LOS ANGELES FIRE COMMISSION

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June 6, 2023

Honorable Members of the City Council
City of Los Angeles
City Hall, Room 395
Attn: City Clerk

[BFC 23-055] – LAFD STANDARDS OF COVER ANALYSIS

At its meeting of June 6, 2023, the Board of Fire Commissioners received the report and its recommendations. The report is hereby transmitted to the City Council for consideration and approval.

Should you need additional information, please contact the Board of Fire Commissioners' office at 213-978-3838.

Sincerely,

Leticia Gomez
Commission Executive Assistant II

Attachment

cc: Fire Chief Kristin M. Crowley (via email)

June 6, 2023

LOS ANGELES FIRE DEPARTMENT

KRISTIN M. CROWLEY
FIRE CHIEF

APPROVED: 6/6/2023
BOARD OF FIRE COMMISSIONERS
BY: [signature]
COMMISSION EXECUTIVE ASSISTANT

May 31, 2023

BOARD OF FIRE COMMISSIONERS
FILE NO. 23-055

TO: Board of Fire Commissioners

FROM: KC Kristin M. Crowley, Fire Chief

SUBJECT: LAFD STANDARDS OF COVER ANALYSIS

FINAL ACTION:	X Approved	___ Approved w/Corrections	___ Withdrawn
	___ Denied	___ Received & Filed	___ Other

SUMMARY

The Los Angeles Fire Department (LAFD or Department) retained Citygate Associates, LLC (Citygate) to perform a Standards of Cover (SOC) deployment analysis. This study included reviewing the adequacy of the existing deployment system of apparatus and personnel from current fire station locations, testing deployment scenarios to improve response performance, and analyzing workload per response unit.

The study does not include specialized response systems at the Port of Los Angeles, Los Angeles International Airport, LAFD Air Operations, hazardous materials, technical rescue, and complex incident teams. This study focuses on neighborhood-based fire and emergency medical services resources.

Throughout the report, Citygate makes key findings and, where appropriate, specific action item recommendations. Overall, there are 17 key findings and six specific action item recommendations.

The report is presented in three volumes. The Technical Report (Volume 1) includes the Executive Summary containing a synopsis of Citygate's analysis and suggested next steps; Sections 1–6, which contain the deployment and SOC elements of the study; and Section 7, which discusses next steps and summarizes all findings and recommendations. A Map Atlas of deployment coverage measures is provided in Volume 2, and a comprehensive Community Risk Assessment is provided in Volume 3.

The Department is evaluating the findings and recommendations contained in the report to prioritize plans to implement those recommendations, as appropriate.

RECOMMENDATION
That the Board:
Receive the report and transmit to the City Council.

DISCUSSION
The scope of work and corresponding Work Plan for the Standards of Cover analysis were developed consistent with Citygate's Project Team members' experience in fire administration. Citygate utilizes various National Fire Protection Association (NFPA) publications as best practice guidelines, along with best practices from the criteria of the Commission on Fire Accreditation International (CFAI).

The scope of the SOC deployment analysis includes the following elements:

- Modeling the response time ability of the current fire station locations. Although this is not an assessment of fire departments adjacent to LAFD, the assessment does consider the impacts of LAFD's automatic/mutual aid agreements common throughout the area.
- Updating performance goals for LAFD consistent with the local risks to be protected, national best practices, and guidelines from the NFPA and the CFAI.
- Using the incident response time analysis program StatsFD™ to review the incident response statistics of historical performance.
- Using the geographic mapping response time measurement tool FireView™ to measure fire unit driving coverages from LAFD's current fire stations.

The assessment addresses the following questions:

- Is the type and quantity of apparatus and personnel adequate for LAFD's deployment to emergencies?
- What is the recommended deployment to provide adequate emergency response times as growth continues?

The data analyzed by Citygate for the SOC report covers Calendar Years 2018 to 2020. Delays in validating the analysis and providing background information to Citygate began to compound as the COVID-19 lockdown began and the Department deployed Special Duty and civilian resources away from their regular duties to support the testing and vaccination efforts. Other City departments also deployed resources from regular duties, further delaying our ability to provide timely updates to Citygate.

The Department's FireStatLA Section conducted its own analysis of the Unit-Hour Utilization data and found that the trends in the data, extended over an additional two-year period, remained, essentially, the same; and, therefore, do not affect the findings in the report.

Standards of Cover Report Findings

Finding #1: LAFD is a leader in response time reporting with its FireStatLA section, measuring from 9-1-1 answer to first-unit arrival.

Finding #2: The physical spacing of LAFD stations is sufficient, apart from small areas in the northern section of the City.

Finding #3: Effective Response Force (multiple-unit responses to more serious emergencies) travel-time coverage is sufficient in areas that are the most populated and carry the highest incident demand.

Finding #4: Given that the current fire station plan provides 5:00-minute travel time coverage to 88.7 percent of public streets City wide, using a 5:00-minute travel time goal to physically space fire stations across the City's very diverse geography is effective. The incident workload assessment in this study evaluates the needed units per station.

Finding #5: The northern service area needs one additional Battalion Command Team at Station 100 to improve command coverage for more serious incidents.

Finding #6: One additional fire station with an engine is needed northeast of Station 81, as modeled in Scenario Map 1a and 1b (Volume 2—Map Atlas).

Finding #7: LAFD's time-of-day, day-of-week, and month-of-year calls for service demand occurs in consistent, predictable patterns. LAFD's service demand is sufficiently high in all areas, 24 hours per day, to require an all-day, year-round response system.

Finding #8: The top ten busiest engines, trucks, and rescue ambulance companies' unit-hour utilization measures significantly exceed 30 percent for several hours or more at a time. Based on this measure alone, the busiest unit crews are overworked and need relief units and/or strategies to decrease the quantity of non-urgent EMS incidents.

Finding #9: The volume and simultaneous demand of 10 to 28 LAFD stations is the highest Citygate has measured in a metro client to date. Given the likelihood that some of these stations are adjacent to each other—as population density zones are typically larger than a single fire station area—Citygate located the top 10 stations and then expanded the search to the top 28.

Finding #10: As shown in Map #18, there are three clusters in the east-central and southern City core containing 16 of the top 28 stations for workload demand, and nine of the top 10. In the northern Valley area, there are two clusters containing five of the top 28, with one of the top ten. There are seven other stations in the top 28, but they exist as individual stations without an adjacent busy station.

Finding #11: Battalion 1 in the east-central area of the City has three of the top 10 overworked stations; Battalion 13 in the southern area of the City has another five of the top 10.

Finding #12: The importance of this clustering measure is that for long, consecutive hours of the day, large numbers of fire crews are busy with only EMS calls, leaving the area underserved for an immediate need fire or rescue response, even when many of the busiest stations have multiple crews assigned to them.

Finding #13: At 2:03 minutes in 2020, call-processing performance to 90 percent of fire and EMS incidents is only 33 seconds longer than Citygate's and the National Fire Protection Association's 1:30-minute recommendation where no language or location identification barriers exist. In light of the size of the City and the typical barriers to a short 9-1-1 call, the LAFD's average processing time of 1:08 minutes is very good as 235,855 incidents are processed faster than best practice guidelines.

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Finding #17: Category A first arrival and ERF call-to-arrival times to 90 percent of all occurrences are better than, or very close to, best practices in all but the most geographically challenged areas. This ERF performance is stronger than what Citygate has observed in other metropolitan clients. It is understandable that the Category B response times are longer as more units travel farther to an incident, as with all metropolitan departments.

Standards of Cover Report Deployment Recommendations

Based on the technical analysis and findings contained in this study, Citygate offers the following near-term deployment recommendations:

Recommendation #1: Maintain current response time goals and reporting.

Recommendation #2: Plan for an added Battalion Command Team at an existing station, and one new fire station with engine company, in the northern area of the City.

Recommendation #3: Shift or rotate crews differently every 12 hours on an agreed-upon number of the highest-workload, 24-hour rescue ambulances.

Recommendation #4: Refine and build the case to shift low-acuity EMS incidents from firefighter-staffed rescue ambulances in very high-incident-demand areas to non-firefighter-staffed, low-acuity units to include medical, mental health care, and homeless resources.

Recommendation #5: Maintain the current mix of single-unit and Effective Response Force deployment units and personnel staffing as they meet the risks to be protected in the City.

Recommendation #6: In the following focus areas, plan to change staffing methods and add additional rescue ambulances as this study's data indicates. Note that the first two focus areas contained 29 percent of Citywide incidents in 2020.

The Department is developing plans to implement the report's recommendations, where appropriate. The plans include outreach to internal and external stakeholders for input and/or approval of the plans.

Board report prepared by David A. Perez, Deputy Chief, Chief of Staff.

Attachment

CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES

LOS ANGELES FIRE DEPARTMENT
STANDARDS OF COVER ANALYSIS

VOLUME 1 OF 3:
TECHNICAL REPORT

MAY 17, 2023

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LOS ANGELES FIRE DEPARTMENT
FOUNDED 1886

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EXECUTIVE SUMMARY

The City of Los Angeles (City) Fire Department (LAFD) retained Citygate Associates, LLC (Citygate) to perform a Standards of Cover (SOC) deployment analysis. This study included reviewing the adequacy of the existing deployment system of apparatus and personnel from current fire station locations, testing deployment scenarios to improve response performance, and analyzing workload per response unit. The study does not include specialized response systems at the Port of Los Angeles, Los Angeles International Airport, the LAFD Aviation bureau, hazardous materials, technical rescue, and complex incident teams. This study focuses on neighborhood-based fire and emergency medical services resources.

This report is presented in three volumes. The Technical Report (**Volume 1**) includes: this Executive Summary containing a synopsis of Citygate's analysis and suggested next steps; Sections 1–6, which contain the deployment and SOC elements of the study; and Section 7, which discusses next steps and summarizes all findings and recommendations. A Map Atlas of deployment coverage measures is provided in **Volume 2**, and a comprehensive Community Risk Assessment is provided in **Volume 3**.

Throughout this report, Citygate makes key findings and, where appropriate, specific action item recommendations. Overall, there are 17 key findings and six specific action item recommendations.

POLICY CHOICES FRAMEWORK

As the City of Los Angeles (City) Mayor, Council, and the Fire Commission all understand, there are no mandatory federal or state regulations directing the level of fire service to be provided, including regulations concerning response times and outcomes. The level of service and any resultant costs are a local community decision in the United States. The body of regulations on the fire service suggests that if fire services are provided, they must be provided with the safety of firefighters and the public in mind. Thus, there is often a constructive tension between the desired level of fire services and the level that can be funded, and many communities may not have the level of fire services they desire. The City's large investments in fire services over the past decades serve as its baseline commitment today.

This study identifies that continued investment in fire services is still necessary to provide expanded and additional services from LAFD as the City evolves. The fundamental fire and EMS ambulance service policy choices are derived from two key questions:

1. What outcomes are desired for the emergencies to which LAFD responds? Is the desire to provide emergency medical care in time to lessen the possibility of preventable death or severe disability, and to keep a building fire to the room, building, or block of origin?

2. Should equitable response performance be provided to all neighborhoods with similar risks to protect?

Once desired outcomes are determined, the fire and EMS first responder deployment must be designed to cover the most geography in the fewest minutes to meet stated outcome goals. In a large fire and EMS agency with multiple neighborhoods, such as Los Angeles, it must be determined whether similarly populated areas should receive similar response time performance from a fire services unit.

Citygate's Overall Observations on LAFD's Fire Crew Deployment

Fire services deployment, simply stated, is about the **speed** and **weight** of the response. **Speed** calls for initial (first-arriving or first-due) all-risk intervention units (engines, ladder trucks, rescue ambulances, and specialty units) strategically located across a jurisdiction to respond within an effective travel time to deliver desired outcomes for routine-to-moderate emergencies and prevent an incident from escalating to greater size or complexity. **Weight** is about multiple-unit response to more serious emergencies, such as a room-and-contents building fire, a wildland fire, a multiple-patient medical incident, a vehicle accident with extrication required, or a technical-rescue incident. In these situations, enough firefighters must be assembled within a reasonable timeframe to safely control the emergency and prevent it from escalating to an even more serious event.

LAFD's service area is marked by diverse populations, land uses, hilly topography in some areas, and a public road pattern that, in certain areas, is geographically challenged with rivers, open spaces, and/or a lack of major cross-connecting roadways, limiting LAFD's response times. Population drives EMS service demand, and infill development increases population. As different areas continue to redevelop and add population density, LAFD's services will need adjustment just to *maintain*, much less *improve*, response times across the City's geography—more so when simultaneous incidents occur at peak hours of the day.

In the most densely developed sections of the City, while the substantial growth in EMS incidents over the past decade seems all-consuming, there is still a need for both a first-due firefighting unit and multiple-unit Effective Response Force (ERF) deployment (First Alarm) consistent with current best practices to limit the risk of fire to only part of an affected building and keep wildland fires small and within the initial attack force's capabilities. In other words, *all communities need a standby and readily available firefighting force* that can respond when fires break out, <u>regardless</u> of peak-hour EMS workload.

As shown in this report, Citygate analyzed response times, station locations, and incident workload on the primary types of responding apparatus. This analysis is based on GIS mapping and incident statistics, which combine to formulate Citygate's opinions and overall deployment findings and recommendations in this section.

The LAFD has response time goals and reports its operational metrics via a public website. The LAFD uses an *average* measure of response time, and the CFAI and NFPA communities use a 90-percent-of-goal (*fractile*) measure. Both are effective measures, and both are utilized in this study. All response time measures point to a strong and effective response system, especially in light of the geographic terrain challenges across the City. Overall, LAFD deployment represents the strongest metropolitan area coverage Citygate has ever studied. While field crew deployment needs some adjustment and improvement in key areas, it is not—by any measure—significantly insufficient or in need of major change or fire station relocation.

Citygate's analysis of prior response statistics and use of geographic mapping tools reveals that LAFD is currently strained by extraordinarily high EMS incident demand in several areas of the City. LAFD's current deployment system performance is described in detail by the maps provided in **Volume 2** and the corresponding text explanation beginning in **Section 4.2** of this volume.

The ongoing effective deployment of fire and EMS first responder units throughout the City is constrained by one critical issue and a small need to add two resources, which will stabilize current response times and increase firefighting unit availability. Across our deployment review, Citygate found the following two challenges by which LAFD is strained to meet the needs of the City.

Challenge #1: High-Volume EMS Incident Demand

As the response unit workloads by time of day show, EMS incidents in 2020 comprised 81.9 percent of total incident demand. The peak of this demand occurs during daylight to mid-evening hours and in clusters of high population and simultaneous incidents. Accordingly, even if fire stations are appropriately located and contain multiple staffed apparatus, peak service demand frequently results in all units assigned to a station simultaneously committed to one or more incidents, thus driving some simultaneous service demand to adjoining stations, which results in cascading delays on unit travel times and overall response performance.

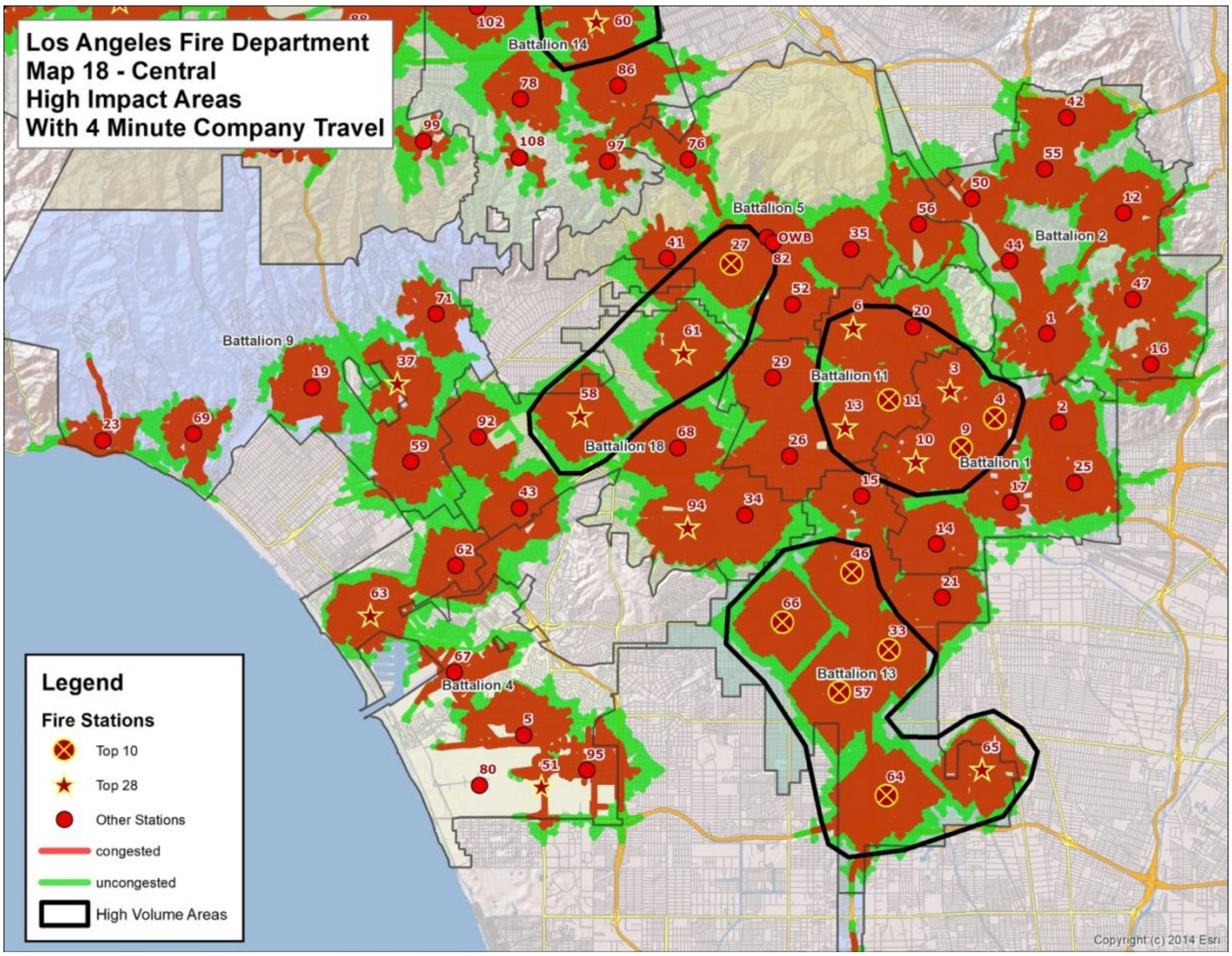
These high workload areas need either (1) more response units or (2) a reduction in non-acute EMS workload, which would be more cost-effective, to stabilize and likely improve response times and availability for serious fire, acute EMS, and technical incidents.

To put the EMS demand in perspective, in 2020, the LAFD responded to 392,949 EMS incidents, some of which had more than one patient. It is not an exaggeration to say the LAFD sees almost half a million patients per year. In 2020, the busiest emergency room in the United States was Parkland Health and Hospital in Dallas, Texas, which saw 210,152 patients. Los Angeles County / USC Medical center was seventh in the nation with 136,161 patients.

In other words, the LAFD is in the human care business, but not all these incidents require traditional emergency medical skills. All incidents do not need the response of a paramedic firefighter engine, truck company, and/or a two-person paramedic or EMT ambulance for a ride to an emergency room. LAFD is well-suited to be an alternative human crisis response agency with specialized responders in addition to LAFD's firefighters. While such an alternative response system is needed Citywide, it is *critically* needed now in core eastern and southern City areas. Although constructing such a system represents a new expense, overall, it will be more cost-effective than adding fire units. The City *"needs its fire department capacity back."*

The highest incident volume in central Los Angeles is in the areas identified by Map #18 (**Volume 2—Map Atlas**). The top ten busiest engine, truck, and rescue ambulance companies are adjacent to each other, predominantly in two clusters.

Figure 1—Central Los Angeles High-Impact Areas



The individual unit-hour utilization (UHU) measures for these units significantly exceed 30 percent for long, consecutive hours at a time. Based on this measure alone, the busiest unit crews are overworked and in need of relief units and/or strategies to decrease the quantity of non-urgent EMS incidents. The volume and simultaneous demand on the top 10 to top 28 LAFD stations is the highest Citygate has ever measured in a metro client.

The busiest fire stations already have three to six primary units assigned (not chiefs or support units). Some units are placed outdoors on front aprons or in rear lot areas. Many sites are now at their physical limit for adding response units and/or personnel.

Over the course of late 2021 and into 2022, the City and County rolled out a pilot project for the delivery of alternative, non-urgent patient care—including mental health and homeless program diversion; however, this is not enough. The alternative response program needs to *scale massively and quickly* to lower the workload placed on fire units back down to moderate and serious emergencies.

As an illustration of volume, in 2020, Fire Station 9 in the east downtown area responded to 18,986 incidents—an average of 52 per day, or two per hour. If 30 percent of those incidents were managed by an alternative response team, that amounts to approximately 16 incidents per day. If the seven busiest stations in just the east-central area of the City had this low-acuity volume, that total would be 112 incidents per day over the busiest 16 hours.

If the alternative response team spent only 30 minutes per patient contact on average, that would be two contacts per hour per team. The east-central area alone could consume two to three units during daylight and early evening hours. If all six high-workload areas needed three units each, that would amount to 18 units per day, seven days per week, for at least 16 hours per day. Additionally, the other battalions could each use at least one alternative unit, representing another eight units, for a total of 26 units Citywide. On eight-hour shifts at two personnel per unit, that equates to 52 personnel per day just to cover five days per week, not including earned leave time. Therefore, well over 100 new non-firefighter personnel must be hired and trained for alternative response measures to meet the service needs of the City.

In light of the large personnel and unit count needed for alternative care teams, even as a "rapid" program, implementation could take two to three fiscal years. In the meantime, the busiest fire units need relief now. Citygate recommends the LAFD add at least 14 additional rescue ambulances (both ALS And BLS to relieve the busiest types), one engine company at a new station in the northern area of the City, and one Battalion Command Team in the north at an existing fire station.

Further, there are currently at least 25 rescue ambulances on 24-hour shift staffing that are overworked for excessively long periods of a 24-hour day. Citygate does not believe that critical patient care, much less safe firefighting, is always possible when a crew has gone from call to call for 12 or more hours. The LAFD should find a way to "split shift" these busiest 24-hour ambulances by either rotating crews to slower companies (though there are none close by in East and South Los Angeles) or placing these units on an alternative staffing workweek with 12-hour days.

Citygate does not recommend this lightly. This change will require collective bargaining with the represented workforce and will require more firefighters be hired in the near term. However, outside of the traditional 24-hour fire service staffing model, where in America do critical health care professionals, airline pilots, or railroad engineers preform critical work well past 12 consecutive hours without a mandated rest break? Citygate does not believe the LAFD can wait years for an alternative response program to be established, during which time EMS incident volume will likely further *increase.*

Challenge #2: Small Response Coverage Gaps

This study identified the need for one additional Battalion Command Team to serve the northern area of the City near Fire Station 100. In addition, a large enough gap in first-due engine travel-time coverage exists in the eastern section of the northern area of the City (Map #17, **Volume 2—Map Atlas**) that one additional fire station is required.

Given the significant Battalion Command Team coverage gap in the north between Stations 73, 100, and 90, the study maps show the significant benefit of adding a Battalion Command Team at Station 100, located at 6751 Louise Avenue in Van Nuys. Almost 100 percent of the underserved road miles at a travel time of 8:00 minutes are included in this area southeast of the Van Nuys Airport.

The addition of an engine on the east side of the northern area, near the intersection of Woodman and Roscoe in Panorama City, would also be beneficial. This location is west of SR-170, a little south of the SR-170/I-5 interchange, at the intersection of two prime arterials, which will allow an added engine to route into far-away neighborhoods more quickly. As such, this location test did the best job of filling in the engine travel time gap at both 4:00 minutes' and 5:00 minutes' travel time. The added engine would increase public road coverage by 51.7 miles at 4:00 minutes, or up to 55.23 more miles at 5:00 minutes of travel time. The remaining underserved gap is between the fifth and sixth minute of coverage from adjoining stations 77 and 98.

FINDINGS AND RECOMMENDATIONS

Overall, there are 17 key findings and six specific action item recommendations contained in the body of the report. These are now presented in a comprehensive list for ease of reference.

Findings

Finding #1: LAFD is a leader in response time reporting with its FireStatLA section, measuring from 9-1-1 answer to first-unit arrival.

Finding #2: The physical spacing of LAFD stations is sufficient, apart from small areas in the northern section of the City.

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Deployment Recommendations

Based on the technical analysis and findings contained in this study, Citygate offers the following near-term deployment recommendations:

Recommendation #1: Maintain current response time goals and reporting.

Recommendation #2: Plan for an added Battalion Command Team at an existing station, and one new fire station with engine company, in the northern area of the City.

Recommendation #3: Shift or rotate crews differently every 12 hours on an agreed-upon number of the highest-workload, 24-hour rescue ambulances.

Recommendation #4: Refine and build the case to shift low-acuity EMS incidents from firefighter-staffed rescue ambulances in very high-incident-demand areas to non-firefighter-staffed, low-acuity units to include medical, mental health care, and homeless resources.

Recommendation #5: Maintain the current mix of single-unit and Effective Response Force deployment units and personnel staffing as they meet the risks to be protected in the City.

Recommendation #6: In the following focus areas, plan to change staffing methods and add additional rescue ambulances as this study's data indicates. Note that the first two focus areas contained <u>29 percent</u> of Citywide incidents in 2020.

Focus Area 1 – Battalions 1 and 11

Total: seven stations, 14.3 percent of Citywide incident volume in 2020.

- Station 3 – Needs split shift crews on both rescue ambulances
- Station 4 – Add third rescue ambulance
- Station 6 – Needs split shift crews on both rescue ambulances
- Station 10 – Needs split shift crews on both rescue ambulances
- Station 11 – Add third rescue ambulance
- Station 13 – Split shift crew rescue ambulance 13

Focus Area 2 – Battalion 13

Total: six stations, 14.8 percent of Citywide incident volume in 2020.

- Station 33 – Add third rescue ambulance
- Station 46 – Add third rescue ambulance
- Station 57 – Add fourth rescue ambulance, split shift crews on the three current rescue ambulances

- Station 64 – Add fourth rescue ambulance, split shift crews on the three current rescue ambulances
- Station 65 – Monitor need for split shift crews and/or fourth rescue ambulance
- Station 66 – Add fourth rescue ambulance

Focus Area 3 – Battalions 5 and 18

- Station 27 – Add third rescue ambulance, split shift crews on two rescue ambulances
- Station 58 – Add fourth rescue ambulance, split shift crews on three rescue ambulances
- Station 61 – Add third rescue ambulance, split shift crews on two rescue ambulances

Focus Area 4 – Northern Areas

- Station 39 – Split shift the rescue ambulance
- Station 60 – Split shift the two rescue ambulances
- Station 89 – Add third rescue ambulance, split shift crews on two rescue ambulances

Focus Area 5 – Northern Area – Battalion 12

- Station 7 – Add second rescue ambulance
- Station 98 – Split shift the two rescue ambulances

Next Steps

Near-Term

- Review and absorb the findings and recommendations provided in this report.
- Develop a methodology for how to split shift the overloaded rescue ambulances.
- Direct staff to return with costs and timing to make near-term staffing changes.

Longer-Term

- Plan for an added Battalion Command Team at an existing station, and one new fire station with engine company, in the northern area of the City.

- If central City, high-impact stations cannot physically add rescue ambulances, locate and implement ambulance-only hub stations in existing commercial properties in the high-workload areas.
- Monitor response time performance against adopted goals.

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Section 1

Introduction and Background

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LAFD LAFD

SECTION 1—INTRODUCTION AND BACKGROUND

Citygate Associates, LLC's (Citygate) detailed work product for the Los Angeles Fire Department (LAFD) is presented in this volume. The scope of work and corresponding Work Plan for this analysis were developed consistent with Citygate's Project Team members' experience in fire administration. Citygate utilizes various National Fire Protection Association (NFPA) publications as best practice guidelines, along with best practices from the criteria of the Commission on Fire Accreditation International (CFAI).

1.1 REPORT ORGANIZATION

This report is comprised of three volumes. A Map Atlas is found in **Volume 2** and a comprehensive Community Risk Assessment is found in **Volume 3**. **Volume 1** consists of the following sections:

	Executive Summary: A summary of our analysis and suggested next steps.
Section 1	Introduction and Background: An introduction to LAFD and background facts.
Section 2	Standards of Coverage Introduction: An introduction to the SOC (deployment) process and methodology used by Citygate in this review.
Section 3	Deployment Goals, Measures, and Risk Assessment: An in-depth examination of LAFD's ability to deploy firefighters and apparatus to meet the risks, expectations, and emergency needs of its constituents.
Section 4	Staffing and Geo-Mapping Analysis: A review of (1) the critical tasks that must be performed to achieve LAFD's desired fire and emergency medical services (EMS) outcomes, and (2) LAFD's existing fire station and apparatus locations as well as needed future locations.
Section 5	Statistical Analysis: A statistical data analysis of LAFD's incident responses.
Section 6	Firefighting and Rescue Ambulance Deployment Evaluation: An integrated summary of deployment priorities and an overall deployment recommendation.
Section 7	Findings and Recommendations and Next Steps: A summary of recommended next steps and a list of all findings and recommendations.

1.1.1 Goals of the Report

This study will cite findings and make recommendations, as appropriate, related to each finding. Findings and recommendations are numbered sequentially. Section 7 of this report brings attention to the highest priority needs and recommended next steps.

This document provides technical information about how fire services are provided and legally regulated and how LAFD currently operates. This information is presented in the form of recommendations and policy choices for the Fire Commission and City Council to consider.

1.2 PROJECT SCOPE OF WORK

1.2.1 Standards of Coverage (Deployment) and Services Reviews

The scope of this SOC deployment analysis includes the following elements:

- Modeling the response time ability of the current fire station locations. Although this is not an assessment of fire departments adjacent to LAFD, the assessment does consider the impacts of LAFD's automatic/mutual aid agreements common throughout the area.
- Updating performance goals for LAFD consistent with the local risks to be protected, national best practices, and guidelines from the NFPA and the CFAI.
- Using the incident response time analysis program StatsFD™ to review the incident response statistics of historical performance.
- Using the geographic mapping response time measurement tool FireView™ to measure fire unit driving coverages from LAFD's current fire stations.

SOC Review Questions

This assessment addresses the following questions:

- Is the type and quantity of apparatus and personnel adequate for LAFD's deployment to emergencies?
- What is the recommended deployment to provide adequate emergency response times as growth continues?

1.3 LOS ANGELES FIRE DEPARTMENT OVERVIEW

This review of LAFD's field services deployment must be completed in the context of the risks and areas served by LAFD. While LAFD exists to provide firefighting and rescue services, the provision of First Responder EMS by LAFD now dominates emergency incident volume, as illustrated by calendar year 2020 when **81.85 percent** of all incidents responded to by LAFD were medical emergencies.

The following facts illustrate the LAFD service area and resultant services system:

- 3.9 million residents

- 469 square miles
- 32.06 square miles of water
- 616,925 single-family residences; 112,081 apartment complexes
- 64,226 commercial or industrial properties
- Over 36,079 acres of all types of open spaces
- Total real property values (2021/22) assessed at $774.38 billion
- Dozens of tourist venues, many with worldwide status
- Large, nationally significant employers
- A total City budget of $11.76 billion
- 106 fire stations with 98 staffed engine companies
- 93 Paramedic ambulances
- 42 ladder truck / light force companies, of which 28 are Paramedic Assessment Engines
- 43 Basic Life Support ambulances
- 15 Brush Patrols
- 6 Urban Search and Rescue (USAR) companies
- 8 aircraft firefighting apparatus
- 7 helicopters
- 5 bulldozers/loaders
- 5 fireboats
- 4 Hazardous Materials companies
- 4 Swift Water Rescue teams
- 4 firefighting foam tenders
- 1 Heavy Rescue Unit
- 14 Battalion Command Teams and 2 Assistant Chiefs for daily incident command
- Fire station personnel are also cross-trained to respond in specialty apparatus, such as hazardous materials units, wildland fire units, all-terrain vehicles, fireboats, foam units, etc.

- In FY22/23, 1,023 fire station platoon field staffing, plus 32 platoon duty dispatch personnel, and 40 special duty sworn field members
- Total LAFD employees: 3,535 sworn and 428 civilian

All sworn LAFD personnel are trained to either the Emergency Medical Technician (EMT) level to provide Basic Life Support (BLS) pre-hospital emergency medical care or to the EMT-Paramedic (EMT-P) level to provide Advanced Life Support (ALS) pre-hospital emergency medical care.

Ambulance transportation is provided by the LAFD. When needed, air ambulance transport services are also provided by LAFD Air Operations.

Section 2

Standards of Coverage Introduction

SECTION 2—STANDARDS OF COVERAGE INTRODUCTION

2.1 STANDARDS OF COVERAGE REVIEW PROCESSES

The core methodology used by Citygate in the scope of its deployment analysis work is the *Community Risk Assessment: Standards of Cover* fifth and sixth editions, which is a systems-based approach to fire crew deployment as published by the CFAI. This approach uses local risk and demographics to determine the level of protection best fitting an agency's service area needs.

The SOC method evaluates deployment as part of the self-assessment process of a fire agency. This approach uses risk and community expectations on outcomes to help elected officials make informed decisions on fire and EMS first responder deployment levels. Citygate has adopted this methodology as a comprehensive tool to evaluate fire station locations. Depending on the needs of the assessment, the depth of the components may vary.

In the United States, there are no federal or state government requirements for a minimum level of fire services. The level of fire services is an issue for each community to consider and fund in protecting its risks as it chooses. Rather than a one-size-fits-all prescriptive formula, the SOC systems approach to deployment allows for local determination. In this comprehensive approach, each agency can match local needs (risks and expectations) with the costs of various levels of service. In an informed public policy debate, a governing board "purchases" the fire and emergency medical service levels the community needs and can afford.

While working with multiple components to conduct a deployment analysis is admittedly more work, it yields a much better result than using only a singular component. For instance, if only travel time is considered, and frequency of multiple calls is not considered, the analysis could miss overworked companies. If a risk assessment for deployment is not considered and deployment is based only on travel time, a community could under-deploy to incidents.

The SOC process consists of the following eight elements.

Table 1—Standards of Coverage Process Elements

Element	Meaning
Existing Deployment Policies	Reviewing the deployment goals the agency has in place today
Community Outcome Expectations	Reviewing the expectations of the community for response to emergencies
Community Risk Assessment	Reviewing the assets at risk in the community
Critical Task Study	Reviewing the tasks that must be performed and the personnel required to deliver the stated outcome expectation for the Effective Response Force (ERF)
Distribution Study	Reviewing the spacing of first-due resources (typically engines) to control routine emergencies
Concentration Study	Reviewing the spacing of fire stations so that building fires can receive sufficient resources in a timely manner (First-Alarm Assignment or ERF)
Reliability and Historical Response Effectiveness Studies	Using prior response statistics to determine the percent of compliance the existing system delivers
Overall Evaluation	Proposing Standards of Coverage statements by risk type as necessary

Fire services deployment, simply stated, is about the **speed** and **weight** of the response. **Speed** calls for first-due, all-risk intervention units (engines, ladder trucks, rescue ambulance and specialty units) strategically located across an agency's service area responding in an effective travel time. These units are tasked with controlling moderate emergencies without the incident escalating to second alarm or greater size, which would unnecessarily deplete the agency's resources as multiple requests for services occur. **Weight** is about multiple-unit response for serious emergencies, such as a room-and-contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy-rescue incident. In these situations, enough firefighters must be assembled within a reasonable period to safely control the emergency, thereby keeping it from escalating to greater alarms.

This deployment design paradigm is reiterated in the following table.

Table 2—Fire Services Deployment Simplified

Element of Attack	Meaning	Purpose
***Speed* of Attack**	Travel time of first-due, all-risk intervention units strategically located across a jurisdiction.	Controlling moderate emergencies without the incident escalating in size or complexity.
***Weight* of Attack**	Number of firefighters in a multiple-unit response for serious emergencies.	Assembling enough firefighters within a reasonable timeframe to safely control the emergency.

Thus, small fires and medical emergencies require a single- or two-unit response (engine and specialty unit) with a quick response time. Larger incidents require more crews. In either case, if the crews arrive too late or the total personnel sent to the emergency are too few for the emergency type, they are drawn into a losing and more dangerous battle. The science of fire crew deployment is to spread crews out across a community for quick response to keep emergencies small with positive outcomes without spreading the crews so far apart that they cannot amass together quickly enough to be effective in major emergencies.

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<u>Section 3</u>

Deployment Goals, Measures, and Risk Assessment


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SECTION 3—DEPLOYMENT GOALS, MEASURES, AND RISK ASSESSMENT

3.1 HOW DOES LAFD DELIVER EXISTING FIRE CREW DEPLOYMENT SERVICES?

3.1.1 Existing Response Time Policies and Goals – What Are LAFD's Goals?

> ***SOC ELEMENT 1 OF 8****
> **EXISTING DEPLOYMENT POLICIES**
> **Note: This is an overview of Element 1. The detail is provided in Section 3.2.*

Advisory best practices are for a City, County Fire Department or Fire District to adopt response time goals to drive the provision of fire services. Historically, where this was done, response time was cited, but not tied to an outcome goal. In the last 20 years, driven by the CFAI and NFPA, the goal statements have become more robust to include organization *by type of emergency*, with an outcome goal that suggests the staffing needed over a response time to deliver the desired service.

There are two typical methods to state a fire/EMS response goal policy—in the Safety Element of a city or county's Comprehensive General Plan for community zoning/development, and/or by fire departments publishing their goals as budget performance measures and in their Strategic Plan. The City uses both methods of stating and measuring fire and EMS services goal statements.

In the City's updated 2021 General Plan Safety Element:

Goal 2: Emergency Response states: *"A city that responds with the maximum feasible speed and efficiency to disaster events so as to minimize injury, loss of life, property damage and disruption of the social and economic life of the City and its immediate environs."*

Objective 2.1 states: *"Develop and implement comprehensive emergency response plans and programs that are integrated with each other and with the City's comprehensive hazard mitigation and recovery plans and programs."*

Policy 2.1.5 Response: Develop, implement, and continue to improve the City's ability to respond to emergency events. Participate in regularly scheduled disaster exercises to better prepare Police, Fire, Public Works, and other City employees with disaster responsibilities.

2.1.6 Standards/Fire: Continue to maintain, enforce, and upgrade requirements, procedures, and standards to facilitate more effective fire suppression and safety.

A. *Enforce peak water supply / fire flow requirements and ensure that new development is able to sufficiently source water, including in VHFHSZs.*

B. *Enforce minimum roadway widths and clearances for evacuation and fire suppression.*

C. *Maintain special fire-fighting units at the Port of Los Angeles, Los Angeles International Airport, and Van Nuys Municipal Airport capable of responding to special emergencies unique to the operations of those facilities.*

D. *Coordinate with CALFIRE, local fire agencies, fire safe councils, private landowners, and other responsible agencies to identify the best method(s) of fuel modification to reduce the severity of future wildfires, including Prescribed fire; Forest thinning; Grazing; Mechanical clearing; Hand clearing (piling, burning/chipping); Education; and Defensible space.*

E. *Maintain mutual aid or mutual assistance agreements with local fire departments to ensure an adequate response in the event of a major earthquake, wildfire, urban fire, fire in areas with substandard fire protection, or other fire emergencies.*

FireStatLA Section

In 2012, then Fire Chief Brian Cummings established a new administrative section to track LAFD performance measures—FireStatLA. The goal for the section was to provide "A leadership and management strategy designed to quantify and evaluate the performance of our fire and EMS units at the station, battalion, and Department level." LAFD was also one of the first departments to widely publish its incident volumes and response times on the web for transparency.

With the creation of FireStatLA, the Department chose to report actual incident counts and response times to major incident types. Los Angeles does not include any Departmental performance measures in its budget. In its strategic plan, the LAFD reviews performance by incident type but does not set forward a specific set of outcome goals. Within FireStatLA, the Department's measures and, just as importantly, measurement standards are:

- **LAFD Operational Response Time:** The time interval that begins when first contact is made (either through 9-1-1 or the fire dispatch center) and ends when the first Standard Unit arrives on-scene.
- **LAFD Call-Processing Time:** The time interval that begins when the call is created in computer-aided dispatch (CAD) by a Fire Dispatcher until the initial fire or EMS unit is dispatched.
- **Turnout Time:** The time interval between the activation of station alerting devices to when first responders have put on their PPE, are aboard apparatus, and are en-route (wheels rolling). Both station alarm and en-route times are required to measure this interval for each unit that responds. Turnout time is calculated for each unit dispatched to each incident.
- **Travel Time:** The time interval that begins when the first Standard Unit is en-route to the incident and ends upon arrival of any of the Standard Units first on scene.

This requires one valid en-route time and one valid on-scene time for the incident. Travel time can differ considerably amongst stations. Many factors, such as traffic, topography, road width, public events, and unspecified incident locations may impact travel time.

- **Incident Count:** The number of incidents that result in one or more LAFD units being dispatched, regardless of record qualification.
- **Qualified Data:** Only qualified data is used to calculate call-processing time, turnout time, and travel time. Qualified data meets the following criteria:
  - Data with negative values or values greater than 24 hours is removed if it involves computed time variables (call processing, turnout, and travel times).
  - Occasionally, multiple time stamps can occur due to multiple button presses. The time stamp recorded with the first button push will be used for the analysis.
  - Non-emergency responses are removed. Only emergency responses are included.
  - Airport and Port resources (Fire Stations 80, 110, 111, and 114) are excluded because they are not dispatched through the LAFD CAD system.
  - Turnout time measurement is restricted to QTR (in quarters) dispatch status.
  - The highest and lowest one percent of computed time values (operational response time, call-processing time, turnout time, and travel time) are removed or "trimmed" from the available data each month. This is done to protect the calculated value from the influence of outliers.
- **ALS Critical Incidents:** This incident type includes all Advanced Life Support (ALS) incidents that are marked for immediate dispatch. This includes most types of critical incidents.
- **Structure Fire Incidents:** This incident type indicates that a building or structure is reported to be actively burning. This category is calculated on a quarterly basis due to frequency of occurrence.

FireStatLA measures and reports average response times and incident counts for the categories of:

- EMS
- Non-EMS

- Critical ALS (Paramedic)
- Structure Fire

FireStatLA uses the "average" measure as it is a more common measure of the middle of a dispersed data set from low to high. As such, an *average* represents the bulk of the transactions. As technical authorities for internal fire service planning, the CFAI and the NFPA, in contrast, have adopted *fractile* (percentile, or percent of goal) measures, as they allow an understanding of the distribution curve for a type of data in the event of there being many responses significantly exceeding the average. Both response time measures do not tell the entire deployment story; they are two useful, *different* views of time. Other measures in an SOC analysis provide even more "camera angles" related to assessing performance. In this study, Citygate will use multiple measures to provide a robust understanding of what and where improvements to deployment are indicated.

LAFD has a long history of striving to provide a level of service that is evidenced in the number and types of fire companies and minimum daily staffing. Thus, even without explicit, outcome-driven response time goals, LAFD has requested funding for a level of service to meet the City's needs as they relate to risks to be protected.

Finding #1: LAFD is a leader in response time reporting with its FireStatLA section, measuring from 9-1-1 answer to first-unit arrival.

This report can assist the LAFD in adding outcome-driven response time goals, should it so choose. Nationally recognized standards and best practices call for a response timeline with several important measurements, including a definition of all aspects of response time—*which the LAFD FireStatLA program already does*. In this SOC assessment, Citygate uses response time goals to include dispatch process time, crew turnout time, and travel time which together equal a total response time to all risks, including fire, EMS, hazardous materials, and technical rescue responses. The goals are consistent with the CFAI and NFPA systems approach to response.

Per the current NFPA Standard 1221 for dispatching, 9-1-1 emergency calls without language barriers to the most acute calls should be dispatched in 60 seconds, 90 percent of the time. Prior versions of this best practice were 90 seconds, absent language barriers. As for crew turnout time, for years, the NFPA and CFAI have believed (without extensive research) that turnout could take 60 to 90 seconds. In Citygate's experience with hundreds of fire services clients over the past 20 years, it is exceedingly difficult to don the protective clothing mandated by the Occupational Safety and Health Administration (OSHA), be seated, and have a seat belt secured in less than 2:00 minutes, 90 percent of the time. These times are also challenged by some station designs and the differences between waking and sleeping hours.

As for travel time, since the NFPA first published its recommended Standard 1710 for career fire services deployment, the travel time goal in urban areas has been 4:00 minutes. However, this was part of an overall response time measure. The 4:00-minute travel time was "believed possible" across a traditional-grid, right-angle road network. There was no empirical research on differing road network designs or topography. In Citygate's experience, few clients can deploy to meet a 4:00-minute travel time outside of urban core downtown areas *with a grid street network and adequate fire station spacing*.

3.1.2 Existing Outcome Expectations

SOC ELEMENT 2 OF 8
COMMUNITY OUTCOME EXPECTATIONS

The SOC process begins by reviewing existing emergency services outcome expectations. This entails determining the purpose for which the response system exists to provide the fire and EMS services funded.

Within the SOC process, positive outcomes are the goal, and from that goal, crew size and response time can be calculated to allow efficient fire station spacing (distribution and concentration). Emergency medical incidents have the most severe time constraints. The brain can only survive between 4:00 and 8:00 minutes without oxygen. Heart attacks, other trauma events that cause severe blood loss, or a respiratory emergency can all cause oxygen deprivation to the brain; drowning, choking, trauma constrictions, or other similar events have the same effect. In a building fire, a small incipient fire can grow to involve the entire room in 8:00 to 10:00 minutes. If fire services response is to achieve positive outcomes in severe emergency medical situations and incipient fire situations, *all* responding crews must arrive, assess the situation, and deploy effective measures before brain death occurs or a fire leaves the room of origin.

Thus, from the time of 9-1-1 receiving the call, an effective deployment system is *beginning* to manage the problem within a 7:00- to 8:00-minute total response time. This is right at the point that brain death is becoming irreversible, or a fire has grown to the point of leaving the room of origin and becoming very serious. Thus, LAFD needs a first-due response goal that is within a range that can give hope for a positive outcome. It is important to note that the fire or medical emergency continues to deteriorate from the time of inception, not the time the fire engine starts to be driven on the response route. Ideally, the emergency is noticed immediately, and the 9-1-1 system is activated promptly. This step of awareness—calling 9-1-1 and giving the dispatcher accurate information—takes, in the best of circumstances, 1:30 minutes. Crew notification and travel time then take additional minutes. Once arrived, the crew must walk to the patient or emergency, assess the situation, and deploy its skills and tools. Even in easy-to-access situations, this step can take 2:00 minutes or more. This timeframe may be increased considerably due to long driveways, apartment buildings with limited access, multiple-story apartments or office complexes, or shopping center buildings such as those found in parts of Los Angeles.

Unfortunately, there are times the emergency becomes too severe, even before 9-1-1 notification or LAFD response, for the responding crew to reverse; however, when an appropriate response time policy is combined with a well-designed system, only issues like bad weather, poor traffic conditions, or multiple emergencies will slow the response system down. Consequently, a properly designed system will give 9-1-1 callers the hope of a positive outcome for their tax-dollar expenditure.

For this report, total response time is the sum of the dispatch processing, crew turnout, and road travel time steps. This is consistent with the recommendations of the CFAI.

3.2 Risk Assessment

SOC Element 3 of 8
Community Risk Assessment

The third element of the SOC process is a community risk assessment. This section summarizes a very detailed Risk Assessment contained in **Volume 3** of this study.

Within the context of an SOC review, the objectives of a community risk assessment are to:

- Identify the values at risk to be protected within the community or service area.
- Identify the specific hazards with the potential to adversely impact the community or service area.
- Quantify the overall risk associated with each hazard.
- Establish a foundation for current/future deployment decisions and risk-reduction / hazard mitigation planning and evaluation.

A *hazard* is broadly defined as a situation or condition that can cause or contribute to harm. Examples include fire, medical emergency, vehicle collision, earthquake, flood, etc. *Risk* is broadly defined as the *probability of hazard occurrence* in combination with the *likely severity of resultant impacts* to people, property, and the community.

3.2.1 Values to Be Protected

Broadly defined, *values at risk* are those tangibles of significant importance or value to the community or jurisdiction potentially at risk of harm or damage from a hazard occurrence. Values at risk typically include people, critical facilities/infrastructure, buildings, and key economic, cultural, historic, and natural resources.

3.2.2 Overview of Values at Risk and Hazards in LAFD's Service Area

Citygate's evaluation of the values at risk and hazards likely to impact LAFD's service area yields the following conclusions.

People

Residents, employees, visitors, and travelers in a community or jurisdiction are vulnerable to harm from a hazard occurrence. Particularly vulnerable are specific at-risk populations, including those unable to care for themselves or self-evacuate in the event of an emergency. At-risk populations typically include children younger than 10 years of age, the elderly, people housed in institutional settings, households below the federal poverty level, and people living unsheltered. The following table summarizes key demographic data for the City.

Table 3—Key Demographic Data – City of Los Angeles

Demographic	2022
Population	**3,903,648**
Under 10 years	11.80%
10 – 14 years	5.90%
15 – 64 years	68.60%
65 – 74 years	7.90%
75 years and older	5.90%
Median age	35.8
Daytime population	3,948,032
Housing Units	**1,513,840**
Owner-Occupied	34.80%
Renter-Occupied	58.90%
Vacant	6.30%
Median Household Size	2.67
Median Home Value	$736,691
Race/Ethnicity	
White Only	34.10%
Black / African American Only	8.50%
Asian Only	12.30%
Other / Two or More Races	45.10%
Hispanic/Latino Origin	47.00%
Diversity Index	87.7
Education (population over 24 yrs. of age)	**2,663,659**
High School Graduate	81.00%
Undergraduate Degree	39.20%
Graduate/Professional Degree	13.10%
Employment (population over 15 yrs. of age)	**2,072,308**
In Labor Force	92.90%
Unemployed	7.10%
Median Household Income	$75,564
Population Below Poverty Level	16.90%
Population without Health Insurance Coverage	12.10%

Source: Esri Community Analyst (2022) and U.S. Census Bureau

Of note from the previous table is the following:

- Nearly 26 percent of the population is under 10 years or over 65 years of age.
- The City's population is predominantly Other / Two or More Races (45 percent), followed by White (34 percent), Asian (12 percent), and Black / African American (9 percent). In addition, 47 percent of the population is Hispanic/Latino in origin.
- Of the population over 24 years of age, 81 percent has completed high school or equivalency.
- Of the population over 24 years of age, slightly more than 39 percent has an undergraduate, graduate, or professional degree.
- Of the population 15 years of age or older, nearly 93 percent is in the workforce; of those, 7 percent are unemployed.
- Median household income is slightly more than $75,500.
- The population below the federal poverty level is nearly 17 percent.
- Slightly more than 12 percent of the population does not have health insurance coverage.

Projected Growth

The Southern California Association of Governments (SCAG) projects the City's population will grow by 18 percent over the next 18 years to 2040.[1]

Buildings

The City has more than 1.1 million buildings[2] with an assessed valuation of more than $774 billion to protect, including more than 1.5 million residential housing units[3] and approximately 200,000 businesses.[4]

Critical Infrastructure / Key Resources

The U.S. Department of Homeland Security defines critical infrastructure / key resources as those physical assets essential to the public health and safety, economic vitality, and resilience of a community, such as lifeline utilities infrastructure, telecommunications infrastructure, essential government services facilities, public safety facilities, schools, hospitals, airports, etc. The City has identified 3,023 critical facilities and infrastructure in its 2018 Local Hazard Mitigation Plan.

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[1] Source: College Station Project, Draft Environmental Impact Report, March 2018, Table 4.8-1.
[2] Source: Los Angeles Fire Department Planning Section.
[3] Source: Esri Community Analyst – Community Profile (2022).
[4] Source: Esri Community Analyst – Business Summary (2022).

A hazard occurrence with significant consequence severity affecting one or more of these facilities would likely adversely impact critical public or community services.

Economic Resources

With the sixteenth largest economy worldwide and regarded as the entertainment capital of the world, the City of Los Angeles economy is led by the education/healthcare/social services industry (22 percent), followed by the professional/scientific/management/administrative industry (15 percent), arts/entertainment/recreation industry (13 percent), public administration (3 percent), and other industries (47 percent).[5] The City's Adopted Budget for Fiscal Year 2022/23 is $11.76 billion, with a total assessed valuation of $723.6 billion.[6]

Natural Resources

Key natural resources within the City of Los Angeles include:

- Pacific Ocean/Los Angeles Harbor
- Los Angeles River
- Griffith Park
- Santa Monica Mountains National Recreation Area

Cultural/Historic Resources

As a vibrant, multicultural city, Los Angeles boasts a large inventory of cultural and historic resources, including:

- Natural History Museum
- Walt Disney Concert Hall
- Los Angeles County Museum of Art
- The Underground Museum
- The Museum of Jurassic Technology
- Museum of Tolerance
- Getty Art Museum
- Discovery Cube

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[5] Source: City of Los Angeles 2018 Local Hazard Mitigation Plan, Figure 4-20.
[6] Source: County of Los Angeles Auditor-Controller's Office website.

- The Banning Museum

Special/Unique Resources

The following facilities are special or unique resources to be protected:

- Los Angeles International Airport
- Multiple internationally known universities, colleges, and their sports venues
- Occidental College
- Dodger Stadium
- Griffith Observatory
- Crypto.com Arena

3.2.3 Hazard Identification

Citygate utilized prior risk studies where available, fire and non-fire hazards as identified by the CFAI, and agency- and jurisdiction-specific data and information to identify the hazards to be evaluated for this study. The 2018 City of Los Angeles Local Hazard Mitigation Plan identifies the following ten hazards of concern:

1. Adverse weather
2. Climate change / sea-level rise
3. Dam failure
4. Drought
5. Earthquake
6. Flood
7. Landslide
8. Tsunami
9. Wildland/Urban Interface (WUI) fire
10. Human-caused hazards

LAFD provides some hazard mitigation services, such as fire prevention, code enforcement, and wildland fuel reduction programs. In addition, it must provide response services related to multiple hazards, including fire suppression, emergency medical services, technical rescue, and hazardous materials response.

