included representatives of the building industry association, John Wayne Airport Port Authority (management team), neighboring fire departments, and EMS agencies. Automatic and Mutual Aid agencies involved in this deployment planning process included: Newport Beach, Laguna Beach, City of Orange, Long Beach, and Anaheim.

Stakeholder interviews conducted identified several “key” expectations/themes including the need to maintain quality communications, monitor resource exchange to ensure equity, and continue to be responsive to mutual interests and concerns.

Internal Stakeholder Input

ESCI met with and interviewed all members of the OCFA executive staff, as well as the Chief Officer’s Association (COA), Local 3631, Orange County Employee’s Association (OCEA), OCFA EMS division, reserve firefighters and the Emergency Command Center (ECC) leadership. Topics discussed during those interviews included strengths, weaknesses, opportunities, challenges, and critical issues; vision and expectations for the SOC; assessment of current deployment model and opportunities to enhance the model; and OCFA programs related to the SOC study.

Comparables Survey

In addition to member, community, and external and internal stakeholder input, ESCI invited twenty-two comparable agencies to participate in a survey regarding elements of the fire department/district in their similarities to and differences from OCFA for the 2012 service year. ESCI made multiple attempts at contacting comparable agencies via electronic survey, email, and telephone correspondence paired with independent research to collect the data. Of the agencies invited to participate, twelve agencies responded in full and two partially participated. ESCI’s data set includes information from the following agencies: Alameda County, California; Anaheim, California; Broward County, Florida; Los Angeles County, California; Los Angeles City, California; Montgomery County, Maryland; Orange, California; Phoenix, Arizona; Portland, Oregon; San Diego, California; San Jose, California; South Metro, Colorado; Tualatin Valley Fire and Rescue, Oregon; and Ventura County, California. Where necessary, outliers are noted and excluded from the data set to provide a more accurate comparison. The results of the survey report can be found on the Exhibits CD.

Community Outcome Goals

From these conversations, general statements of outcome have been developed regarding the community's expectations of the OCFA. These statements have been synthesized by ESCI using its understanding of community expectations. They should provide the organization with a better understanding of the needs and expectations of its communities within each service area.

Figure 13: Community Outcome Goals

Service	Community Outcome Goal
Fire Suppression	For all fire incidents, OCFA shall arrive in a timely manner with sufficient resources to stop the escalation of the fire and keep the fire to the area of involvement. An effective concentration of resources shall arrive within time to be capable of containing the fire, rescuing at-risk victims, and performing salvage operations, while providing for the safety of the responders and general public.
Wildland Fire Suppression	For all wildfire incidents, OCFA shall arrive in a timely manner with sufficient resources to first protect homes and other buildings, then to begin controlling the rate of fire spread.
Emergency Medical Services	For core emergency medical incidents, OCFA shall arrive in a timely manner with sufficient trained and equipped personnel to provide medical services that will stabilize the situation, provide care and support to the victim, and reduce, reverse, or eliminate the conditions that have caused the emergency while providing for the safety of the responders. When warranted, timely transportation of victim(s) to appropriate medical facilities shall be accomplished by the private provider in an effective and efficient manner.
Hazardous Materials Response	For all hazardous materials incidents, OCFA shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. For those incidents requiring only operations-level containment, OCFA will perform the necessary functions while providing for the safety and security of the responders, public, and the environment. For those incidents requiring more extensive technician-level functions, OCFA will call for and support additional specially trained and organized regional resources to perform the necessary containment, stabilization, and/or clean-up functions while providing for the safety and security of the responders, public, and the environment.
Airport Rescue Fire Fighting	For all airport rescue and/or firefighting incidents, OCFA shall arrive in a timely manner with sufficient resources to provide for all hazard mitigation, and evacuation and possible rescue of passengers and crew of an aircraft involved in an airport ground emergency.
Vehicle Extrication	For all vehicle accidents where rescue of victims is required, OCFA shall arrive in a timely manner with sufficient resources to stabilize the situation and extricate the victim(s) from the emergency situation or location without causing further harm to the victim, responders, public, and the environment.
High-Angle Rescue	For all high-angle rescue incidents, OCFA shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. Working in conjunction with additional specially trained and organized regional resources, OCFA will perform the necessary rescue functions while providing for the safety and security of the responders, public, and the environment.

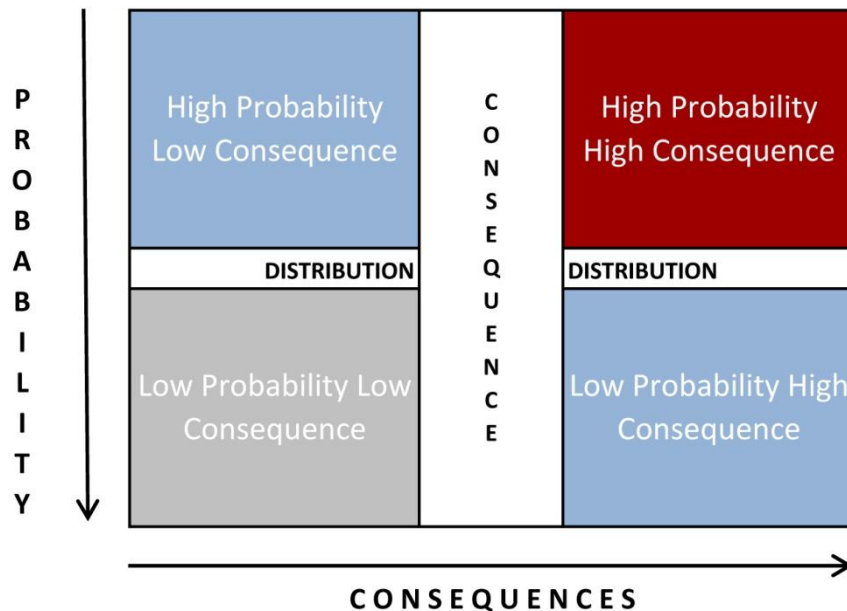
Service	Community Outcome Goal
Confined Space Rescue	For all confined space rescue incidents, OCFA shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. Working in conjunction with additional specially trained and organized regional resources, OCFA will perform the necessary rescue functions while providing for the safety and security of the responders, public, and the environment.
Trench and Collapse Rescue	For all trench or collapse rescue incidents, OCFA shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. Working in conjunction with additional specially trained and organized regional resources, OCFA will perform the necessary rescue functions while providing for the safety and security of the responders, public, and the environment.
Swift-Water Rescue	For all swift-water rescue incidents, OCFA shall arrive in a timely manner with sufficient resources to stabilize the situation and establish an action plan for the successful conclusion of the incident. Working in conjunction with additional specially trained and organized regional resources, OCFA will perform the necessary rescue functions while providing for the safety and security of the responders, public, and the environment.

Section D – Overview of Community Risk Assessment

This section analyzes certain categorical risks that are present within Orange County that potentially threaten the persons and businesses within the community and that can create response workload for the OCFA. These risks are identified to assist the OCFA in identifying where to locate response resources in the types and numbers needed to effectively respond to likely emergencies. Descriptions of specific target hazards are included in the Appendix (OCFA Major Risk Sites).

Risk management is the assessment of the chance of an event occurring and the damage that will occur as a result of the event. As the actual or potential risk increases, the need for higher numbers of personnel and apparatus also increases. With each type of incident and corresponding risk, specific critical tasks need to be accomplished and certain numbers and types of apparatus should be dispatched. Risk management must also take into consideration the political environment and the financial environment of the region being served. Ultimately the policy makers must make decisions to determine what services will be provided and to what level they will be provided in order to provide appropriate coverage throughout the jurisdiction. Figure 14 illustrates a risk based approach to response.

Figure 14: Risk-Based Response Matrix



Geographic and Weather Related Risks

Weather Risk

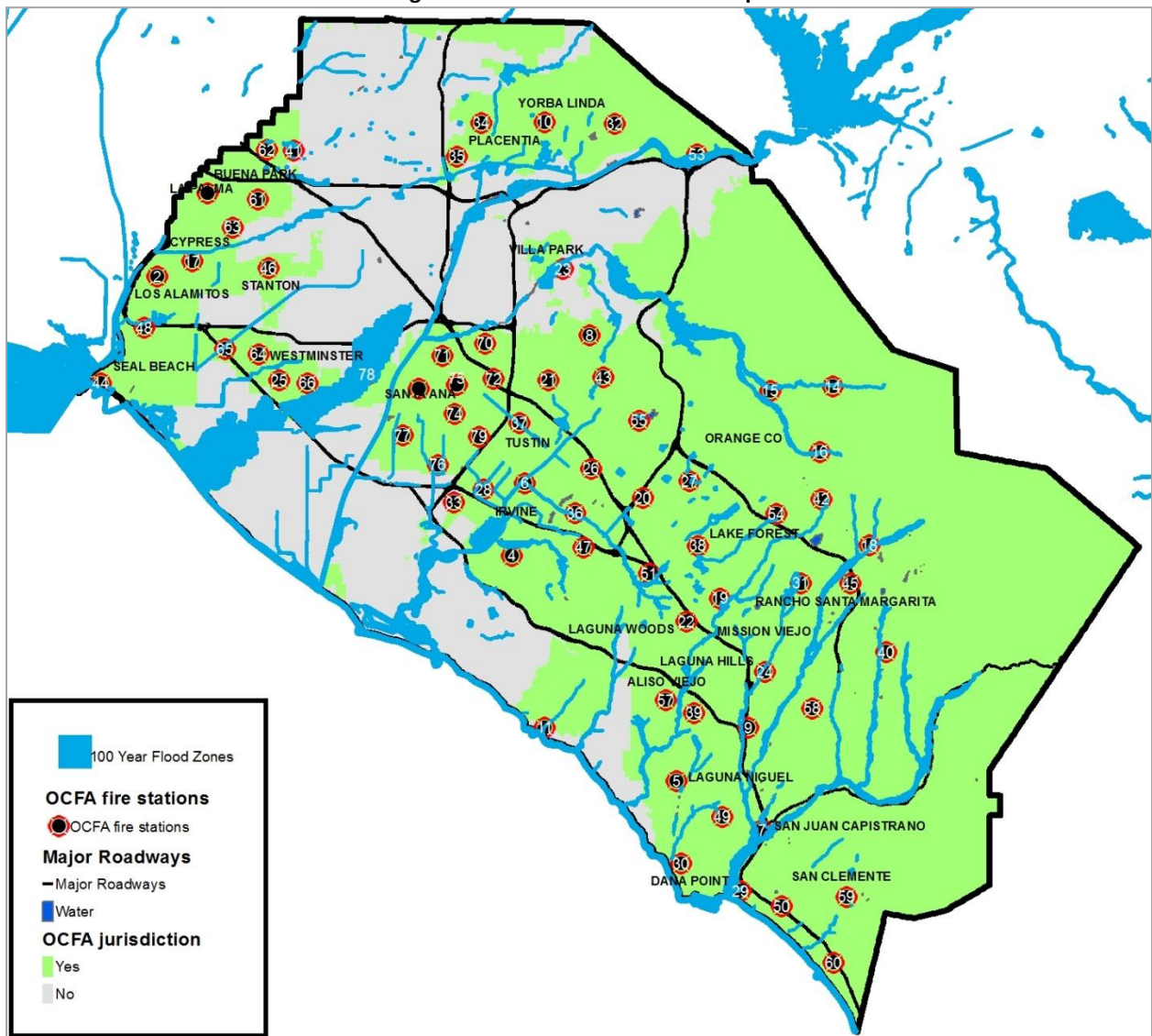
Orange County receives an average of 13 inches of rain per year; the US average is 37 inches. Snowfall is zero inches with the average US city getting 25 inches of snow per year. The number of days with any measurable precipitation is 33. On average, there are 278 sunny days per year in Orange County with

July average high temperatures of 82 degrees and the January average low temperature of approximately 42 degrees.

Orange County has a significant flood history. The first recorded flood in Orange County was in 1810. Floods have occurred in the county on a 20-30 year cycle since 1825. Floods and flood control have had a major impact on the development of Orange County. Significant incidents led to the formation of the Orange County Swift Water Rescue team and the consolidation of the swift water function with USAR trucks.

The following map illustrates areas at risk based on the FEMA 100 year flood map and the FEMA 100 year coastal flood map (based on a 1.4 meter rise in coastal waters).

Figure 15: 100-Year Flood Zone Map



Wildfire Risk

Orange County’s climate, vegetation, and topography coupled with shifting winds and the potential of Santa Ana winds make the risk of wildland fires real with the potential of significant destruction.

Historically, Orange County has experienced large, rapid moving, wildland fires on a regular basis. High temperatures, strong winds, and dry fuel loads can carry wildland fires into residential areas easily. The following figure illustrates areas of very high wildfire risk as identified by the California Department of Forestry and Fire Protection.

Figure 16: Wildland Fire History, 1950 – 2011

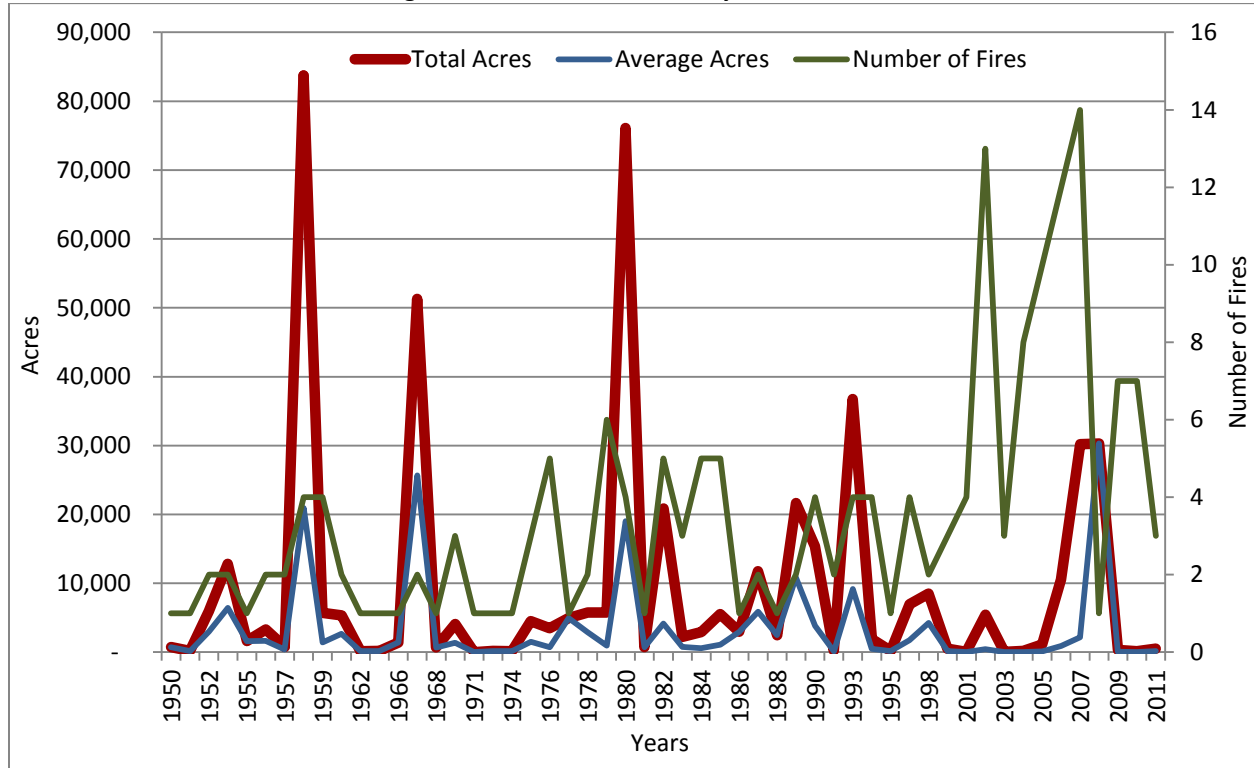
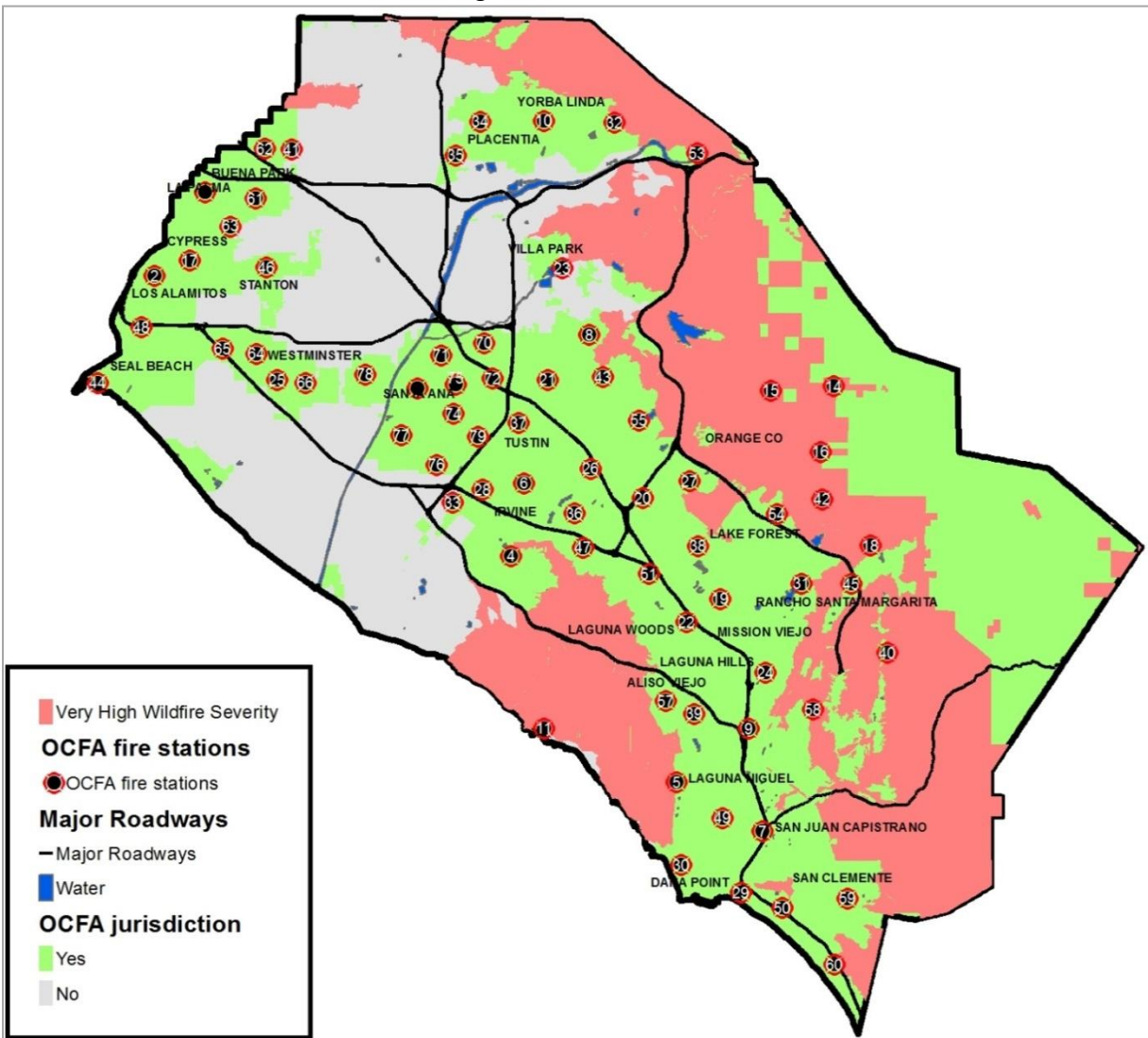


Figure 17: Wildland Fires 10,000 Acres or Greater, 1958 – 2008

Year	Name	Acres Consumed
1958	Stewart Fire	69,444
1958	Unnamed Fire	11,774
1967	Paseo Grande Fire	51,075
1980	Owl Fire	18,332
1980	Carbon Canyon Fire	14,613
1980	Indian Fire	28,983
1982	Gypsum Fire	20,142
1993	Ortega Fire	21,010
1993	Laguna Fire	14,337
2006	Sierra Peak Fire	10,515
2007	Santiago Fire	28,359
2008	Freeway Fire	30,306

Figure 18: Wildfire Risk

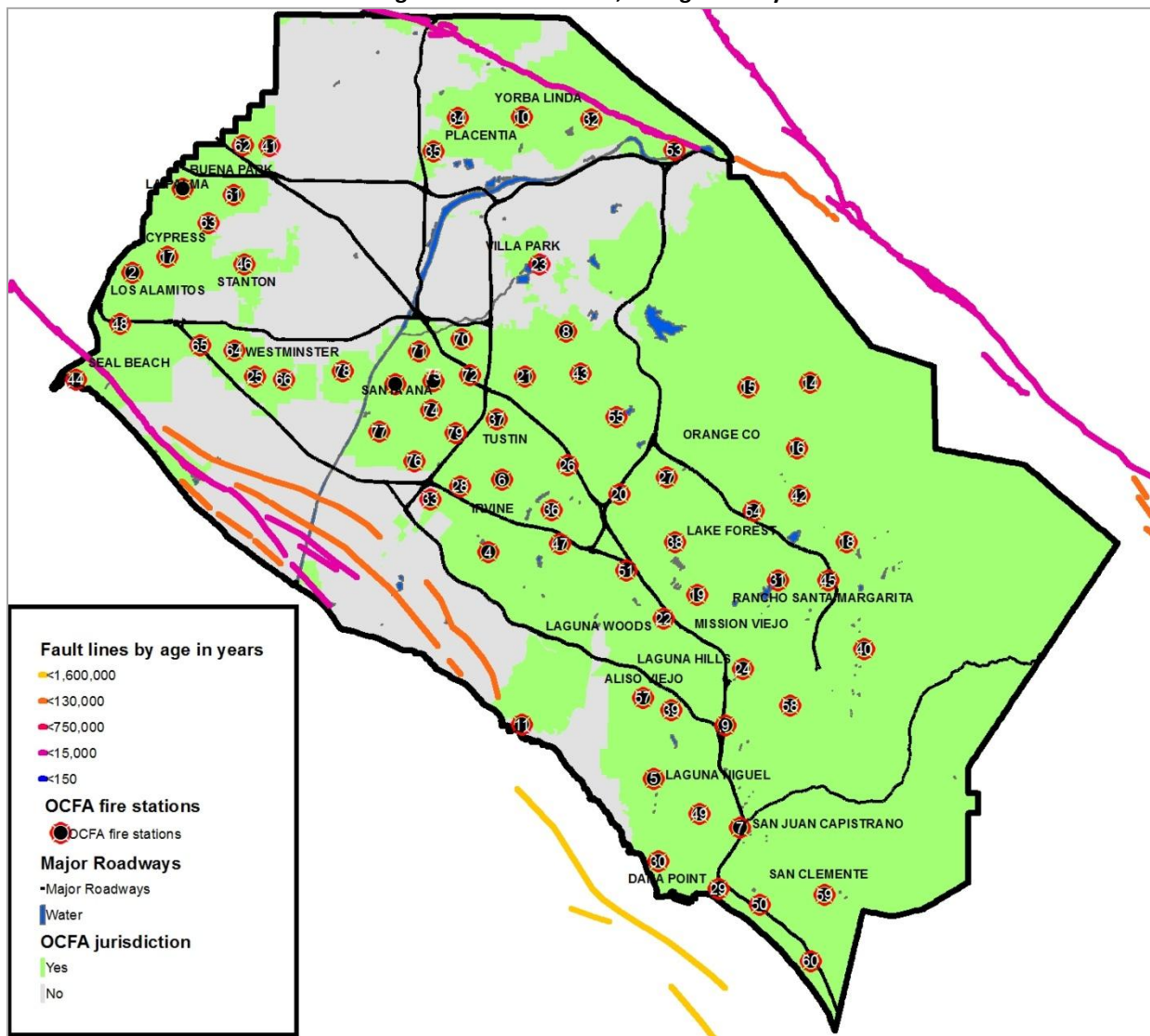


Geographic/Geological Risk

In Southern California, the last major earthquake on the San Andreas Fault was more than 150 years ago (1857), rupturing the fault from Central California to San Bernardino. At that time, few people lived in the area, so there was very little damage.

Further south along the San Andreas Fault, from San Bernardino through the Coachella Valley to the Salton Sea, more than 320 years have passed since the last major earthquake (around 1680). However, hundreds of additional faults that branch off the San Andreas Fault produce thousands of small to significant earthquakes each year. Examples include the 1994 Northridge and 1987 Whittier Narrows earthquakes. A fault map below shows where the ground has been broken by faults during earthquakes.

Figure 19: Active Faults, Orange County



Landslide

Several issues related to topography and soil conditions cause both potential risk and actual incidents. The most common risk is hillside instability or landslides. Areas of instability have caused many incidents where homes have fallen down the hillside. Most of the slides have been slow moving events that have not resulted in rescue situations; however, some have been rapid moving incidents, such as the mudslides in Laguna Canyon and the landslides in Bluebird Canyon, which resulted in major rescue efforts. The same slope features also impact the spread of wildland fires.

Elevation Changes

Orange County is bordered on the southwest by the Pacific Ocean, on the north by Los Angeles County, on the northeast by San Bernardino County and Riverside County, and on the southeast by San Diego County. The northwestern part of the county lies on the coastal plain of the Los Angeles Basin. The southeastern end rises into the foothills of the Santa Ana Mountains. Most of Orange County's population resides in one of two shallow coastal valleys that lie in the basin, the Santa Ana Valley and the Saddleback Valley. The Santa Ana Mountains lie within the eastern boundaries of the county and of the Cleveland National Forest. The high point is Santiago Peak (5,689 feet) about 20 miles east of Santa Ana. Santiago Peak and nearby Modjeska Peak, just 200 feet shorter, form a ridge known as Saddleback, visible from almost everywhere in the county. The Peralta Hills extend westward from the Santa Ana Mountains through the communities of Anaheim Hills, Orange, and end in Olive. The Loma Ridge is another prominent feature, running parallel to the Santa Ana Mountains through the central part of the county, separated from the taller mountains to the east by Santiago Canyon.

Transportation Risk

Major Highways

Surface transportation in Orange County relies heavily on three major interstate highways: the Santa Ana Freeway (I-5), the San Diego Freeway (I-405 and I-5 south of Irvine), and the San Gabriel River Freeway (I-605), which only briefly enters Orange County territory in the northwest. The other freeways in the county are state highways, and include the perpetually congested Riverside and Artesia Freeway (SR 91) and the Garden Grove Freeway (SR 22) running east-west, and the Orange Freeway (SR 57), the Costa Mesa Freeway (SR/SR 55), the Laguna Freeway (SR 133), the San Joaquin Transportation Corridor (SR 73), the Eastern Transportation Corridor (SR 261, SR 133, SR 241), and the Foothill Transportation Corridor (SR 241) running north-south. Minor stub freeways include the Richard M. Nixon Freeway (SR 90), also known as Imperial Highway, and the southern terminus of Pacific Coast Highway (SR 1). There are no U.S. Highways in Orange County, though two existed in the county until the mid-1960s: 91 and 101. Highway 91 went through what is now the state route of the same number, and 101 was replaced by Interstate 5. SR-1 was once a bypass of US-101 (Route 101A).

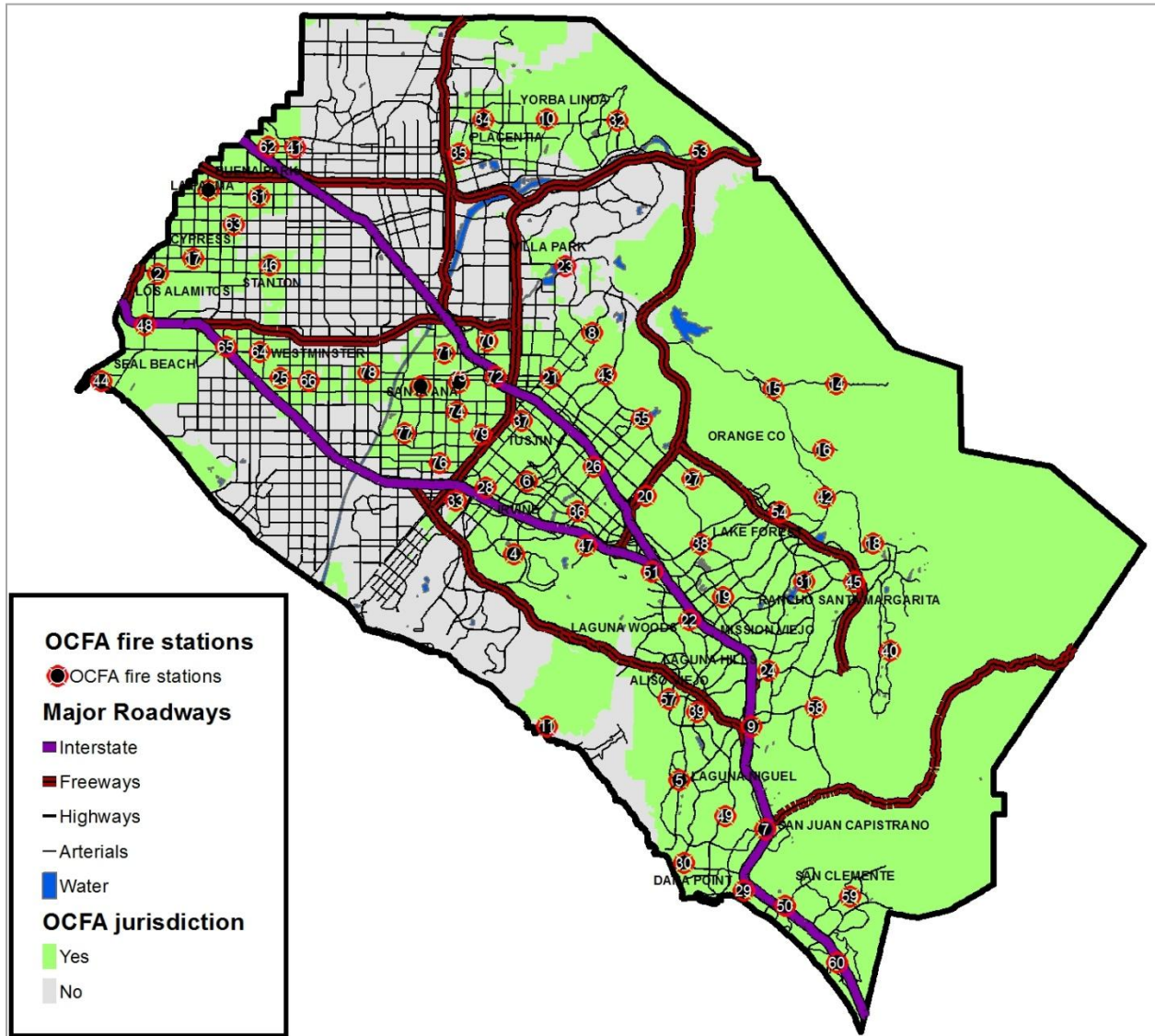
Roads

The street network is the backbone of an emergency response system. The network must be both efficient and effective in order to maximize emergency response. The best-case scenario is a network with direct routes and multiple points of entry. Orange County has a mix of good and bad areas with respect to overall traffic circulation but the street network generally works well. Lack of efficient circulation within a project, community or region can seriously degrade the ability of the Fire Authority to provide effective and rapid response. One of the biggest problems is the planning of a delivery system based on anticipated infrastructure not yet completed. A missing street at a critical point can completely change the service delivery area of a station and the effectiveness of the overall response. For example, removal of planned transportation corridors such as the extension of the 241 freeway or the previous master plan Crown Valley Parkway extension has adversely impacted fire service response.

Access issues fall into two categories; access in developed areas and access to wildland fires. The hillside and canyon areas have circulation issues with respect to emergency response. In many cases, it is not possible to access adjacent properties quickly due to the geographic features that have been preserved in the development. Topographic response barriers are prevalent in many areas served by the OCFA. Elevation changes and large open space impact the ability of emergency resources to reach the scene of an emergency in a timely manner. In some hillside communities, it is possible to see directly across a natural area to other homes or businesses, but actually driving time may take several minutes on narrow winding roads. These can be significant impediments to response.

Riparian areas and roadless areas may also play a significant role in the ability of the fire department to access fires quickly. These same access issues are also factors in remote rescue situations.

Figure 20: Arterial and Greater Roadways



Increases in traffic can become a significant negative factor that directly effects deployment. Traffic issues continue to increase in Orange County. Impacts are directly related to growth and demographic changes. Increased traffic presents distribution (initial response time) and concentration (multiple resource response) problems. If response times lengthen, the effective response area for each station is reduced. If multiple resources from multiple stations cannot arrive in an acceptable time frame, then more resources will be needed within the system.

Some traffic improvement options may actually reduce response times while others simply slow the negative impacts. Increased traffic decreases response performance and increases the potential for accidents. In some traffic situations, with raised center medians, units must simply turn off emergency lights and wait for the traffic to clear before proceeding.

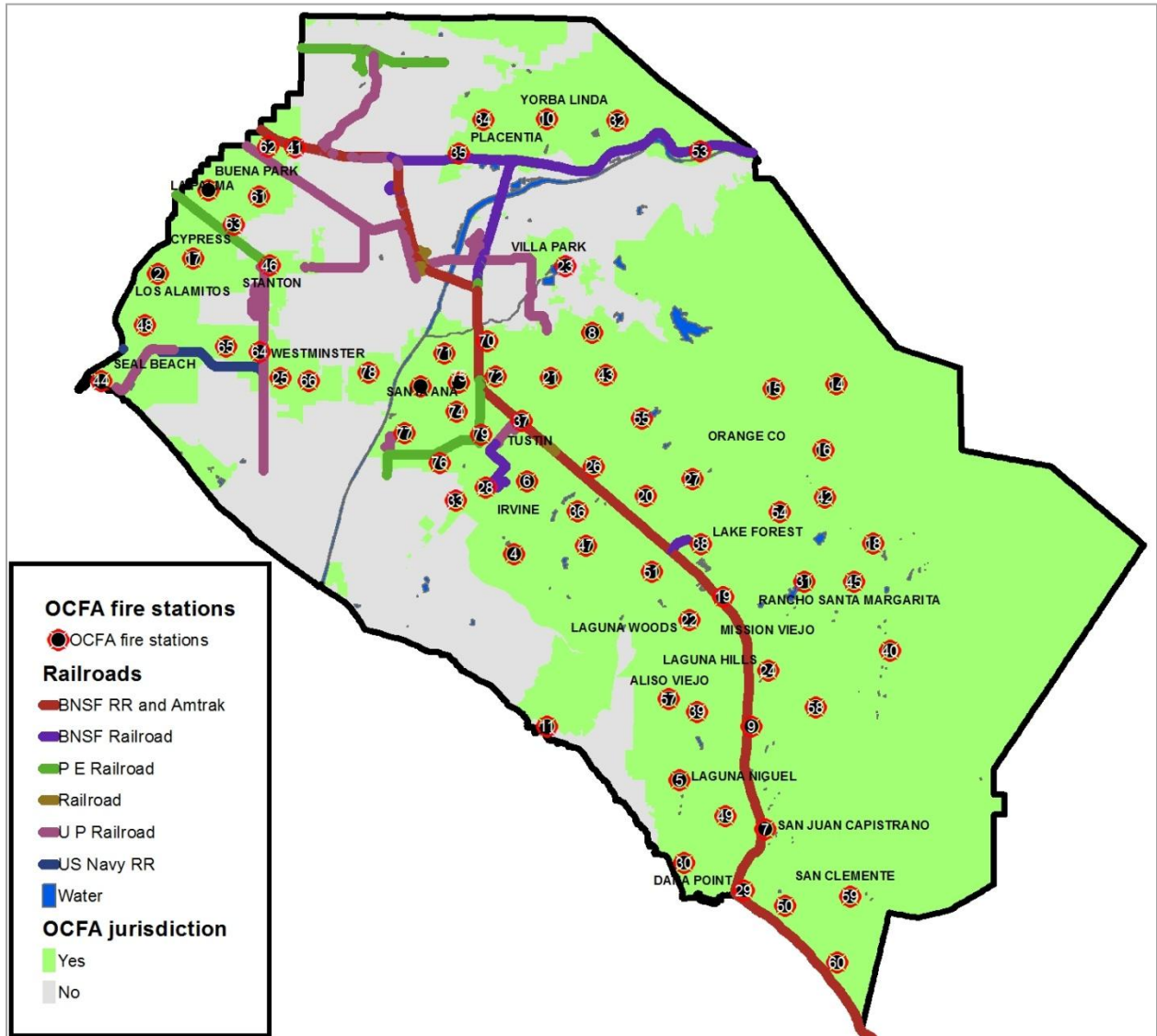
Rail

Metrolink operates three commuter rail lines through Orange County, and also maintains Rail-to-Rail service with parallel *Amtrak* service. On a typical weekday, over 40 trains run along the Orange County Line, the 91 Line and the Inland Empire-Orange County Line. Along with *Metrolink* riders on parallel *Amtrak* lines, these lines generate approximately 15,000 boardings per weekday. As ridership has steadily increased in the region, new stations have opened at Anaheim Canyon, Buena Park, Tustin, and Laguna Niguel/Mission Viejo. Plans for a future station in Placentia are underway which is expected to be completed by 2014.

The *Burlington Northern Santa Fe Railroad* and later *Amtrak*, have operated the *Pacific Surfliner* regional passenger train route through Orange County. The route contains stops at eight stations in Orange County including San Clemente, San Juan Capistrano, Laguna Niguel/Mission Viejo, Irvine, Santa Ana, Orange, Anaheim, and Fullerton.

Rail lines are an inherent risk due to the nature and volume of the materials transported. Much of the materials that are used in our society travel by rail. Large amounts of chemicals, flammables, toxics and people are transported daily on rail networks. While the number of incidents may be small, the consequences of a rail incident can be significant. This has been the case in Orange County with both freight and passenger rail incidents.

Figure 21: Rail Lines

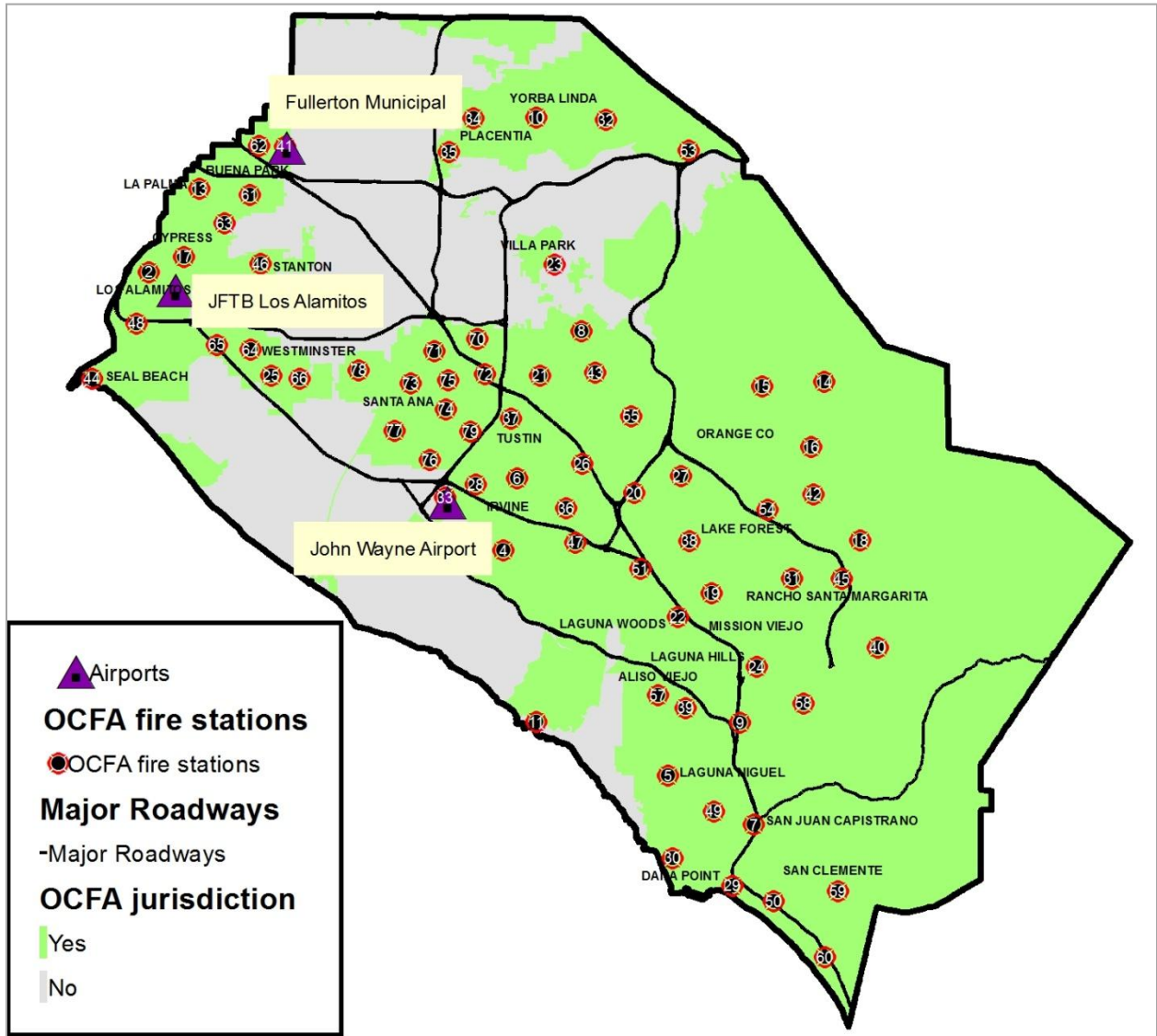


Airports

Orange County's only major airport is John Wayne Airport. Although the airport code (SNA) refers to Santa Ana, the airport is in fact located in unincorporated territory surrounded by the cities of Newport Beach, Costa Mesa, and Irvine. There are two other small airports, Fullerton Municipal and JFTB Los Alamitos. Airports have a low incident frequency but an even greater consequence when an incident occurs. The OCFA protects John Wayne Airport (SNA) and the majority of the area surrounding the airport and flight path. The risk associated with the airport extends far beyond the actual airport boundaries. According to statistics observed over a ten-year period (1995 to 2004) over half of the aircraft accidents occur during the final approach and landing while 38 percent occur during the takeoff and climb phase. Only 5 percent of accidents occur during the cruising phase of air travel. The result is that accidents will likely occur near, but not necessarily on, airport property.

In the past ten years, there have been 27 recorded aircraft incidents, four that involved substantial damage to the aircraft.

Figure 22: Orange County Airports

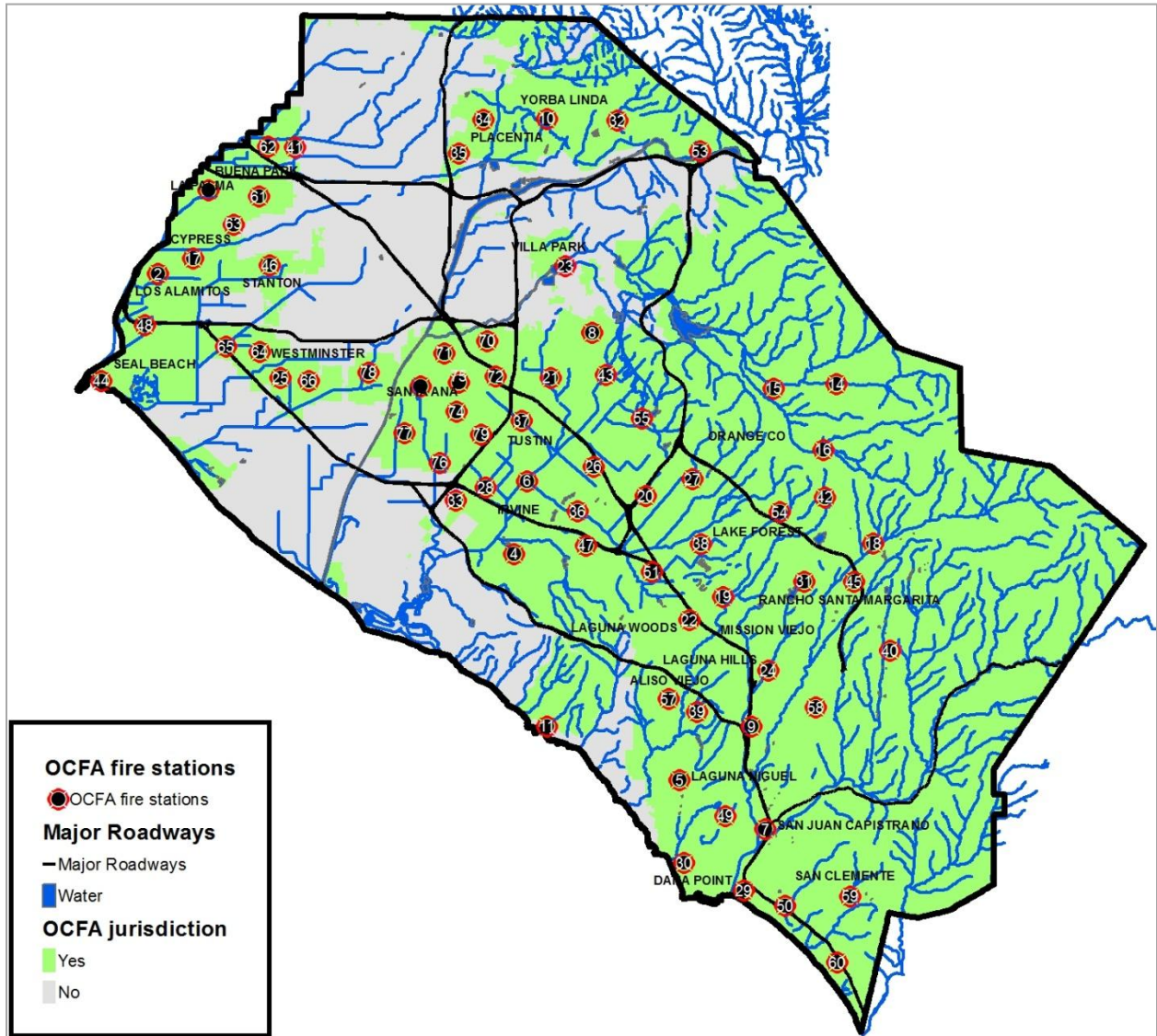


Waterways

In Orange County, the issue of waterways is not so much about the transportation of goods or people on the waterways as it is the impact of the waterways on the other transportation systems, namely the street network. The waterway features (rivers, bays, lakes, and ocean) are impediments to response in many cases. With limited points to cross these features, they cause inefficiencies that greatly impact the ability of emergency resources to service areas that would otherwise be accessible in terms of time and distance from fire stations.

The Santa Ana River is the county's principal watercourse, flowing through the middle of the county from northeast to southwest. Its major tributary to the south and east is Santiago Creek. Other watercourses within the county include Aliso Creek, San Juan Creek, and Horsethief Creek. In the north, the San Gabriel River also briefly crosses into Orange County and exits into the Pacific on the Los Angeles-Orange County line between the cities of Long Beach and Seal Beach. Laguna Beach is home to the county's only natural lakes, Laguna Lakes, which are formed by water rising up against an underground fault.