3.2.4 Risk Assessment Summary

Citygate's evaluation of the values at risk and hazards likely to impact the City of Los Angeles yields the following:

- LAFD serves a very diverse urban population with densities ranging from less than 5,000 to more than 40,000 people per square mile over a widely varied urban land-use pattern.
- The City's population is projected to grow by 18 percent over the next 18 years to 2040.
- The City has a large inventory of residential and non-residential buildings to protect.
- The City has significant economic and other resource values to be protected, as identified in this assessment.
- The City has multiple mass emergency notification options available to effectively communicate emergency information to the public in a timely manner.
- The City's risk for five hazards related to emergency services provided by LAFD range from **Low** to **Extreme**, as summarized in the following table. Risk ratings consider the probability of occurrence, probable consequence severity, and impact on LAFD's ability to maintain sufficient response capacity.

Table 4—Overall Risk by Incident Type

Hazard	Sub-Hazard	Risk Rating
Building Fire	Outbuilding/ADU	***Moderate***
	Single-Family Residence	***High***
	Multi-Family Residence	***High***
	Light Commercial	***High***
	Heavy Commercial / Industrial	***High***
Vegetation/Wildland Fire	Grass/Brush (Non-Hazard Areas)	***Low***
	Grass/Brush (Moderate-Hazard Areas)	***Moderate***
	Grass/Brush (High/Very High-Hazard Areas)	***High***
	WUI (> 25 acres)	***Extreme***
Medical Emergency	BLS only	***Moderate***
	BLS/ALS	***High***
	ALS	***High***
	Mass Casualty Incident	***High***
	Weapon of Mass Destruction	***Extreme***
Hazardous Materials	Alarm/Odor Investigation	***Low***
	HazMat Level 1	***Moderate***
	HazMat Level 2 Biological/Chemical Threat Natural Gas Leak	***High***
	HazMat Level 3 Biological/Chemical Release Railroad Incident	***High***
	Explosion / WMD	***Extreme***
Technical Rescue	Elevator Rescue	***Low***
	Trauma / Pin-In / Potential Jumper Rope Rescue	***Moderate***
	Confined Space / Trench Rescue	***Moderate***
	Building Collapse / Natural Disaster	***Extreme***

3.3 CURRENT LAFD DEPLOYMENT

3.3.1 Existing Deployment Situation – What LAFD Currently Has in Place

SOC ELEMENT 1 OF 8*
EXISTING DEPLOYMENT POLICIES
**Note: Continued from Section 3.1.*

As the Department has not adopted specific fire and EMS response time goals, this assessment will benchmark LAFD against the fractile response time recommendations of NFPA 1710 for career fire services deployment, as well as LAFD's internally reported results as averages.

The NFPA 1710 goals are:

- Travel time of 4:00 minutes for the first-due unit to 90 percent of all types of fire and EMS *emergencies* (thus not including other and non-emergent incidents).
- Travel time of 8:00 minutes for multiple units needed to 90 percent of *serious emergencies* (First Alarm).

LAFD's current daily staffing plan is summarized in the following table.

Table 5—LAFD Current Daily Minimum Staffing per Unit

Primary Units	Minimum Staffing Per Unit	Extended Minimum
98 Engine Companies	4	392
42 Aerial Ladder Truck/Light Force companies	6	252
1 Aerial Ladder Company (Single Piece)	5	5
93 Paramedic Ambulance	2	186
43 Basic Life Support Ambulances	2	86
7 EMS Supervision Units	1	7
Technical Response Companies (HazMat, USAR, ARFF)	Varies by Company	31
Other Response Companies (Fire Boats, Helicopters)	Varies by Resource	32
14 Battalion Command Teams and 2 Bureau Command Teams	2	32
Total Typical 24/7/365 Fire/EMS Operations Staffing		**1,023**

These daily personnel "cross-staff" specialty response units such as:

- 15 Brush patrols
- 5 Urban Search and Rescue (USAR) companies
- 2 Aircraft firefighting apparatus

- 5 Bulldozer/loaders
- 3 Hazardous Materials companies
- 4 Swift Water Rescue teams
- 4 Firefighting foam tenders

This total daily staffing is adequate for the immediate response needs presented in the most built-up, urban areas of LAFD—without the mandatory use of automatic aid forces from a neighboring agency to staff typical daily incident types.

Services Provided

LAFD provides an all-risk response, providing the public with services that include structure, wildland, and marine fires, BLS and ALS first responder EMS, ALS and BLS ambulances for patient transport, technical rescue, and hazardous materials response, as well as other services.

Given these risks, the City's Metropolitan Fire Communications (MFC, or dispatch) uses a tiered approach of dispatching different types of apparatus to each incident category. MFC selects the closest and most appropriate resource type for each incident. As an example, the following table shows the resources dispatched to common risk types.

Table 6—Resources Dispatched to Common Risk Types

Risk Type	Minimum Number and Type of Resources Sent	Initial LAFD Personnel Sent
One-Patient EMS	One Engine or Light Force and Rescue Ambulance	6
Auto Fire	One Engine	4
Category A Small Building/Residential Fire	Three Engines, One Light Force, One Paramedic Rescue Ambulance, One Basic Rescue Ambulance, and One Battalion Command Team	24
Category B Commercial Building Fire	Four Engines, Two Light Forces, One Paramedic Rescue Ambulance, One Basic Rescue Ambulance, One EMS Captain, and One Battalion Command Team	35
Category C Special, such as Technical Rescue and Hazardous Materials or aircraft or harbor	Minimum of three Engines, one Light Force	18

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Section 4

Staffing and Geo-Mapping Analysis

SECTION 4—STAFFING AND GEO-MAPPING ANALYSIS

4.1 CRITICAL TASK TIME MEASURES – WHAT MUST BE DONE OVER WHAT TIME FRAME TO ACHIEVE THE STATED OUTCOME EXPECTATION?

SOC ELEMENT 4 OF 8
CRITICAL TASK TIME STUDY

SOC studies use task time information to determine the number of firefighters needed within a timeframe to accomplish the desired fire control objective on moderate residential fires and modest emergency medical incidents.

4.1.1 Firefighting Critical Tasks

LAFD's Effective Response Force (ERF, or First Alarm Assignment) to initial reports of a residential structure (dispatch Category A) fire in urban areas includes three engines, one Light Force ladder truck, one Battalion Command Team, one Paramedic Rescue Ambulance, one BLS Ambulance, for an ERF total of **24** personnel.

The following table shows what a force of 24 can accomplish. The larger the force (weight of attack), the faster the tasks are completed.

Scenario: *The following is a simulated one-story residential working structure fire with no rescue situation. Responding companies received dispatch information as typical for a witnessed fire.*

Upon arrival, they were told approximately 1,000 square feet of the home was involved in fire.

Table 7—First Alarm Category A Structure Fire – 24 Personnel

Company Level Tasks
First Arriving Engine and Light Force
1. Lay in a hydrant supply line
2. Stretch the 200-foot, 1 ¾-inch hose line to the point of access for fire attack
3. Operate the pump to supply water and attach hydrant supply line.
4. Assume command of initial operations.
5. Conduct primary search and rescue.
6. Ventilation and salvage of the structure and contents
Second Arriving Engine
1. If necessary, lay in a second hydrant supply line.
2. Stretch a second 200-foot hose line as a back-up line and for fire attack.
3. Establish two-in / two-out safety team.
Third Arriving Engine
1. Staff the Rapid Intervention Crew.
2. Secondary rescue search if needed.
Rescue Ambulances
1. Assist with forcible access/egress as needed. Patient care as needed.
2. Secure utilities.
3. Remove any obstructions or debris that would hinder fire ground operations.
Battalion Command Team
1. Establish exterior command and scene safety.

Grouped together, these duties form an ERF or First Alarm Assignment. These tasks must be performed simultaneously and effectively to achieve the desired outcome; arriving on-scene does not stop the escalation of the emergency. While firefighters accomplish these tasks, the incident progression clock keeps running.

Fire spread in a structure can double in size during its *free-burn* period before firefighting starts. Many studies have shown that a small fire can spread to engulf an entire room in fewer than 6:00 to 8:00 minutes after free burning has started. Once the room is completely superheated and involved in fire (known as flashover), the fire will spread quickly throughout the structure and into the attic and walls. For this reason, it is imperative that fire attack and search commence before the flashover point occurs if the outcome goal is to keep fire damage in or near the room of origin. In addition, flashover presents a danger to both firefighters and any occupants of the building.

4.1.2 EMS Critical Tasks

LAFD responded to approximately 392,949 EMS incidents in 2020. These incidents included car accidents, childbirths, strokes, heart attacks, difficulty breathing, falls, and many other medical emergencies.

Some EMS calls require treatment for more than one patient. These calls include vehicle accidents, chemical exposures, construction or industrial accidents, and any other event that occurs with several people in proximity. Patient conditions can range from minor cuts and bruises to life-threatening injuries.

MFC dispatchers are responsible for screening calls to establish the correct initial response. The first fire officer on the scene can amend the response once conditions have been assessed. Standard operating procedures are used to request adequate personnel and resources.

The following critical task table reviews the tasks required on a critical response to a single illustrative cardiac arrest incident.

Table 8—Cardiac Arrest – Engine Crew (Four Personnel) and Ambulance (Two ALS or BLS Personnel)

Task	Personnel Required	Type of Treatment Administered
Compressions	1–2	Compression of chest to circulate blood
Ventilate/oxygenate	1–2	Bag-valve-mask, apply O_2
Airway control	1–2	Manual techniques/intubation/cricothyrotomy
Defibrillate	1–2	Electrical defibrillation of dysrhythmia
Establish I.V.	1–2	Peripheral or central intravenous access
Interpret ECG	2	Identify type and treat dysrhythmia
Administer drugs	1	Administer appropriate pharmacological agents
Patient charting	1–2	Record vitals, treatments administered, etc.
Hospital communication	1–2	Receive treatment orders from physician
Scene management	1	Safety, security, and communications
Quality assurance	1	Medical Service Officer oversight
Treat en route	2–3	Continue to treat/monitor/transport patient
Total	**6**	

4.1.3 Critical Task Analysis and Effective Response Force Size

What does a deployment assessment derive from a critical task analysis? The total task needs (as displayed in Table 7 and Table 8) to stop the escalation of an emergency must be compared to outcomes. When flashover occurs after approximately 6:00 to 8:00 minutes of free burning, the entire room is engulfed, the structure becomes threatened, and human survival near or in the fire room becomes impossible. Additionally, brain death begins to occur within 6:00 to 8:00 minutes of the heart having stopped. Thus, the ERF must arrive in time to stop these catastrophic events from worsening.

LAFD, given its size, is staffed with enough firefighters to deliver multiple ERFs of 24 firefighters, each without the use of automatic aid, to a building fire. Mitigating an emergency event is a team effort once units have arrived. This refers to the "weight" of response analogy: if too few personnel arrive too slowly, the emergency will worsen instead of improving. The outcome times will be longer with less desirable results if the arriving force is later or smaller.

The quantity of staffing and the arrival timeframe can be critical in a serious fire. Fires in older and/or multiple-story buildings could well require the initial firefighters needing to rescue trapped or immobile occupants. If a lightly staffed force arrives, it cannot simultaneously conduct rescue and firefighting operations.

Fires and complex medical incidents require that the other units arrive in time to complete an effective intervention. Time is one factor that comes from *proper station placement*. Good performance also comes from *adequate staffing* and *training*. In the critical tasks identified previously, LAFD can perform well in terms of staffing. However, in situations where fire stations are spaced too far apart, such as when one unit must cover another unit's area, or multiple units are needed, these units can be too far away.

Previous critical task studies conducted by Citygate, the National Institute of Standards and Technology (NIST), and NFPA Standard 1710 find that all units must arrive with 17 or more firefighters within 11:30 minutes from the time of call at a residential room-and-contents structure fire to be able to perform the tasks of rescue, fire attack, and ventilation *simultaneously and effectively*.[7]

If fewer firefighters arrive, the search team will most likely be delayed, as will ventilation efforts. The attack lines will only consist of two firefighters, which does not allow for rapid movement above the first-floor deployment. Rescue is conducted with only two-person teams; thus, when rescue is essential, other tasks are not completed in a simultaneous, timely manner. Effective

[7] NIST Technical Note 1661, Report on Residential Fireground Field Experiments (April 2010).

deployment is about the **speed** (travel time) and the **weight** (firefighters, medics, appropriate apparatus, etc.) of response.

Twenty-eight initial firefighters can manage a moderate-risk, confined house fire; however, even an ERF of 24 will be seriously slowed by a fire that is above the first floor in a low-rise apartment building, or in a commercial/industrial building. This is where the capability to add units to the standard response (as LAFD does) becomes important.

The fact that LAFD's First Alarm plan (ERF) delivers 24 personnel to a moderate-risk building fire reflects LAFD's goal to confine serious building fires to or near the room of origin. This is a typical desired outcome in built-out areas and requires more firefighters more quickly than the typical rural outcome goal of keeping a fire contained to the parcel of origin.

LAFD's current physical response to building fires is, in effect, LAFD's de facto deployment measure to built-up urban/suburban areas. Thus, this becomes the baseline policy for the deployment of firefighters.

4.2 Distribution and Concentration Studies – How the Location of First-Due and First-Alarm Resources Affects the Outcome

SOC Element 5 of 8
Distribution Study

SOC Element 6 of 8
Concentration Study

LAFD is currently served by 106 fire stations fielding engine companies, ladder truck companies, specialty units, and Chief Officers for incident command. It is appropriate to understand what the existing stations do and do not cover, if there are any coverage gaps needing additional stations, and what, if anything, to do about them.

In brief, there are two geographic perspectives to fire station deployment:

- Distribution – the spacing of first-due fire units to manage routine emergencies.
- Concentration – the clustering of fire stations in proximity of each other so that building fires can receive sufficient resources from multiple fire stations quickly. This is known as the ERF or, more commonly, the First Alarm Assignment.

To analyze first-due fire unit travel time coverage, Citygate used a geographic mapping tool to measure theoretical travel time over the City's street network. For this calculation, Citygate used the base map and street travel speeds calibrated to actual fire company travel times from previous responses to simulate real-world coverage. A second model was built that uses traffic congestion data to slow the fire unit responses at peak traffic periods. Using these tools, Citygate ran several deployment tests and measured impacts on various parts of LAFD's service area. The first-due unit *travel* time measure initially used was 4:00 minutes and 8:00 minutes for multiple units over the road network, which is consistent with the benchmark recommendation in NFPA 1710 and desirable outcomes in critical emergencies.

In all the geographic information system (GIS) models described, care was taken to add into the model as many of the newest streets as possible. The following described maps can be found in **Volume 2—Map Atlas**. Due to the City's size, the maps measure response time coverage in three views—North, Central, and South. There is some overlap between views to help maintain orientation. Some map series' also feature a letter designation—a, b, c, or d—to differentiate between the types of coverage shown—such as uncongested, congested, or a scenario (i.e., showing both uncongested and congested).

- Each map series with an "a" designation (e.g., Map #3a) shows uncongested coverage in green street segments.
- Each map series with a "b" designation shows traffic-congested coverage in a dark color above the non-congested green street segments.
- Each map series with a "c" designation shows paramedic Rescue Ambulance coverage.
- Map series "d" shows EMT (BLS) ambulance coverage.

This is further clarified in the description of each map series in the following section, with a clear discussion of what the sub views each show.

4.2.1 Base Maps – Existing Coverage

Due to LAFD's extensive service area, each map "series" is presented by "Central," "North," and "South" designations for greater fidelity in representing detailed coverage in the City.

Map Series #1 – General Geography and Station Locations

Map Series #1 shows the existing fire station locations in the City and, by differing colors, each Battalion area. These are reference maps for the other maps that follow.

Map #2 – Risk Planning Zones

Map #2 shows the current 14 Battalion areas for risk assessment planning and quantification by differing colors for each Battalion area. This is also a Citywide reference and orientation map for other maps that follow.

Map #2a – Population Density

This map shows current population densities in the City by Battalion risk planning areas. Zoning across the City's diverse communities allows for differing population clusters. For EMS events in particular, population drives 9-1-1 requests for medical assistance. It is important to understand where the highest density resident population areas are in relation to the actual incident demand to be mapped later in this series. [This map does not describe the mobile populations of traffic, employment, and tourism as accounting for those populations by geographic area is very difficult given variabilities over the course of a year.]

What should be noted are the population densities in Battalion 11 in the downtown core. In Citygate's experience, the areas with more than 40,000 people per square mile are the highest in the western United States and in just one mile there are more people than many smaller suburban cities spread out over many square miles. This high population density is what is driving the high EMS incident demands on the LAFD.

Map Series #2 Bat. 1–18 – Battalion Level Risk Maps

Map Series #2 Bat. shows the risks assessed in each Battalion planning area. Note: At present, there are only 14 battalions. Some numbers were reserved for creation of a future Battalion. Hazard occurrences are identified in the risk assessment at a local level to understand where significant risks occur that—in the event of an emergency—the resultant loss will impact individuals, the public, or community services and local economics.

Map Series #3a – First-Due Unit Distribution: 4:00-Minute Engine Travel

Using green street segments, Map Series #3a shows the *distribution* of fire stations per a response goal of a 4:00-minute best practice *travel* time recommendation. Therefore, green indicates the locations an engine could reach within this time *assuming* it is in its station and encounters no unusual traffic delays. The computer mapping tool uses prior fire company speeds by roadway type. Thus, the green projection is realistic for engines within normal traffic conditions.

Given the design of the road network, topographical barriers, and the current fire station locations, there are very few gaps in coverage of the public streets when applying a 4:00-minute travel time goal in the central and southern areas. However, in the north area, there are several—both small and more significant gaps. These will be studied further after the baseline maps are reviewed.

Map Series #3b – First-Due Unit Distribution: 4:00-Minute Engine Travel – Traffic Congestion Combined

Map Series #3b uses red to represent the reduced travel time coverage at peak traffic congestion during morning/evening hours, which is overlaid on the green uncongested coverage. Severe traffic congestion can hamper travel time even with traffic signal preemption technology. The impact is the largest in the more travelled major road and commercial corridors but does have an impact in all areas of the City. Larger impacts are seen in the northern and west central areas where the fire stations are farther apart.

The purpose of this geographic mapping is to determine response time coverage across a community's geography to balance station locations. This geographic mapping design is then checked against actual dispatch time data, which reflects real response times. There should be some overlap between station areas so that a second-due unit has a chance of an adequate response time when it covers a call in another station's first-due area.

As Section 5 will detail, the *travel* time to 90 percent of core fire and EMS incidents is 7:00 minutes Department-wide in reporting year (RY) 2020. This is supported by the GIS model that shows that 4:00 minutes for travel does not fully cover the road network, more so during periods of traffic congestion.

Map Series #3c – ALS (Paramedic) Rescue Ambulance Coverage

Map Series #3c measures the coverage for Paramedic RAs at a travel time of 6:00 minutes, which when added to dispatch and turnout time, delivers Paramedic-level transport in less than 10:00 minutes. 6:00-minute coverage is very good Citywide, with only small gaps apparent in the northern and southern areas.

Map Series #3d – BLS (EMT) Rescue Ambulance Coverage

Map Series #3d measures the coverage for BLS RAs at a travel time of 6:00 minutes, which when added to dispatch and turnout time, delivers BLS-level transport in less than 10:00 minutes. There are larger gaps in the BLS RA coverage in the northern and southern areas of the City, where there are not as many deployed due to incident demand and the placement of the Paramedic RAs in areas at the edge of the City.

Map Series #4 – ISO 1.5-Mile Travel Coverage Areas

This map set displays the Insurance Services Office (ISO) requirement that stations cover a 1.5-mile *distance* response area. Depending on the road network in an agency, the 1.5-mile measure usually equates with a 3:30- to 4:00-minute travel time. However, a 1.5-mile measure is a reasonable indicator of station spacing and overlap. As the map series shows, the more conservative ISO coverage does not cover all public road miles and, outside of the most central urban areas, has many of the same gaps as the 4:00-minute travel time model.

Map Series #5a – Citywide Residential Building Fire: Category A ERF – 8:00-Minute Travel Concentration

The most common multiple-unit ERF needed in any urban area is for a residential or small commercial building fire. The LAFD response to these fires is three Engines, one Light Force, one Paramedic Rescue Ambulance, and one basic rescue ambulance, and one Battalion Command Team totaling 24 personnel.

Map Series #5a shows the *concentration*, or massing, of Category A fire crews for serious fire or rescue calls. Building fires require 17 or more firefighters to a house fire, or 28 personnel to a smaller commercial building fire (per NFPA 1710).[8] arriving within a reasonable timeframe to work together and effectively stop the escalation of an emergency. Otherwise, if too few firefighters arrive, or if they arrive too late in the fire's progress, the result is a greater-alarm fire, which is more dangerous to the public and the firefighters.

The concentration maps display LAFD's ability to initially send its Category A within an 8:00-minute travel time (11:30 minutes from 9-1-1 dispatch receipt). This measure ensures that a *minimum* of 24 personnel can arrive on-scene to work *simultaneously* and effectively to begin to stop the spread of a serious building fire.

This map set shows in green where LAFD's current fire station system <u>should</u> deliver the Category A force. Given an 8:00-minute travel time measure, the coverage is all but complete except for small pockets in the northern and southern areas.

Map Series #5b – Citywide Residential Building Fire: Category A ERF – 8:00-Minute Travel Concentration – <u>Traffic Congestion Impacts</u>

This map set shows the Category A coverage impacted by traffic congestion. In a multiple-unit response, the coverage measure cannot be met until the last-due unit arrives on-scene. It is much more challenging to get all needed units on-scene when some must travel against congestion the entire travel route.

As the map set shows, traffic congestion impacts Category A coverage in all areas of the City, with a smaller impact in the central, core areas where station coverage spacing is tighter due to historic demand for service.

Map Series #5c – Citywide Residential Building Fire: Category B ERF – 8:00-Minute Travel Concentration

For more serious fires in larger buildings, the LAFD response is called a Category B level as it adds units to provide more firefighters immediately. The Category B force is four Engines, two Light Forces, one Paramedic Rescue Ambulance, one basic rescue ambulance, one EMS Captain, and one Battalion Command Team totaling 35 personnel.

As with Category A, this coverage is very good in the central area of the City. However, the added units do mean that gaps in the north and south are larger as there are too many units in 8:00-minutes' travel time to the edges of the south service area. As for the north, the fire stations in much of the northern area, along the mountains and to either side of the I-5, are too far apart.

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[8] NFPA 1710, 2020 Edition, Section 5.2.4.1.1.

Map Series #5d – Citywide Residential Building Fire: Category B ERF – 8:00-Minute Travel Concentration – Traffic Congestion Impacts

This map set shows the Category A coverage impacted by traffic congestion. Given more units to cover the distance, the impact of congestion increases even more in all three areas. However, the Category B coverage is good where it must be—in the most populated core areas.

Map Series #6a – Ladder Truck Coverage (Light Forces): Category A ERF – 8:00-Minute Travel Concentration

A valuable part of the multi-unit ERF is the aerial ladder truck which, in the LAFD, is a two-apparatus team of an aerial Ladder and a pumping Engine, together staffed by one crew. As this uncongested coverage shows, there are enough Ladder units to cover the entire City in almost all areas.

Map Series #6b – Ladder Truck Coverage (Light Forces): Category A ERF – 8:00-Minute Travel – Traffic Congestion Impacts

The spacing of the Light Forces is so good that even under traffic congestion, they can cover all but a few small pockets of the City within a travel time of 8:00 minutes, and two of those pockets are in northern area, not the most populated central area.

Map Series #6c – Citywide Residential Building Fire: Category B ERF – 8:00-Minute Travel – Normal and Combined with Traffic Congestion Impacts

The Category B response adds a second Light Force Ladder team; thus, these maps show the normal and congested coverage for two Light Force Ladder teams. As would be expected by adding a second Light Force, the uncongested coverage is reduced in all three areas, but this reduction is less in the central area of the City. However, under traffic congestion, there are significant reductions everywhere except the most densely populated areas.

Map Series #7a – One Battalion Command Team: 8:00-Minute Travel

This map set shows ERF coverage for one Battalion Command Team on either a Category A or B response. The uncongested coverage is all but complete Citywide. The two small, underserved areas are the southern tip of San Pedro and the northern area near Station 100 up to Station 114.

Map Series #7b – One Battalion Command Team: 8:00-Minute Travel – Traffic Congestion Impacts

The single Battalion Command Team coverage under traffic congestion is reduced in all areas to the sections around Battalion headquarters. The impact is the most severe in the center of the northern area of the City.

Map Series #7c – One Emergency Medical Supervisor: 8:00-Minute Travel – Normal and Combined with Traffic Congestion Impacts

There are not as many of these specialty supervisor units as there are Battalion Command Teams. As such, 8:00-minute travel coverage is somewhat weaker than it is for Battalion Command Teams. In both normal and congested traffic, the coverage of these units is sufficient in the most densely populated sections of the central and southern areas of the City. However, the core of the northern area is not reached in a travel time of 8:00 minutes even under normal traffic conditions.

Map Series #8 – All Incident Locations

This series of maps shows the exact location for all incident types across a three-year period. It is apparent that there is a need for fire services on almost every developed street segment of the service area. This incident plot (and the others to follow) also show where LAFD units respond outside of its area for regional mutual aid incidents.

Map Series #9 – Emergency Medical Services and Rescue Incident Locations

This series shows only emergency medical and rescue call locations. With most of the calls for service being EMS-related, virtually all areas of the City need EMS coverage.

Map Series #10 – All Fire Type Locations

This map set identifies the location of all fires in the City for the three-year assessment period. All fires include any type of fire call, from auto to dumpster to building. There are obviously fewer fires compared to medical or rescue calls; however, it remains evident that all first-due engine districts experience fires—although fires are more concentrated where buildings are older or more densely spaced due to zoning and historic growth. Major road arterials can also be seen due to the occurrence of vehicle fires.

Map Series #11 – Structure Fire Locations

This series shows all structure fire locations. While the structure fire quantity is a smaller subset of the total fire quantity, there are two meaningful findings from this map. First, there are still structure fires in every fire station district, and the location of many building fires parallels the areas where it is more common to find older and higher-risk building types. These areas and buildings pose a significant fire- and life-loss risk to communities. Second, fires in the more complicated building types must be controlled quickly or losses can be significant. Thus, again, core areas of the City must maintain an available, effective multiple-unit response capacity.

Map Series #12 – Emergency Medical Services and Rescue Incident Location Densities

This map set examines (by mathematical density) where clusters of EMS incident activity occurred over the three-year assessment period. The darkest color plots the highest concentration of all incidents and shows the location of frequent workload, which is more meaningful than simply mapping the locations of all EMS incidents, as were measured for Map Series #9.

This perspective is important because the deployment system must include an overlap of units to ensure the delivery of multiple units when needed for serious incidents, or to handle simultaneous calls for service. It is obvious that there are multiple areas that generate a much higher demand for emergency medical services. Therefore, crew workload planning must consider actual incident demand by hour—not just population density in general.

Map Series #13 – All Fire Location Densities

This series is like Map Series #10 but shows the hot spots of activity for all types of fires. As with EMS incidents, fire density is more concentrated in the highly populated, most-developed, older areas of the City.

Map Series #14 – Structure Fire Densities

This map set shows only the building fire workload by density. While the density is greater in the oldest areas, each battalion has smaller clusters of structure fires over the three-year assessment period, pointing to the need for a successful ERF for building fires in every battalion's service area.

Map Series #15 – Wildland Fire Densities

This series shows the wildland fire workload by density. While smaller in total count than building fires, importantly, many are in open space areas and hills with a high risk for wildfire. Also worrisome is the quantity of fires along highway corridors where an auto fire can easily spread to a wildland area. In these areas, fires must be suppressed quickly during dangerous fire weather or they can easily become catastrophic events.

4.2.2 Coverage Gap and Improvement Scenarios

Given the 4:00-minute travel time coverage gaps in the existing station network—as evidenced in both the normal and congested travel maps in addition to historical incident response travel time records in **Section 5** of this study—Citygate conducted additional GIS measures to understand where adding fire stations or specific fire company types might be indicated. Some of the following analyses feature the GIS tool measuring how many public road miles are covered by a fire station plan. The entire table of measures will follow the map descriptions.

Map Series #16 – 5:00-Minute Travel Time Coverage

Given that LAFD's fire station spacing covers 76 percent of the City, and most of the coverage gaps are at the edges of small gaps between two fire station areas, the question becomes how much better is the coverage at just one more minute of travel? In Citygate's experience, many larger departments with challenging geography to cover can space fire stations at 5:00 minutes and, ensuring they control dispatch and turnout times, still deliver first-due units in 8:30 minutes or slightly less from the time of dispatch answering a call.

These three maps test this measure. As can be seen in just one more minute of travel from 4:00 to 5:00 minutes, central and southern area coverage is almost complete. In the northern area, the gaps have reduced to only two that remain large enough to merit further consideration for resources—between stations 100 and 88 and stations 98 and 99. The 5:00-minute coverage for public streets increases to 92 percent Citywide, which is a figure Citygate has never seen citywide in a metro client.

Map Series #17 – 4:00- and 5:00-Minute Travel Gap: Small Area Gap Analysis

To further illustrate the locations of some of the remaining travel time gaps at both the fourth and fifth minute of travel, this series of maps scales in very close to see neighborhood-level coverage compared to the terrain and highway barriers present. The following table compares the gaps by mile of coverage.

Table 9—Small Area Gap Analysis

Gap Area	Gap in Coverage at 4:00 Minutes	Gap Miles Covered at 5:00 Minutes	Open Gap Miles Remaining
North Gap Near Station 7	169.11	89.2	79.91
Central Gap Near Station 57	72.09	34.51	37.58
South Gap Near Station 85	28.02	6.22	21.8

In the central area, simply increasing the measure to 5:00 minutes closes *48 percent* of existing gaps and, due to the remaining gaps being at the edges of the City limits, adding fire stations would not be cost effective, as most of the added coverage would extend more into neighboring cities.

In the northern area, using 5:00-minute coverage closes 53 percent of the gap, but still leaves a large gap between stations 98 and 99. Even with 5:00-minute coverage, the remaining east side gap in the northern area is 79.9 road miles. This is large enough to merit further study for an added station once this analysis considers the incident demands and response times for the five stations in proximity to this gap.

As for the southern area, at either the fourth or fifth minute of travel, the only significant gap is the small corridor of City limits connecting Battalion 6 – San Pedro, to the central City areas. Given the gap left after 5:00 minutes of travel time is only 21.8 miles, the area is too small to justify adding a fire station.

Map Series #18 – Central and North Area Highest Incident Demand Locations

These maps are presented at full scale and will also be used in this analysis in the incident statistics section to follow. The volume and simultaneous demand on the top 10 to 28 LAFD stations is the highest Citygate has measured in a metro client. Given that it was likely that some of these stations were in close proximity to each other as zones with greater population density are typically larger than the area that can be covered by one fire station, Citygate located the top 10 stations and then expanded the search to the top 28.

As the map set shows, this instinct was correct. In the central area of the City in three clusters are 16 of the top 28 stations for workload demand, and **9** of the top 10. In the northern area, there are two clusters containing 5 of the top 28 stations for workload demand, and **1** of the top ten.

There are 7 other stations in the top 28, but they exist individually/distinctly in the central and southern areas and, as such, are not mapped. The importance of this clustering measure is that at peak hours of the day, a large area's worth of fire crews is likely busy with only EMS calls, leaving the area underserved for an immediate need fire or rescue response. When multiple units are added to fire stations it is to provide "reliever units" to high-incident demand stations.

4.2.3 Road Mile Coverage Measures

In addition to the visual representation of coverage provided by maps, the GIS software allows the miles of public streets covered at 4:00, 5:00, or 8:00 minutes to be measured.

The following tables provide these metrics to compare the existing normal coverage to congested coverage in each area of the City.

<u>Table 10—LAFD North: Road Mile Coverage – First-Due and ERF</u>

Measure	Total Road Miles (within City Limits)	Uncongested Miles Reached by Open Fire Stations	Congested Road Miles	Difference in Miles Covered
8:00-Minute ERF	3936.98	2818.65		**1118.33**
		(72% of total public miles)		
		2818.65	1146.55	**1672.1**
			(41% of uncongested ERF)	
4:00-Minute First-Due	3936.98	2323.2		**1613.78**
		(59% of total public miles)		
		2323.2	1347.23	**975.97**
			(58% of uncongested first-due)	
5:00-Minute First-Due	3936.98	3385.2		**551.78**
		(86% of total public miles)		
		3385.2	2544.51	**840.69**
			(75% of uncongested first-due)	

Table 11—LAFD Central: Road Mile Coverage – First-Due and ERF

Measure	Total Road Miles (within City Limits)	Uncongested Miles Reached by Open Fire Stations	Congested Road Miles	Difference in Miles Covered
8:00-Minute ERF	4399.34	3588.61		**810.73**
		(82% of total public miles)		
		3588.61	2307.16	**1281.45**
			(64% of uncongested ERF)	
4:00-Minute First-Due	4399.34	3353.33		**1046.01**
		(76% of total public miles)		
		3353.33	2386.43	**966.9**
			(71% of uncongested first-due)	
5:00-Minute First-Due	4399.34	4056.83		**342.51**
		(92% of total public miles)		
		4056.83	3568.7	**488.13**
			(88% of uncongested first-due)	

Table 12—LAFD South: Road Mile Coverage – First-Due and ERF

Measure	Total Road Miles (within City Limits)	Uncongested Miles Reached by Open Fire Stations	Congested Road Miles	Difference in Miles Covered
8:00-Minute ERF	661.42	279.32 *(42% of total public miles)*		**382.1**
		279.32	142.03 *(51% of uncongested ERF)*	**137.29**
4:00-Minute First-Due	661.42	401.77 *(61% of total public miles)*		**259.65**
		401.77	327.73 *(50% of uncongested first-due)*	**74.04**
5:00-Minute First-Due	661.42	535.02 *(81% of total public miles)*		**126.4**
		535.02	473.54 *(89% of uncongested first-due)*	**61.48**

The current fire station spacing for first-due units at 4:00 minutes only covers 59 percent of the City's public road miles. The fire station spacing in the west central and northern area of the City is simply too great. However, at the fifth minute of travel time, coverage increases to 86 percent which, in Citygate's experience, is particularly good for a large, metropolitan City.

At present, traffic congestion—and more curvilinear streets rather than a right-angle grid system—outside of core downtown areas only slows travel time coverage by one percent for the fourth travel minute. However, the more expansive fifth minute of coverage, as it extends more to the edges of the City limits or hillside areas, is slowed by 11 percent.

As for multiple-unit ERF coverage for Schedule A at 8:00 minutes, coverage ranges from 82 percent in the central area, to 72 percent in the north, to 42 percent in the south. Given the demands for service in the central area, the 82 percent coverage is particularly good for a major metro location. Adding a small number of resources in the north will improve the ERF in that area. As for the southern area, coverage is only reduced due to the Battalion Command team being located farther inland. There is not a serious building fire rate closer to the ocean that would justify adding another Battalion Command Team or moving Battalion 6 from Station 49 in the middle harbor.

4.2.4 Added Coverage Scenarios

Given the Engine and Battalion Command Team gap identified in the Northern area, the next three maps model the benefit of adding coverage, or lack thereof.

Map Series Scenario 1a & 1b – Central and North Area Highest Incident Demand Locations – 4:00- and 5:00-Minute Travel

These maps measure the addition of an engine in the east side of the northern area near the intersection of Woodman and Roscoe in Panorama City. This location is west of SR-170, a little south of the SR-170/I-5 interchange, and is at the intersection of two major prime arterials which will allow an added engine to route into farther away neighborhoods more quickly. As such, this location test does the best job of filling in the engine company gap at both 4:00- and 5:00-minutes of travel time. There remains some uncovered area to the northeast, but if the station is placed any further in that direction, north coverage is lost to the south.

The added coverage is shown in two views. The "a" view includes overlapping coverage with existing engine companies. The "b" view is the added coverage for only the test location against the outside boundary line of the entire gap area. The added Engine would increase coverage by 51.7 miles at a travel time of 4:00 minutes, or up to 55.23 miles at a travel time of 5:00 minutes. The remaining gap is between the fifth and sixth minute of coverage from adjoining stations 77 and 98. Given the added coverage in an area that is difficult to serve quickly, the added engine would be beneficial.

Map Scenario 2 – Add a Battalion Command Team in the North Area

Given the significant Battalion Command Team coverage gap in the North between stations 73, 100, and 90, this map shows the significant benefit of adding a Chief at Station 100, located at 6751 Louise Avenue, Van Nuys. Almost 100 percent of the underserved road miles at an 8:00-minute travel time are covered in this area southeast of Van Nuys Airport. Note: Station 114 on the map is inside the working airport property and is the aviation base for LAFD aircraft. As such, it is not a typical neighborhood fire station.

4.2.5 GIS Mapping Findings

Finding #2:	The physical spacing of LAFD stations is sufficient, apart from small areas in the northern section of the City.

Finding #3: Effective Response Force (multiple-unit responses to more serious emergencies) travel-time coverage is sufficient in areas that are the most populated and carry the highest incident demand.

Finding #4: Given that the current fire station plan provides 5:00-minute travel time coverage to 88.7 percent of public streets City wide, using a 5:00-minute travel time goal to physically space fire stations across the City's very diverse geography is effective. The incident workload assessment in this study evaluates the needed units per station.

Finding #5: The northern service area needs one additional Battalion Command Team at Station 100 to improve command coverage for more serious incidents.

Finding #6: One additional fire station with an engine is needed northeast of Station 81, as modeled in Scenario Map 1a and 1b (**Volume 2—Map Atlas**).

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Section 5

Statistical Analysis

S ANGELES
RE DEPT.
CLASS 1
FIREFIGHTER
27
LAFD
CA EXEMPT
1520375
FIRE LINE DO NOT CROSS
FIRE LINE DO NOT CROSS

SECTION 5—STATISTICAL ANALYSIS

5.1 HISTORICAL EFFECTIVENESS AND RELIABILITY OF RESPONSE – WHAT STATISTICS SAY ABOUT THE EXISTING SYSTEM PERFORMANCE

SOC ELEMENT 7 OF 8
RELIABILITY & HISTORICAL RESPONSE EFFECTIVENESS STUDIES

The maps described in Section 4 show the GIS-projected response coverage given perfect conditions with no competing calls and units all in place. Examination of the actual response time data provides a picture of coverage in the real world of simultaneous calls, rush hour traffic conditions, units out of position, and delayed travel time for events such as periods of severe weather.

5.1.1 Data Set Identification

The Department provided both National Fire Information Reporting System Version 5 (NFIRS 5) and CAD apparatus response data for 2018 through 2020. While CAD records are created for all apparatus responses, EMS incidents are not documented in the NFIRS 5 reporting system.

Over the three-year study period, there were 5,265,591 apparatus response records provided from the CAD system. When EMS response records were added, the total number of incident records, both NFIRS 5- and CAD-created, grew to 1,471,423, or an average of 490,474 incidents per year. The average daily incident quantity for the three-year period was 1,344, which is less than the total incident quantity since the scope of this study does not include specialty responses for aircraft operations in two airport fire stations or maritime operations for the fireboat stations.

Metropolitan fire department operations have multiple operational layers. Significant operational layers in the City of Los Angeles include:

1. Department
2. Bureau (Central, West, Valley, and South)
3. Battalions
4. Stations
5. Apparatus

Bureaus are identified by name in this analysis. While various measures are created for each operational level, the focus of this analysis is on battalions (the third level).

5.1.2 Analysis Measurement Categories

In general, all analysis measurements fall into two categories:

1. Demand for service
2. Performance

Demand for Service is measured by type and quantity of incidents over various time and space segments. These include number of incidents by battalion, number of incidents by incident type by year, number of incidents hour of the day, hourly station demand, unit-hour utilization, etc.

The following table illustrates the number of incidents by bureau by year.

Table 13—Number of Incidents by Bureau by Year

Bureau	2018	2019	2020	Total
Central	121,539	125,692	121,916	**369,147**
South	142,728	142,415	140,044	**425,187**
Valley	146,832	148,527	146,783	**442,142**
West	80,027	82,485	70,825	**233,337**
-Blank-	485	643	482	**1,610**
Total	**491,611**	**499,762**	**480,050**	**1,471,423**

The total number of incidents peaked in 2019, with the West Bureau showing the steepest decline in incident quantity from 2019 to 2020 (likely due to COVID-19). The incident quantities in the other three bureaus held steady during this same period.

Performance is measured by the number of minutes and seconds it takes for 90 percent of a specific set of incidents to complete a specific performance objective. For example, travel time measures the time it takes an apparatus to travel to the scene of an emergency. The measurement begins at "wheels turning" and ends as the apparatus arrives on scene. Unlike demand for service, where all incidents are counted, performance excludes all **non-emergency** responses. Since CAD data identifies approximately 92 percent of incidents as emergencies—those marked as *N*, for *non-emergency*, are eliminated from performance calculations.

The set of records used for performance calculations is also trimmed by outlier definitions. This trimming process excludes incidents that fall outside of a normal range. For example, travel times of zero seconds are eliminated as well as travel times over 20:00 minutes (1,200 seconds). Incidents requiring responses outside the City are also eliminated. The number in parenthesis is the number of incidents used for the performance calculation. These numbers will always be less than the total number of incidents used in the demand calculations.

5.2 SERVICE DEMAND

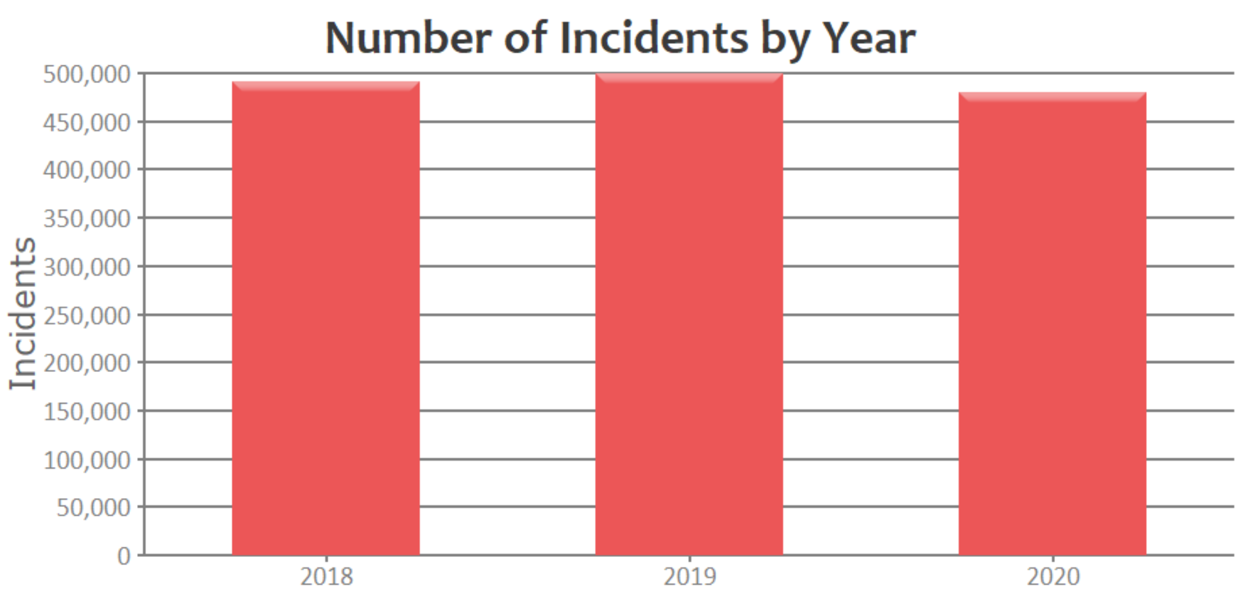
This analysis covers operations from January 1, 2018, through December 31, 2020. During this time there were 1,471,423 incidents and 5,265,590 apparatus response records.

The number of incidents in 2020 was 480,050. The average number of incidents per day was 1,315. The number of apparatus responses in 2020 was 1,420,823. In 2020 there was an average of 2.96 apparatus responses per incident.

In 2020 the percentage of fire incidents was 3.05 percent. EMS incidents accounted for **81.85 percent** (tracked as *RA* in CAD data). *Other* types of incidents were 15.1 percent.

The Department's demand for service grew from 2018 to 2019 but declined slightly from 2019 to 2020.

Figure 2—Number of Incidents by Year



The following table shows the number of incidents by incident type by year. Fire incidents grew year to year, while EMS and other incident types increased between 2018 and 2019, then decreased from 2019 to 2020.

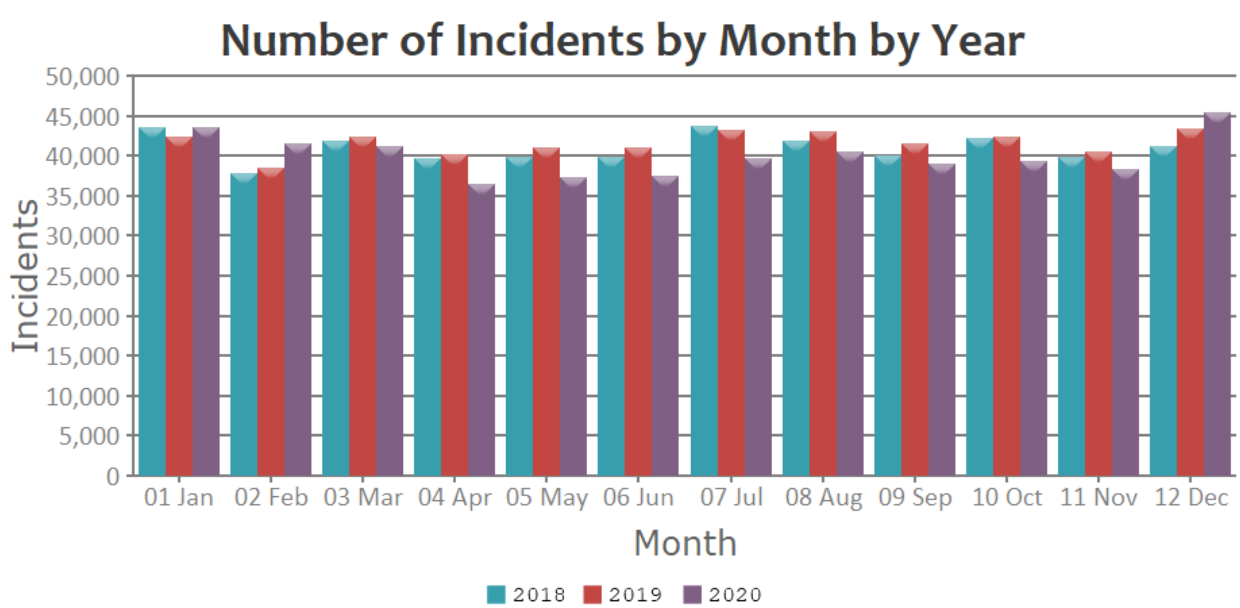
Table 14—Number of Incidents by Incident Type by Year

Incident Type	2018	2019	2020	Total
Fire	11,468	11,812	14,686	**37,966**
EMS	412,478	414,354	392,949	**1,219,781**
Other	67,665	73,596	72,415	**213,676**
Total	**491,611**	**499,762**	**480,050**	**1,471,423**

Because NFIRS 5 incident types are generally used for this calculation, Rescue Ambulance (RA*)* incidents were summed to determine the total number of EMS incidents. The number of fire incidents was calculated for NFIRS 5 incidents with a *1XX* incident type. The remainder were *other* incident types. The difference between the number of analyzed incidents and the number of incidents which fell within a recognized category is two incident records. These are likely two damaged incident records.

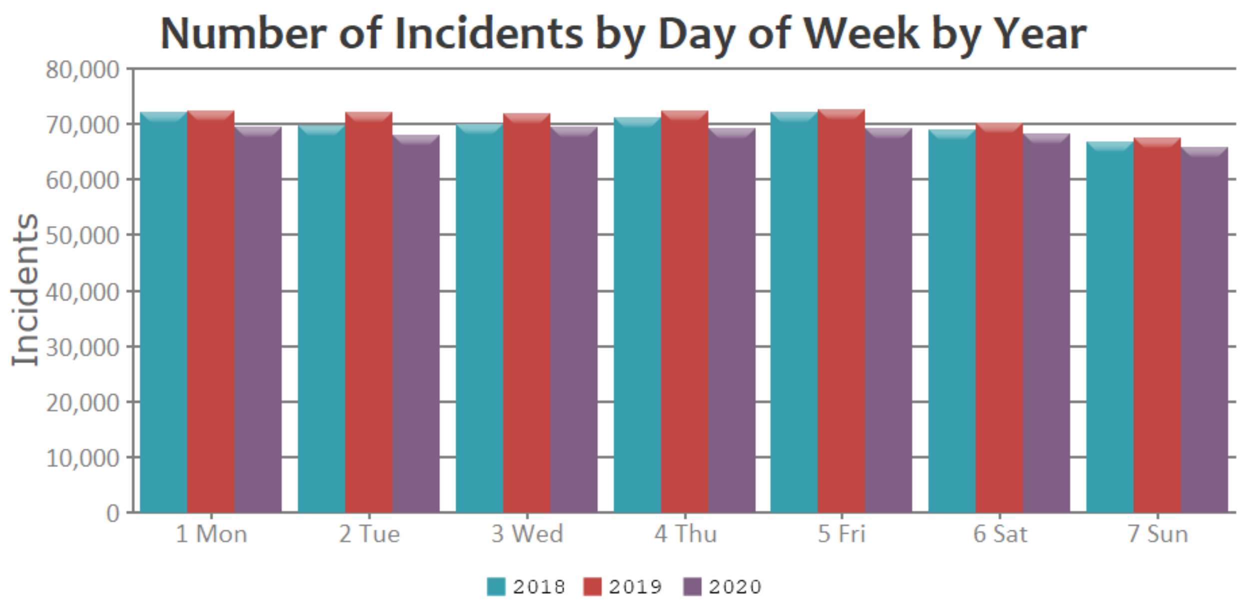
The number of incidents tends to remain consistent month to month, with December having the most activity and April having the least.

Figure 3—Number of Incidents by Month by Year



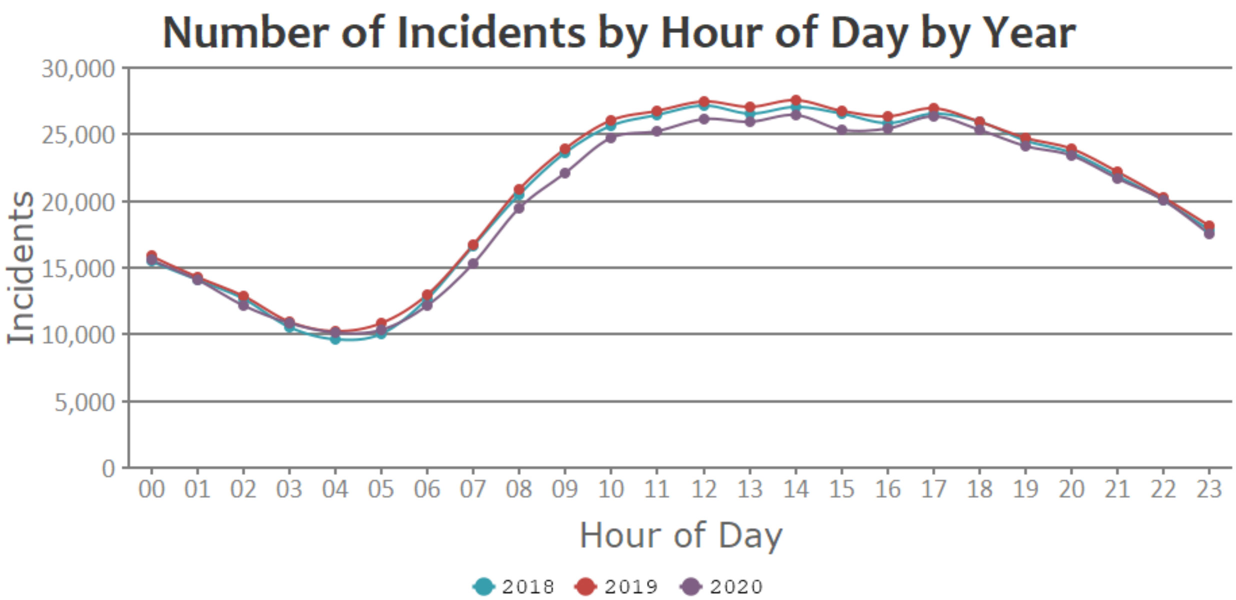
The number of incidents by day of week also tends to be steady, with a high on Friday and a low on Sunday.

Figure 4—Number of Incidents by Day of Week by Year



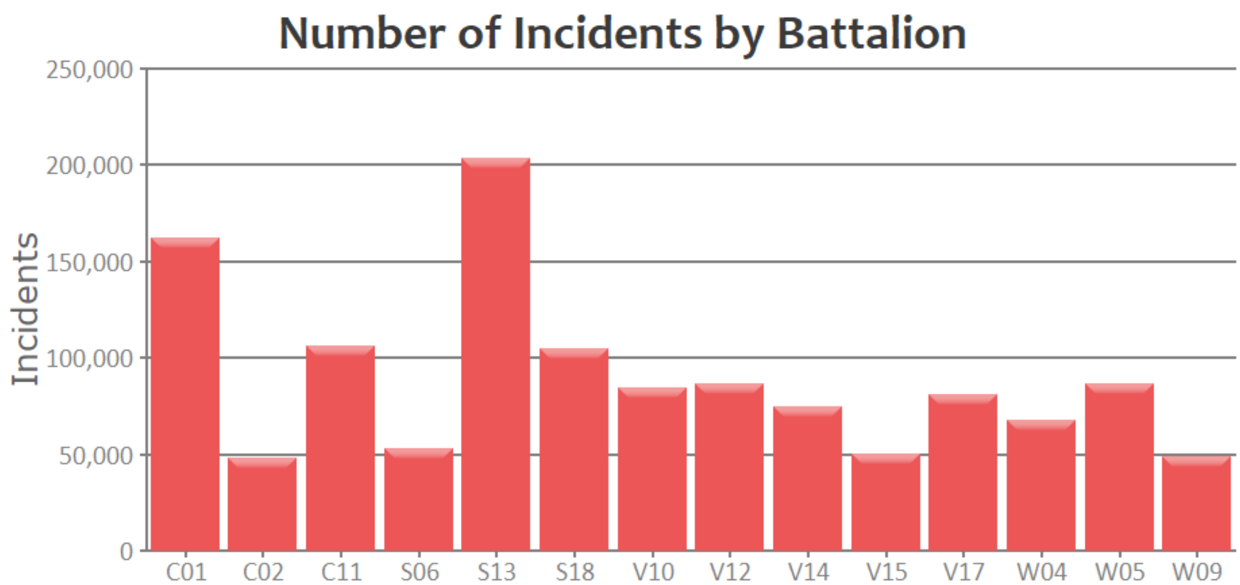
The following figure illustrates the breakdown of incidents by hour of the day by year. There is a slight variance in annual hourly volume. The lower volume in 2020 seems focused from morning through the afternoon hours.

Figure 5—Number of Incidents by Hour of Day by Year



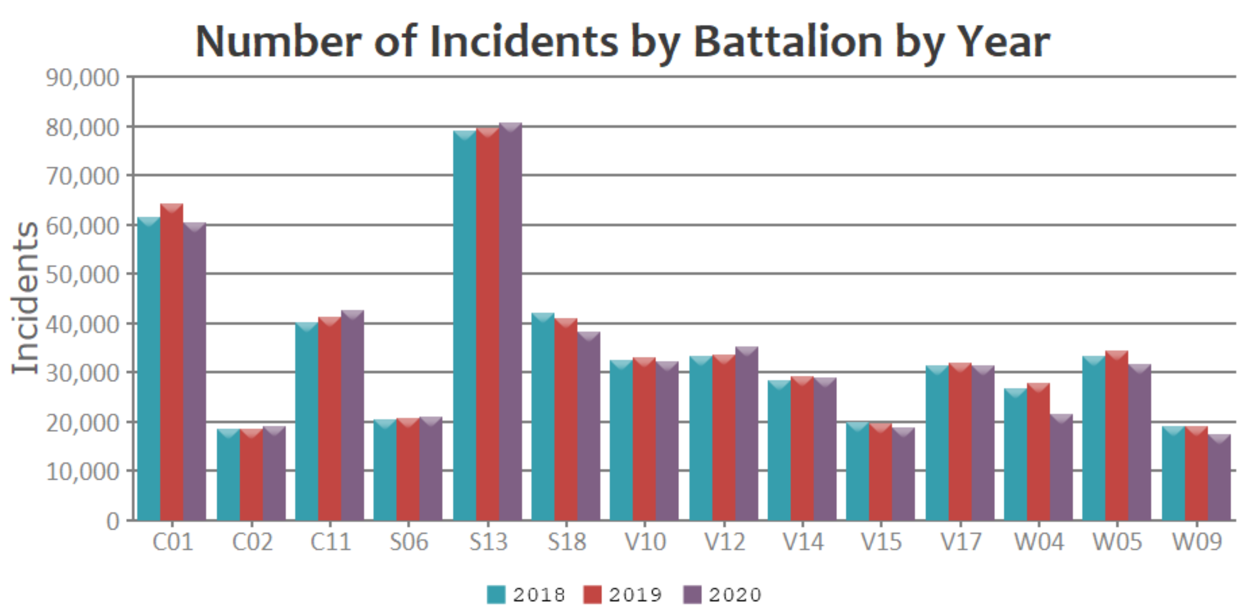
The following figure illustrates the number of incidents by battalion for the three-year study period. Battalion 13 had the highest volume of activity. Battalions 2, 15, and 9 had the lowest volume.

Figure 6—Number of Incidents by Battalion



The following figure breaks down the number of incidents by battalion by year. Volume in 13 continues to grow year after year. Activity in Battalion 1 peaked slightly in 2019.

Figure 7—Number of Incidents by Battalion by Year



The following table illustrates the number of incidents by station by year. The station identifiers were taken from the two CAD data loads, with the last six months in 2020 coming exclusively from the second CAD data load. The data is presented as they were entered, so all incidents are included; this even applies to entries such as *Station 000*, which may not represent an actual station area.

Table 15—Number of Incidents by Station by Year

Station	2018	2019	2020	Total
-Blank-	3,895	4,001	52	**7,948**
000			1	**1**
001	4,020	4,236	4,584	**12,840**
002	5,577	5,674	5,752	**17,003**
003	6,670	7,112	6,788	**20,570**
004	8,617	8,856	7,929	**25,402**
005	3,112	3,293	3,054	**9,459**
006	6,237	6,474	6,683	**19,394**
007	6,149	6,229	6,870	**19,248**
008	1,052	1,097	1,063	**3,212**
009	21,658	22,810	19,986	**64,454**
010	7,760	8,161	7,626	**23,547**
011	11,383	11,901	12,422	**35,706**
012	3,512	3,278	3,270	**10,060**
013	6,721	7,147	7,439	**21,307**
014	5,422	5,708	6,325	**17,455**
015	6,506	6,275	5,235	**18,016**
016	1,804	1,679	1,648	**5,131**
017	2,657	2,824	2,643	**8,124**
018	1,857	1,969	1,867	**5,693**
019	3,483	3,601	3,306	**10,390**
020	4,189	4,400	4,222	**12,811**
021	4,600	4,477	4,777	**13,854**
023	907	921	923	**2,751**
024	1,046	1,131	1,026	**3,203**
025	3,142	3,170	3,369	**9,681**
026	5,789	5,571	6,115	**17,475**

Station	2018	2019	2020	Total
027	8,727	9,186	7,798	**25,711**
028	821	874	902	**2,597**
029	5,965	6,014	5,769	**17,748**
033	9,615	10,070	10,864	**30,549**
034	5,675	5,804	5,751	**17,230**
035	5,765	5,516	5,252	**16,533**
036	2,207	2,088	2,087	**6,382**
037	6,767	6,783	6,227	**19,777**
038	4,723	4,997	5,181	**14,901**
039	8,448	8,654	8,081	**25,183**
040	432	359	346	**1,137**
041	5,608	5,773	5,118	**16,499**
042	1,892	1,935	1,776	**5,603**
043	3,713	3,525	3,394	**10,632**
044	1,627	1,669	1,705	**5,001**
046	10,793	10,683	11,020	**32,496**
047	2,176	2,161	2,328	**6,665**
048	2,827	2,967	2,971	**8,765**
049	722	776	716	**2,214**
050	1,917	1,911	1,874	**5,702**
051	8,281	8,625	3,833	**20,739**
052	4,407	4,693	4,578	**13,678**
055	1,756	1,832	1,859	**5,447**
056	2,584	2,720	2,368	**7,672**
057	12,618	13,104	12,952	**38,674**
058	6,880	6,975	6,496	**20,351**
059	4,832	4,810	4,151	**13,793**
060	7,317	7,568	7,581	**22,466**
061	8,292	7,943	7,151	**23,386**
062	3,580	3,928	3,670	**11,178**
063	6,258	6,344	6,238	**18,840**
064	15,028	14,910	15,756	**45,694**
065	7,270	7,127	7,438	**21,835**

Station	2018	2019	2020	Total
066	12,808	13,095	12,778	**38,681**
067	3,510	3,460	3,016	**9,986**
068	6,089	5,486	5,511	**17,086**
069	1,351	1,402	1,383	**4,136**
070	3,651	3,351	3,164	**10,166**
071	1,744	1,712	1,514	**4,970**
072	5,345	5,285	5,259	**15,889**
073	4,689	4,892	5,110	**14,691**
074	3,334	3,460	3,522	**10,316**
075	4,268	4,116	4,097	**12,481**
076	1,438	1,570	1,305	**4,313**
077	4,311	4,256	4,516	**13,083**
078	3,336	3,420	3,293	**10,049**
079	2,826	2,967	2,801	**8,594**
081	5,569	5,634	5,425	**16,628**
082	4,784	5,056	5,261	**15,101**
083	3,808	3,834	3,538	**11,180**
084	3,985	4,160	3,973	**12,118**
085	3,517	3,590	3,440	**10,547**
086	3,496	3,424	3,462	**10,382**
087	4,060	4,191	3,930	**12,181**
088	5,149	5,244	5,138	**15,531**
089	8,723	9,158	9,150	**27,031**
090	5,070	5,019	5,400	**15,489**
091	6,899	6,954	7,319	**21,172**
092	3,519	3,447	2,907	**9,873**
093	6,026	6,154	5,880	**18,060**
094	7,941	7,800	7,032	**22,773**
095	2,135	2,141	1,874	**6,150**
096	3,247	3,166	3,228	**9,641**
097	746	801	776	**2,323**
098	7,376	7,470	7,880	**22,726**
099	629	564	597	**1,790**

Station	2018	2019	2020	Total
100	3,077	3,349	3,321	**9,747**
101	1,319	1,375	1,445	**4,139**
102	4,514	4,503	4,268	**13,285**
103	3,056	2,882	2,820	**8,758**
104	3,671	3,623	3,332	**10,626**
105	4,726	4,712	4,794	**14,232**
106	3,161	3,125	3,097	**9,383**
107	2,176	2,261	1,969	**6,406**
108	358	441	415	**1,214**
109	865	951	812	**2,628**
110	25	29	18	**72**
111	128	82	64	**274**
112	1,868	1,831	1,994	**5,693**
121			7	**7**
122			3	**3**
123			3	**3**
124			1	**1**
125			2	**2**
Total	**491,611**	**499,762**	**480,050**	**1,471,423**

The following table illustrates hourly incident quantity by day of week and hour of day for 2020. Green areas have the least activity. Red areas have the heaviest activity. There is a defined block of high activity from 10:00 am to 7:00 pm during the workweek.

Table 16—Number of Incidents by Day of Week and Hour of Day – 2020

Hour	1 Mon	2 Tue	3 Wed	4 Thu	5 Fri	6 Sat	7 Sun	Total
00:00	2,203	2,088	2,112	2,117	2,159	2,382	2,531	**15,592**
01:00	2,085	1,816	1,948	1,894	1,928	2,133	2,327	**14,131**
02:00	1,702	1,570	1,710	1,607	1,682	1,849	2,076	**12,196**
03:00	1,603	1,413	1,498	1,525	1,476	1,609	1,693	**10,817**
04:00	1,518	1,299	1,417	1,447	1,421	1,456	1,552	**10,110**
05:00	1,542	1,473	1,434	1,465	1,464	1,462	1,508	**10,348**
06:00	1,842	1,712	1,788	1,810	1,766	1,712	1,546	**12,176**
07:00	2,358	2,210	2,369	2,262	2,180	1,993	1,932	**15,304**
08:00	2,952	2,888	2,888	2,896	2,855	2,530	2,406	**19,415**
09:00	3,313	3,252	3,336	3,318	3,238	2,913	2,734	**22,104**
10:00	3,653	3,857	3,707	3,669	3,599	3,212	3,069	**24,766**
11:00	3,749	3,686	3,812	3,805	3,662	3,384	3,165	**25,263**
12:00	3,877	3,984	3,807	3,857	3,682	3,525	3,424	**26,156**
13:00	3,771	3,717	3,844	3,869	3,787	3,558	3,402	**25,948**
14:00	3,852	3,711	3,908	4,006	3,782	3,675	3,559	**26,493**
15:00	3,640	3,618	3,660	3,702	3,678	3,574	3,457	**25,329**
16:00	3,647	3,623	3,684	3,668	3,690	3,625	3,461	**25,398**
17:00	3,809	3,830	3,843	3,738	3,909	3,628	3,610	**26,367**
18:00	3,650	3,588	3,659	3,657	3,687	3,670	3,443	**25,354**
19:00	3,337	3,353	3,378	3,534	3,538	3,556	3,405	**24,101**
20:00	3,309	3,135	3,377	3,365	3,457	3,538	3,212	**23,393**
21:00	2,977	3,080	3,075	2,993	3,066	3,362	3,137	**21,690**
22:00	2,698	2,733	2,748	2,807	2,976	3,240	2,823	**20,025**
23:00	2,358	2,352	2,519	2,401	2,643	2,784	2,517	**17,574**
Total	**69,445**	**67,988**	**69,521**	**69,412**	**69,325**	**68,370**	**65,989**	**480,050**

Finding #7:	LAFD's time-of-day, day-of-week, and month-of-year calls for service demand occurs in consistent, predictable patterns. LAFD's service demand is sufficiently high in all areas, 24 hours per day, to require an all-day, year-round response system.

5.2.1 Service Demand by Incident Types

The following table shows the number of incidents by incident type by year. As expected, Rescue Ambulance (*RA)* incidents top the list; however, since they are not in NFIRS, they do not have an incident type identified. *False alarms* and *dispatched* and *cancelled en route* incidents also rank high on the list. Building fires rank in sixteenth place by volume.

Table 17—Number of Incidents by Property Use by Year – Greater Than 300

Incident Type	2018	2019	2020	Total
"RA" and other incident categories not NFIRS 5 coded	412,656	413,984	393,811	**1,220,451**
700 False alarm or false call, other	21,235	26,222	27,437	**74,894**
611 Dispatched & canceled en route	11,396	12,092	10,933	**34,421**
622 No incident found on arrival of incident address	3,985	4,027	4,912	**12,924**
745 Alarm system sounded, no fire - unintentional	3,705	3,652	2,976	**10,333**
735 Alarm system sounded due to malfunction	3,480	3,386	2,425	**9,291**
118 Trash or rubbish fire, contained	2,777	2,867	3,408	**9,052**
151 Outside rubbish, trash, or waste fire	2,010	2,076	3,717	**7,803**
353 Removal of victim(s) from stalled elevator	2,621	2,745	2,132	**7,498**
900 Special type of incident, other	1,532	1,824	2,050	**5,406**
651 Smoke scare, odor of smoke	1,611	1,609	1,767	**4,987**
131 Passenger vehicle fire	1,492	1,491	1,569	**4,552**
440 Electrical wiring/equipment problem, other	1,362	1,420	1,289	**4,071**
113 Cooking fire, confined to container	1,173	1,235	1,136	**3,544**
520 Water problem, other	1,190	1,145	1,110	**3,445**
111 Building fire	**970**	**1,022**	**1,055**	**3,047**
150 Outside rubbish fire, other	783	844	1,266	**2,893**
522 Water or steam leak	1,050	876	760	**2,686**
412 Gas leak (natural gas or LPG)	930	921	824	**2,675**
743 Smoke detector activation, no fire - unintentional	919	931	701	**2,551**
511 Lock-out	861	784	580	**2,225**
553 Public service	757	758	466	**1,981**
500 Service Call, other	538	629	807	**1,974**
444 Power line down	661	619	530	**1,810**
733 Smoke detector activation due to malfunction	616	608	469	**1,693**
100 Fire, other	545	553	588	**1,686**
551 Assist police or another governmental agency	434	446	543	**1,423**
600 Good intent call, other	415	426	373	**1,214**
324 Motor vehicle accident no injuries	399	365	342	**1,106**
730 System malfunction, other	346	492	223	**1,061**
541 Animal problem	300	324	425	**1,049**
736 CO detector activation due to malfunction	260	355	427	**1,042**

Incident Type	2018	2019	2020	Total
911 Citizen complaint	248	400	367	**1,015**
550 Public service assistance, other	280	371	364	**1,015**
740 Unintentional transmission of alarm, other	359	258	343	**960**
812 Flood assessment	304	388	253	**945**
130 Mobile property (vehicle) fire, other	276	306	312	**894**
143 Grass fire	327	257	297	**881**
154 Dumpster or other outside trash receptacle fire	267	246	346	**859**
322 Vehicle accident with injuries	309	251	263	**823**
445 Arcing, shorted electrical equipment	281	256	259	**796**
331 Lock-in (if lock out, use 511)	293	304	184	**781**
531 Smoke or odor removal	260	270	197	**727**
746 Carbon monoxide detector activation, no CO	156	262	278	**696**
744 Detector activation, no fire - unintentional	249	198	182	**629**
462 Aircraft standby	176	237	159	**572**
741 Sprinkler activation, no fire - unintentional	207	190	161	**558**
140 Natural vegetation fire, other	169	175	196	**540**
552 Police matter	175	157	205	**537**
142 Brush, or brush and grass mixture fire	144	172	176	**492**
561 Unauthorized burning	101	108	269	**478**
460 Accident, potential accident, other	113	222	141	**476**
411 Gasoline or other flammable liquid spill	162	165	136	**463**
400 Hazardous condition, other	98	121	237	**456**
320 Emergency Medical Service, other	145	132	136	**413**
711 Municipal alarm system, malicious false alarm	62	172	178	**412**
653 Barbecue, tar kettle	164	114	127	**405**
442 Overheated motor	175	124	87	**386**
112 Fires in structures other than in a building	105	127	144	**376**
555 Defective elevator, no occupants	129	123	99	**351**
710 Malicious, mischievous false call, other	124	120	93	**337**
540 Animal problem, other	82	83	155	**320**
424 Carbon monoxide incident	76	113	125	**314**
321 EMS call, excluding vehicle accident with injury	110	84	114	**308**

5.2.2 Service Demand by Property Use

The following table ranks incidents by property use. For those property uses coded within NFIRS 5 incidents, the highest rankings are residential dwellings.

Table 18—Number of Incidents by Property Use by Year– Greater Than 300

Property Use	2018	2019	2020	Total
"RA" and other incident categories not NFIRS 5 coded	412,656	413,984	393,811	**1,220,451**
429 Multifamily dwellings	15,901	17,826	16,260	**49,987**
419 1 or 2 family dwelling	10,604	11,283	11,826	**33,713**
UUU Undetermined	9,525	10,457	10,085	**30,067**
963 Street or road in commercial area	5,859	6,778	8,952	**21,589**
960 Street, other	4,841	5,547	7,035	**17,423**
962 Residential street, road, or residential driveway	4,982	5,077	6,211	**16,270**
961 Highway or divided highway	2,649	2,788	3,435	**8,872**
400 Residential, other	2,533	3,119	3,015	**8,667**
599 Business office	2,216	2,403	1,951	**6,570**
449 Hotel/motel, commercial	1,379	1,558	747	**3,684**
500 Mercantile, business, other	1,231	1,200	1,136	**3,567**
NNN None	917	1105	1057	**3,079**
215 High school/junior high school/middle school	1,029	1,064	613	**2,706**
931 Open land or field	790	756	969	**2,515**
898 Dock, marina, pier, wharf	864	846	721	**2,431**
965 Vehicle parking area	891	767	677	**2,335**
439 Boarding/rooming house, residential hotels	754	641	814	**2,209**
213 Elementary school, including kindergarten	683	746	478	**1,907**
331 Hospital - medical or psychiatric	592	670	500	**1,762**
171 Airport passenger terminal	688	694	357	**1,739**
210 Schools, non-adult	570	626	394	**1,590**
900 Outside or special property, other	428	482	590	**1,500**
161 Restaurant or cafeteria	434	456	346	**1,236**
936 Vacant lot	365	379	434	**1,178**
888 Fire station	235	239	665	**1,139**
891 Warehouse	369	334	358	**1,061**
100 Assembly, other	296	445	291	**1,032**

Property Use	2018	2019	2020	Total
241 Adult education center, college classroom	307	377	299	**983**
882 Parking garage, general vehicle	281	359	291	**931**
150 Public or government, other	278	281	304	**863**
580 General retail, other	312	306	230	**848**
311 24-hour care Nursing homes, 4 or more persons	272	272	239	**783**
519 Food and beverage sales, grocery store	273	261	246	**780**
131 Church, mosque, synagogue, temple, chapel	293	243	201	**737**
951 Railroad right of way	179	232	241	**652**
200 Educational, other	186	206	142	**534**
700 Manufacturing, processing	186	187	147	**520**
460 Dormitory type residence, other	193	192	121	**506**
160 Eating, drinking places	189	147	142	**478**
972 Aircraft runway	191	179	106	**476**
549 Specialty shop	166	174	130	**470**
124 Playground	135	132	200	**467**
800 Storage, other	142	142	130	**414**
340 Clinics, Doctors' offices, hemodialysis centers	117	107	103	**327**
529 Textile, wearing apparel sales	114	121	90	**325**

5.2.3 Simultaneous Analysis

Simultaneous incidents occur when other incidents are underway at the time a new incident begins. During 2020, the simultaneous incident activity rate was 10 or more incidents 94.52 percent of the time.

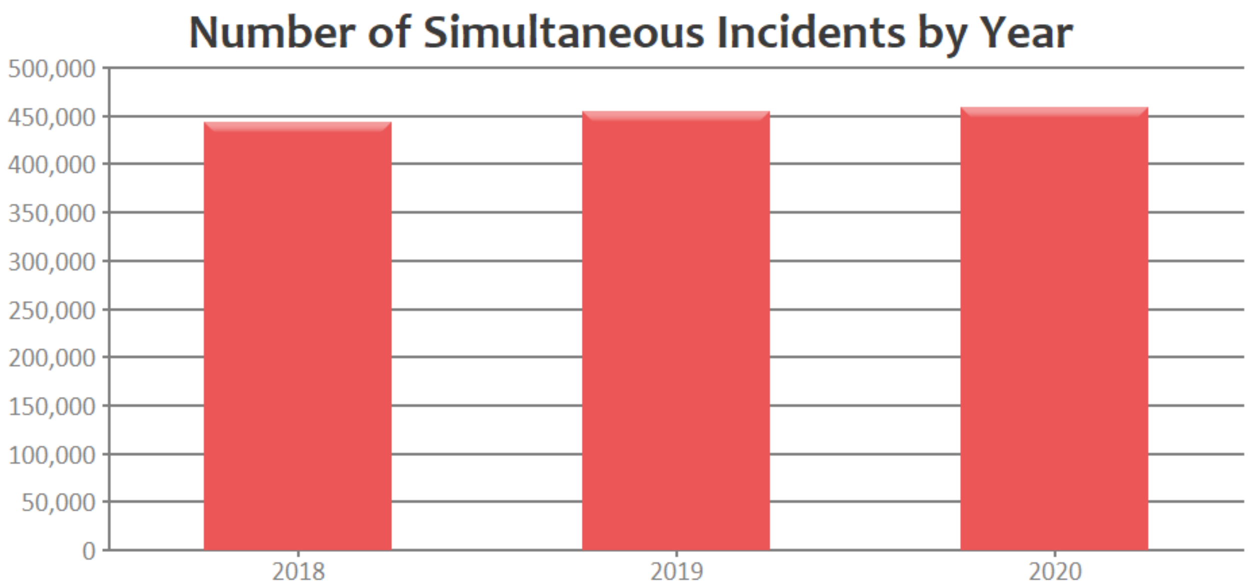
Table 19—Simultaneous Incident Activity – 2020

Number of Simultaneous Incidents	Percentage
10 or more simultaneous incidents	94.52%
11 or more simultaneous incidents	93.74%
12 or more simultaneous incidents	92.74%
13 or more simultaneous incidents	91.51%
14 or more simultaneous incidents	90.08%
15 or more simultaneous incidents	88.43%
16 or more simultaneous incidents	86.62%

Number of Simultaneous Incidents	Percentage
17 or more simultaneous incidents	84.69%
18 or more simultaneous incidents	82.69%
19 or more simultaneous incidents	80.67%
20 or more simultaneous incidents	78.47%
21 or more simultaneous incidents	76.21%
22 or more simultaneous incidents	73.78%
23 or more simultaneous incidents	71.23%
24 or more simultaneous incidents	68.58%
25 or more simultaneous incidents	65.78%
26 or more simultaneous incidents	62.81%
27 or more simultaneous incidents	59.63%
28 or more simultaneous incidents	56.32%
29 or more simultaneous incidents	52.85%
30 or more simultaneous incidents	49.24%
31 or more simultaneous incidents	45.52%
32 or more simultaneous incidents	41.79%
33 or more simultaneous incidents	38.09%
34 or more simultaneous incidents	34.45%
35 or more simultaneous incidents	30.94%
36 or more simultaneous incidents	27.61%
37 or more simultaneous incidents	24.40%
38 or more simultaneous incidents	21.36%
39 or more simultaneous incidents	18.57%
40 or more simultaneous incidents	16.05%
41 or more simultaneous incidents	13.80%
42 or more simultaneous incidents	11.78%
43 or more simultaneous incidents	10.00%

The following figure shows the number of simultaneous incidents is increasing year by year. This figure echoes the previous table by showing that most incidents in Los Angeles occur while other incidents are underway.

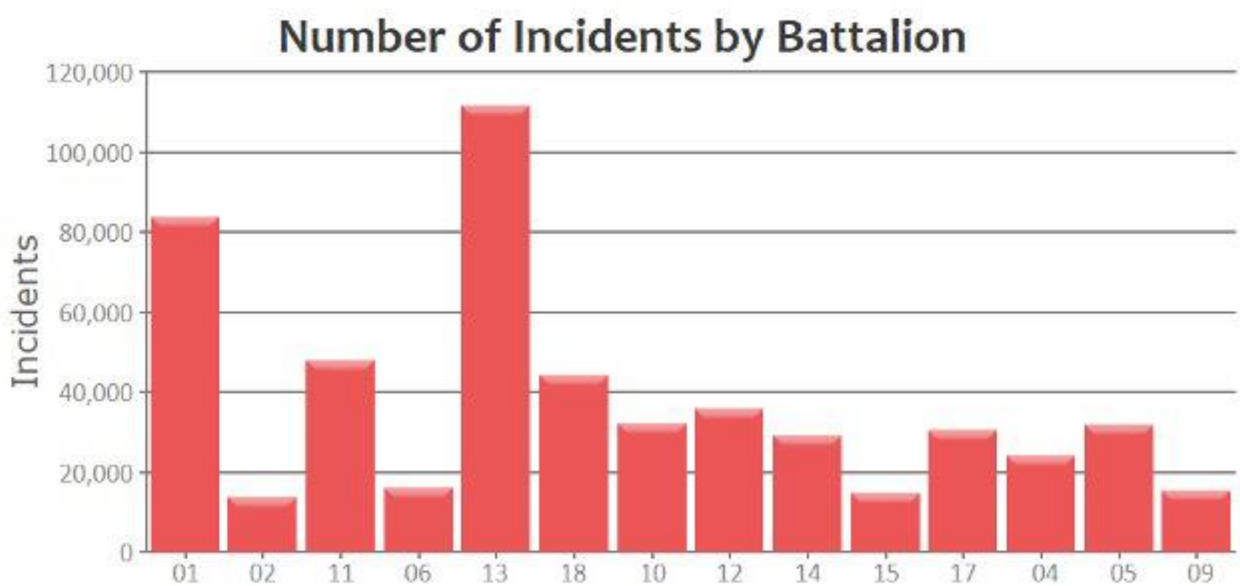
Figure 8—Number of Simultaneous Incidents by Year



In a larger city, simultaneous incidents in different station areas usually have very little operational consequence. However, when simultaneous incidents occur within a single station area there can be significant delays in response times.

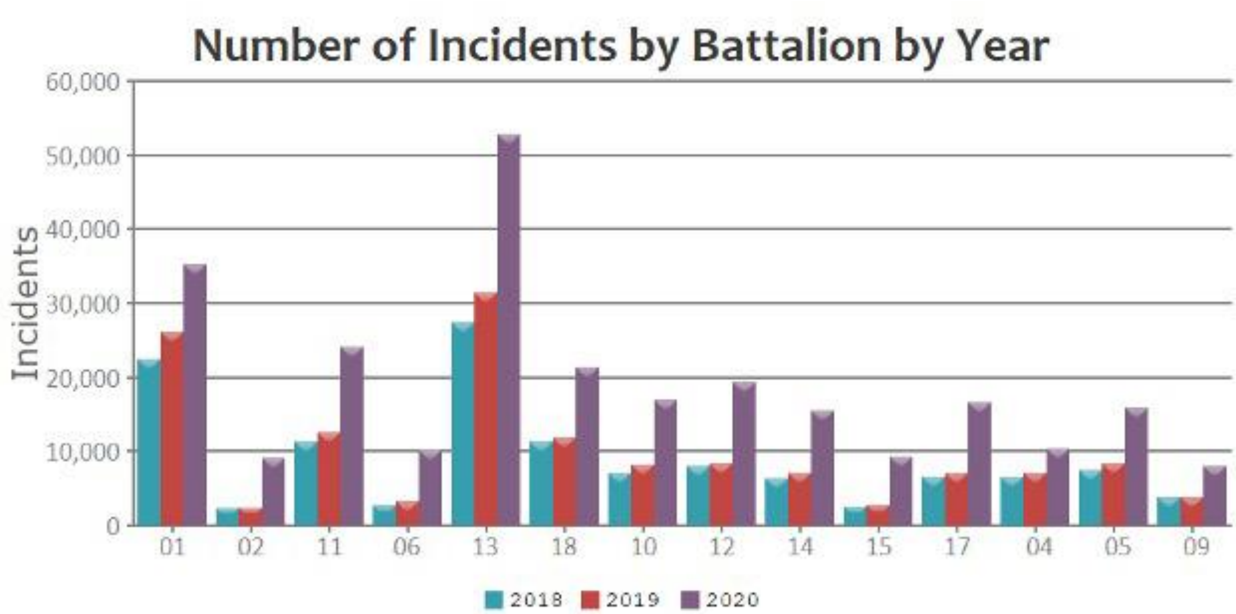
The following figure illustrates the number of single-station simultaneous incidents by battalion for the three years of this study. Stations in Battalion 13 have, by far, the greatest number of single-station simultaneous incidents. Stations in Battalions 2 and 15 have the smallest number.

Figure 9—Number of Single-Station Simultaneous Incidents by Battalion



The following figure illustrates single-station simultaneous incidents by battalion by year.

Figure 10—Number of Single-Station Simultaneous Incidents by Battalion by Year



From 2018 through 2020 there were more than 533,000 single-station simultaneous incidents. The following table illustrates single-station simultaneous activity by hour of day and day of week over the three-year analysis. The redder the cell, the more likely there will be multiple simultaneous incidents within a single station area. Not surprisingly, high simultaneous activity tends to mirror high activity times for incidents in general.

Table 20—Single-Station Simultaneous Incidents by Hour of Day and Day of Week – 2018–2020

Hour	1 Mon	2 Tue	3 Wed	4 Thu	5 Fri	6 Sat	7 Sun	Total
00:00	2,037	1,928	1,865	1,977	1,978	2,490	2,724	**14,999**
01:00	1,957	1,577	1,626	1,665	1,697	2,105	2,523	**13,150**
02:00	1,447	1,271	1,374	1,399	1,385	1,862	2,196	**10,934**
03:00	1,280	1,143	1,184	1,190	1,142	1,480	1,581	**9,000**
04:00	1,239	1,003	1,008	1,152	1,104	1,259	1,332	**8,097**
05:00	1,206	1,145	1,093	1,197	1,173	1,180	1,256	**8,250**
06:00	1,563	1,500	1,499	1,532	1,486	1,421	1,293	**10,294**
07:00	2,366	2,222	2,254	2,280	2,095	1,793	1,638	**14,648**
08:00	3,198	3,040	3,123	3,204	2,945	2,428	2,314	**20,252**
09:00	3,922	3,869	3,958	4,006	3,725	3,028	2,835	**25,343**
10:00	4,527	4,526	4,529	4,511	4,355	3,618	3,469	**29,535**
11:00	4,817	4,642	4,756	4,865	4,452	3,869	3,600	**31,001**
12:00	5,017	4,952	4,770	4,837	4,596	4,149	3,935	**32,256**
13:00	4,758	4,751	4,773	4,800	4,602	4,147	3,777	**31,608**
14:00	4,841	4,707	4,858	4,835	4,662	4,302	4,025	**32,230**
15:00	4,696	4,570	4,679	4,701	4,606	4,161	3,903	**31,316**
16:00	4,519	4,442	4,486	4,476	4,585	4,156	3,842	**30,506**
17:00	4,669	4,608	4,746	4,574	4,836	4,226	4,132	**31,791**
18:00	4,370	4,366	4,353	4,395	4,594	4,278	3,885	**30,241**
19:00	3,937	4,039	4,057	4,162	4,303	4,009	3,833	**28,340**
20:00	3,810	3,587	3,770	3,800	3,907	4,043	3,700	**26,617**
21:00	3,369	3,315	3,423	3,418	3,564	3,670	3,377	**24,136**
22:00	2,803	2,827	2,844	2,869	3,257	3,512	2,946	**21,058**
23:00	2,304	2,332	2,444	2,431	2,849	2,968	2,486	**17,814**
Total	**78,652**	**76,362**	**77,472**	**78,276**	**77,898**	**74,154**	**70,602**	**533,416**

5.2.4 Station Demand Percentage

The following table summarizes overall hourly activity percentages by station for 2020. The percentage listed is the percentage of likelihood a particular station was involved in an incident at any given hour. This number considers not only the number of incidents but also the duration of those incidents. Only the top 10 busiest stations are listed. A separate Microsoft Excel exhibit (Exhibit 1) has been provided to illustrate the activity percentage for all individual units. Multiple simultaneous incidents handled by multiple station resources can drive a station demand percentage above 100 percent.

Table 21—Station Demand by Hour – 2020

Hour	Station 009	Station 064	Station 057	Station 066	Station 046	Station 011	Station 004	Station 033	Station 089	Station 094
00:00	66.98%	63.93%	59.45%	56.46%	50.20%	51.80%	39.10%	44.59%	36.11%	33.89%
01:00	75.41%	64.84%	70.73%	44.18%	53.79%	45.40%	45.26%	50.20%	34.35%	33.47%
02:00	65.95%	60.45%	47.62%	45.39%	42.86%	39.16%	29.26%	34.00%	27.73%	21.65%
03:00	61.58%	51.10%	48.66%	52.46%	45.87%	37.04%	24.27%	38.17%	24.27%	25.40%
04:00	68.05%	42.47%	43.84%	42.17%	34.57%	34.62%	24.20%	28.94%	32.32%	30.58%
05:00	57.58%	57.02%	47.48%	39.26%	40.34%	40.53%	27.02%	34.41%	26.83%	26.84%
06:00	71.49%	68.58%	52.89%	44.92%	40.52%	36.61%	39.29%	35.37%	26.81%	32.22%
07:00	93.67%	70.99%	63.97%	58.08%	57.65%	46.34%	61.68%	44.06%	35.08%	37.28%
08:00	103.60%	83.33%	68.74%	80.10%	60.97%	62.10%	140.63%	48.95%	50.49%	46.01%
09:00	120.96%	84.71%	81.15%	85.01%	81.42%	70.43%	129.46%	65.83%	58.08%	61.11%
10:00	140.58%	110.81%	111.93%	99.78%	82.13%	79.00%	101.81%	69.47%	56.91%	64.51%
11:00	125.59%	104.85%	97.02%	90.75%	81.98%	90.09%	87.68%	77.69%	51.93%	65.40%
12:00	214.96%	103.38%	103.87%	89.16%	82.17%	84.21%	83.13%	74.75%	65.43%	62.94%
13:00	119.97%	99.51%	95.78%	91.74%	74.79%	82.72%	72.35%	71.28%	62.69%	60.64%
14:00	136.41%	109.66%	111.26%	97.02%	83.65%	89.47%	86.29%	78.86%	58.67%	57.93%
15:00	133.49%	103.70%	94.49%	99.56%	90.07%	80.09%	60.62%	72.87%	61.60%	60.42%
16:00	117.05%	107.11%	99.99%	94.99%	85.15%	80.13%	57.54%	77.27%	54.19%	64.59%
17:00	121.55%	111.92%	117.21%	108.30%	87.49%	84.43%	51.78%	74.64%	65.67%	62.55%
18:00	112.35%	108.47%	105.98%	96.31%	87.30%	70.69%	50.12%	71.25%	59.30%	53.29%
19:00	95.47%	108.96%	108.60%	96.67%	75.25%	65.51%	48.62%	73.54%	52.68%	43.47%
20:00	93.04%	103.78%	96.32%	84.67%	82.25%	70.06%	49.81%	66.15%	50.49%	50.29%
21:00	83.56%	93.85%	90.13%	76.87%	70.95%	69.56%	45.47%	62.20%	58.34%	41.72%
22:00	86.07%	91.29%	85.55%	63.57%	56.77%	67.08%	46.15%	57.78%	39.30%	39.59%
23:00	73.50%	74.45%	75.97%	60.17%	61.89%	51.76%	39.92%	46.19%	40.46%	36.72%
Overall	**101.62%**	**86.63%**	**82.44%**	**74.90%**	**67.08%**	**63.70%**	**60.06%**	**58.27%**	**47.07%**	**46.35%**
Runs	**19,986**	**15,756**	**12,952**	**12,778**	**11,020**	**12,422**	**7,929**	**10,864**	**9,150**	**7,032**

5.2.5 Unit-Hour Utilization

The unit-hour utilization (UHU) percentage for apparatus is calculated by two primary factors: the number of responses and the duration of responses.

What should the maximum utilization percentage on a firefighting unit be? When crews on a 24-hour shift must also pay attention to apparatus checkout, station duties, training, public education, paperwork, as well as required physical training and meal breaks, Citygate believes the maximum commitment UHU per hour across the normal workday should not exceed 30 percent. Beyond that, the most important duties to suffer will be training hours and employee health and wellness.

For a dedicated unit, such as an ambulance or low-acuity unit *working less than* a 24-hour shift, UHU can rise to 40 to 50 percent at a maximum. At that UHU level, Peak Activity Units (PAUs) must then have additional duty days specifically for training, during which they are not responding to incidents, to meet their annual requirements for continuing education and training hours.

The following table summarizes UHU for the 10 busiest LAFD engine companies. The busiest engines are listed first. A separate Microsoft Excel exhibit (Exhibit 1) has been provided to illustrate the hourly UHU percentages for all truck companies.

Table 22—Unit-Hour Utilization – Engine Companies – 2020

Hour	E64	E57	E33	E11	E66	E46	E209	E9	E4	E7
00:00	38.43%	25.23%	32.19%	20.97%	22.29%	26.20%	17.56%	33.18%	17.47%	17.34%
01:00	21.97%	21.03%	25.52%	16.39%	17.27%	19.54%	16.63%	24.70%	15.16%	21.09%
02:00	24.21%	17.19%	18.56%	16.51%	15.53%	15.93%	15.29%	18.60%	18.19%	14.81%
03:00	20.79%	24.29%	19.14%	19.62%	20.17%	27.33%	14.80%	14.90%	11.32%	13.15%
04:00	17.91%	18.60%	15.89%	22.45%	17.51%	14.37%	19.62%	21.15%	12.31%	12.80%
05:00	23.51%	19.44%	15.25%	17.48%	13.23%	16.67%	15.45%	14.66%	13.81%	12.78%
06:00	22.79%	20.56%	21.57%	13.64%	13.93%	12.91%	18.70%	18.10%	12.54%	13.46%
07:00	18.42%	25.27%	15.11%	17.26%	14.11%	22.28%	18.00%	17.77%	17.98%	19.19%
08:00	28.35%	20.45%	16.79%	20.57%	23.51%	16.25%	19.55%	20.47%	14.63%	17.50%
09:00	19.21%	22.04%	31.41%	37.07%	24.53%	23.50%	19.95%	21.23%	27.14%	19.33%
10:00	21.03%	29.64%	20.97%	39.09%	29.27%	26.67%	23.69%	23.16%	22.50%	26.83%
11:00	36.29%	31.87%	22.63%	26.68%	26.84%	23.45%	27.73%	21.92%	23.82%	22.26%
12:00	25.58%	32.90%	23.68%	29.06%	27.75%	30.55%	45.30%	28.77%	43.80%	27.18%
13:00	26.19%	33.15%	25.80%	24.55%	24.99%	22.73%	21.86%	19.95%	23.62%	28.47%
14:00	26.79%	34.81%	35.15%	42.33%	31.86%	28.46%	31.76%	37.24%	25.46%	28.68%
15:00	29.03%	33.63%	29.73%	35.97%	30.79%	28.95%	26.07%	33.33%	22.94%	26.76%
16:00	42.15%	33.98%	30.73%	29.47%	27.56%	30.46%	33.88%	29.61%	34.06%	30.57%
17:00	31.51%	37.96%	30.58%	27.23%	37.56%	28.25%	26.32%	31.70%	22.57%	24.60%
18:00	31.98%	31.87%	28.26%	23.34%	23.15%	32.21%	49.81%	21.99%	42.17%	28.29%
19:00	32.21%	32.92%	31.33%	22.12%	36.13%	30.52%	28.04%	26.72%	23.97%	26.69%
20:00	37.65%	35.12%	30.09%	23.53%	28.20%	30.91%	27.88%	29.46%	22.61%	27.62%
21:00	42.12%	28.29%	29.02%	28.07%	28.30%	27.06%	17.66%	15.93%	21.26%	25.08%
22:00	32.47%	28.12%	28.24%	24.66%	32.75%	25.43%	19.05%	19.18%	20.25%	21.82%
23:00	24.47%	22.24%	19.05%	17.88%	20.40%	19.13%	17.89%	17.87%	15.71%	18.14%
Runs	**7,684**	**7,338**	**6,472**	**6,340**	**6,813**	**6,098**	**5,980**	**5,927**	**4,591**	**5,610**

The following table shows unit-hour utilization for the 10 busiest truck companies, with the busiest trucks listed first. A separate Microsoft Excel exhibit (Exhibit 1) has been provided to illustrate the hourly UHU percentages for all truck companies.

Table 23—Unit-Hour Utilization – Truck Companies – 2020

Hour	T9	T10	T11	T98	T64	T27	T33	T89	T3	T60
00:00	29.24%	13.23%	16.74%	10.34%	10.72%	8.22%	22.18%	11.92%	19.93%	13.88%
01:00	13.22%	18.42%	10.50%	12.01%	7.05%	19.94%	5.85%	11.01%	10.29%	9.26%
02:00	15.05%	19.32%	13.67%	8.28%	13.65%	8.87%	11.93%	6.89%	9.91%	6.76%
03:00	12.96%	17.74%	17.86%	9.86%	8.16%	8.96%	12.59%	8.47%	11.60%	7.96%
04:00	15.54%	8.04%	9.16%	4.45%	6.92%	10.47%	9.09%	4.17%	6.63%	2.80%
05:00	12.41%	12.63%	11.51%	12.24%	12.86%	6.79%	10.93%	4.92%	13.47%	5.74%
06:00	13.53%	10.95%	7.64%	11.10%	7.85%	7.32%	8.88%	5.54%	10.35%	7.44%
07:00	14.28%	9.55%	8.39%	11.51%	11.63%	13.27%	7.52%	8.96%	7.95%	6.96%
08:00	16.00%	12.98%	17.58%	12.07%	16.76%	15.50%	9.92%	18.29%	9.32%	20.52%
09:00	17.40%	13.11%	23.97%	11.49%	10.52%	18.41%	16.40%	13.56%	11.00%	13.56%
10:00	16.59%	14.34%	24.74%	17.25%	14.75%	23.16%	11.97%	18.10%	10.73%	18.95%
11:00	16.21%	15.23%	21.26%	25.22%	22.45%	13.59%	11.76%	15.71%	13.15%	18.06%
12:00	19.99%	25.09%	22.09%	21.43%	19.44%	19.07%	15.48%	22.19%	10.66%	25.38%
13:00	18.37%	13.37%	18.11%	25.62%	17.06%	14.10%	14.28%	17.60%	15.27%	15.77%
14:00	22.96%	21.79%	20.80%	24.41%	17.25%	20.29%	18.46%	18.75%	20.99%	15.68%
15:00	20.69%	23.27%	18.65%	21.73%	21.26%	16.12%	17.18%	18.93%	18.45%	22.74%
16:00	17.85%	21.89%	14.85%	23.55%	19.76%	21.11%	18.27%	17.54%	22.04%	15.76%
17:00	21.50%	22.64%	16.35%	21.52%	22.25%	17.24%	19.62%	19.33%	22.32%	17.16%
18:00	28.15%	40.09%	19.52%	20.43%	16.54%	14.71%	24.29%	20.72%	34.18%	20.86%
19:00	18.54%	18.71%	13.50%	16.79%	16.63%	16.12%	14.96%	23.06%	13.65%	17.11%
20:00	18.63%	18.59%	20.14%	15.88%	22.63%	17.07%	17.56%	13.45%	16.52%	16.08%
21:00	17.17%	17.02%	16.29%	18.50%	19.94%	14.13%	18.68%	17.57%	9.84%	17.25%
22:00	21.44%	11.46%	14.60%	11.53%	21.21%	18.36%	19.31%	10.15%	13.67%	9.68%
23:00	15.08%	11.94%	12.55%	11.11%	10.17%	10.97%	7.36%	13.83%	8.17%	11.28%
Runs	**5,186**	**3,433**	**4,322**	**3,154**	**3,967**	**3,327**	**3,414**	**3,460**	**2,932**	**3,147**

The following table illustrates a unit-hour utilization summary for Rescue Ambulances (RA), with the busiest RAs listed first.

Table 24—Unit-Hour Utilization – RA – 2020

Hour	RA857	RA11	RA9	RA809	RA846	RA209	RA257	RA866	RA881	RA57
00:00	35.57%	29.38%	24.12%	26.05%	21.68%	24.72%	23.40%	27.98%	34.86%	28.37%
01:00	27.14%	25.98%	30.11%	30.96%	28.78%	27.45%	38.73%	33.22%	26.14%	32.03%
02:00	19.31%	19.50%	25.31%	22.86%	20.08%	24.28%	17.88%	15.38%	24.34%	19.85%
03:00	25.38%	26.24%	24.75%	21.82%	15.78%	20.84%	28.07%	19.14%	24.08%	18.50%
04:00	23.21%	21.80%	21.14%	20.64%	22.60%	18.85%	20.03%	17.40%	19.43%	18.34%
05:00	22.28%	27.67%	27.59%	24.36%	22.93%	27.43%	19.54%	12.61%	19.67%	18.94%
06:00	28.73%	30.77%	62.79%	28.52%	20.01%	46.32%	33.61%	23.27%	17.15%	27.66%
07:00	27.86%	44.98%	27.09%	38.64%	35.28%	32.26%	24.43%	28.50%	32.83%	33.68%
08:00	38.99%	39.27%	33.79%	33.31%	41.46%	35.86%	44.64%	38.63%	29.51%	27.75%
09:00	42.52%	51.41%	53.36%	49.48%	41.35%	57.17%	37.88%	45.95%	35.06%	36.66%
10:00	48.80%	46.90%	41.79%	43.99%	49.61%	46.26%	47.75%	51.29%	44.33%	40.71%
11:00	48.54%	48.46%	48.89%	47.84%	44.39%	43.11%	45.55%	43.12%	38.22%	45.36%
12:00	37.53%	54.81%	48.92%	54.69%	53.49%	45.89%	41.06%	45.89%	54.61%	44.49%
13:00	48.63%	50.70%	49.01%	49.30%	45.14%	46.66%	48.92%	52.09%	42.35%	37.67%
14:00	52.80%	49.02%	42.75%	50.27%	56.13%	48.08%	41.96%	44.42%	49.68%	46.90%
15:00	45.01%	47.56%	54.25%	57.92%	57.04%	51.95%	47.99%	48.81%	47.48%	49.62%
16:00	49.42%	53.07%	41.94%	51.37%	51.16%	49.13%	49.88%	44.91%	51.34%	51.25%
17:00	59.99%	45.65%	38.15%	52.14%	54.39%	40.53%	59.94%	52.79%	40.34%	51.14%
18:00	53.73%	52.30%	44.43%	46.76%	41.70%	43.51%	44.43%	46.71%	48.93%	44.02%
19:00	44.71%	38.64%	43.31%	37.60%	43.07%	45.26%	55.40%	47.05%	42.73%	45.26%
20:00	54.15%	41.57%	42.76%	34.06%	47.74%	36.04%	42.23%	47.89%	40.69%	49.83%
21:00	46.04%	41.38%	30.00%	28.90%	38.41%	32.25%	39.80%	41.74%	44.72%	37.72%
22:00	49.09%	36.74%	36.32%	33.98%	30.99%	35.48%	33.11%	38.70%	31.69%	34.94%
23:00	34.08%	28.82%	27.11%	29.26%	29.13%	31.47%	20.52%	28.31%	32.02%	26.90%
Runs	**5,668**	**5,159**	**5,227**	**6,522**	**4,819**	**5,070**	**4,198**	**5,644**	**5,483**	**4,263**

Finding #8:	The top ten busiest engines, trucks, and rescue ambulance companies' unit-hour utilization measures significantly exceed 30 percent for several hours or more at a time. Based on this measure alone, the busiest unit crews are overworked and need relief units and/or strategies to decrease the quantity of non-urgent EMS incidents.
Finding #9:	The volume and simultaneous demand of 10 to 28 LAFD stations is the highest Citygate has measured in a metro client to date. Given the likelihood that some of these stations are adjacent to each other—as population density zones are typically larger than a single fire station area—Citygate located the top 10 stations and then expanded the search to the top 28.
Finding #10:	As shown in Map #18, there are three clusters in the east-central and southern City core containing 16 of the top 28 stations for workload demand, and nine of the top 10. In the northern Valley area, there are two clusters containing five of the top 28, with one of the top ten. There are seven other stations in the top 28, but they exist as individual stations without an adjacent busy station.
Finding #11:	Battalion 1 in the east-central area of the City has three of the top 10 overworked stations; Battalion 13 in the southern area of the City has another five of the top 10.
Finding #12:	The importance of this clustering measure is that for long, consecutive hours of the day, large numbers of fire crews are busy with only EMS calls, leaving the area underserved for an immediate need fire or rescue response, even when many of the busiest stations have multiple crews assigned to them.

5.3 DISTRIBUTION RESPONSE TIME PERFORMANCE

This sub-section reports performance for the first apparatus to arrive on the scene of emergency incidents. Measurements are presented two ways - the number of minutes and seconds necessary for 90 percent completion and average time for completion of 100% of all occurrences.

- Call processing

- Turnout
- Travel
- Dispatch to arrival
- Call to arrival

Each one of these components starts with a year-to-year comparison followed by a representation of compliance.

5.3.1 Call Processing

Call processing measures the time from the first incident timestamp until apparatus are notified of the request for assistance.

Call processing performance definitions vary depending on what is being measured. If the first timestamp on an incident takes place at the time the fire communication centers receive a 9-1-1 call from the police PSAP, then call processing includes the full fire dispatcher processing. Otherwise, the performance here represents only a portion of the entire call processing operation.

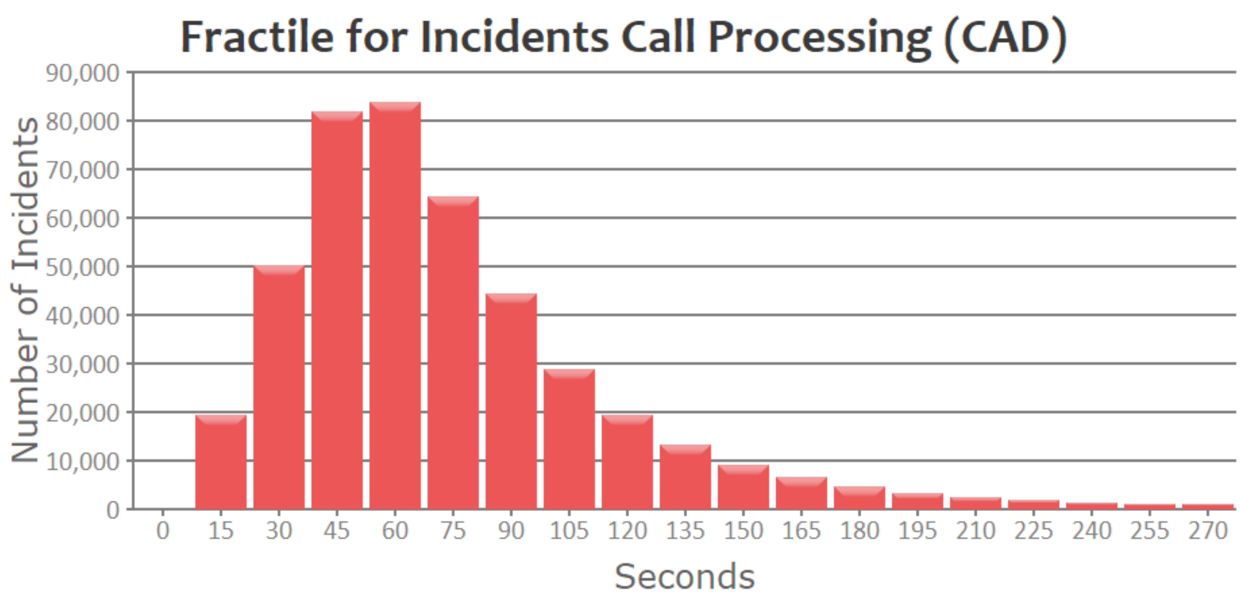
There is another consideration. Not all requests for assistance are received via 9-1-1 calls. Generally, there will be a mix of channels for receiving requests for assistance. Each channel will have a timestamp at a different point in the processing operation. This is not as much of a factor if most requests are received via 9-1-1 PSAP.