Figure 23: Waterways



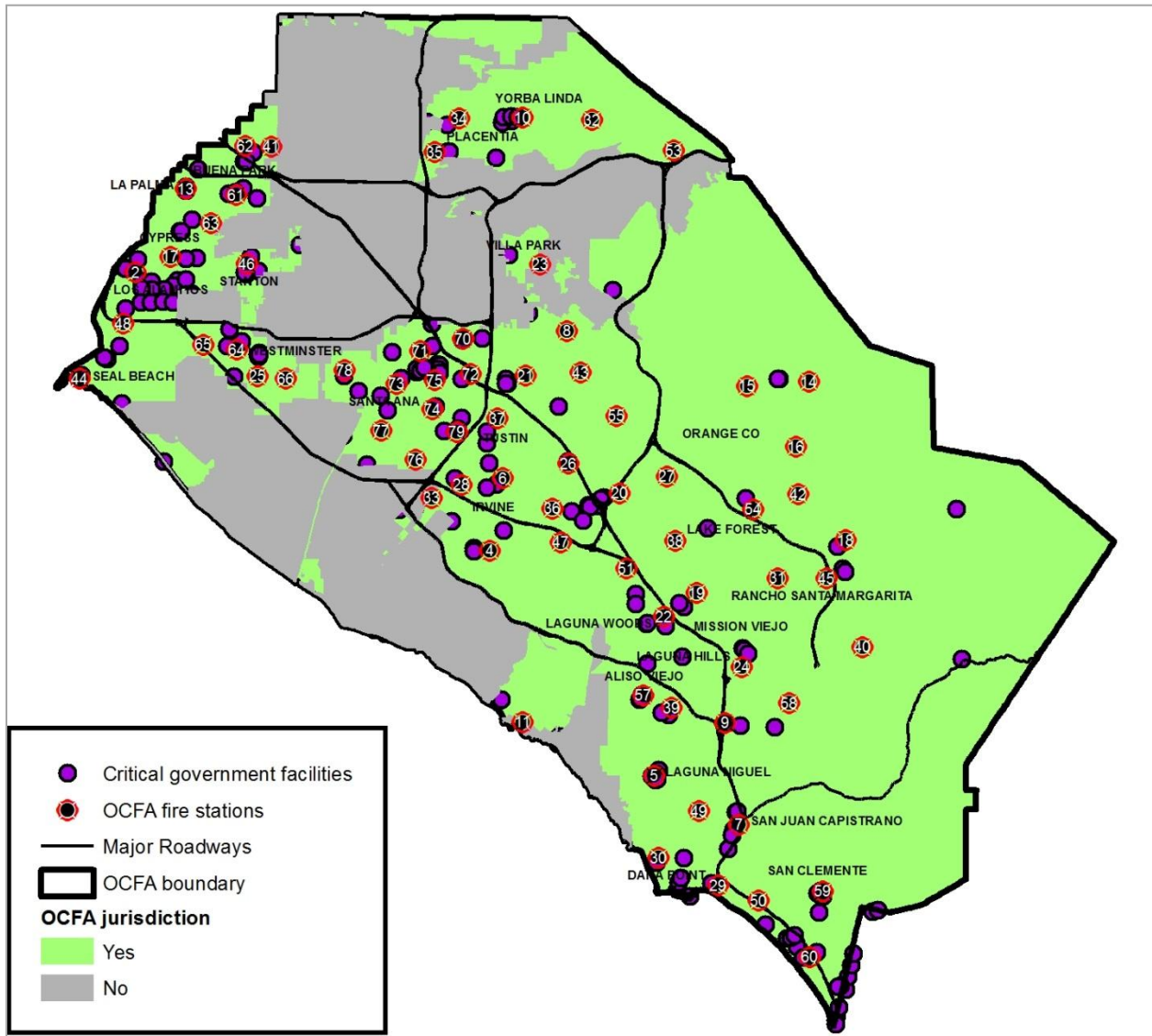
Physical Assets Protected

Government Buildings

There is a variety of government buildings in OCFA considered important to providing critical services to the community in times of disaster. Buildings such as city halls, fire stations, federal, state, and county offices, police stations, and the like provide important services to the community. There are more than 190 government buildings in the OCFA service area.

The following map shows the locations of some of the important government buildings within and near the OCFA service area.

Figure 24: Critical Government Facilities

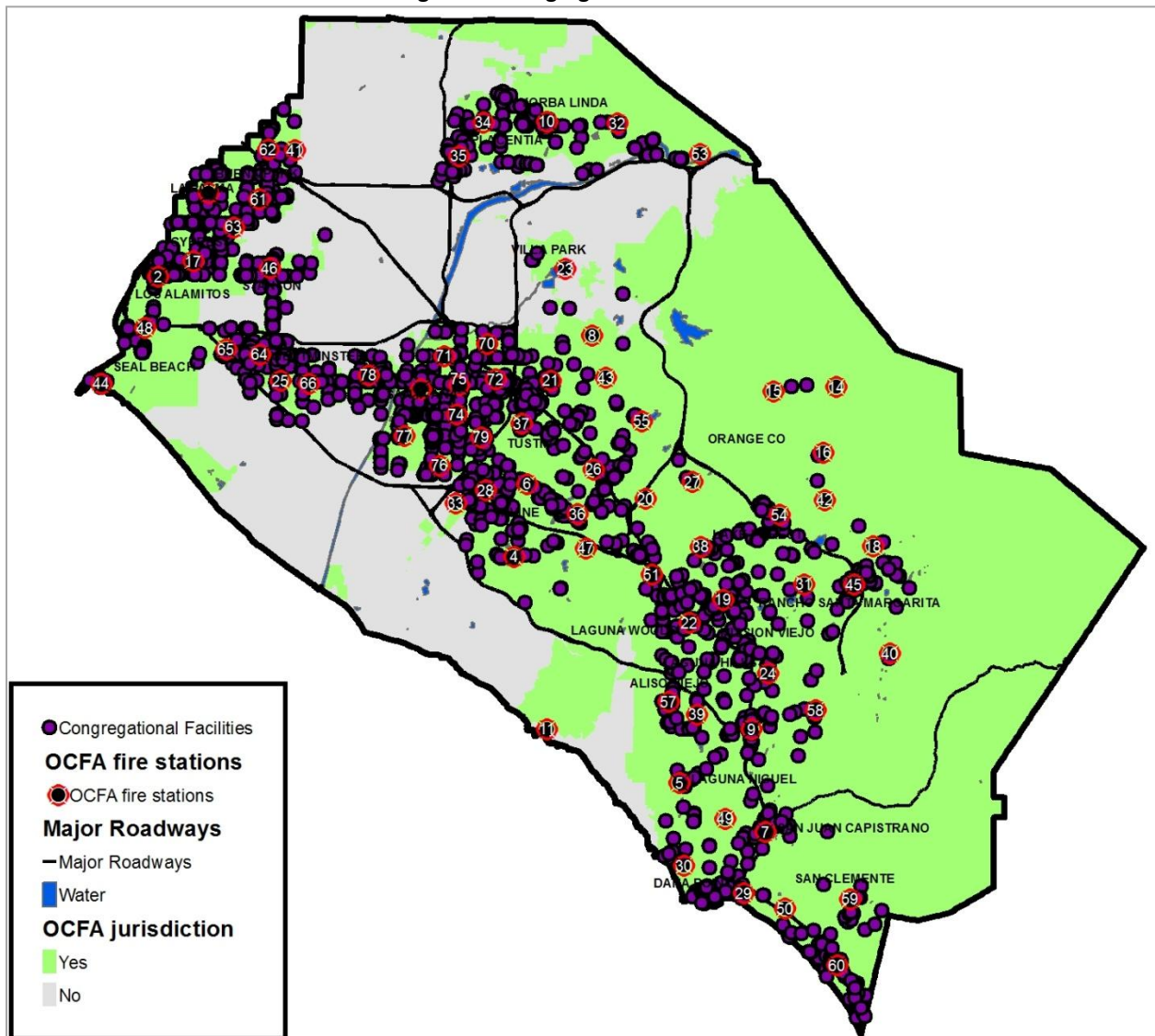


Congregational

Numerous buildings lie within the OCFA service area in which large numbers of people gather for entertainment, worship, and such. A variety of nightclubs, theatres, and other entertainment venues exist in the downtown area. There are more than 3,700 identified congregational facilities in the OCFA service area.

These facilities present additional risk, primarily for mass casualty incidents. Fire, criminal mischief, and potentially terrorism, could cause a major medical emergency requiring significant emergency resources. The following map shows the locations of congregational facilities.

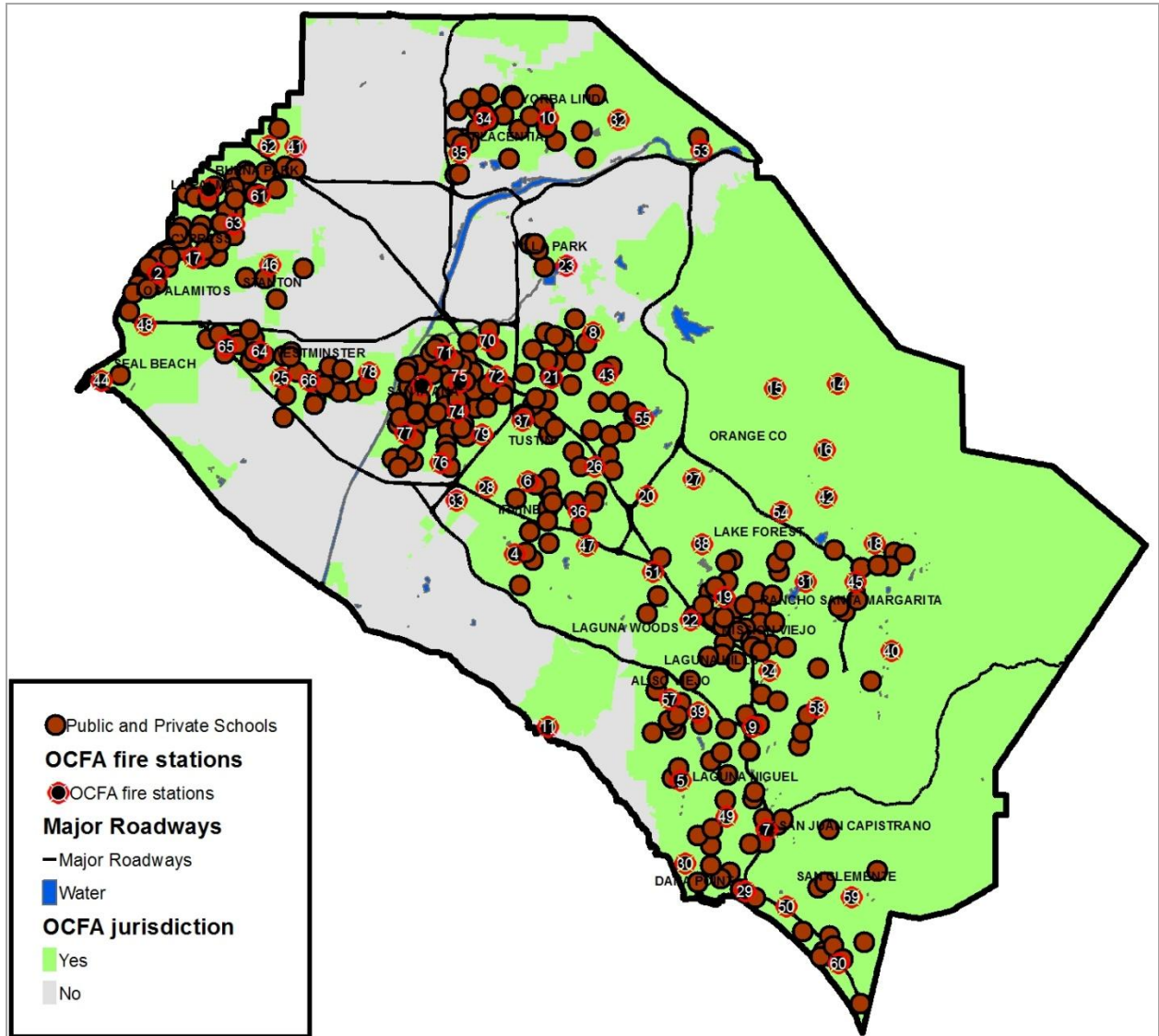
Figure 25: Congregational Facilities



Schools

School-age students in the area are served by 21 separate school districts. The service area encompasses a total of 516 public and private school facilities (including colleges and universities). Schools represent a significant risk because of the large numbers of children and students each houses.

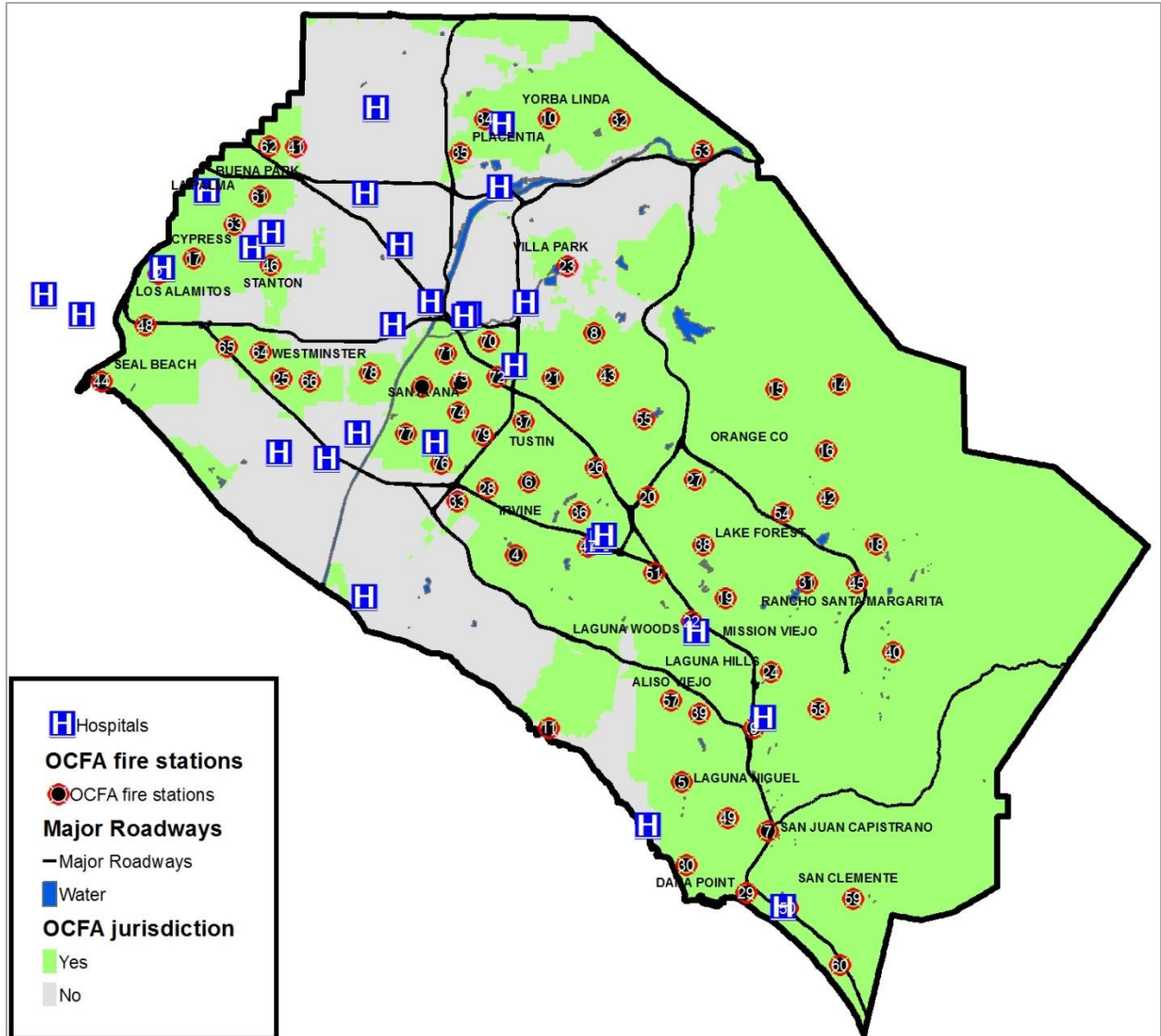
Figure 26: Public and Private School Facilities



Hospitals

The OCFA service area is home to 14 paramedic-receiving hospitals and trauma centers. Though medical facilities and hospitals are constructed to a high degree of quality and safety, fire resistance problems can still occur that threaten a particularly vulnerable population. The following map shows the location of many of these important community resources.

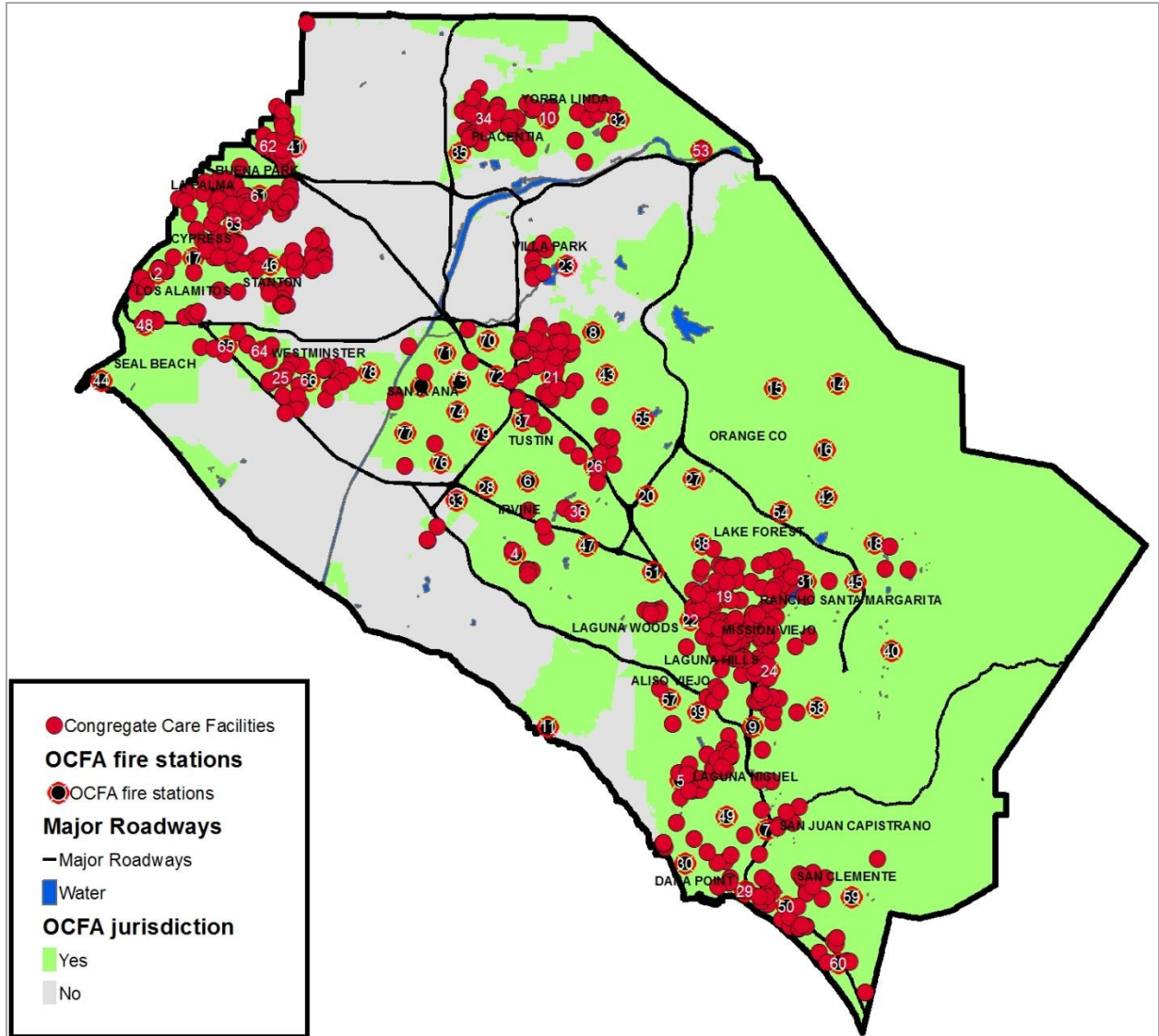
Figure 27: Paramedic-Receiving Hospitals and Trauma Centers



Congregate Care Facilities

Distributed throughout the OCFA service area are facilities dedicated to the 24 hour care of the infirm and elderly. These facilities also present significant risk to a vulnerable population in the event of an emergency. The following map shows the locations of congregate care facilities of four or more residents (as of this writing, there are approximately 890 facilities in the OCFA service area).²⁰

Figure 28: Congregate Care Facilities



²⁰ There is a confidential list of medical facilities, care facilities, and homes located in the service area on file with OCFA.

Other Critical Infrastructure

Water Distribution

An obvious concern to the OCFA is the reservoir, water main, and fire hydrant system. Providing sufficient storage, distribution, and access to this valuable firefighting resource through well-distributed fire hydrants is very important.

The last Insurance Services Office (ISO) review of the water systems within OCFA was in 2000. At that time, ISO gave the water systems credit ranging from 27.94 percent to 36.99 percent out of 40 percent indicating that the systems provide good to very good delivery of firefighting water supply.

Communications

Emergency communication centers and the associated transmitting and receiving equipment are essential facilities for emergency response. OCFA provides emergency call receipt and dispatch service for itself. This center provides for the receipt of 9-1-1 calls for help, dispatching of fire and other emergency responders, and important support to the incident management function. There are other communication facilities and equipment that are equally important to the community and government operations. These are the telephone company central offices and the transmission lines of local telephone providers. Internet service providers, along with wireless cellular communication providers, provide essential communication capabilities for the community as well as emergency personnel through their facilities and equipment.

Energy

Previously discussed community services, from communications to traffic signals to normal operations, require the use of energy. Whether it is electricity generation and transmission systems, fuel distribution and storage tanks, or natural gas pipelines and regulator stations, the community is dependent upon energy sources.

Nuclear Risk

The San Onofre Nuclear Generating Station (SONGS) is located next to San Onofre State Beach, which adjoins the Camp Pendleton U.S. Marine Corps Base in northern San Diego County just south of Orange County. Large portions of South Orange County are within the identified Emergency Planning Zone for the plant. The plant contains three nuclear reactors. Unit 1 was retired in 1992 after 25 years of service and is currently being decommissioned.

Southern California Edison states the station was “built to withstand a 7.0 magnitude earthquake directly under the plant.” Additionally, there is a 25-foot tsunami wall to protect the plant from a rogue wave that could be potentially generated by the active fault five miles offshore.

The plant's remaining two reactors (Units 2 and 3) have been shut down since January 2012 due to premature wear found on tubes in steam generators, which apparently contributed to the accidental release of a small amount of radioactive steam. As of this writing, plant officials are in process of closing the facility.

Bridges

These structures provide essential crossings and unimpeded travel across physical and man-made barriers. In the event of an emergency, these are crucial as evacuation routes as well as for aid supplies to be brought into the area. Given the level of earthquake risk in this region, reinforcement of bridges is essential to preserve routes of transportation for emergency relief supplies. The OCFA service area has numerous bridges mostly associated with freeway and rail line crossings. Most Cal-Trans maintained bridges have been seismically retrofitted; five bridges within the OCFA service area are scheduled for retrofitting within the next four years (Oso Creek, Valley View Street, Route 91/39 separation, MacArthur Boulevard, and Bear Street).

Terrorism

In Orange County there exists the risk of an individual or group of individuals using force or violence against persons or property in violation of the criminal laws of the United States. This typically is done for the purposes of intimidation, coercion, or ransom. There is not a consistent and shared definition of terrorism risk. Estimating terrorism risk requires treatment of numerous, large uncertainties. There is no existing framework for selecting and combining risk indicators.

OCFA is a partner of the Orange County Joint Terrorism Task Force (JTTF). The JTTF is tasked with collecting, analyzing and sharing critical information and intelligence involving matters related to any terrorism investigation occurring in or affecting the Orange County area.

Structural Risks

Information relative to specific buildings that present a structural risk is contained in the OCFA's occupancy database and from the Insurance Services Office (ISO) individual occupancy database.

Pipelines

Throughout the OCFA service area are pipelines that carry natural gas and combustible and flammable liquids. Though primarily underground, these pipelines present risk. Ruptures due to system failures or mechanical damage can create a significant fire event. Ruptures of the pipelines have occurred in the OCFA service area.

The following maps illustrate the locations of natural gas and petroleum pipelines.

Figure 29: Natural Gas Pipeline Map

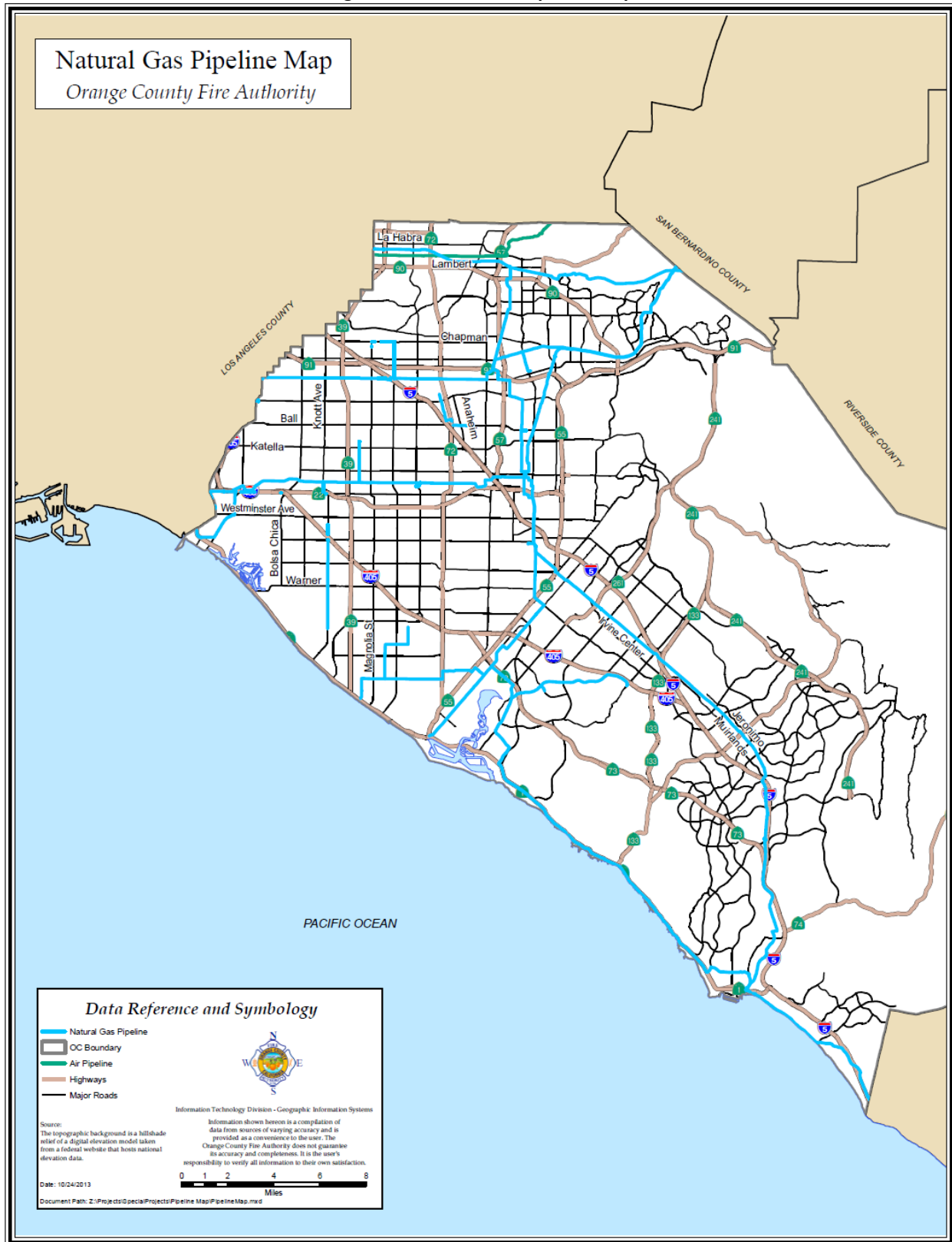
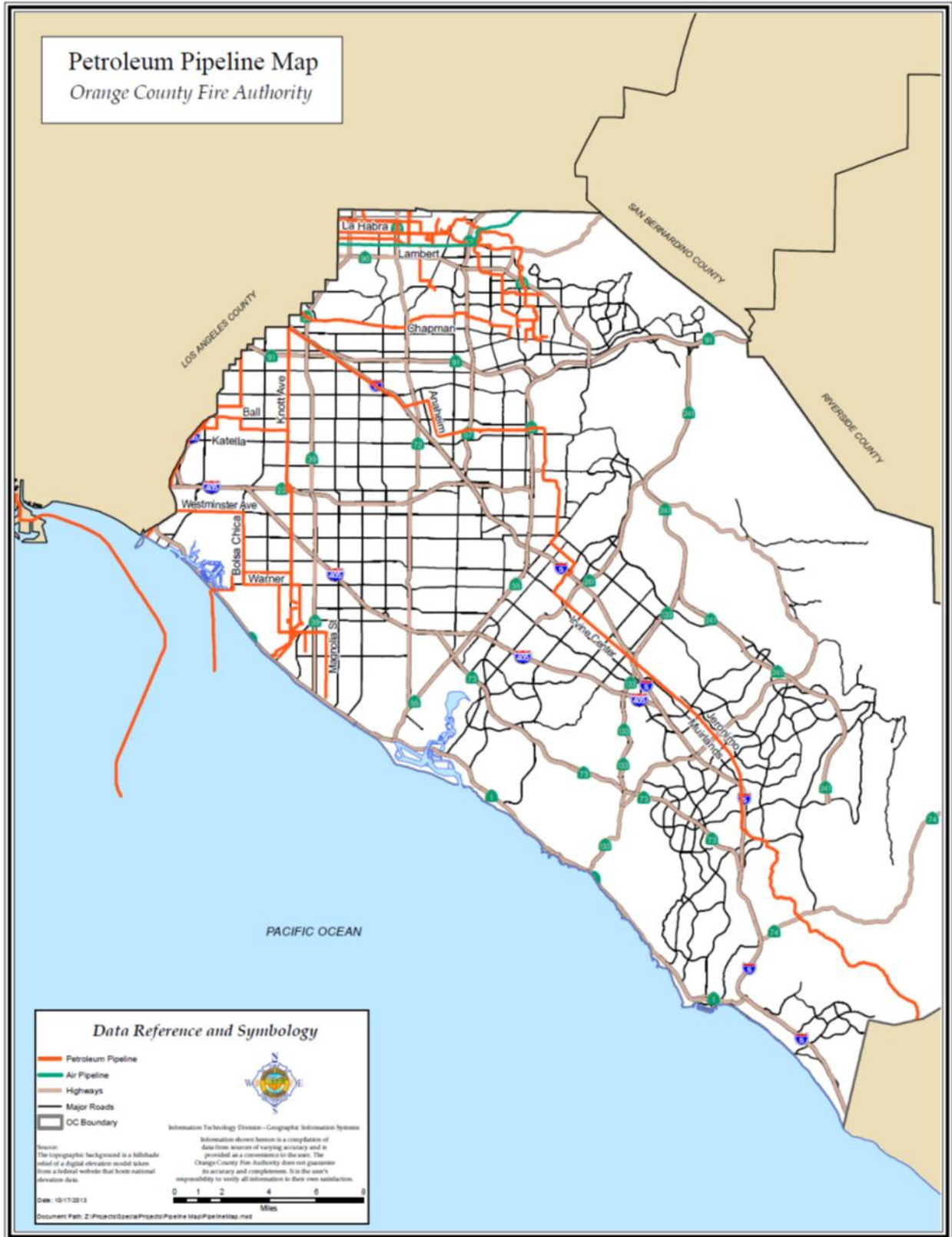


Figure 30: Petroleum Pipeline Map

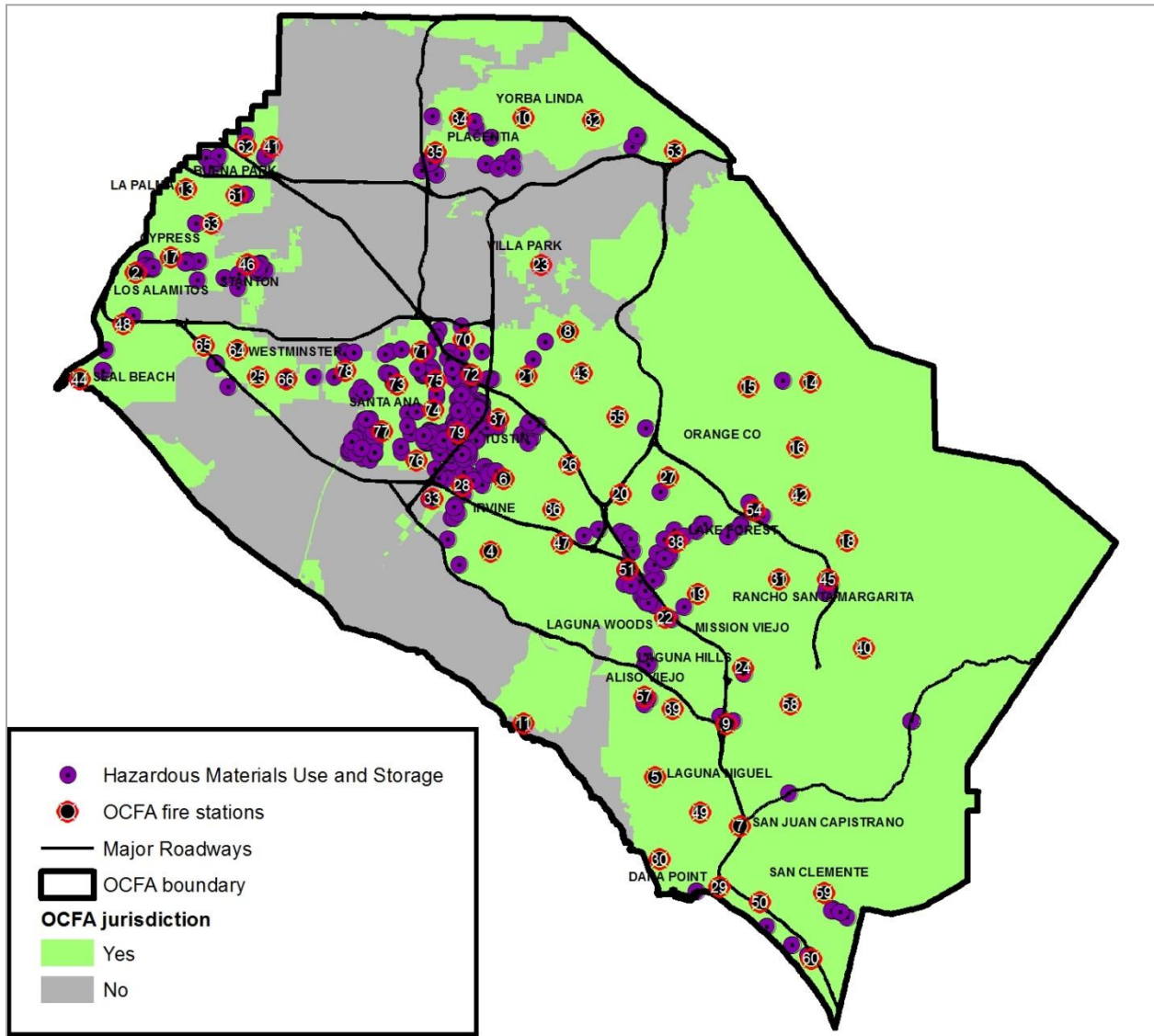


Hazardous Materials

Buildings that have been identified as containing hazardous materials can create a dangerous environment to the community as well as the firefighters present during a spill or fire. Special equipment such as protective clothing and sensors, along with specialized training, is necessary to successfully mitigate a hazardous materials incident.

The OCFA operates a hazardous materials response team capable of conducting “A” level intervention (typically the highest level of emergency response service). The following map shows the locations of facilities classified as hazardous use materials and storage sites by the OCFA.

Figure 31: Hazardous Materials Use and Storage Sites

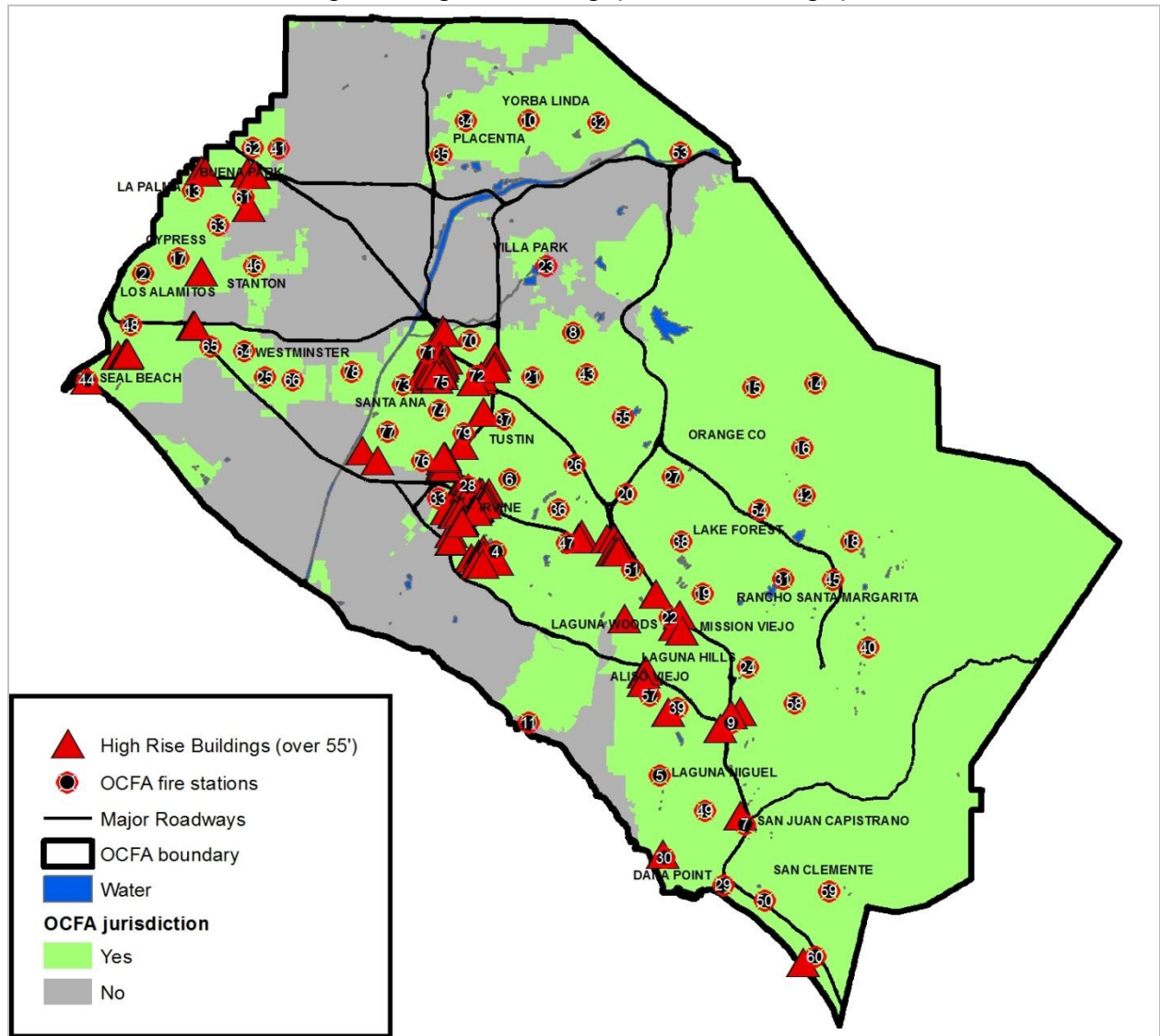


Multi-Storied Buildings

The height of buildings is also a factor in assessing risk. There is a direct relationship between height and the equipment and personnel needed to protect the building. For example, the roof of most three-story buildings cannot be accessed with a 24-foot ladder standard on many of the OCFA engine companies. An aerial ladder truck may be needed. In addition, ISO rating guidelines call for an aerial ladder truck for areas with buildings three or more stories in height.

High-rise buildings, those buildings having floors used for human occupancy located more than 55 feet above the lowest floor level having building access (approximately six stories), present a particular challenge to firefighters. In order to transport equipment needed for firefighting to upper floors, additional personnel are needed early in the incident. In addition, aerial ladder trucks typically cannot reach beyond the fifth floor. The following map shows the locations of most high-rise buildings

Figure 32: High Rise Buildings (over 55 feet in height)



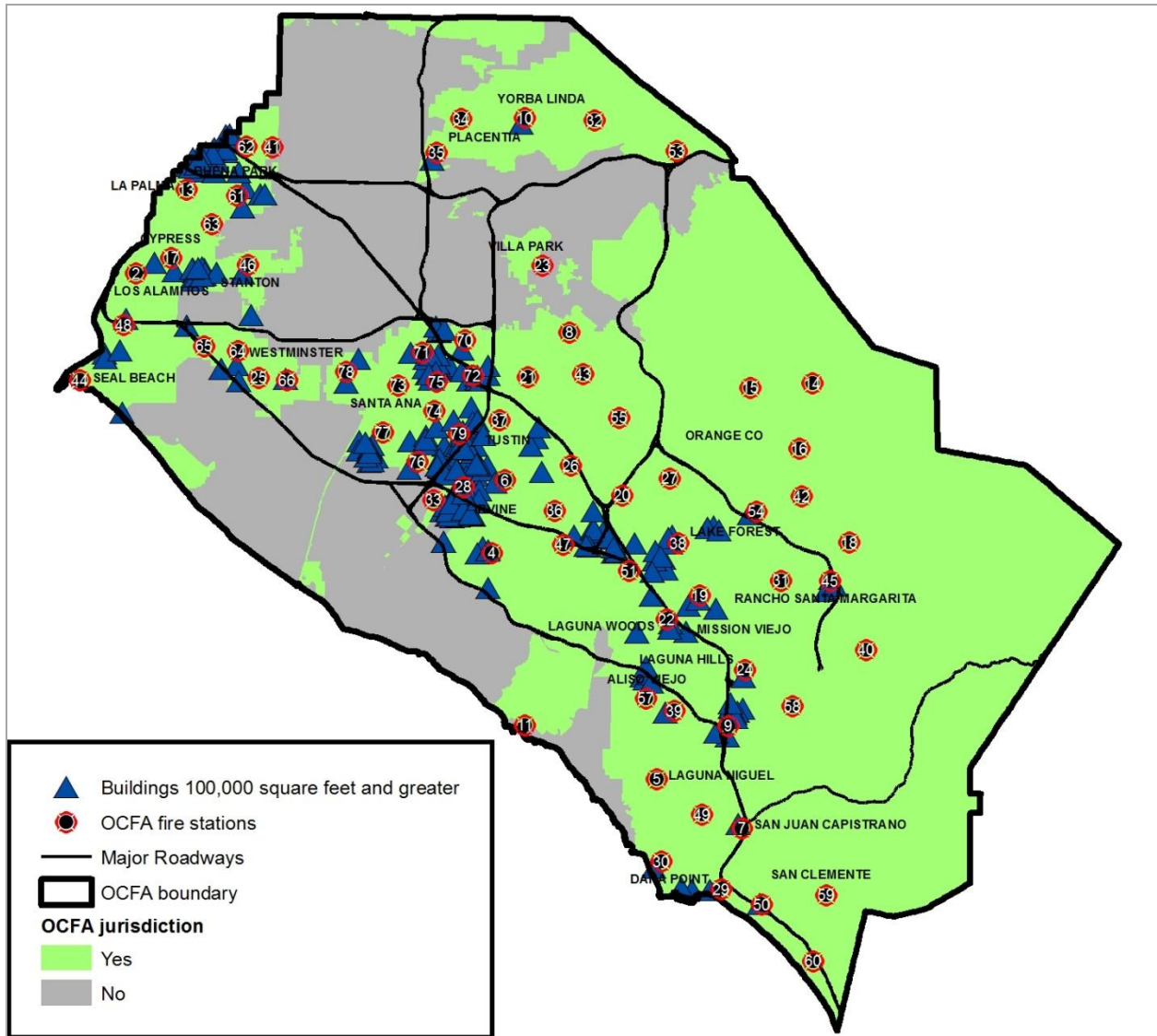
Age/Construction type

Structure fire risk assessment is performed on the community's building stock. According to 2010 Census data, the OCFA has 573,302 housing units. Only 2.5 percent of the total housing units were built before 1940 and half of the housing stock was built in the 1960s and 1970s. The actual inventory of building stock within the Fire Authority ranges from historical adobe homes to high-rise buildings of up to 20 stories. The majority of large commercial structures are protected with fire sprinkler systems. Residential dwellings in some areas are protected with residential sprinkler systems, however, most are not.

Large Square Footage Buildings

Large buildings, such as warehouses, malls, and large 'box' stores typically require greater volumes of water for firefighting and require more firefighters to advance hose lines long distances into the building. The following map shows the locations for buildings 100,000 square feet and larger.

Figure 33: Buildings 100,000 Square Feet and Larger

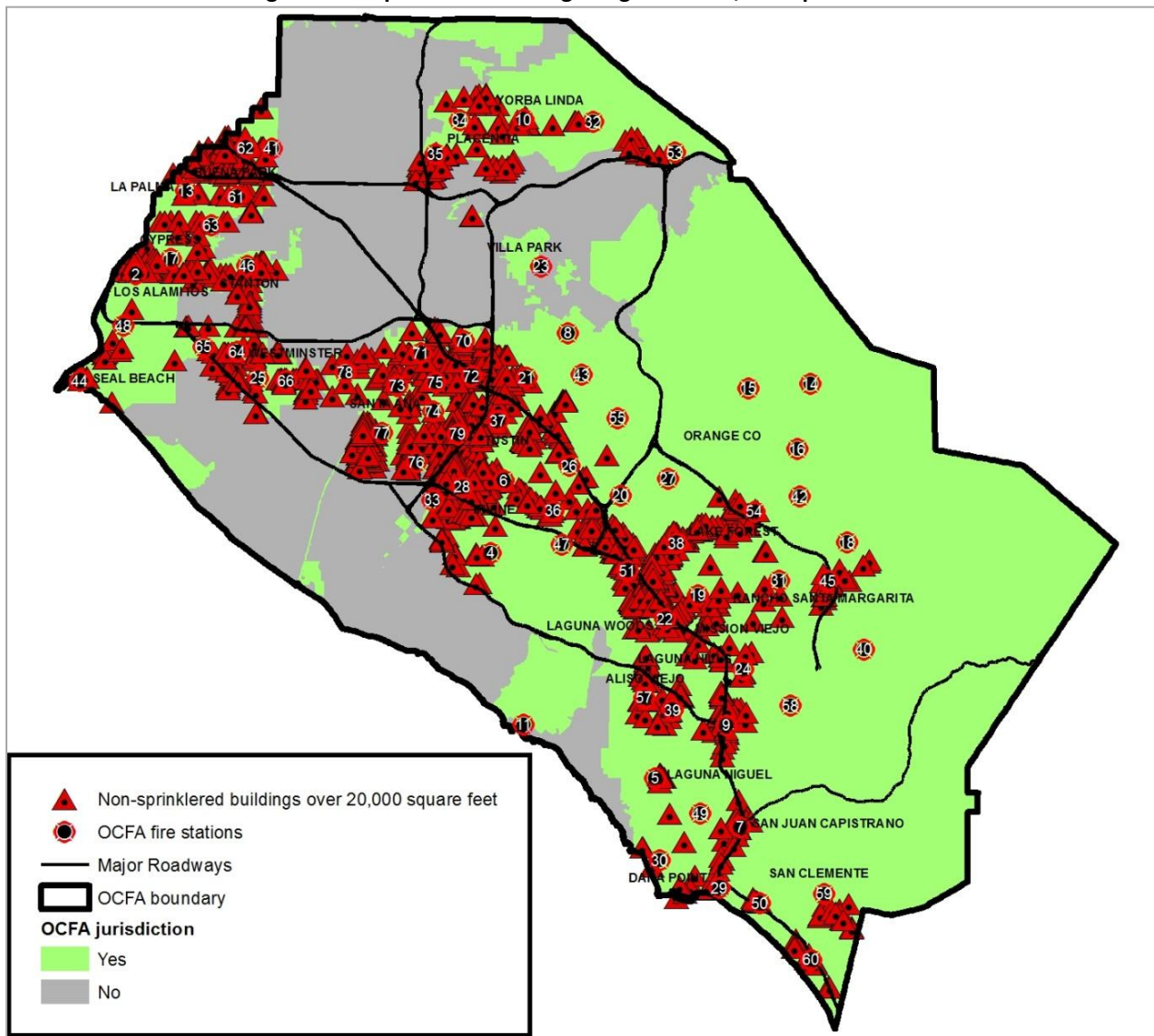


Built-in protection

Built-in fire protection (fire sprinklers) provides significant benefit to a building’s fire resistance. Modern building codes require fire suppression systems in many buildings. In many communities, developers and builders are given “credit” for built-in protection by allowing narrower streets, longer cul-de-sacs, larger buildings, and/or smaller water mains for new residential developments. While built-in fire protection should significantly reduce the spread of fire, it may not extinguish the fire. Firefighters still need to complete the extinguishment and perform ventilation, overhaul, and salvage operations.