Table 25—Call Processing Analysis – 90 Percent Performance

Battalion	Overall	2018	2019	2020	2020 Average
Department-Wide	**02:04** (1,309,254)	**02:05** (430,872)	**02:03** (438,873)	**02:03** (439,509)	**1:08**
1	02:08 (166,290)	02:09 (54,487)	02:08 (56,740)	02:08 (55,063)	1:09
2	02:03 (49,805)	02:05 (16,338)	02:04 (16,244)	02:01 (17,223)	1:07
11	02:08 (112,166)	02:10 (35,714)	02:07 (37,229)	02:08 (39,223)	1:10
6	02:06 (53,777)	02:08 (17,350)	02:05 (17,772)	02:06 (18,655)	1:10
13	02:02 (215,142)	02:02 (70,011)	02:01 (70,906)	02:04 (74,225)	1:07
18	02:00 (108,646)	02:01 (37,282)	01:59 (36,314)	01:59 (35,050)	1:06
10	02:02 (87,696)	02:02 (28,901)	02:01 (29,385)	02:01 (29,410)	1:07
12	02:05 (91,366)	02:07 (29,394)	02:04 (29,689)	02:05 (32,283)	1:09
14	01:59 (78,261)	02:01 (25,405)	01:58 (26,167)	01:57 (26,689)	1:05
15	01:54 (52,525)	01:55 (17,599)	01:54 (17,479)	01:54 (17,447)	1:05
17	01:59 (85,120)	01:59 (27,851)	01:58 (28,298)	01:59 (28,971)	1:06
4	02:10 (68,705)	02:15 (23,969)	02:09 (24,785)	02:06 (19,951)	1:10
5	02:04 (89,622)	02:06 (29,685)	02:03 (30,749)	02:04 (29,188)	1:08
9	02:02 (50,133)	02:02 (16,886)	02:03 (17,116)	02:02 (16,131)	1:08

The following figure illustrates that many calls are being processed between 45 and 60 seconds. There are, however, some calls that require longer processing times, typically due to language barriers or difficult locations such a freeways or open space areas.

Figure 11—Fractile for Incidents Call Processing



Finding #13:	At 2:03 minutes in 2020, call-processing performance to 90 percent of fire and EMS incidents is only 33 seconds longer than Citygate's and the National Fire Protection Association's 1:30-minute recommendation where no language or location identification barriers exist. In light of the size of the City and the typical barriers to a short 9-1-1 call, the LAFD's average processing time of 1:08 minutes is very good as 235,855 incidents are processed faster than best practice guidelines.

5.3.2 Turnout

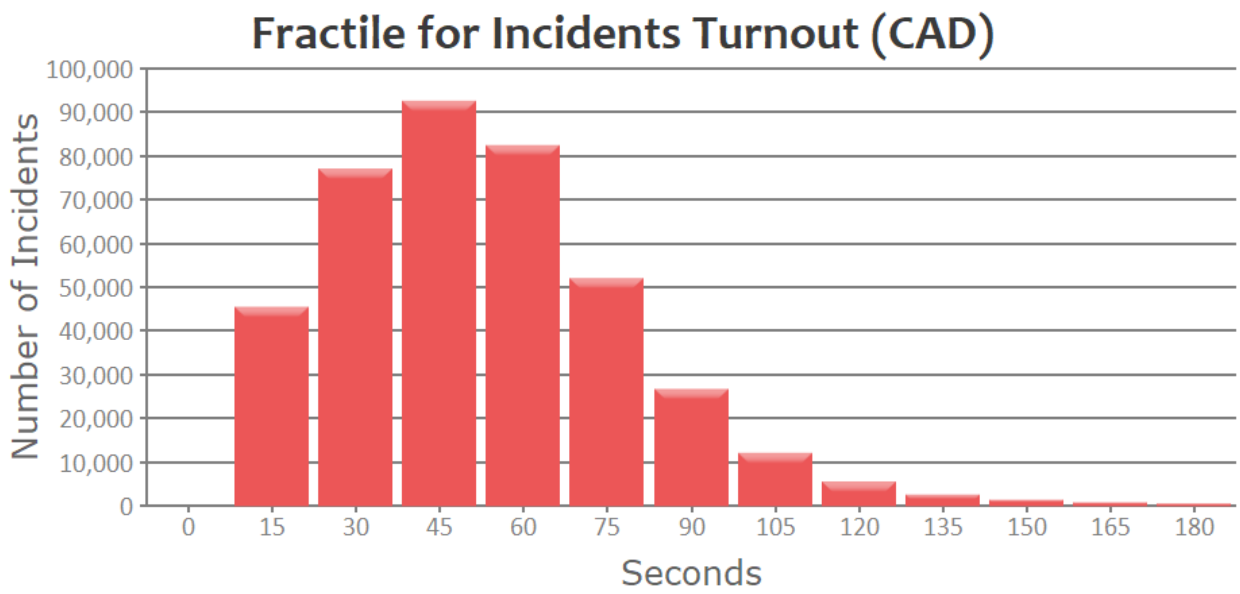
Turnout measures the time from apparatus notification until apparatus start traveling to the scene. A maximum 2:00-minute goal across a 24-hour day is used for measurement. This goal is consistently met by more than 30 seconds.

Table 26—Turnout Analysis – 90 Percent Performance

Battalion	Overall	2018	2019	2020	2020 Average
Department-Wide	**01:23** (1,275,702)	**01:24** (424,973)	**01:22** (433,503)	**01:21** (417,226)	**0:47**
1	01:29 (160,125)	01:31 (52,932)	01:29 (55,536)	01:28 (51,657)	0:49
2	01:21 (48,847)	01:21 (16,347)	01:20 (16,140)	01:23 (16,360)	0:50
11	01:22 (109,540)	01:25 (35,094)	01:21 (36,696)	01:20 (37,750)	0:46
6	01:27 (52,858)	01:29 (17,264)	01:29 (17,759)	01:24 (17,835)	0:51
13	01:20 (213,017)	01:23 (70,349)	01:20 (71,066)	01:18 (71,602)	0:45
18	01:20 (105,606)	01:21 (36,624)	01:20 (35,786)	01:19 (33,196)	0:46
10	01:22 (85,725)	01:25 (28,583)	01:21 (29,159)	01:20 (27,983)	0:47
12	01:18 (88,926)	01:21 (28,983)	01:18 (29,276)	01:15 (30,667)	0:43
14	01:19 (75,745)	01:24 (24,695)	01:18 (25,721)	01:17 (25,329)	0:46
15	01:18 (51,649)	01:20 (17,572)	01:18 (17,405)	01:18 (16,672)	0:49
17	01:18 (83,007)	01:18 (27,455)	01:17 (27,991)	01:18 (27,561)	0:45
4	01:27 (66,895)	01:25 (23,802)	01:27 (24,619)	01:27 (18,474)	0:52
5	01:25 (85,939)	01:26 (28,824)	01:25 (29,814)	01:23 (27,301)	0:49
9	01:29 (47,823)	01:27 (16,449)	01:29 (16,535)	01:32 (14,839)	0:55

The following figure illustrates fractile turnout performance. Most turnout times fall between 30 seconds and 75 seconds.

Figure 12—Turnout Performance in 15-Second Increments



While the CFAI and the NFPA best practice advice recommends 60 to 80 seconds (fire or EMS) for turnout, it is a standard rarely met in practical experience. Crews hear the dispatch message and don the appropriate personal protective clothing mandated by the Occupational Safety and Health Administration for the type of emergency. Due to this and the floorplan design of some stations, Citygate has long recommended that agencies can reasonably achieve a 2:00-minute crew turnout to 90 percent of emergency incidents.

Finding #14:	At 1:21 minutes, crew turnout performance to 90 percent of fire and EMS incidents, with an average of 47 seconds, is excellent, and shows a rare attention to the importance of delivering prompt turnout times.

5.3.3 Travel

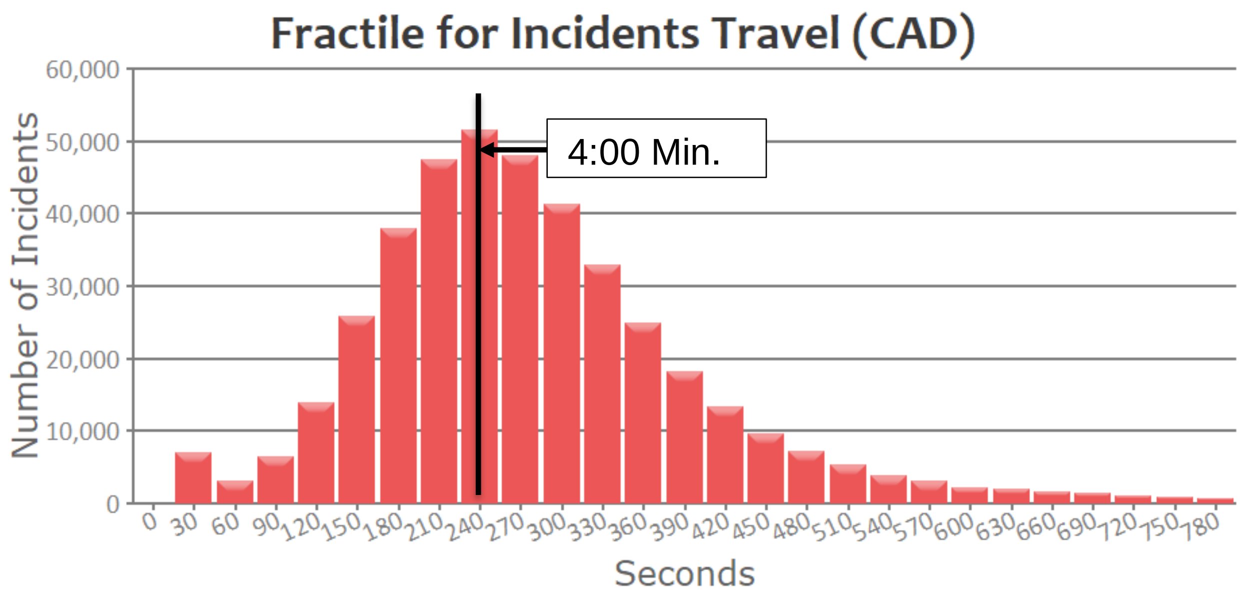
Travel measures time to travel to the scene of the emergency. For effective outcomes at critical emergencies in urban fire departments and as recommended by NFPA #1710, a 4:00-minute travel performance 90 percent of the time is a desirable goal. The Department's overall travel time was at 7:00 minutes in 2020. Battalion 11 had the best travel-time performance while Battalion 4 took approximately 1:30 minutes longer to reach 90 percent compliance.

Table 27—Travel Analysis by Battalion – 90 Percent Performance

Battalion	Overall	2018	2019	2020	2020 Average
Department-Wide	**06:55** (1,267,347)	**06:50** (422,361)	**06:54** (430,882)	**07:00** (414,104)	**4:27**
1	06:21 (159,346)	06:18 (52,716)	06:21 (55,298)	06:25 (51,332)	4:03
2	07:20 (48,388)	07:11 (16,208)	07:23 (15,988)	07:24 (16,192)	4:36
11	06:06 (108,956)	06:07 (34,877)	06:06 (36,528)	06:06 (37,551)	3:51
6	06:57 (52,498)	06:46 (17,156)	06:54 (17,645)	07:07 (17,697)	4:25
13	06:54 (211,818)	06:50 (70,019)	06:51 (70,714)	07:01 (71,085)	4:29
18	07:02 (104,962)	07:01 (36,404)	07:02 (35,598)	07:03 (32,960)	4:36
10	06:43 (85,245)	06:36 (28,448)	06:41 (28,990)	06:52 (27,807)	4:34
12	07:33 (88,248)	07:27 (28,747)	07:27 (29,106)	07:44 (30,395)	4:55
14	06:42 (75,304)	06:35 (24,542)	06:43 (25,577)	06:48 (25,185)	4:24
15	06:30 (51,327)	06:25 (17,468)	06:25 (17,327)	06:41 (16,532)	4:24
17	07:05 (82,493)	06:54 (27,298)	07:03 (27,848)	07:16 (27,347)	4:44
4	07:35 (66,205)	07:26 (23,580)	07:44 (24,327)	07:38 (18,298)	4:47
5	07:05 (85,171)	06:59 (28,599)	07:08 (29,536)	07:07 (27,036)	4:24
9	07:33 (47,386)	07:28 (16,299)	07:35 (16,400)	07:37 (14,687)	4:47

The following figure illustrates fractile travel-time performance. The peak segment for travel performance is 240 seconds, or 4:00 minutes. This data is slightly right shifted, though, which indicates that while many incidents can be reached within the first 4:00 minutes, there are still many incidents that require longer response times. Also suggestive of a travel time reaching many incidents promptly is the citywide average travel time of 4:27 minutes in 2020.

<u>Figure 13—Fractile for Incidents Travel in 30-Second Increments</u>



While NFPA Standard 1710 recommends a 4:00-minute travel time goal in urban areas, given the topography and traffic congestion in LAFD's service area as shown in the GIS mapping analysis section of this report, this goal is not cost-effectively achievable to 90 percent of the incidents. Just over 70 percent of the incidents are reached in 4:00 minutes.

Finding #15:	At 7:00 minutes, LAFD's fire unit <u>travel</u> times to 90 percent of fire and EMS incidents is slower than the National Fire Protection Association's urban best practice recommendation of 4:00 minutes, due in part to LAFD's difficult topography in some areas, traffic congestion, and simultaneous incidents. The average travel time of 4:27 minutes does reach 193,743 incidents promptly.

5.3.4 Call to Arrival

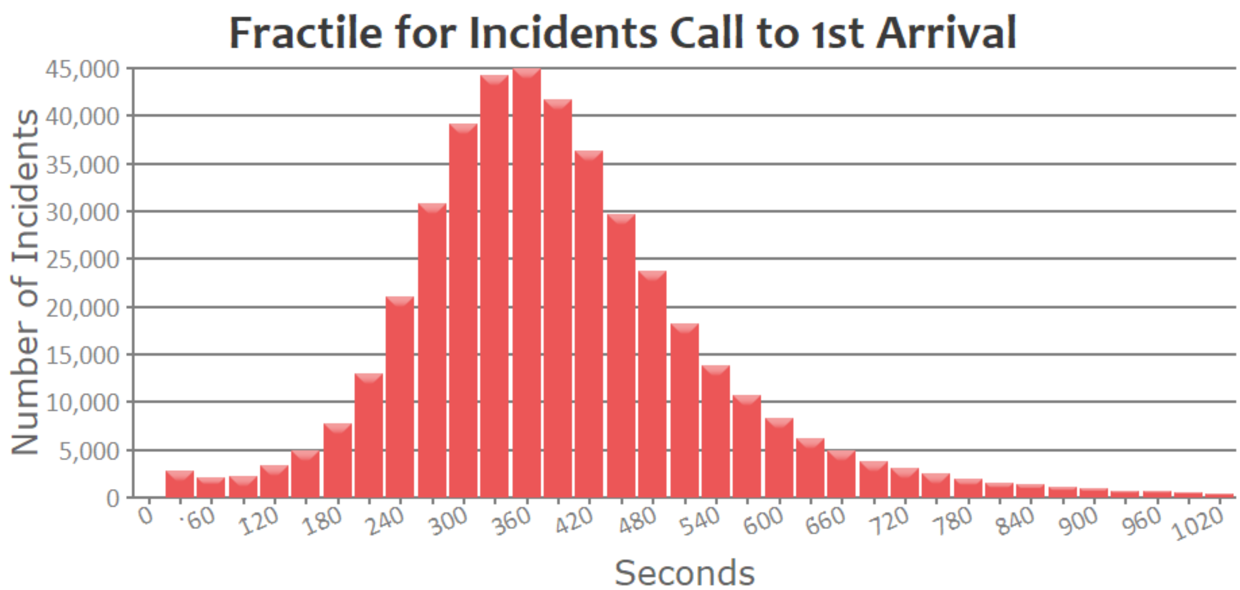
Call to arrival measures time from receipt of the request for assistance until the apparatus arrives on the scene. A call processing of 1:30 minutes in addition to 2:00 minutes for turnout and 4:00

minutes for travel equates to 7:30 minutes or 450 seconds. The Department comes within 1:45 minutes of meeting the 7.30-minute call-to-arrival goal.

Table 28—Call to Arrival Analysis – 90 Percent Performance

Battalion	Overall	2018	2019	2020	2020 Average
Department-Wide	**09:17 (1,313,151)**	**09:14 (436,193)**	**09:16 (445,565)**	**09:21 (431,393)**	**6:20**
1	08:53 (167,181)	08:52 (55,299)	08:52 (57,715)	08:54 (54,167)	5:57
2	09:45 (50,257)	09:38 (16,685)	09:47 (16,653)	09:48 (16,919)	6:32
11	08:33 (112,528)	08:37 (36,105)	08:31 (37,695)	08:32 (38,728)	5:47
6	09:23 (53,942)	09:19 (17,571)	09:19 (18,119)	09:30 (18,252)	6:25
13	09:15 (216,263)	09:09 (71,080)	09:13 (72,080)	09:22 (73,103)	6:21
18	09:20 (108,955)	09:18 (37,713)	09:20 (36,930)	09:22 (34,312)	6:26
10	09:03 (88,147)	08:59 (29,273)	09:01 (29,936)	09:10 (28,938)	6:25
12	09:51 (91,371)	09:51 (29,693)	09:42 (30,059)	10:00 (31,619)	6:45
14	08:59 (78,079)	08:56 (25,415)	08:57 (26,437)	09:04 (26,227)	6:13
15	08:46 (52,789)	08:42 (17,912)	08:41 (17,779)	08:57 (17,098)	6:15
17	09:18 (85,291)	09:10 (28,166)	09:15 (28,761)	09:29 (28,364)	6:33
4	10:04 (68,869)	09:57 (24,294)	10:12 (25,162)	10:04 (19,413)	6:43
5	09:31 (89,579)	09:28 (29,939)	09:33 (31,093)	09:31 (28,547)	6:18
9	10:01 (49,900)	09:55 (17,048)	10:05 (17,146)	10:02 (15,706)	6:43

Figure 14—Call to First-Arrival Performance in 30-Second Increments



Finding #16:	First-due unit call-to-arrival performance to 90 percent of fire and EMS incidents Citywide, at 9:21 minutes, is longer than a best practice goal of 7:30 minutes. However, the average measure of 6:20 minutes means 216,937 incidents received a first responder *faster* than a best practice goal, or 594 times per day in 2020.

5.3.5 Distribution and Concentration Measurements for Building Fires

Moving from first-due unit analysis to multiple units for building fires, an agency should not spread its stations so far apart that it cannot mass an ERF, or First Alarm, to serious, emerging building fires. National best practices recommendations for the ERF in urban areas is that all the needed units arrive within an 8:00-minute travel time. When 1:30 minutes for dispatch and 2:00 minutes for turnout are added, the call receipt to ERF arrival becomes 11:30 minutes.

For a typical house fire in an urban area, a minimum national best practice recommendation is for a force of 15 or more firefighters, plus at least one chief officer for command/safety functions. LAFD serves a metropolitan area consisting of many diverse risk types. The current LAFD Category A ERF for a low-risk residential building fire is three Engines, one Light Force, one Paramedic Rescue Ambulance, one Basic Rescue Ambulances, and one Battalion Command Team for a total of **24** personnel. A more serious risk building fire receives a Category B response of is four Engines, two Light Forces (ladders), one Paramedic Rescue Ambulance, one Basic Rescue Ambulances, one EMS Captain, and one Battalion Command Team for a total of **35** personnel.

Delivering a multi-unit force of eight to eleven units anywhere in the vast city, in an 8:00-minute travel time or less to 90 percent of the service area is very challenging. Again, the ERF measure is primarily a concern of station spacing.

For this analysis, Citygate models travel times for LAFD's Category A and B ERFs using engines and light forces only. Given the larger spacing distances Citywide for rescue ambulances and Battalion Command Teams, those units are not reflected in the following tables to avoid distorting the arrival time capacity of the firefighting units themselves. Given that LAFD staffs engines and ladder trucks with four personnel, the Department delivers a substantial number of firefighters so that critical tasks can be performed simultaneously and effectively until one or more command chiefs can arrive.

The following tables illustrates the time-over-distance travel time challenges of multiple-unit responses. The number of ERF incidents, where all units arrive on-scene in any one year is small in some areas, so the table shows the incident quantity in parenthesis alongside the time to show when a small sample size might lead to statistical volatility.

A *dispatch delay* filter is used to identify and exclude *escalated alarms* from ERF analysis. An escalated alarm is, for example, a single engine company dispatched to a report of an automatic interior alarm. Upon arrival the engine company sees smoke showing and requests an ERF response. Because this incident was not originally dispatched as an ERF incident, it should not be included in the analysis of ERF performance. This analysis uses a 120-second dispatch delay to eliminate escalated alarms.

There are a total of 3,664 building fire incidents to be evaluated for Effective Response Force (ERF). Data for each ERF Response Team is reported in its own following subsection. Incidents beyond the following outlier limits were eliminated from the calculations.

- Dispatch delay less than or equal to 2:00 minutes
- Travel limit of 25:00 minutes
- Call-to-arrival limit of 30:00 minutes

4.1.1 Low-ERF Response Team – LAFD Category A

Table 29—Distribution – First Arrival Travel – 90 Percent Performance

Area	Overall	2018	2019	2020
Department-Wide	04:18 (1,914)	04:17 (601)	04:11 (642)	04:24 (671)
Central Bureau	03:29 (431)	03:34 (137)	03:21 (155)	03:39 (139)
South Bureau	03:55 (582)	04:01 (197)	03:50 (194)	03:50 (191)
Valley Bureau	04:39 (598)	04:35 (177)	04:39 (198)	04:47 (223)
West Bureau	04:41 (303)	04:56 (90)	04:56 (95)	04:25 (118)

Table—Low-ERF Response Team – LAFD Category A – Travel – 90 Percent Performance & Average

Area	Overall	2018	2019	2020	2020 Average
Department-Wide	10:10 (1,931)	10:17 (603)	10:04 (650)	10:14 (678)	8:15
Central Bureau	08:27 (434)	09:14 (137)	07:14 (157)	07:51 (140)	8:39
South Bureau	08:40 (589)	08:33 (198)	07:48 (198)	09:34 (193)	9:53
Valley Bureau	10:47 (602)	10:58 (177)	10:45 (198)	10:22 (227)	9:52
West Bureau	12:04 (306)	12:15 (91)	12:29 (97)	10:59 (118)	8:15

Table 30—Low-ERF Response Team – LAFD Category A – Call-to-Arrival – 90 Percent Performance

Area	Overall	2018	2019	2020
Department-Wide	11:50 (1,931)	11:51 (603)	11:47 (650)	11:49 (678)
Central Bureau	09:53 (434)	10:27 (137)	09:11 (157)	09:23 (140)
South Bureau	09:57 (589)	09:48 (198)	09:04 (198)	11:12 (193)
Valley Bureau	12:29 (602)	12:29 (177)	12:39 (198)	12:12 (227)
West Bureau	13:24 (306)	13:46 (91)	14:05 (97)	11:56 (118)

4.1.3 High-ERF Response Team – LAFD Category B

Table 31—Distribution – First Arrival Travel – 90 Percent Performance

Area	Overall	2018	2019	2020
Department-Wide	04:13 (1,268)	04:11 (393)	04:05 (436)	04:18 (439)
Central Bureau	03:29 (288)	03:25 (91)	03:21 (106)	03:58 (91)
South Bureau	03:54 (385)	04:22 (135)	03:46 (129)	03:41 (121)
Valley Bureau	04:37 (395)	04:38 (113)	04:21 (133)	04:37 (149)
West Bureau	04:30 (200)	04:29 (54)	04:23 (68)	04:30 (78)

Table 32—High-ERF Response Team – LAFD Category B – Travel – 90 Percent Performance & Average

Area	Overall	2018	2019	2020	2020 Average
Department-Wide	14:11 (1,276)	13:37 (393)	14:29 (440)	14:35 (443)	7:41
Central Bureau	13:49 (289)	12:27 (91)	13:54 (106)	14:07 (92)	8:01
South Bureau	13:25 (389)	13:37 (135)	12:29 (132)	13:25 (122)	9:18
Valley Bureau	14:54 (397)	14:54 (113)	16:07 (133)	14:39 (151)	9:28
West Bureau	14:35 (201)	13:10 (54)	14:29 (69)	15:58 (78)	7:41

Table 33—High-ERF Response Team – LAFD Category B – Call-to-Arrival – 90 Percent Performance

Area	Overall	2018	2019	2020
Department-Wide	15:49 (1,276)	14:49 (393)	16:07 (440)	15:52 (443)
Central Bureau	14:57 (289)	13:37 (91)	16:02 (106)	15:04 (92)
South Bureau	14:49 (389)	15:07 (135)	14:04 (132)	15:08 (122)
Valley Bureau	16:15 (397)	16:06 (113)	17:24 (133)	15:52 (151)
West Bureau	16:10 (201)	14:39 (54)	16:07 (69)	17:24 (78)

Finding #17:	Category A first arrival and ERF call-to-arrival times to 90 percent of all occurrences are better than, or very close to, best practices in all but the most geographically challenged areas. This ERF performance is stronger than what Citygate has observed in other metropolitan clients. It is understandable that the Category B response times are longer as more units travel farther to an incident, as with all metropolitan departments.

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Section 6

Firefighting and Rescue Ambulance Deployment Evaluation and Recommendations


13

SECTION 6—FIREFIGHTING AND RESCUE AMBULANCE DEPLOYMENT EVALUATION

6.1 OVERALL DEPLOYMENT EVALUATION

SOC ELEMENT 8 OF 8
OVERALL EVALUATION

LAFD's service area is marked by diverse populations, land uses, hilly topography in some areas, and a public road pattern that, in certain areas, is geographically challenged with rivers, open spaces, and/or a lack of major cross-connecting roadways, limiting LAFD's response times. Population drives EMS service demand, and infill development increases population. As different areas continue to redevelop and add population density, LAFD's services will need adjustment just to *maintain*, much less *improve*, response times across the City's geography—more so when simultaneous incidents occur at peak hours of the day.

In the most densely developed sections of the City, while the substantial growth in EMS incidents over the past decade seems all-consuming, there is still a need for both a first-due firefighting unit and multiple-unit Effective Response Force (ERF) deployment (First Alarm) consistent with current best practices to limit the risk of fire to only part of an affected building and keep wildland fires small and within the initial attack force's capabilities. In other words, *all communities need a standby and readily available firefighting force* that can respond when fires break out, regardless of peak-hour EMS workload.

As shown in this report, Citygate analyzed response times, station locations, and incident workload on the primary types of responding apparatus. This analysis is based on GIS mapping and incident statistics, which combine to formulate Citygate's opinions and overall deployment findings and recommendations in this section.

The LAFD has response time goals and reports its operational metrics via a public website. The LAFD uses an *average* measure of response time, and the CFAI and NFPA communities use a 90-percent-of-goal (*fractile*) measure. Both are effective measures, and both are utilized in this study. All response time measures point to a strong and effective response system, especially in light of the geographic terrain challenges across the City. Overall, LAFD deployment represents the strongest metropolitan area coverage Citygate has ever studied. While field crew deployment needs some adjustment and improvement in key areas, it is not—by any measure—significantly insufficient or in need of major change or fire station relocation.

The ongoing effective deployment of fire and EMS first responder units throughout the City is constrained by one critical issue and a small need to add two resources, which will stabilize current response times and increase firefighting unit availability.

6.1.1 Challenge #1: High-Volume EMS Incident Demands

As the response unit workloads by time of day show, EMS incidents in 2020 comprised 81.9 percent of total incident demand. The peak of this demand occurs during daylight to mid-evening hours and in clusters of high population and simultaneous incidents. Accordingly, even if fire stations are appropriately located and contain multiple staffed apparatus, peak service demand frequently results in all units assigned to a station simultaneously committed to one or more incidents, thus driving some simultaneous service demand to adjoining stations which results in cascading delays on unit travel times and overall response performance.

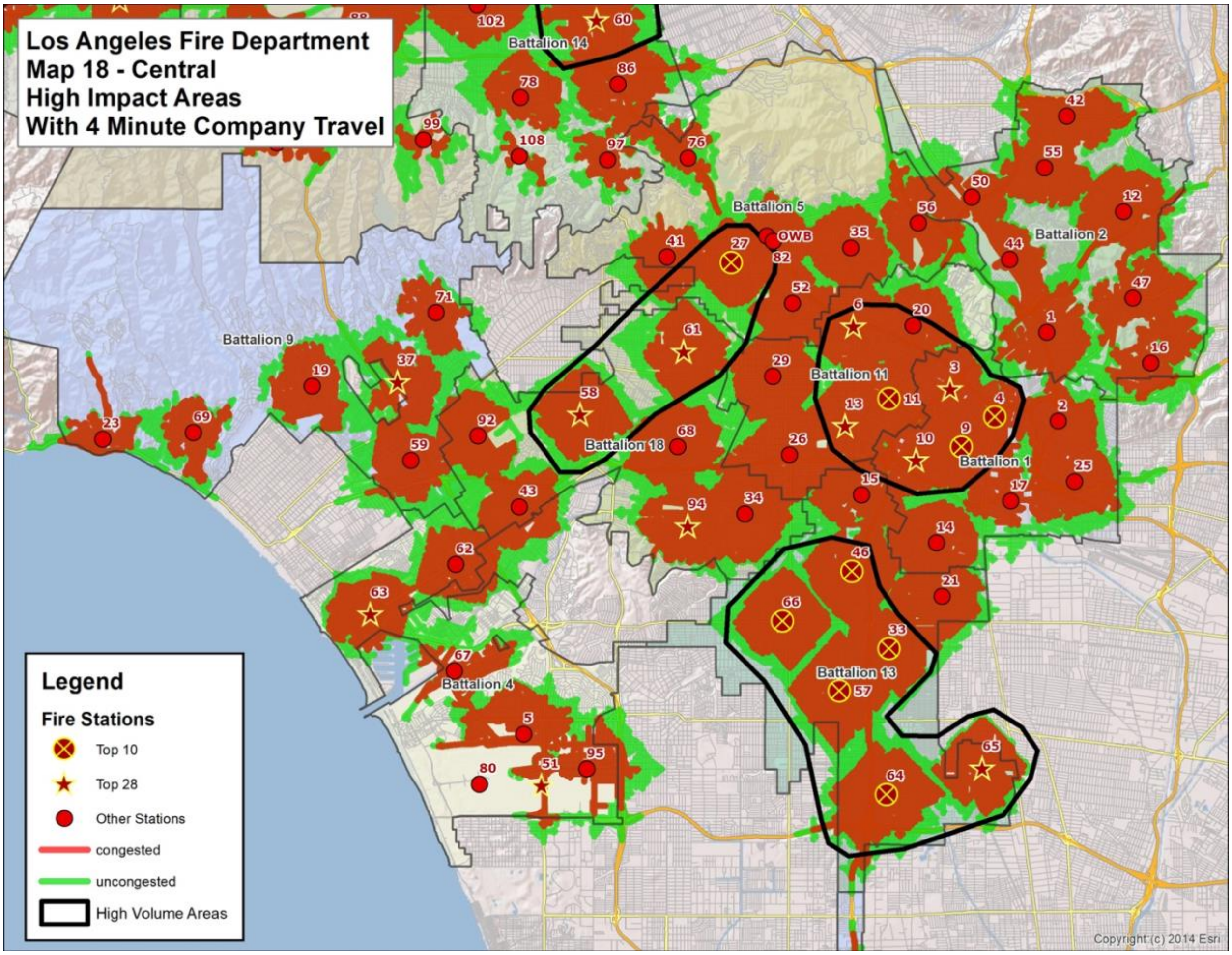
These high workload areas need either (1) more response units or (2) a reduction in non-acute EMS workload, which would be more cost-effective, to stabilize and likely improve response times and availability for serious fire, acute EMS, and technical incidents.

To put the EMS demand in perspective, in 2020, the LAFD responded to 392,949 EMS incidents, some of which had more than one patient. It is not an exaggeration to say the LAFD sees almost half a million patients per year. In 2020, the busiest emergency room in the United States was Parkland Health and Hospital in Dallas, Texas, which saw 210,152 patients. Los Angeles County / USC Medical center was seventh in the nation with 136,161 patients.

In other words, the LAFD is in the human care business, but not all these incidents require traditional emergency medical skills. All incidents do not need the response of a paramedic firefighter engine, truck company, and/or a two-person paramedic or EMT ambulance for a ride to an emergency room. LAFD is well-suited to be an alternative human crisis response agency with specialized responders in addition to LAFD's firefighters. While such an alternative response system is needed Citywide, it is *critically* needed now in core eastern and southern City areas. Although constructing such a system represents a new expense, overall, it will be more cost-effective than adding fire units. The City *"needs its fire department capacity back."*

The highest incident volume in central Los Angeles is in the areas identified by Map #18 (**Volume 2—Map Atlas**). The top ten busiest engine, truck, and rescue ambulance companies are adjacent to each other, predominantly in two clusters.

Figure 15—Central Los Angeles High-Impact Areas



The individual unit-hour utilization (UHU) measures for these units significantly exceed 30 percent for long, consecutive hours at a time. Based on this measure alone, the busiest unit crews are overworked and in need of relief units and/or strategies to decrease the quantity of non-urgent EMS incidents. The volume and simultaneous demand on the top 10 to top 28 LAFD stations is the highest Citygate has ever measured in a metro client.

The busiest fire stations already have three to six primary units assigned (not chiefs or support units). Some units are placed outdoors on front aprons or in rear lot areas. Many sites are now at their physical limit for adding response units and/or personnel.

Over the course of late 2021 and into 2022, the City and County rolled out a pilot project for the delivery of alternative, non-urgent patient care—including mental health and homeless program diversion; however, this is not enough. The alternative response program needs to *scale massively and quickly* to lower the workload placed on fire units back down to moderate and serious emergencies.

As an illustration of volume, in 2020, Fire Station 9 in the east downtown area responded to 18,986 incidents—an average of 52 per day, or two per hour. If 30 percent of those incidents were managed by an alternative response team, that amounts to approximately 16 incidents per day. If the seven busiest stations in just the east-central area of the City had this low-acuity volume, that total would be 112 incidents per day over the busiest 16 hours.

If the alternative response team spent only 30 minutes per patient contact on average, that would be two contacts per hour per team. The east-central area alone could consume two to three units during daylight and early evening hours. If all six high-workload areas needed three units each, that would amount to 18 units per day, seven days per week, for at least 16 hours per day. Additionally, the other battalions could each use at least one alternative unit, representing another eight units, for a total of 26 units Citywide. On eight-hour shifts at two personnel per unit, that equates to 52 personnel per day just to cover five days per week, not including earned leave time. Therefore, well over 100 new non-firefighter personnel must be hired and trained for alternative response measures to meet the service needs of the City.

In light of the large personnel and unit count needed for alternative care teams, even as a “rapid” program, implementation could take two to three fiscal years. In the meantime, the busiest fire units need relief now. Citygate recommends the LAFD add at least 14 additional rescue ambulances (both ALS And BLS to relieve the busiest types), one engine company at a new station in the northern area of the City, and one Battalion Command Team in the north at an existing fire station.

Further, there are currently at least 25 rescue ambulances on 24-hour shift staffing that are overworked for excessively long periods of a 24-hour day. Citygate does not believe that critical patient care, much less safe firefighting, is always possible when a crew has gone from call to call for 12 or more hours. The LAFD should find a way to “split shift” these busiest 24-hour ambulances by either rotating crews to slower companies (though there are none close by in East and South Los Angeles) or placing these units on an alternative staffing workweek with 12-hour days.

Citygate does not recommend this lightly. This change will require collective bargaining with the represented workforce and will require more firefighters be hired in the near term. However, outside of the traditional 24-hour fire service staffing model, where in America do critical health care professionals, airline pilots, or railroad engineers preform critical work well past 12 consecutive hours without a mandated rest break? Citygate does not believe the LAFD can wait years for an alternative response program to be established, during which time EMS incident volume will likely further *increase.*

6.1.2 Challenge #2: Small Gaps in Coverage

This study identified the need for one additional Battalion Command Team to serve the northern area of the City near Fire Station 100. In addition, a large enough gap in first-due engine travel-time coverage exists in the eastern section of the northern area of the City (Map #17, **Volume 2—Map Atlas**) that one additional fire station is required.

Given the significant Battalion Command Team coverage gap in the north between Stations 73, 100, and 90, the study maps show the significant benefit of adding a Battalion Command Team at Station 100, located at 6751 Louise Avenue in Van Nuys. Almost 100 percent of the underserved road miles at a travel time of 8:00 minutes are included in this area southeast of the Van Nuys Airport.

The addition of an engine on the east side of the northern area, near the intersection of Woodman and Roscoe in Panorama City, would also be beneficial. This location is west of SR-170, a little south of the SR-170/I-5 interchange, at the intersection of two prime arterials, which will allow an added engine to route into far-away neighborhoods more quickly. As such, this location test did the best job of filling in the engine travel time gap at both 4:00 minutes' and 5:00 minutes' travel time. The added engine would increase public road coverage by 51.7 miles at 4:00 minutes, or up to 55.23 more miles at 5:00 minutes of travel time. The remaining underserved gap is between the fifth and sixth minute of coverage from adjoining stations 77 and 98.

Section 7

Next Steps and List of Findings and Recommendations


S FIRE DEPT.
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SECTION 7—FINDINGS AND RECOMMENDATIONS AND NEXT STEPS

Overall, there are 17 key findings and 6 specific action item recommendations contained in the body of the report. These are now presented in a comprehensive list for ease of reference.

The following lists Citygate's findings in report order and then the resultant actionable recommendations related to deployment improvements.

7.1 LIST OF FINDINGS

Finding #1: LAFD is a leader in response time reporting with its FireStatLA section, measuring from 9-1-1 answer to first-unit arrival.

Finding #2: The physical spacing of LAFD stations is sufficient, apart from small areas in the northern section of the City.

Finding #3: Effective Response Force (multiple-unit responses to more serious emergencies) travel-time coverage is sufficient in areas that are the most populated and carry the highest incident demand.

Finding #4: Given that the current fire station plan provides 5:00-minute travel time coverage to 88.7 percent of public streets City wide, using a 5:00-minute travel time goal to physically space fire stations across the City's very diverse geography is effective. The incident workload assessment in this study evaluates the needed units per station.

Finding #5: The northern service area needs one additional Battalion Command Team at Station 100 to improve command coverage for more serious incidents.

Finding #6: One additional fire station with an engine is needed northeast of Station 81, as modeled in Scenario Map 1a and 1b (**Volume 2—Map Atlas**).

Finding #7: LAFD's time-of-day, day-of-week, and month-of-year calls for service demand occurs in consistent, predictable patterns. LAFD's service demand is sufficiently high in all areas, 24 hours per day, to require an all-day, year-round response system.

Finding #8: The top ten busiest engines, trucks, and rescue ambulance companies' unit-hour utilization measures significantly exceed 30 percent for several hours or more at a time. Based on this measure alone, the busiest unit crews are overworked and need relief units and/or strategies to decrease the quantity of non-urgent EMS incidents.

Finding #9: The volume and simultaneous demand of 10 to 28 LAFD stations is the highest Citygate has measured in a metro client to date. Given the likelihood that some of these stations are adjacent to each other—as population density zones are typically larger than a single fire station area—Citygate located the top 10 stations and then expanded the search to the top 28.

Finding #10: As shown in Map #18, there are three clusters in the east-central and southern City core containing 16 of the top 28 stations for workload demand, and nine of the top 10. In the northern Valley area, there are two clusters containing five of the top 28, with one of the top ten. There are seven other stations in the top 28, but they exist as individual stations without an adjacent busy station.

Finding #11: Battalion 1 in the east-central area of the City has three of the top 10 overworked stations; Battalion 13 in the southern area of the City has another five of the top 10.

Finding #12: The importance of this clustering measure is that for long, consecutive hours of the day, large numbers of fire crews are busy with only EMS calls, leaving the area underserved for an immediate need fire or rescue response, even when many of the busiest stations have multiple crews assigned to them.

Finding #13: At 2:03 minutes in 2020, call-processing performance to 90 percent of fire and EMS incidents is only 33 seconds longer than Citygate's and the National Fire Protection Association's 1:30-minute recommendation where no language or location identification barriers exist. In light of the size of the City and the typical barriers to a short 9-1-1 call, the LAFD's average processing time of 1:08 minutes is very good as 235,855 incidents are processed faster than best practice guidelines.

Finding #14: At 1:21 minutes, crew turnout performance to 90 percent of fire and EMS incidents, with an average of 47 seconds, is excellent, and shows a rare attention to the importance of delivering prompt turnout times.

Finding #15: At 7:00 minutes, LAFD's fire unit travel times to 90 percent of fire and EMS incidents is slower than the National Fire Protection Association's urban best practice recommendation of 4:00 minutes, due in part to LAFD's difficult topography in some areas, traffic congestion, and simultaneous incidents. The average travel time of 4:27 minutes does reach 193,743 incidents promptly.

Finding #16: First-due unit call-to-arrival performance to 90 percent of fire and EMS incidents Citywide, at 9:21 minutes, is longer than a best practice goal of 7:30 minutes. However, the average measure of 6:20 minutes means 216,937 incidents received a first responder *faster* than a best practice goal, or 594 times per day in 2020.

Finding #17: Category A first arrival and ERF call-to-arrival times to 90 percent of all occurrences are better than, or very close to, best practices in all but the most geographically challenged areas. This ERF performance is stronger than what Citygate has observed in other metropolitan clients. It is understandable that the Category B response times are longer as more units travel farther to an incident, as with all metropolitan departments.

7.2 Deployment Recommendations

Based on the technical analysis and findings contained in this study, Citygate offers the following near-term deployment recommendations:

Recommendation #1: Maintain current response time goals and reporting.

Recommendation #2: Plan for an added Battalion Command Team at an existing station, and one new fire station with engine company, in the northern area of the City.

Recommendation #3: Shift or rotate crews differently every 12 hours on an agreed-upon number of the highest-workload, 24-hour rescue ambulances.

Recommendation #4: Refine and build the case to shift low-acuity EMS incidents from firefighter-staffed rescue ambulances in very high-incident-demand areas to non-firefighter-staffed, low-acuity units to include medical, mental health care, and homeless resources.

Recommendation #5: Maintain the current mix of single-unit and Effective Response Force deployment units and personnel staffing as they meet the risks to be protected in the City.

Recommendation #6: In the following focus areas, plan to change staffing methods and add additional rescue ambulances as this study's data indicates. Note that the first two focus areas contained 29 percent of Citywide incidents in 2020.

Focus Area 1 – Battalions 1 and 11

Total: seven stations, 14.3 percent of Citywide incident volume in 2020.

- Station 3 – Needs split shift crews on both rescue ambulances
- Station 4 – Add third rescue ambulance
- Station 6 – Needs split shift crews on both rescue ambulances

- Station 10 – Needs split shift crews on both rescue ambulances
- Station 11 – Add third rescue ambulance
- Station 13 – Split shift crew rescue ambulance 13

Focus Area 2 – Battalion 13

Total: six stations, 14.8 percent of Citywide incident volume in 2020.

- Station 33 – Add third rescue ambulance
- Station 46 – Add third rescue ambulance
- Station 57 – Add fourth rescue ambulance, split shift crews on the three current rescue ambulances
- Station 64 – Add fourth rescue ambulance, split shift crews on the three current rescue ambulances
- Station 65 – Monitor need for split shift crews and/or fourth rescue ambulance
- Station 66 – Add fourth rescue ambulance

Focus Area 3 – Battalions 5 and 18

- Station 27 – Add third rescue ambulance, split shift crews on two rescue ambulances
- Station 58 – Add fourth rescue ambulance, split shift crews on three rescue ambulances
- Station 61 – Add third rescue ambulance, split shift crews on two rescue ambulances

Focus Area 4 – Northern Areas

- Station 39 – Split shift the rescue ambulance
- Station 60 – Split shift the two rescue ambulances
- Station 89 – Add third rescue ambulance, split shift crews on two rescue ambulances

Focus Area 5 – Northern Area – Battalion 12

- Station 7 – Add second rescue ambulance
- Station 98 – Split shift the two rescue ambulances

7.3 NEXT STEPS

7.3.1 Near-Term

- Review and absorb the findings and recommendations provided in this report.
- Develop a methodology for how to split shift the overloaded rescue ambulances.
- Direct staff to return with costs and timing to make near-term staffing changes.

7.3.2 Longer-Term

- Plan for an added Battalion Command Team at an existing station, and one new fire station with engine company, in the northern area of the City.
- If central City, high-impact stations cannot physically add rescue ambulances, locate and implement ambulance-only hub stations in existing commercial properties in the high-workload areas.
- Monitor response time performance against adopted goals.

CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES

LOS ANGELES FIRE DEPARTMENT

STANDARDS OF COVER ANALYSIS

VOLUME 2 OF 3: MAP ATLAS

MAY 17, 2023

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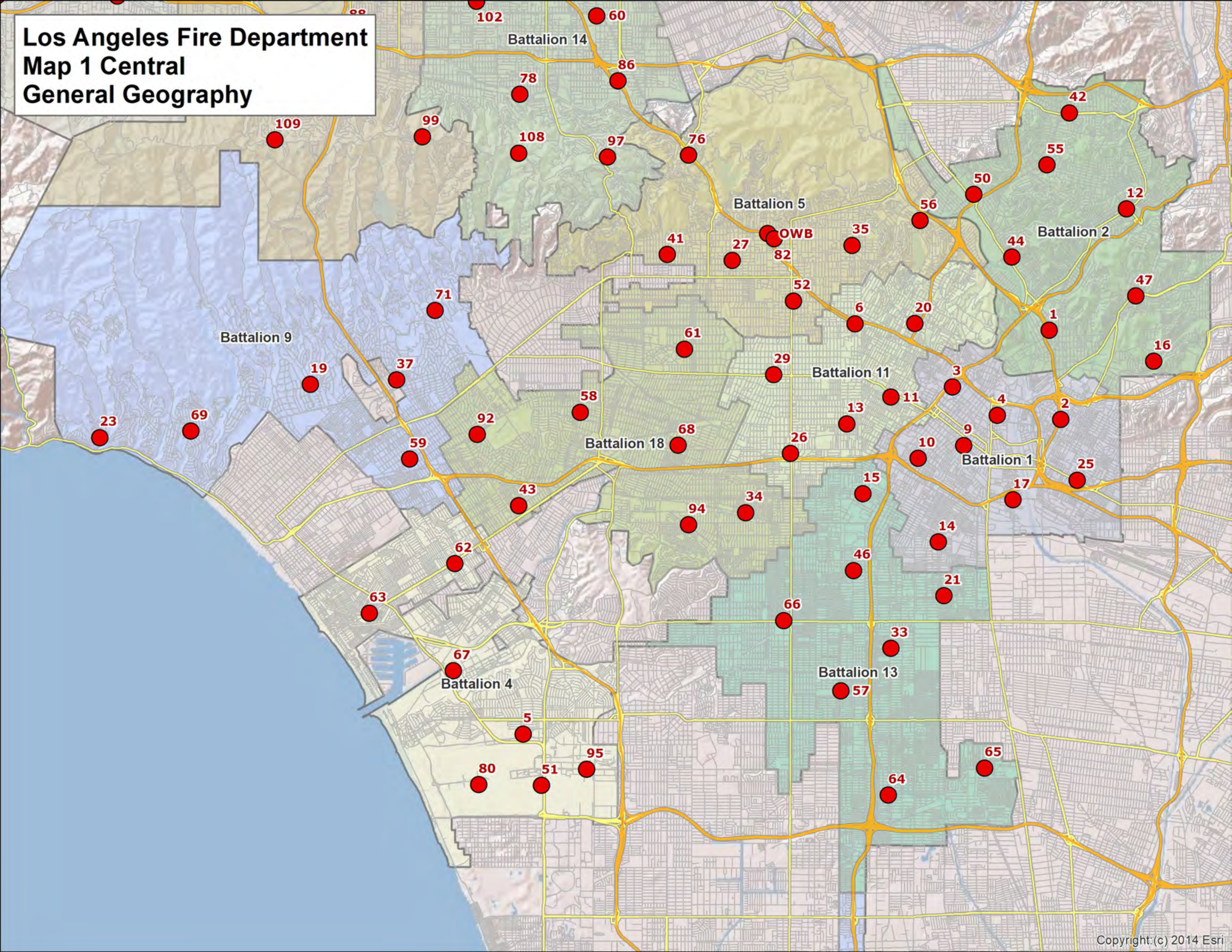
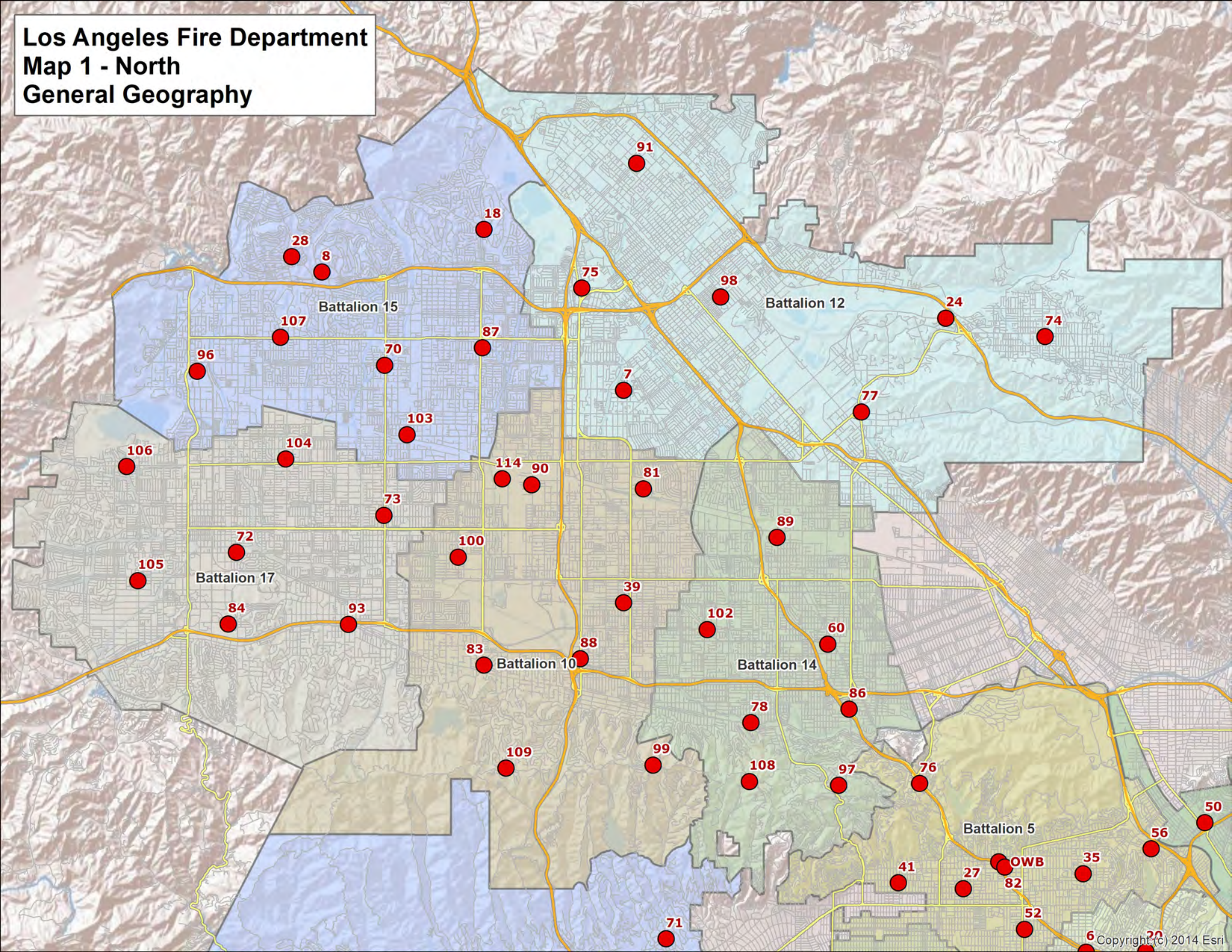
LOS ANGELES FIRE DEPARTMENT
FOUNDED 1886

Los Angeles Fire Department
Map 1 Central
General Geography





Los Angeles Fire Department
Map 1 - North
General Geography
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
91
18
28
8
75
98
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74
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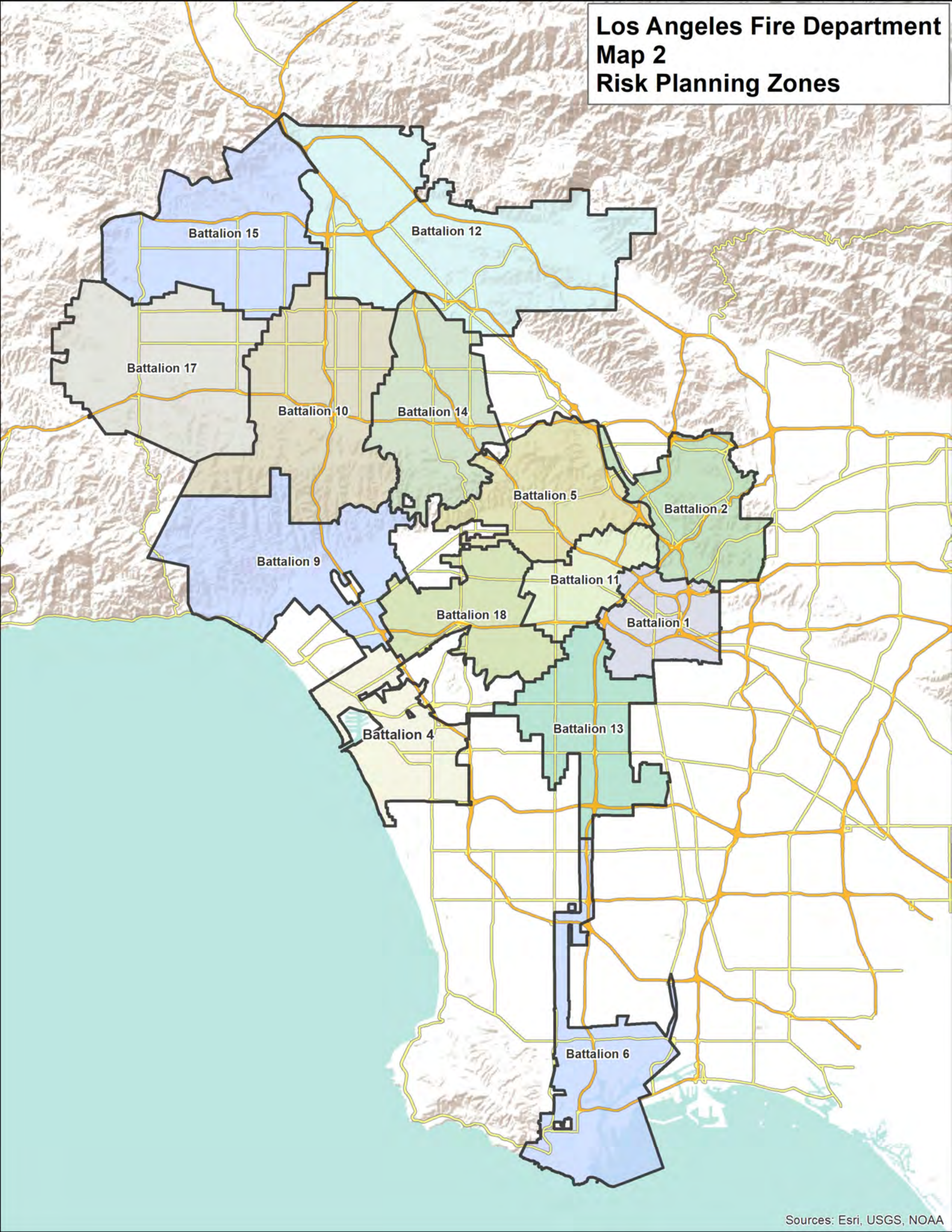
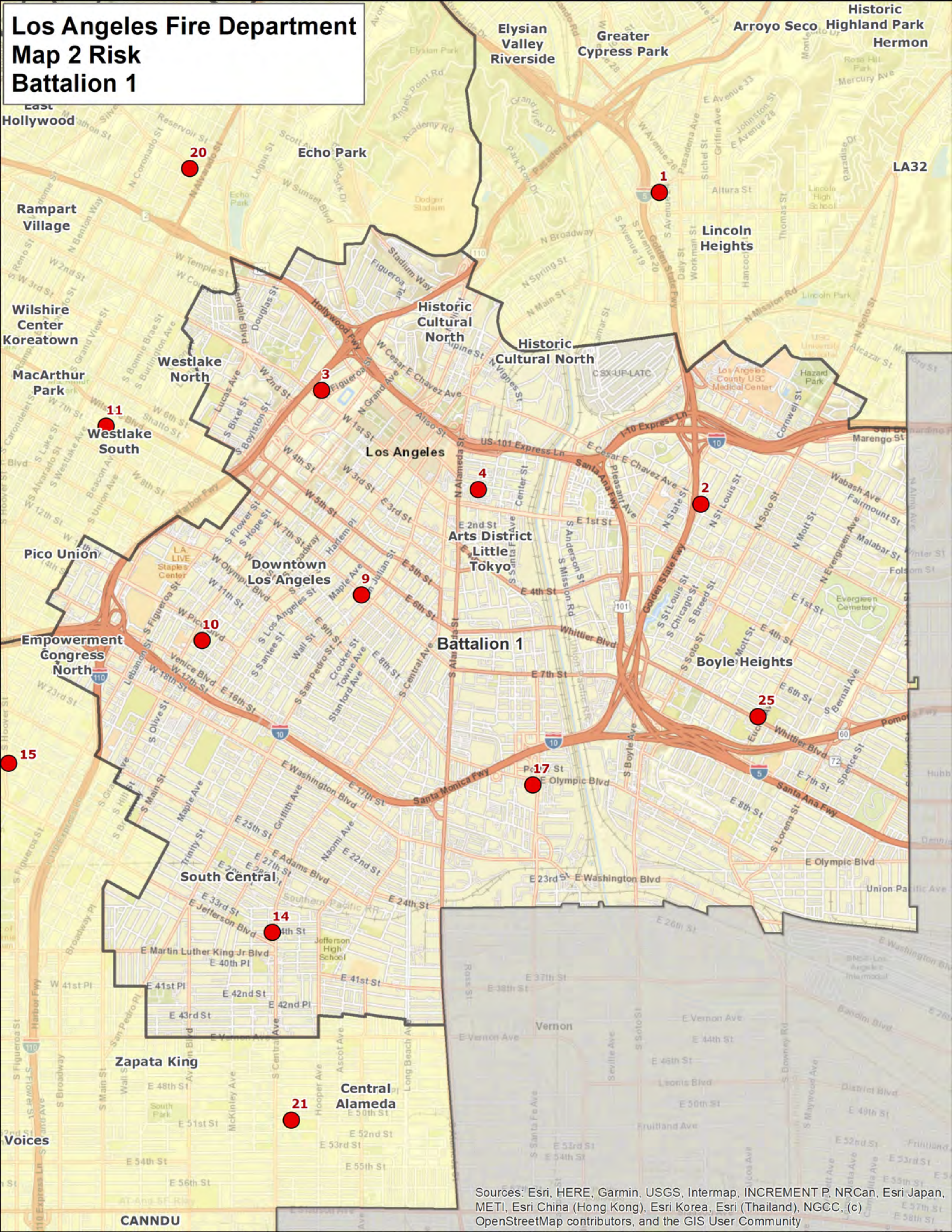
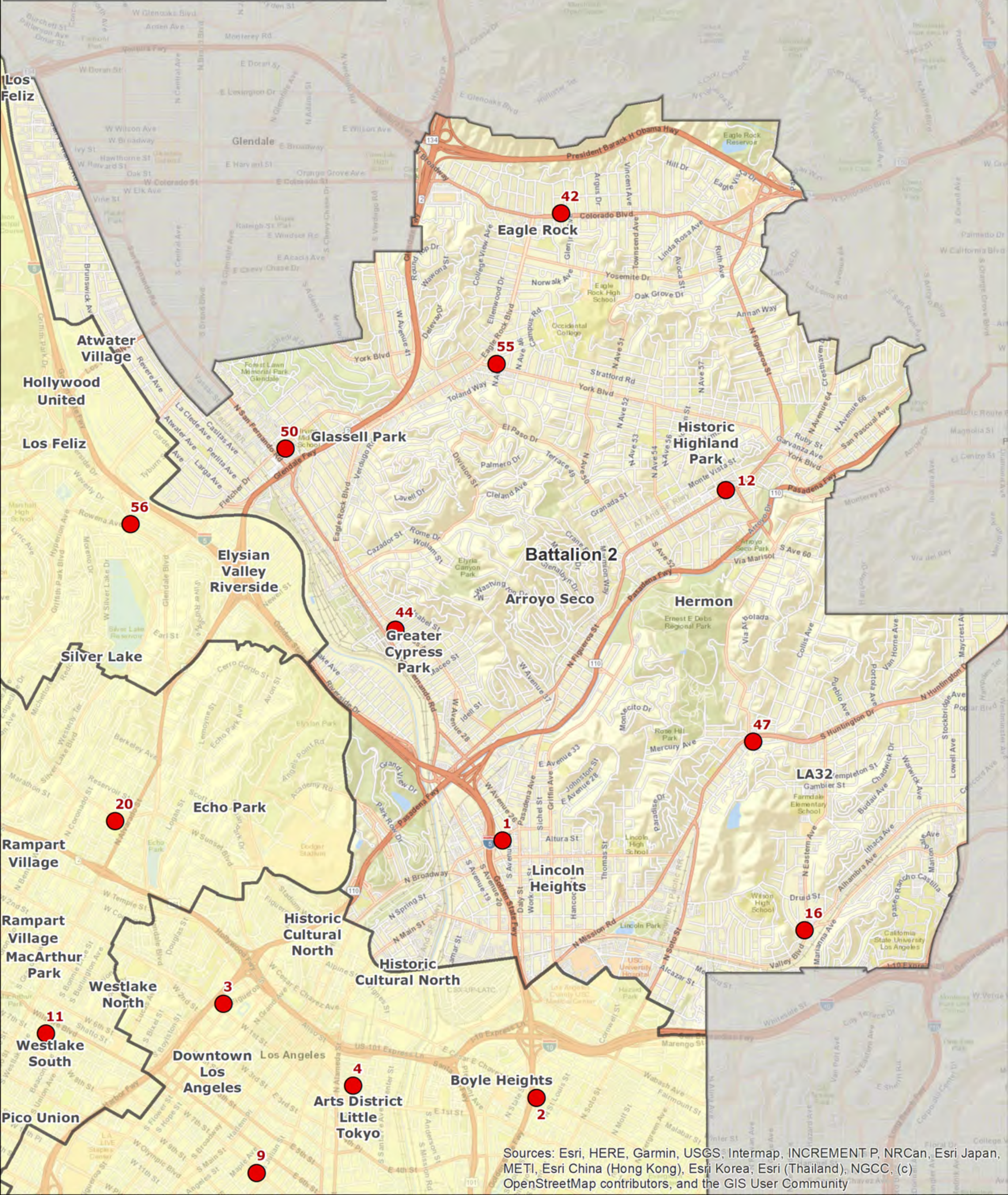
Los Angeles Fire Department
Map 1 - South
General Geography


Los Angeles Fire Department
Map 2
Risk Planning Zones
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 4
Battalion 13
Battalion 6
Sources: Esri, USGS, NOAA

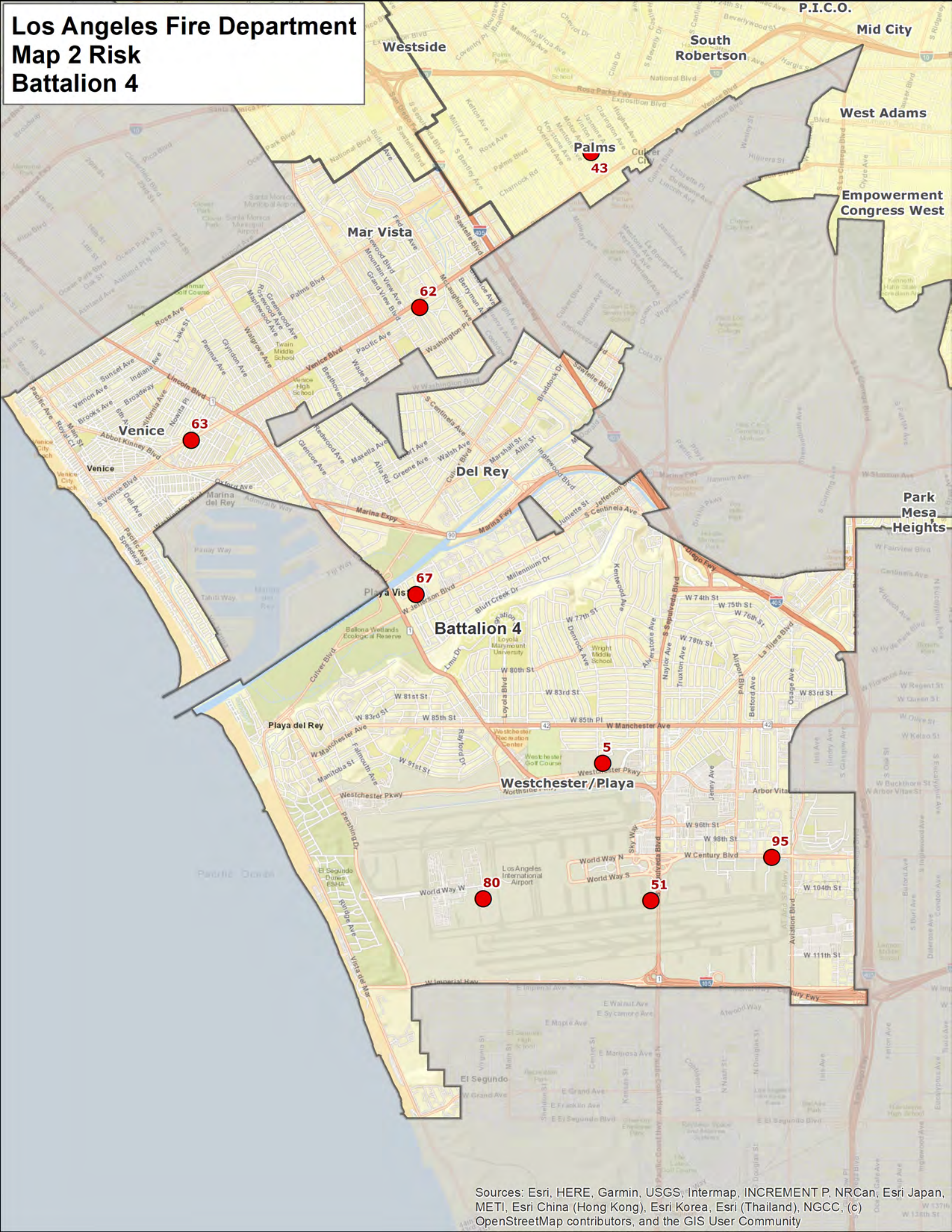
Los Angeles Fire Department
Map 2 Risk
Battalion 1

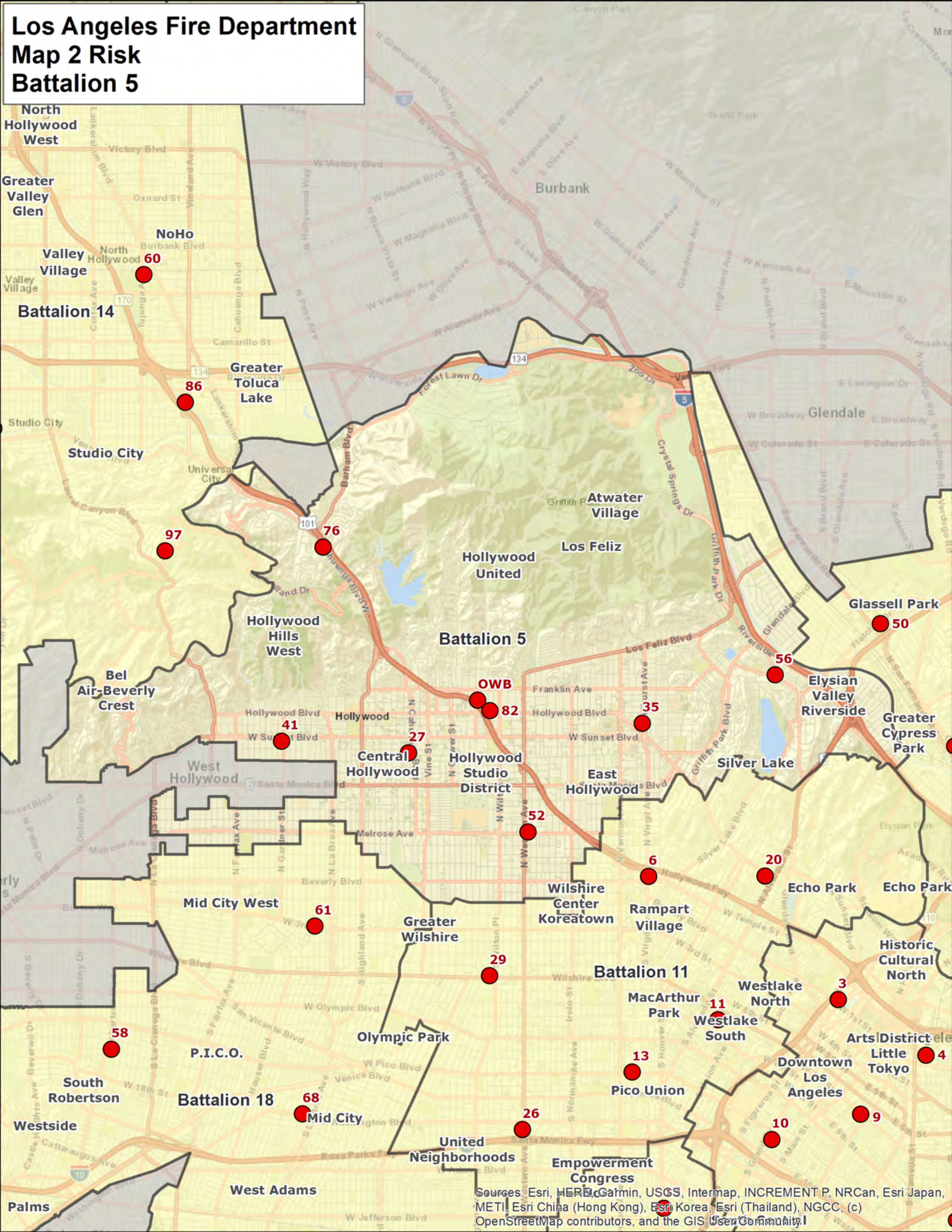


Los Angeles Fire Department
Map 2 Risk
Battalion 2



Los Angeles Fire Department
Map 2 Risk
Battalion 4




Los Angeles Fire Department
Map 2 Risk
Battalion 5
Battalion 5
Battalion 14
Battalion 11
Battalion 18
North Hollywood West
Greater Valley Glen
NoHo
Valley Village
Greater Toluca Lake
Studio City
Universal City
Burbank
Glendale
Atwater Village
Los Feliz
Hollywood United
Hollywood Hills West
Bel Air-Beverly Crest
Hollywood
Central Hollywood
Hollywood Studio District
East Hollywood
Silver Lake
Glassell Park
Elysian Valley Riverside
Greater Cypress Park
West Hollywood
Mid City West
Greater Wilshire
Wilshire Center Koreatown
Rampart Village
Echo Park
Historic Cultural North
Westlake North
Westlake South
MacArthur Park
Arts District
Little Tokyo
Downtown Los Angeles
Olympic Park
P.I.C.O.
South Robertson
Westside
Mid City
United Neighborhoods
Pico Union
Empowerment Congress
West Adams
Palms
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86
97
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OWB
82
35
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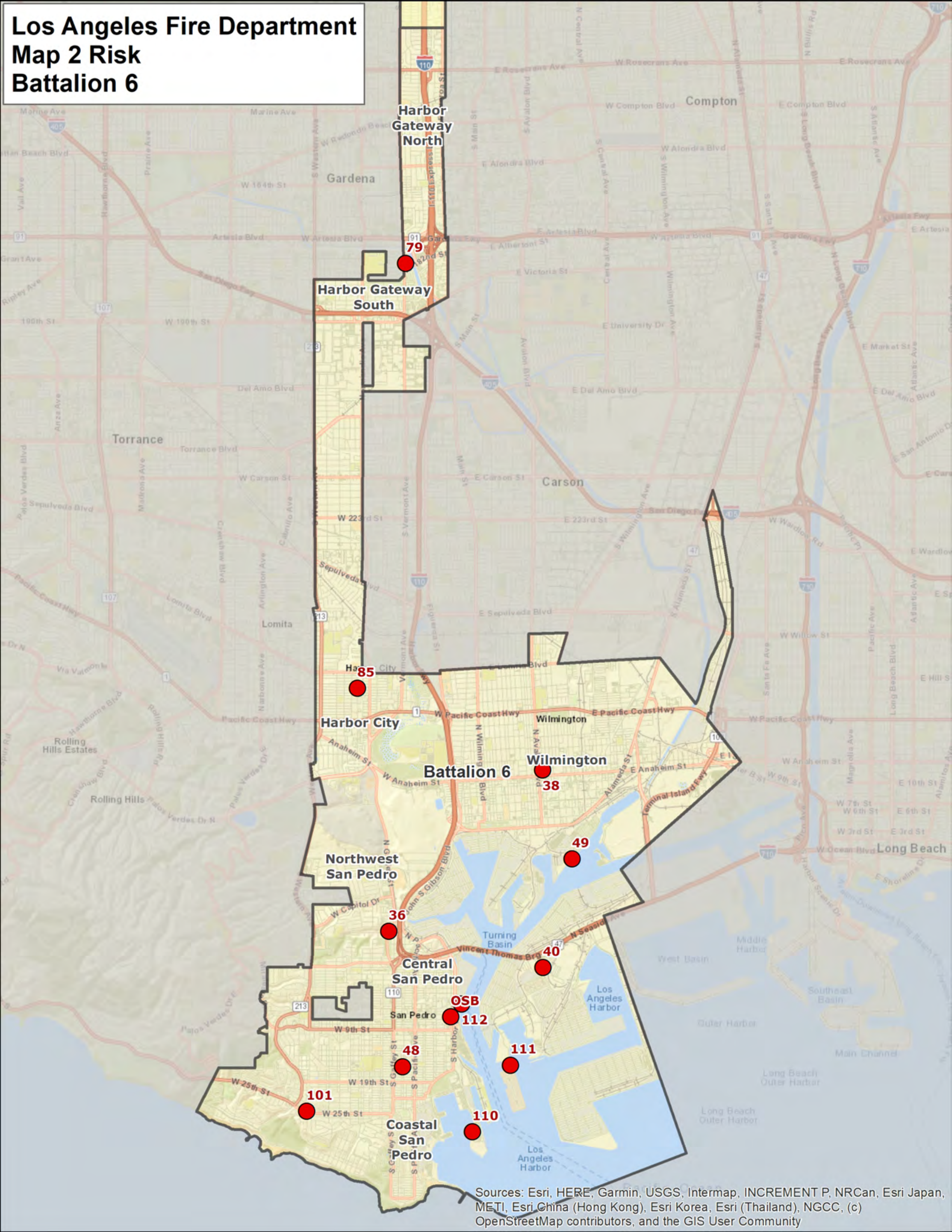
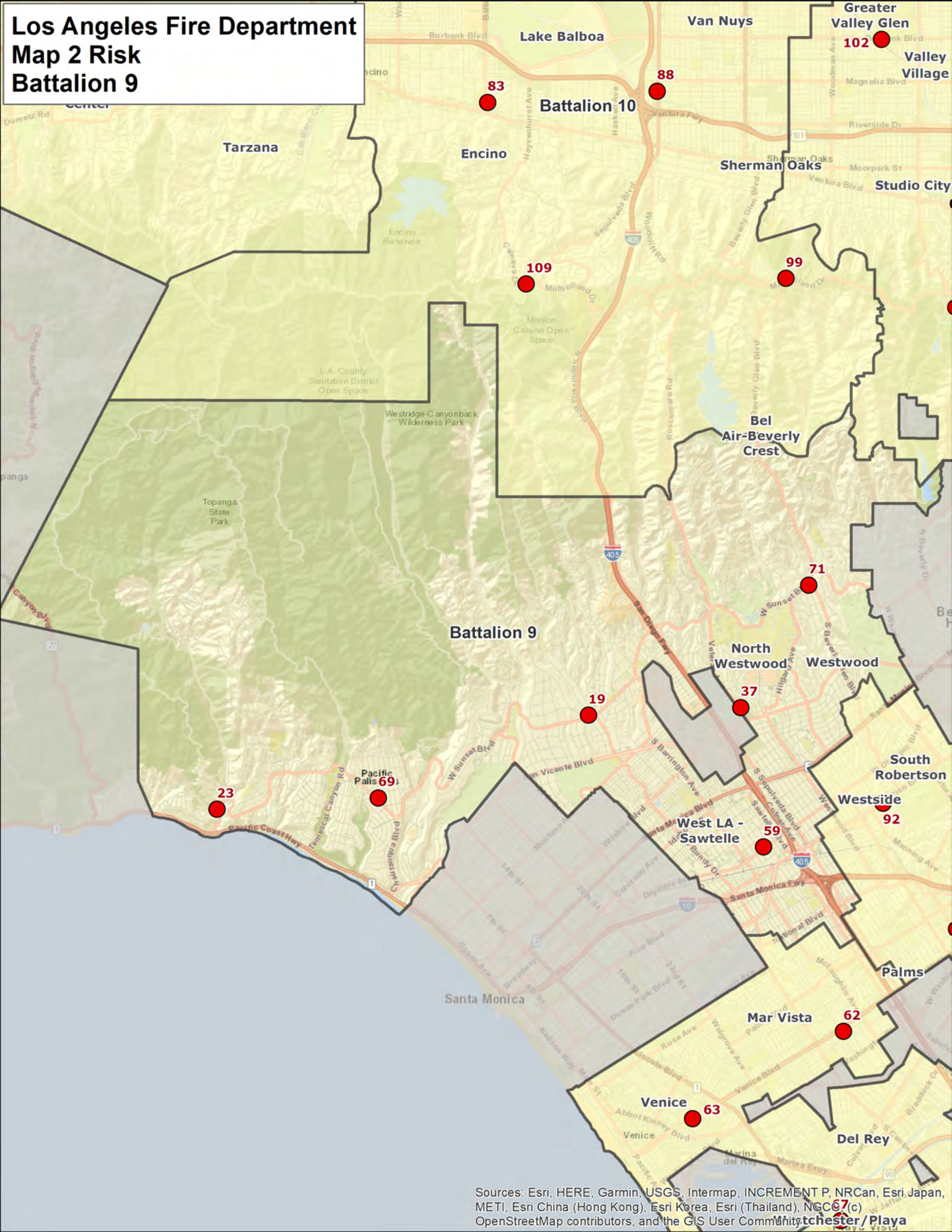
41
27
52
6
20
61
29
3
11
58
13
4
68
26
10
9
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

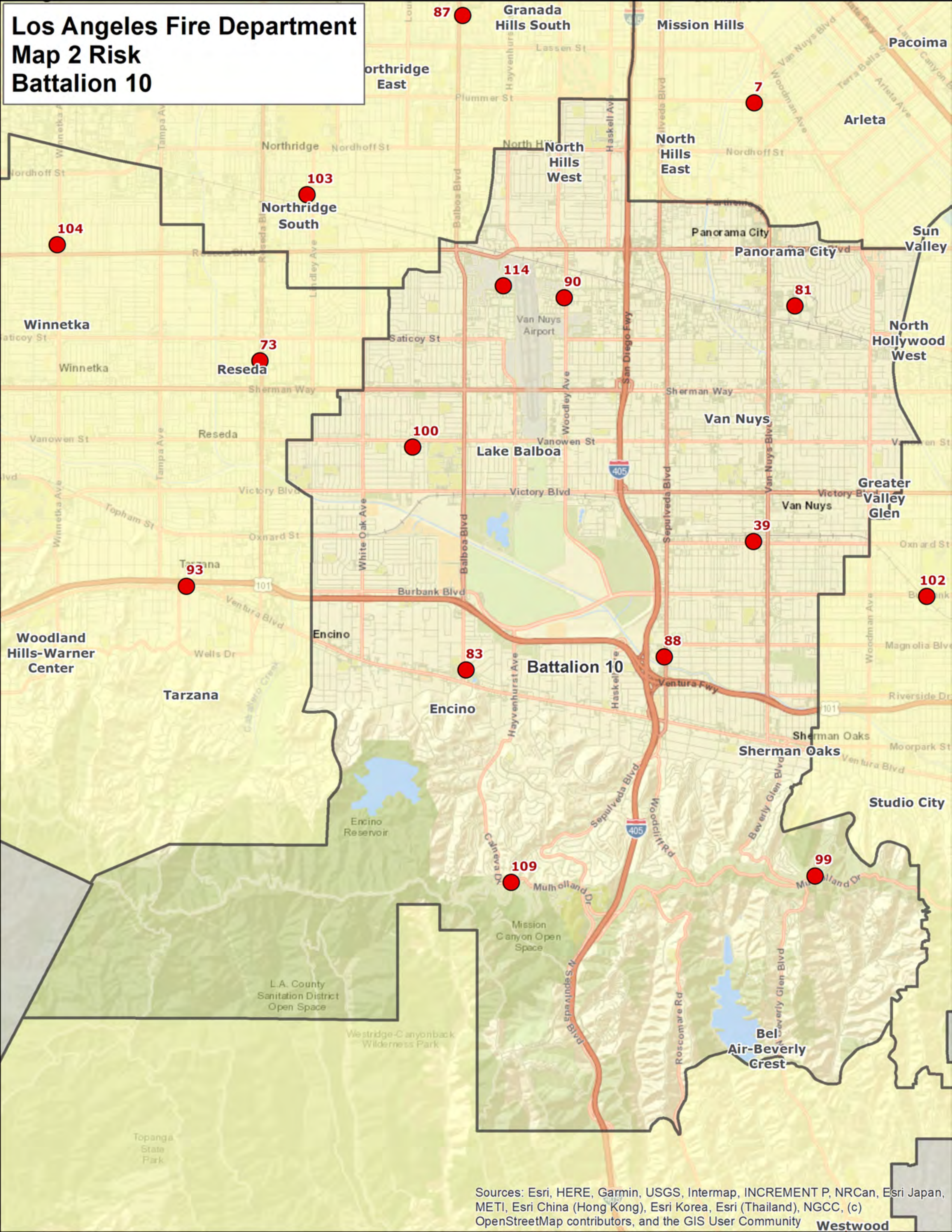
Los Angeles Fire Department
Map 2 Risk
Battalion 6

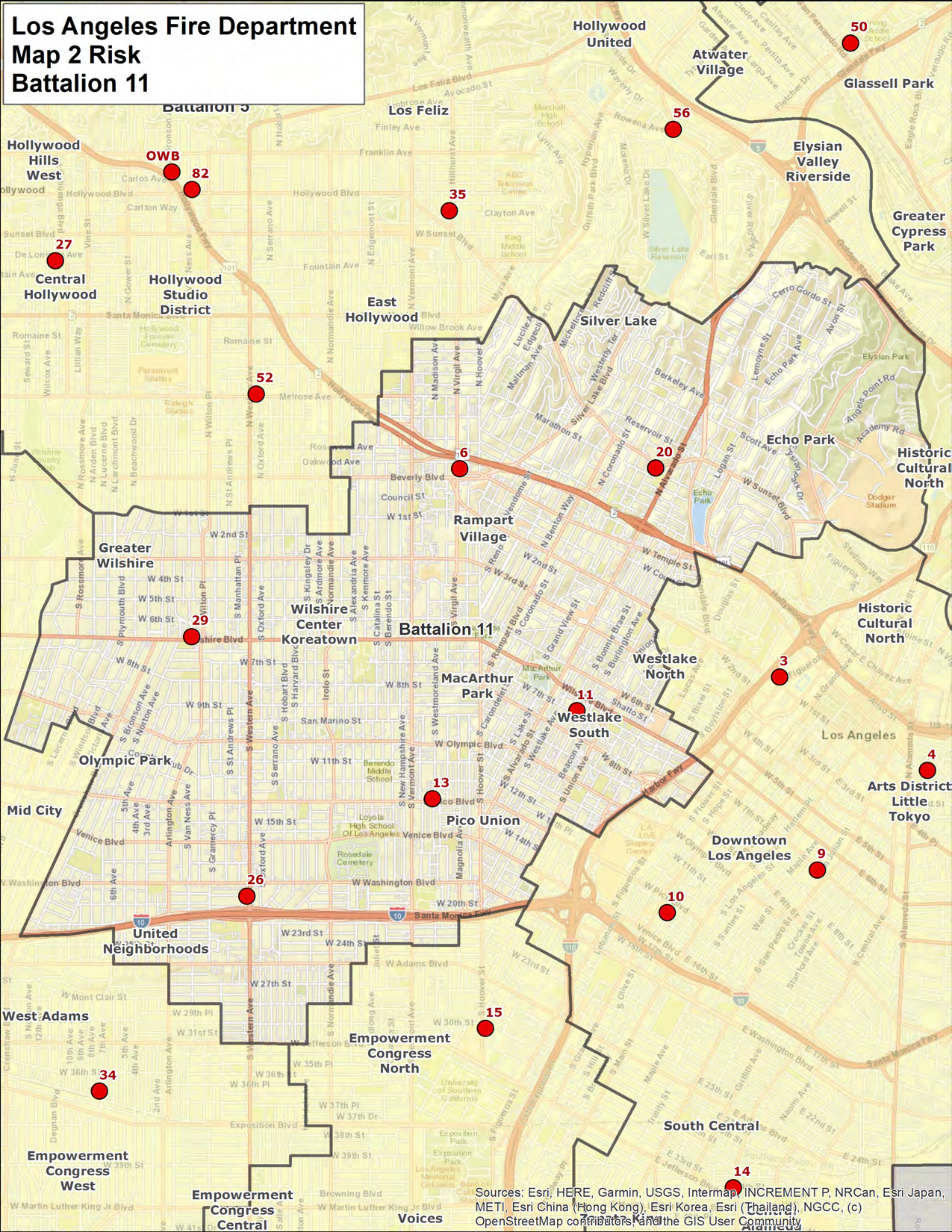


Los Angeles Fire Department
Map 2 Risk
Battalion 9



Los Angeles Fire Department Map 2 Risk Battalion 10




Los Angeles Fire Department
Map 2 Risk
Battalion 11
Battalion 5
Battalion 11
Hollywood Hills West
Hollywood United
Atwater Village
Glassell Park
Los Feliz
Elysian Valley Riverside
Greater Cypress Park
Central Hollywood
Hollywood Studio District
East Hollywood
Silver Lake
Echo Park
Historic Cultural North
Rampart Village
Greater Wilshire
Wilshire Center Koreatown
MacArthur Park
Westlake North
Westlake South
Los Angeles
Arts District Little Tokyo
Olympic Park
Mid City
Pico Union
Downtown Los Angeles
United Neighborhoods
West Adams
Empowerment Congress North
Empowerment Congress West
Empowerment Congress Central
South Central
Voices
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OWB
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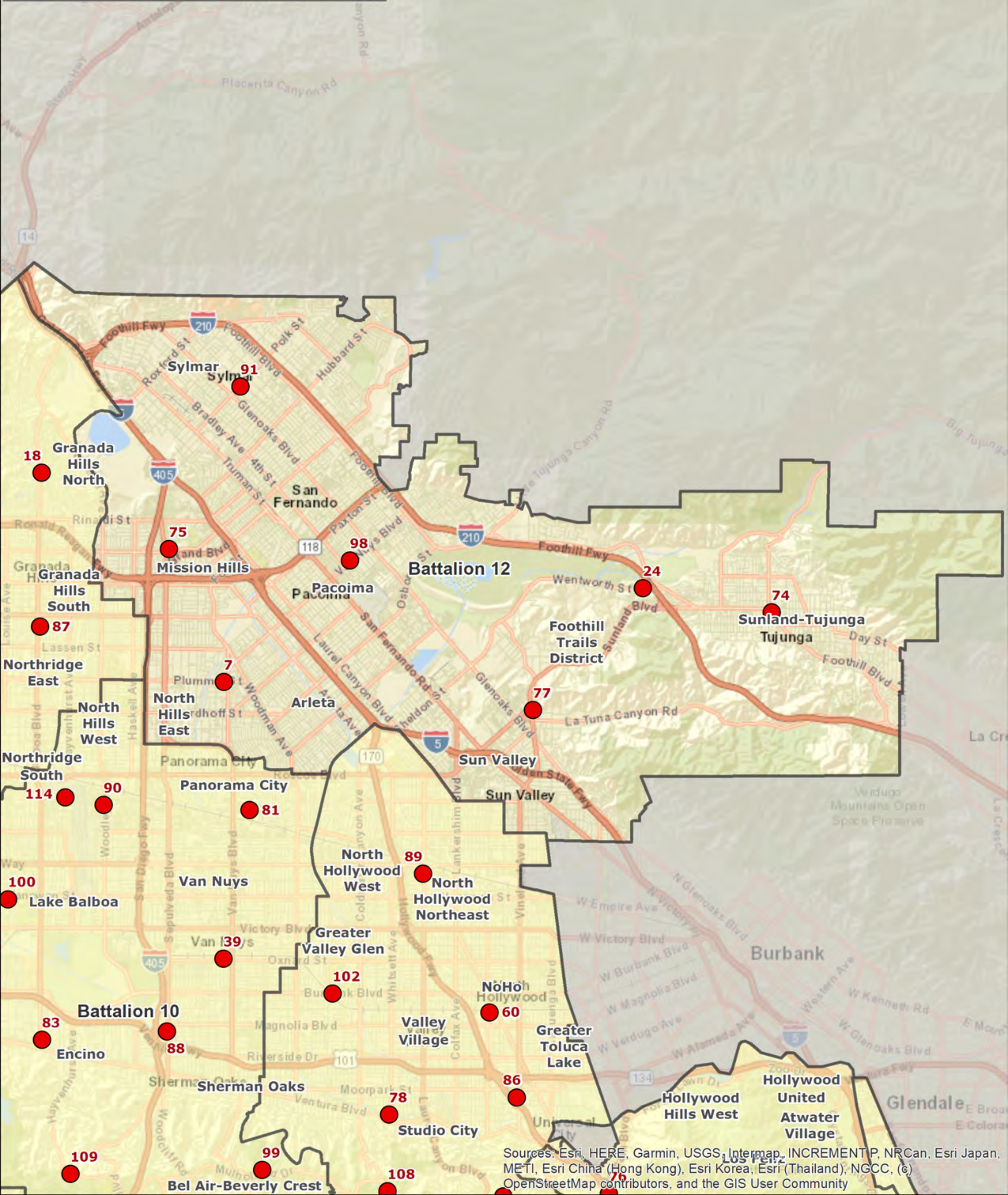
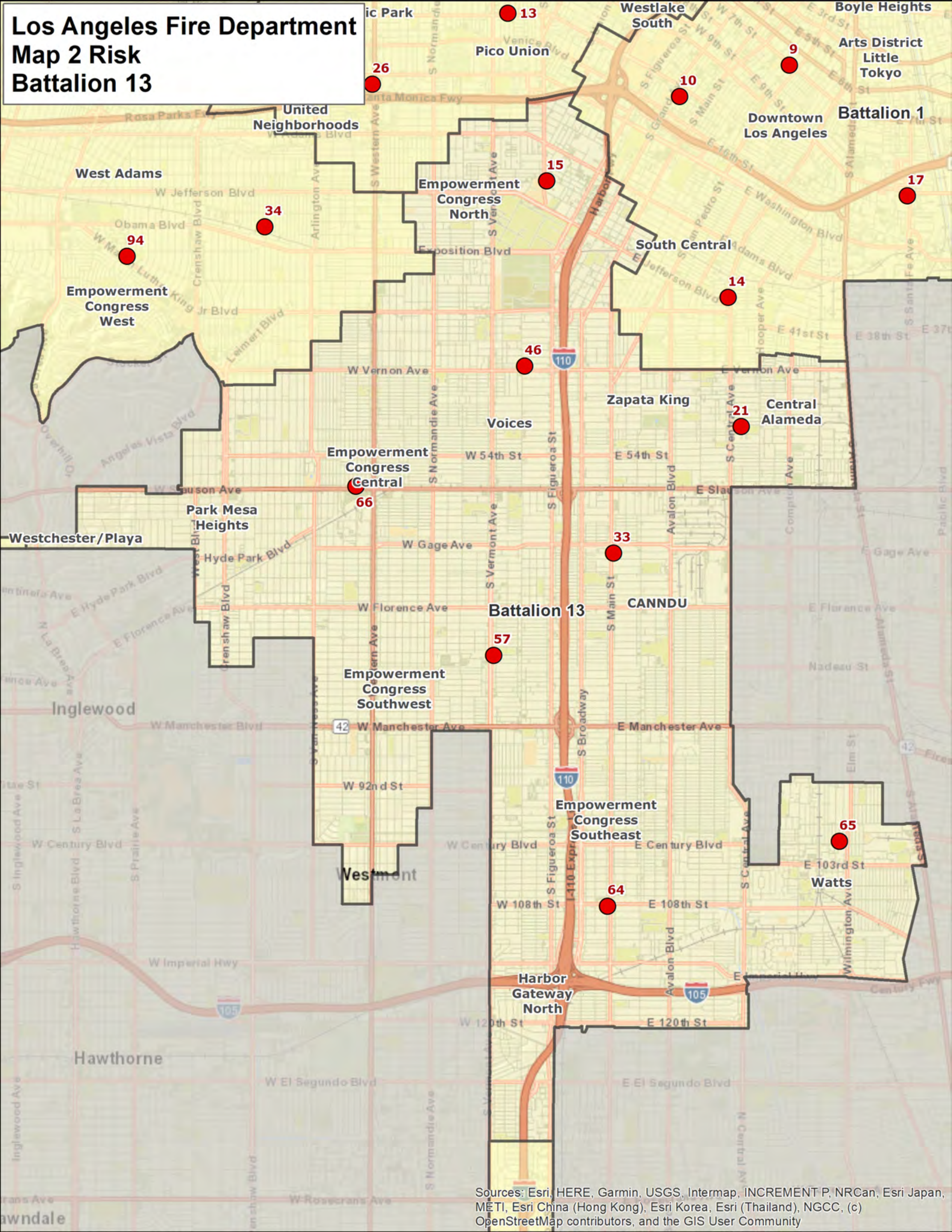
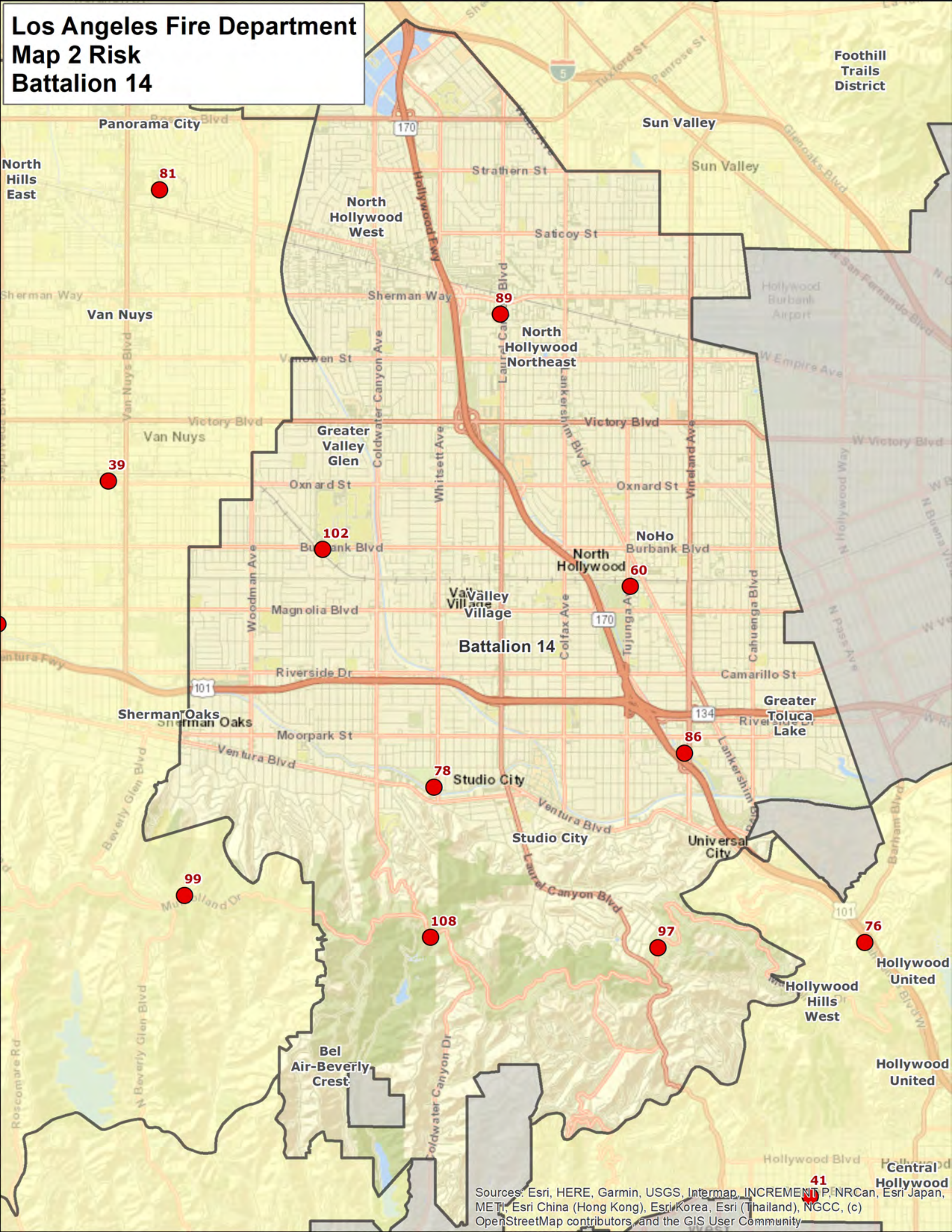
10
15
34
14
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

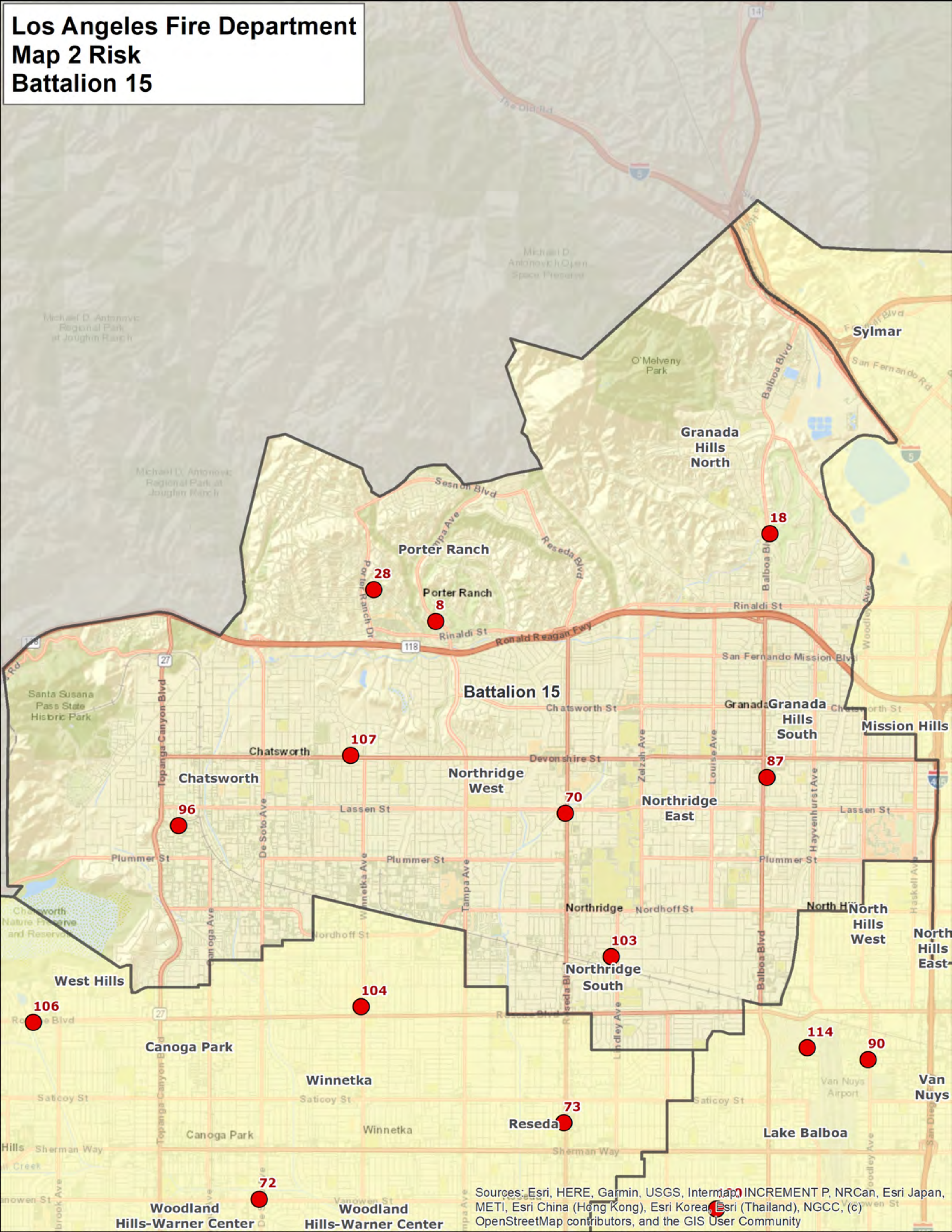
Los Angeles Fire Department
Map 2 Risk
Battalion 12



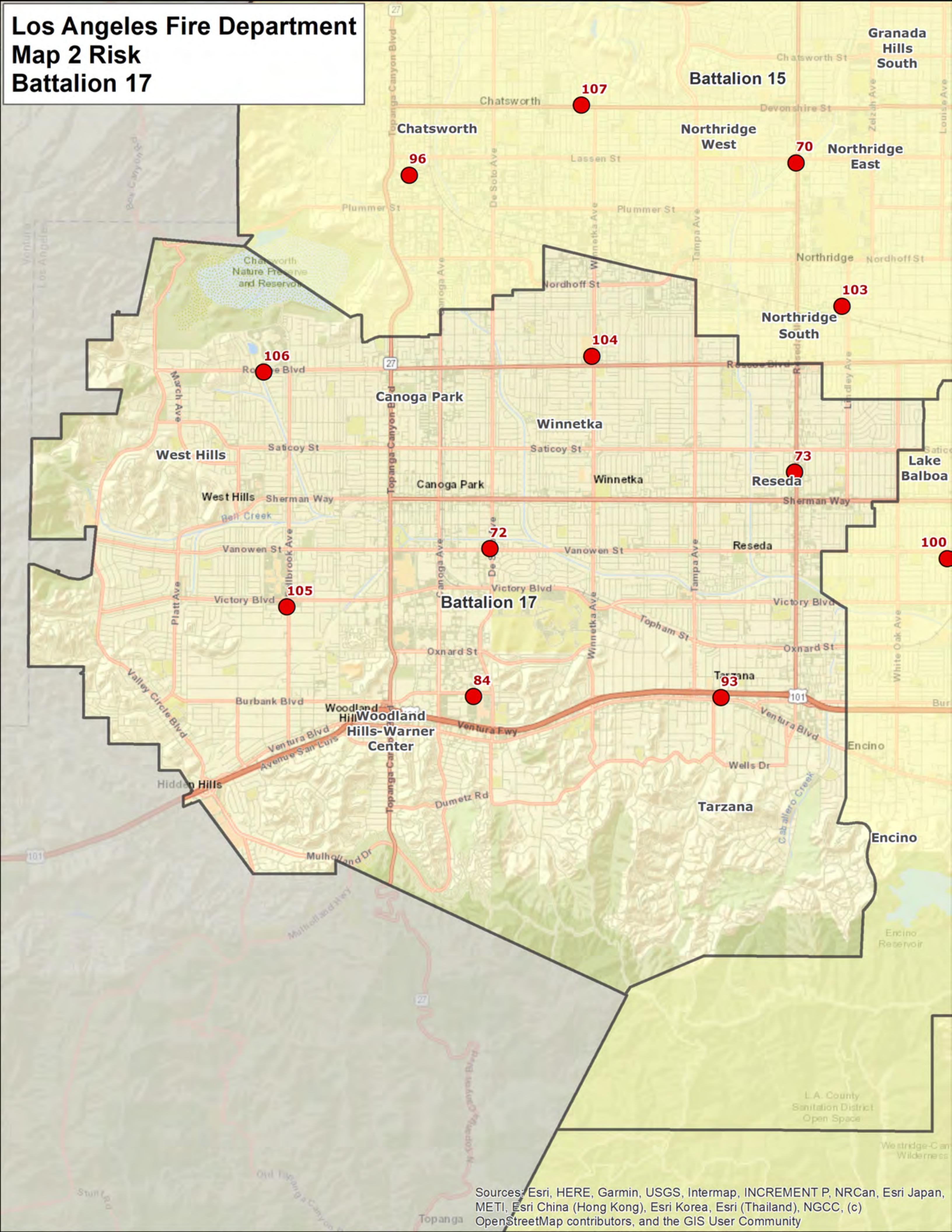

Los Angeles Fire Department
Map 2 Risk
Battalion 13
Battalion 1
Battalion 13
West Adams
United Neighborhoods
Pico Union
Westlake South
Boyle Heights
Arts District Little Tokyo
Downtown Los Angeles
Empowerment Congress North
Empowerment Congress West
South Central
Zapata King
Central Alameda
Voices
Empowerment Congress Central
Park Mesa Heights
Westchester/Playa
CANNDU
Empowerment Congress Southwest
Empowerment Congress Southeast
Watts
Harbor Gateway North
Inglewood
Westmont
Hawthorne
13
26
9
10
15
17
34
94
14
46
21
66
33
57
65
64
W Jefferson Blvd
Obama Blvd
Exposition Blvd
W Vernon Ave
E Vernon Ave
W 54th St
E 54th St
W Slauson Ave
E Slauson Ave
W Gage Ave
W Florence Ave
W Manchester Ave
E Manchester Ave
W 92nd St
W Century Blvd
E Century Blvd
E 103rd St
W 108th St
E 108th St
W Imperial Hwy
W 120th St
E 120th St
W El Segundo Blvd
E El Segundo Blvd
W Rosecrans Ave
S Vermont Ave
S Figueroa St
S Main St
S Broadway
Avalon Blvd
S Central Ave
Compton Ave
S Normandie Ave
S Western Ave
Crenshaw Blvd
Arlington Ave
Hyde Park Blvd
Angeles Vista Blvd
Santa Monica Fwy
Rosa Parks Fwy
Harbor Fwy
Century Fwy
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