The OCFA service area contains many larger buildings that do not have built-in fire suppression systems. The following map shows buildings larger than 20,000 square feet that are not protected by fire suppression sprinkler systems.

Figure 34: Unprotected Buildings Larger than 20,000 Square Feet



Access issues

Changes in types of development are happening in Orange County. Land values have risen to a point where developers are beginning to use housing/building configurations in Orange County that have not been used to any real extent previously. Each presents a unique challenge to fire suppression operations. Examples include:

1. The “wrap,” which is a parking structure with living or work areas on three or more sides of the parking structure.
2. “Podium” style construction with parking areas below the living or work areas.
3. The “Row House” which is a continuous structure for major portions of a block where there is no access from front to back without going through or around the structure.
4. Mid-rise and high-rise residential structures.
5. Limited road infrastructure in several rural and wilderness areas.

Community Risk Reduction Strategies

In an effort to reduce some of the risks typically found in the community, OCFA has developed a series of collaborative educational programs to assist its citizenry. These public safety programs include:

Smoke Alarm Program

OCFA's Smoke Alarm Program delivers smoke alarm education messages rapidly and effectively. This program ensures that more of Orange County is safer from the negative impact of fire in residential properties due to the increase of working smoke alarms through residents taking the responsibility to maintain them.

Cooking Fire Program

The Residential Cooking Fire Program incorporates multiple integrated strategies to prevent and mitigate residential cooking fire risks. The program is designed to educate community leaders and members about cooking fire risks, how to cook safely, and how a safe and appropriate response to cooking fires can reduce fatalities, injuries, and property damage.

Multifamily Risk Reduction Program

The Multifamily Risk Reduction Program targets occupants and property owners/managers with fire and life safety messages designed to change behavior or otherwise reduce losses in multifamily occupancies. The messages are delivered through an interactive web based program called, "OC Safe Apartments" and initially targets known fire risks. Over time, the program will be expanded to include other high-risk life safety issues.

Ready, Set, Go!

This collaborative program focuses on changing the wildfire risks in communities through engaging the community members to accept personal responsibility for mitigating their own wildfire risk. This community-specific program utilizes educational, engineering, enforcement, emergency response, and economic incentive solutions to decrease injuries, death, property loss, and environmental loss. OCFA will host the first community live action evacuation drill to help residents test their preparedness, identify areas for improvement, and continue expanding the practice so no lives are lost when a wildfire strikes.

Swimming and Drowning Program

Children drown without a sound, learning the ABC's of pool safety could help prevent this senseless tragedy. Drowning is the nation's number one killer of children under the age of 5 and it is the second leading cause of death from unintentional injuries for ages 1 to 14. The majority of these accidents occur in residential swimming pools and spas. The OCFA along with the other fire agencies support the ABC's of pool safety.

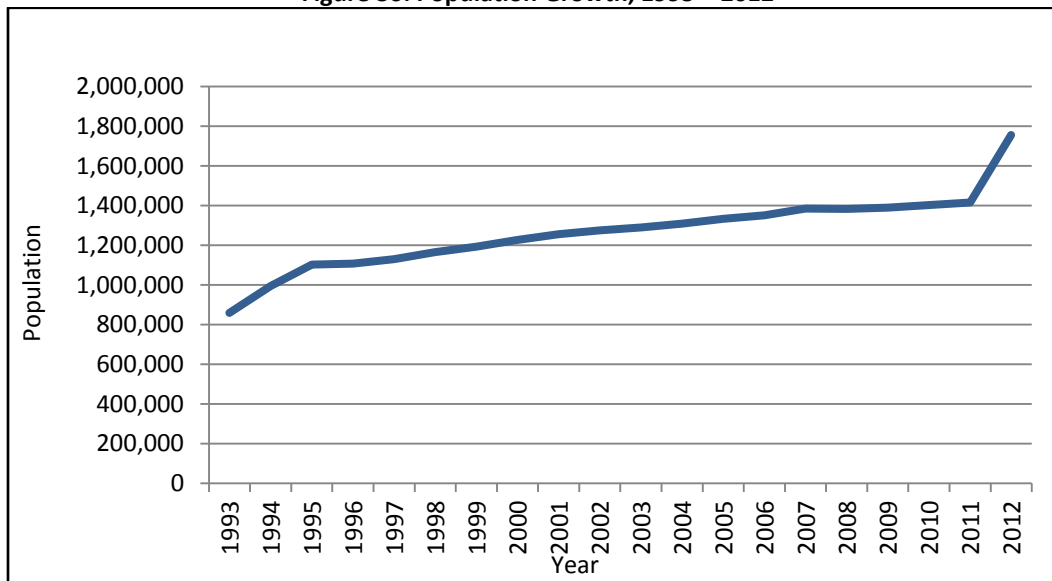
Development and Population Growth

Current Population/Population Growth

A review of the Southern California Association of Governments (SCAG) data on population growth indicates that Orange County will increase by 26 percent to nearly 3.7 million people by 2050, a 0.7 percent annual growth rate. Population has a direct correlation on risk. The OCFA has a correlation of 0.9899 for emergency calls for service shown in relationship to population served. This means that population almost exclusively drives emergency events. High-density population areas, including high-rise residential dwellings, increase the risk associated with that service area. The more people in a given service area, the more incidents, or calls, are generated. Density is increasing throughout Orange County, and higher concentrations of population are appearing in areas that historically have not had population centers. Examples include the infill development in the Irvine industrial area and the older commercial areas such as Buena Park and Lake Forest.

The following figure shows the growth in population within OCFA's service area. The sharp increase between 2011 and 2012 is due to the inclusion of the City of Santa Ana in OCFA's service area.

Figure 36: Population Growth, 1993 – 2012



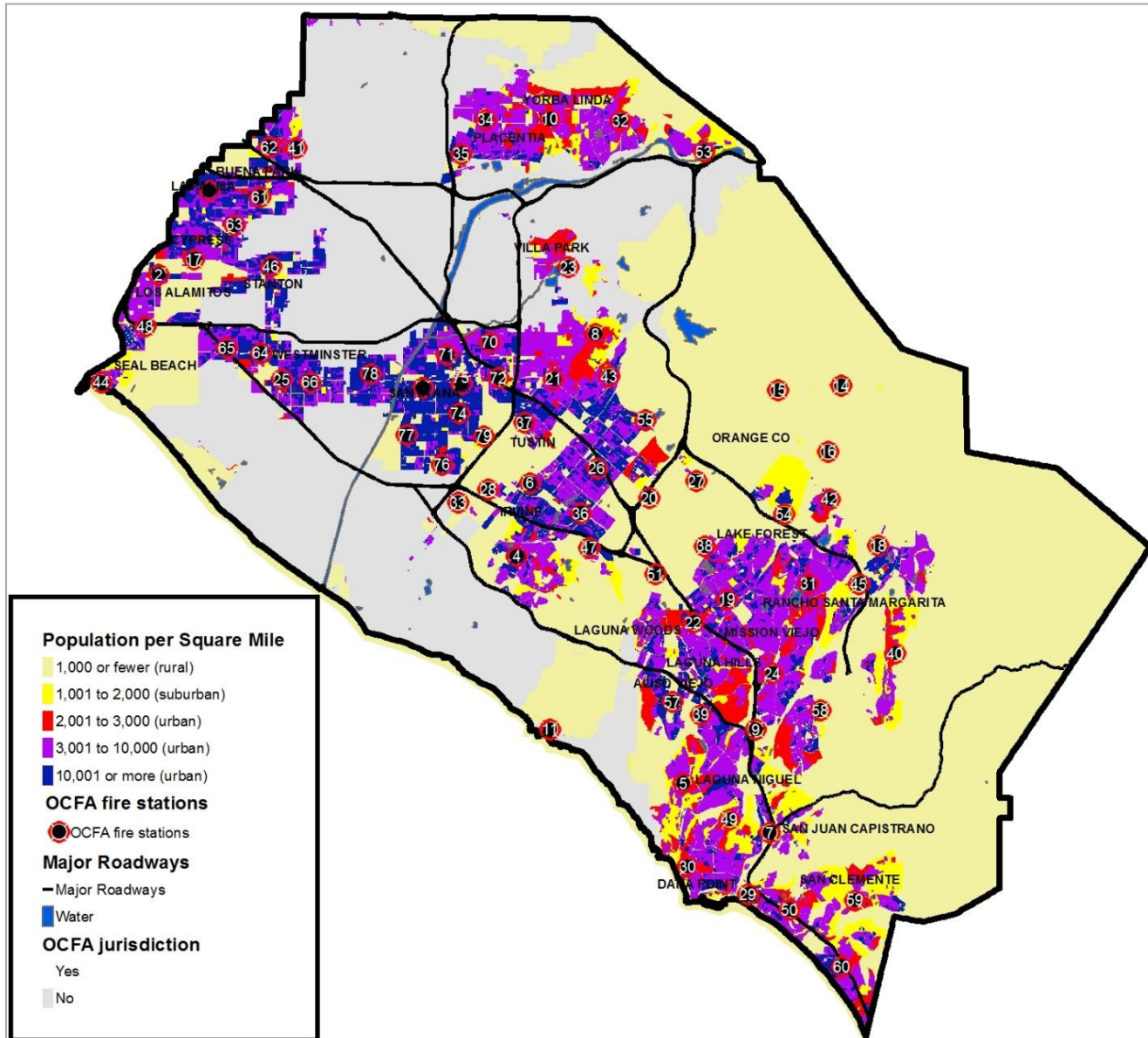
The population growth history of Orange County over the past four years shows a total increase of 2.4 percent, while the areas protected by the OCFA increased by a total of 26.8 percent during the same time period. Most member agencies experienced growth of less than 2.0 percent, while the unincorporated areas increased by 2.5 percent.

Density

A review of census data and other regional sources of data show that density (population per square mile) is much greater in some areas compared to others. Density is important because there is a direct relationship between population, risk, and the impact on workload. New development is being encouraged to build to higher density specifically focused on increasing densities to 50 or more dwelling units per acre.

While most density issues revolve around housing units, “job centers” that produce daytime occupancy rates in excess of the housing limits also exist. These “job centers” bring workers and customers into an area, which doubles or triples the transient populations during normal business hours. The structures in these areas are often higher occupancy mid-rise (four and five-story) and high-rise (six or more stories/over 70 feet) buildings with large workforces. Several high-density job center properties exist within the OCFA protection area.

Figure 37: Population Density



Age

Persons aged 65 years or older make up 11.4 percent of the population in Orange County. This is important because of the aging of our society (baby-boomers getting older) and the rate at which the elderly population use the OCFA’s emergency services. The following table provides an overview of the county’s population categorized by age group.

Figure 38: Orange County Population by Age Group

Age Group	Count
Under 5 years	194,230
5 to 9 years	200,060
10 to 14 years	208,103
15 to 19 years	223,223
20 to 24 years	211,548
25 to 34 years	413,879
35 to 44 years	445,323
45 to 54 years	437,740
55 to 59 years	171,737
60 to 64 years	141,984
65 to 74 years	181,623
75 to 84 years	112,526
85 years and over	47,972

The Orange County Demographic Analysis (2000-2050) clearly shows that the current population over 60 years of age will increase by 240 percent (27.1 percent of the overall population) by the year 2050.²¹ The majority of this increase will occur by 2030. This is noteworthy because call history in Orange County shows that the elderly population segment uses OCFA services at a rate 3.5 times greater than the average age population. The doubling effect will have a significant impact on service delivery distribution, workloads, and the reliability of the system.

The population makeup in Orange County is changing as well. When the same data is examined for the age of the population served, several areas of elderly population are evident and tend to be the areas of increased call loading. According to the U.S. Census Bureau, the median age is 36 and comprised of 49.5 percent men, and 50.5 percent women.

²¹ Developed by ESCI and published as Exhibit 5E of the OCFA 2006 Standards of Coverage; originally sourced from the State of California, Department of Finance, *Population Projections by Race/Ethnicity, Gender and Age for California and Its Counties, 2000 – 2050*, published May 2004.

Diversity

In Orange County, 42.1 percent of the population speaks a language other than or in addition to English. Trend analysis of census data shows that this percentage is likely to increase in the future. The number of calls where responders may encounter language barriers will increase. It may also affect the time it takes to dispatch a call when decisions need to be made, or the length of time on a call to obtain report information and history.

Construction Limits/Limitations

Orange County is rapidly approaching a time of build-out as raw land is developed. The final large-scale development plans are underway. Once the current building projects are completed, the built-upon areas of the county will be surrounded by the Pacific Ocean, Cleveland National Forest, and state/dedicated open space lands. No large area of developable land or even agricultural land will be left in Orange County. This will have an effect on land values and will increase the pressure on the redevelopment of existing developed areas. Increased density and intensification of uses are expected.

Infrastructure Limitations

Three infrastructure issues that will have the greatest limitation on future growth include traffic, water, and sewer capabilities. Traffic trip counts are one of the most limiting factors in growth and development in Orange County today and will continue to be so in the future. Water and its by-product (sewage) have shaped the Southern California landscape for over a hundred years. The lack of water or sewer capacity to support development is a major issue in many of the communities served by the OCFA. New developments must provide “will serve” documents detailing how the commodities will be provided before development is allowed to proceed. Without adequate water the OCFA cannot protect the new developments.

Traffic also has a direct impact on the ability of the OCFA to provide service. As traffic congestion increases, response times increase in some proportion. Safeguards are in place to monitor the water issues, but the traffic issues are not within the control of the OCFA.

Many of the communities the OCFA protects are currently adopting land use plans that utilize the “New Urbanism” concepts. This new orientation to higher densities, transit orientated development, mixed-use complexes, and the move to a more vertical footprint will have impacts on the resources needed to serve the newly developed areas.

Level of Service Classification

Areas of higher risk require greater numbers of personnel and apparatus to effectively mitigate emergencies. Areas with a higher incident activity require additional response units to ensure reliable response. Staffing and deployment decisions for different regions of the OCFA service area should be made in consideration of the level of risk.

Most communities contain areas with different population densities and property risk allowing the community's policy makers to specify different response performance objectives by geographic area. The categories are identified as:²²

- **Metropolitan**—Geography with populations of over 200,000 people in total and/or a population density of over 3,000 people per square mile. These areas are distinguished by mid-rise and high-rise buildings, often interspersed with smaller structures.
- **Urban**—Geography with a population of over 30,000 people and/or a population density of over 2,000 people per square mile.
- **Suburban**—Geography with a population of 10,000 to 29,999 and/or a population density of between 1,000 and 2,000 people per square mile.
- **Rural**—Geography with a total population of less than 10,000 people or with a population density of less than 1,000 people per square mile.
- **Wilderness/Frontier/Undeveloped**—Geography that is both rural and not readily accessible by a publicly or privately maintained road.

The OCFA service area, based on population density, is of three risk classifications: urban, rural, and wilderness. Areas that would typically be considered 'suburban' in terms of risk classification represent a very small amount of the overall service area; the OCFA has routinely considered the area to be suburban based upon the large open space areas, lack of residential within commercial districts, and due to topography. Moving to an "urban" level of service is based upon the CFAI definition and not the perceived lifestyle of the community. The community's risk designations should influence how response resources are distributed now and in the future.

The level of service classification is used to define response performance objectives and goals. Urban areas typically have response performance objectives shorter than rural and wilderness areas. This accounts for higher levels of risk that exist within urban areas, and adopts the deployment strategy to serve areas of more dense population at higher levels than areas of sparse or no population.

Based on this assessment, the following maps identify the risk classifications assigned to various portions of the OCFA service area. The following map illustrates the performance areas.

²² CFAI *Standards of Cover*, 5th edition, pages 20-21.

Historic System Response Workload

Before a full response performance analysis is conducted, it is important to first examine the level of workload (service demand) that a fire department experiences. Higher service demands can strain the resources of a department and may result in a negative effect on response time performance.

The following figures show response workload for 20 previous calendar years. Response workload increased by a total of 130 percent between January 1, 1993 (45,480 total responses), and December 31, 2012 (104,735 total responses), an average of 6.5 percent per year.

Figure 40: Total Fire Incidents by Year, 1993 – 2012

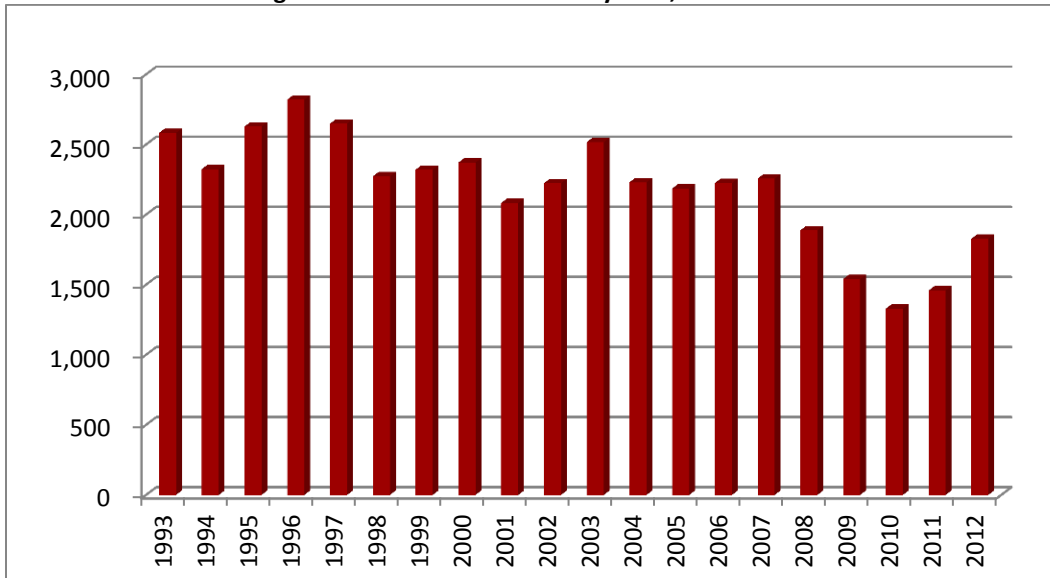


Figure 41: Total Emergency Medical Incidents by Year, 1993 – 2012

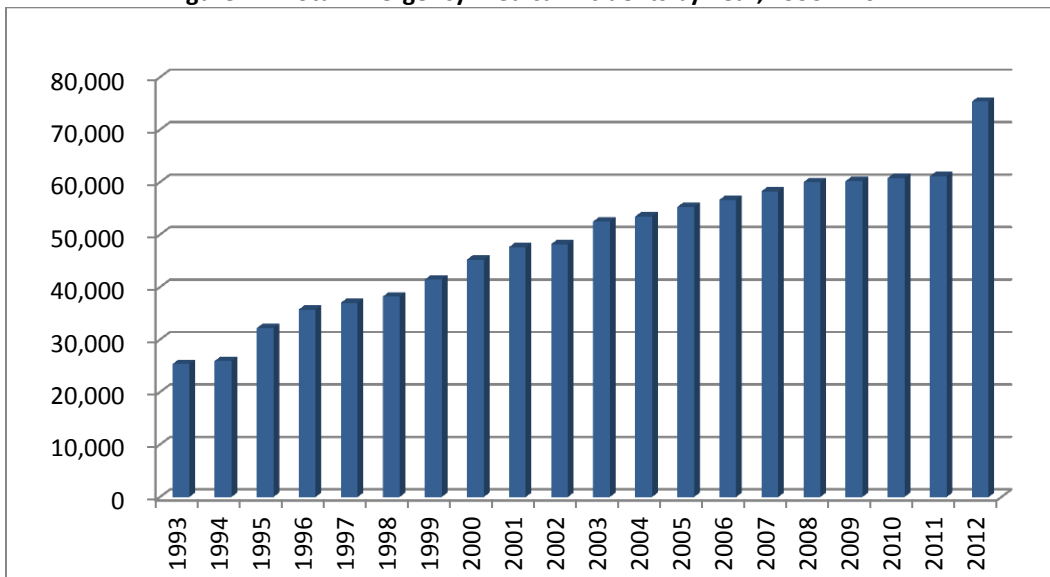


Figure 42: Total Other Type Incidents by Year, 1993 – 2012

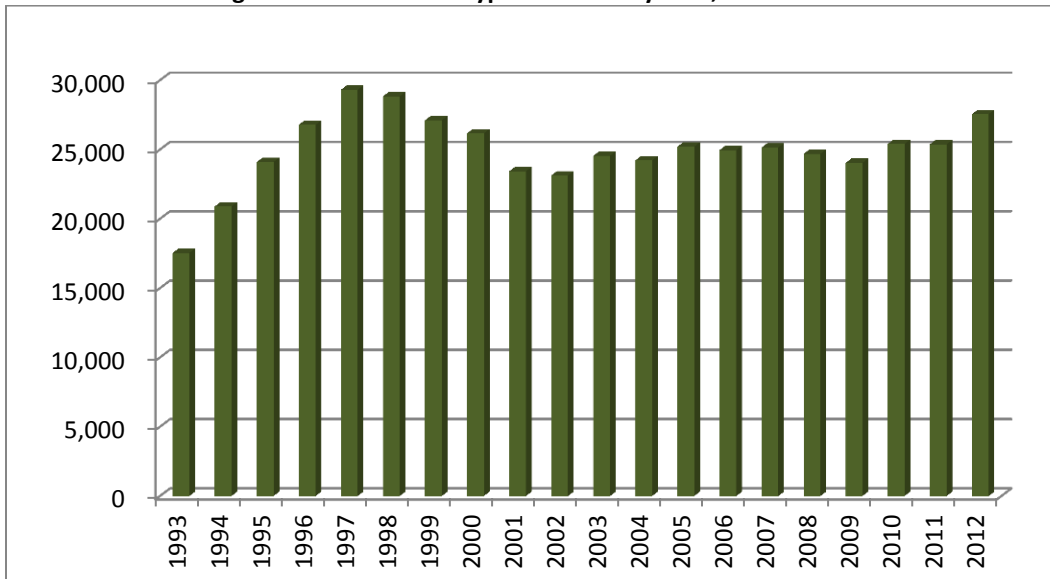
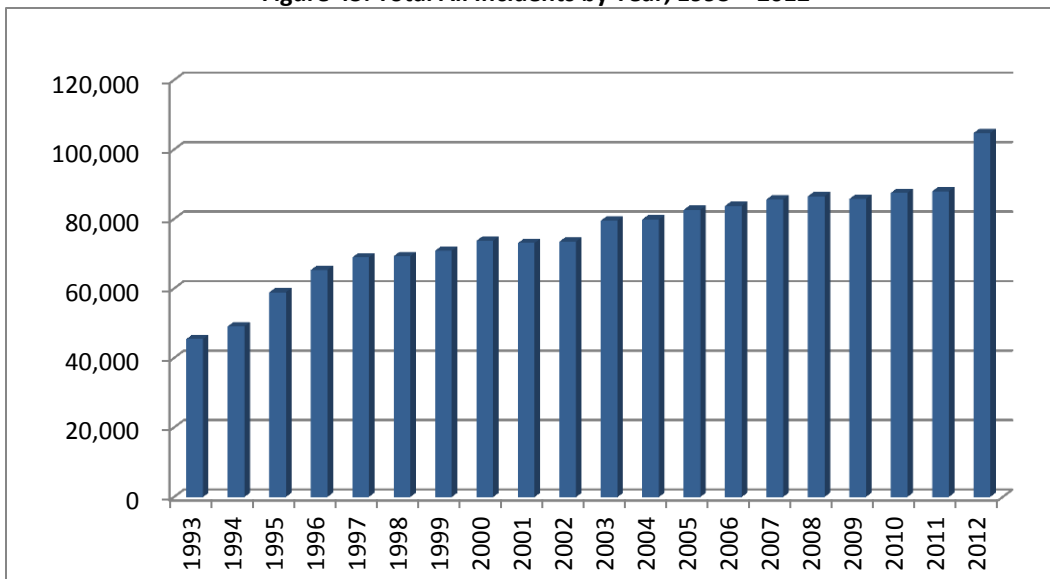


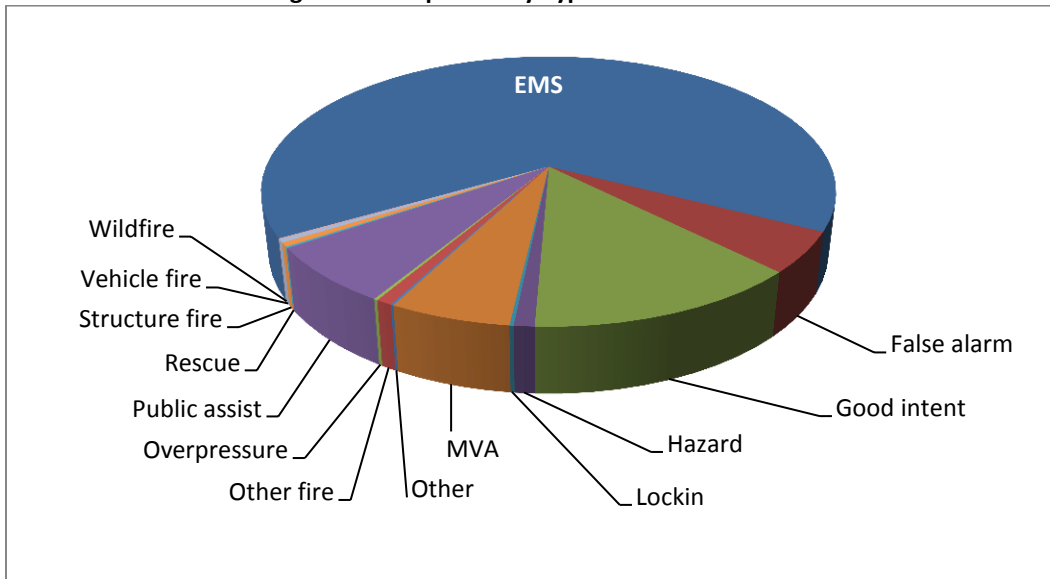
Figure 43: Total All Incidents by Year, 1993 – 2012



The significant uptick in total responses between 2011 and 2012 is primarily due to the inclusion of the City of Santa Ana in the OCFA service area. Fires have decreased at a rate of 1.5 percent per year over the past 20 years. EMS incidents have increase at a rate of 10 percent per year over the past 20 years.

The next figure shows responses by type of incident for calendar year 2012. Emergency medical responses are the most common at 66 percent of total responses.

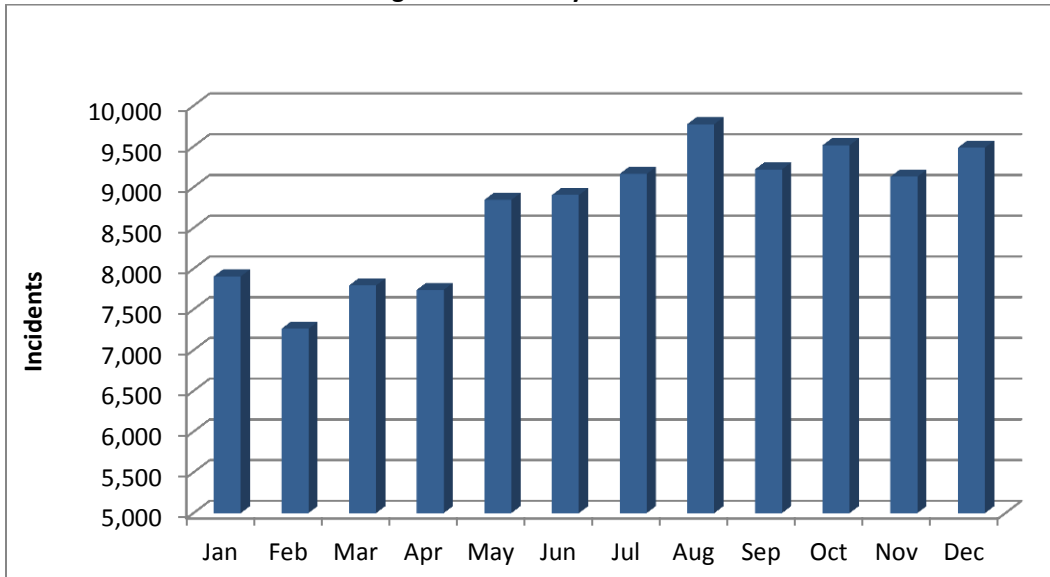
Figure 44: Responses by Type of Incident – 2012



Temporal Analysis

A review of incidents by time of occurrence also reveals when the greatest response demand is occurring. The following figures show how activity and demand changes for OCFA based on various measures of time. The following figure shows response activity for calendar year 2012 by month.

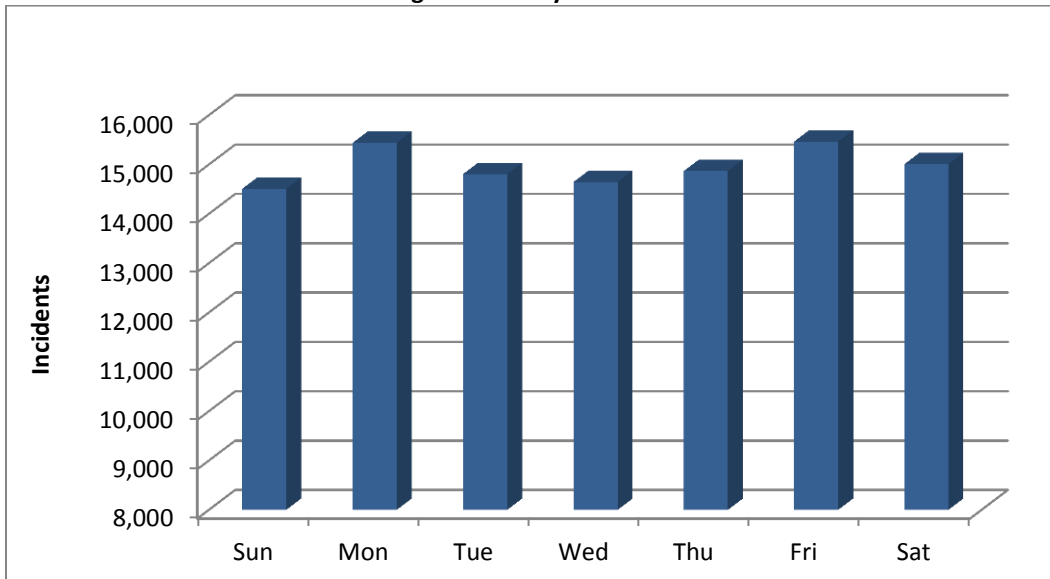
Figure 45: Monthly Workload



During the study period, there was 35 percent more incident activity in the busiest month, August, versus the slowest month, February.

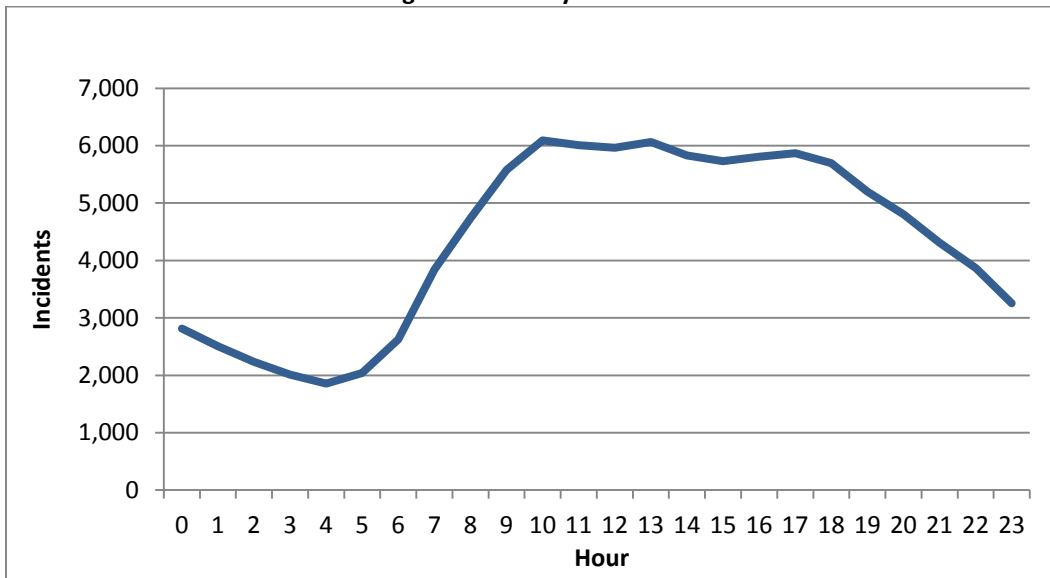
Next, response workload is compared by day of week. In this case there is only 5.6 percent more incident activity on the busiest day, Friday, versus the slowest day, Wednesday.

Figure 46: Daily Workload



One analysis that can show significant variation is response activity by hour of day. Response workload directly correlates with the activity of people, with workload increasing during daytime hours and decreasing during nighttime hours as shown in the following figure. Incident activity is at its highest between 10:00 AM and 5:00 PM.

Figure 47: Hourly Workload

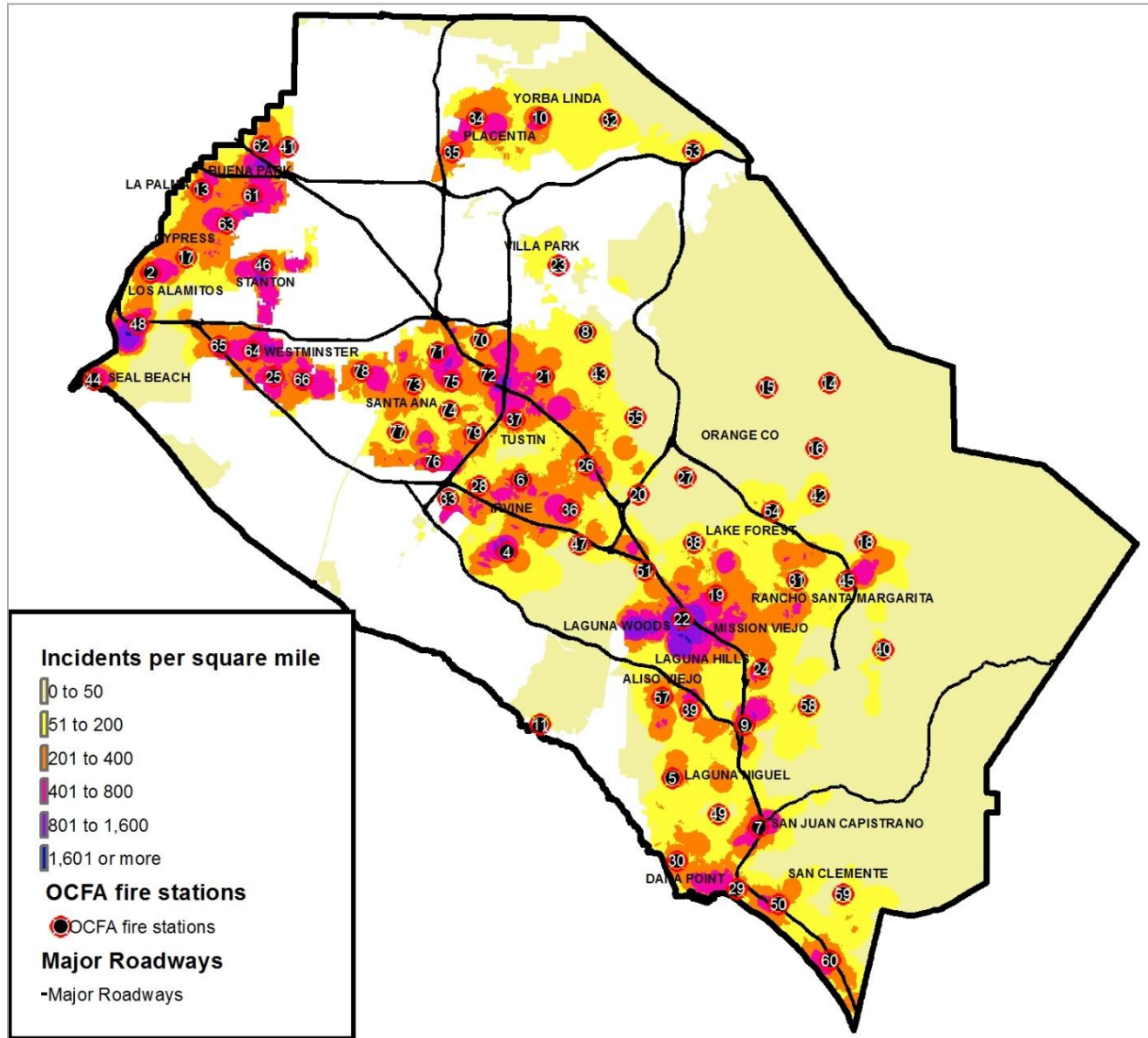


Spatial Analysis

In addition to the temporal analysis of the current service demand, it is useful to examine geographic distribution of service demand. The following map series indicates the distribution of emergency incidents in the OCFA service area during calendar year 2012.

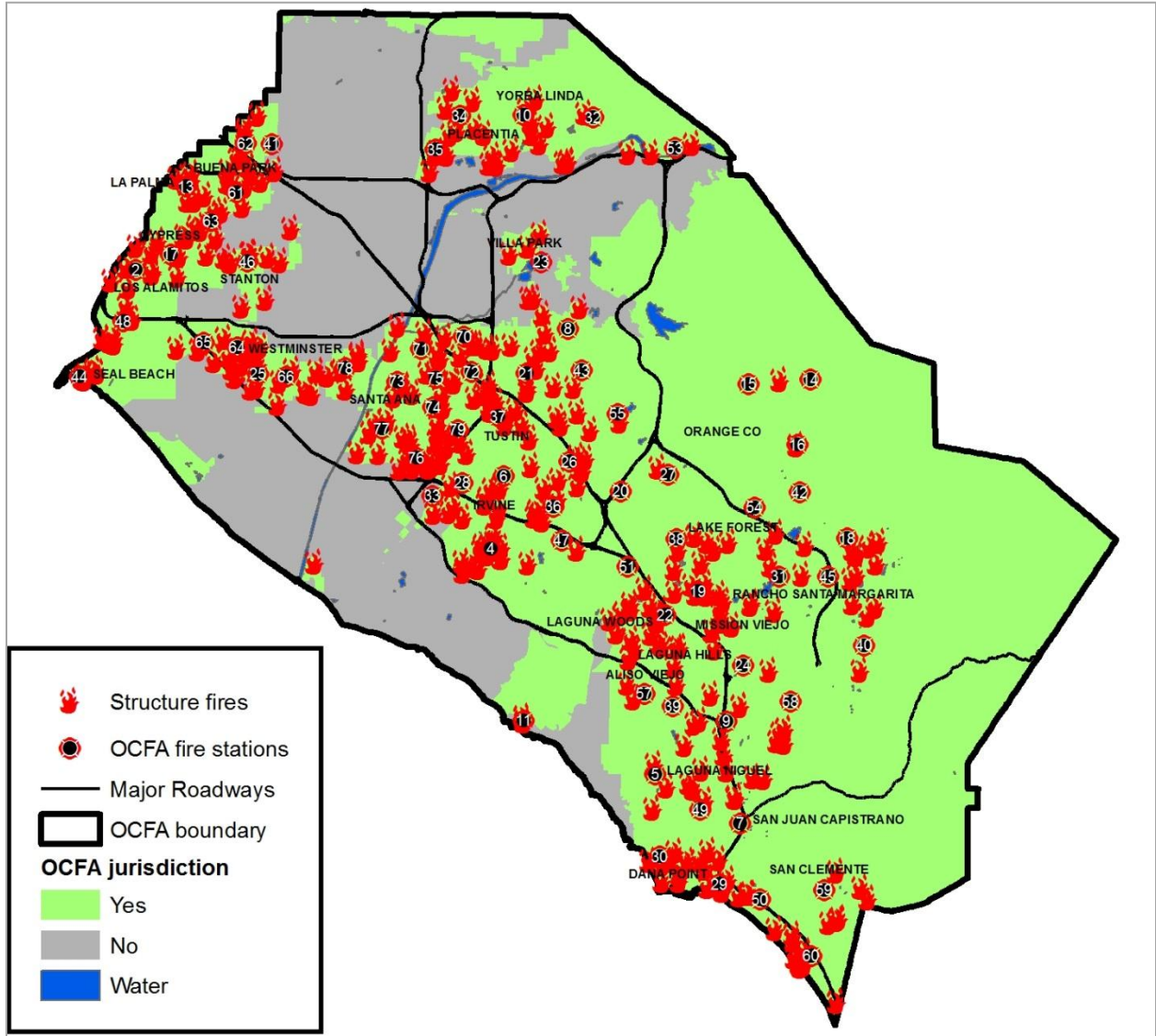
The next figure displays the number of incidents of all types per square mile within various parts of the service area. The areas of greatest service demand are around Fire Stations 4, 46, 48, 72, and most particularly Station 22.

Figure 48: Incidents per Square Mile – 2012



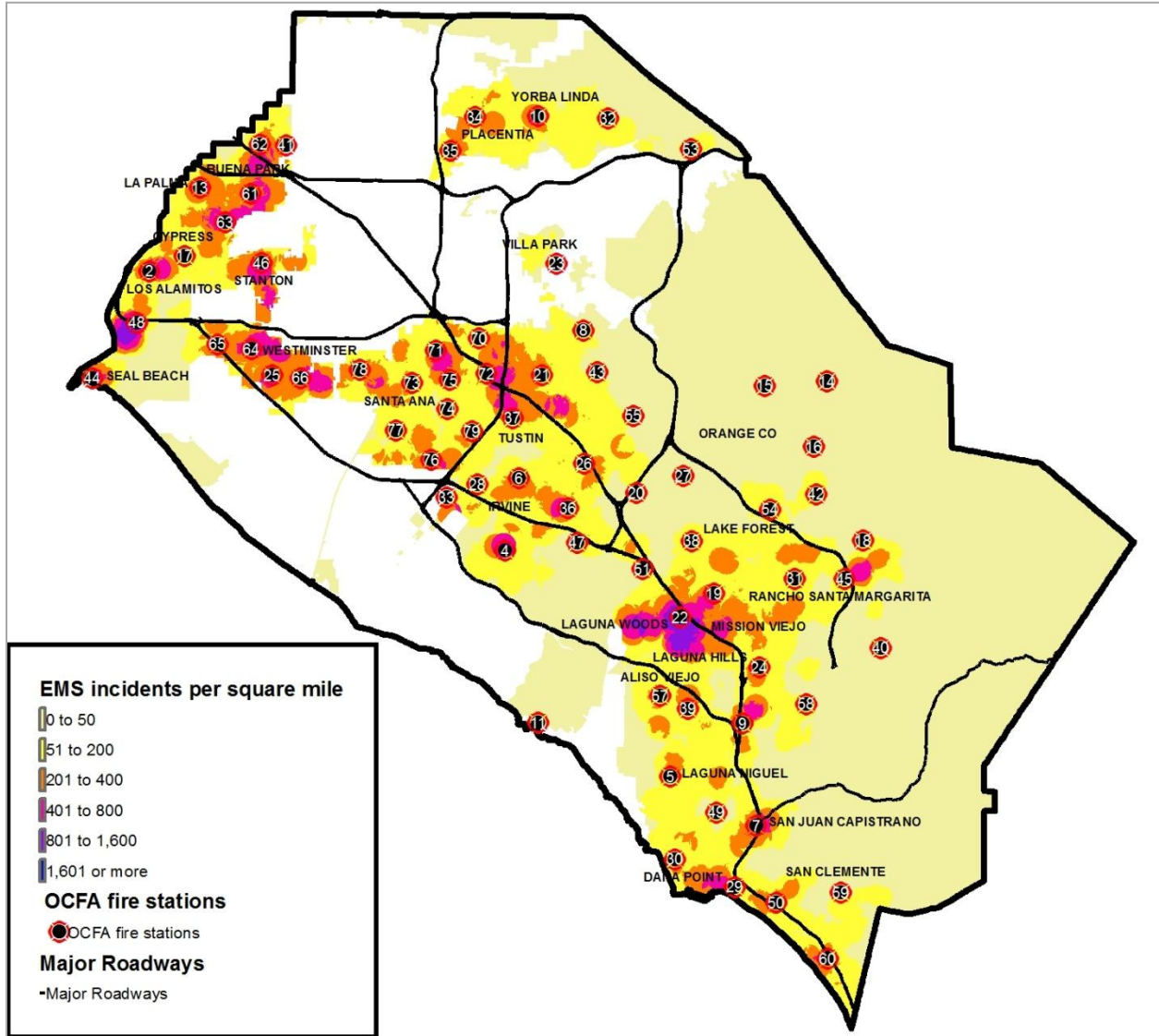
Service demand can vary by area based on incident type. The following map displays the location of structure fires during this time period. It illustrates that actual structure fire incidents are also concentrated in OCFA's more densely populated areas.

Figure 49: Structure Fire Locations



Similarly, emergency medical incidents also occur in greater concentration in areas of higher population density. The following map displays the number of emergency medical incidents per square mile occurring during calendar year 2012. Again, Stations 48 and 22 experience the greatest density.

Figure 50: Emergency Medical Incident Density



Station and Unit Workload Analysis

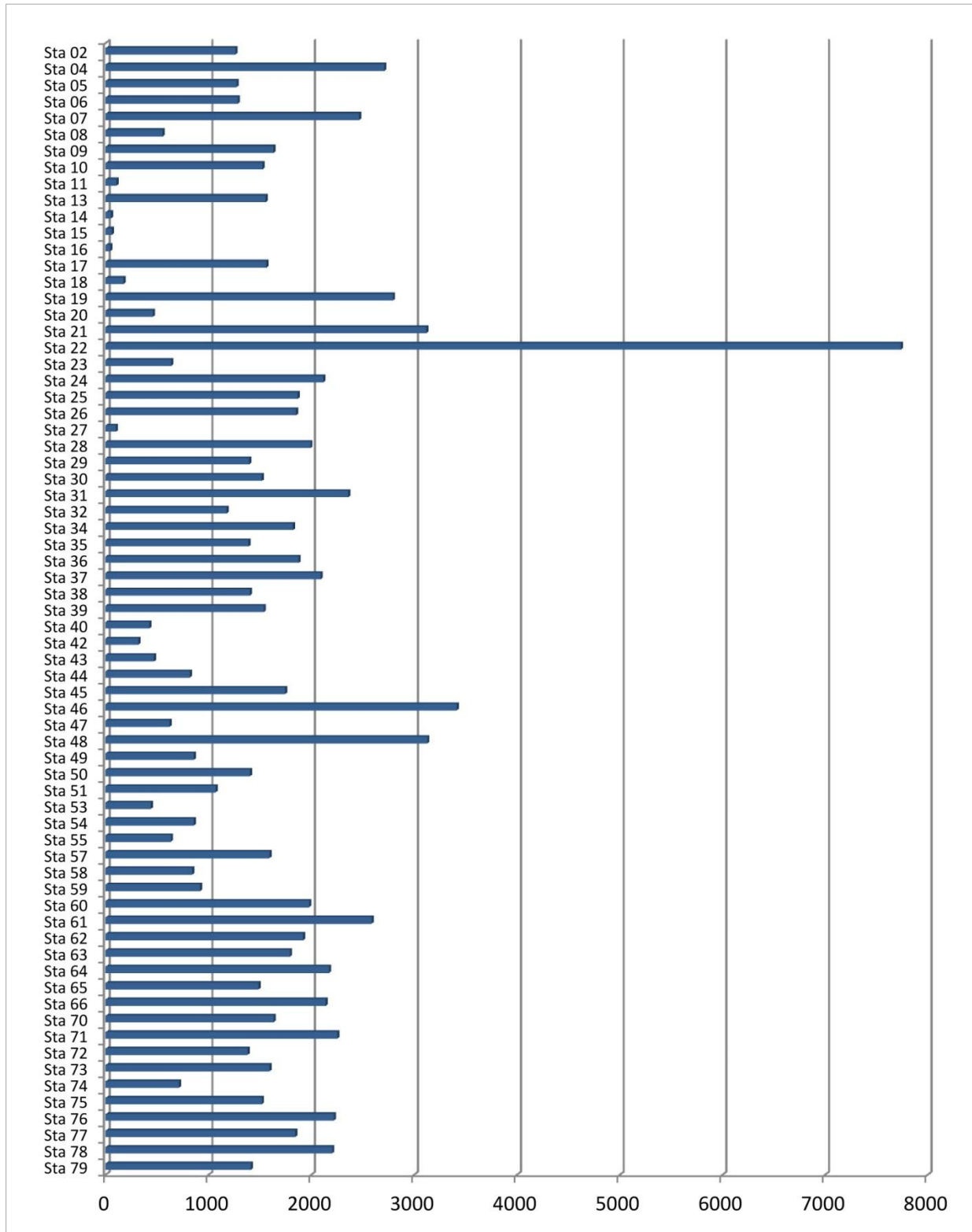
A review of workload by station and response unit can reveal much about the drivers of response performance. Although fire stations and response units may be distributed in a manner to provide quick response, that level of performance can only be obtained when the response unit is available in its primary service area. If a response unit is already on an incident and a concurrent request for service is received, a more distant response unit will need to be dispatched. This will increase response times.

Fire Station Workload

As noted earlier, response workload is not evenly distributed across the OCFA service area. Areas of higher population density, aged population, and institutional populations typically present a greater demand for fire department services. The following figure lists incident activity by fire station area during calendar year 2012. Workload in the Fire Station 22 area was the highest at 7,738 calls for service.

OCFA assumed operation of Stations 70 through 79 from the City of Santa Ana on April 20, 2012. As such, records of responses prior to that date are not available and total response has been estimated.

Figure 51: Responses by Fire Station Area – 2012



Response Unit Workload

The workload on individual response units during calendar year 2012 is shown in the following figures. Individual response unit workload can be greater than the workload in its home station area. Many incidents, such as structure fires, require more than one response unit.

Figure 52: 2012 Response Unit Workload – Battalion Chiefs

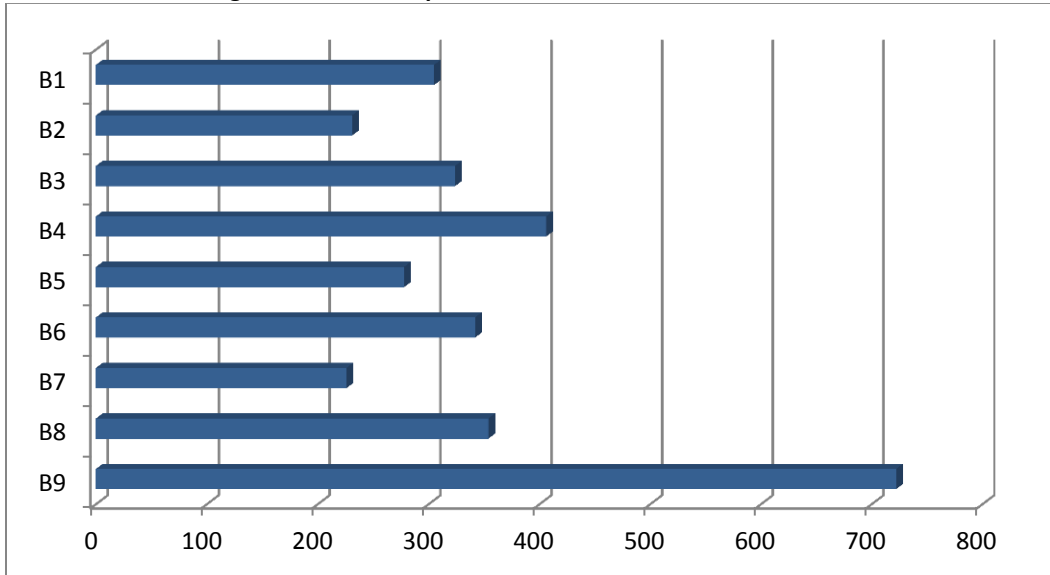


Figure 53: 2012 Response Unit Workload – Engines

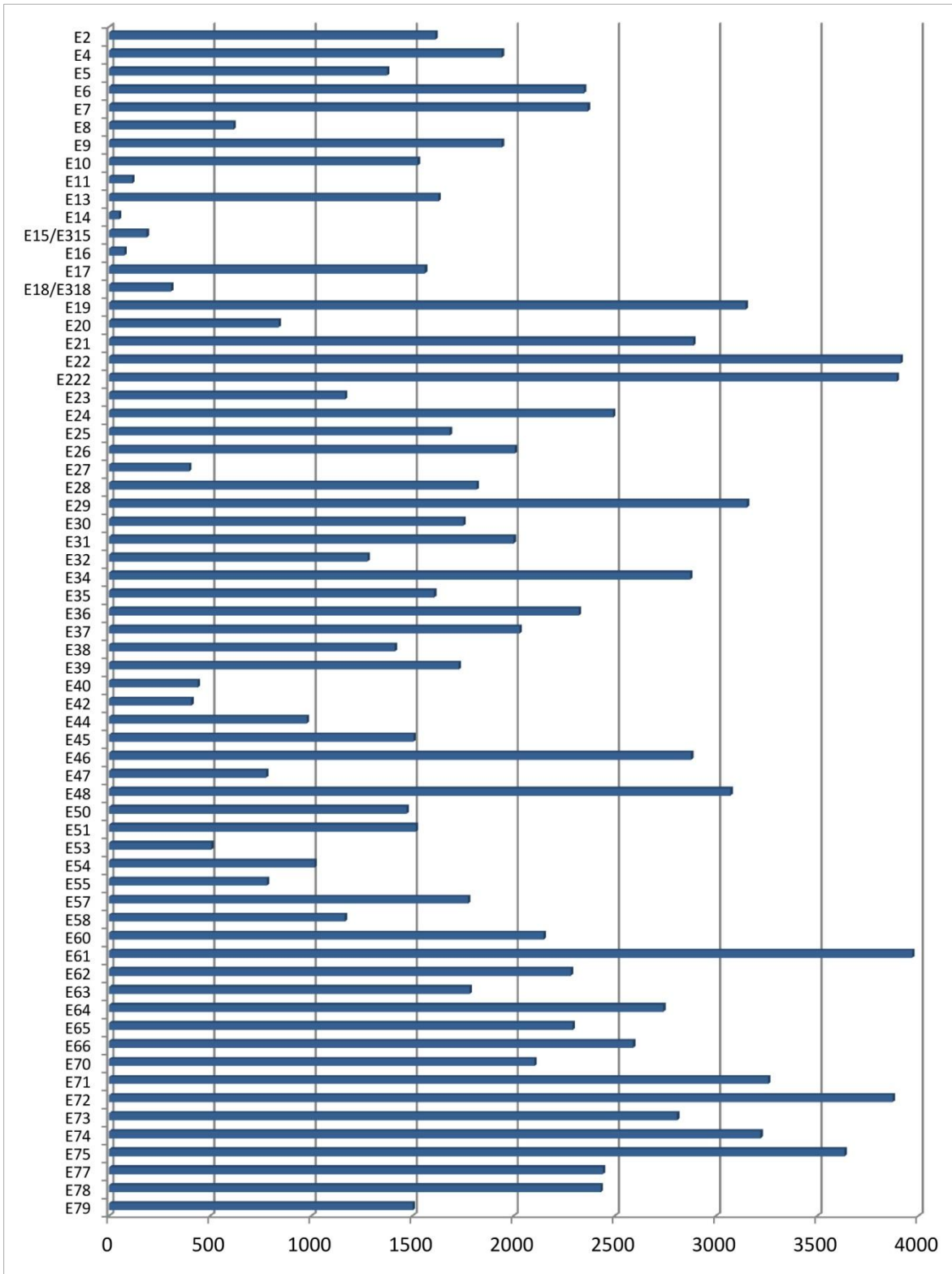


Figure 54: 2012 Response Unit Workload –Trucks

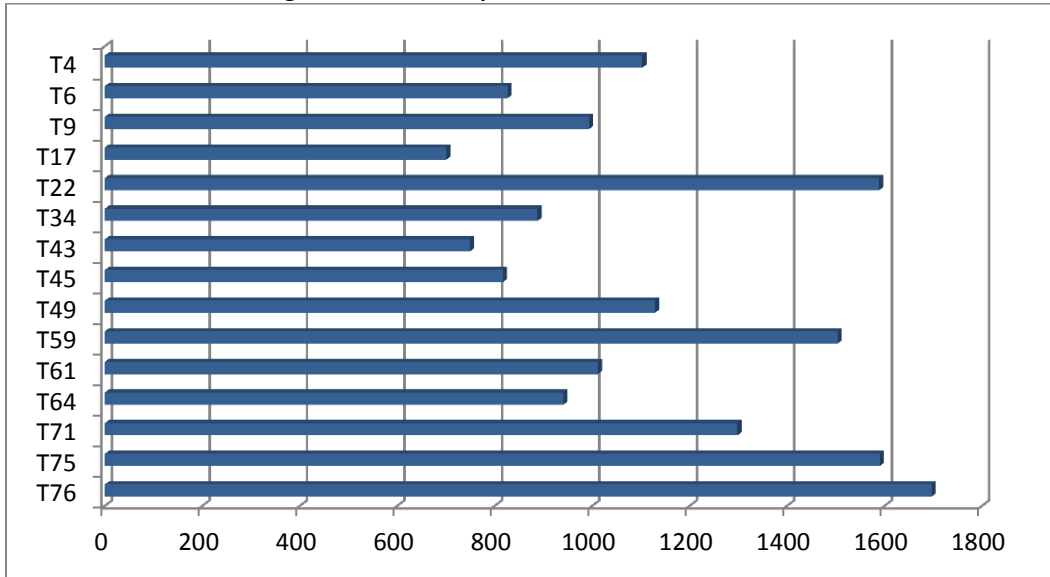


Figure 55: 2012 Response Unit Workload – Medic Vans

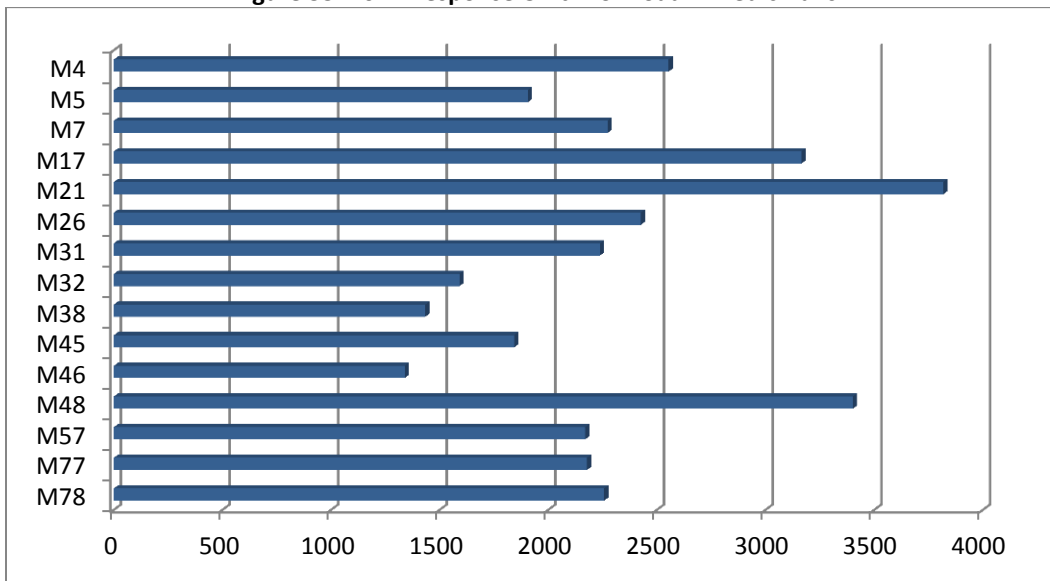
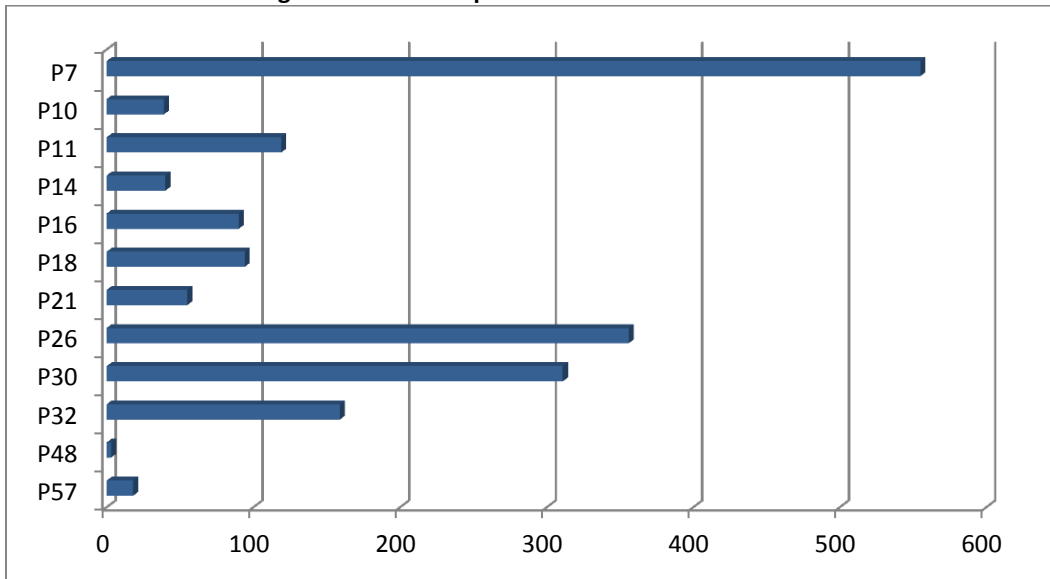


Figure 56: 2012 Response Unit Workload – Patrols



Unit hour utilization is an important statistic to monitor for those fire agencies using percentile based performance standards. For instance, in OCFA's case, where performance is measured at the 90th percentile, unit hour utilization greater than 0.10 means that the response unit will not be able to provide on-time response to its 90 percent target even if response is its only activity and if there is only one unit in the station. A total of 30 of OCFA's response units are exceeding a unit hour utilization of 10 percent. Of these, 18 are fire engines and 12 are medic units.

Figure 57: Unit Hour Utilization – Engines

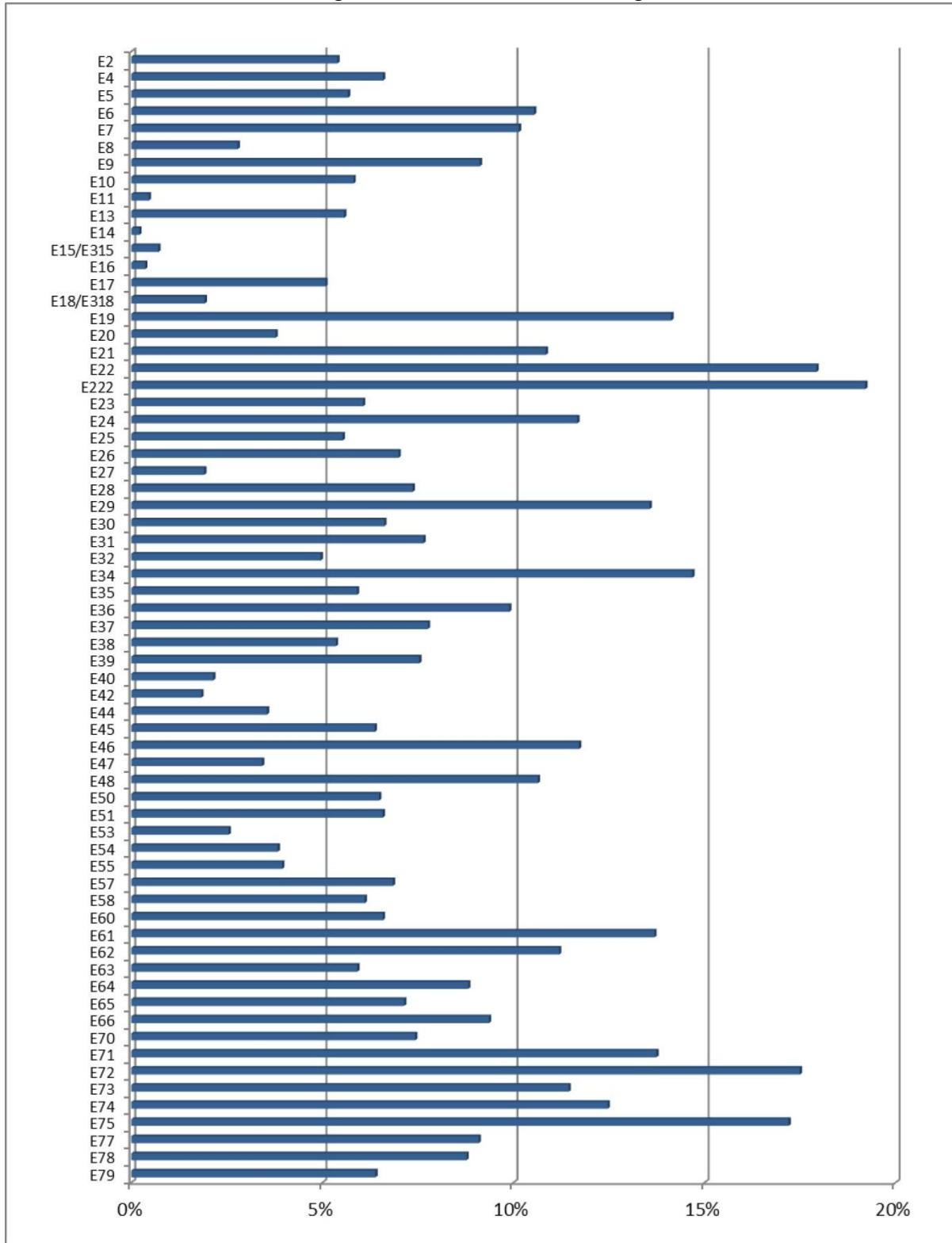


Figure 58: Unit Hour Utilization – Trucks

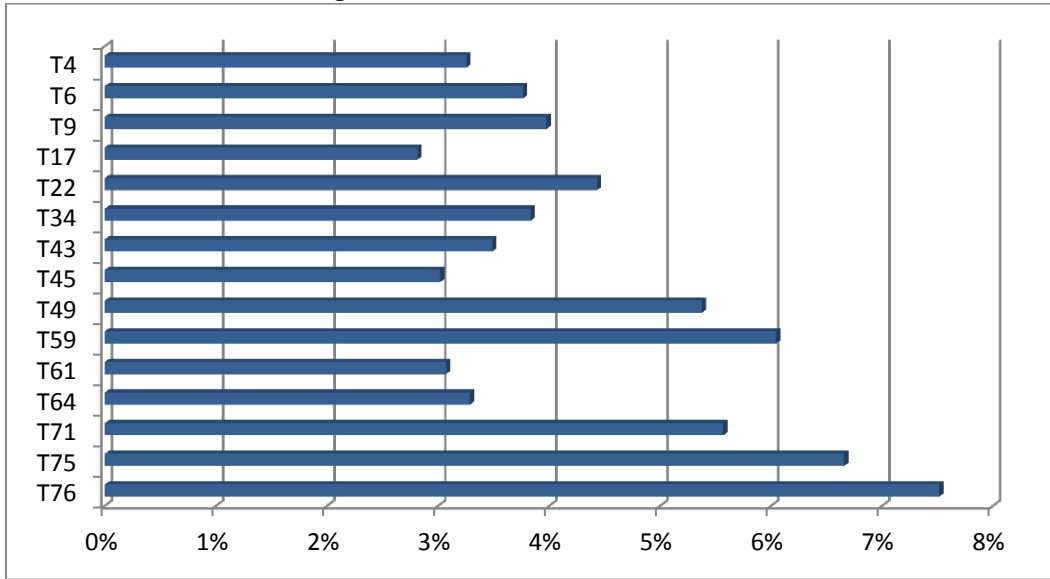


Figure 59: Unit Hour Utilization – Medic Vans

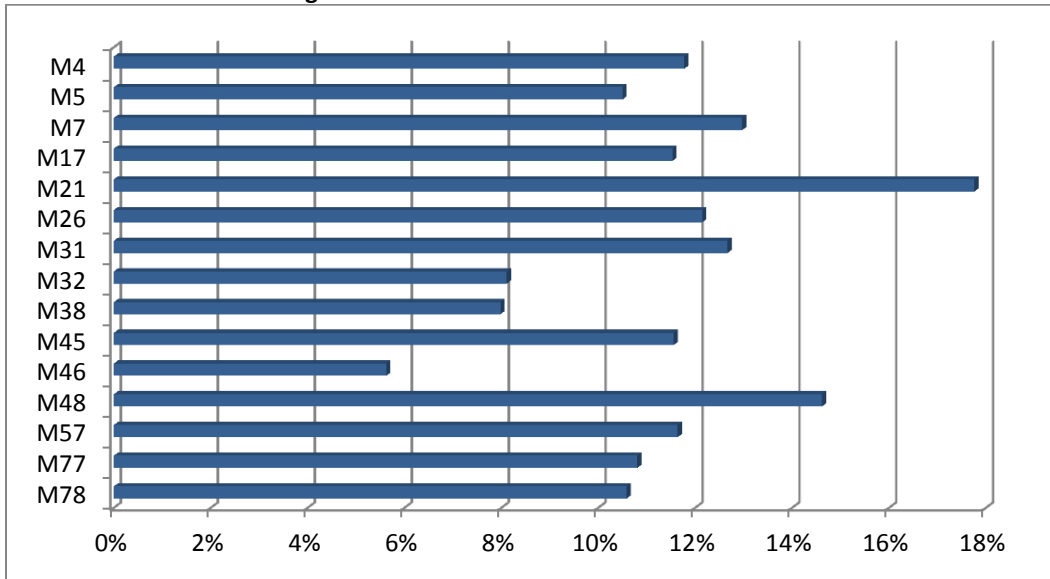


Figure 60: Unit Hour Utilization – Patrols

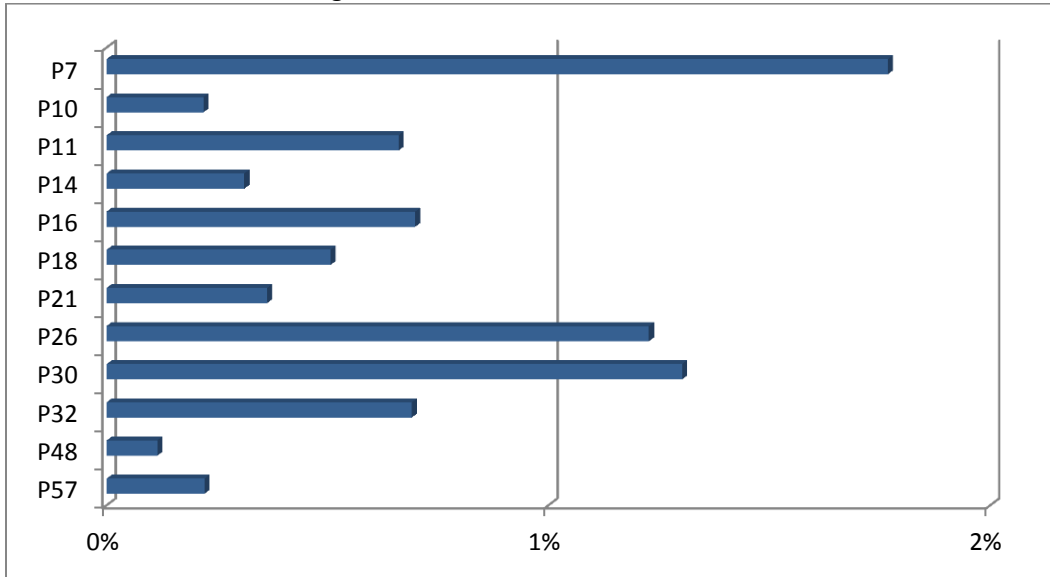
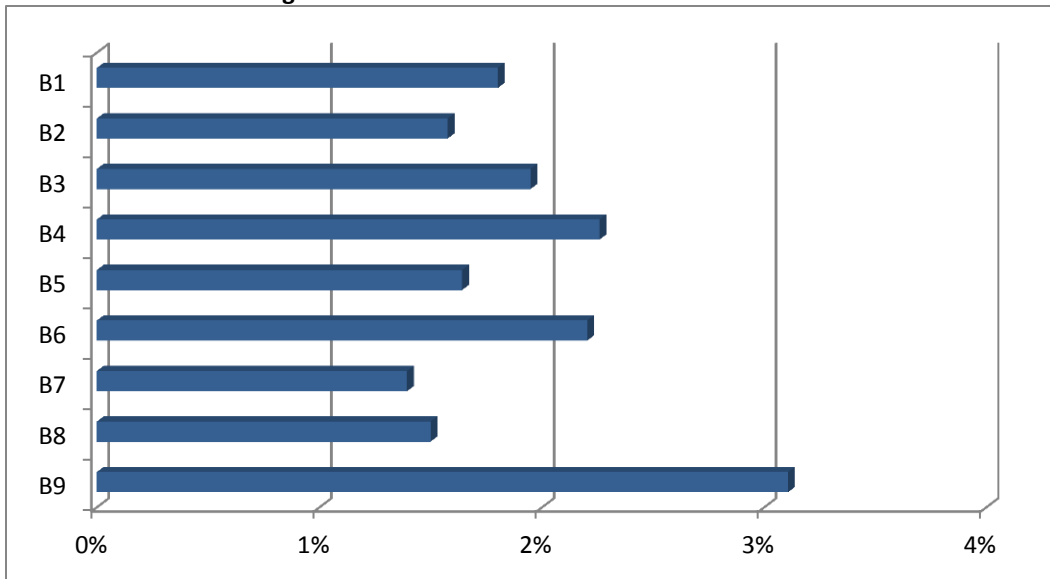


Figure 61: Unit Hour Utilization – Battalion Chiefs

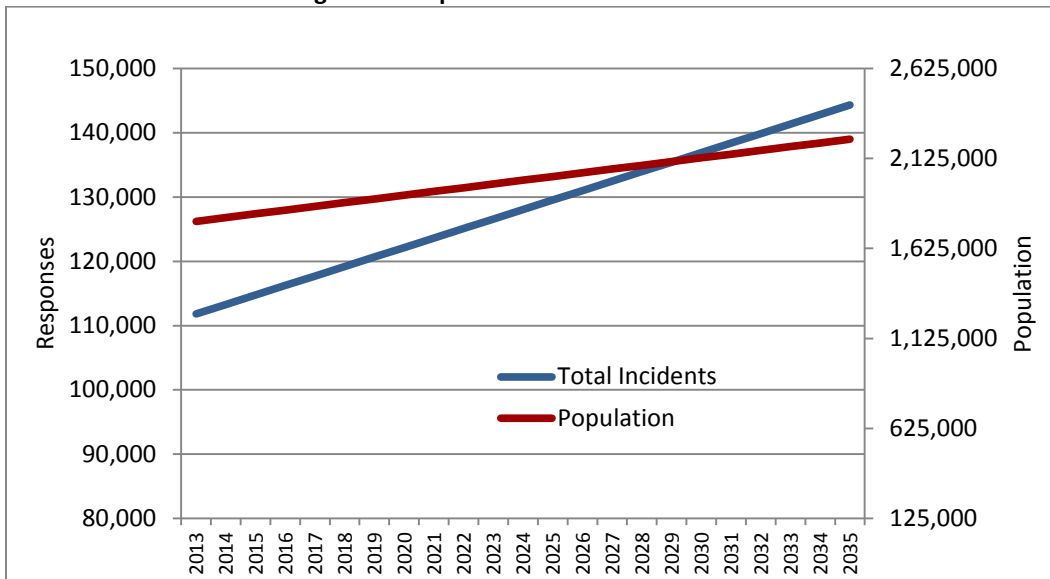


Incident Workload Projection

The most significant predictor of future incident workload is population and age of community; 100 percent of requests for emergency medical service are people-driven. The National Fire Protection Association reports that approximately 70 percent of all fires are the result of people either doing something they should not have (i.e., misuse of ignition source) or not doing something they should have (i.e., failure to maintain equipment). It is reasonable to use future population growth to predict future fire department response workload.

The following figure forecasts future incident workload. The figure uses changes in fire department service usage rates to forecast future response activity based on population growth. The current utilization rate is 59.6 incidents per 1,000 population. Utilization is expected to grow to 64.7 incidents per 1,000 population for a total of 144,000 incidents in 2035.²³

Figure 62: Population and Incident Forecast



²³ The OCFA currently serves approximately 1.7 million residents; projections anticipate the service population to be 1.9 million in 2020 and 2.23 million in 2035.

Section E – Critical Tasking and Alarm Assignments

The OCFA service area has a densely populated urban environment and, as such, contains an elevated number, density, and distribution of risk. Further, its rural areas present unique challenges such as wildland fires. Ideally, the fire department should have the resources needed to effectively mitigate the incidents that have the highest potential to negatively impact the community. As the actual or potential risk increases, the need for higher numbers of personnel and apparatus also increases. With each type of incident and corresponding risk, specific critical tasks need to be accomplished and certain numbers and types of apparatus should be dispatched. This section considers the community's identified risks and illustrates the number of personnel that are necessary to accomplish the critical tasks at an emergency.

Tasks that must be performed at a fire can be broken down into two key components: life safety and fire flow. Life safety tasks are based on the number of building occupants and their location, status, and ability to take self-preservation action. Life safety related tasks involve the search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water to extinguish the fire and create an environment within the building that allows entry by firefighters.

The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent action, the command officer must prioritize the tasks and complete some in chronological order, rather than concurrently. These tasks, at a minimum, would include:

- Command
- Scene safety
- Search and rescue
- Fire attack
- Water supply
- Pump operation
- Ventilation
- Backup/rapid intervention

Critical task analysis also applies to non-fire type emergencies including medical, technical rescue, and hazardous materials emergencies. Numerous simultaneous tasks must be completed to effectively control an emergency. The department's ability to muster needed numbers of trained personnel quickly enough to make a difference is critical to successful incident outcomes.

The following figure illustrates the emergency incident staffings of the Commission on Fire Accreditation, International.

The following definitions apply to the figure:

Low Risk – Minor incidents involving small fires (fire flow less than 250 GPM), single patient non-life threatening medical incidents, minor rescues, small fuel spills, and small wildland fires without unusual weather or fire behavior.

Moderate Risk – Moderate risk incidents involving fires in single-family dwellings and equivalently sized commercial office properties (fire flow between 250 GPM to 1,000 GPM), life threatening medical emergencies, hazardous materials emergencies requiring specialized skills and equipment, rescues involving specialized skills and equipment, and larger wildland fires.

High Risk – High risk incidents involving fires in larger commercial properties with sustained attack (fire flows more than 1,000 GPM), multiple patient medical incidents, major releases of hazardous materials, high risk rescues, and wildland fires with extreme weather or fire behavior.

Figure 63: Staffing Recommendations Based on Risk

Incident Type	High Risk	Moderate Risk	Low Risk
Structure Fire	29	15	6
Emergency Medical Service	12	4	2
Rescue	15	8	3
Hazardous Materials	39	20	3
Wildland Fire	41 (Red Flag level)	20	7

OCFA has identified the following categories of risk for the purpose of establishing the Critical Task analysis and Alarm Assignments:

Fire Risk	
Low	Areas with mobile property, outbuildings, structures with less than 1,000 GPM needed fire flow, and/or a BAR (building area ration-amount of land covered by building) of less than 10 percent.
Moderate	Areas with single occupancy structures with a needed fire flow requirement from 1,000 to 2,500 GPM and/or a BAR greater than 10 percent and less than 75 percent.
High	Areas with multi-occupancy structures with a needed fire flow above 2,500 GPM, structures over three stories in height, and/or a BAR greater than 75 percent.
Rescue Risk	
Low	Areas with a history or potential for rescue situations that require only the tools and knowledge set available on first due apparatus. Examples include persons needing assistance up or down an elevation difference where simple solutions such as a rope or ladder will complete the rescue.
Moderate	Areas with a history or potential for rescue situations requiring the use of specialty equipment carried on all OCFA truck companies. Examples include: traffic accidents with persons trapped, persons needing to be moved up or down an elevation while unable to walk or help themselves.
High	Areas with a history or potential for rescue calls requiring specialized equipment and training. Examples include: technical rescues of persons trapped by equipment, buildings, or earth that will require extended and complex rescue solutions.
Medical Risk	
Low	Areas with a history or potential for emergency incidents where predominately a Basic Life Support level of care is provided routinely. Calls requiring basic first aid/EMT-I skills. These areas would normally have low population densities and/or limited residential or commercial development.
Moderate	Areas with a history or potential for emergency incidents where Paramedic or Advance Life Support level of care is provided routinely. Calls requiring the full scope and depth of the Emergency Medical System.
High	Areas with a history of potential for needing multiple Paramedic Level responses simultaneously. These areas would normally have high population densities and/or large numbers of "at risk" populations.

Hazardous Materials	
Low	Areas with hazards that would require Level “D” entry. Incidents that require only the tools and knowledge set available on first due apparatus. This risk would include incidents related to common chemicals such as those in the home or business.
Moderate	Areas with hazards that would require Level “B or C” entry. Incidents that require specialized tools and knowledge to deal with hazardous materials that are normally liquids or solids without acute hazards. This risk would include incidents related to chemicals used in light industry, larger amounts of hazardous materials in transport or storage.
High	Areas with hazards that would require Level “A” entry. Incidents involving “Acutely Hazardous” materials that require encapsulation of the workers and multiple specialized teams with a level of decontamination that is potentially hazardous.
Airport Rescue Fire Fighting	
	The protection provided at Orange County Airport is provided under the federal regulations and FAA requirements per OCFA’s contract with the airport. OCFA will continue to use the current ARFF risk categories, Categories I, II, and III.
Wildland/Interface Fire Fighting	
Wildland/Undeveloped Areas and National Forest Land	The weight and speed of initial attack for wildland fires is dependent on location, weather, topography, and fuels. OCFA will continue to use the regional accepted wildland response levels of Low Watershed, Medium Watershed, High Watershed, and Red Flag.
Swiftwater	
Moderate	Areas with standing water, such as lakes, where victims do not tend to move large distances from the area of the original emergency.
High	Areas with moving water, such as streams, flood control channels, or the ocean, where victim can move large distances in a short period of time.

Critical Tasking

Critical tasks are those activities that must be conducted in a timely manner by firefighters at emergency incidents in order to control the situation. The fire department is responsible for assuring that responding companies are capable of performing all of the described tasks in a prompt, efficient, and safe manner.

The OCFA has developed the following critical task analysis for various incident types. Further, it has defined based on current unit staffing levels, and the number and type of apparatus needed to deliver sufficient numbers of personnel to meet the critical tasking identified. ESCI's review of the critical task analysis is that all are in keeping with industry standards and provide the minimum number of personnel needed for effective incident operations.

Fires – Effective Response Force			
Critical Task	High Risk	Moderate Risk	Low Risk
Attack line	4	2	2
Search and rescue	4	2	-
Ventilation	4	2	-
Backup lines	4	2	2
Rapid Intervention Team (RIT)	6	3	-
Pump operator	2	1	1**
Water supply	1	1	-
Utilities support*	1	-	-
Command	1	1	1**
Forcible entry*	-	-	-
Salvage*	-	-	-
Overhaul*	-	-	-
Communication*	-	-	-
Chief's aide*	-	-	-
Operations section chief*	-	-	-
Logistics*	-	-	-
Planning*	-	-	-
Rehabilitation*	-	-	-
Division/group supervisors*	1	-	-
High-rise evacuation*	-	-	-
Stairwell support*	-	-	-
Safety Officer	1	1	-
Total Staffing	29	15	4-6

*Additional assignments as needed.

**Can be accomplished as a collateral duty.

Emergency Medical Services – Effective Response Force			
Critical Task	High Risk	Moderate Risk	Low Risk
Command	1	1	1
Patient Care	4	1	1
Documentation	1	1	1**
Communications	1	1	1**
Safety	1	1**	1**
Operations section chief*	-	-	-
Logistics*	-	-	-
Planning*	-	-	-
Staging			
Rehabilitation*	-	-	-
Division/group supervisors*	-	-	-
Total Staffing	8	4-5	2-5

*Additional assignments as needed.

**Can be accomplished as a collateral duty.

Rescues – Effective Response Force			
Critical Task	High Risk	Moderate Risk	Low Risk
Command	2	1	1
Rescue Team (Hurst Tools)	2	2	1
Backup Team	2	-	-
Patient Care (Paramedics)	2	2	1
Ground Support	2	-	-
Safety Hose Line (Engine)	1	1	-
Safety	1	2	-
Service Support Unit/Rehabilitation*	2	2	-
Total Staffing	14	10	3

*Additional assignments as needed.

Hazardous Materials – Effective Response Force			
Critical Task	High Risk	Moderate Risk	Low Risk
Command	2	1	-
Safety	1	1	-
Entry Team	3	2	-
Backup Team	3	2	-
Patient Care	2	2	-
Decon Team	2	4	-
Tech Support	2	1	-
Containment	4	4	-
Service Support Unit/Rehabilitation*	1	1	-
Total Staffing	20	18	0

*Additional assignments as needed.

Wildland/Interface Fires – Effective Response Force			
Critical Task	High Risk	Moderate Risk	Low Risk
Attack lines	6	6	2
Backup lines	6	6	2
Pump operator	2	2	1
Water supply	2	1	-
Structure protection	-	-	-
Mop-up line holding crews	22	22	-
Line construction	6	-	-
Air operations	1*	1*	-
Safety	2	1	1**
Communication*	-	-	-
Rehabilitation*	-	-	-
Patrol	-	-	-
Command	1	1	1
Operations section chief*	-	-	-
Logistics*	-	-	-
Planning*	-	-	-
Staging	1	-	-
Division/group supervisors*	1	1	-
Total Staffing	49	40	7

*Additional assignments as needed.

**Can be accomplished as a collateral duty.

Alarm Assignments

In order to ensure sufficient personnel and apparatus are dispatched to an emergency event, the following first alarm response assignments have been established. "Total Staffing Needed" is the number identified in the Critical Tasking analysis above.

Fire Unit Type	Number of Units			Minimum Number of Personnel		
	High	Moderate	Low	High	Moderate	Low
Engine/ Truck	6	3	1	18	9	3/4
Truck	2	1	0	8	4	0
Medic Unit	1	1*	0	2	2	0
Chief Officer	2	1	0	2*	1	1
Total Staffing Provided				30	15*-16	3-4
Total Staffing Needed				29	15	4-5

**Could be provided on medic engine, which would add one person to that unit (engine/truck).*

EMS Unit Type	Number of Units			Minimum Number of Personnel		
	High	Moderate	Low	High	Moderate	Low
Engine/Truck	2	1	1	6	3	3
Truck	0	0	0	0	0	0
Medic Unit	2	1	0	4*	2*	0
Chief Officer	0	0	0	0	0	0
Total Staffing Provided				8-10	4-5	3
Total Staffing Needed				8	4	2

**Could be provided on medic engine, which would add one person to that unit (engine/truck)*

Rescues Unit Type	Number of Units			Minimum Number of Personnel		
	High	Moderate	Low	High	Moderate	Low
Engine/Truck	1	1	1	9	3	3
Truck	1	1	0	4	4	0
USAR	1	0	0	4	0	0
Medic Unit	1	1*	0	2*	2*	0
Chief Officer	1	1	0	1	1	0
Total Staffing Provided				19-20	8-10	3
Total Staffing Needed				19	8	3

**Could be provided on medic engine, which would add one person to that unit (engine/truck)*

HazMat	Number of Units			Minimum Number of Personnel		
	High	Moderate	Low	High	Moderate	Low
Engine	3	3	1	9	9	3
Truck	2	1	0	8	4	0
HazMat Unit	2	1	0	10	5	0
Medic Unit	1	1	0	2	2*	0
Chief Officer	2	1	0	2	1	0
Total Staffing Provided				31	20-21	3
Total Staffing Needed				31	20	3

**Could be provided on medic engine, which would add one person to that unit (engine/truck)*

Wildland	Number of Units			Minimum Number of Personnel		
	High	Moderate	Low	High	Moderate	Low
Engine	3	3	2	9-12	9-12	6-8
Truck	0	0	0	0	0	0
Brush Unit	2	2	0	6	6-7	0
Medic Unit	1	1	0	2	2	0
Chief Officer	3	3	0	3	3	1
Hand Crews	3	3	0	18-22	0	0
Water Tenders	1	0	0	2	0	0
Air Support**	2	1	0	2-4	2	0
Safety Officer	1	1	0	1	1	0
Dozers	1	0	0	2	0	0
Patrol	1	0	0	3	0	0
Total Staffing Provided				48-57	41-49	7
Total Staffing Needed				48	41	6-8

**Could be provided on medic engine, which would add one person to that unit (engine/truck)*

***If available*

Swiftwater	Number of Units		Minimum Number of Personnel	
	High	Moderate	High	Moderate
Engine/Truck	4	3	13	10/11
Medic Unit	1	1	2	2
USAR/Swift Water Unit	2	1	8	4
Heavy Rescue	1	1	4	4
Helo	1	1	2	2
Patrol	1	1	2	2
Chief Officer	2	1	2	1
Safety Officer			2	1
Public Info Officer			2	2
Total Staffing Provided			37	28
Total Staffing Needed			37	28/27

Helo Operational hours are not 24 hrs. Daylight hours will provide two additional personnel.

Section F – Review of Historical System Performance

Incident data for calendar year 2012 was evaluated in detail to determine OCFA's current performance. Data was obtained from department incident reports and the dispatch center's computer-aided dispatch system. Only core incidents (incidents that have a direct impact on the placement of fire resources and involve a threat to life or property risk and require an emergency response) are included in the performance results.

Each phase of the incident response sequence was evaluated to determine current performance. This allows an analysis of each individual phase to determine where opportunities might exist for improvement.

The total incident time continuum consists of several steps, beginning with initiation of the incident and concluding with the appropriate mitigation of the incident. The time required for each of the components varies. The policies and practices of the fire department directly influence some of the steps.

In accordance with OCFA's performance objectives and in keeping with national standards, all response time elements are reported at the 90th percentile. Percentile (fractal) reporting is a methodology by which response times are sorted from least to greatest, and a "line" is drawn at a certain percentage of the calls to determine the percentile. The point at which the "line" crosses the 90th percentile is the percentile time performance. Thus, 90 percent of times were at or less than the result. Only 10 percent were greater

Percentile differs greatly from average. Averaging calculates response times by adding all response times together and then dividing the total number of minutes by the total number of responses (mean average). Measuring and reporting average response times is not recommended. Using averages does not give a clear picture of response performance because it does not clearly identify the number and extent of events with times beyond the stated performance objective.

Detection

The detection of a fire (or medical incident) may occur immediately if someone happens to be present or if an automatic reporting system is functioning. Otherwise, detection may be delayed, sometimes for a considerable period. The time period for this phase begins with the inception of the emergency and ends when the emergency is detected. It is largely outside the control of the fire department and not a part of the event sequence that is reliably measurable.

Call Processing

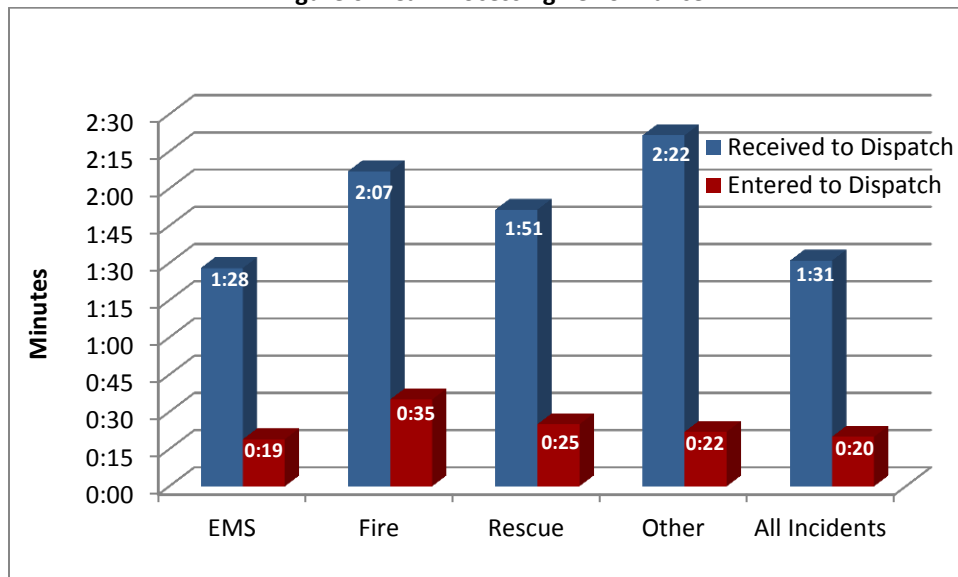
Today most emergency incidents are reported by telephone to the 9-1-1 center. Call takers must quickly elicit accurate information about the nature and location of the incident from persons who are apt to be excited. A citizen well-trained in how to report emergencies can reduce the time required for this phase. The dispatcher must identify the correct units based on incident type and location, dispatch them to the emergency, and continue to update information about the emergency while the units respond. This

phase typically begins when the call is answered at the dispatch center and ends when response personnel are notified of the emergency.