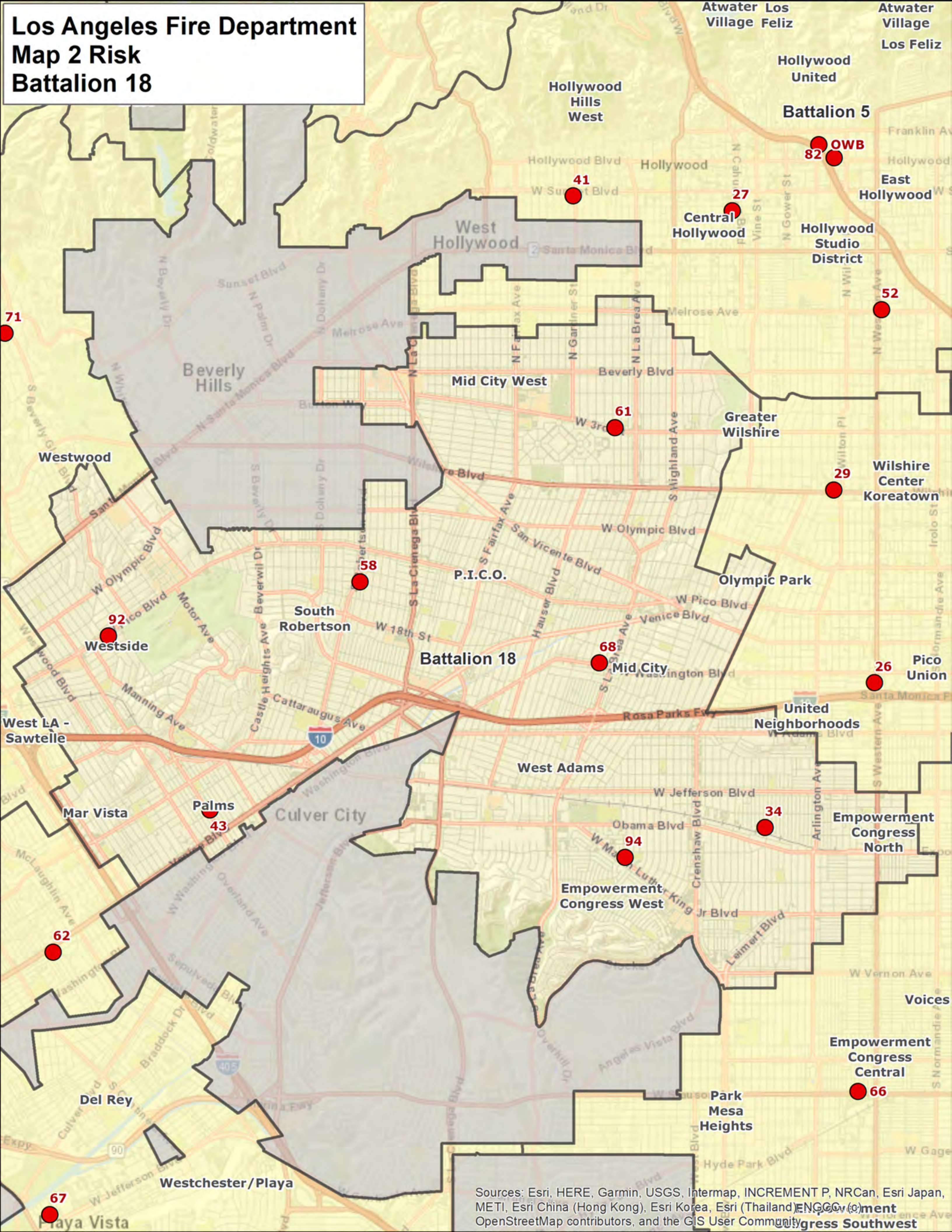

Los Angeles Fire Department
Map 2 Risk
Battalion 14
Panorama City
North Hills East
Van Nuys
Sherman Oaks
Foothill Trails District
Sun Valley
North Hollywood West
North Hollywood Northeast
Greater Valley Glen
NoHo
North Hollywood
Valley Village
Battalion 14
Greater Toluca Lake
Studio City
Universal City
Hollywood Burbank Airport
Hollywood Hills West
Hollywood United
Bel Air-Beverly Crest
Central Hollywood
81
39
102
89
60
78
86
99
108
97
76
41
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Los Angeles Fire Department
Map 2 Risk
Battalion 15

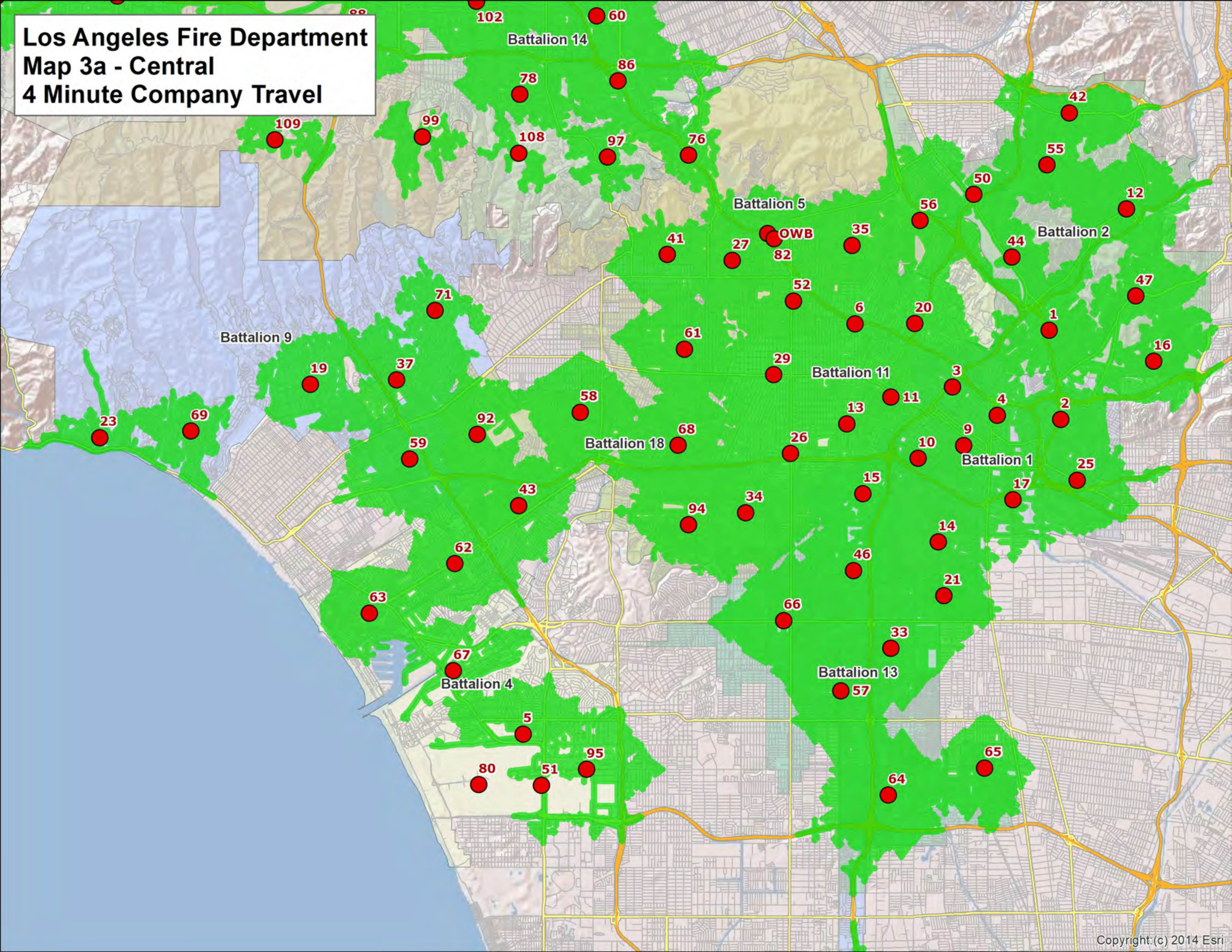


Los Angeles Fire Department
Map 2 Risk
Battalion 17





Los Angeles Fire Department
Map 2 Risk
Battalion 18
Battalion 18
Battalion 5
Beverly Hills
West Hollywood
Culver City
Mid City West
Greater Wilshire
P.I.C.O.
South Robertson
Mid City
West Adams
Olympic Park
United Neighborhoods
Empowerment Congress West
Empowerment Congress North
Empowerment Congress Central
Wilshire Center Koreatown
Pico Union
Westside
Westwood
West LA - Sawtelle
Mar Vista
Palms
Del Rey
Westchester/Playa
Playa Vista
Park Mesa Heights
Hollywood Hills West
Hollywood
Central Hollywood
East Hollywood
Hollywood Studio District
Hollywood United
Atwater Village
Los Feliz
Voices
41
27
82
OWB
52
71
61
29
58
92
68
26
34
94
43
62
66
67
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



Los Angeles Fire Department
Map 3a - Central
4 Minute Company Travel
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 4
Battalion 13
102
60
86
78
109
99
108
97
76
42
55
50
12
56
35
OWB
82
41
27
44
47
52
6
20
1
71
61
16
29
3
19
37
11
4
2
58
13
92
23
69
68
9
59
26
10
25
15
17
43
34
94
14
62
46
21
63
66
33
67
57
5
65
95
80
51
64
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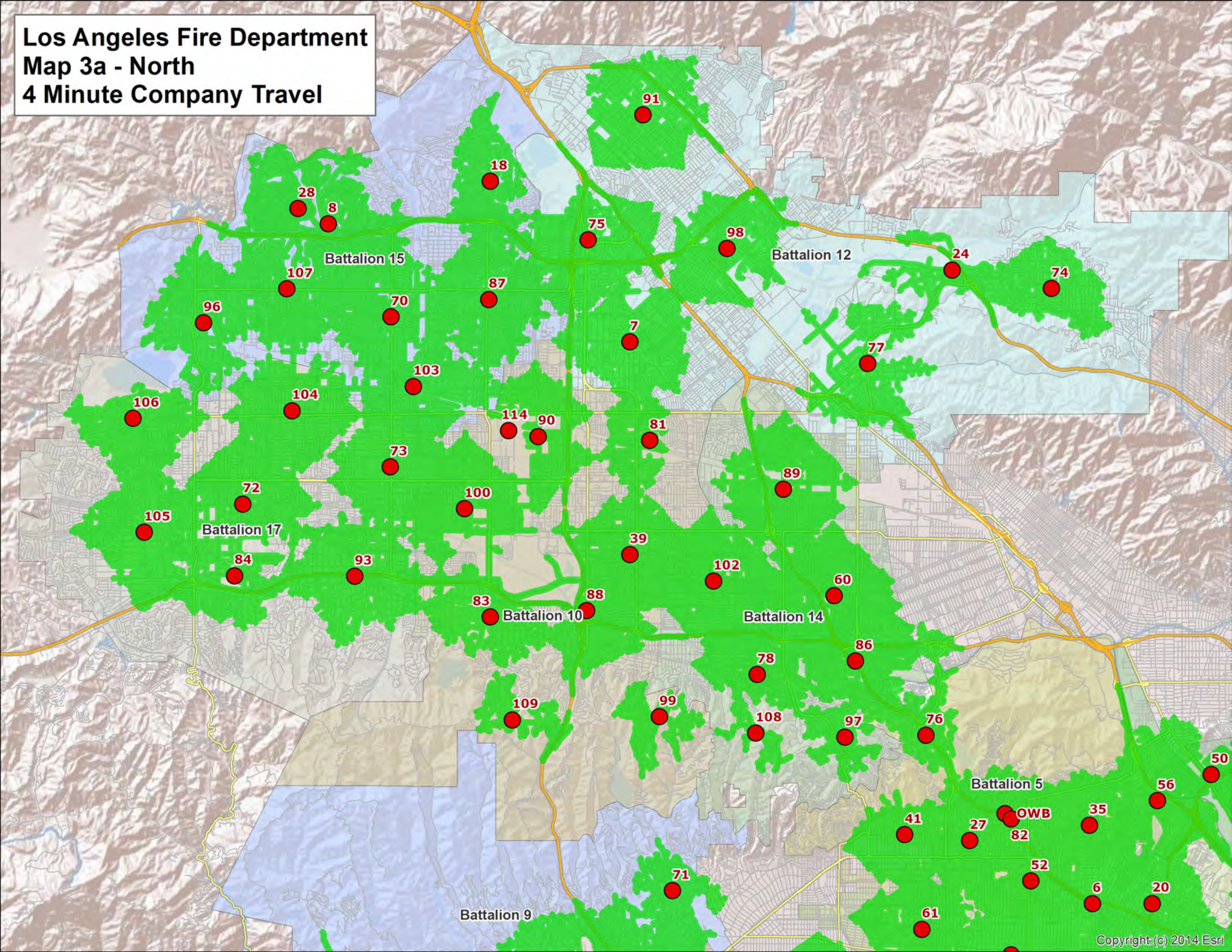
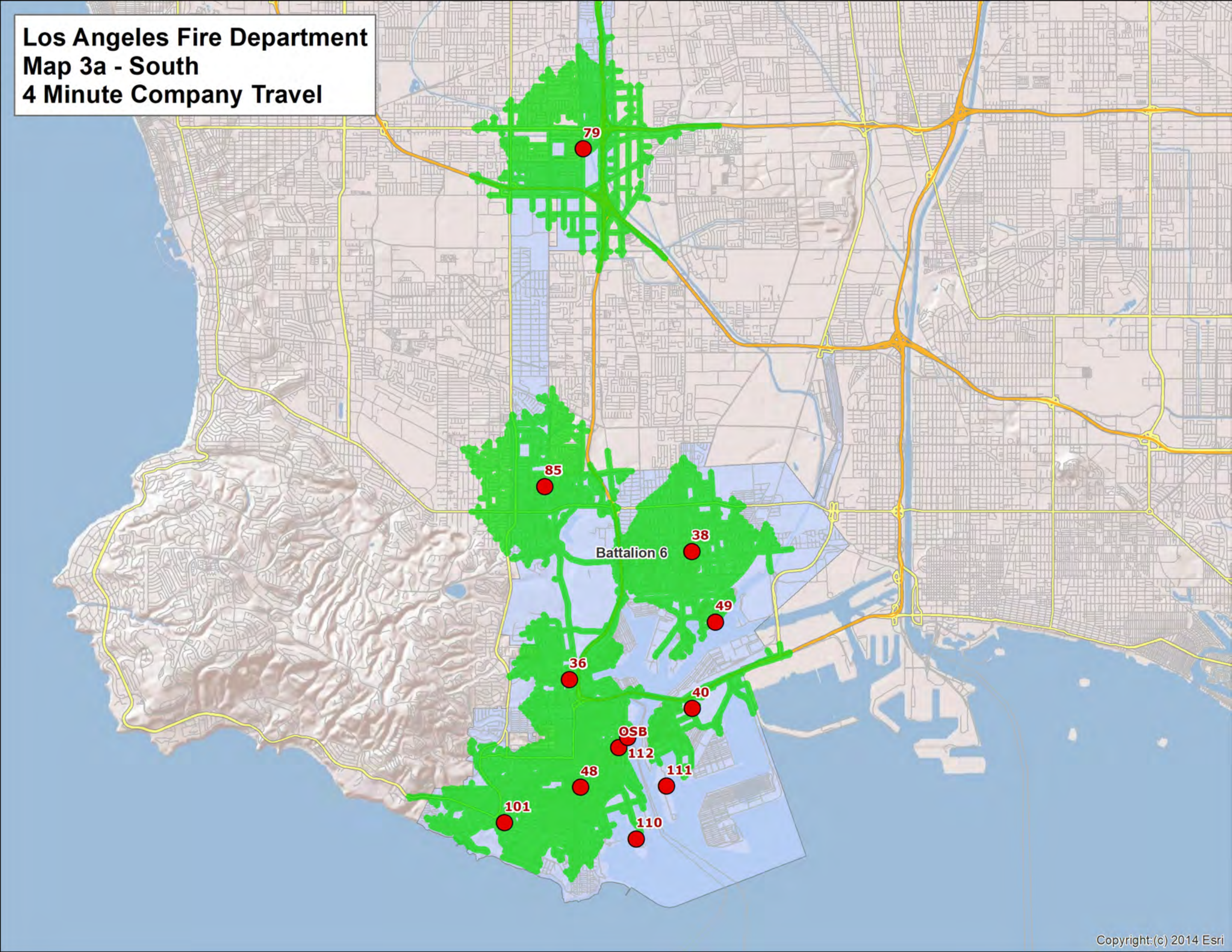
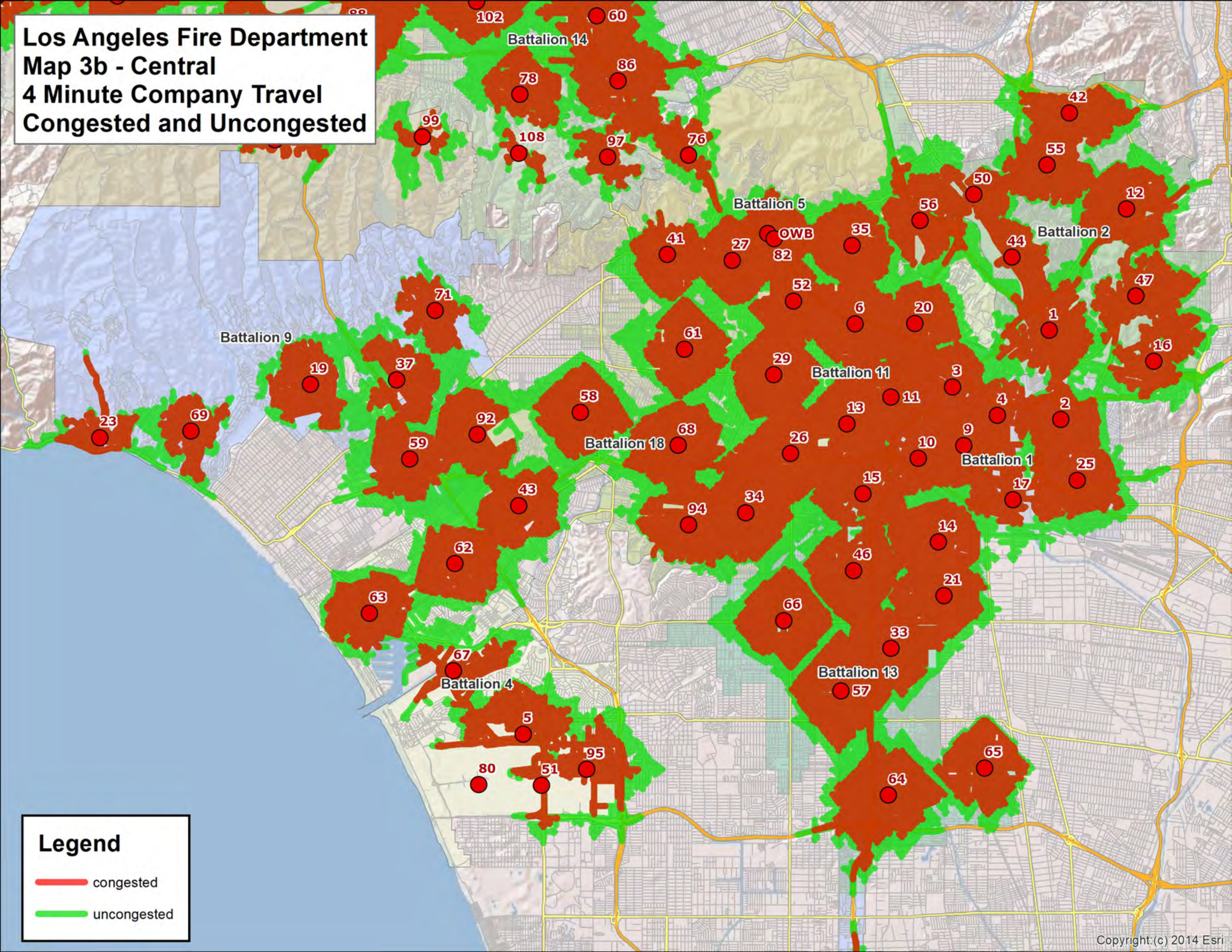
Los Angeles Fire Department
Map 3a - North
4 Minute Company Travel




Los Angeles Fire Department
Map 3a - South
4 Minute Company Travel
79
85
38
Battalion 6
49
36
40
OSB
112
111
48
101
110
Copyright:(c) 2014 Esri



Los Angeles Fire Department
Map 3b - Central
4 Minute Company Travel
Congested and Uncongested
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
102
60
86
78
99
108
97
76
42
55
50
12
56
OWB
82
35
41
27
44
47
52
6
20
71
1
61
16
29
3
19
37
11
4
2
13
58
23
69
92
68
9
26
10
59
25
15
17
43
34
94
14
62
46
21
63
66
33
67
57
5
65
95
80
51
64
Legend
congested
uncongested
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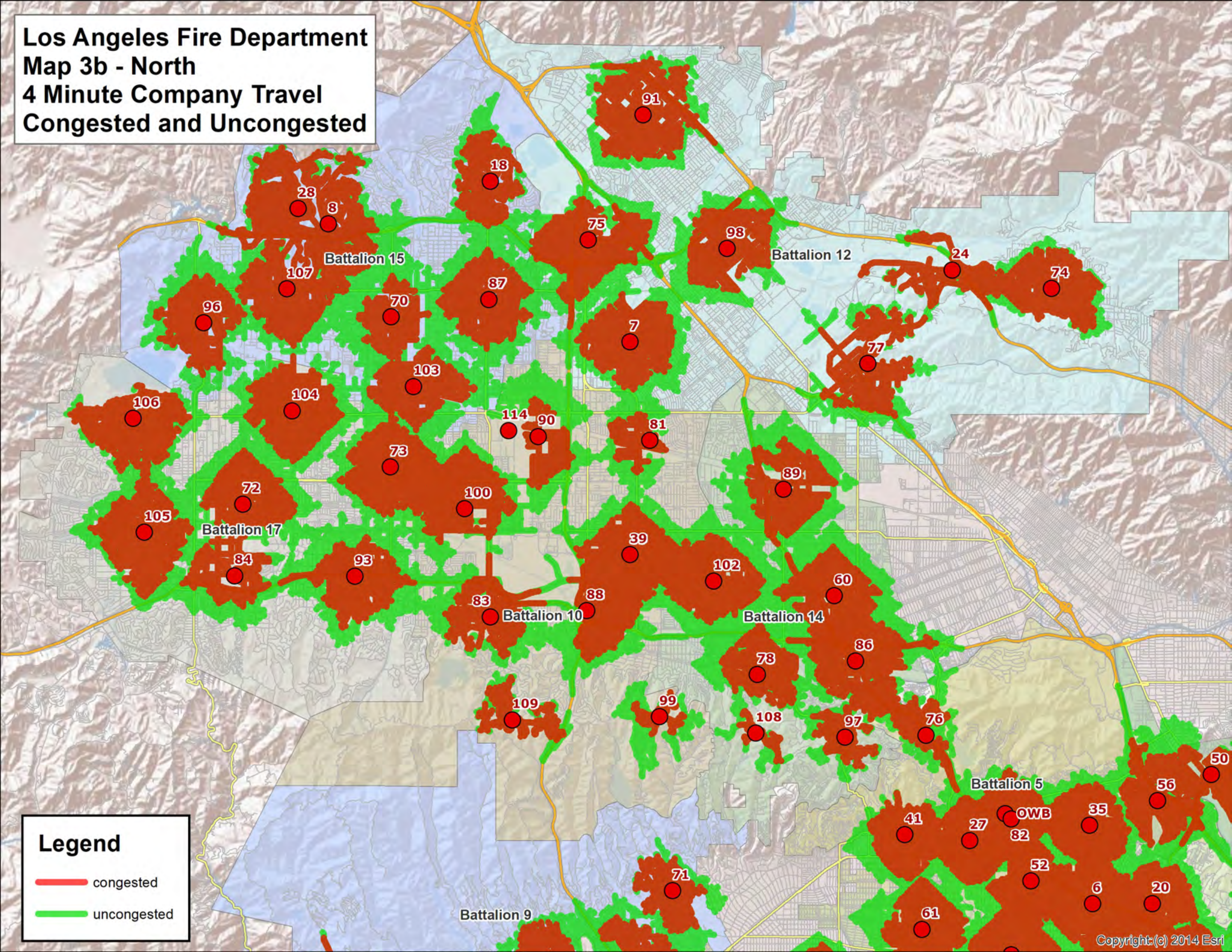
Los Angeles Fire Department
Map 3b - North
4 Minute Company Travel
Congested and Uncongested
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
91
18
28
8
75
98
24
74
107
87
70
96
7
77
103
104
106
114
90
81
73
89
72
100
105
39
102
84
93
60
83
88
86
78
109
99
108
97
76
50
56
41
27
OWB
82
35
52
71
6
20
61
Legend
congested
uncongested
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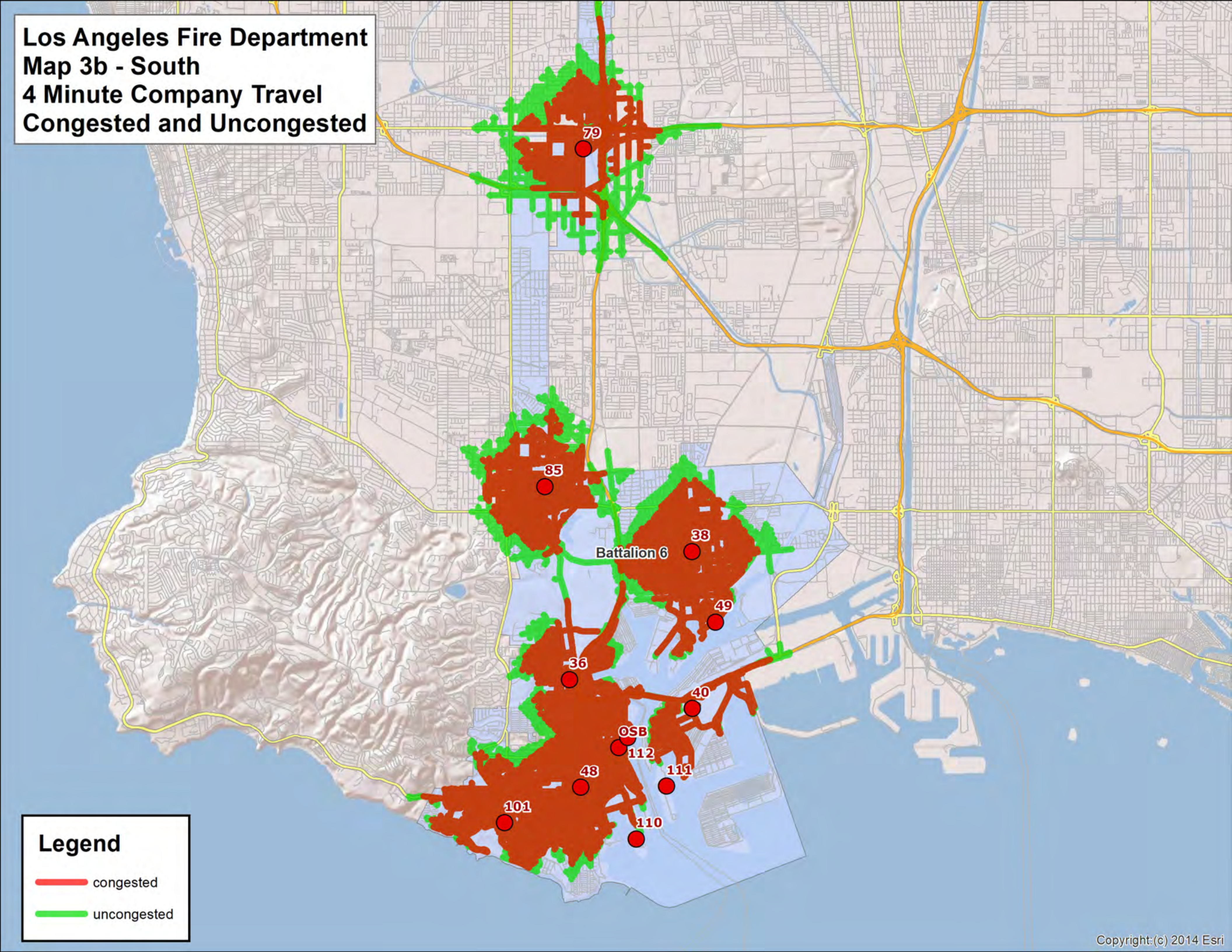

Los Angeles Fire Department
Map 3b - South
4 Minute Company Travel
Congested and Uncongested
79
85
38
Battalion 6
49
36
40
OSB
112
111
48
101
110
Legend
congested
uncongested
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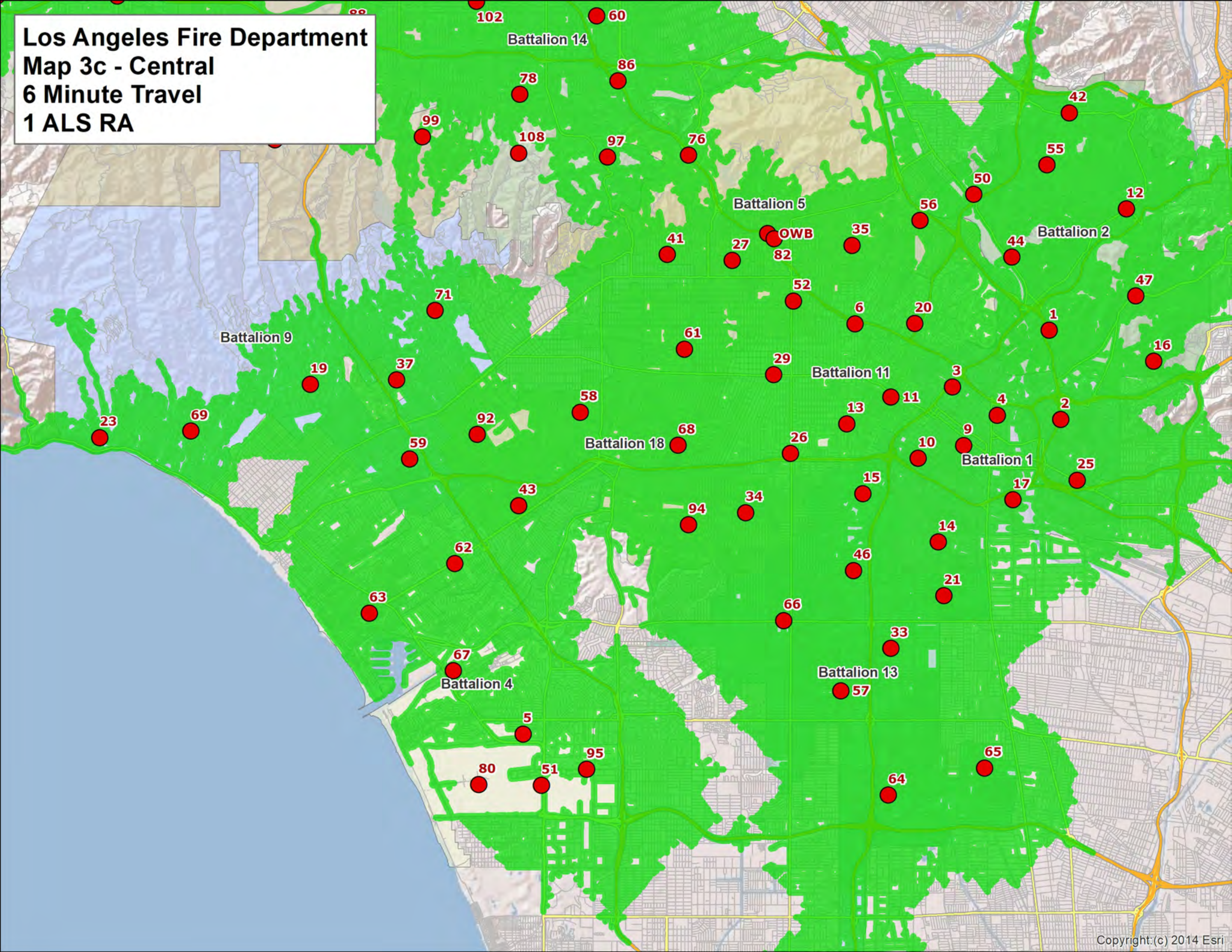

Los Angeles Fire Department
Map 3c - Central
6 Minute Travel
1 ALS RA
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
102
60
86
78
99
108
97
76
42
55
50
12
56
35
OWB
82
41
27
44
47
52
6
20
1
71
61
16
29
3
19
37
11
4
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58
13
23
69
92
68
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26
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59
25
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95
65
80
51
64
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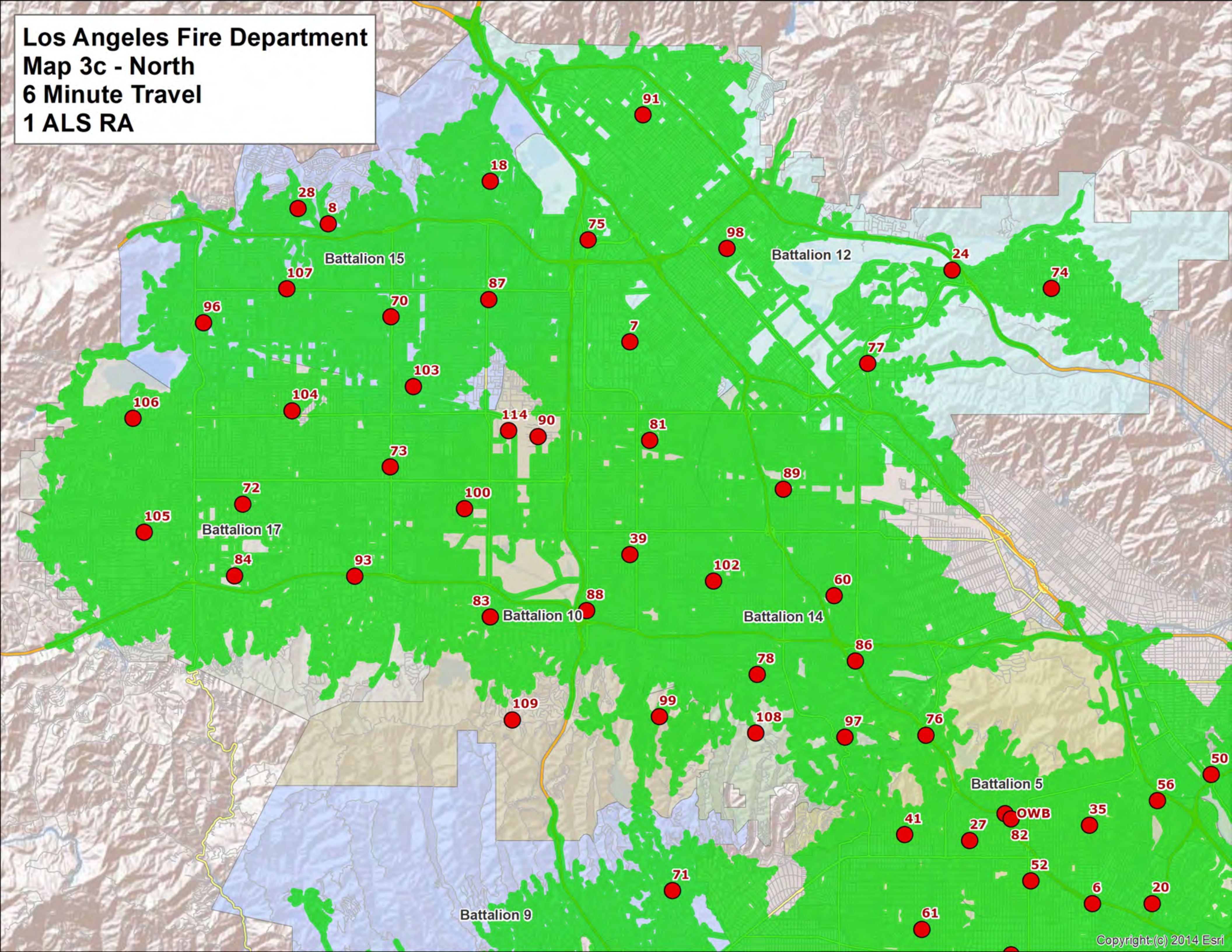
Los Angeles Fire Department
Map 3c - North
6 Minute Travel
1 ALS RA
91
18
28
8
75
98
Battalion 15
Battalion 12
24
74
107
87
70
96
7
77
103
104
106
114
90
81
73
89
72
100
105
Battalion 17
39
84
93
102
60
88
83
Battalion 10
Battalion 14
86
78
109
99
108
97
76
50
Battalion 5
56
OWB
35
41
27
82
52
71
6
20
Battalion 9
61
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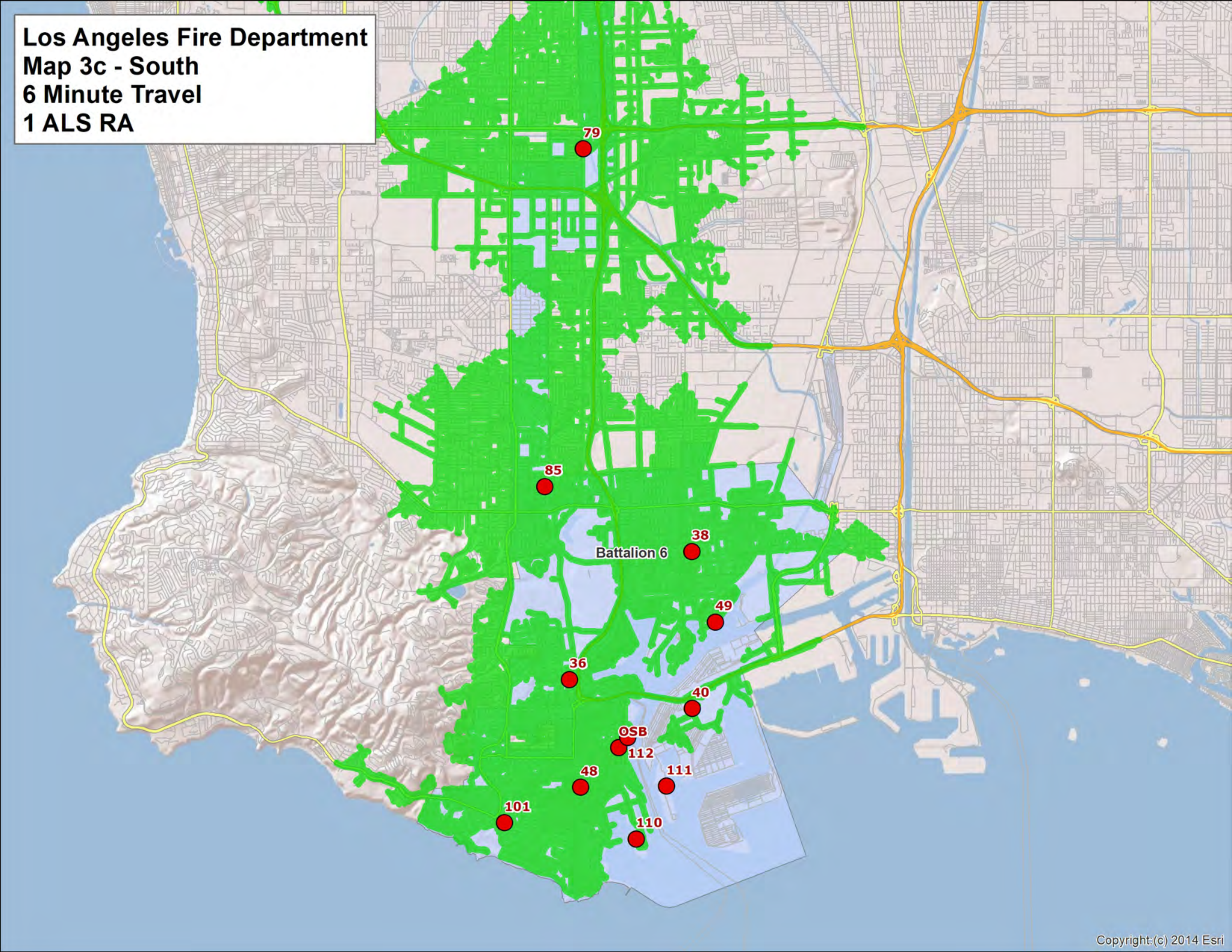
Los Angeles Fire Department
Map 3c - South
6 Minute Travel
1 ALS RA
79
85
38
Battalion 6
49
36
40
OSB
112
111
48
101
110
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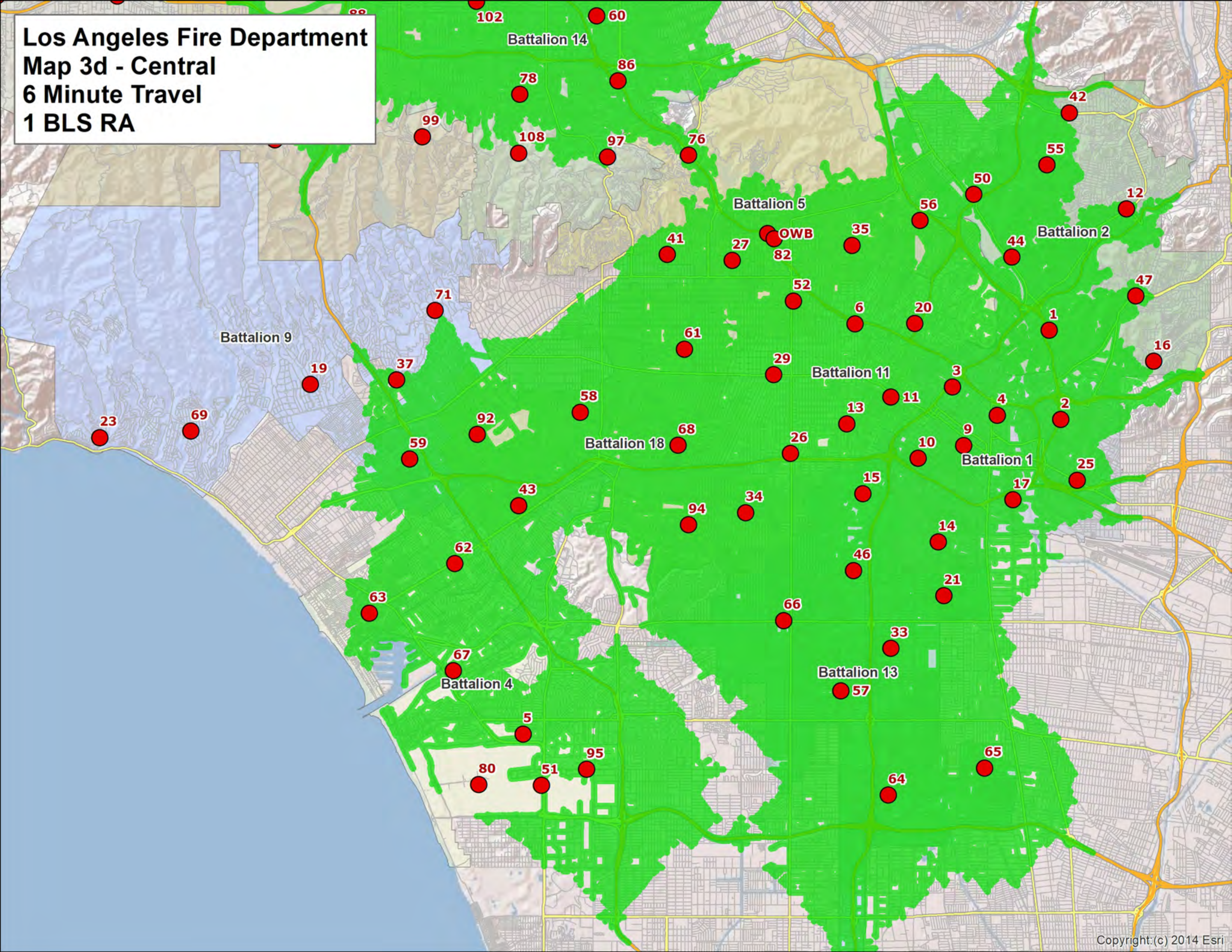
Los Angeles Fire Department
Map 3d - Central
6 Minute Travel
1 BLS RA
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
102
60
86
78
99
108
97
76
42
55
50
12
56
OWB
82
35
41
27
44
47
52
6
20
1
71
61
16
29
3
37
19
11
4
2
58
13
92
68
26
9
23
69
59
10
25
15
17
43
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51
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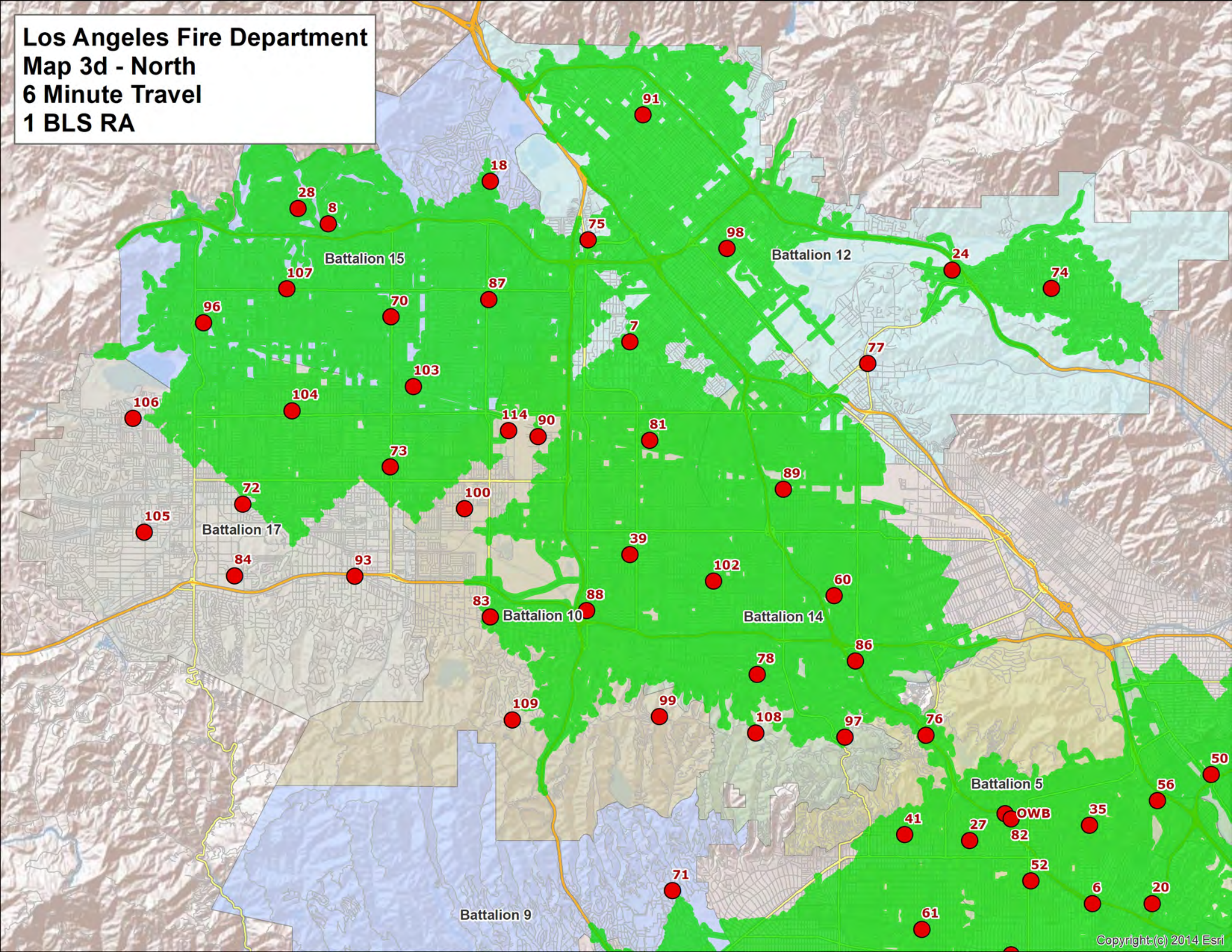
Los Angeles Fire Department
Map 3d - North
6 Minute Travel
1 BLS RA
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
91
18
28
8
75
98
24
74
107
87
70
96
7
77
103
104
106
114
90
81
73
89
72
100
105
39
84
93
102
60
83
88
86
78
109
99
108
97
76
50
56
OWB
35
41
27
82
52
71
6
20
61
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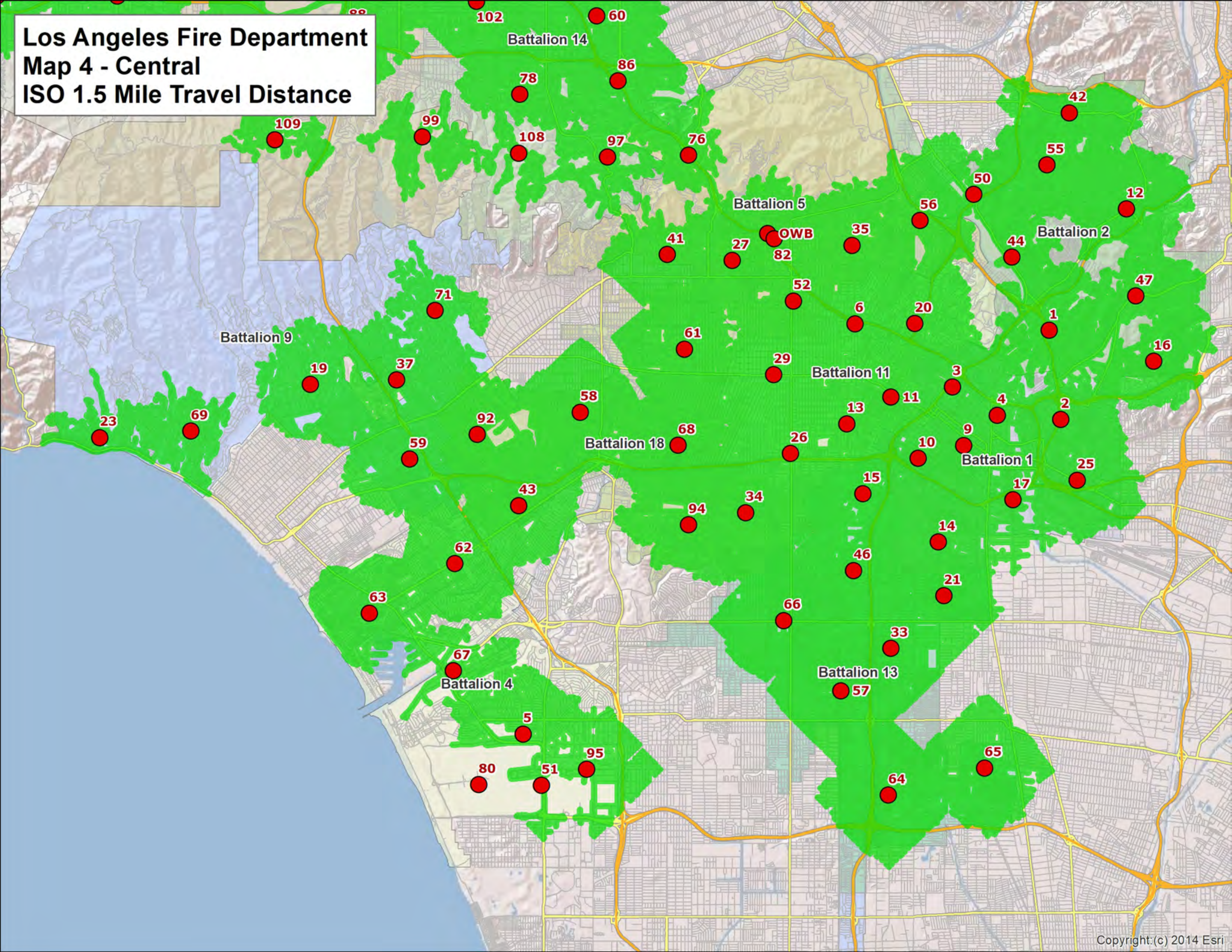
Los Angeles Fire Department
Map 3d - South
6 Minute Travel
1 BLS RA
79
85
38
Battalion 6
49
36
40
OSB
112
111
48
101
110
Copyright:(c) 2014 Esri