The OCFA Emergency Command Center’s performance has been reviewed by evaluating the time required from receipt of the call for help until the response units are notified of the emergency (received to dispatched). Performance was also evaluated by reviewing the time between the call taker forwarding information to the dispatcher and the notification of response units (entered to dispatched). OCFA can only measure calls received via 9-1-1 at this time. The software required to measure all calls will be provided in the new CAD system to be installed in 2014.²⁴

The following figure lists both call processing times for all incidents as well as specific incident types. Overall, the time from receipt of call at the dispatch center until notification of response personnel is within one minute 31 seconds, 90 percent of the time. It is within one minute 10 seconds, 80 percent of the time, longer than the 60 seconds, 80 percent of the time specified in national standards.²⁵

Figure 64: Call Processing Performance

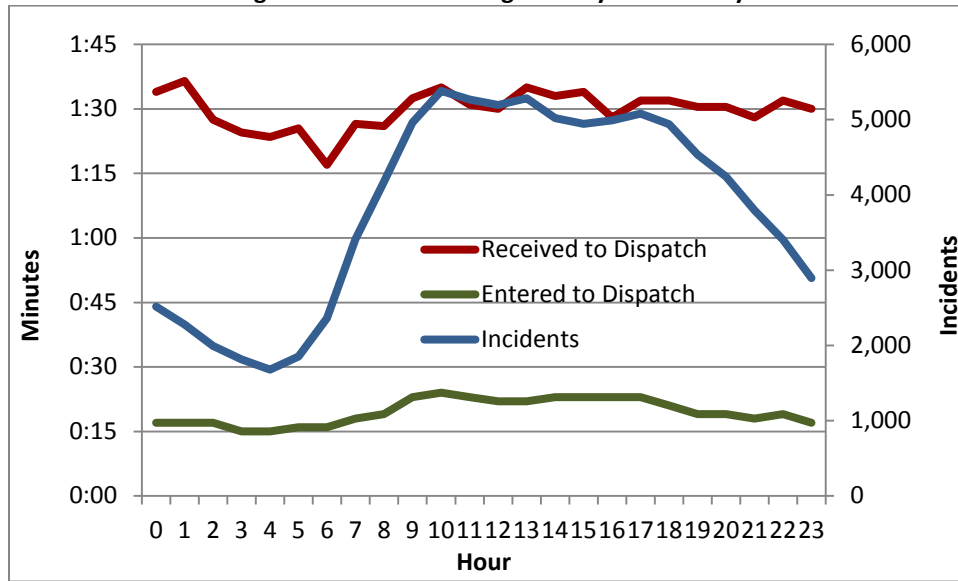


Activity levels at the dispatch center can affect the time it takes to receive, process and dispatch a request for service. The following figure shows call processing times and incidents by hour of day. Call processing time is influenced to small degree by levels of incident activity.

²⁴ Calls received via cellular phone can take up to an additional 20 seconds or more to process due to the need to acquire more information. Technology will likely fill this gap in the years to come.

²⁵ National Fire Protection Association Standard 1221, 2013.

Figure 65: Call Processing Time by Hour of Day

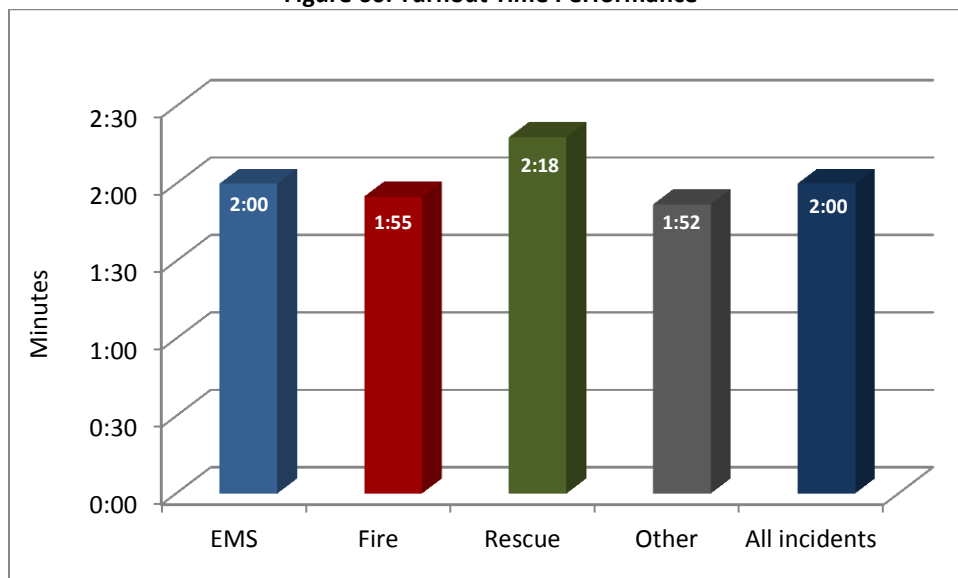


Turnout Time

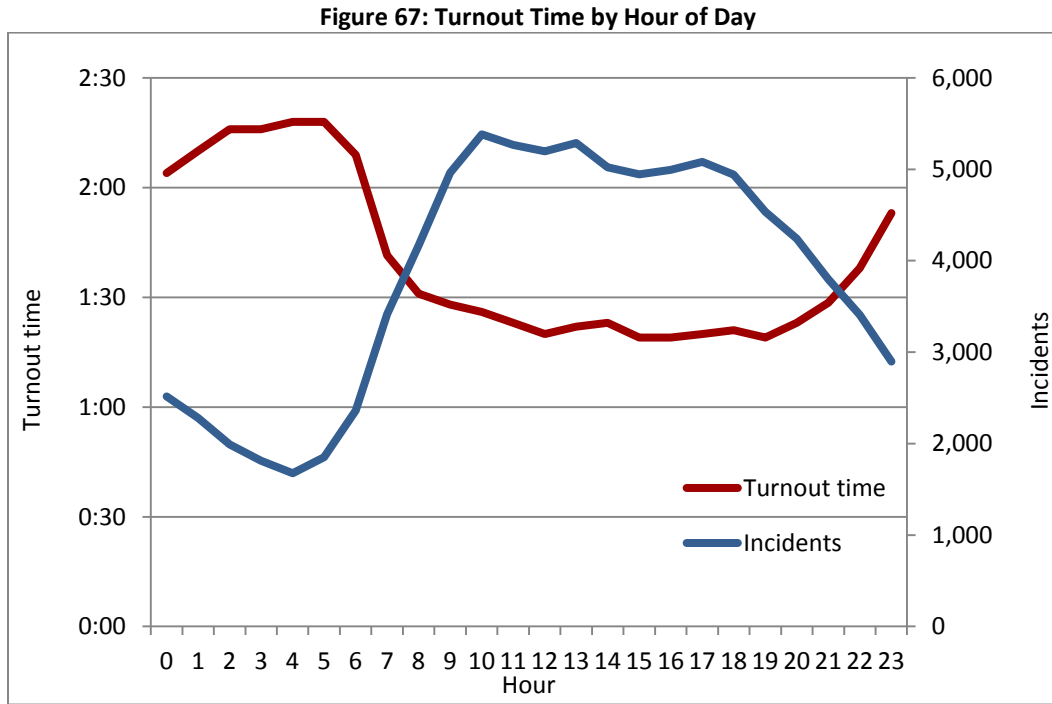
Turnout time is the first of the response phases controllable by the fire department. This phase begins at notification of response personnel of an emergency in progress by the dispatch center and ends when personnel and apparatus begin movement towards the incident location. Personnel must don appropriate equipment, assemble on the response vehicle, and begin travel to the incident. Good training and proper fire station design can minimize the time required for this step.

The following figure lists OCFA turnout time for all incidents as well as specific incident types. Overall, turnout time for all incidents is within two minutes, 90 percent of the time. Turnout time for all fire incidents is within 1 minute 55 seconds, 90 percent of the time. Turnout time for all EMS incidents is within two minutes, 90 percent of the time.

Figure 66: Turnout Time Performance



Turnout time can vary by hour of day. As depicted in the following figure, turnout time varies by one minute six seconds between the early morning hours and daytime hours.



Distribution and Initial Arriving Unit Travel Time

Travel time is potentially the longest of the response phases. The distance between the fire station and the location of the emergency influences total response time the most. The quality and connectivity of streets, traffic, driver training, geography, and environmental conditions are also factors. This phase begins with initial apparatus movement towards the incident location and ends when response personnel and apparatus arrive at the emergency's location.

The following map illustrates the area that can be reached from all OCFA fire stations in five minutes of travel time. It is based on posted road speeds and compensates for turning movements. Five minutes is used for the following analysis because it replicates the time allowed for travel within the OCFA adopted first unit response time goal for the urban level of service area. Nearly all of the urban area is within five minutes of an OCFA fire station.

Figure 68: Initial Unit Travel Time Capability – Urban

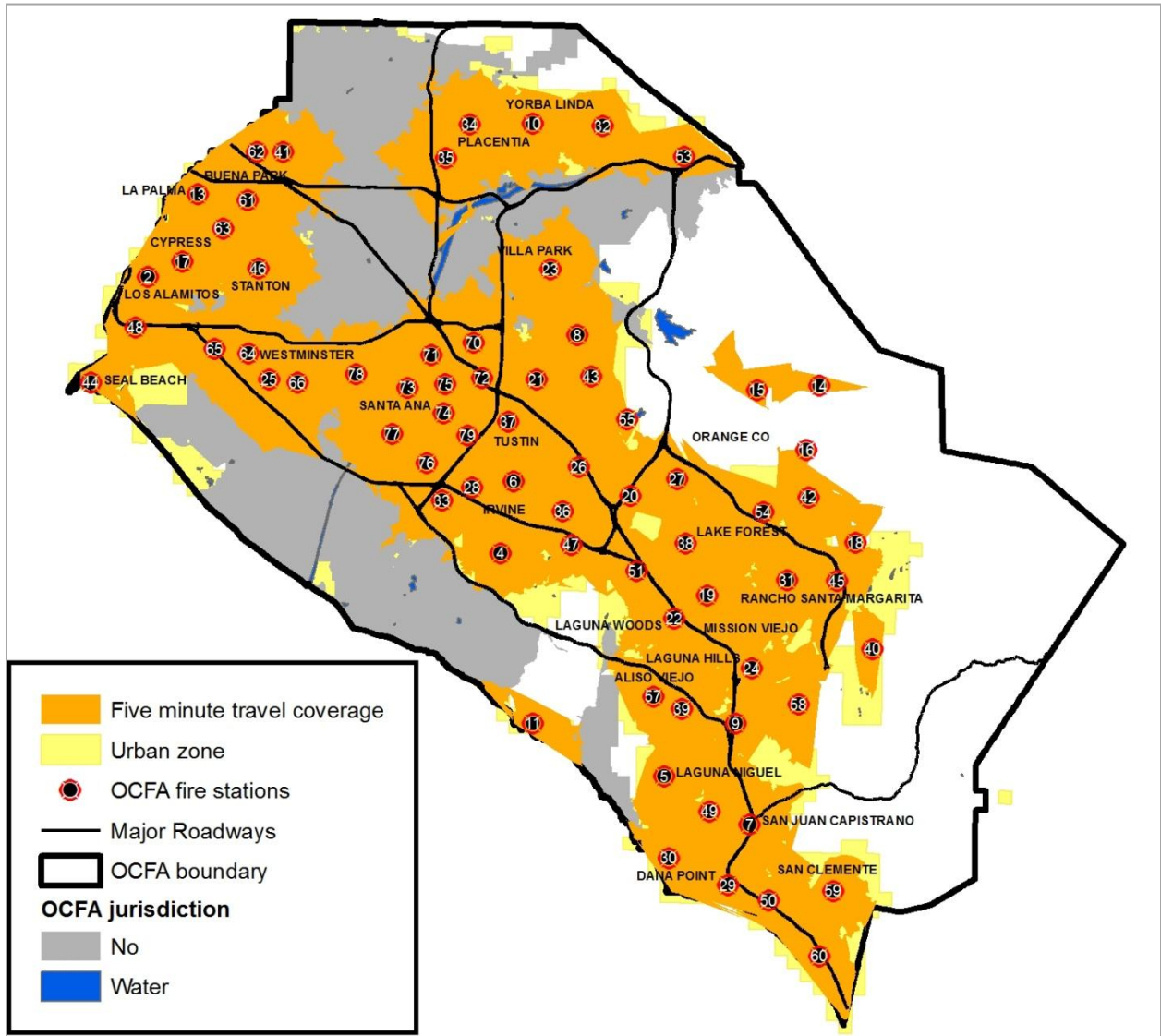
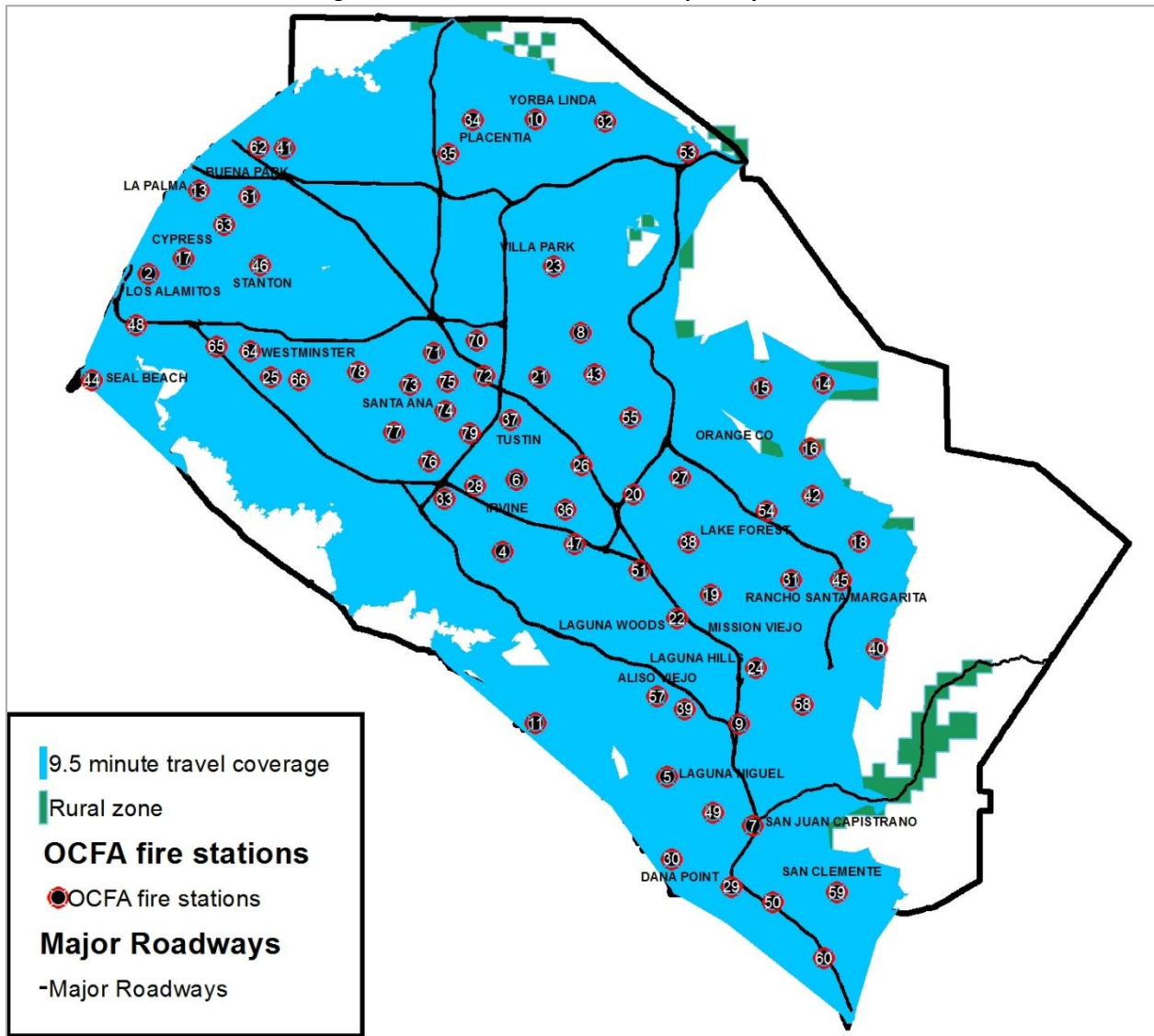


Figure 69: Urban Incidents Within Five Travel Minute Coverage

	Total	Percent of Total
Total incidents in GIS data set	101,910	100.0%
Total incidents inside station five travel minute coverage	99,667	97.8%

The following map illustrates the area that can be reached from all OCFA fire stations in 9.5 minutes of travel time. Again, it is based on posted road speeds and compensates for turning movements. 9.5 minutes is used for the following analysis because it replicates the time allowed for travel within the OCFA adopted first unit response time goal for the rural level of service area. The entire rural area is within 9.5 minutes of an OCFA fire station except for the area along the Ortega Highway to the southeast.

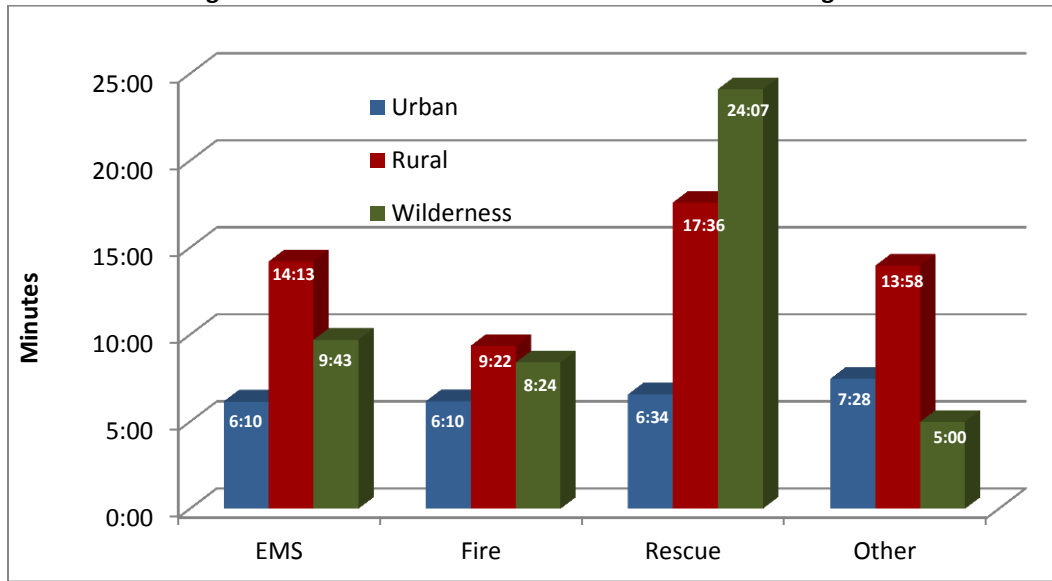
Figure 70: Initial Unit Travel Time Capability – Rural



GIS analysis was completed to determine how many urban area incidents during 2012 occurred within five travel minutes of OCFA fire stations. The following figure shows the result of this analysis.

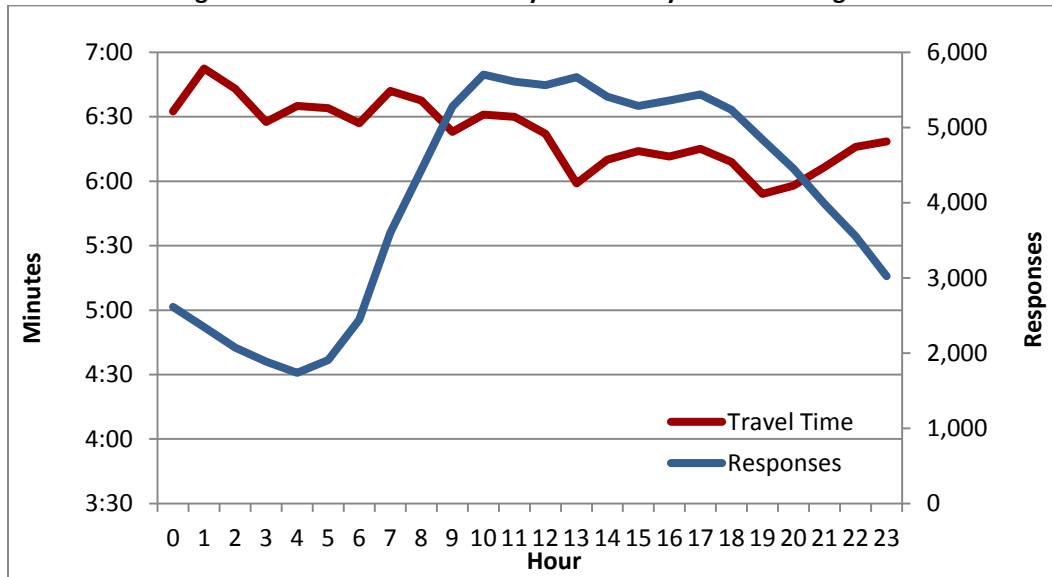
The following figure lists travel time for all incidents as well as specific incident types. Overall, travel time for all incidents is within six minutes 18 seconds, 90 percent of the time.

Figure 71: Overall Travel Time Performance – First Arriving Unit



Travel time can, in some situations, vary considerably by time of day. Heavy traffic at morning and evening rush hour can slow fire department response. Travel time varies by 59 seconds during the course of the day.

Figure 72: Overall Travel Time by Hour of Day – First Arriving Unit



Travel Time Performance by Region

Travel time performance by region is highly variable. This is influenced by a number of factors, including individual station area workload and the number of times a station must cover another station's area. Additional factors include the size of the station area and the street system serving it. More highly connected, grid patterned street systems contribute to faster response times than do areas with meandering streets with numerous dead-ends. The following maps show travel time performance by region.

Figure 73: Travel Time Performance by Region

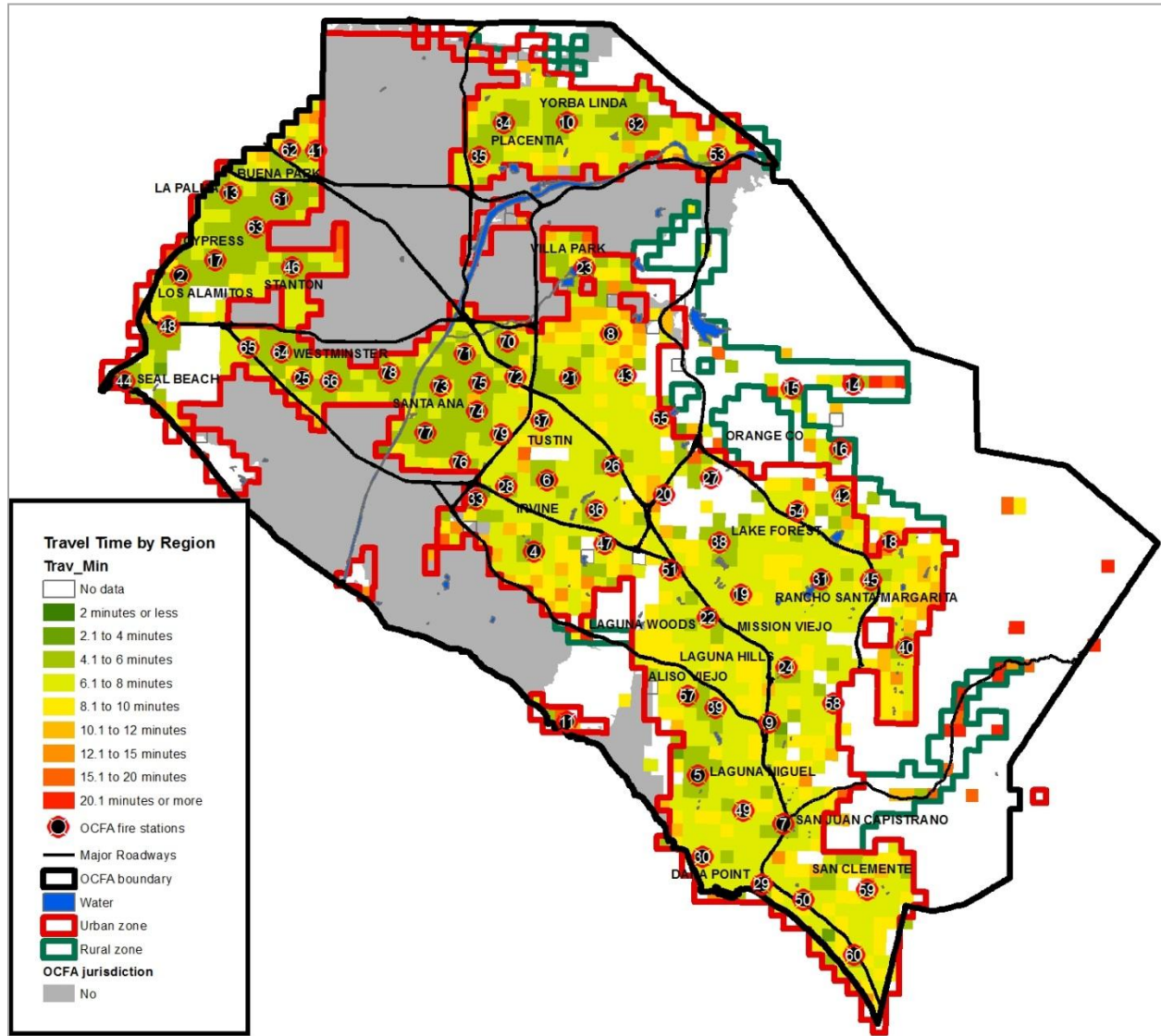


Figure 74: Travel Time Performance by Region – North

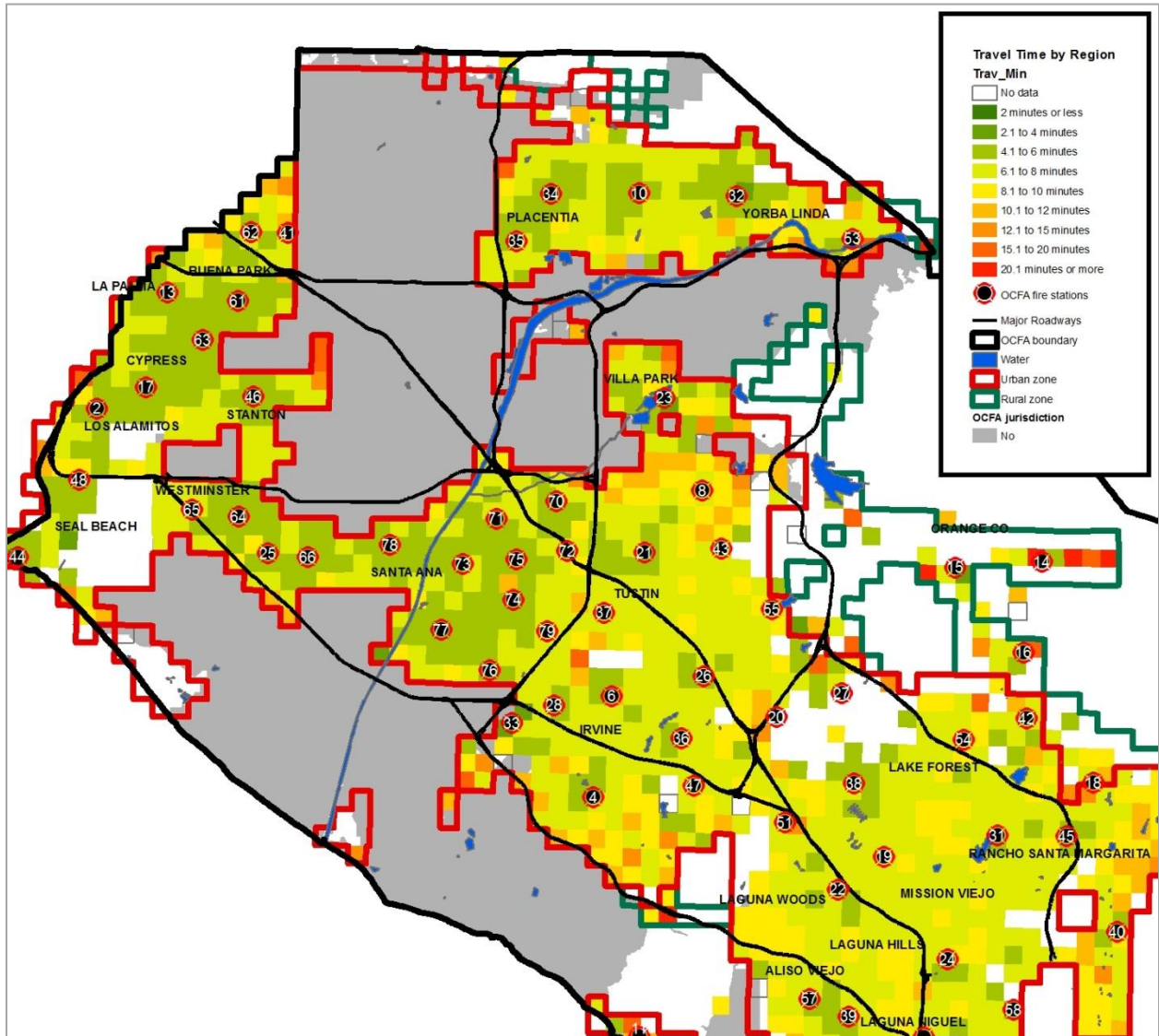
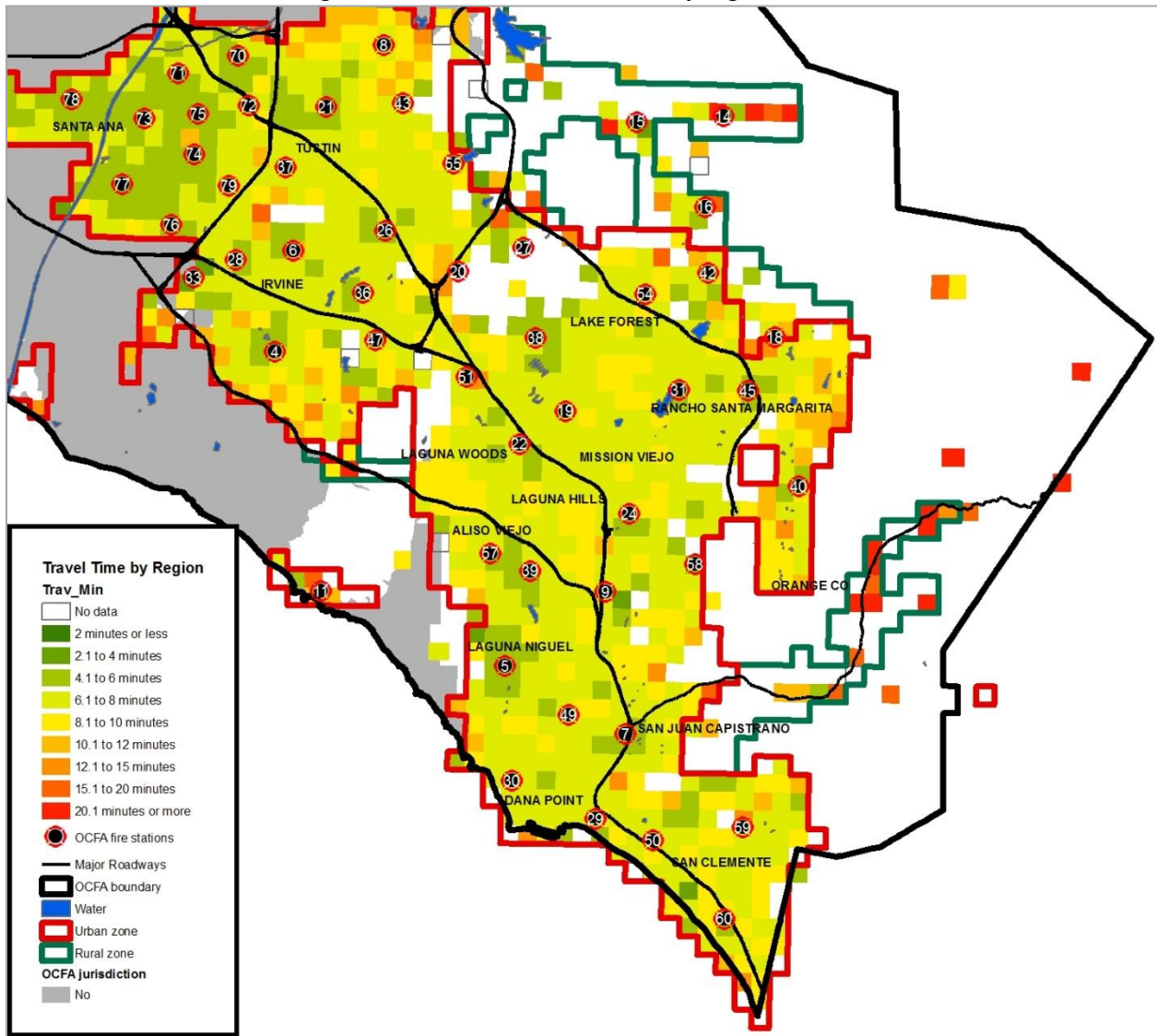
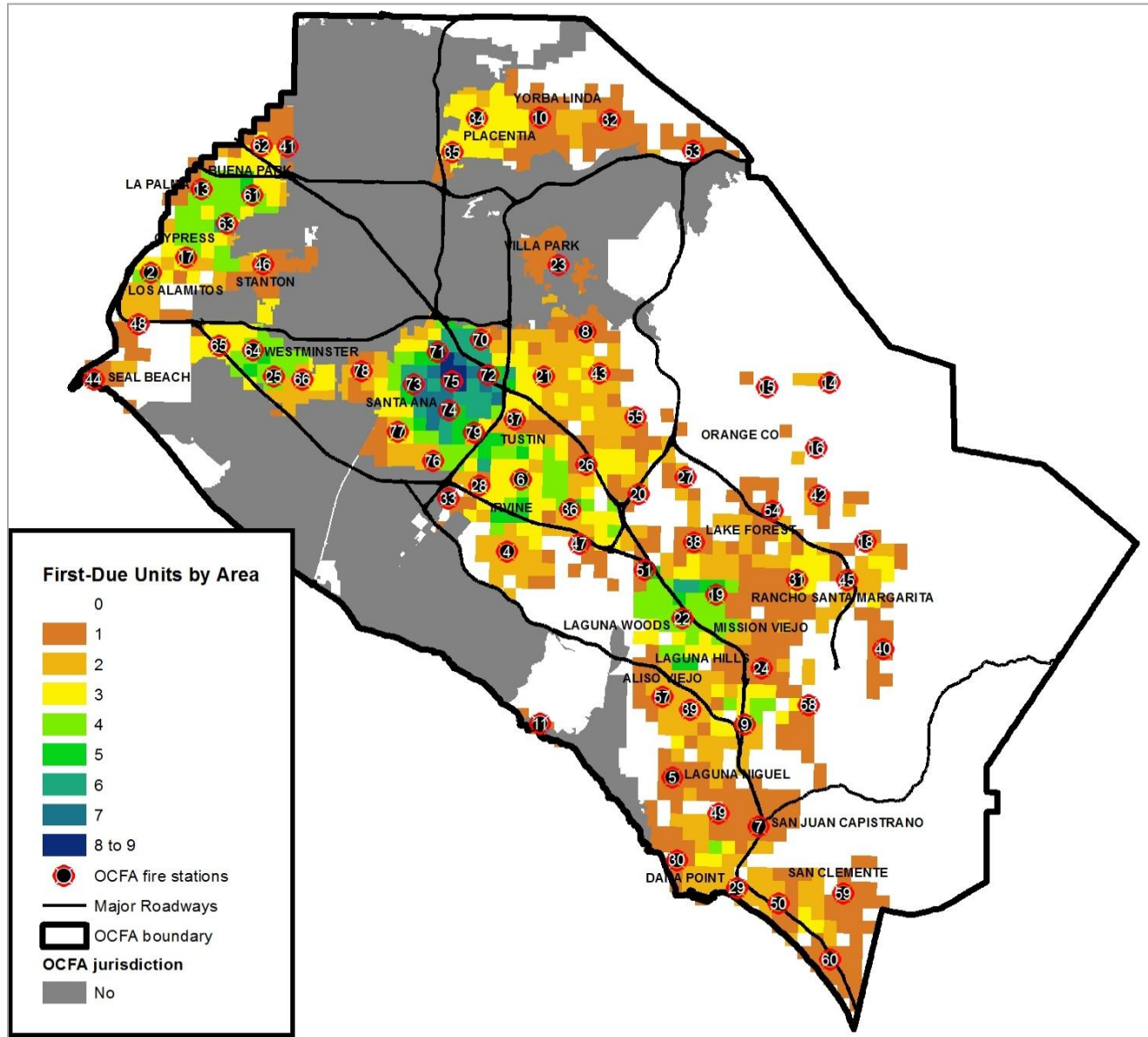


Figure 75: Travel Time Performance by Region – South



As important as it is to ensure that all portions of the service area are within the target travel time of a fire station, it is equally important to provide some degree of redundancy, or overlap, in areas of high incident activity. Figure 45 in this report illustrates the portions of the service area with higher incident activity. The likelihood of concurrent incidents is greater in these areas due to the number of incidents that occur in that area. Some degree of overlap is helpful to better serve concurrent incidents and minimize travel time. The following map illustrates the service area and show the number of response units, regardless of type, available within five minutes travel. This map was developed using distance traveled rather than posted road speeds. An average travel speed of 30 MPH is assumed.

Figure 76: Number of Units within Five Minutes Travel by Area

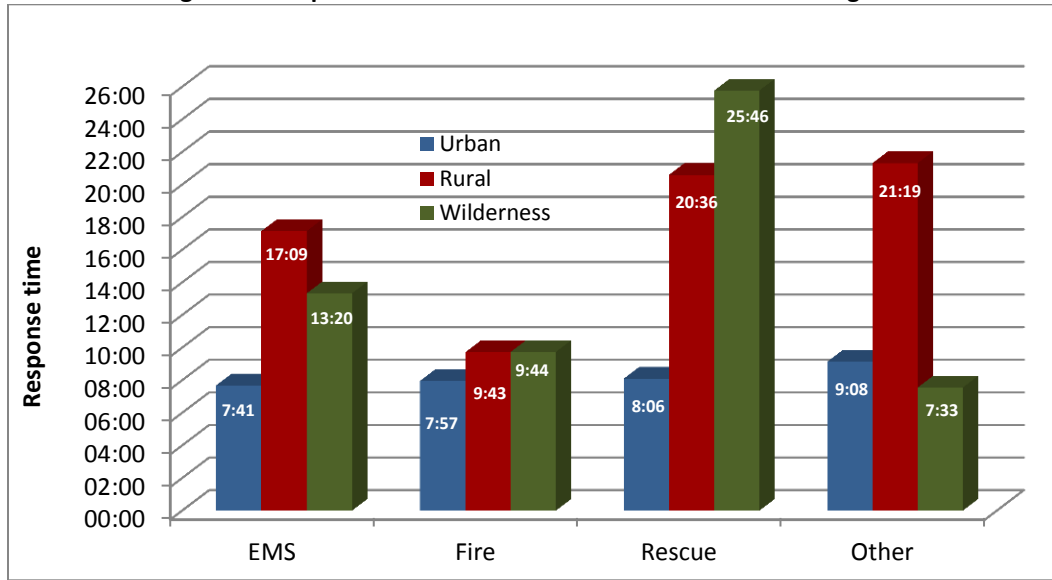


First Arriving Unit Dispatch to Arrival Time

Dispatch to arrival time is defined as that period between notification of response personnel by the dispatch center that an emergency is in progress until arrival of the first fire department response unit at the emergency. This is the time period of the response phases most controllable by the fire department.

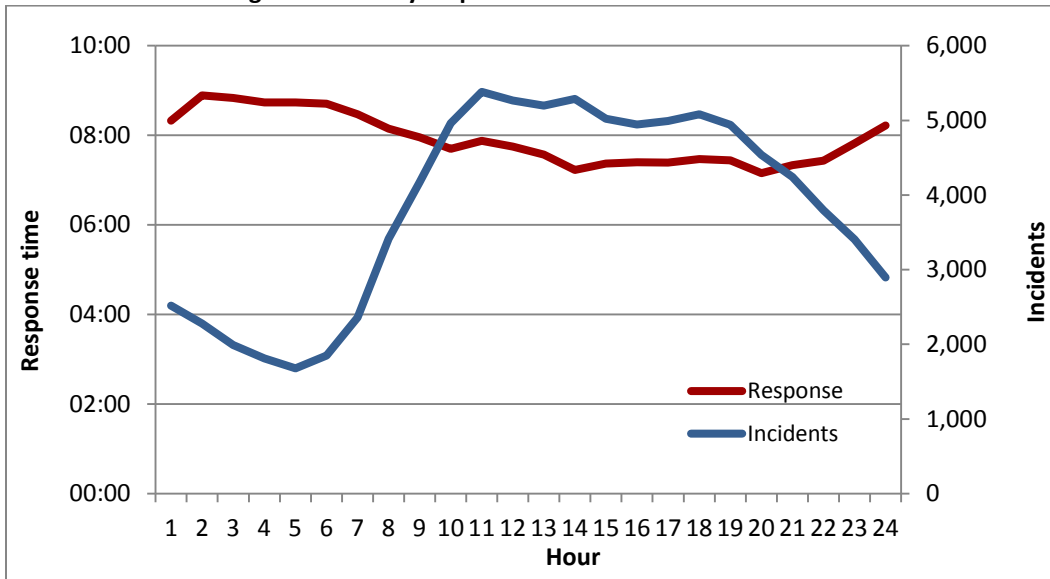
The following figure lists dispatch-to-arrival time for all incidents as well as specific incident types. Overall, dispatch to arrival time for all incidents is within seven minutes 51 seconds 90 percent of the time.

Figure 77: Dispatch to Arrival Time Performance – First Arriving Unit



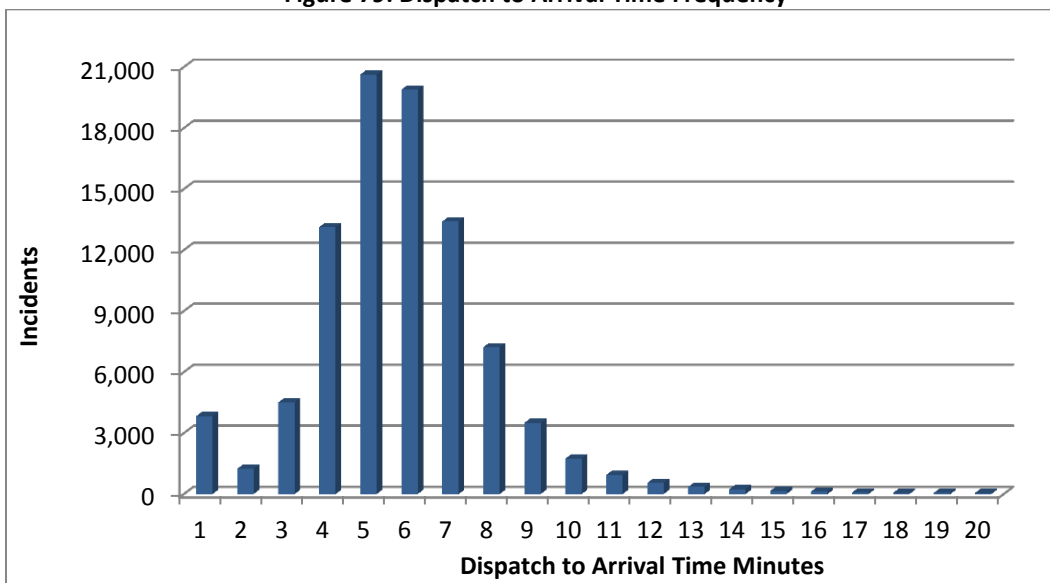
The next figure shows dispatch to arrival time by hour of day for all incidents. Dispatch to arrival time is slowest during the night-time hours and fastest during the day. OCFA's best dispatch to arrival times occur during the period of the day when response activity is at its highest. Dispatch to arrival time varies by one minute 39 seconds during the course of the day.

Figure 78: Hourly Dispatch to Arrival Time Performance



The next figure shows the frequency of incidents during 2012 at various minutes of dispatch to arrival time. Though OCFA evaluates its performance at the 90th percentile, most incidents have dispatch to arrival times between four and seven minutes.

Figure 79: Dispatch to Arrival Time Frequency



Dispatch to Arrival Time Performance by Region

Like travel time, dispatch to arrival time varies to a significant degree across the service area. The following maps show dispatch to arrival time performance by region.