Los Angeles Fire Department
Map 4 - Central
ISO 1.5 Mile Travel Distance
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
102
60
86
78
109
99
108
97
76
42
55
50
12
56
35
OWB
82
41
27
44
47
52
6
20
1
71
61
29
16
19
37
3
11
4
2
23
69
58
13
92
68
26
10
9
59
25
17
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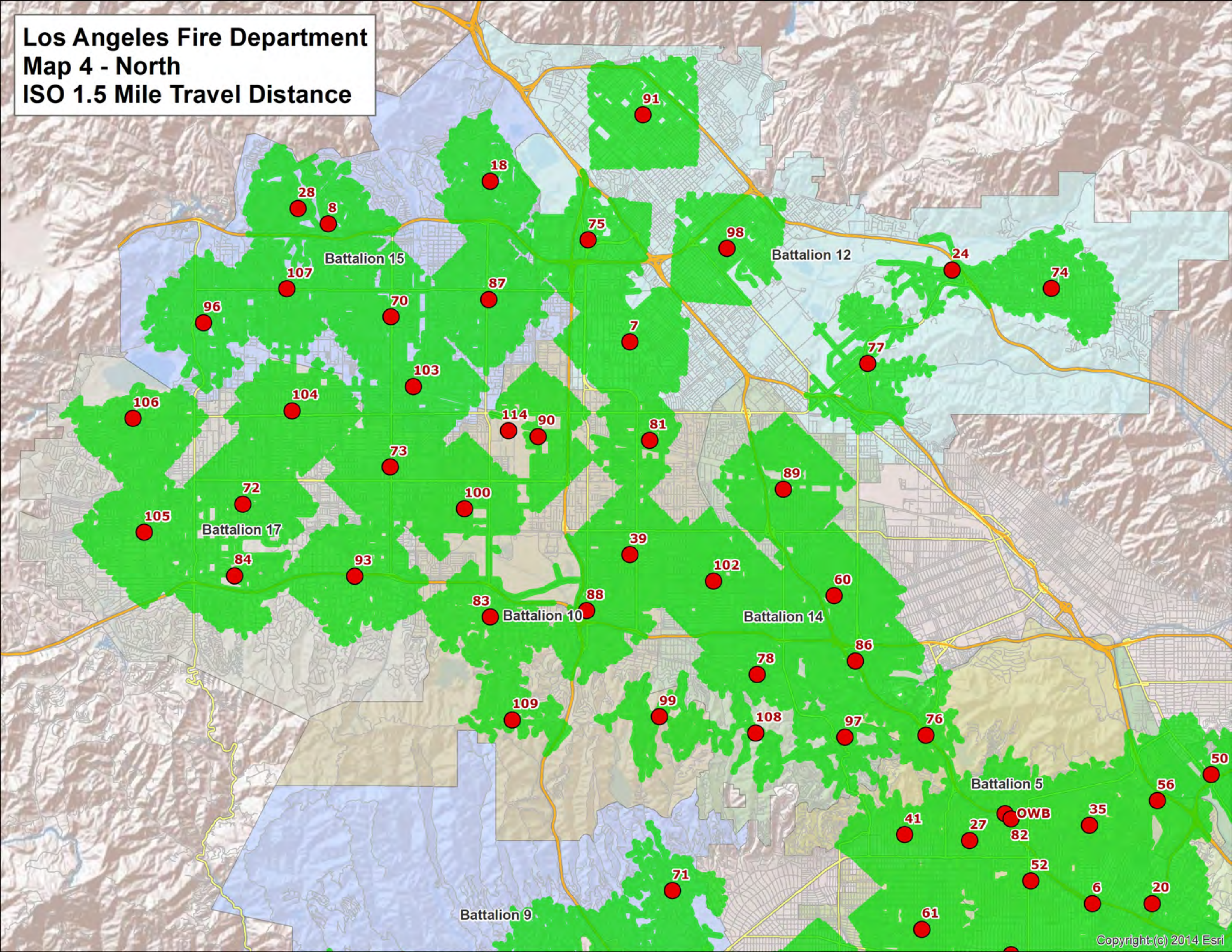
Los Angeles Fire Department
Map 4 - North
ISO 1.5 Mile Travel Distance
91
18
28
8
75
98
Battalion 15
Battalion 12
24
74
107
87
96
70
7
77
103
106
104
114
90
81
73
89
72
100
105
Battalion 17
39
84
93
102
60
88
83
Battalion 10
Battalion 14
86
78
109
99
108
97
76
50
Battalion 5
56
OWB
35
41
27
82
52
71
6
20
Battalion 9
61
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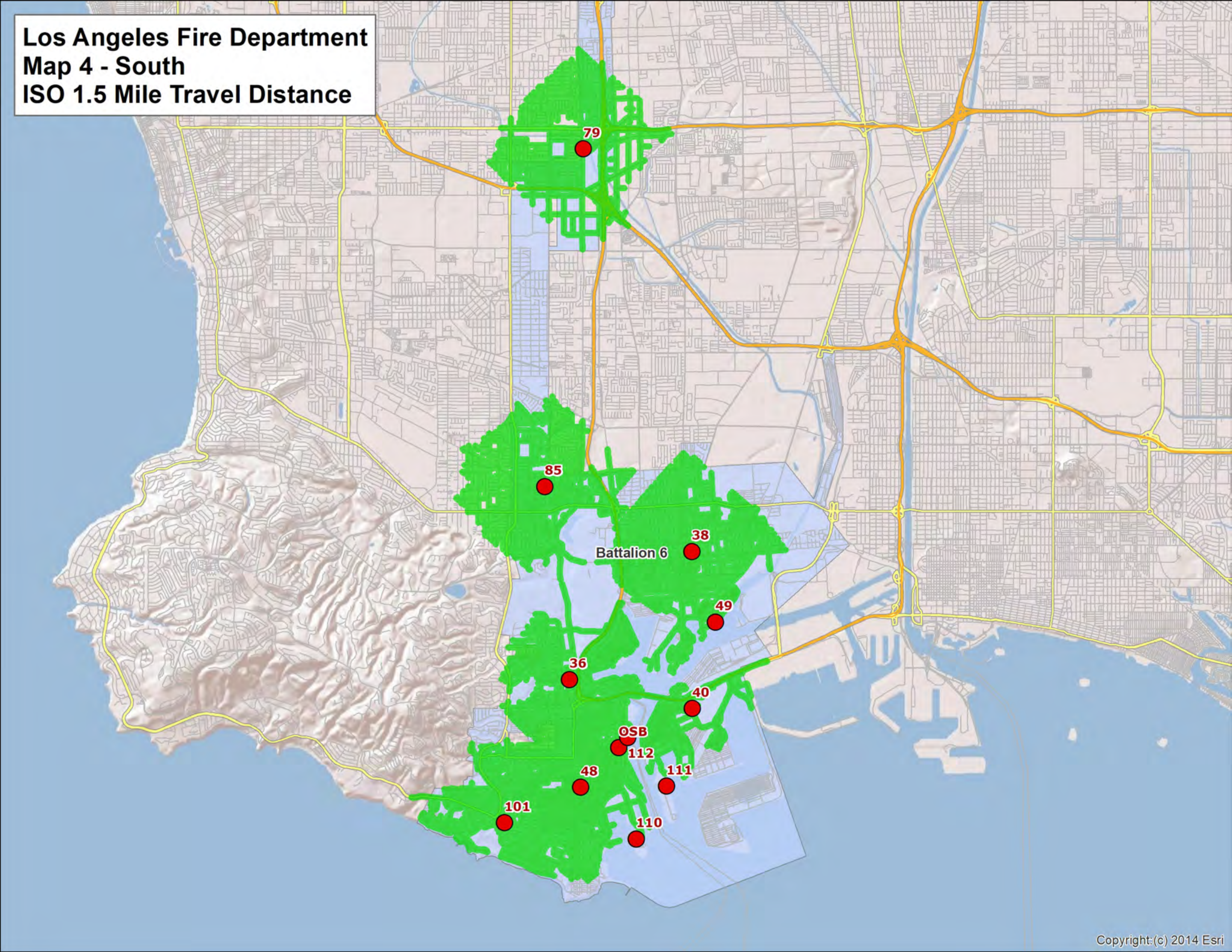
Los Angeles Fire Department
Map 4 - South
ISO 1.5 Mile Travel Distance
79
85
38
Battalion 6
49
36
40
OSB
112
111
48
101
110
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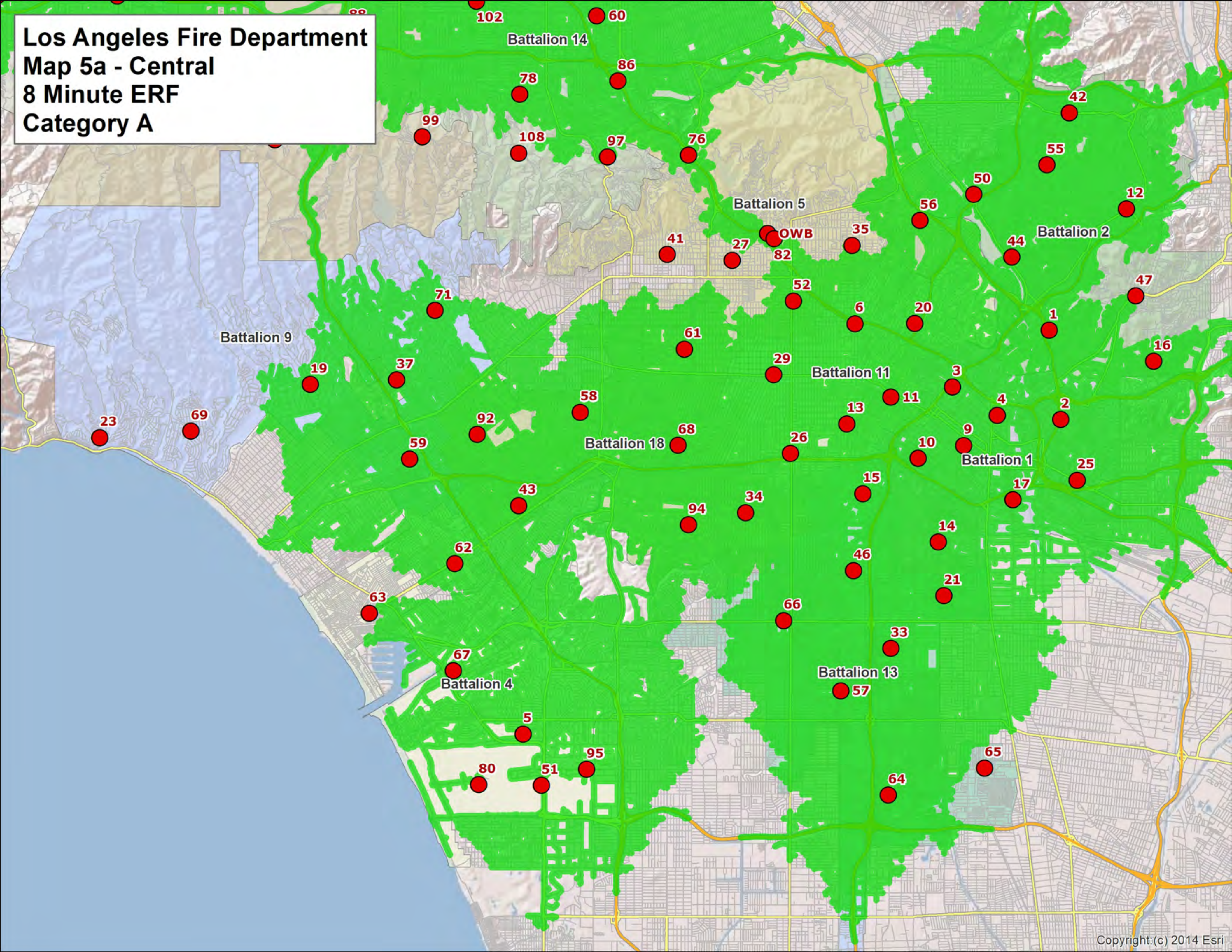
Los Angeles Fire Department
Map 5a - Central
8 Minute ERF
Category A
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
OWB
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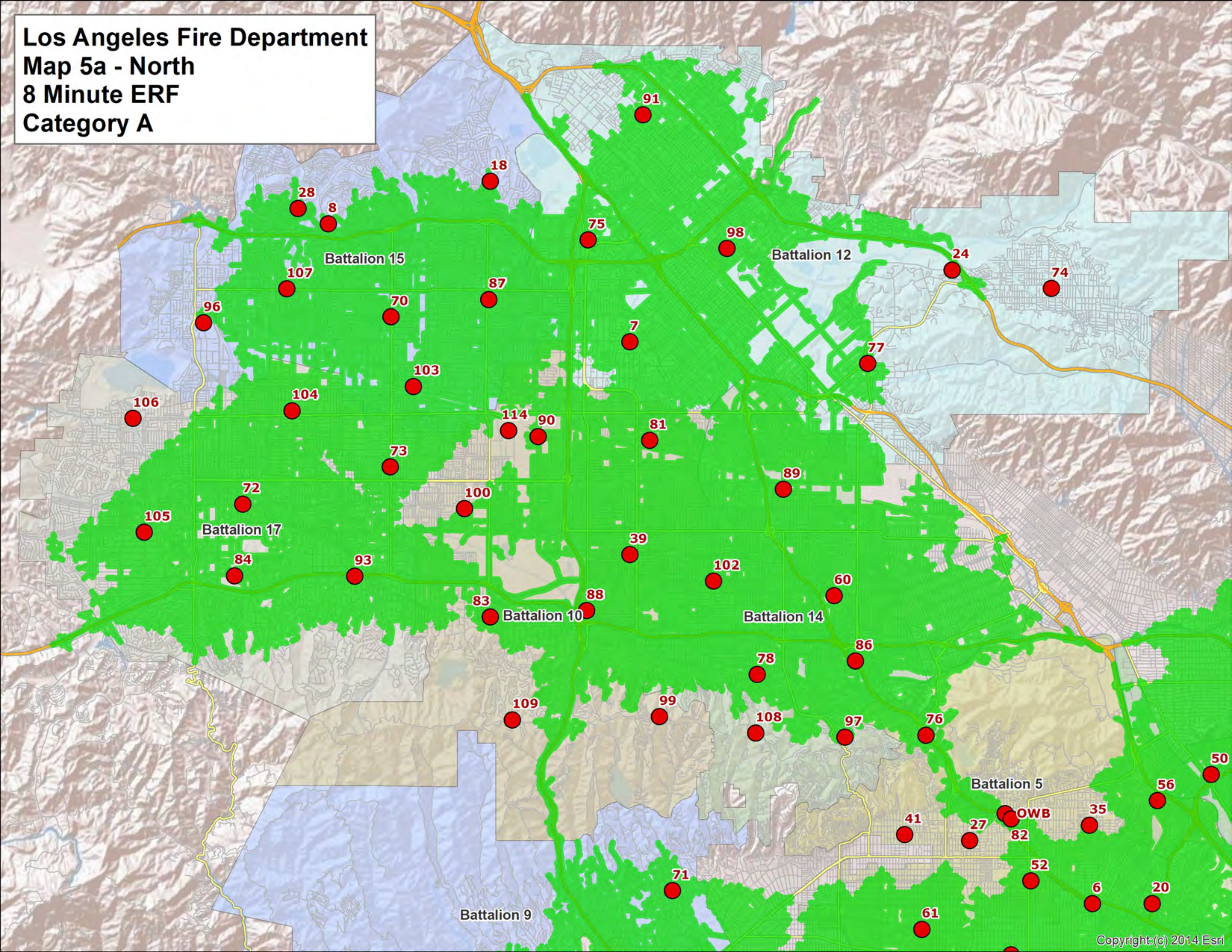
Los Angeles Fire Department
Map 5a - North
8 Minute ERF
Category A
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
91
18
28
8
75
98
24
74
107
87
70
96
7
77
103
104
106
114
90
81
73
89
72
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105
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84
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102
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OWB
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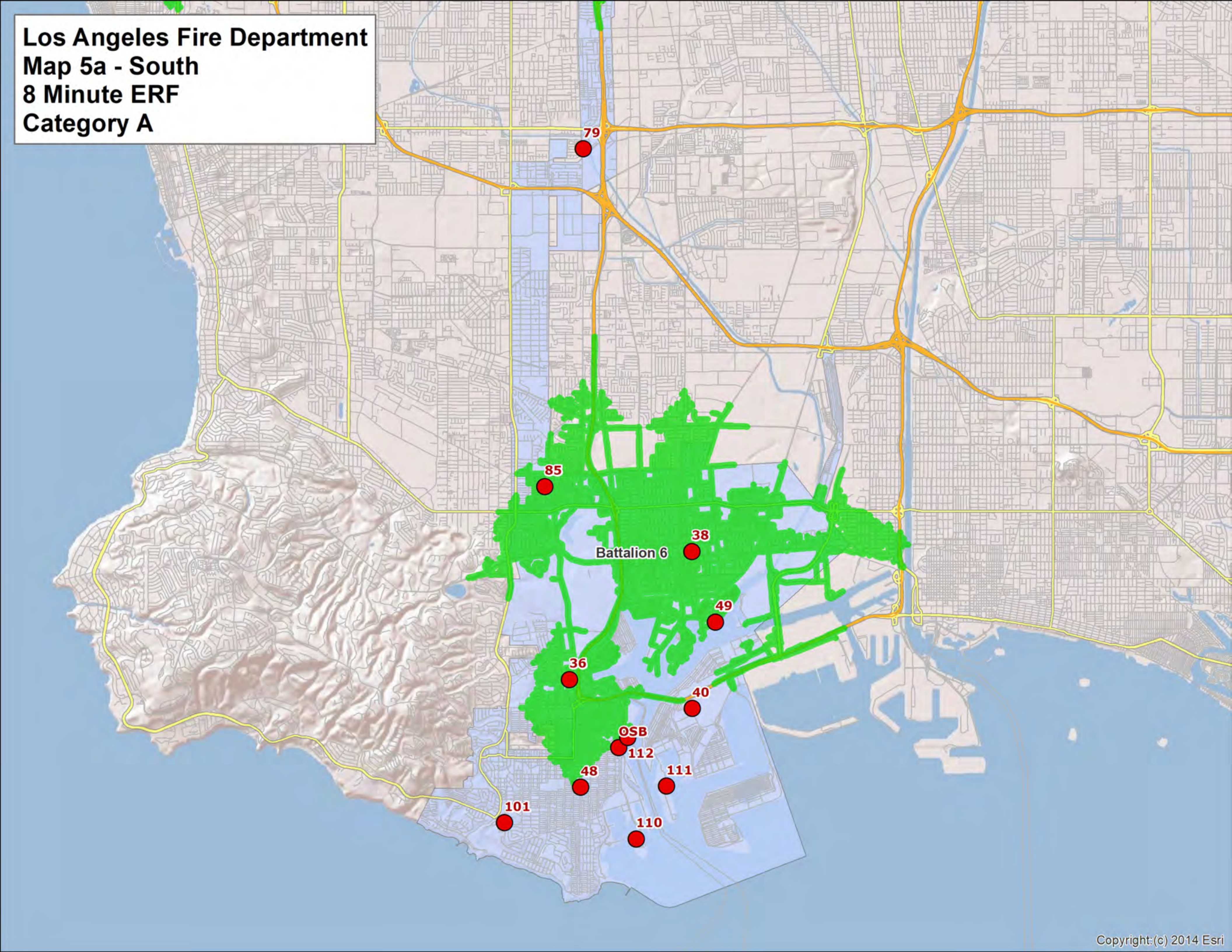

Los Angeles Fire Department
Map 5a - South
8 Minute ERF
Category A
79
85
38
Battalion 6
49
36
40
OSB
112
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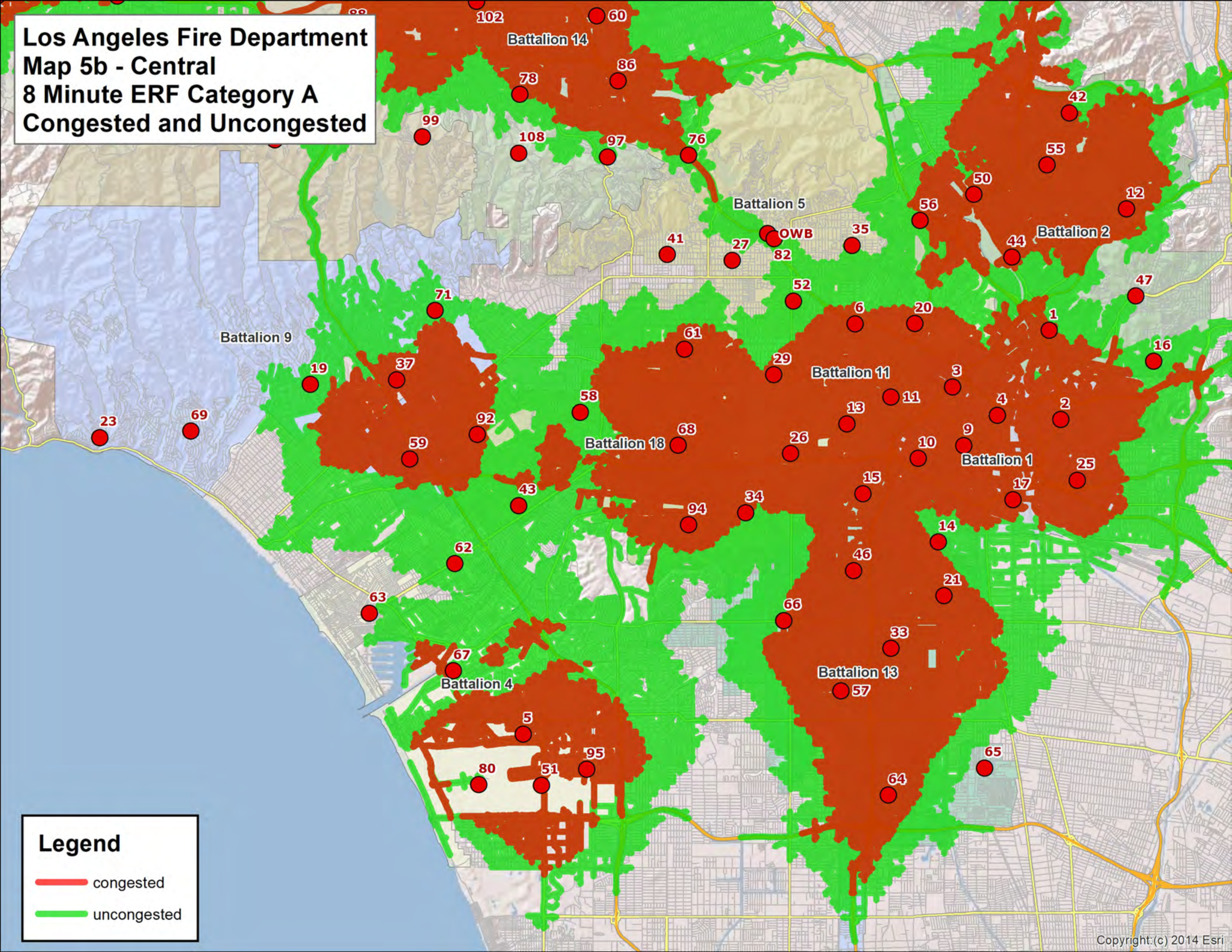
101
110
Copyright:(c) 2014 Esri



Los Angeles Fire Department
Map 5b - Central
8 Minute ERF Category A
Congested and Uncongested
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 4
Battalion 13
102
60
86
78
99
108
97
76
42
55
50
56
12
44
OWB
82
41
27
35
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47
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6
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1
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23
69
92
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17
43
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94
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67
57
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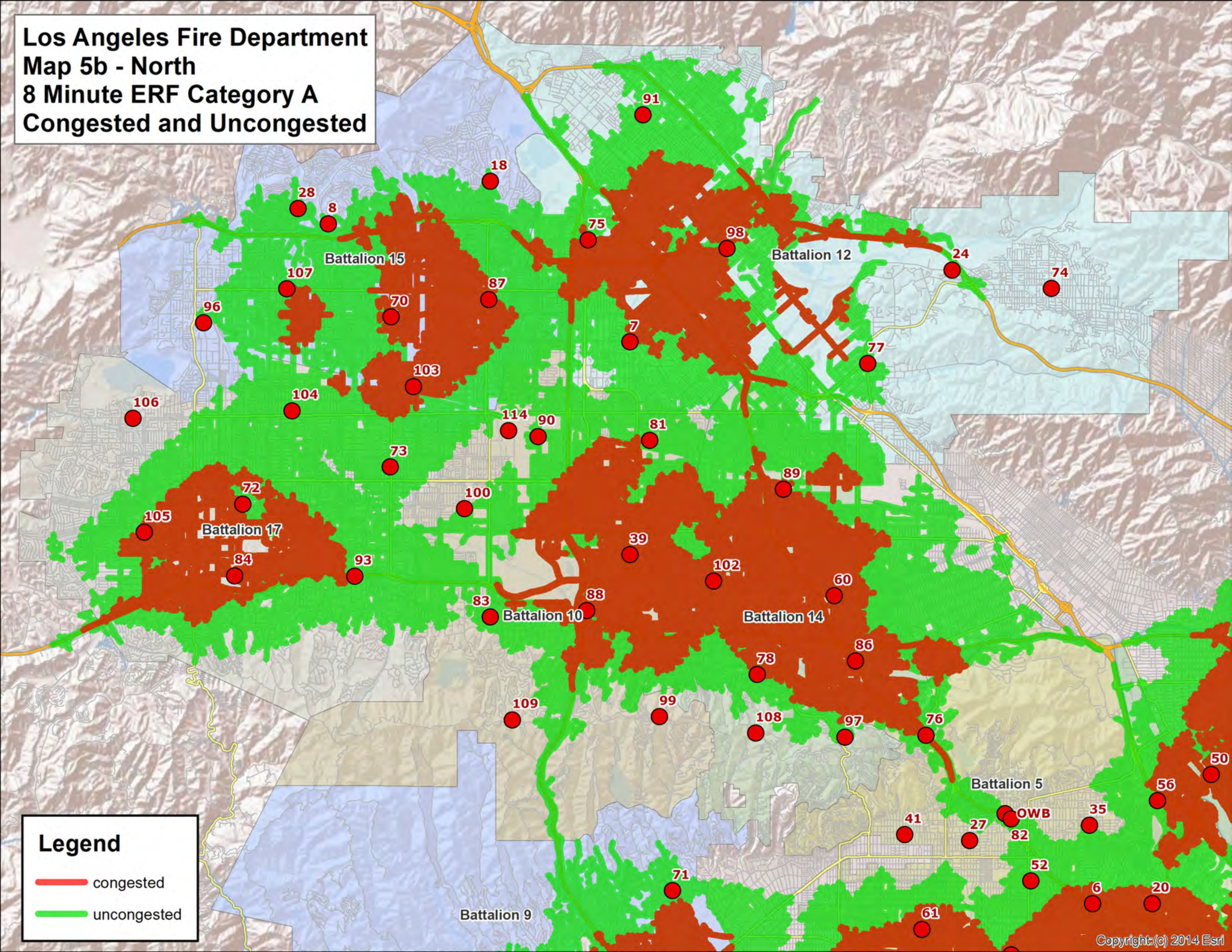
95
65
80
51
64
Legend
congested
uncongested
Copyright:(c) 2014 Esri


Los Angeles Fire Department
Map 5b - North
8 Minute ERF Category A
Congested and Uncongested
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
91
18
28
8
75
98
24
74
107
87
70
96
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77
103
104
106
114
90
81
73
89
72
100
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OWB
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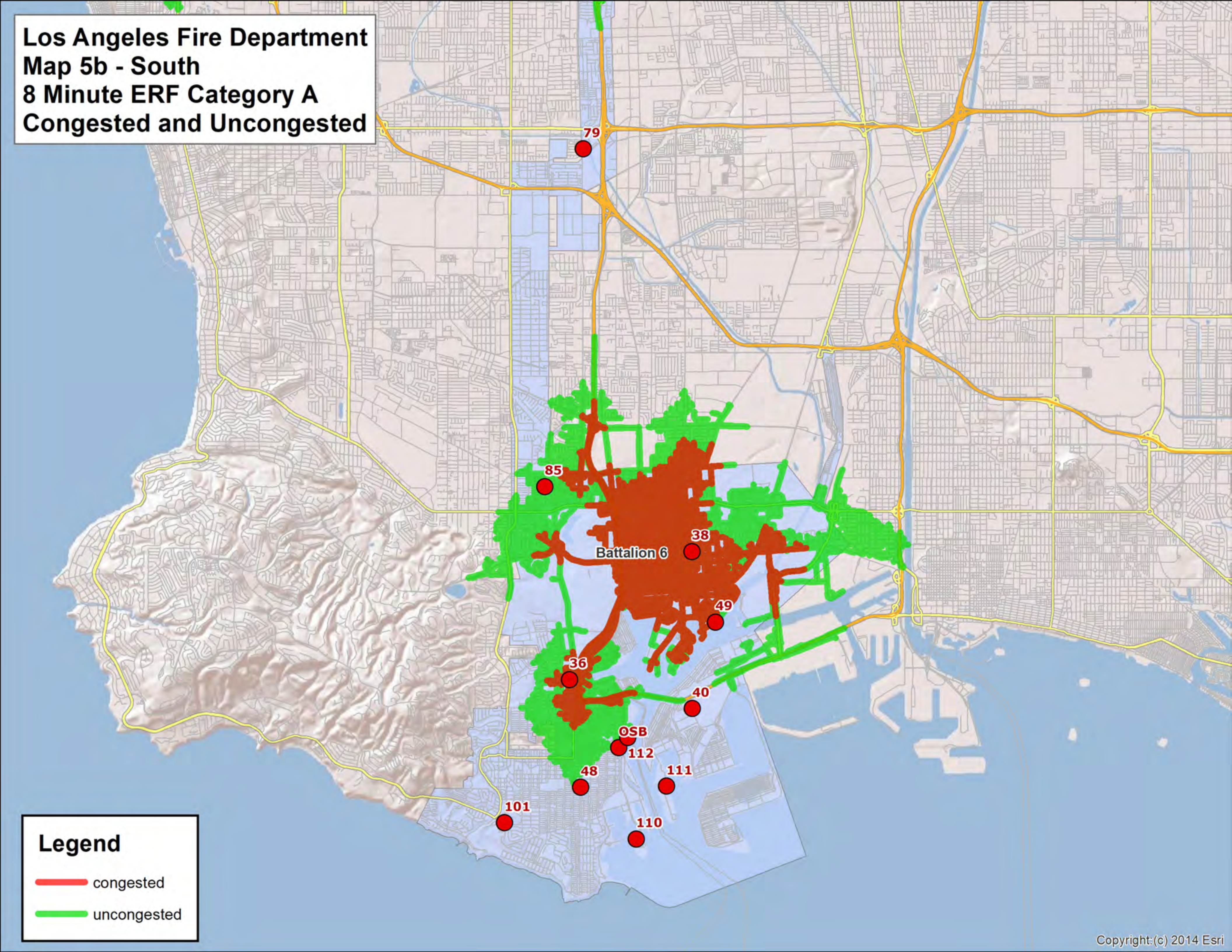
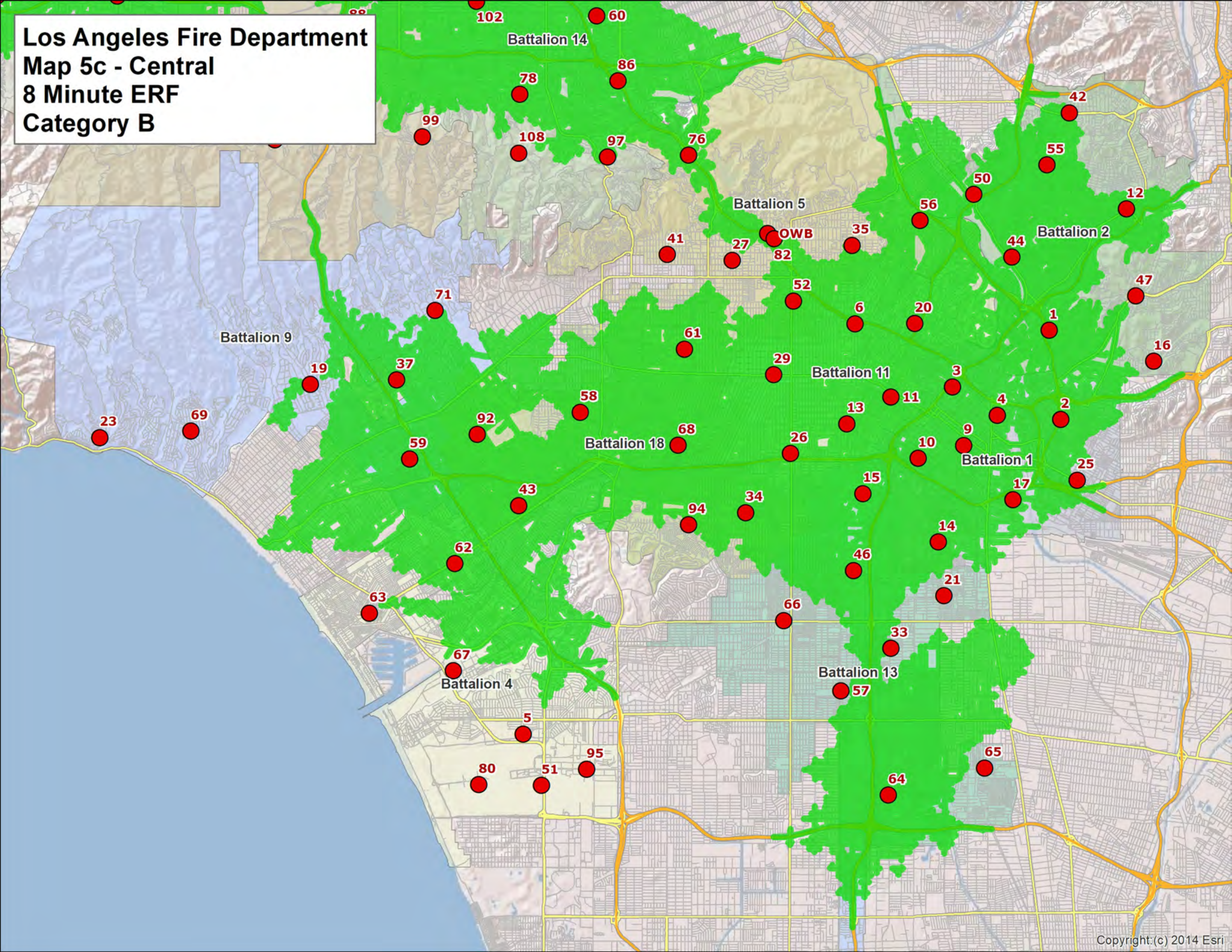
61
Legend
congested
uncongested
Copyright:(c) 2014 Esri



Los Angeles Fire Department
Map 5b - South
8 Minute ERF Category A
Congested and Uncongested
79
85
38
Battalion 6
49
36
40
OSB
112
48
111
101
110
Legend
congested
uncongested
Copyright:(c) 2014 Esri


Los Angeles Fire Department
Map 5c - Central
8 Minute ERF
Category B
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
102
60
86
78
99
108
97
76
42
55
50
12
56
OWB
82
35
41
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44
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52
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71
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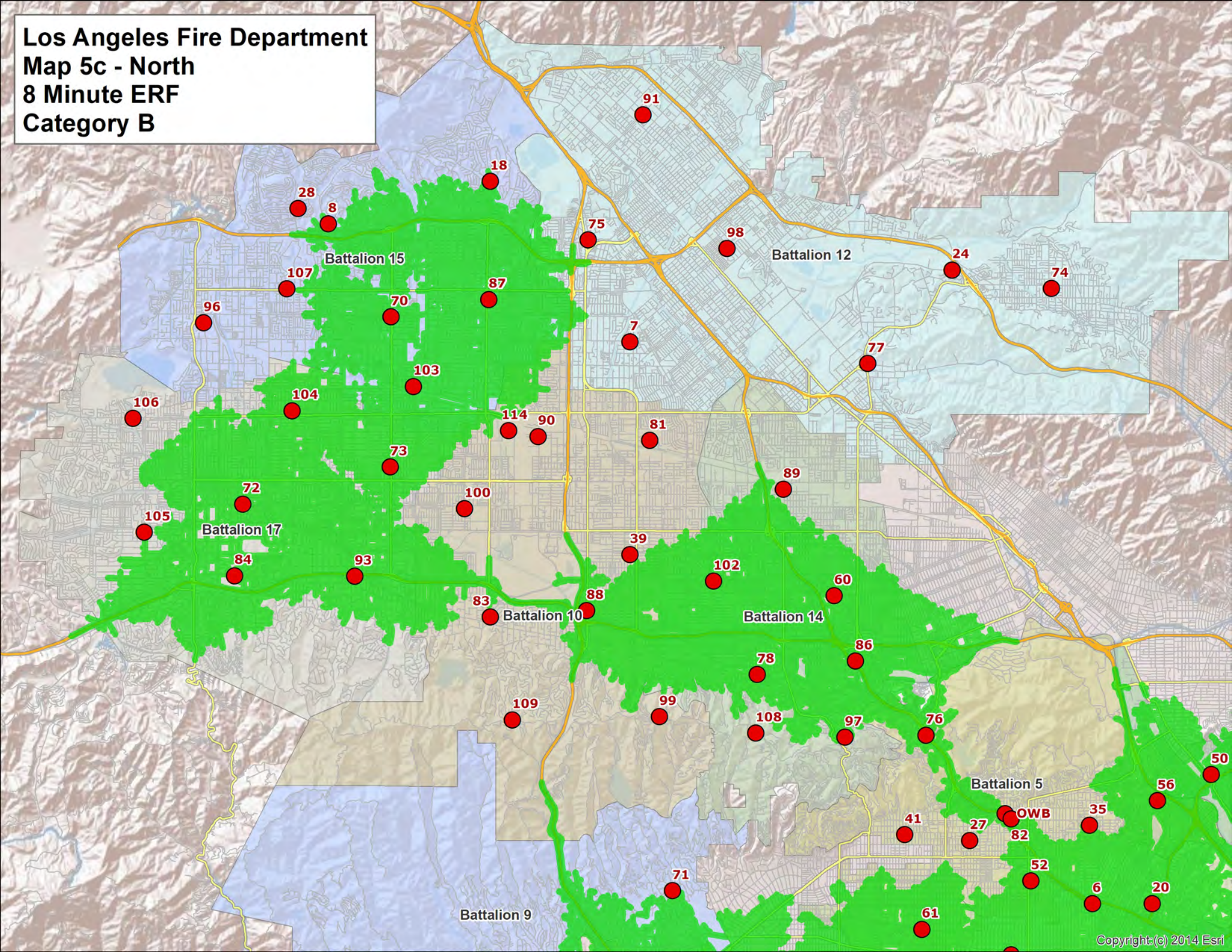
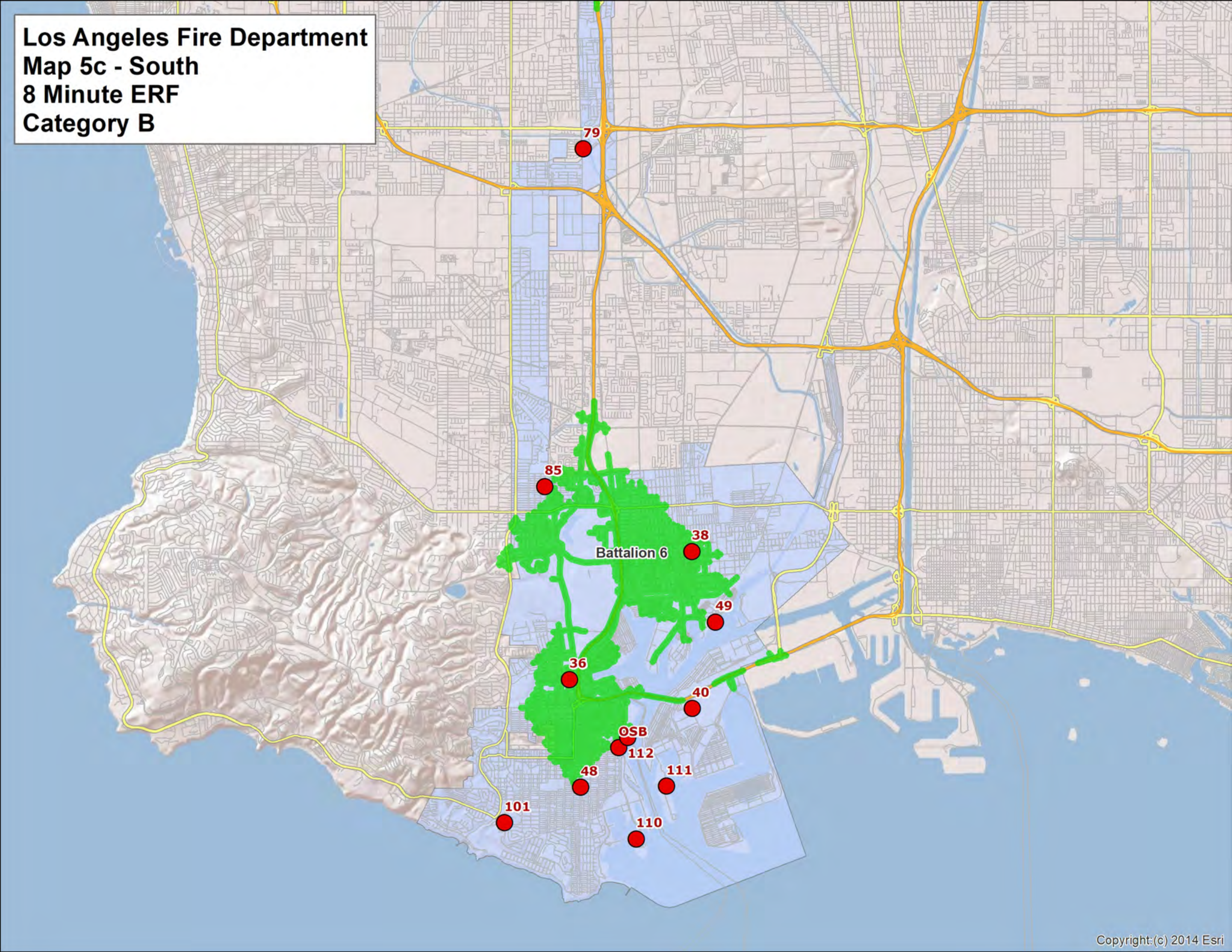
Los Angeles Fire Department
Map 5c - North
8 Minute ERF
Category B





Los Angeles Fire Department
Map 5c - South
8 Minute ERF
Category B
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85
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Battalion 6
49
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OSB
112
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111
101
110
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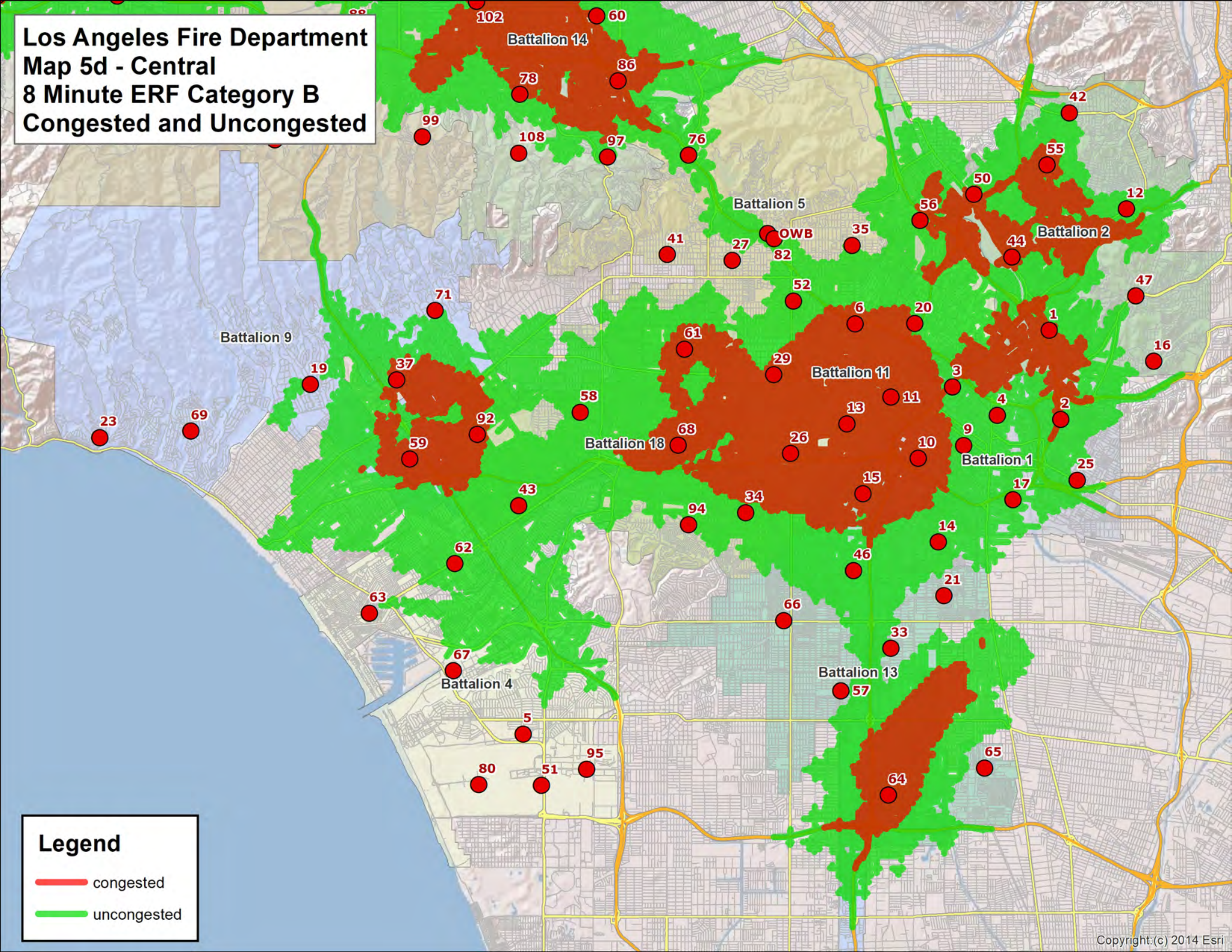

Los Angeles Fire Department
Map 5d - Central
8 Minute ERF Category B
Congested and Uncongested
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
OWB
Legend
congested
uncongested
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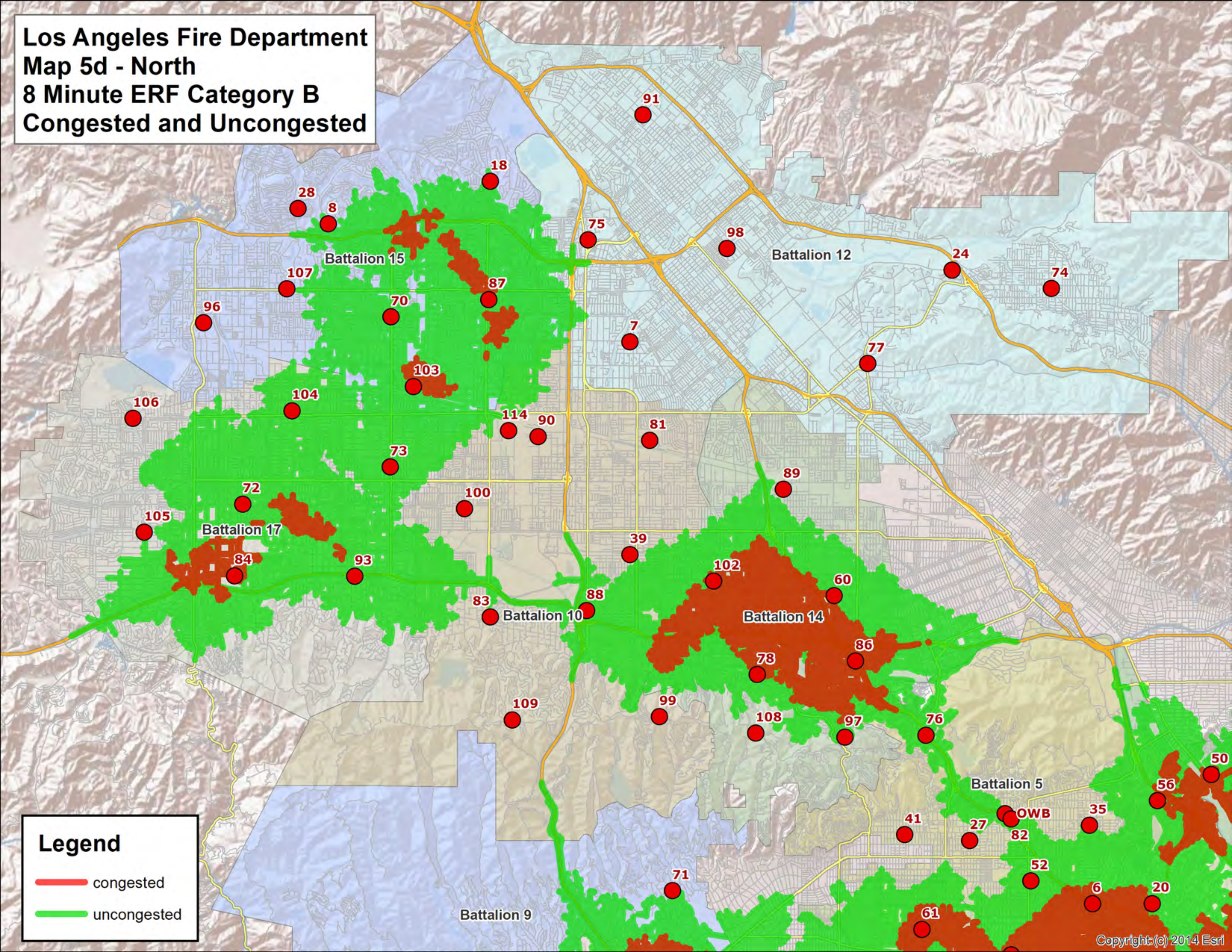

Los Angeles Fire Department
Map 5d - North
8 Minute ERF Category B
Congested and Uncongested
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
91
18
28
8
75
98
24
74
107
87
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96
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103
104
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114
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89
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102
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OWB
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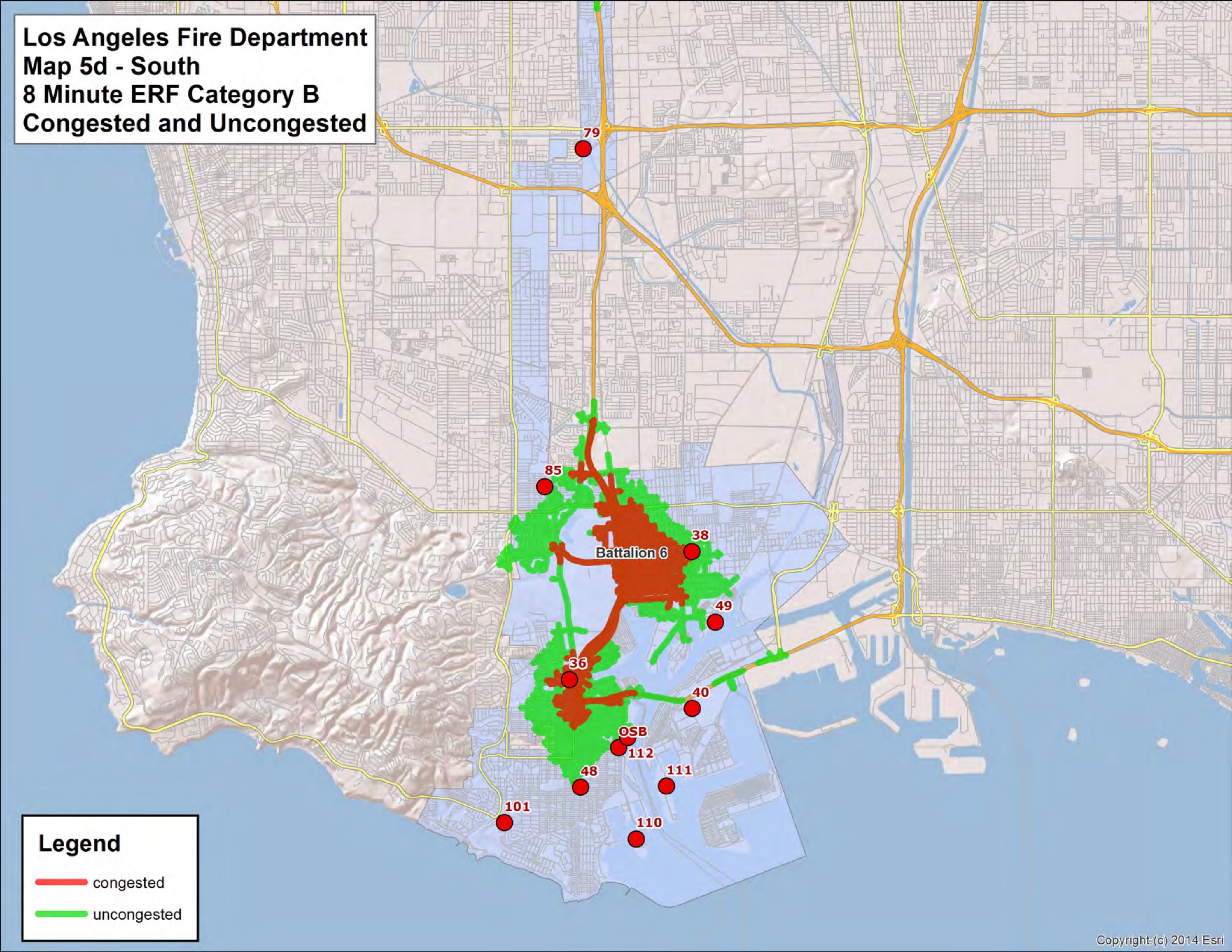
Legend
congested
uncongested
Copyright:(c) 2014 Esri



Los Angeles Fire Department
Map 5d - South
8 Minute ERF Category B
Congested and Uncongested
79
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Battalion 6
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OSB
112
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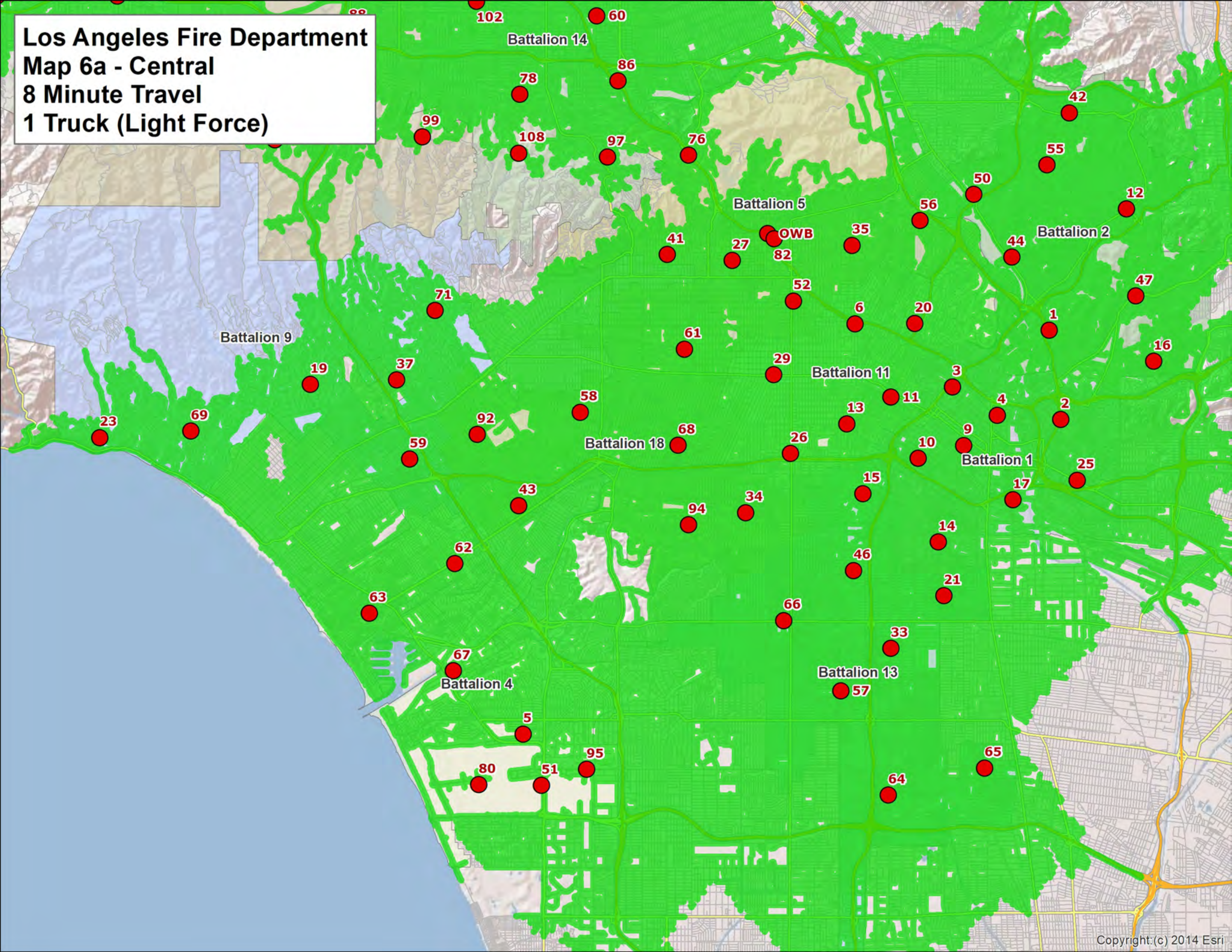
101
110
Legend
congested
uncongested
Copyright:(c) 2014 Esri