Figure 80: Dispatch to Arrival Time Performance by Region

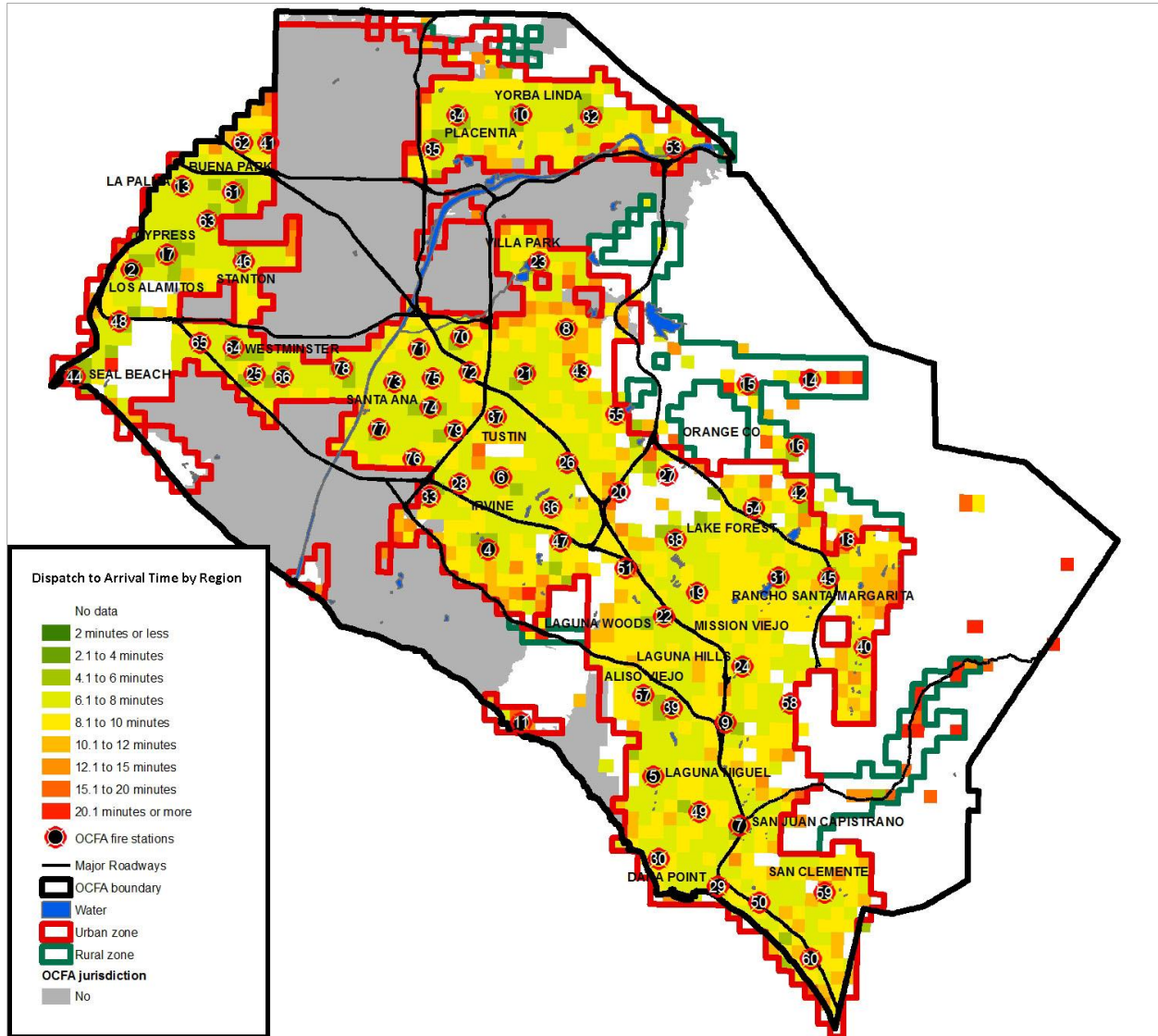


Figure 81: Dispatch to Arrival Time Performance by Region – North

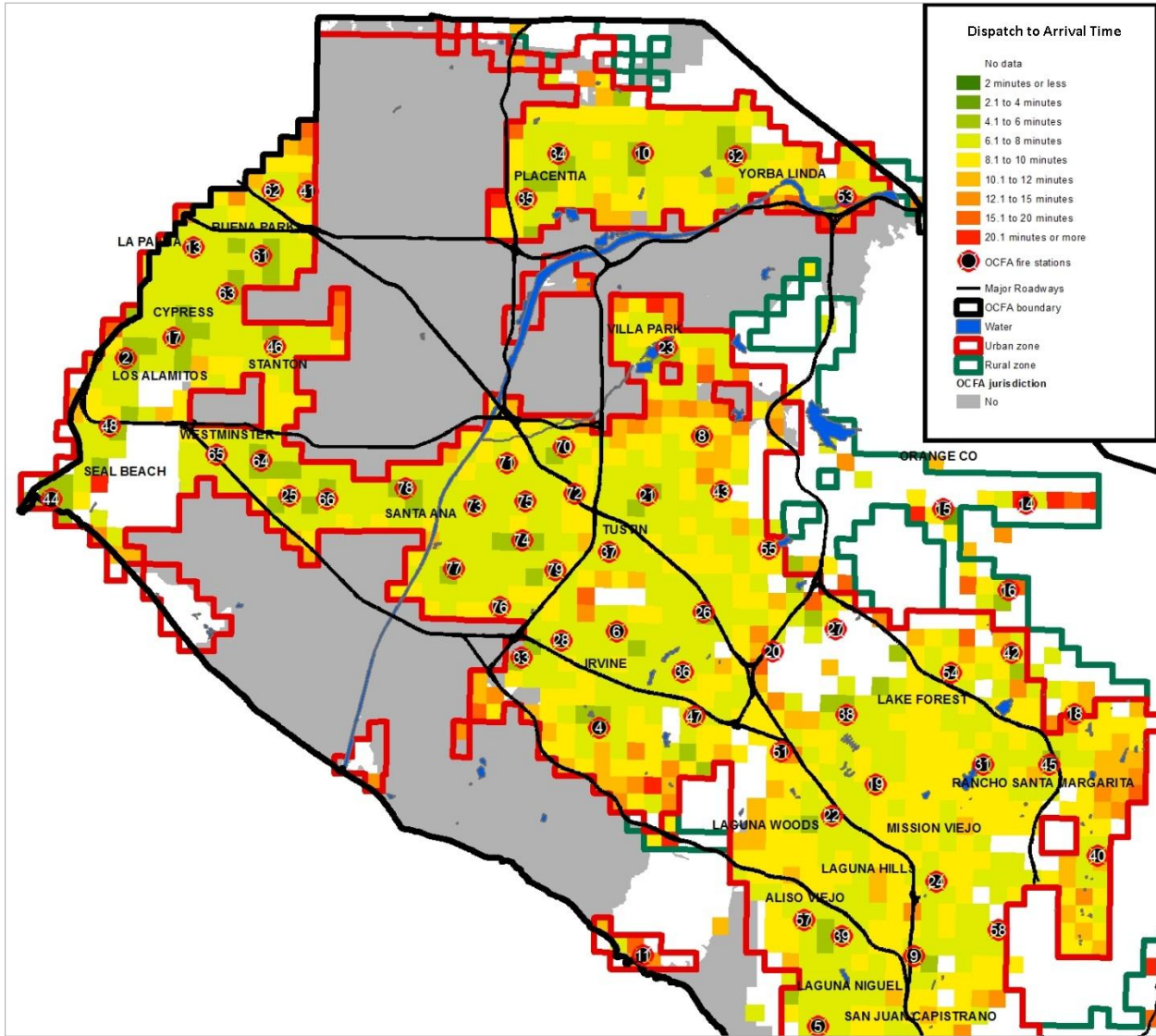
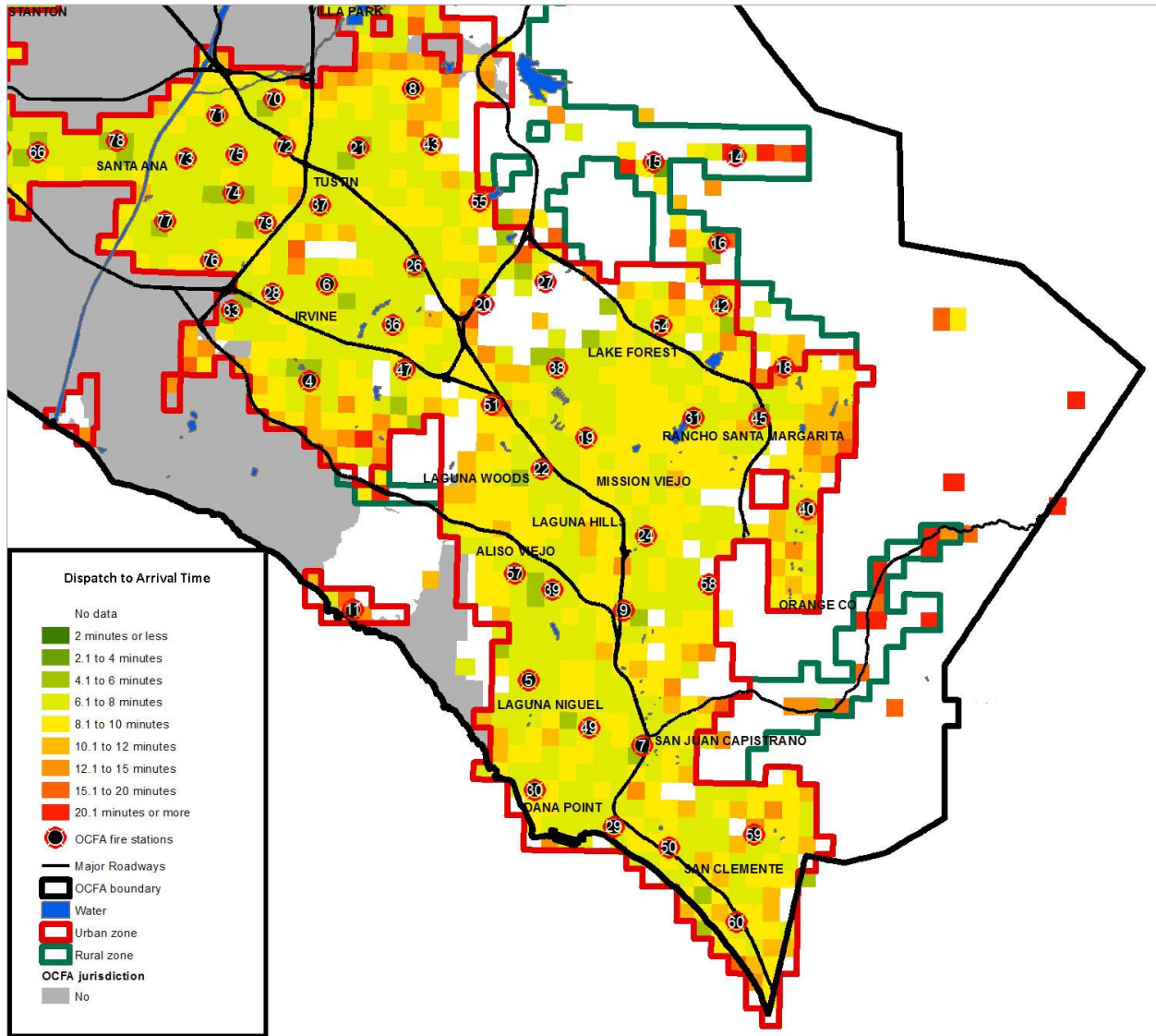


Figure 82: Dispatch to Arrival Time Performance by Region – South



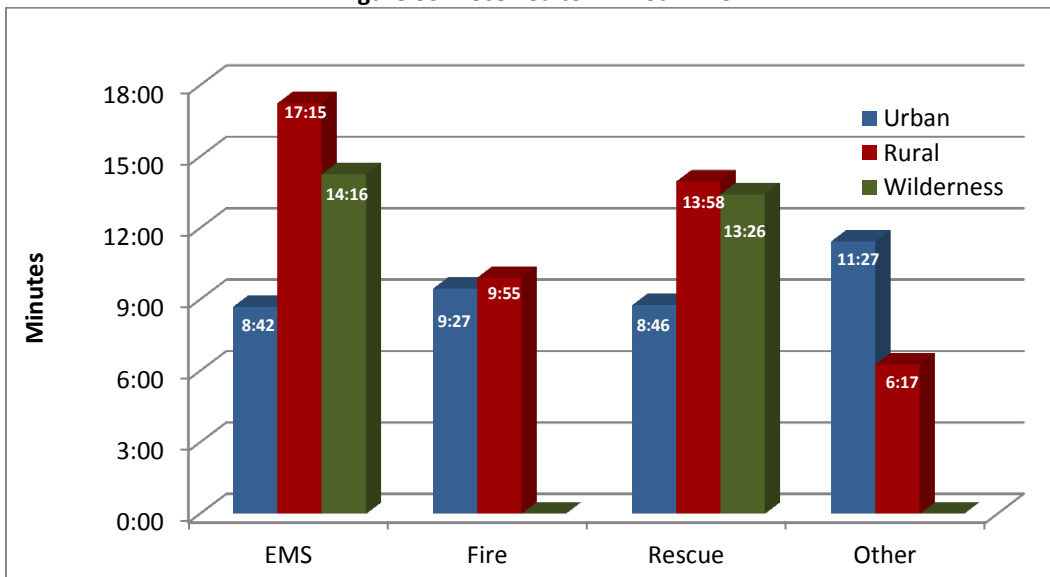
Total Response Time: Received to Arrived Time

From a customer’s standpoint, time begins when the emergency occurs. Their first contact with emergency services is when they call for help, usually by dialing 9-1-1. “Received to arrived” time best reflects customer time.

The dispatch center only captures a received time for 9-1-1 calls. As a consequence only 44,058 of the 92,036 core incidents have a valid received time.

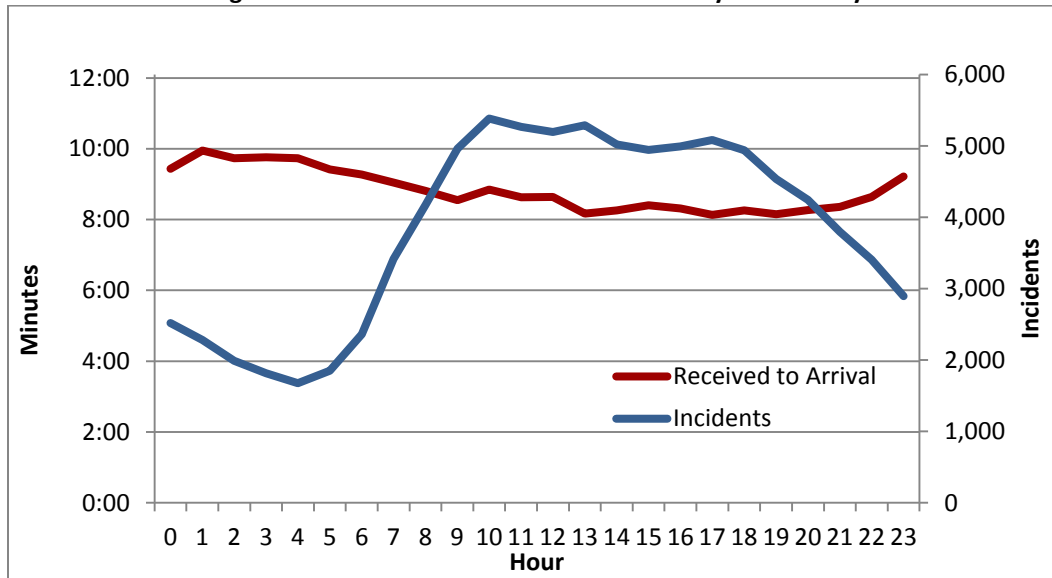
The next figure shows response performance at the 90th percentile from the time the phone rings at the dispatch center until the first unit arrives at the incident location. Received to arrival time in the urban area is within eight minutes 45 seconds, 90 percent of the time. In the Rural area it is within 16 minutes 45 seconds, 90 percent of the time. In the Wilderness area it is within 14 minutes 19 seconds, 90 percent of the time. Overall, received to arrival time for all incidents is within eight minutes 46 seconds, 90 percent of the time.

Figure 83: Received to Arrived Time



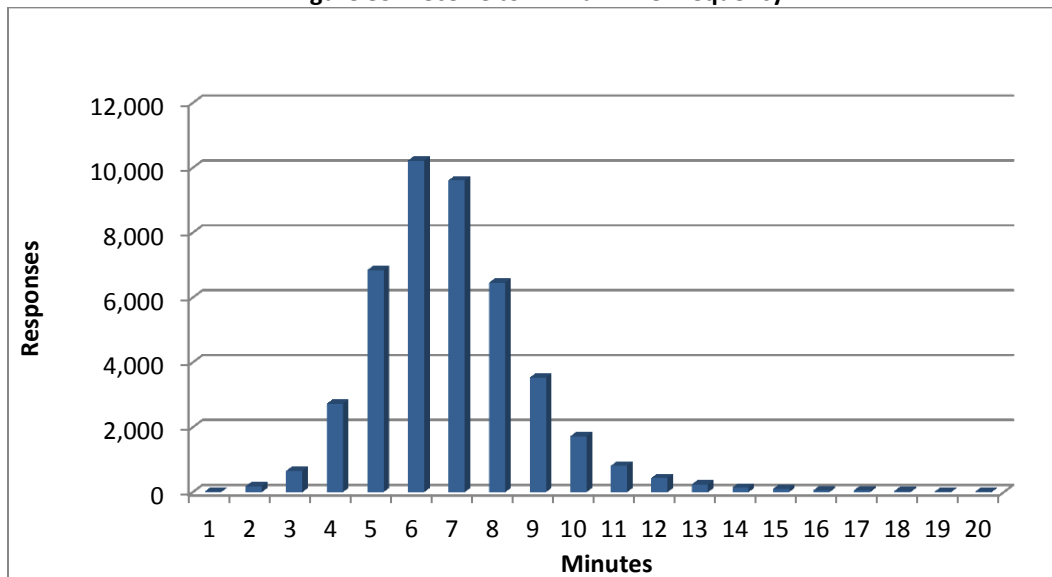
The next figure shows received to arrived performance by time of day. Again, total response time, from the customer’s standpoint is quickest during the day and slowest during the early morning hours.

Figure 84: Received to Arrived Performance by Hour of Day



The next figure shows the frequency of incidents during 2012 at various minutes of received to arrival time. Though OCFA evaluates its performance at the 90th percentile, most incidents have received to arrival times between five and eight minutes.

Figure 85: Receive to Arrival Time Frequency



Received to Arrival Time Performance by Region

Received to arrival time performance by region is also highly variable. As with travel and response time this is influenced by a number of factors, including individual station area workload and the number of times a station must cover another station's area. The following maps show response time performance by region.

Figure 86: Received to Arrival Time Performance by Region

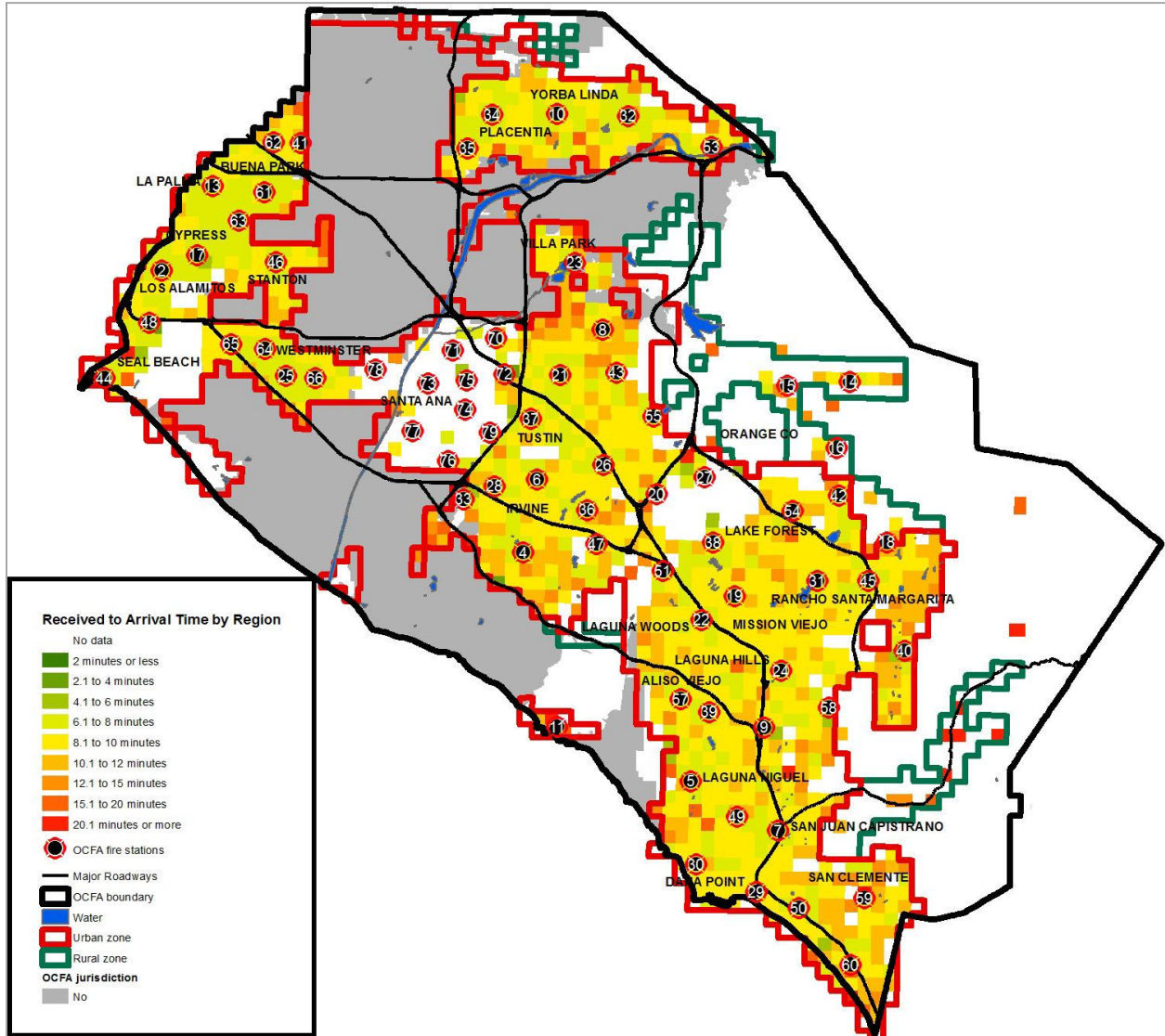


Figure 87: Received to Arrival Time Performance by Region – North

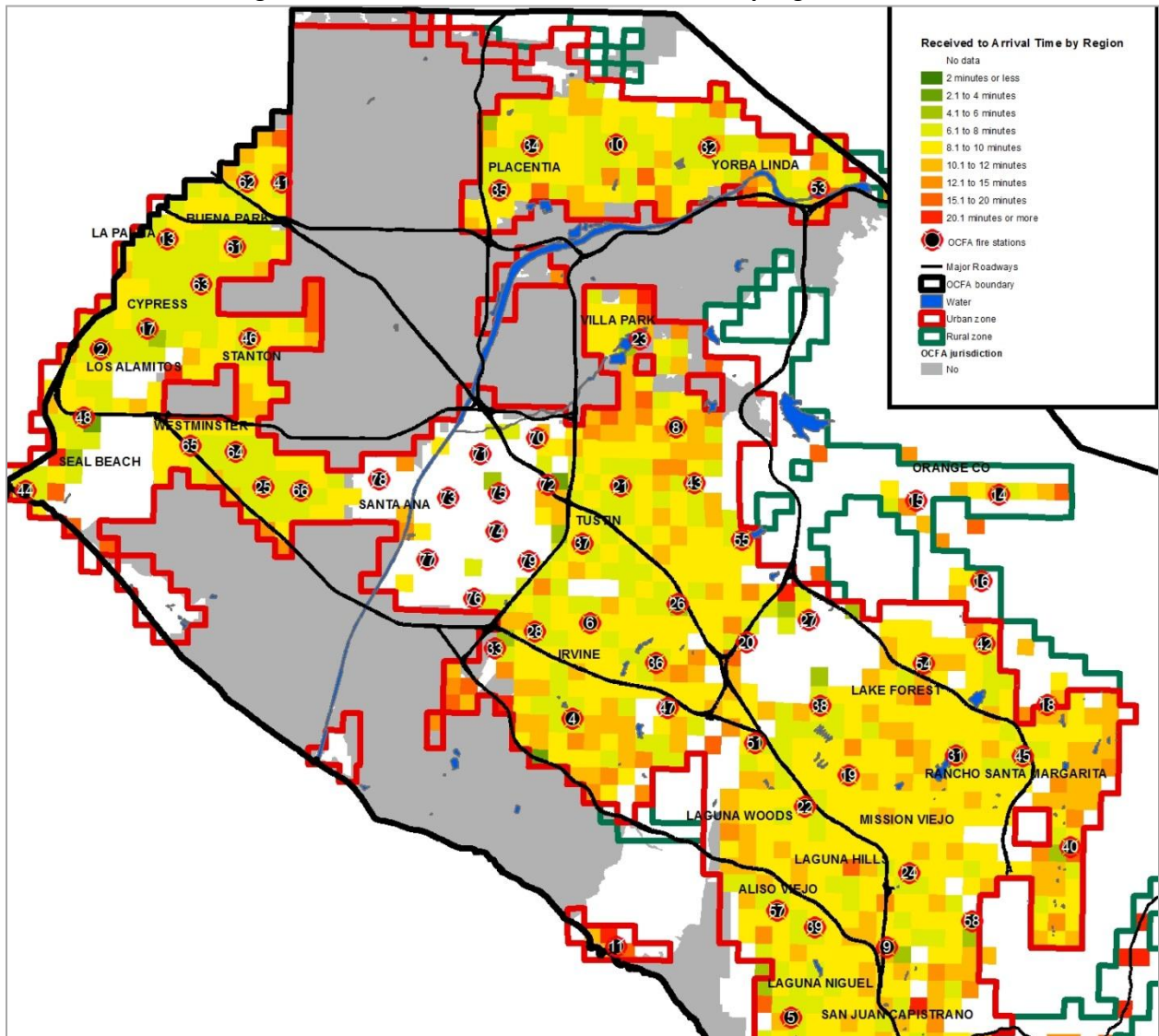
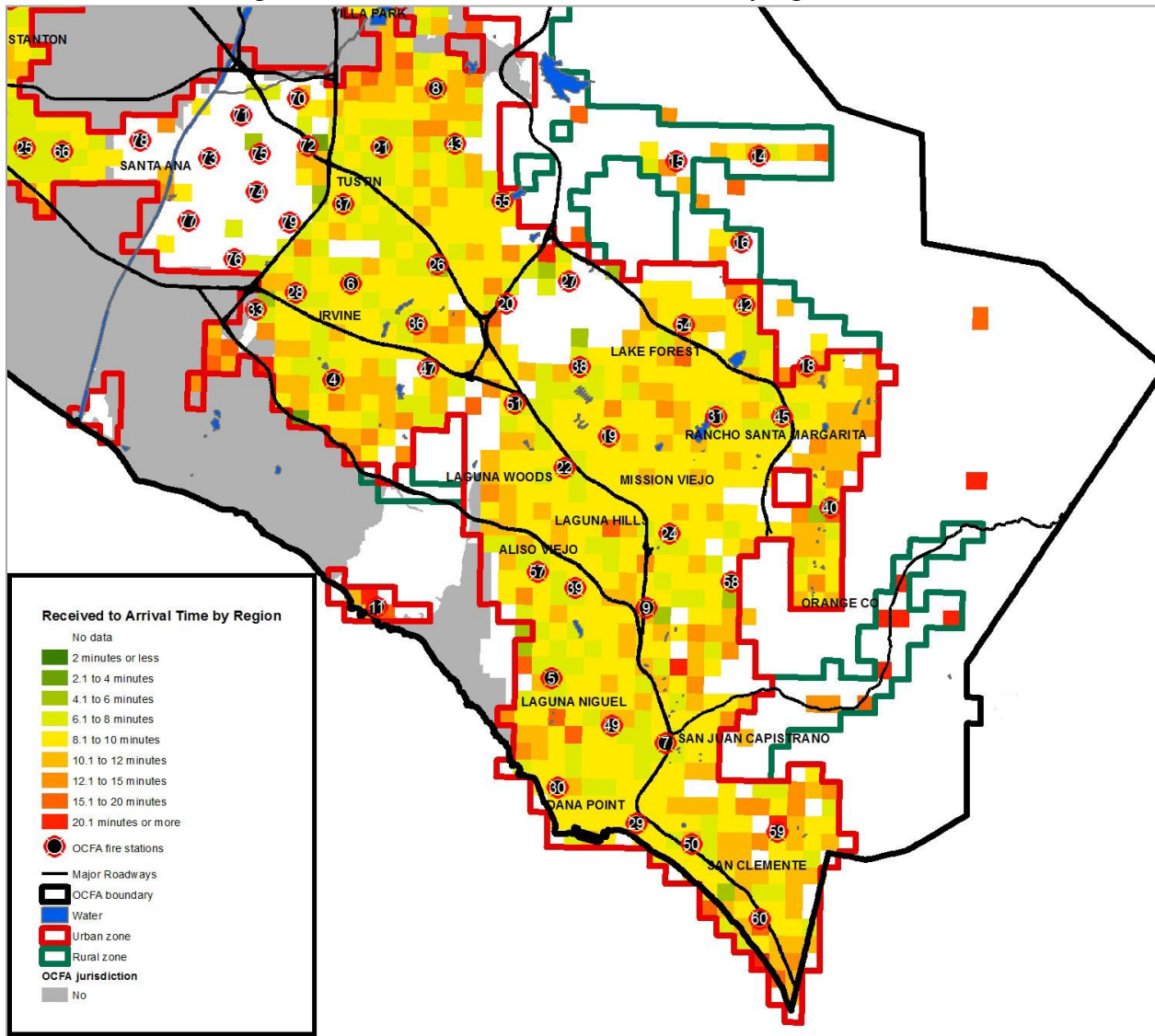


Figure 88: Received to Arrival Time Performance by Region – South



Concentration and Current Effective Response Force Capability Analysis

Effective Response Force (ERF) is the number of personnel and apparatus required to be present on the scene of an emergency incident to perform the critical tasks in such a manner as to effectively mitigate the incident without unnecessary loss of life and/or property. The ERF is specific to each individual type of incident, as are the critical tasks that must be performed.

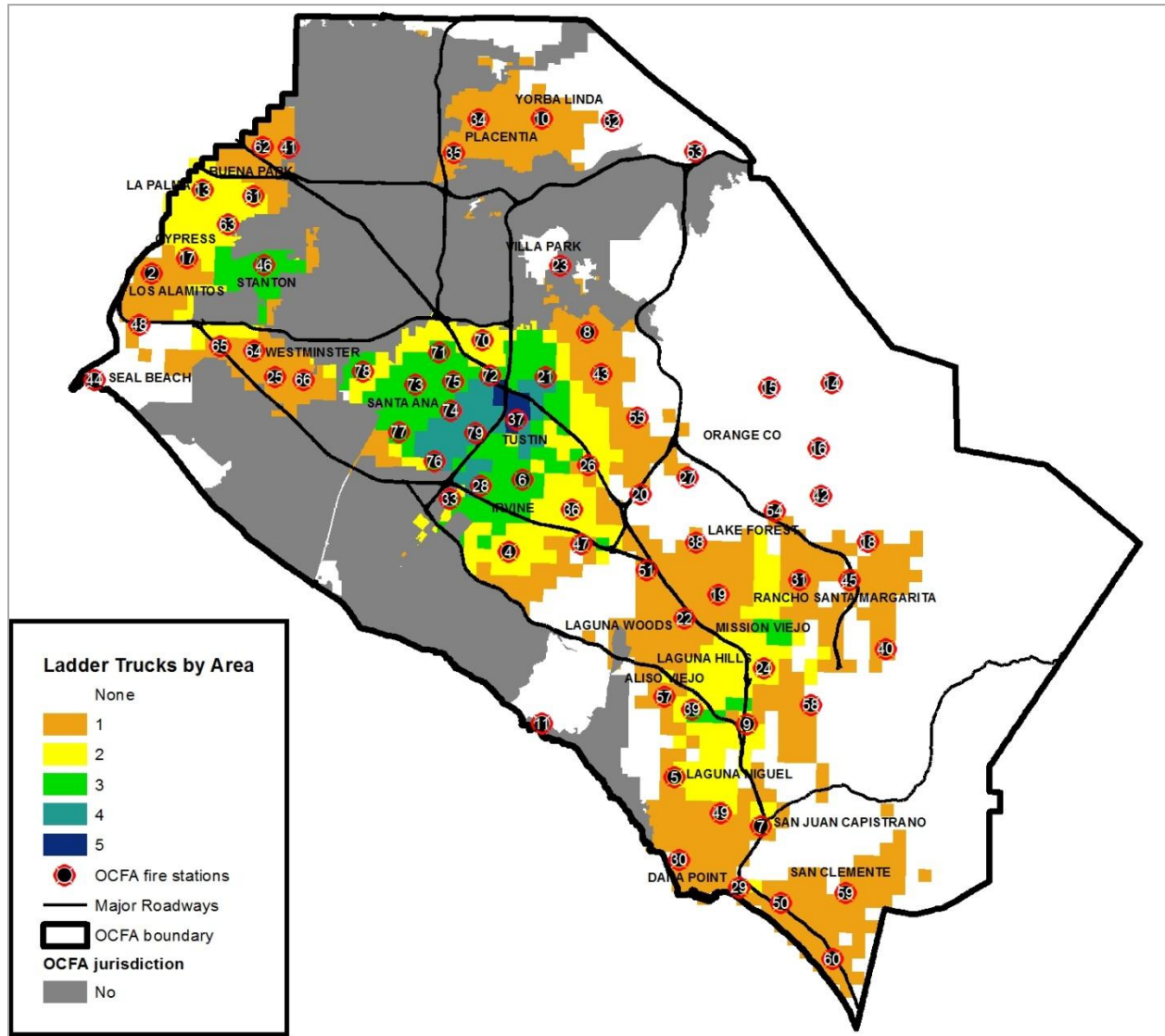
The concentration analysis begins with a review of the physical capability of OCFA’s resources to achieve a target ERF response time to the service area. Then further analysis will determine whether or not OCFA’s *actual* ERF assembly performance matches this physical concentration capability.

Fire incident resource requirements will be used since this incident type is typically the most complex. The ability to deliver resources required for a moderate risk fire such as a single family residence will be shown.

The following maps depict the physical capability of OCFA to assemble various concentrations of apparatus within ten minutes of travel time. The modeled analysis shown assumes that all response units are available and uses road distance at an average travel speed of 30 MPH. This analysis illustrates the number of response units, regardless of type, within ten minutes travel by area. There are many areas, particularly in the southern region, that do not have sufficient units to provide a full effective response force within ten minutes travel.

The previous map illustrates the number of units within ten minutes travel of OCFA service area. Structure fires require a ladder truck as part of the full effective response force. The following map illustrates the number of ladder trucks within ten minutes travel of the OCFA service area. Most of the OCFA service area is within ten travel minutes of at least one ladder truck and in many areas, more than one.

Figure 90: Number of Ladder Trucks within Ten Minutes Travel



OCFA's actual full effective response force performance for moderate risk structure fires for calendar year 2012 was within 15 minutes 53 seconds, 90 percent of the time in the urban area. No data was available to evaluate performance with either the rural or wilderness areas.

Rescue type incidents also can require more than one response unit. The effective response force for a moderate risk rescue incident is at least one engine or ladder truck and one medic unit with a total complement of four firefighters and two paramedics.

OCFA's actual full effective response force performance for moderate risk rescue incidents for calendar year 2012 was within 16 minutes 32 seconds, 90 percent of the time in the urban area. Coincidentally, it was also within 16 minutes 32 seconds, 90 percent of the time in the rural area.

Second Unit Arrival Time

The same group of urban area structure fires was reviewed to determine at what time the second fire engine arrived on the scene. According to the data, the second unit arrived on scene within eight minutes 19 seconds, 90 percent of the time, one minute 51 seconds, 90 percent of the time after the first engine's arrival.

Reliability

When evaluating the effectiveness of any resource deployment plan, it is necessary to evaluate the workload of individual companies to determine to what extent their availability for dispatch is affecting response time performance. In simplest terms, a response unit cannot make it to an incident simply across the street from its own station within the target response time if it is already committed to another call.

The ability of a fire station's first-due unit(s) to respond to an incident within its assigned response area is known as unit *reliability*. The reliability analysis is done by measuring the percentage of time response unit(s) assigned to a given fire station was available to respond to a request for service within that fire station's primary service area.

The following figure illustrates the percentage of time a response unit was able to serve an incident within its home station area. It also lists the percentage of time any unit, regardless of its assigned station, was able to serve an incident with a target time of 7 minutes 20 seconds, the response performance objective established in the *2006 OCFA Standards of Cover*. Reliability ranges from a low of 80 percent to a high of 94 percent. Shorter travel times result as reliability increases.

Figure 91: Reliability – 2012

	1st Due Units Availability in First Due Area	Any Unit Reliability In First Due Area Within 07:20			1st Due Units Availability in First Due Area	Any Unit Reliability In First Due Area Within 07:20
ORC02	81%	93%		ORC47	58%	80%
ORC04	78%	83%		ORC48	87%	87%
ORC05	84%	83%		ORC50	69%	82%
ORC06	81%	87%		ORC51	70%	74%
ORC07	80%	79%		ORC53	75%	70%
ORC08	69%	70%		ORC54	74%	76%
ORC09	78%	86%		ORC55	79%	76%
ORC10	76%	84%		ORC57	85%	75%
ORC11	26%	61%		ORC58	82%	76%
ORC13	78%	90%		ORC60	80%	77%
ORC17	86%	90%		ORC61	78%	93%
ORC19	72%	77%		ORC62	72%	88%
ORC21	72%	87%		ORC63	69%	94%
ORC22	87%	78%		ORC64	82%	89%
ORC23	70%	85%		ORC65	79%	85%
ORC24	72%	73%		ORC66	74%	90%
ORC25	55%	88%		ORC70	48%	87%
ORC26	84%	83%		ORC71	60%	88%
ORC27	50%	83%		ORC72	53%	87%
ORC28	65%	84%		ORC73	53%	89%
ORC29	72%	83%		ORC74	54%	94%
ORC30	69%	83%		ORC75	75%	93%
ORC31	80%	71%		ORC77	73%	89%
ORC32	84%	80%		ORC78	68%	90%
ORC34	87%	86%		ORC79	45%	86%
ORC35	76%	86%		ORC43	69%	80%
ORC36	69%	85%		ORC49	71%	75%
ORC37	62%	82%		ORC59	79%	67%
ORC38	80%	85%		ORC76	41%	88%
ORC39	74%	85%			Rural Stations	
ORC40	83%	60%		ORC14	24%	73%
ORC42	73%	71%		ORC15	47%	87%
ORC44	81%	94%		ORC16	48%	82%
ORC45	93%	77%		ORC18	74%	93%
ORC46	75%	87%				

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Section G – Factors Influencing Incident Outcomes

Most fires within buildings develop in a predictable fashion, unless influenced by highly flammable material. Ignition, or the beginning of a fire, starts the sequence of events. It may take several minutes or even hours from the time of ignition until a flame is visible. This smoldering stage is very dangerous, especially during times when people are sleeping, since large amounts of highly toxic smoke may be generated during this phase.

Once flames do appear, the sequence continues rapidly. Combustible material adjacent to the flame heat and ignite, which in turn heats and ignites other adjacent materials if sufficient oxygen is present. As the objects burn, heated gases accumulate at the ceiling of the room. Some of the gases are flammable and highly toxic.

The spread of the fire from this point continues quickly. Soon the flammable gases at the ceiling as well as other combustible material in the room of origin reach ignition temperature. At that point, an event termed “flashover” occurs; the gases and other material ignite, which in turn ignites everything in the room. Once flashover occurs, damage caused by the fire is significant and the environment within the room can no longer support human life.

Flashover usually occurs about five to eight minutes from the appearance of flame in typically furnished and ventilated buildings. Since flashover has such a dramatic influence on the outcome of a fire event, the goal of any fire agency is to apply water to a fire before flashover occurs.

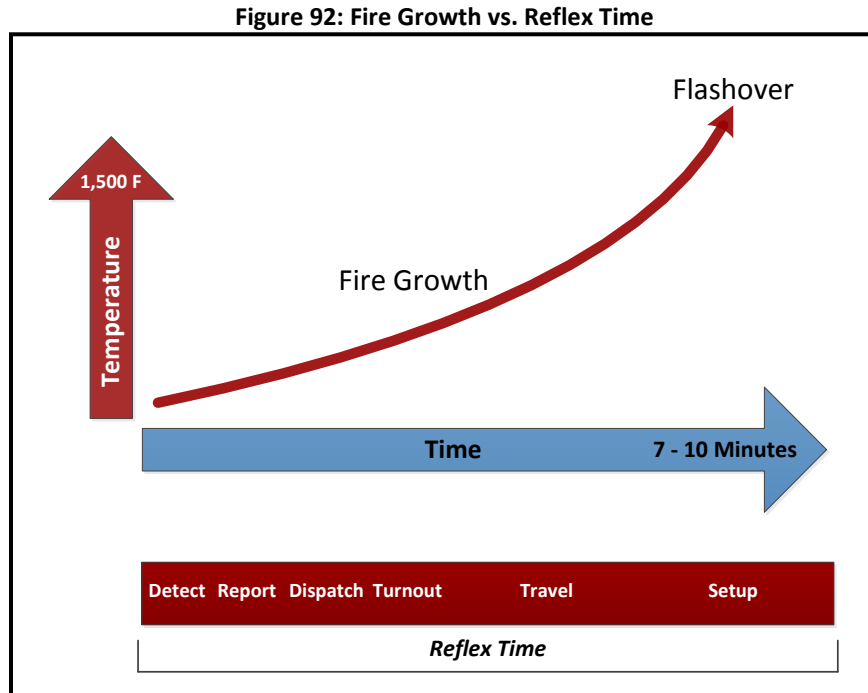
Although modern codes tend to make fires in newer structures more infrequent, today’s energy-efficient construction (designed to hold heat during the winter) also tends to confine the heat of a hostile fire. In addition, research has shown that modern furnishings generally burn hotter (due to synthetics).

In the 1970s, scientists at the National Institute of Standards and Technology found that after a fire broke out, building occupants had about 17 minutes to escape before being overcome by heat and smoke. Today, that estimate is as short as three minutes.²⁶ The necessity of effective early warning (smoke alarms), early suppression (fire sprinklers), and firefighters arriving on the scene of a fire in the shortest span of time is more critical now than ever.

Perhaps as important as preventing flashover is the need to control a fire before it does damage to the structural framing of a building. Materials used to construct buildings today are often less fire resistive than the heavy structural skeletons of older frame buildings. Roof trusses and floor joists are commonly made with lighter materials that are more easily weakened by the effects of fire. “Light weight” roof trusses fail after five to seven minutes of direct flame impingement. Plywood I-beam joists can fail after as little as three minutes of flame contact. This creates a dangerous environment for firefighters.

²⁶ National Institute of Standards and Technology, *Performance of Home Smoke Alarms, Analysis of the Response of Several Available Technologies in Residential Fire Settings*, Bukowski, Richard, et al.

In addition, the contents of buildings today have a much greater potential for heat production than in the past. The widespread use of plastics in furnishings and other building contents rapidly accelerate fire spread and increase the amount of water needed to effectively control a fire. All of these factors make the need for early application of water essential to a successful fire outcome. A number of events must take place quickly to make it possible to achieve fire suppression prior to flashover. **Figure 92** illustrates the sequence of events.



As is apparent by this description of the sequence of events, application of water in time to prevent flashover is a serious challenge for any fire department. It is critical, though, as studies of historical fire losses can demonstrate.

The National Fire Protection Association found that fires contained to the room of origin (typically extinguished prior to or immediately following flashover) had significantly lower rates of death, injury, and property loss when compared to fires that had an opportunity to spread beyond the room of origin (typically extinguished post-flashover). As evidenced in the following figure, fire losses, casualties, and deaths rise significantly as the extent of fire damage increases.

Figure 93: Fire Extension in Residential Structures

Consequence of Fire Extension In Residential Structures 2003-2007			
Extension	Rates per 1,000 Fires		Average Dollar Loss Per Fire
	Civilian Deaths	Civilian Injuries	
Confined to room of origin or smaller	2.17	25.75	\$4,228
Confined to floor of origin	16.86	82.56	\$35,581
Confined to building of origin or larger	27.90	61.30	\$65,450

Source: National Fire Protection Association, "Home Structure Fires," March 2010.

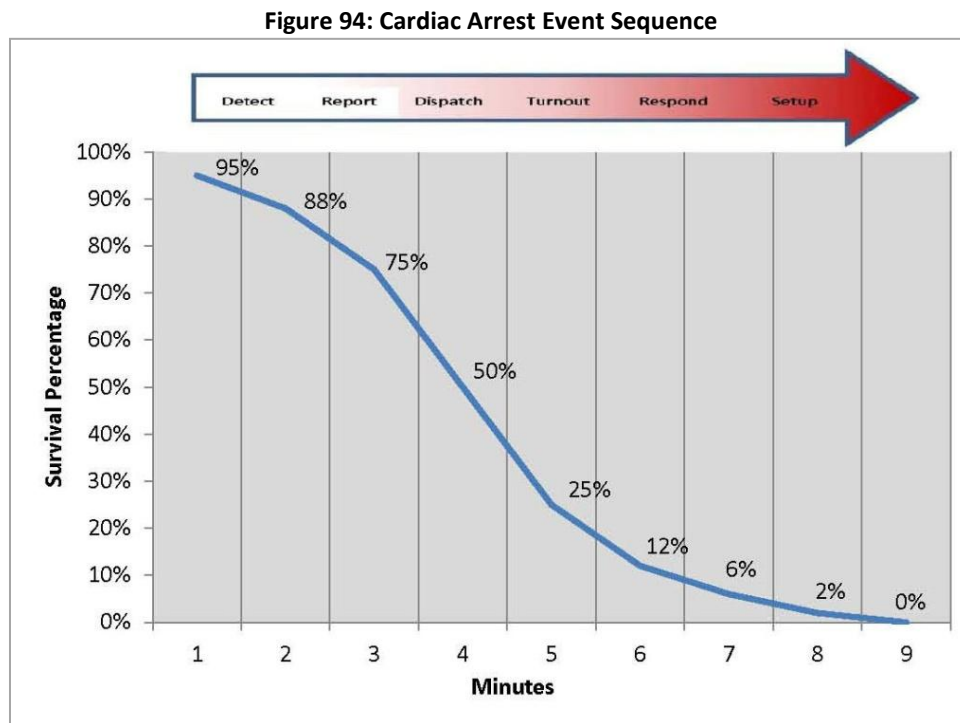
Emergency Medical Event Sequence

Cardiac arrest, also known as sudden cardiac arrest, is the abrupt loss of heart function. This can occur with or apart from the diagnosis of heart disease. The time and mode of death are unexpected; occurring instantly or shortly after symptoms appear. Cardiac arrest is the most significant life-threatening medical event in emergency medicine today. A victim of cardiac arrest has mere minutes in which to receive lifesaving care if there is to be any hope for resuscitation.

The American Heart Association (AHA) issued a set of cardiopulmonary resuscitation (CPR) guidelines designed to streamline emergency procedures for heart attack victims, and to increase the likelihood of survival. Hands-only CPR is the current recommendation by dispatchers for all 9-1-1 cardiac arrest calls. The AHA guidelines include goals for the application of cardiac defibrillation to cardiac arrest victims.

Cardiac arrest is reversible in most victims if it is treated within a few minutes, however survival chances fall by 7 to 10 percent for every minute between collapse and defibrillation. Consequently, the AHA recommends rapid application of an automated external defibrillator (AED) as early as possible and within five minutes of cardiac arrest.

As with fires, the sequence of events that lead to emergency cardiac care can be graphically illustrated, as in the following figure.



The percentage of opportunity for recovery from cardiac arrest drops quickly as time progresses. The stages of medical response are very similar to the components described for a fire response. Recent research stresses the importance of rapid cardiac defibrillation and administration of certain medications as a means of improving the opportunity for successful resuscitation and survival.

People, Tools, and Time

Time matters a great deal in the achievement of an effective outcome to an emergency event. Time, however, is not the only factor. Delivering sufficient numbers of properly trained, appropriately equipped personnel within the critical time period completes the equation.

For medical emergencies this can vary based on the nature of the emergency. Many medical emergencies are not time critical. However, for serious trauma, cardiac arrest, or conditions that may lead to cardiac arrest, a rapid response is essential.

Equally critical is delivering enough personnel to the scene to perform all of the concurrent tasks required to deliver quality emergency care. For a cardiac arrest, this can be up to six personnel; two to perform CPR, two to set up and operate advanced medical equipment, one to record the actions taken by emergency care workers, and one to direct patient care.

Thus, for a medical emergency, the real test of performance is the time it takes to provide the personnel and equipment needed to deal effectively with the patient's condition.

Fire emergencies are even more resource critical. Again, the true test of performance is the time it takes to deliver sufficient personnel to initiate application of water to a fire. This is the only practical method to reverse the continuing internal temperature increases and ultimately prevent flashover.

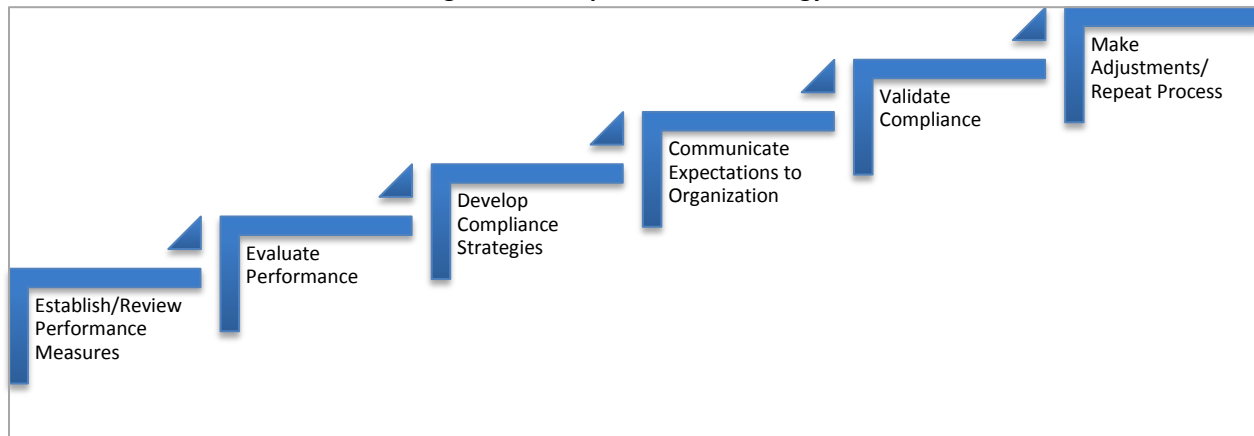
Section H – Overview of Compliance Methodology

Compliance Methodology requires that performance objectives and performance measures are evaluated and efforts are made to reach or maintain the established levels.

Compliance Model

Compliance is best achieved through a systematic approach. The OCFA has identified the following six-step compliance model:

Figure 95: Compliance Methodology



Phase 1—Establish/Review Performance Measures

Conduct a full review of the performance measures every five years. Process is risk-based:

- Identify services provided
- Define levels of service
- Categorize levels of risk
- Develop performance objectives and measures:
 - Distribution measures
 - Concentration measures

Phase 2—Evaluate Performance

Performance measures are applied to actual service provided:

- System level
- Regional level
- First Due Area level
- Unit level

Phase 3—Develop Compliance Strategies

Determine issues and opportunities:

- Determine what needs to be done to close the gaps
- Determine if resources can/should be reallocated
- Seek alternative methods to provide service at desired level
- Develop budget estimates as necessary
- Seek additional funding commitment as necessary

Phase 4—Communicate Expectations to Organizations

Communicate expectations:

- Explain method of measuring compliance to personnel who are expected to perform services
- Provide feedback mechanisms
- Define consequences of noncompliance

Train personnel:

- Provide appropriate levels of training/direction for all affected personnel
- Communicate consequences of noncompliance
- Modify (remediate) business processes, business application systems, and technical infrastructure as necessary to comply

Phase 5—Validate Compliance

Develop and deploy verification tools and/or techniques that can be used by sub-sections of the organization on an ongoing basis to verify that they are meeting the requirements:

- Monthly evaluation:
 - Performance by unit
 - Overall performance
 - Review of performance by division/section management
- Quarterly evaluation:
 - Performance by unit
 - Performance by first due
 - Overall performance
 - Review of performance by executive management

Determine whether independent validation and verification techniques will be used to measure the performance. Solicit external assistance as necessary.

Phase 6—Make Adjustments/Repeat Process

Review changes to ensure that service levels have been maintained or improved. Develop and implement a review program to ensure ongoing compliance.

- Annual review and evaluation
 - Performance by unit
 - Performance by first due
 - Overall performance
 - Review of performance by governing body
 - Adjustment of performance standards by governing body as necessary.

- Five-year update of standards
 - Performance by unit
 - Performance by first due
 - Overall performance
 - Adoption of performance measures by governing body

Establish management processes to deal with future changes in the OCFA service area.

Should include:

- ✓ Management information systems used
- ✓ Assignment of responsibility
- ✓ Schedule of assessments
- ✓ Review requirements

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Section I – Recommendations

Recommendation One

Formally adopt response performance goals to establish clear service level expectations to guide the allocation and distribution of response resources and development of service delivery practices.

Discussion

A community's desired level of service is a uniquely individual decision. No two communities are exactly alike. Performance goals must be tailored to match community expectations, community conditions, and the ability to pay for the resources necessary to attain the desired level of service.

Levels of service and resource allocation decisions are the responsibility of the community's elected officials, in this case the OCFA Board of Directors. The Board must carefully balance the needs and expectations of its citizenry when deciding how much money to allocate to all of the services it provides.

Current response performance, as measured by response time, is not in keeping with community expectations. The following are recommended as the Orange County Fire Authority fire and life safety response performance goals. These are not levels of service that will be achieved immediately but, instead, are target goals that may be achieved as recommendations from the deployment plan are implemented.

Dispatch Call Processing Time Performance

Call processing time is the first phase of overall response time. Though much information must be gathered to properly identify the resources needed to respond to the emergency, keeping this time as short as possible has a direct impact on response time. Although national standards recommend a call be processed and dispatched within 60 seconds, 80 percent of the time the recommended performance goal sets a higher standard as stated in the following goal.

Goal:

Response resources shall be notified of a priority incident within 60 seconds from receipt of the call at the dispatch center until notification of response personnel 90 percent of the time.

- Current performance – Within 91 seconds, 90 percent of the time

Turnout Time Performance

Turnout time is one area over which the fire department has total control and is not affected by outside influences. Turnout time, or the time between when the call is received by the response units (dispatched) and when the unit is actually en route to the scene (responding), can have dramatic effects on overall response times. Reducing this response time component reduces total response time.

A national standard recommends turnout time performance of 80 seconds or less for a fire response and 60 seconds or less for all other priority responses.²⁷ OCFA is not meeting the turnout time recommended in the national standard for either fires or other incidents. Given that turnout time is one area in which field personnel can improve overall response time, an aggressive objective is recommended.

Goal:

Response personnel shall assemble on apparatus and initiate movement towards a priority emergency within 90 seconds of notification by the dispatch center, 90 percent of the time.

- Current performance – Within 120 seconds, 90 percent of the time

Total Response Time for Arrival of the First Arriving Response Unit

Overall response time measures performance from the customer's point of view – from the time they dial 9-1-1 until help is at their doorstep. It includes dispatch call processing time, turnout time, and travel time. Improvements in performance in any of these three intervals improves overall response time.

Goal:

The first response unit capable of initiating effective incident intervention shall arrive at a priority emergency within the time specified for each response performance area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 7 minutes 30 seconds

Rural Area – 12 minutes

Wilderness Area – As soon as practical

- Current performance
 - Urban Area – 8 minutes 46 seconds
 - Rural Area – 16 minutes 45 seconds
 - Wilderness Area – As soon as practical

Total Response Time for Arrival of the Advanced Life Support Care

OCFA is responsible for providing advanced life support (ALS) emergency medical care. The delivery of ALS requires at least two paramedics at the incident. California State EMSA guideline is eight minutes from receipt of call to unit on scene 90 percent of the time, and NFPA recommends eight minutes travel time 90 percent of the time. Using the NFPA guidelines for travel time, and OCFA goals of 60 seconds call processing and 90 seconds turnout time, brings total NFPA recommended response time to 10 minutes 30 seconds. However, OCFA goals for total response time would be 10 minutes 90 percent of the time, 30 seconds faster than NFPA recommendations.

²⁷ National Fire Protection Association, *Standard 1710*.

Goal:

The first response unit capable of initiating effective incident intervention shall arrive at a priority emergency within the time specified for each response performance area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 10 minutes
Rural Area – 14 minutes 30 seconds
Wilderness Area – As soon as practical

- Current performance
 - Urban Area – 9 minutes 54 seconds
 - Rural Area – 23 minutes 0 seconds
 - Wilderness Area – As soon as practical

Concentration Total Response Time Performance

A fire department's concentration is the spacing of multiple resources close enough together so that an initial "Effective Response Force" (ERF) for a given risk can be assembled on the scene of an emergency within the specific time frame identified in the community's performance goals for that risk type. An initial effective response force is defined as that which will be most likely to stop the escalation of the emergency.

The ERF for moderate risk structure fires in OCFA is identified as the arrival of at least three fire engines, a ladder truck, a medic van, and one battalion chief (15 firefighters total). The ERF for moderate risk rescue incidents is defined as one fire engine, one ladder truck, and one medic van (8 personnel total including two paramedics).

This initial ERF does not necessarily represent the entire alarm assignment, as additional units may be assigned based on long-term incident needs and risks. Additional engines, ladders, or other specialty companies are assigned to higher risk responses in order to accomplish additional critical tasks that are necessary beyond the initial attack and containment.

Goal:

Total Response Time For Arrival Of The Full First Alarm Assignment At A Moderate Risk Structure Fire

For moderate risk structure fires the full effective response force shall arrive within the time specified for each response performance area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 12 minutes 30 seconds
Rural Area – 16 minutes 30 seconds
Wilderness Area – As soon as practical

- Current Performance
 - Urban Area – 15 minutes 53 seconds
 - Rural Area – (no data)
 - Wilderness Area – As soon as practical

Response Time For Arrival Of The Full First Alarm Assignment At A Moderate Risk Rescue Incident

For moderate risk rescue incident the full effective response force shall arrive within the time specified for each response performance area from receipt of the call at the dispatch center 90 percent of the time.

Urban Area – 12 minutes 30 seconds
Rural Area – 16 minutes 30 seconds
Wilderness Area – As soon as practical

- Current Performance
 - Urban Area – 16 minutes 32 seconds
 - Rural Area – 16 minutes 32 seconds
 - Wilderness Area – As soon as practical

Implementation

The response performance goals should be discussed with internal stakeholders, member agencies, the Technical Advisory Committee, and ultimately the OCFA Board of Directors. Once information is shared and the importance of establishing and adopting response performance goals are understood, and supported, the Board of Directors should formally adopt these response performance goals or an acceptable variation. The adopted goals should become critical considerations for OCFA decision making.

Recommendation Two

Improve call processing performance through improvement of dispatch protocols and procedures, early initiation of response resource notification through pre-alerting, and through personnel performance management.

Discussion

OCFA operates its call receipt and dispatch system like most emergency service organizations. There are opportunities to reduce the time between receipt of a request for service from the public to notification of response units. Reducing time required for this phase of the response shortens overall response time.

Procedures and technology can be implemented that ensures early notification of the closest appropriate response unit once basic incident information is determined. The call taker can continue to query the caller for additional information and additional response units can be dispatched as needed.

The closest appropriate unit can easily be determined very early in the call triage process. Only the basic nature of the emergency (emergency medical, fire, etc.) and the incident location must be determined. Technology can be incorporated into the computer aided dispatch system that can generate unit dispatch actions automatically once the basic nature and location are determined.

Finally, clear expectations for the performance of dispatch center personnel should be established and monitored to ensure quality service.

Implementation

OCFA should continue to review dispatch protocols as it moves towards standing up the new computer aided dispatch system (CAD). Automatic dispatch of the closest appropriate unit once basic incident information is determined should be incorporated into the system. Regular review of performance data should be incorporated into dispatch center quality assurance discussions with the goal of discovering best practices for reducing call processing and dispatch time. Appropriate training and education should be provided to all OCFA members regarding the change in the performance goal – criteria for success.

Recommendation Three

Improve turnout time performance by incorporating assistive technology and through personnel performance management.

Discussion

National guidance sets a target of within 60 seconds, 90 percent of the time, to initiate response (turnout time) for most emergency responses. For fire responses, national guidance sets turnout time at within 80 seconds, 90 percent of the time. This is the time period between when dispatchers notify response personnel of the incident and when response crews begin travel towards the incident location. OCFA's current turnout time performance is one minute longer for EMS incidents 35 seconds longer for fires. Current performance is 40 seconds longer than the recommended performance goal.

Like call processing time, shortening the time required for this phase of the response also reduces overall response time. Though certain technology and other physical modifications can help, rapid turnout time is largely a function of response crew performance.

Implementation

OCFA should review fire station configuration to determine if there are obstacles to rapid turnout. Solutions could include adding doors between rooms, rearranging furnishings and adding dispatch alerting system speakers to improve audibility.

OCFA should acquire technology that will accurately capture the initiation of vehicle movement towards an incident. This technology should be incorporated into and implemented as part of the new CAD system installation.

Response personnel performance must also be addressed. Fire department management should regularly prepare information that describes current turnout time performance by individual response crews. Performance expectations should be reinforced and periodic monitoring conducted to determine if improvements are being made and sustained. Appropriate training and education should be provided to all OCFA members regarding the change in the performance goal – criteria for success. The importance of turnout time performance and turnout time protocols and procedures should be incorporated into the training program for all operations personnel.

Recommendation Four

Improve response system reliability by minimizing response unit movement away from primary service areas for non-emergency purposes and by moving resources to stations that must be vacated for training and other reasons.

Discussion

Current workload, response practices, and deployment have reduced station reliability to below 90% in all but one station.²⁸ One factor that contributes to this is daily non-emergency response movements of units within the system. The majority of this type of movement is a result of crews being summoned from their station and first due area for training, meetings, and other scheduled or non-scheduled events.

Implementation

OCFA should review non-response crew movement to ensure that only mission critical movements are taking place. Web-based and in-station training should be incorporated into the training schedule whenever and wherever possible. For those times when it is necessary for a unit to move out of their first due area (such as mandatory TAG training) stations should be back-filled strategically with peak activity units to ensure that the ability to meet response performance objectives are being maintained.

Peak activity units can be systematically incorporated into the delivery system on a trial basis (for example, 90-day trial periods) utilizing overtime. Ninety-day trial periods would give the organization the opportunity to monitor accumulative alarm response data and compare reliability performance prior to and after incorporating the peak activity units. If the performance data indicates an overall improvement in response reliability the peak activity units can be established on-going by incorporating the units into the dynamic staffing plan (see Recommendation Eight).

This methodology is a significant change to current deployment practices. Implementation will require substantial initial planning, training, meetings with individual cities/county and, in some cases, meeting and conferring with labor. Appropriate modifications would have to be made to policies and procedures and MOUs.

²⁸ See figure 89 (Reliability – 2012).

Recommendation Five

Improve the delivery of emergency medical service by implementing criteria based dispatch and staffing all engines and ladder trucks with at least one paramedic.

Discussion

OCFA has assumed full responsibility for the delivery of advanced life support emergency medical service within its service area. This imposes a significant burden on the response system, normally requiring two response units for every emergency medical incident. This is contributing to low system reliability during higher workload periods and higher costs of service.

OCFA is currently conducting criteria based dispatch triaging of requests for emergency medical service. It has determined during this trial period that roughly 80 percent of emergency medical requests are non-life threatening and only 20 percent are life threatening. Thus, OCFA should consider changes that will allow a single unit response to the 80 percent triaged as non-life threatening.

There are several options to the current system that OCFA could consider. Option One and Option Three provide a more efficient response system without degrading level of service.

Option One

Formally establish criteria based dispatch protocols to allow a single unit response to those incidents triaged as non-life threatening. Staff the majority of fire engines with three personnel, one of whom is a paramedic; in areas considered hard to cover, or those lacking an effective response force coverage (for example areas covered by stations 40 and 53), staff fire engines with four persons, two being paramedics; and staff all aerial trucks with four personnel, one of whom is a paramedic. Phase out the use of medic vans and replace them with two person squad units, one of whom would be a paramedic. Response to a non-life threatening incident would be a single unit. Response to a life threatening incident would be two units. In discussions with the Orange County medical director, it was determined that a trial period would be necessary and that funding and staffing is available to conduct such a trial. Both the medical director and the OCEMS director were supportive of the concept. The trial program will openly allow for explorations to changes in deployment standards and regulations. Once the program is conducted, based on the results driven by data, two-person squads could be implemented based on geographic regions. Natural regions to consider would include the northwest coastal area including Seal Beach and La Palma, the northern service area including Placentia and Yorba Linda, the southern service area including San Clemente, San Juan Capistrano, and Dana Point, and other logical areas that would meet the intent of this recommendation without disrupting service to other areas.

Discussion

In order to improve the overall response performance of the OCFA delivery system the number of units sent to most emergency medical incidents must be reduced. Criteria-based dispatch (CBD) protocols could be implemented allowing a single unit response to most emergency medical incidents. This change will require approval by both the OCFA Medical Director and the Orange County Emergency Medical Services Agency Board. It is, however, a practice common in many other areas of the country.

For non-life threatening incidents, any response unit can be dispatched. If for example, a squad and engine are both available and the same distance from the incident the squad can be dispatched preserving the engine in the event of a fire incident.

Advantages of this option would include:

- OCFA can place a paramedic on all responding emergency vehicles.
- The overall reliability of the first due response from the closest station should improve.
- The use of squads rather than medic vans will maintain the initial responder's ability to provide EMS care while providing additional service delivery capabilities including small fire extinguishment, additional resources available for wildland incidents, as well as quick intervention on other emergencies where a variety of tools and equipment are needed.
- The wear and tear on large fire response vehicles (fire engines and ladder trucks) will be reduced due to fewer miles being put on them, thus extending their life and reducing long term capital costs.
- The implementation of Option 1 will address multiple expectations and concerns expressed by many of the jurisdictions served.
 - Expectation: Service should be as equal as possible throughout urban areas of the OCFA.
 - Expectation: The delivery system should be efficient and effective utilizing technology and innovation where ever possible.
 - Concern: There are too many vehicles responding to minor, non-life threatening EMS calls (the number of total daily responses by vehicles within the system will be reduced).
 - Supports the ability to respond an effective response force to fires and other special emergencies.

Disadvantages of this option would include:

- The reduction of engine company staffing from four to three personnel. This would increase the time it would take to accomplish initial tasks at the scene of a fire.
- This option would also eliminate the ability to send a single vehicle to life threatening medical incidents under the current Orange County EMS Policy/Procedure #700.00. To reduce the impact of this option certain more remote response areas could be staffed with three person engines that maintain two paramedics, or retain four person engines that maintain two paramedics.

Option Two

Staff all engines as four person medic engines in lieu of medic vans.

Discussion

This option would remove 15 current medic vans from the delivery system and transfer personnel to fire engines. Response to emergency medical incidents would be by a single fire engine staffed with two paramedics.

Advantages of this option include:

- There would be two paramedics responding on each fire engine significantly reducing the number of life threatening calls whereby a second unit would be dispatched.
- There would be four firefighters arriving on all fire engines at fire emergencies which would allow initial on-scene tasks to be accomplished quicker than with three persons.

Disadvantages of this option:

- The end result would be fewer emergency response vehicles in the system which will decrease system reliability. The consequences of reduced reliability are longer response times.
- The system would have a reduced ability to respond to medical incidents during times when fire engines are committed to fire emergencies.

Option Three

Staff transport ambulances with paramedics.

Discussion

This option shifts a portion of the responsibility and cost of delivering ALS level of service from OCFA to the private ambulance system. The ALS level of care is defined as the delivery of two paramedics at the incident. Under the current system this level of care is often accomplished by dispatching multiple OCFA units to meet the two paramedic requirement. Under this option OCFA would only be responsible for providing one paramedic. The other paramedic would be provided by the private ambulance that arrives to provide patient transportation. This would require a major change to the current ambulance franchise agreement in place.

Advantages of this option include:

- OCFA would only need to send one response unit to an emergency medical incident reducing the number of total units needed in the system.
- The number of paramedics required by OCFA is reduced.
- Training and recertification costs to OCFA for maintaining paramedics is reduced.
- It would significantly reduce the need to place OCFA units out of service while the unit's paramedic accompanies the patient to the hospital in the ambulance.

Disadvantages of this option include:

- Loss of some control over the delivery of advanced life support care.
- Implementing this option would most likely result in a reduction or loss of ALS pass-through fees.

Recommendation and Implementation

Option One is recommended. Given that this option requires the approval of outside parties it would need to be phased in over a period of time, and first on a trial basis. In order to proceed with the implementation of Option One OCFA would have to formally request and have approved a policy amendment to Orange County EMS Policy/Procedure #700.00 last revised 8-24-95. Under Section III "Criteria" the language would have to be changed to reduce the EMT-P requirement from two EMT-Ps per ALS unit to one EMT-P per ALS unit. In addition, the implementation of criteria based dispatch and the reduction of response to BLS incidents to a single paramedic must be approved. Once this change is codified OCFA could begin placing single paramedic squads in the system. As indicated previously, squads could be phased in to replace medic vans and add additional units in the system. A three year phase in period would coincide with the current capital replacement program for the 15 medical vans. Five medical vans are scheduled to be replaced each year for the next three years. The FY 2014/15 cost of purchasing and equipping a squad Unit with CAFS is \$181,693. The FY 2014/15 cost of purchasing a medic van is \$111,693. It is anticipated that the cost of replacing a squad Unit with CAFS will increase to \$188,493 in FY 2016/17. It is anticipated that the cost of replacing a medic van will increase to \$118,495 by FY 2016/17.

This methodology is a significant change to current deployment practices. Implementation will require substantial initial planning, training, meetings with individual cities/county and, in some cases, meeting and conferring with labor. Appropriate modifications would have to be made to policies and procedures and MOUs.

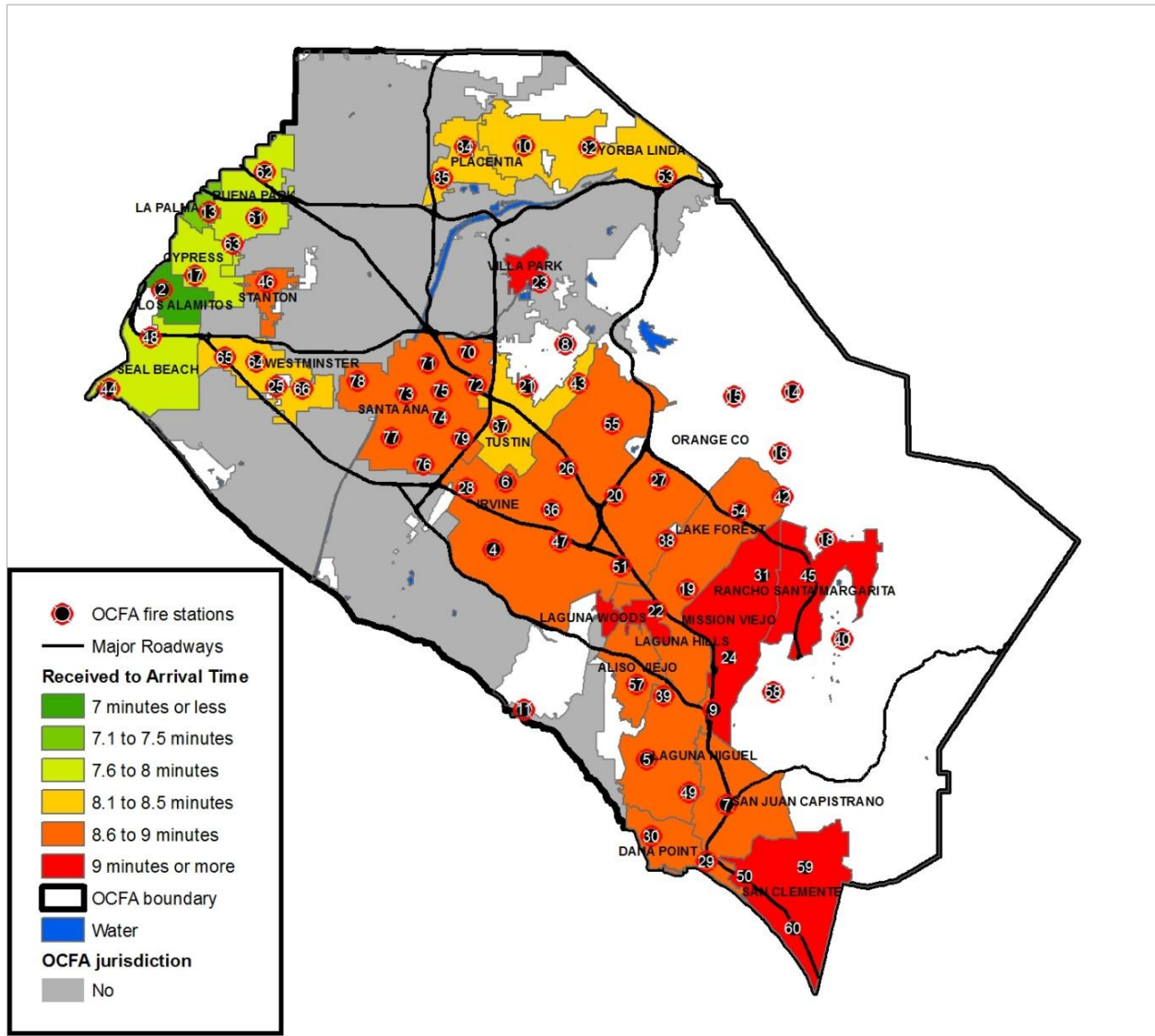
Recommendation Six

Redistribute available resources to provide more consistent levels of service across the entire OCFA service area.

Discussion

The manner in which response units are currently distributed throughout the OCFA service area leads to differences in response capability region by region. Response performance is generally better in the northern portion of the OCFA service area and less effective in the southern areas. The following figure illustrates response performance by city for priority (core call) incidents during 2012. Each city is color-coded by its 90th percentile response performance from the time the call is received at the dispatch center until the first response unit arrives on scene (total response time).

Figure 96: Response Time Performance by City



The following figure lists the actual total response time for each city during 2012 at the 90th percentile.

Figure 97: Response Time Performance by City

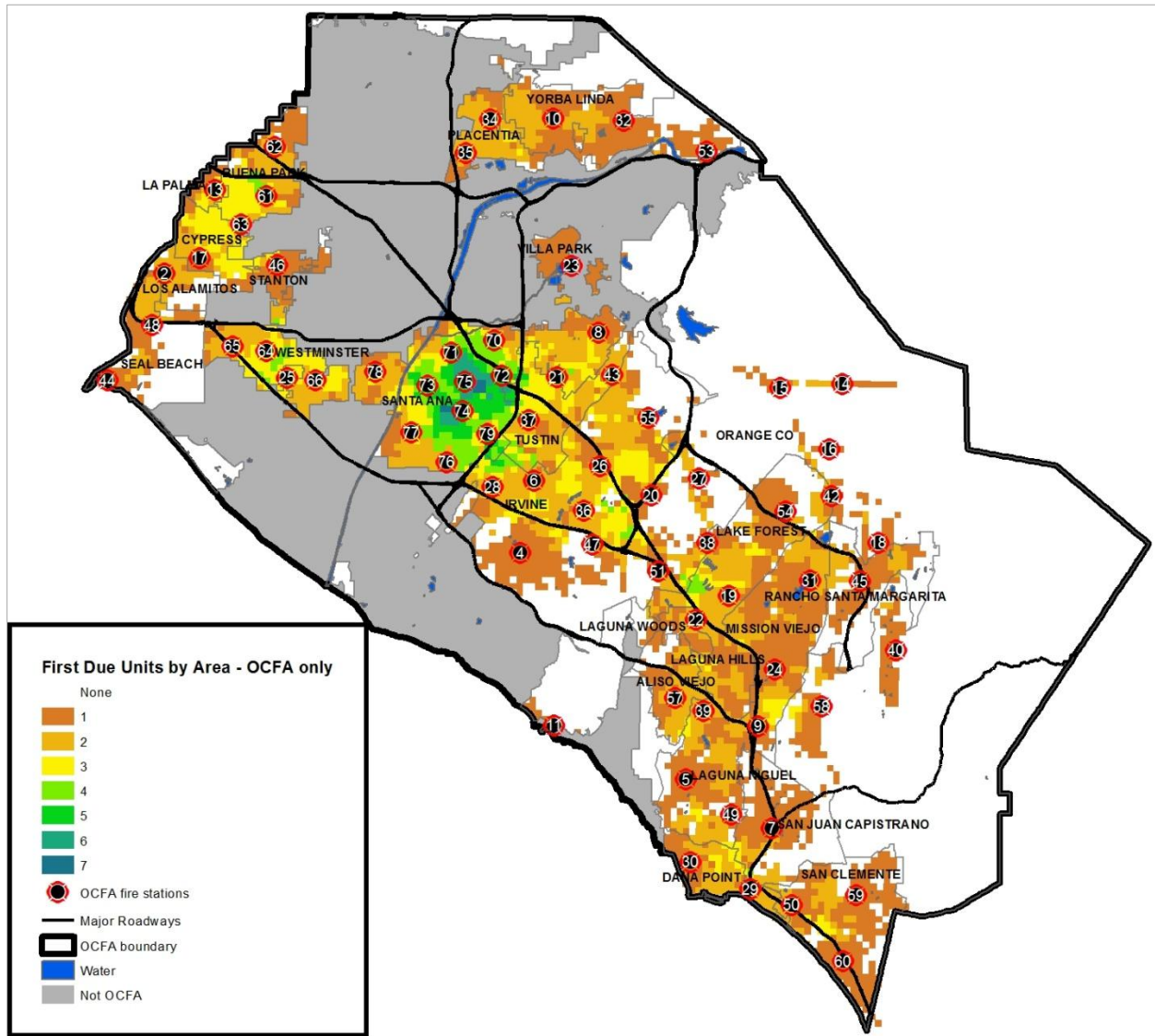
City	Total Response Time
LOS ALAMITOS	06:57
LA PALMA	07:08
BUENA PARK	07:41
SEAL BEACH	07:52
CYPRESS	07:55
PLACENTIA	08:12
WESTMINSTER	08:13
YORBA LINDA	08:15
TUSTIN	08:24
LAGUNA NIGUEL	08:38
IRVINE	08:39
SANTA ANA	08:39
DANA POINT	08:41
LAKE FOREST	08:46
STANTON	08:47
SAN JUAN CAPISTRANO	08:49
ALISO VIEJO	08:57
LAGUNA HILLS	09:00
MISSION VIEJO	09:02
RANCHO SANTA MARGARITA	09:17
VILLA PARK	09:22
LAGUNA WOODS	09:26
SAN CLEMENTE	09:29
UNINCORPORATED ORANGE COUNTY	10:15

Based on this information, response service is not uniformly provided to each of the cities. Unincorporated Orange County is largely rural thus longer total response times are expected.

Differences in distance between fire stations, the number of response units available within each jurisdiction, availability of automatic and mutual aid resources, and in some cases response workload, all contribute to the differing levels of service.

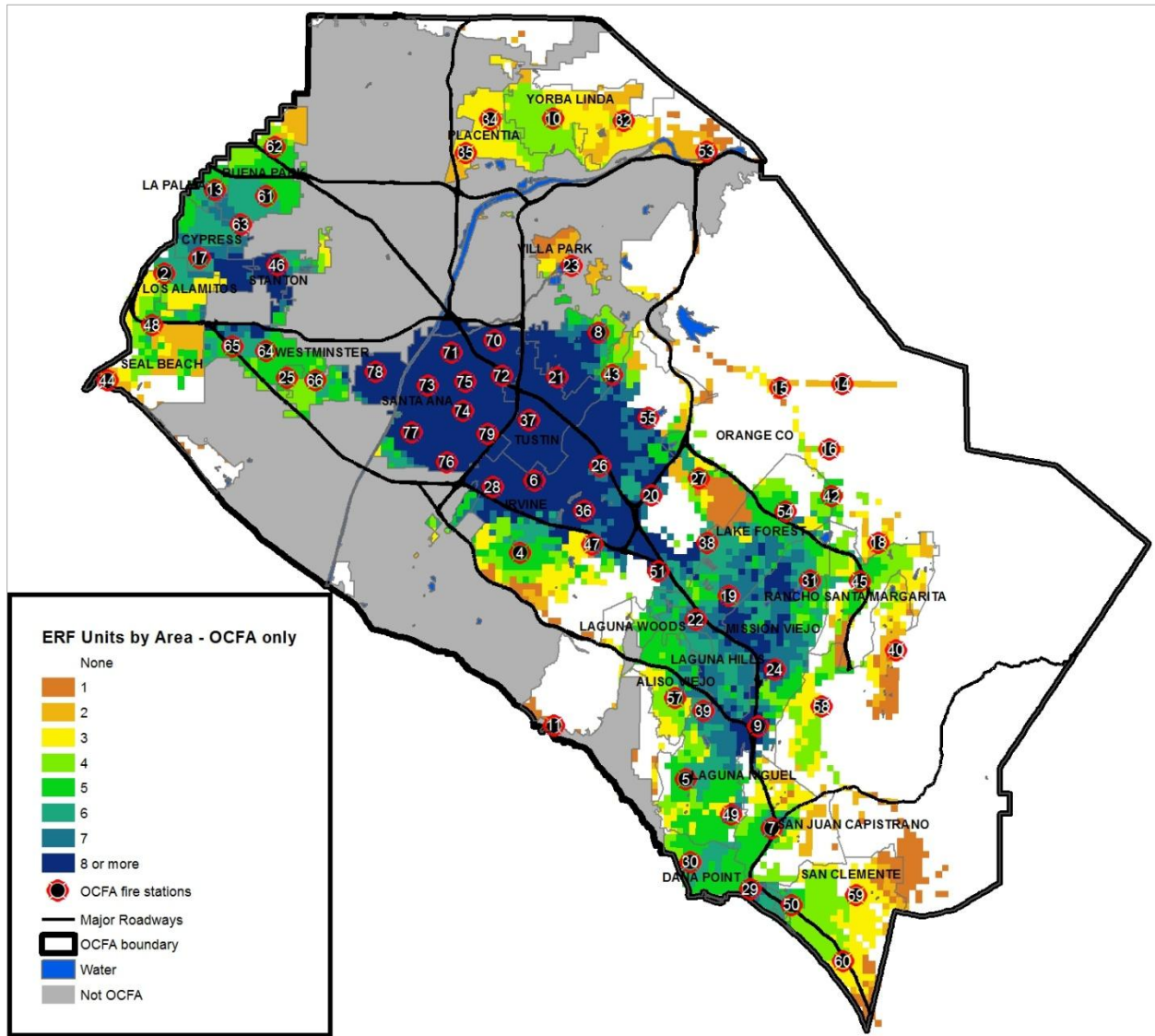
The differences in available response resources are displayed in the following figure. It shows the number of response units available within five minutes travel time by small area. Resources are most available in the Santa Ana, Cypress, La Palma, Buena Park, Westminster, and portions of Irvine and Lake Forest.

Figure 98: First-Due Units by Area



Differences in resource distribution become even more apparent when the number of units available within ten travel minutes is presented on a figure. This is the travel time allowed to deliver the full effective response force to an emergency. For example, the full effective response force to a moderate risk structure fire (home or small commercial building) is at least four response units (engines and ladder trucks). There are many portions of the OCFA service area to which this minimum response force is unavailable even if all response units are in station and available.

Figure 99: Effective Response Force Units by Area



The majority of OCFA board members and appointed city managers interviewed as stakeholders indicated the services and service levels should be consistent throughout the OCFA, but also were aware that response times for service would increase as the location of an incident shifted from an urban location, to a rural or remote location. The majority interviewed expressed the need for the system to be affordable and sustainable financially. Providing more uniform service across the entire urbanized OCFA service area is recommended. This will require the movement of response resources from areas rich in resources to areas that are deficient. Most impacted would be the Santa Ana/Tustin area. Most benefited will be the Seal Beach, Yorba Linda, and San Clemente areas.

Implementation

Level of service and financial equity is a policy issue. The Board of Directors should consider each of the following questions and provide clear direction to staff.

1. Is the more effective distribution of service level equity across the urbanized OCFA service area desired? Based on stakeholder interviews and community expectations we believe a baseline level of service is desired throughout the OCFA.
2. What baseline level of service should be provided? Our recommendation is that the baseline level of service should be established in the form of response performance goals that define the response time performance that should be provided across the urbanized area. The criteria and format for the baseline level of service is outlined in the SOC.
3. To what degree is OCFA willing to depend on the response resources of non-OCFA fire agencies to provide service within OCFA? The OCFA should determine the degree to which it wishes to rely on outside agencies to deliver the defined level of service. Automatic aid is intended to be mutual. In other words each agency providing support should receive a similar amount in return. The timeliness by which other agencies can be dispatched is also important. There are several dispatch centers in Orange County. The request for automatic aid assistance can be delayed by the time needed to transfer incident information from the OCFA dispatch center to the other agency's dispatch center. If this time is too long it can negate the benefits of automatic aid assistance. For the most part, automatic aid is being utilized effectively within the region. Imbalance of resource exchange currently is being addressed through the updating of agreements. Discussions at the operational level are ongoing.
4. Does creating *service level equity* require a change to the manner in which funding is provided to OCFA by each of the partner cities? This discussion will certainly generate numerous concerns about financial equity as it always does in a regionalized service delivery system. This is complicated for OCFA due to the different ways partner cities pay for service. Resolution of this may require a new methodology for assessing system costs to each of the partners. Currently these issues are being addressed through the utilization of a Board of Directors sub-committee (The Equity Committee) which makes recommendations to the full board of directors relative to financial equity issues and requests that may be forwarded for consideration from participating agencies.
5. Should individual cities be able to opt for, and pay for, a higher level of service than the established baseline? Determining if individual cities can request higher levels of service should be considered. Requests for higher levels of service can be accommodated so long as the funding for the higher level of service is provided or agreed upon.
6. Should individual cities be able to opt for a reduced cost or a lesser level of service than the established baseline? Lower levels of service can be problematic. Since OCFA operates its services as a system, reductions in level of service to one city could negatively impact adjacent cities and the overall performance capability of the system. The criteria for considering any reductions in service should take into account the impact on the system's ability to meet response performance goals.

Once the policy issues have been resolved, OCFA staff should review its resource deployment to provide more uniform distribution of apparatus and personnel based on the defined baseline performance level. Additional considerations will include individual area workload, unique risks within specific areas (i.e. high rise buildings), and the ability to promptly notify mutual and automatic aid resources.

Recommendation Seven

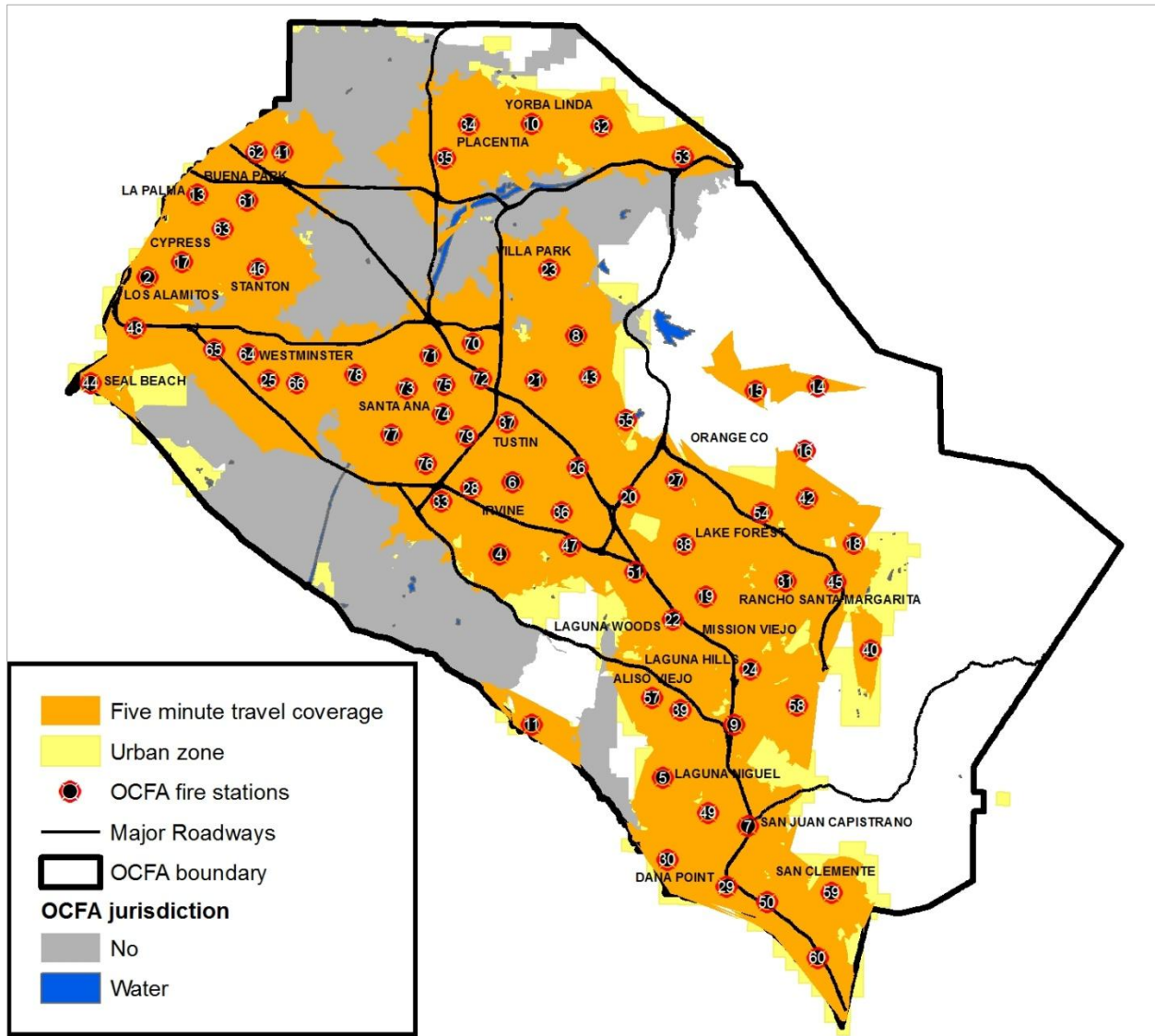
Consolidate fire stations in areas of significant overlapping coverage. Continue to plan and develop new fire stations as needed.

Discussion

Deployment practices suggest that fire stations should be located to ensure the ability to provide a target travel time to all areas within the jurisdiction. Once stations are located, each are staffed in order to reliably serve the workload within the station area and provide sufficient resources for the full effective response force when needed.

The current OCFA deployment criteria seeks to provide a fire station within five travel minutes of all portions of the urban performance area, which includes all areas within a city. Current fire station locations provide this coverage in nearly all areas as shown in the following map. There are small areas to which five minute travel coverage is not provided.

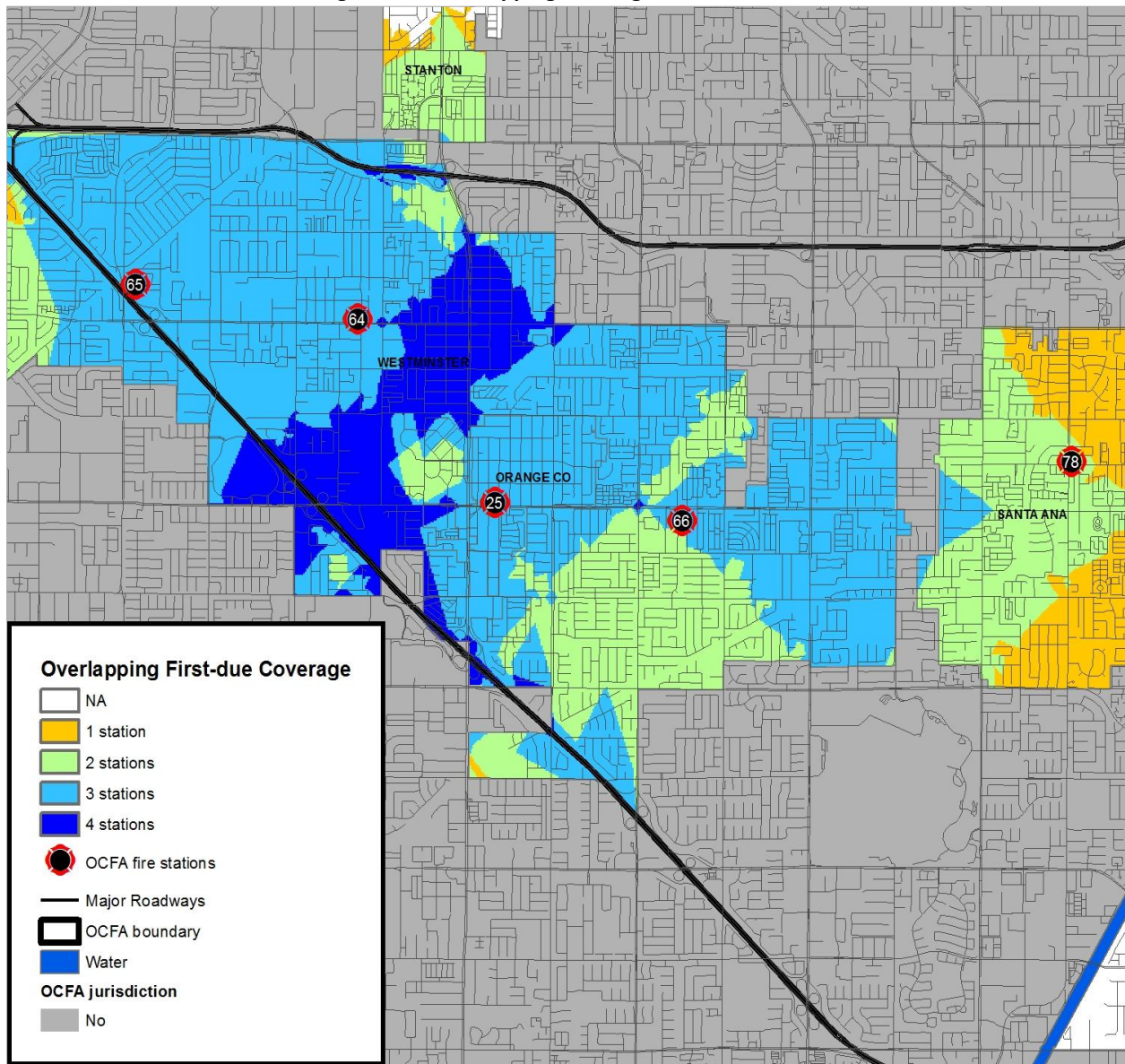
Figure 100: Five Minute Travel Coverage – Current Fire Stations



There are many areas to which the five minute travel coverage overlaps one or more adjacent fire stations. While a small degree of overlap is acceptable, some areas have significant amounts of overlap. For example, Westminister has four fire stations in its immediate area. In addition there are stations in neighboring Stanton, Seal Beach, and Santa Ana, all of which provide prompt service to Westminister.

The following map illustrates that much of Westminister is within five minutes of three different fire stations, and in one portion within five minutes of four different fire stations. If adjacent agency fire stations were included in this analysis the amount of overlap would be greater.

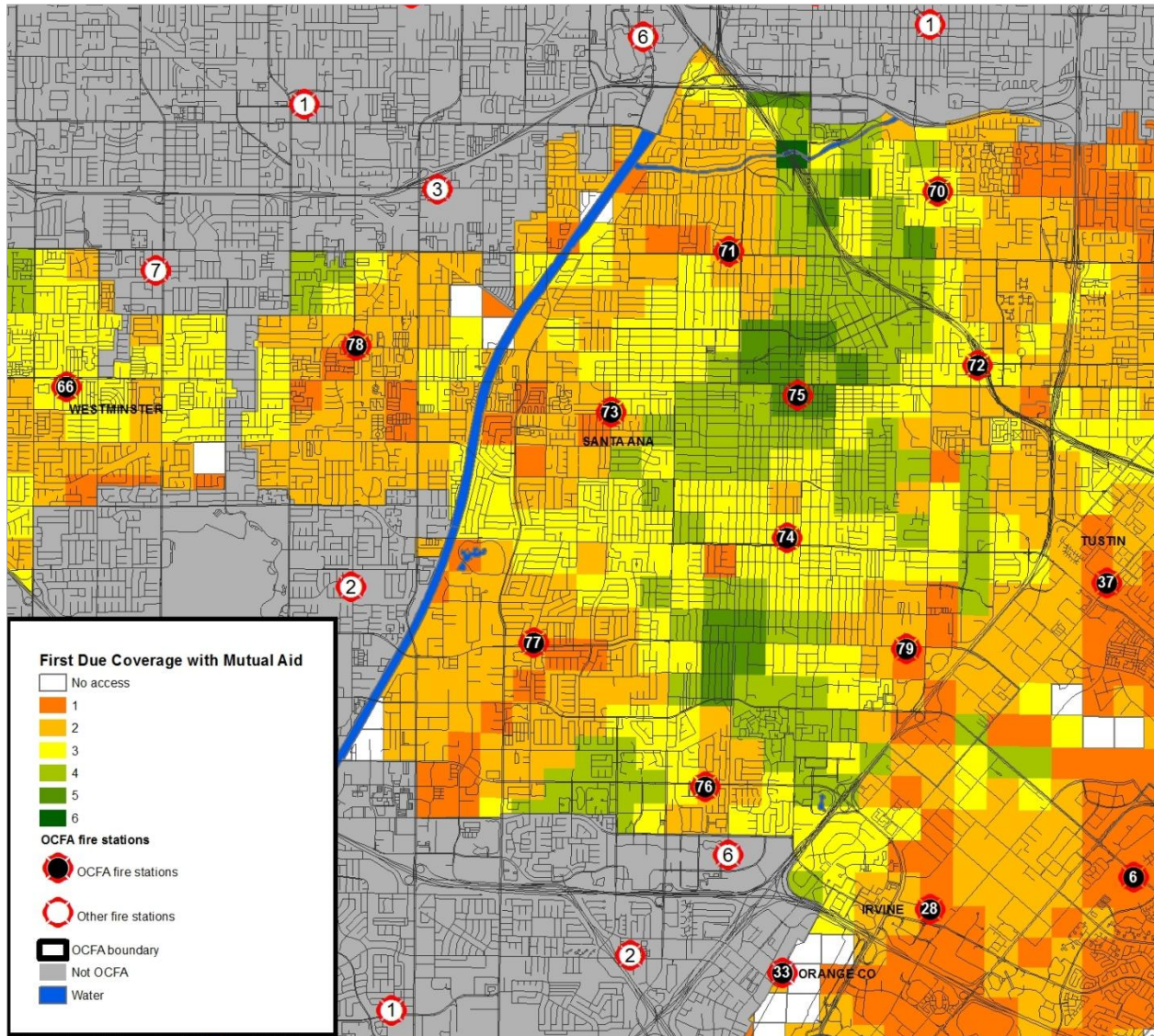
Figure 101: Overlapping Coverage – Westminster



In this example, the Westminster area could be adequately served without Fire Stations 64 and 66. However, no response units should be eliminated. The response units in Station 64 and 66 could be moved to Stations 25 and 65 in order to maintain the resources needed to provide a reliable response and provide the full effective response force. Station 25 would need to be rebuilt or modified in order to house the additional apparatus and personnel.

The Santa Ana area also has fire stations located in close proximity to each other. Further, neighboring fire agencies, with which OCFA has mutual aid agreements, have fire stations near the Santa Ana border. This area provides another opportunity to consider reducing the number of stations, but not reducing the number of response units. As in Westminster, units from closed stations would be moved to adjacent stations. The following map shows the Santa Ana area with OCFA and other agency fire stations.

Figure 102: Santa Ana Area with Current Fire Stations



Consolidating the number of fire stations operated by OCFA is an opportunity to reduce costs. As already mentioned, this recommendation does not suggest eliminating response units, or personnel. However, it does recommend that certain redundant stations be closed. This will save the cost of maintaining, repairing, and operating these facilities.

OCFA is in the planning stages for several additional stations to meet the incident demands of new development and to better manage existing workload. Many of these projects are developer funded. This sort of planning for future workload and response needs is progressive and recommended. The following two maps illustrate the proposed locations of future fire stations currently under consideration.

Figure 103: Locations of Proposed New Fire Station – Irvine Area Station 52

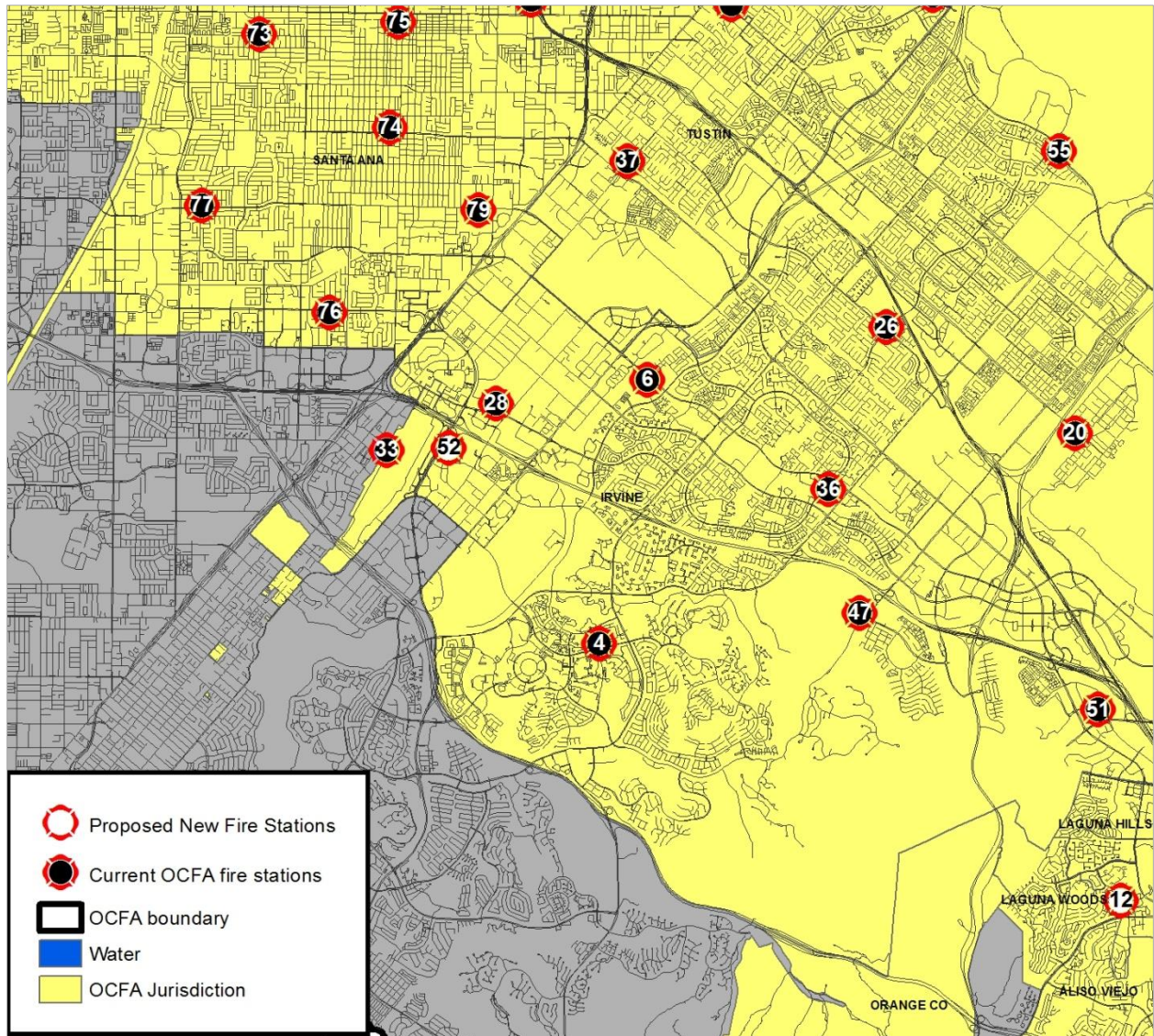
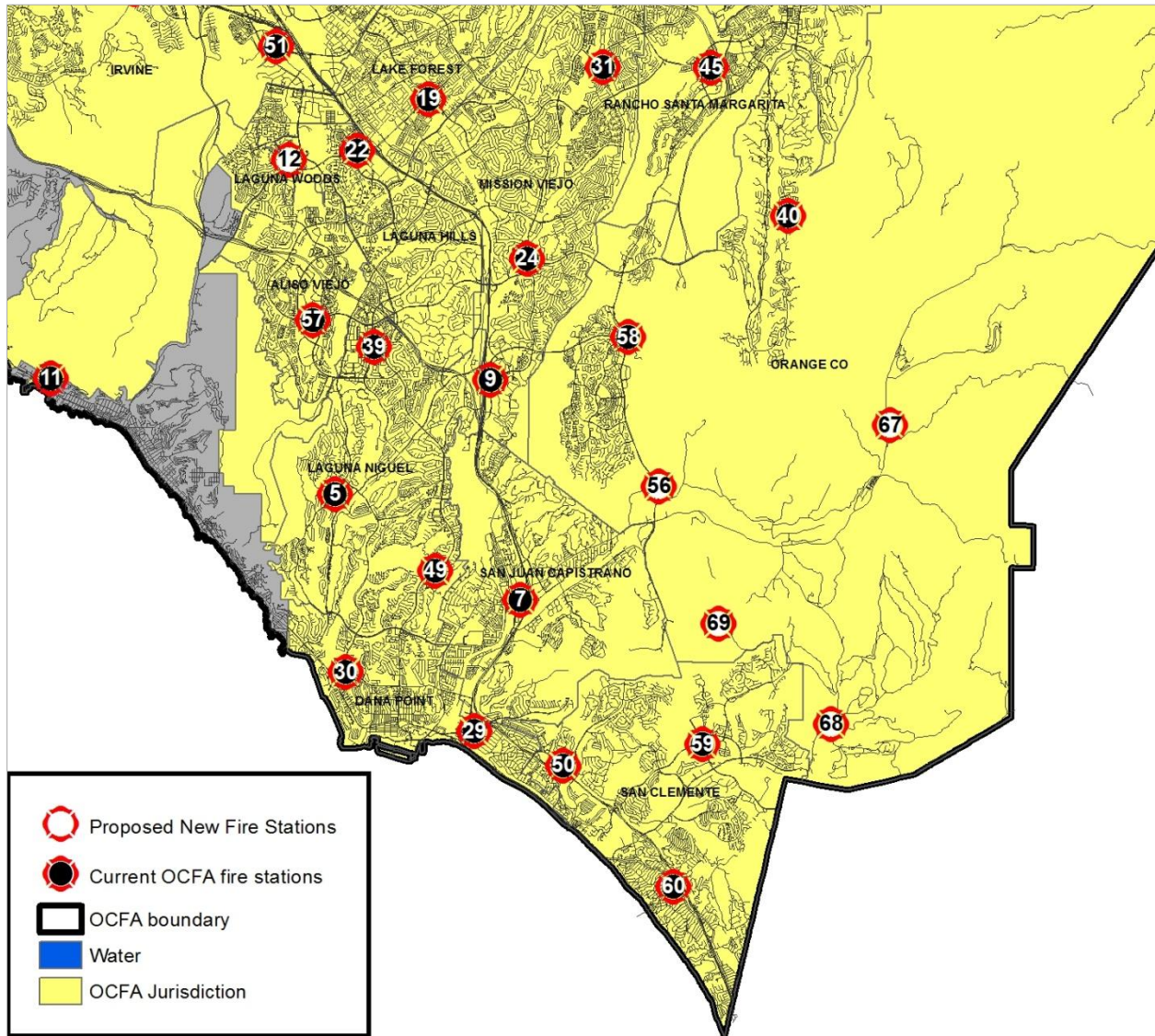


Figure 104: Locations of Proposed New Fire Station – South



Implementation

As for station consolidation, two areas provide very apparent opportunities for reduction of cost through the closure of redundant stations and the relocation of the response units in those stations to adjacent stations. These include Westminster and Santa Ana. Any decision to close or relocate a station should be made by the Board of Directors as level of service is a policy decision. It is estimated the closure of one station could realize a cost savings of \$35,000 annually.

Remaining stations will likely need improvement in order to house additional apparatus and personnel. This need will be based on those stations selected for closure. This process would require a facility assessment to study renovation/remodeling strategies.

Future station locations will provide the coverage necessary to accommodate planned development. When Fire Station 52 is built it will make current Fire Station 28 unnecessary for target response coverage. The cost of constructing a new fire station is estimated at approximately \$400/sf for construction costs only. Taxes, furnishings, equipment, professional fees, and reasonable contingencies would likely add 40% to that amount, for a conservative estimate of \$560/sf.

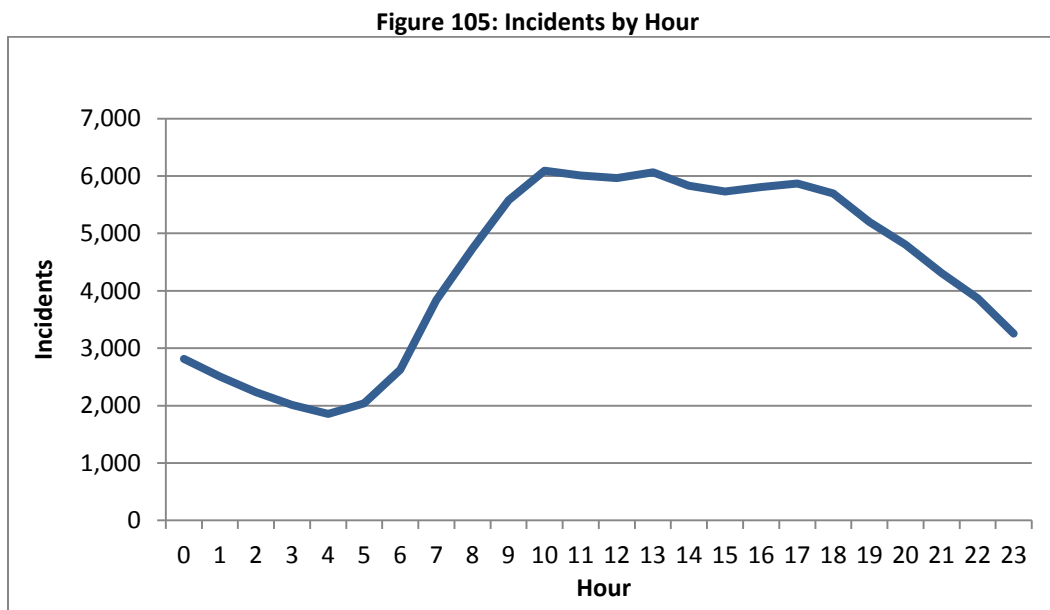
Recommendation Eight

Implement dynamic staffing practices to ensure sufficient resources are available to serve incident demand as it varies by time of day. A staffing plan that provides resources to provide a minimum level of protection based on community risk, augmented during higher workload periods with additional resources, should be implemented.

Discussion

OCFA staffs stations and apparatus with the same number of personnel at all hours of the day. However, workload is not constant throughout the 24 hour period. Consequently OCFA has a surplus of resources available during slow workload periods and often runs short during high workload periods. This impacts both level of service and system cost.

The following figure illustrates the variability of workload throughout the 24-hour day. Even during peak workload hours the probability that the typical fire station would be dispatched to an incident is an average of 23 percent. During early morning hours that probability drops to an average of seven percent.



The following figure lists the number of incidents and average incidents per hour by station for two different time periods; 9:00 am to 8:59 pm and from 9:00 pm to 8:59 am. It helps illustrate the workload of various OCFA stations during the peak activity period and the lower activity period. Stations 21, 22, 45, 46 and 48 respond to the most incidents per time period.

Figure 106: Incidents by Station and By Period of Day

Station Area	Incidents 9:00 am to 8:59 pm	Incidents 9:00 pm to 8:59 am	Total	Incidents per hour - 9:00 am to 8:59 pm	Incidents per hour - 9:00 pm to 8:59 am
Sta 02	866	396	1262	0.198	0.090
Sta 03	48	12	60	0.011	0.003
Sta 04	1735	976	2711	0.396	0.223
Sta 05	815	456	1271	0.186	0.104
Sta 06	845	440	1285	0.193	0.100
Sta 07	1688	777	2465	0.385	0.177
Sta 08	347	208	555	0.079	0.047
Sta 09	1168	464	1632	0.267	0.106
Sta 10	996	530	1526	0.227	0.121
Sta 11	77	26	103	0.018	0.006
Sta 13	1004	553	1557	0.229	0.126
Sta 14	29	21	50	0.007	0.005
Sta 15	40	18	58	0.009	0.004
Sta 16	31	11	42	0.007	0.003
Sta 17	1042	520	1562	0.238	0.119
Sta 18	120	52	172	0.027	0.012
Sta 19	1921	874	2795	0.439	0.200
Sta 20	304	154	458	0.069	0.035
Sta 21	2024	1092	3116	0.462	0.249
Sta 22	5071	2667	7738	1.158	0.609
Sta 23	420	214	634	0.096	0.049
Sta 24	1426	688	2114	0.326	0.157
Sta 25	1192	675	1867	0.272	0.154
Sta 26	1232	620	1852	0.281	0.142
Sta 27	68	32	100	0.016	0.007
Sta 28	1355	636	1991	0.309	0.145
Sta 29	959	434	1393	0.219	0.099
Sta 30	973	546	1519	0.222	0.125
Sta 31	1485	875	2360	0.339	0.200
Sta 32	753	420	1173	0.172	0.096
Sta 34	1197	624	1821	0.273	0.142
Sta 35	849	540	1389	0.194	0.123
Sta 36	1248	628	1876	0.285	0.143
Sta 37	1278	812	2090	0.292	0.185
Sta 38	932	468	1400	0.213	0.107
Sta 39	1046	490	1536	0.239	0.112
Sta 40	267	157	424	0.061	0.036
Sta 42	200	115	315	0.046	0.026
Sta 43	303	168	471	0.069	0.038

Station Area	Incidents 9:00 am to 8:59 pm	Incidents 9:00 pm to 8:59 am	Total	Incidents per hour - 9:00 am to 8:59 pm	Incidents per hour - 9:00 pm to 8:59 am
Sta 44	599	217	816	0.137	0.050
Sta 45	2314	1174	3488	0.528	0.268
Sta 46	2152	1261	3413	0.491	0.288
Sta 47	437	183	620	0.100	0.042
Sta 48	2010	1119	3129	0.459	0.255
Sta 49	544	314	858	0.124	0.072
Sta 50	947	457	1404	0.216	0.104
Sta 51	734	333	1067	0.168	0.076
Sta 53	267	172	439	0.061	0.039
Sta 54	578	280	858	0.132	0.064
Sta 55	396	237	633	0.090	0.054
Sta 57	1020	572	1592	0.233	0.131
Sta 58	566	276	842	0.129	0.063
Sta 59	586	333	919	0.134	0.076
Sta 60	1243	734	1977	0.284	0.168
Sta 61	1706	880	2586	0.389	0.201
Sta 62	1187	734	1921	0.271	0.168
Sta 63	1176	617	1793	0.268	0.141
Sta 64	1362	811	2173	0.311	0.185
Sta 65	943	543	1486	0.215	0.124
Sta 66	1334	807	2141	0.305	0.184
Sta 70	839	418	1257	0.192	0.095
Sta 71	1132	601	1733	0.258	0.137
Sta 72	693	367	1060	0.158	0.084
Sta 73	818	406	1224	0.187	0.093
Sta 74	346	201	547	0.079	0.046
Sta 75	744	425	1169	0.170	0.097
Sta 76	1083	624	1707	0.247	0.142
Sta 77	908	509	1417	0.207	0.116
Sta 78	1043	652	1695	0.238	0.149
Sta 79	700	387	1087	0.160	0.088

Fire stations should be staffed and equipped to provide response resources using two primary considerations.

1. Provide sufficient resources to effectively intervene in predictable requests for emergency service.
2. Provide sufficient resources to ensure a reliable response to any predictable emergency service request.

The first consideration suggests that there should be sufficient resources available 24 hours per day to effectively respond to an incident based on risk. For example, resources should be deployed so that the full effective response force can be provided to a building fire in any area at any time of the day. In most of OCFA that means three fire engines, one ladder truck, a medic unit, and a battalion chief (15 firefighters total) should be available to respond and arrive within a set amount of time. In areas with much larger buildings, high-rise buildings, or other unusual risks, additional resources may be needed 24 hours per day.

The second consideration suggests that during periods of higher workload additional resources should be available to respond. The additional resources should be of the type necessary for predictable requests for service; in OCFA's case emergency medical incidents.

Dynamic deployment practices can also be used during unusual events such as red flag wildfire danger periods. Since the likelihood of a wildfire is greater during these events additional resources can be assigned and positioned to where wildfire is likely to occur.

This dynamic approach to deployment provides two benefits. First, additional response resources can be made available during times each are predictably needed. Second, since these resources are not needed or assigned during slower workload periods the organization is maximizing its ability to match resources with system demand.

Implementation

OCFA should regularly review response workload by time of day and by the type of service requested. This information should inform decisions about when and what type of response resources should be available at given times of each day and assigned to which areas. Later in this section of the report an proposed dynamic deployment plan is offered for consideration that identifies resource levels by station and time of day and analysis tools that can be used to aid decision making.

Changes of this size within any agency will need to be discussed amongst internal stakeholders and all invested parties. Changes in policies and procedures as well as modifications to existing MOUs will need to be made. An action plan will need to be developed to address critical steps, responsibilities, and timelines involved in implementing the change.

Recommendation Nine

Utilize available technologies to enhance service delivery. Implement closest-unit dispatch technology to ensure the closest appropriate response unit is sent to an emergency. Implement technology that ensures response resources are moved as needed to maintain consistent levels of service. Implement citizen alerting technology (CAD to mobile device).

Discussion

It is imperative as OCFA moves towards a more “dynamic” deployment scheme the system is capable of identifying and notifying the “closest available unit” to an incident rather than the unit in the closest station. Historically, the fire department has been limited in its ability to monitor the real time location of units. Typically units would have to communicate their proximity to an emergency to the dispatch center after the alerting process was complete. Now OCFA has the ability to incorporate technology into their new CAD system. This will enhance their ability to dispatch the closest available unit with accuracy using real time information.

Many departments across the country have implemented technology that ensures the closest available response unit is sent to an emergency. This technology incorporates global positioning systems on fire apparatus linked to the dispatch center’s computer aided dispatch system. When a call is received at the dispatch center, the incident’s location is instantly compared to the actual location of every available response unit. Travel times are computer calculated and the closest unit selected for dispatch. Implementation of this system requires:

- Dispatch center computer software must be capable of increased technological functions.
- LiveMUM is software that connects with the CAD in real time, identifying holes in coverage or changes in a unit’s status. The software then recommends the optimal use of selected apparatus.
- Automatic vehicle locator technology (AVL) is global positioning equipment installed on fire apparatus. This technology will assist in optimizing OCFA’s ability to quickly determine the availability and location of the closest units to respond most efficiently.
- CAD to Mobile Device citizen alert for the need to perform CPR and/or utilize an AED.

Communities that have implemented these technologies have realized improvements in response times and emergency event outcomes. Battalion chiefs are able to better redistribute response resources to ensure effective system-wide response coverage.

Implementation

The planned CAD replacement includes closest unit dispatch capability. This feature should be implemented as soon as practical.

An additional capability of the new CAD system is its ability to recommend the movement of response units to balance response capability across the system. This feature called LiveMUM, identifies areas that have units out of service on incidents and recommends moving specific units to those areas to ensure a prompt response to the next incident. This feature should also be implemented as soon as practical.

Summary of Recommendations and Proposed Response Resource Re-deployment Plan

ESCI has conducted a thorough review of the OCFA response resource deployment system and its ability to provide prompt, effective service. Areas of concern have been identified and detailed in the preceding sections of this Standards of Coverage and Deployment Plan. A series of recommendations have been developed, options considered, and implementation steps outlined.

Based on this analysis and the recommendations offered, ESCI has developed a proposed deployment plan for response resources. It attempts to provide OCFA the means to deliver quality, consistent, and effective emergency response services to its entire service area. Ultimately, policy decisions at several levels, as well as administrative implementation strategies, will determine specific deployment practices.

The following is a summary of all recommendations offered:

1. Formally adopt response performance goals to establish clear service level expectations to guide the allocation and distribution of response resources and development of service delivery practices.
2. Improve call processing performance through improvement of dispatch protocols and procedures, early initiation of response resource notification through pre-alerting, and through personnel performance management.
3. Improve turnout time performance by incorporating assistive technology and through personnel performance management.
4. Improve response system reliability by minimizing response unit movement away from primary service areas for non-emergency purposes and by moving resources to stations that must be vacated for training and other reasons.
5. Improve the delivery of emergency medical service by implementing criteria based dispatch, staffing all engines and ladder trucks with at least one paramedic.
6. Redistribute available resources to provide more consistent levels of service across the entire OCFA service area.
7. Reduce the number of fire stations in areas of significant overlapping coverage.
8. Implement dynamic staffing practices to ensure sufficient resources are available to serve incident demand as it varies by time of day.
9. Utilize available technologies to enhance service delivery.

The proposed deployment plan incorporates a number of changes to OCFA's traditional means of deploying resources. These include:

1. All fire stations have at least one fire engine except airport stations.
2. All fire engines are staffed with a minimum of three personnel, one of whom is a paramedic.
3. All aerial trucks are staffed with four personnel, one of whom is a paramedic.
4. Medic vans are transitioned to squad-type vehicles. Each is staffed with two personnel, one of whom is a paramedic.

5. The number of fire engines and aerial trucks remains constant throughout the 24 hour day. These apparatus are deployed to ensure adequate response to fire type incidents.
6. The number of squad type vehicles (formerly medic vans) increases during day time hours and decreases during night time hours.
7. Criteria based dispatch is implemented reducing response to emergency medical incidents to a single vehicle for all incidents other than those triaged at the dispatch center as potentially life-threatening.

The number and type of units needed in each station area has been evaluated using several analysis tools. Geographic information system (GIS) analysis was used to ensure the appropriate type of units (engines, trucks, and squads) were available within the target travel times recommended earlier. GIS was also used to evaluate coverage redundancy.

A process called “queuing analysis” has been used to determine the number of additional squad units needed in each station area. This utilizes probability analysis to determine the number of units needed in each station area to reduce the likelihood that a response unit would not be available to serve an incident to ten percent or less in all but three station areas. It uses the variables incidents per hour, number of available response units, and average time committed per incident.

Though very useful to this effort, queuing analysis has some limitations. It assumes that customers (incidents) arrive at a constant rate. This is not always true in emergency services. It also assumes that each customer requires an equal amount of time from servers (response units). While the average time committed to an incident was used for service time some incidents require less, or substantially more than the average.

The following figure illustrates the current deployment and proposed deployment plan for both daytime (9:00 am to 8:59 pm) and night-time (9:00 pm to 8:59 am). The figure includes individual station workload and the current and proposed probability of wait analysis.

Figure 107: Current and Proposed Response Unit Deployment²⁹

Station Area	Current Engines	Current Trucks	Current Medic Vans	Current Total Units	Proposed Daytime PAU Engines	Proposed Daytime PAU Trucks	Proposed Daytime Medic Vans	Proposed Daytime Total Units	Proposed Night-time PAU Engines	Proposed Night-time PAU Trucks	Proposed Night-time Medic Vans	Proposed Night-time Total Units
ORC02	1			1	1			1	1			1
ORC04	1	1	1	3	1	1	1	3	1	1		2
ORC05	1		1	2	1		1	2	1		1	2
ORC06	1	1		2	1	1		2	1	1		2
ORC07	1		1	2	1		1	2	1			1
ORC08	1			1	1			1	1			1
ORC09	1	1		2	1	1		2	1	1		2
ORC10	1			1	1			1	1		1	2
ORC11	1			1	1			1	1			1
ORC13	1			1	1		1	2	1			1
ORC14	1			1	1			1	1			1
ORC15	1			1	1			1	1			1
ORC16	1			1	1			1	1			1
ORC17	1	1	1	3	1	1		2	1	1		2
ORC18	1			1	1			1	1			1
ORC19	1			1	1		1	2	1			1
ORC20	1			1	1	1		2	1	1	1	3
ORC21	1		1	2	1	1	1	3	1	1	1	3
ORC22	2	1		3	1	1	1	3	1	1	1	3
ORC23	1			1	1		1	2	1			1
ORC24	1			1	1		1	2	1			1
ORC25	1			1	2		1	3	2			2
ORC26	1		1	2	1		1	2	1			1
ORC27	1			1	1			1	1			1
ORC28	1			1	1		1	2	1		1	2
ORC29	1			1	1	1	1	3	1	1		2
ORC30	1			1	1		1	2	1			1
ORC31	1		1	2	1		1	2	1			1
ORC32	1		1	2	1	1	1	3	1	1		2
ORC34	1	1		2	1	1	1	3	1	1		2
ORC35	1			1	1			1	1			1
ORC36	1			1	1		1	2	1			1
ORC37	1			1	1		1	2	1			1
ORC38	1		1	2	1			1	1			1
ORC39	1			1	1			1	1			1
ORC40	1			1	1*			1	1*			1
ORC42	1			1	1			1	1			1
ORC43		1		1	1			1	1			1
ORC44	1			1	1			1	1			1
ORC45	1	1	1	3	1	1		2	1	1	1	3
ORC46	1		1	2	1		1	2	1		1	2
ORC47	1			1	1			1	1			1
ORC48	1		1	2	1		1	2	1		1	2

²⁹ An asterisk (*) in the chart indicates a four-person medic engine.

Station Area	Current Engines	Current Trucks	Current Medic Vans	Current Total Units	Proposed Daytime PAU Engines	Proposed Daytime PAU Trucks	Proposed Daytime Medic Vans	Proposed Daytime Total Units	Proposed Night-time PAU Engines	Proposed Night-time PAU Trucks	Proposed Night-time Medic Vans	Proposed Night-time Total Units
ORC49		1		1	1			1	1			1
ORC50	1			1	1		1	2	1		1	2
ORC51	1			1	1			1	1			1
ORC53	1			1	1*			1	1*			1
ORC54	1			1	1		1	2	1			1
ORC55	1			1	1			1	1			1
ORC57	1		1	2	1		1	2	1			1
ORC58	1			1	1		1	2	1		1	2
ORC59		1		1	1	1		2	1	1		2
ORC60	1			1	1		1	2	1			1
ORC61	1	1		2	1	1	1	3	1	1	1	3
ORC62	1			1	1		1	2	1			1
ORC63	1			1	1		1	2	1			1
ORC64	1	1		2				Closed				Closed
ORC65	1			1	1	1		2	1	1		2
ORC66	1			1				Closed				Closed
ORC70	1			1	1		1	2	1			1
ORC71	1	1		2	1		1	2	1			1
ORC72	1			1	1		1	2	1			1
ORC73	1			1	1		1	2	1		1	2
ORC74	1			1	1	1		2	1	1		2
ORC75	1	1		2				Closed				Closed
ORC76		1		1				Closed				Closed
ORC77	1		1	2	1		1	2	1			1
ORC78	1		1	2	1	1		2	1	1		2
ORC79	1			1				Closed				Closed
UNIT TOTALS	66	15	15	96	65	16	34	115	65	16	13	94

Placing one additional ladder truck in service was needed in order to properly distribute this resource so that all urban areas had a ladder truck within the 10 minute travel time target. PAU Squads were added during the day to accommodate response workload.

Current deployment provides 840,960 total unit hours per year. However, daytime probability of wait for eleven station areas is above the 10 percent target. This, in part is contributing to reduced station reliability and longer response times.

The proposed deployment totals 915,420 total unit hours per year, an 8.8 percent increase. Probability of wait is reduced to at or below 10 percent in all but three station areas during daytime hours and all but three station areas during night-time hours.. The greatest probability of wait is 11.9 percent, much less than current at 21.9 percent.

Currently OCFA staffs apparatus with a minimum of 311 personnel 24 hours per day. The proposed deployment requires a minimum of 327 personnel during daytime hours and 285 personnel during night-time hours. The estimated cost difference between current deployment and the proposed plan shall be determined prior to implementation.

The proposed system provides greater system flexibility. The additional units deployed during the day can be used to refill stations vacated for training and other non-response purposes. It also enhances the capability to move units within the entire service area to ensure adequate coverage during unusually busy times or during major incidents. Reducing to a single unit response for most emergency medical incidents through the use of criteria based dispatch will also improve system reliability. Finally, this plan, along with implementation of the other recommendations offered, should provide OCFA the opportunity to meet the recommended response performance goals and in turn improve overall system performance and effectiveness.

The effectiveness of this proposed deployment plan should be closely monitored and adjusted as needed to maximize system quality and efficiency. For example, as criteria based dispatch is implemented it may be that fewer units are required during the daytime period than are proposed. As new development brings increased incident workload other adjustments may be needed. There are two fire stations that could benefit from retaining four person medic engines; Station 40 and Station 53. Delivering effective response force and two paramedics to ensure ALS level of service to these stations' service areas is difficult due to road access and proximity of other fire stations. The process of system analysis and adjustment should be ongoing.

Section J – Appendices, Exhibits, and Attachments

Terminology

In order to fully understand the components of a Standards of Cover, it is critical to first understand the terminology utilized and applied in the development of the document.

The Basics

CPSE: The Center for Public Safety Excellence, a nonprofit organization that assists local public safety agencies around the world streamline and improve the services they provide their communities.

CFAI: The Commission on Fire Accreditation International is a CPSE commission that is committed to assisting and improving fire and emergency service agencies in achieving organizational and professional excellence through its strategic self-assessment model and accreditation process to provide continuous quality improvement and enhancement of service delivery to the community and the world at large.

Distribution: The geographic location of resources. Units must be placed (distributed) in a manner that ensures rapid deployment of the first-due unit to minimize and mitigate emergencies.

Concentration: The arrangement of multiple resources (close enough together) that allow the establishment of a prescribed Effective Response Force (ERF) to assemble at the scene and stop the escalation/forward progress of the emergency.

Distribution is about time and distance while concentration is about calls for service and risk level being protected.

CFAI Benchmark: Performance goals outlined by CFAI based upon industry standards.

CFAI Baseline: Performance objectives outlined by CFAI based upon industry standards that should be achievable by an agency given appropriate physical resources, staffing, and levels of funding.

OCFA Baseline: Performance objectives based upon retrospective data that were achievable given the physical resources, staffing, and levels of funding of the analyzed time period. Internal factors (e.g., deployment changes, resources, staffing, funding) and external factors (e.g., economy, population, transportation networks, development) can influence these objectives; therefore, OCFA's Baselines are reviewed periodically to understand the impacts of those factors and implement changes as needed in an effort to maintain or improve those objectives. For the purposes of accreditation, OCFA's Baseline must not grossly deviate from the CFAI Baseline.

Response Performance Definitions

For the purposes of maintaining a consistent dataset for response performance analysis, the following definitions are used.

Code 1: Non-emergency response mode; lights and sirens are not used and traffic laws are followed.

Code 3: Emergency response mode; faster response and lights and sirens are used. Only Code 3 incidents are utilized for response performance analysis. Within each time interval, the process must initiate and conclude with a Code 3 response. If an incident is dispatched Code 3, a unit responds Code 3, but slows to Code 1 at arrival only the alarm processing and turnout intervals will be utilized in response performance analysis. The travel and total response intervals will not be utilized.

Incident Types

All Incidents: Includes all National Fire Incident Reporting System (NFIRS) incident type definitions.

Non-Fire: Includes all NFIRS incidents minus those outlined below.

EMS: Includes all NFIRS Series 300 (Rescue and Emergency Medical Service) incidents.

Structure Fire: Includes NFIRS incidents 111 (building fire), 112 (fire in a structure other than a building), and 120–123 (fire in a mobile property used as a fixed structure) that were dispatched at a Task Force or greater alarm.

Non-Structure Fire: Includes NFIRS Series 100 (Fire) incidents, minus those incidents included in the Structure Fire definition.

Special Operations: Based on the following call types with a response from one of the specified units.

ERF: Structure Fire: Includes incidents in the Structure Fire incident type definition with a minimum arrival of 1 Truck, 3 Engines and any other combination of units until 15 personnel have arrived.

ALS: Includes incidents in the EMS incident type definition minus those in the ALS Advanced definition with a minimum arrival of two personnel.

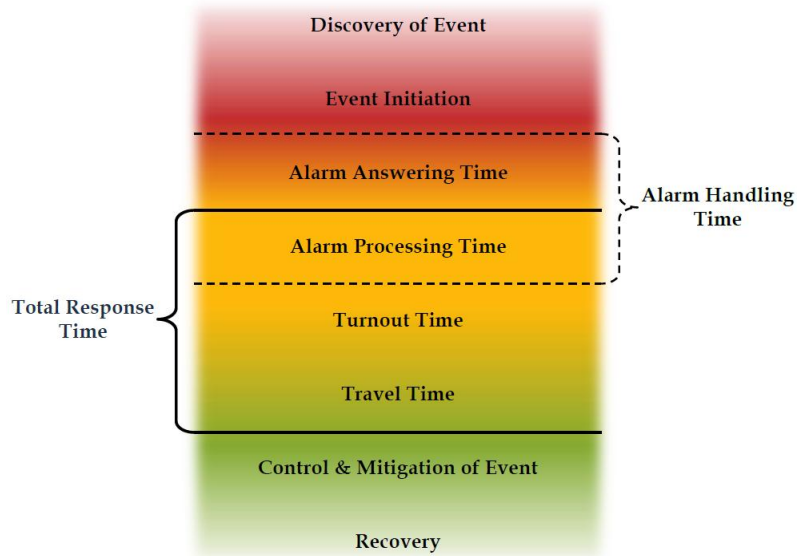
ALS Advanced: Includes incidents where the patient has a Clinical Impression of a “Cardiac Arrest,” or a Precipitating Event of “Drowning, near drowning, submersion” with a minimum arrival of four personnel.

Cascade of Events

Discovery of Event: The point at which the public makes the decision to seek emergency assistance.

Event Initiation: The point at which the public, by human or technologic means (e.g., 9-1-1 call or automatic alarm signal), activates the emergency response system.

Alarm Transfer Time: The time interval from the receipt of the emergency alarm at the public safety answering point (PSAP) until the alarm is first received at the communication center.



The OCFA’s Emergency Command Center receives alarms by two means—directly and through a transfer from the Orange County Sheriff’s dispatch center.

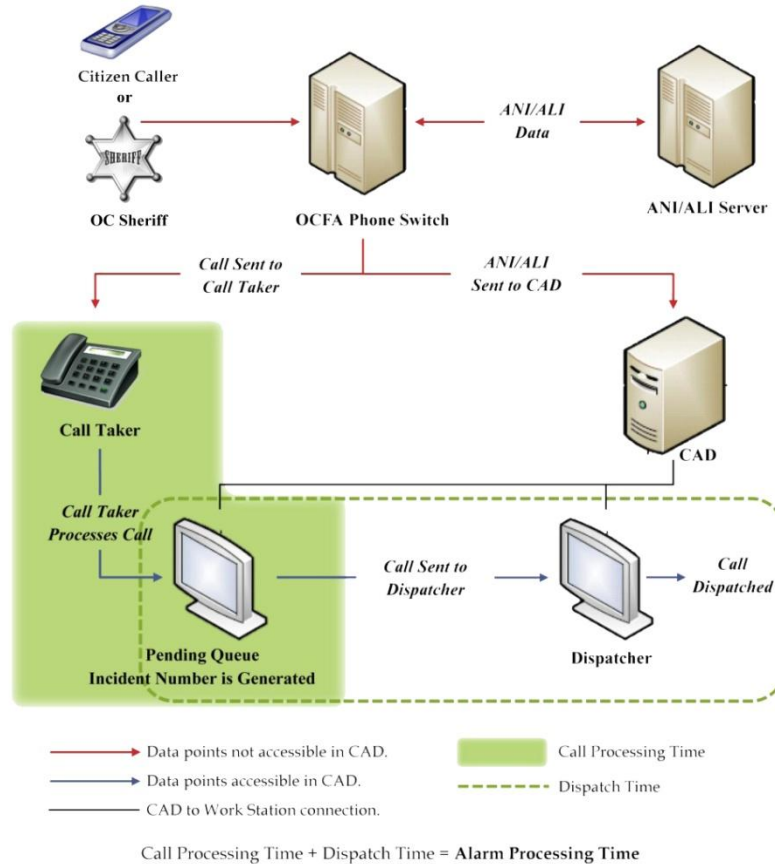
Alarm Answering Time: The time interval from the receipt of the call at dispatch until the call is answered.

ANI/ALI information is captured when a call is received at the dispatch center. Automatic Number Identification (ANI) corresponds to a caller’s seven digit telephone number. Automatic Location Identification (ALI) provides an address display of the caller including the caller’s address, community, state, type of service and if a business, the name of the business.

Alarm Processing Time: The time interval from the acknowledgement of the call in the Computer Aided Dispatch (CAD) system by the dispatch Call Taker to the dispatch of emergency responders.

OCFIRS records two time components that makeup the alarm processing time: the call processing and dispatch time. Call processing is the time interval from the acknowledgement of the call in the CAD system by the call taker to the transfer of the call to the dispatcher. Dispatch is the time interval from the receipt of the call by the Dispatcher to the dispatch of emergency responders.

Alarm Handling Time: The combined time of the alarm transfer, answering, and processing times. The figure below provides an illustration of the call handling process.



Note: As a result of the transition of the city of Santa Ana into the Orange County Fire Authority, a dual-CAD dispatch model was implemented.

Turnout Time: The time interval from the receipt of the call by emergency responders (tones ringing at the station) to the emergency responders going en route to the incident.

The methodology by which turnout performance is reported and measured by the OCFA is reflected in a 24-hour timeframe.

Travel Time: The time interval that begins when emergency responders are en route to the emergency incident and ends when an emergency responder arrives at the scene.

Dispatch-to-Arrival Time: The combined time of the turnout and travel times.

Total Response Time: The combined time of the alarm processing, turnout and travel times (the point the 9-1-1 call is acknowledged in CAD to the arrival of emergency responders).

CFAI benchmarks and baselines reference total response time. As defined above, total response time includes the performance of an agency's dispatch center and factors in the alarm processing time. When a member of the public calls for emergency assistance their emergency has already started and their performance expectations begin as soon as they pick up the phone and dial 9-1-1. Therefore, setting performance objectives based upon total response time more accurately reflects the needs and

expectations of an agency's communities and citizens. Again, in an effort to align with industry standard, the OCFA has adopted the utilization of total response time as the time reporting measurement.

Industry Standards

There are many industry standards and suggested best practices in the fire industry. Although industry standards have not been formally adopted by the OCFA they have been taken into consideration as the SOC process.

National Fire Protection Association

NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments, 2010 Edition:

- Applicable Sections of Chapter 3: Definitions
- Applicable Sections of Chapter 4: Organization
- Applicable Sections of Chapter 5: Fire Department Services
- Applicable Sections of Chapter 6: Systems

Insurance Services Office

The Fire Suppression Rating System (FSRS) considers three main areas of a community's fire protection program.

Fire Alarms

The acceptance and transmission of incidents from the dispatch center to the fire stations.

Ten percent of a community's overall score is based on how well the fire department receives and dispatches fire alarms. Field representatives evaluate:

- The communications center, including the number of operators at the center.
- The telephone service, including the number of telephone lines coming into the center.
- The listing of emergency numbers in the telephone book.
- The dispatch circuits and how the center notifies firefighters about the location of the emergency.

Fire Department

Fifty percent of the overall score is based on the fire department. ISO reviews the distribution of fire companies throughout the area and checks that the fire department tests its pumps regularly and inventories each engine company's nozzles, hoses, breathing apparatus, and other equipment. ISO also reviews the fire company records to determine:

- Type and extent of training provided to fire company personnel.
- Number of people who participate in training.
- Firefighter response to emergencies.
- Maintenance and testing of the fire department's equipment.

Water Supply

Forty percent of the overall score is based on the community's water supply. This part of the survey focuses on whether the community has sufficient water supply for fire suppression beyond daily maximum consumption. ISO surveys all components of the water supply system, including pumps, storage, and filtration. They observe fire-flow tests at representative locations in the community to determine the rate of flow the water mains provide. They also review the condition and maintenance of fire hydrants. Last, the distribution of fire hydrants no more than 1,000 feet from the representative locations is counted.

Summary of Findings

- The overarching critical issue with member agencies is the long-term financial sustainability of the OCFA.
- There is an expectation amongst member agencies that the OCFA will incorporate efficiencies and innovation where possible as it relates to service delivery and deployment.
- Community and member agency expectations are that services provided throughout the OCFA are consistent and similar, understanding that rural areas will have slower response times.
- Community expectations have remained consistent since 2006 with the exception of issues surrounding finance and equity.
- The community and member agencies believe their expectations are being met relative to service delivery, services provided, and the professional manner in which the OCFA membership delivers the requested services.
- There is a “gap” between the expectation of the community relative to response time and the reality of the actual performance (majority of member agencies and citizens expect service within 4-6 minutes from initial phone call).
- EMS, fire suppression, and technical rescue are the highest prioritized services from the community’s perspective.
- The community desires to maintain or improve current response performance to critical calls.
- Response resources are deployed in a manner consistent with providing a five-minute travel time to the vast majority of the urban area.
- Levels of service within the OCFA vary based on fire station location, response unit workload, and physical barriers to rapid response.
- A comprehensive automatic and mutual aid system is in place and is critical to the delivery of seamless service delivery within the region.
- The OCFA initiated a trial tiered medical dispatch protocol on July 7, 2013, although this has not been fully implemented as response assignments have not changed.
- System workload has increased at a rate of approximately 7.3 percent per year for EMS over the past 20 years. Fires have decreased at a rate of 1.5 percent per year over the past 20 years.
- Currently, the utilization rate for emergency response is 59.6 incidents per 1,000 population annually. Incident workload count is expected to grow to 64.7 incidents per 1,000 population by 2035 (a total of 144,000 estimated incidents).
- The demand for service within the jurisdictional boundaries will increase as population projections are realized and the general population continues to age.
- The canyon areas, national forests, and remote areas with limited road infrastructure present time/distance and access challenges relative to service delivery.
- Under contract, the OCFA protects approximately 175,000 acres of wildland in state and federal areas located in the county. These areas present time/distance and access challenges relative to service delivery.
- Current locations of some fire stations were based on available land rather than best distribution of resources.

- Current distribution of response resources leaves some areas unable to generate an effective response force in a timely manner.
- Inventories were provided and, generally speaking, facilities and apparatus are in good condition.
- The OCFA has three fire stations that are stand-alone reserve firefighter stations within their delivery system. The possibility of a delayed response from these stations can have an impact on response times depending on availability of reserve personnel.
- Only one station (FS45) had unit reliability greater than 90%. However, only 29 of the 117 response units in the OCFA system had unit hour utilization rates above 10%. Station reliability is impacted by something other than response workload. A review of resource location management is warranted.
- Response volume is directly impacting overall response performance.
- The automatic aid agreements are in the process of being updated to reflect current practices.
- Specific utilization of automatic aid units needs to be addressed especially as it relates to imbalance and staffing levels on units.
- Data collection methods are inaccurate and incomplete in some instances (OCFA and Santa Ana).
- The dispatch center only captures received time for 9-1-1 calls. As a consequence, only 44,696 of the 92,036 priority incidents have a valid received time. This will change with the new Tri Tech CAD implementation (est. March 2014).
- Currently, the closest unit is not necessarily dispatched to emergencies at all times. There are inadvertent crossing of responders.
- Community risk has increased as development continues at a fairly aggressive pace.
- OCFA has implemented important community risk reduction strategies/programs: Smoke Alarm program, Cooking Fire program, Multi-Family Risk Reduction program, and Ready, Set, Go!
- Incident activity is the highest between the hours of 8AM and 9PM.
- There is a need and desire to focus more on “outcome driven results” for all services and programs.
- Six strategic plan objectives related directly or indirectly to the SOC.

Implementation Timeline

The following figure presents a proposed timeline for the implementation of the recommendations represented in this report.

Figure 108: Proposed Implementation of Recommendations Timeline

Proposed Recommendation	2014	2015	2016
Recommendation One Formally adopt response performance goals to establish clear service level expectations to guide the allocation and distribution of response resources and development of service delivery practices.	■		
Recommendation Two Improve call processing performance through improvement of dispatch protocols and procedures, early initiation of response resource notification through pre-alerting, and through personnel performance management.	■		
Recommendation Three Improve turnout time performance by incorporating assistive technology and through personnel performance management.		■ On-Going	
Recommendation Four Improve response system reliability by minimizing response unit movement away from primary service areas for non-emergency purposes and by moving resources to stations that must be vacated for training and other reasons.		■ Trial Periods	
Recommendation Five Improve the delivery of emergency medical service by implementing criteria based dispatch and staffing all engines and ladder trucks with at least one paramedic.		■	
Recommendation Six Redistribute available resources to provide more consistent levels of service across the entire OCFA service area.		■ Phases	
Recommendation Seven Consolidate fire stations in areas of significant overlapping coverage. Continue to plan and develop new fire stations as needed.		■	
Recommendation Eight Implement dynamic staffing practices to ensure sufficient resources are available to serve incident demand as it varies by time of day. A staffing plan that provides resources to provide a minimum level of protection based on community risk, augmented during higher workload periods with additional resources, should be implemented.		■ Phases	
Recommendation Nine Utilize available technologies to enhance service delivery. Implement closest-unit dispatch technology to ensure the closest appropriate response unit is sent to an emergency. Implement technology that ensures response resources are moved as needed to maintain consistent levels of service. Implement citizen alerting technology (CAD to mobile device).		■ In Conjunction with New CAD	

Exhibits Included on CD

The following documents can be found on the “Exhibits CD” included with this report:

Orange County Fire Authority Strategic Plan 2010-2015

OCFA Comparables Agencies Chart

OCFA Comparables Survey Report

OCFA Major Risk Sites

OCFA Standards of Cover and Deployment Plan 2014