Los Angeles Fire Department
Map 6a - Central
8 Minute Travel
1 Truck (Light Force)
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
102
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86
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108
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12
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OWB
82
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41
27
44
47
52
6
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71
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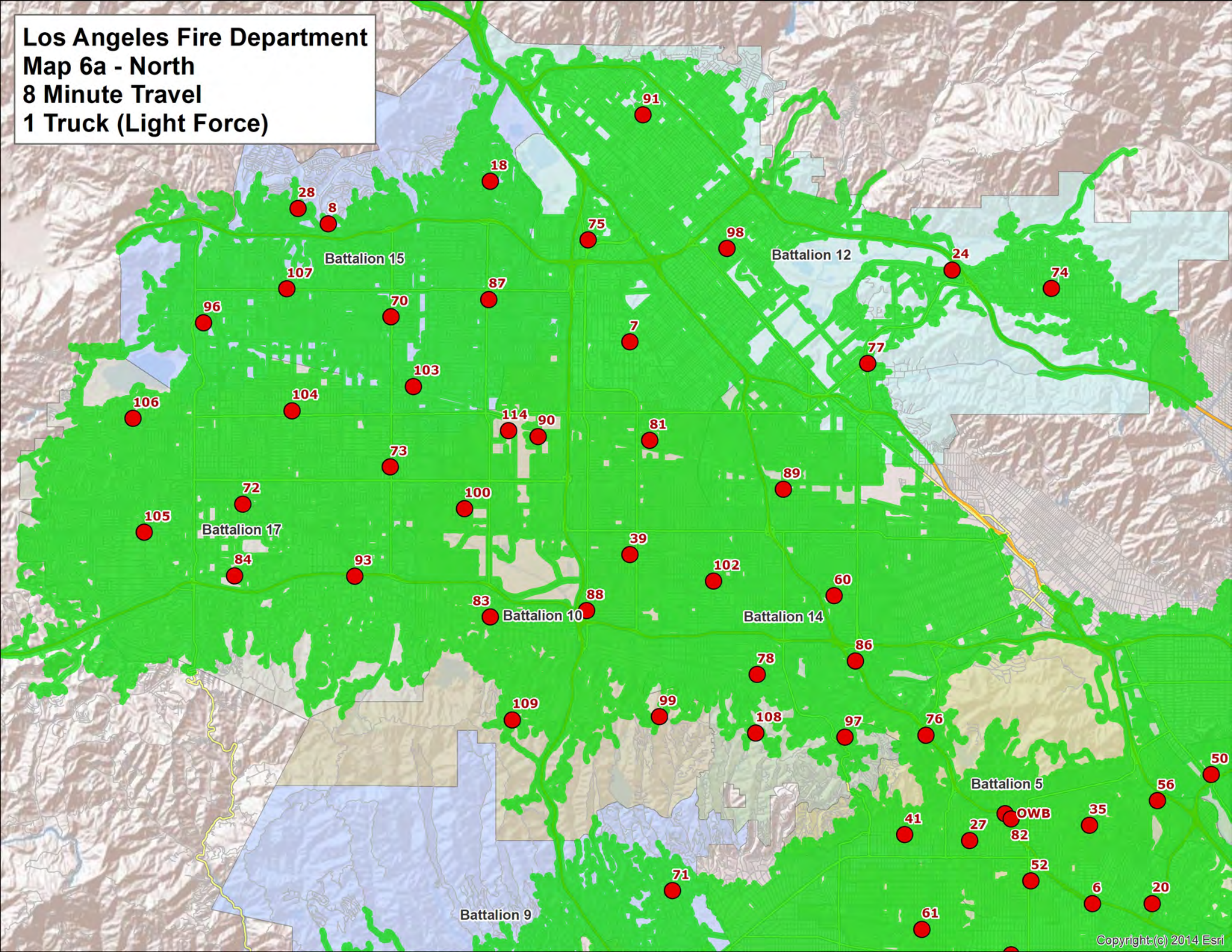
Copyright:(c) 2014 Esri


Los Angeles Fire Department
Map 6a - North
8 Minute Travel
1 Truck (Light Force)
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
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39
84
93
102
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OWB
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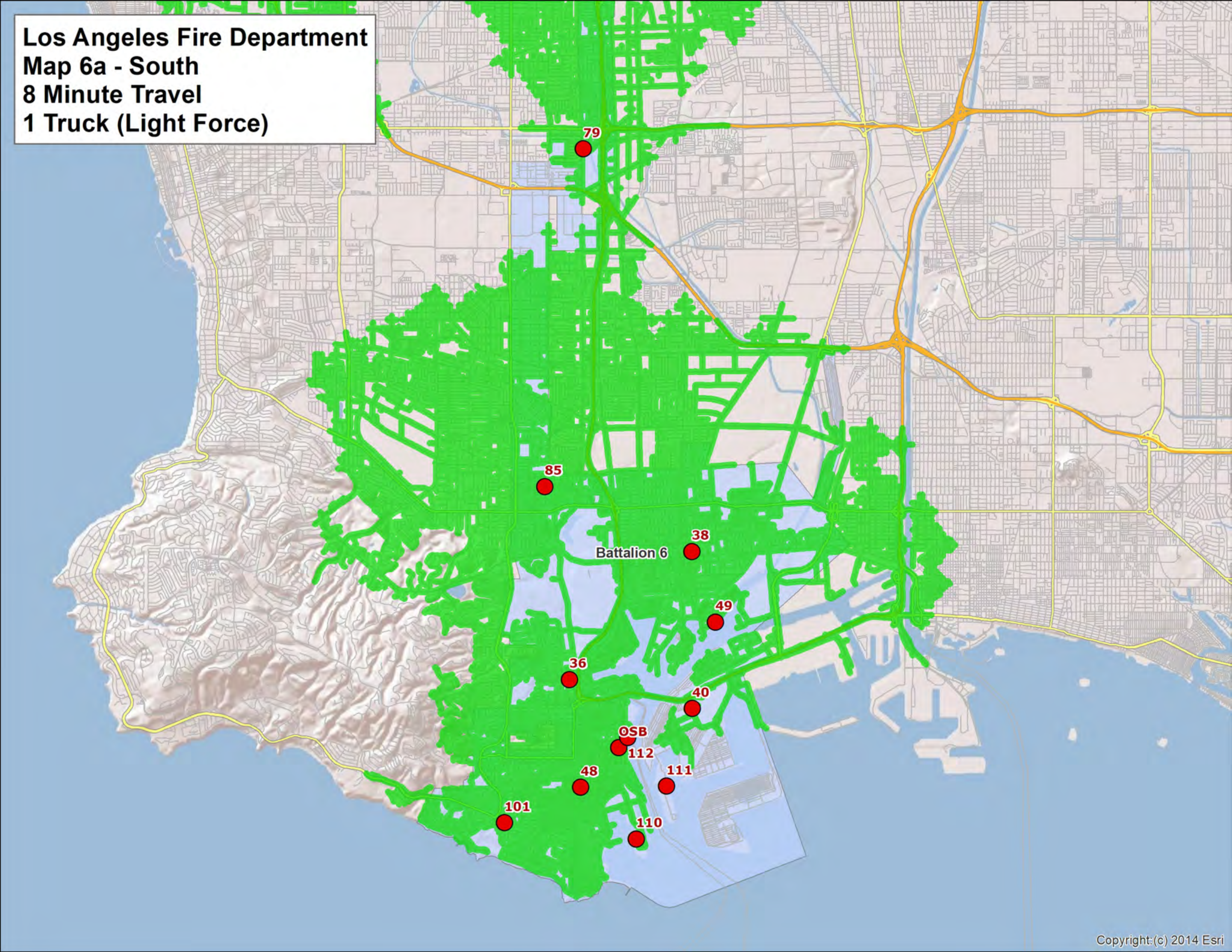
Copyright:(c) 2014 Esri


Los Angeles Fire Department
Map 6a - South
8 Minute Travel
1 Truck (Light Force)
79
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Battalion 6
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OSB
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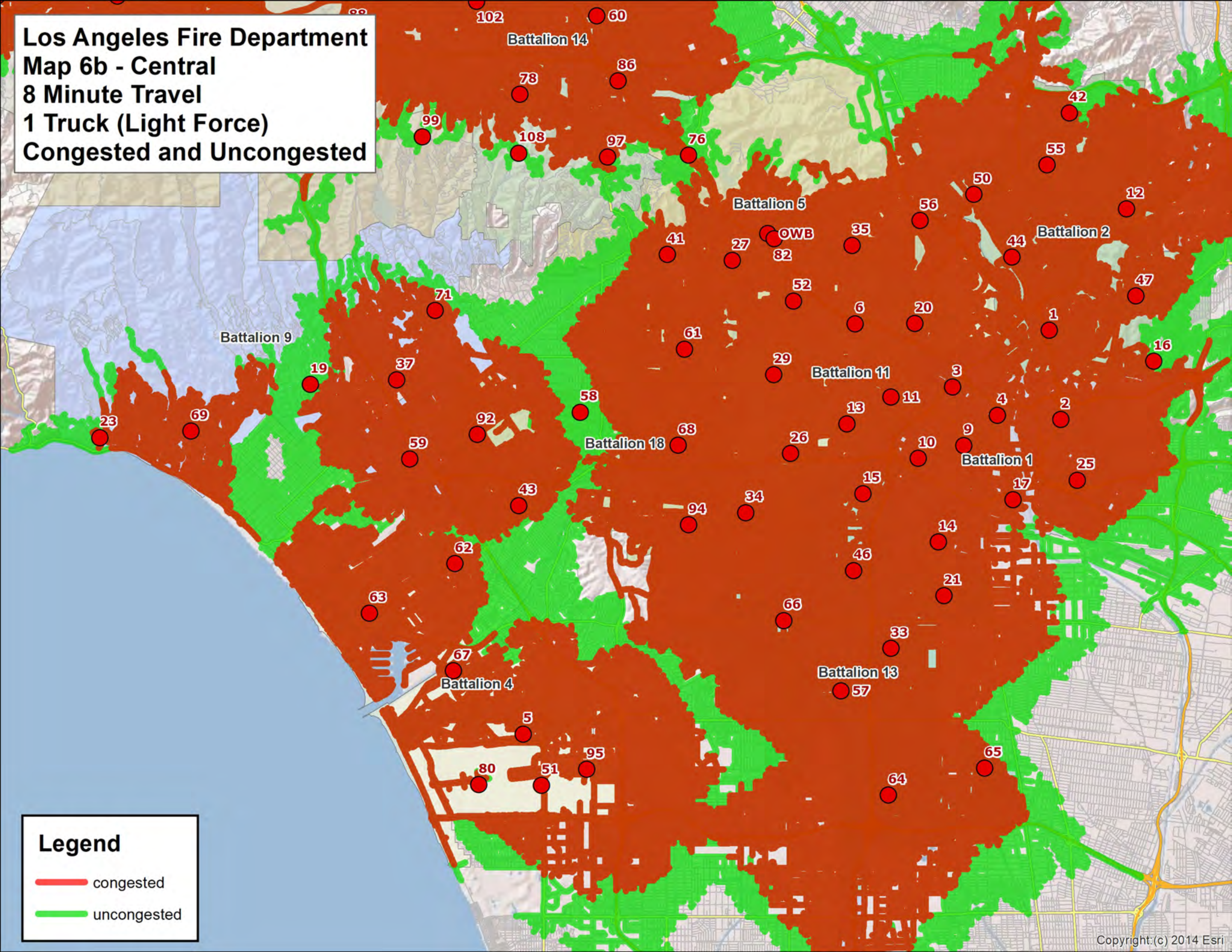
Copyright:(c) 2014 Esri


Los Angeles Fire Department
Map 6b - Central
8 Minute Travel
1 Truck (Light Force)
Congested and Uncongested
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
OWB
Legend
congested
uncongested
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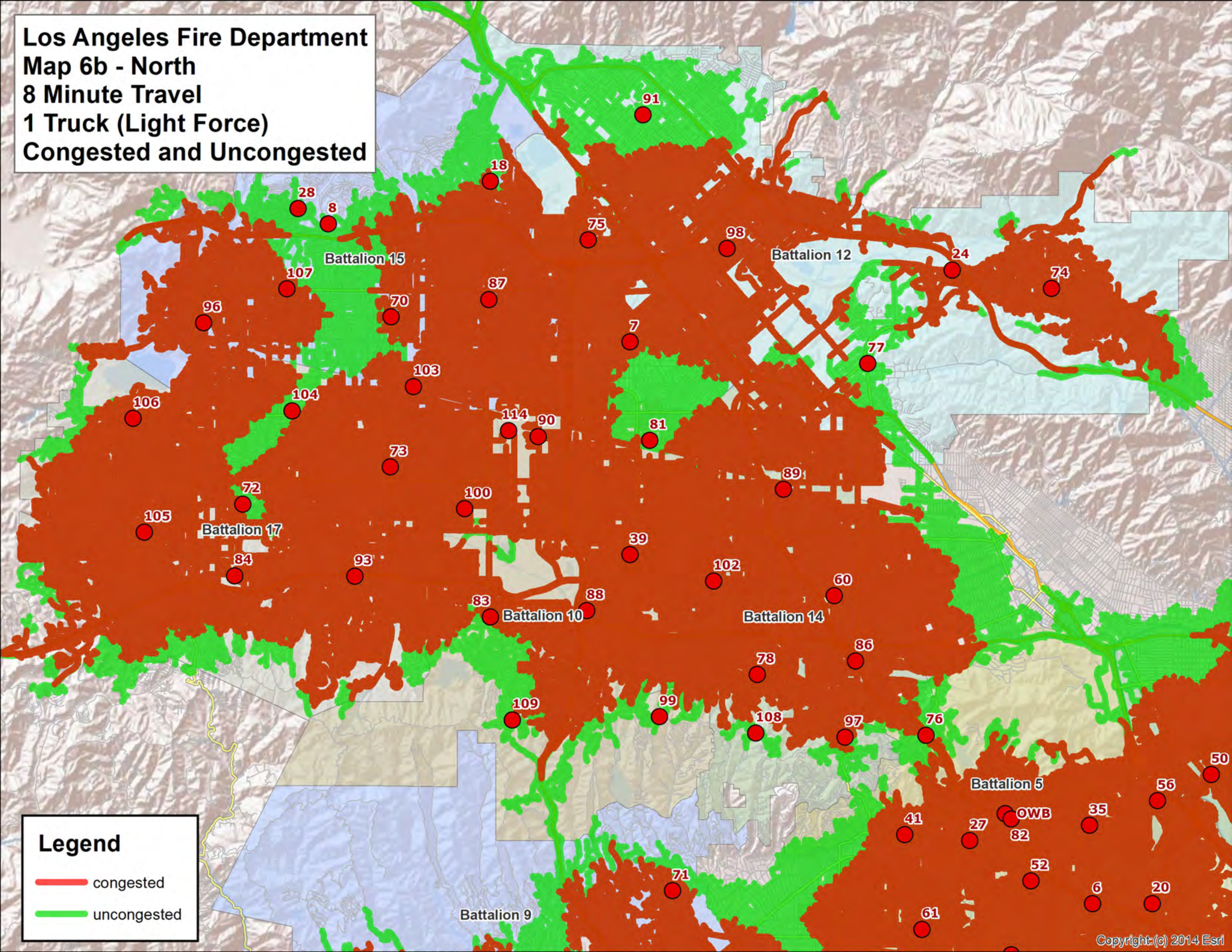
Los Angeles Fire Department
Map 6b - North
8 Minute Travel
1 Truck (Light Force)
Congested and Uncongested
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
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OWB
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Legend
congested
uncongested
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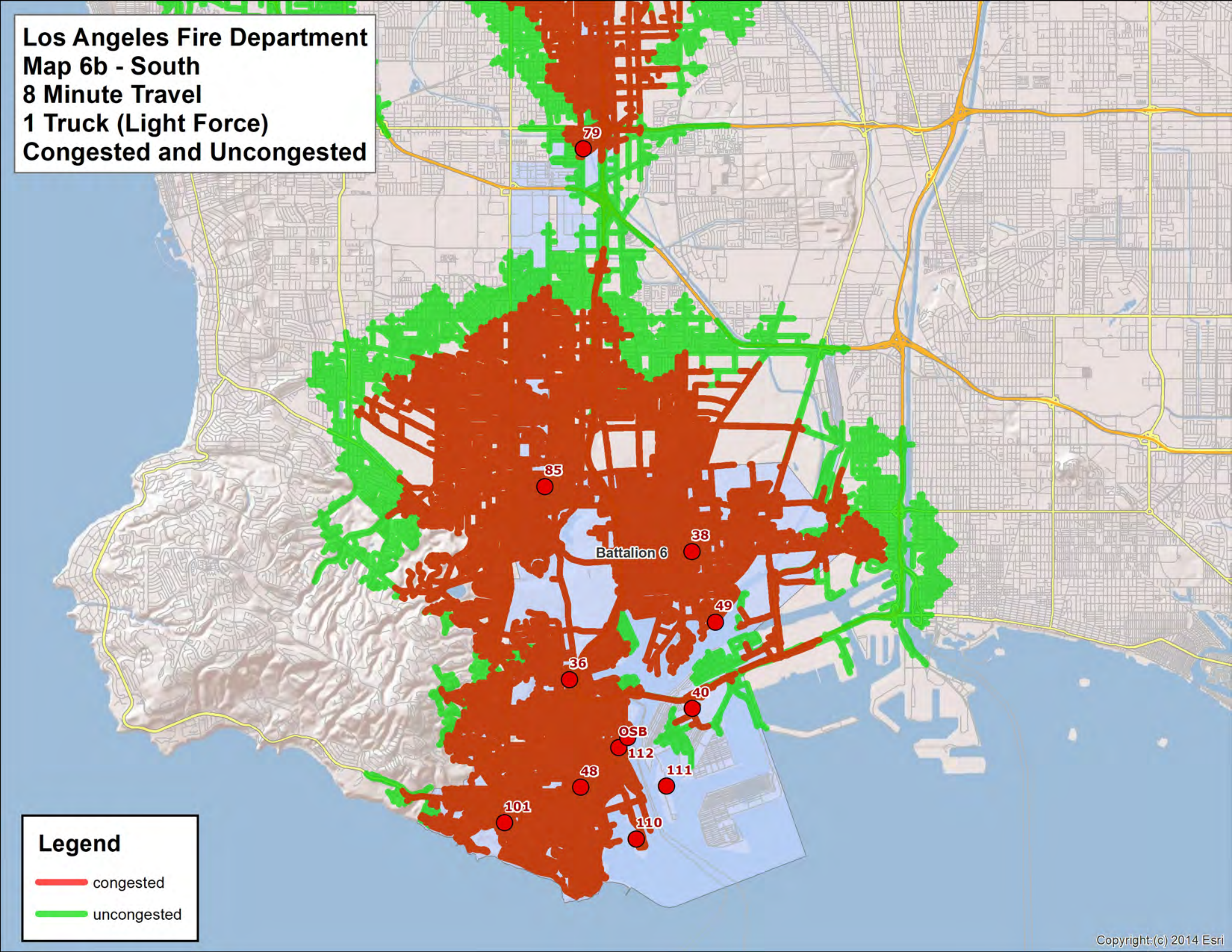
Los Angeles Fire Department
Map 6b - South
8 Minute Travel
1 Truck (Light Force)
Congested and Uncongested
79
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Battalion 6
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OSB
112
111
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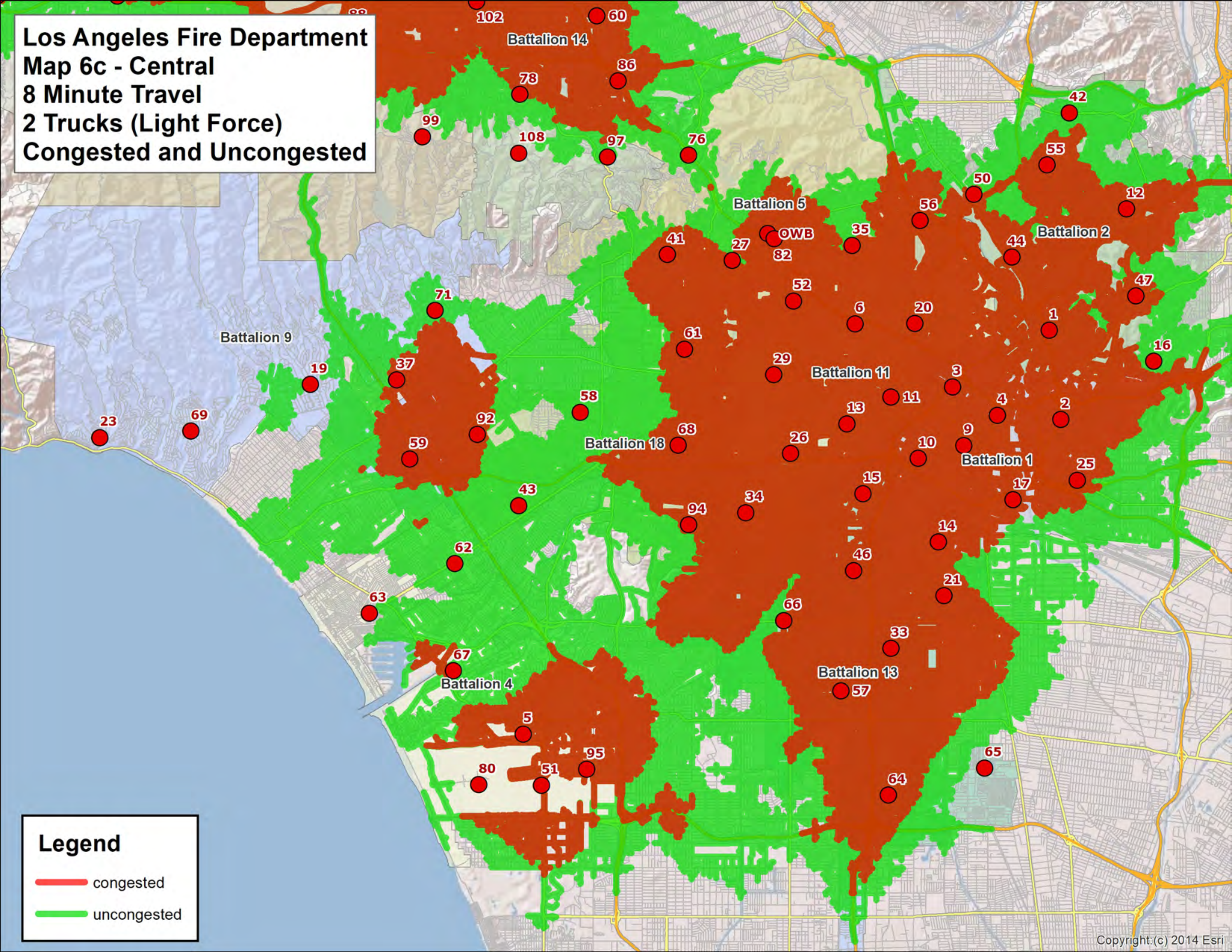
101
110
Legend
congested
uncongested
Copyright:(c) 2014 Esri


Los Angeles Fire Department
Map 6c - Central
8 Minute Travel
2 Trucks (Light Force)
Congested and Uncongested
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 4
Battalion 13
102
60
86
78
99
108
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76
42
55
50
12
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OWB
82
35
44
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27
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52
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71
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3
37
19
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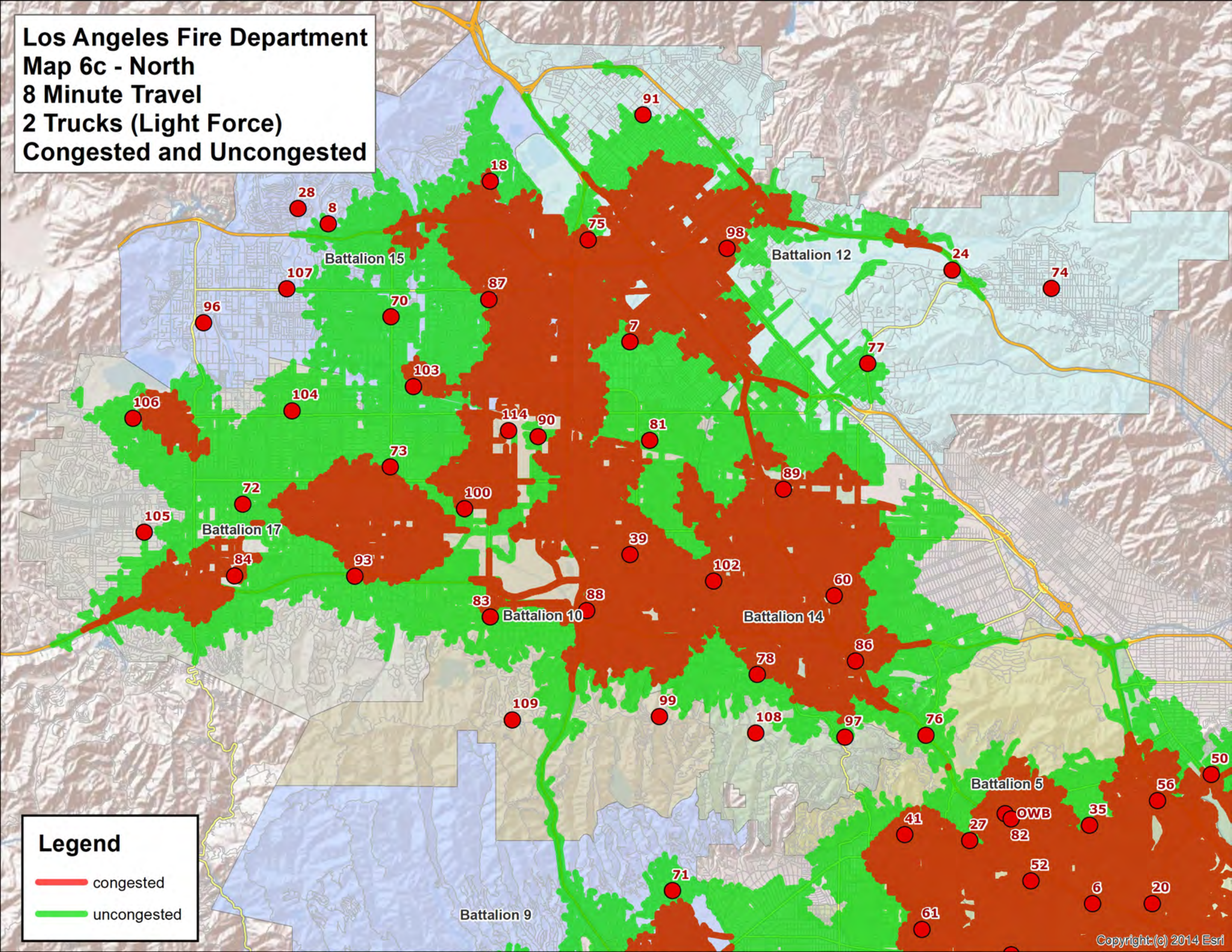
Legend
congested
uncongested
Copyright:(c) 2014 Esri



Los Angeles Fire Department
Map 6c - North
8 Minute Travel
2 Trucks (Light Force)
Congested and Uncongested
Legend
congested
uncongested
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
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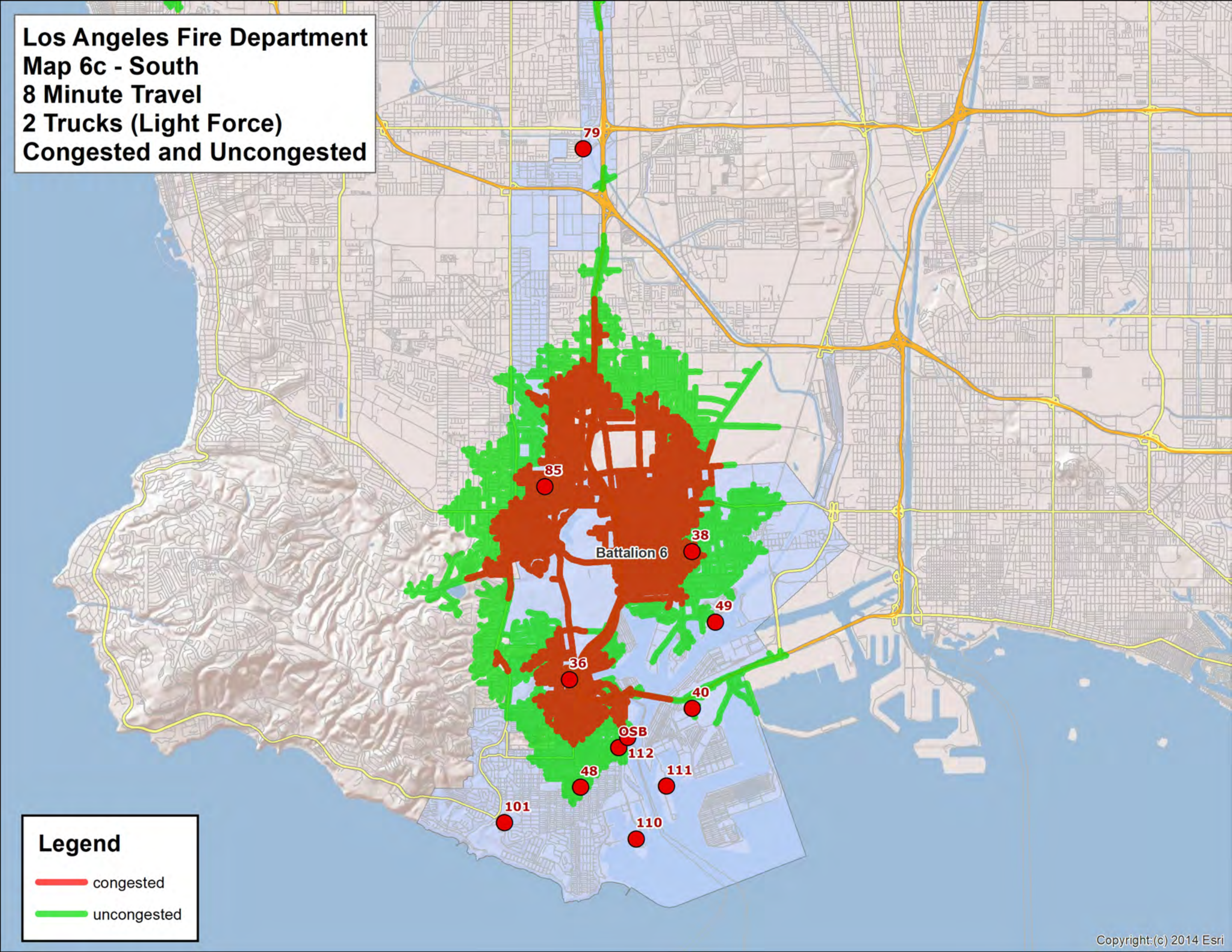
Los Angeles Fire Department
Map 6c - South
8 Minute Travel
2 Trucks (Light Force)
Congested and Uncongested
79
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Battalion 6
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OSB
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Legend
congested
uncongested
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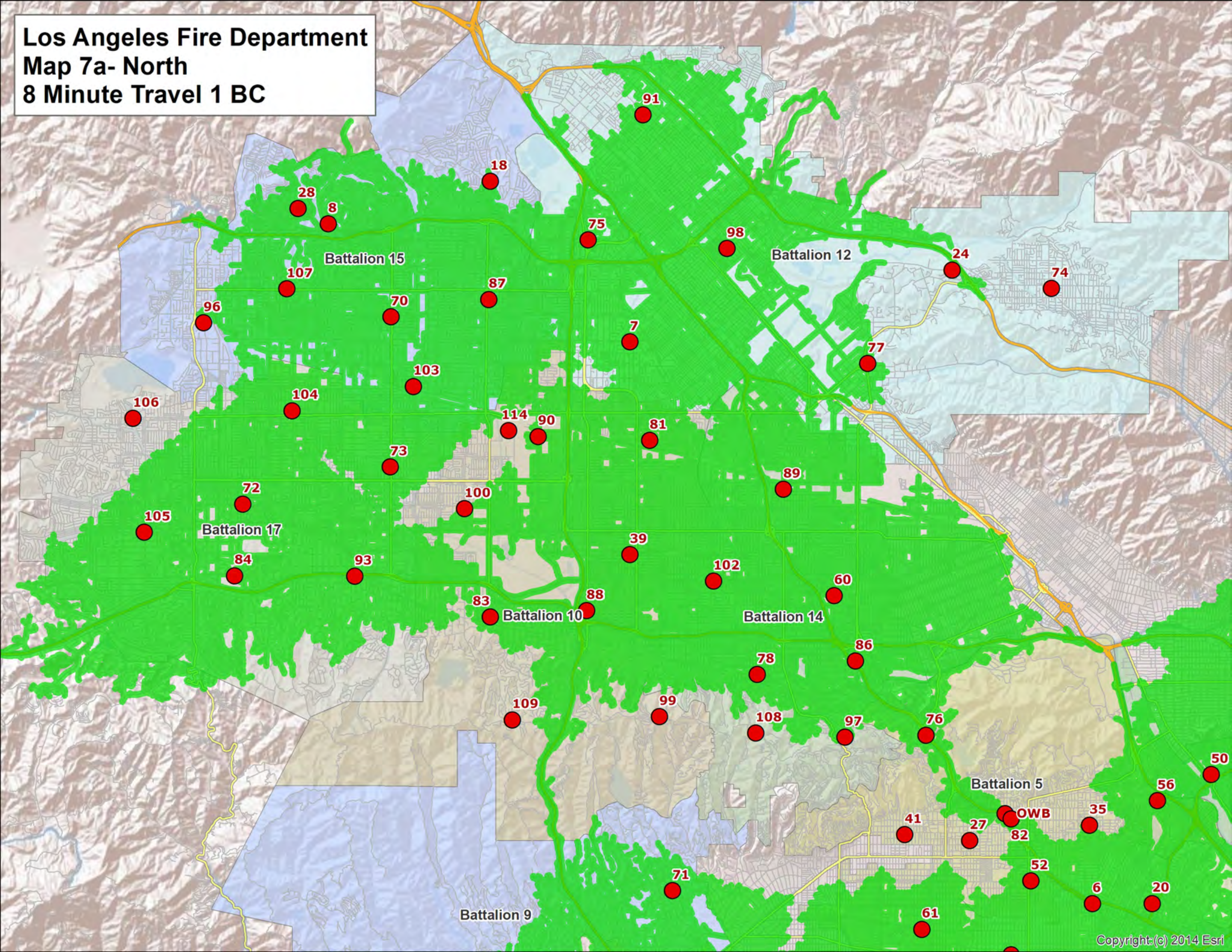
Los Angeles Fire Department
Map 7a- North
8 Minute Travel 1 BC
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
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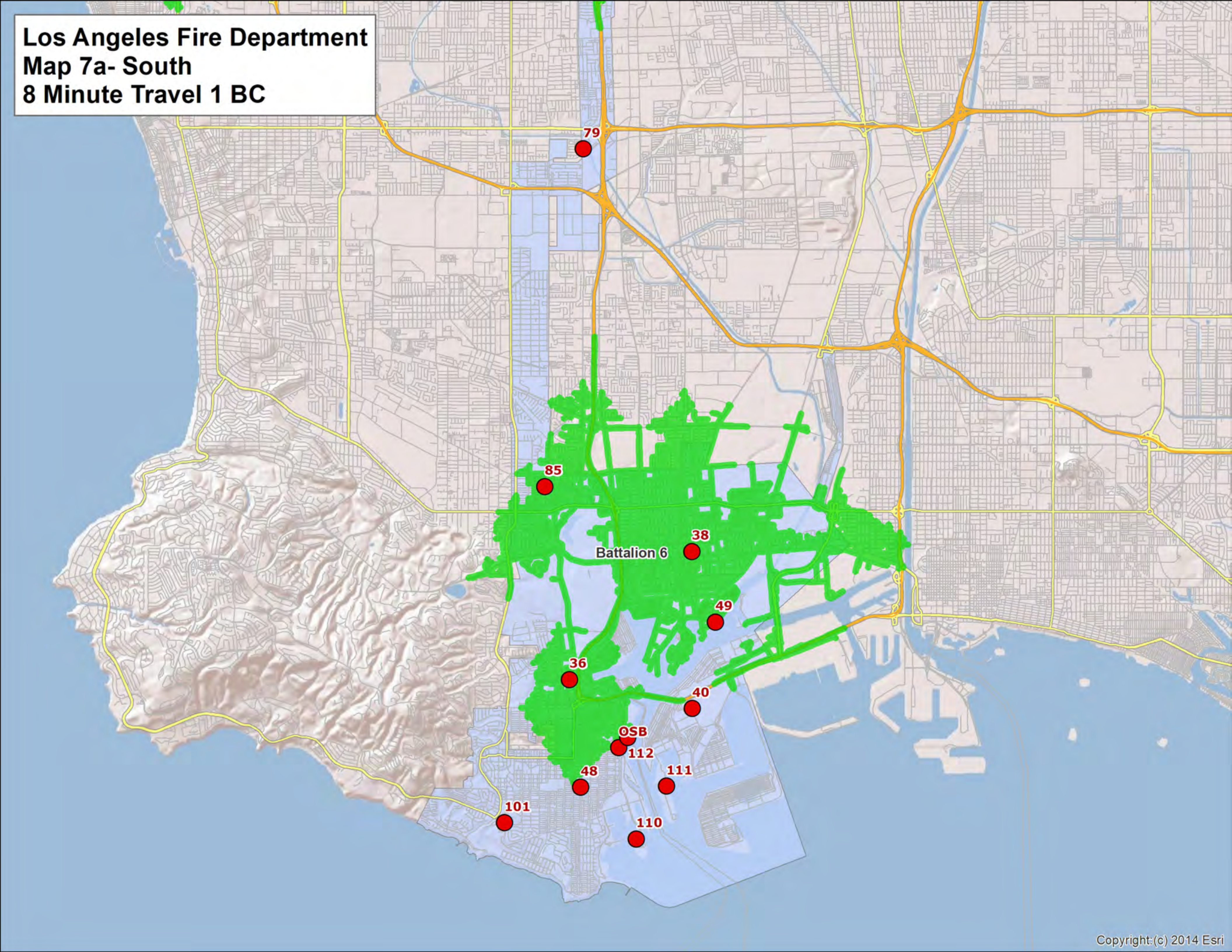
Los Angeles Fire Department
Map 7a- South
8 Minute Travel 1 BC
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Battalion 6
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OSB
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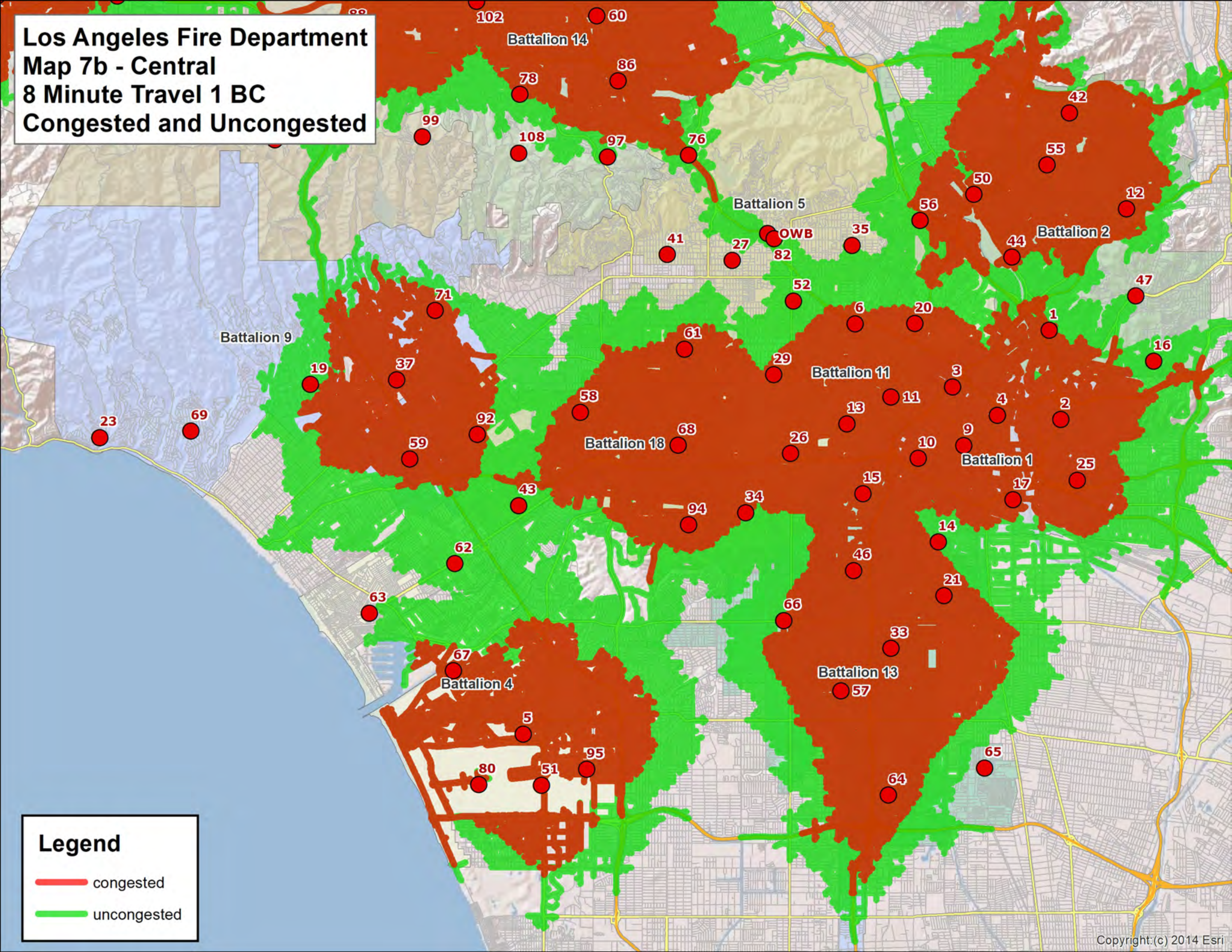

Los Angeles Fire Department
Map 7b - Central
8 Minute Travel 1 BC
Congested and Uncongested
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
102
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OWB
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Legend
congested
uncongested
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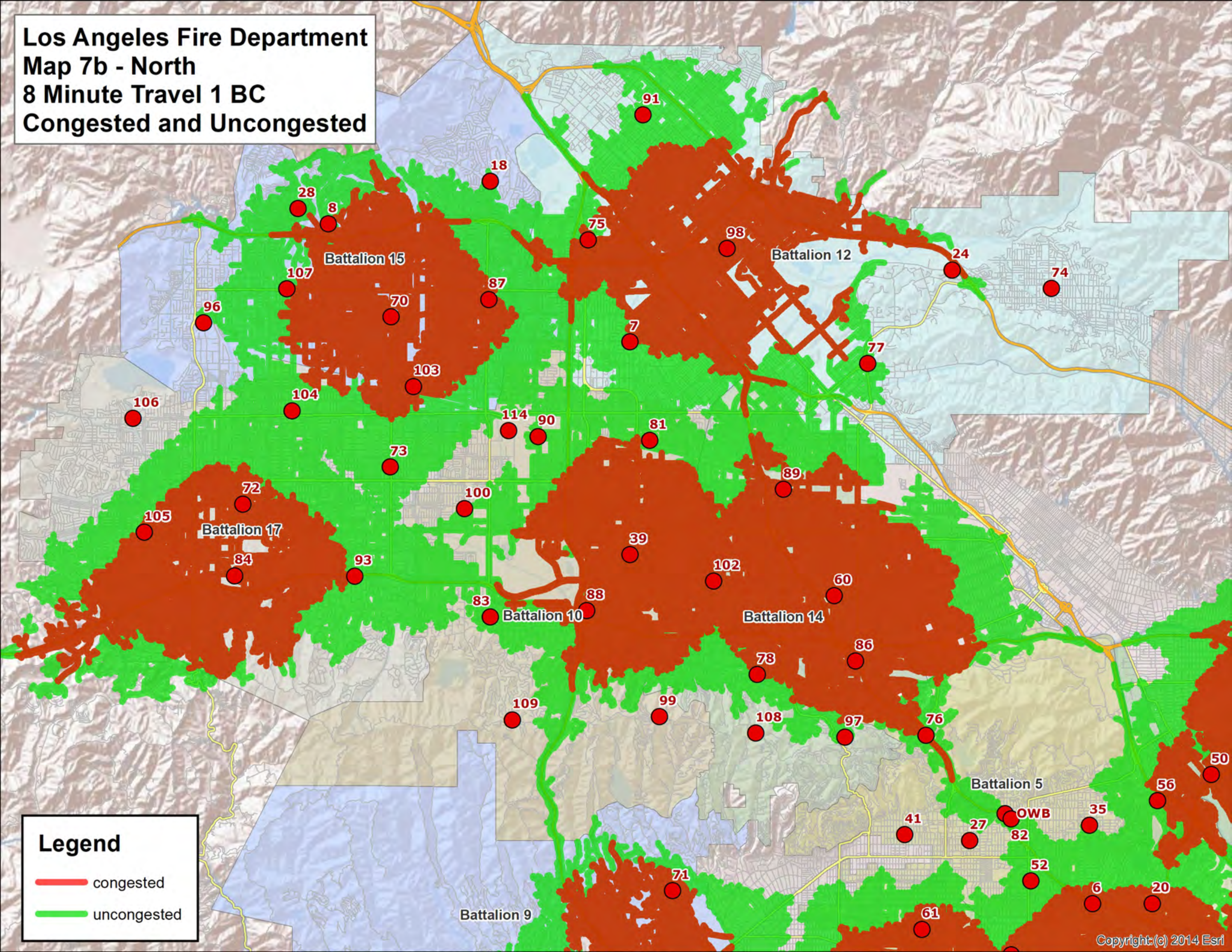
Los Angeles Fire Department
Map 7b - North
8 Minute Travel 1 BC
Congested and Uncongested
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
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OWB
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Legend
congested
uncongested
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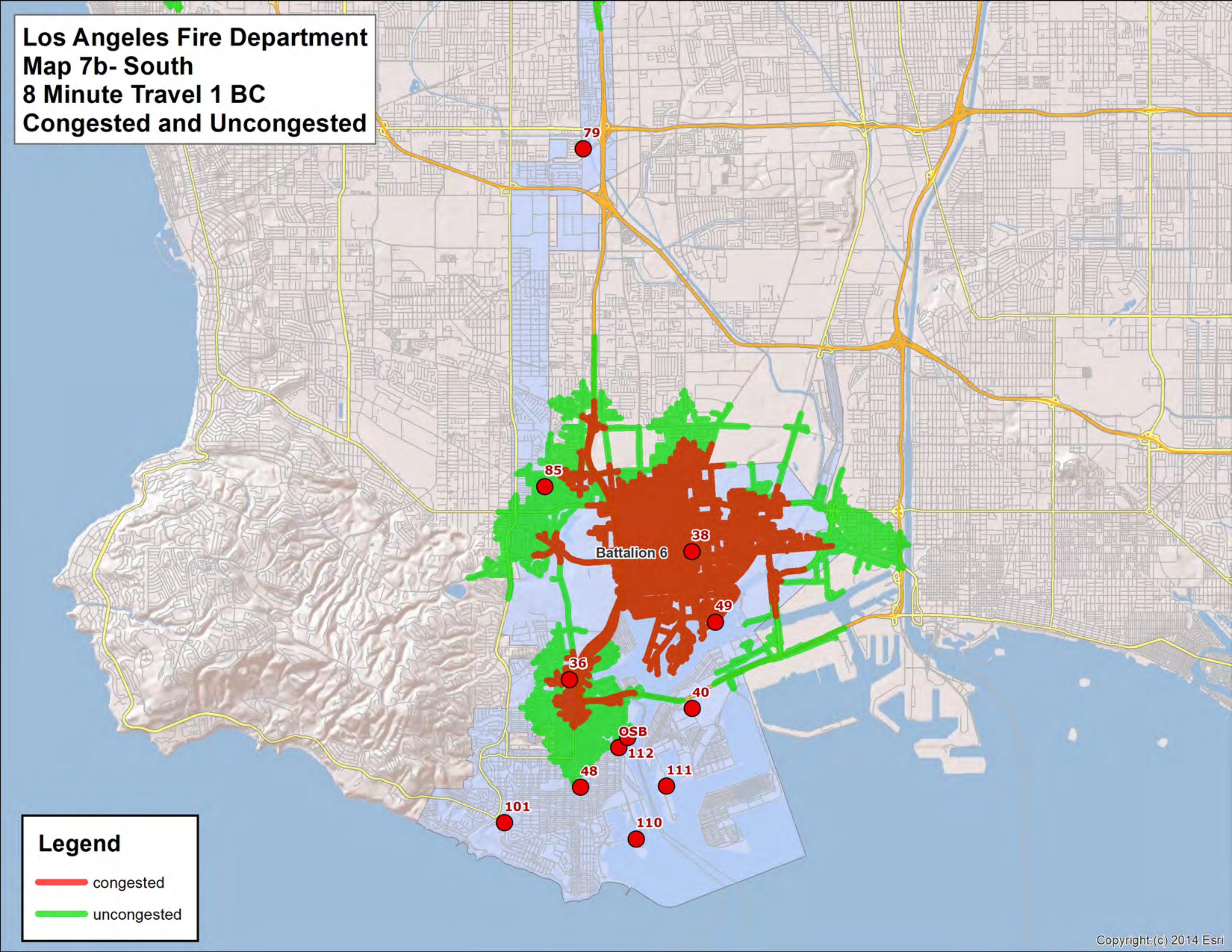

Los Angeles Fire Department
Map 7b- South
8 Minute Travel 1 BC
Congested and Uncongested
79
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Battalion 6
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OSB
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Legend
congested
uncongested
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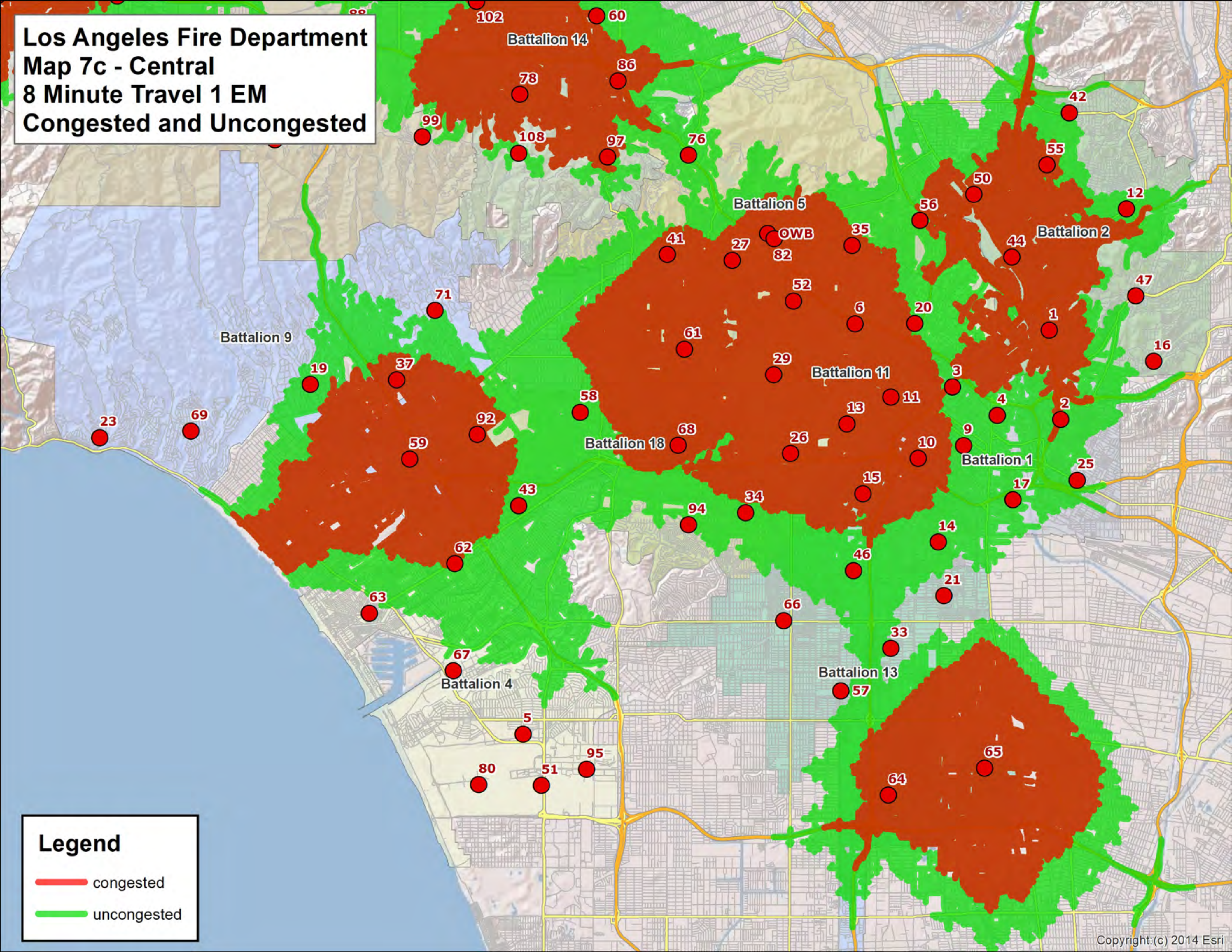

Los Angeles Fire Department
Map 7c - Central
8 Minute Travel 1 EM
Congested and Uncongested
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
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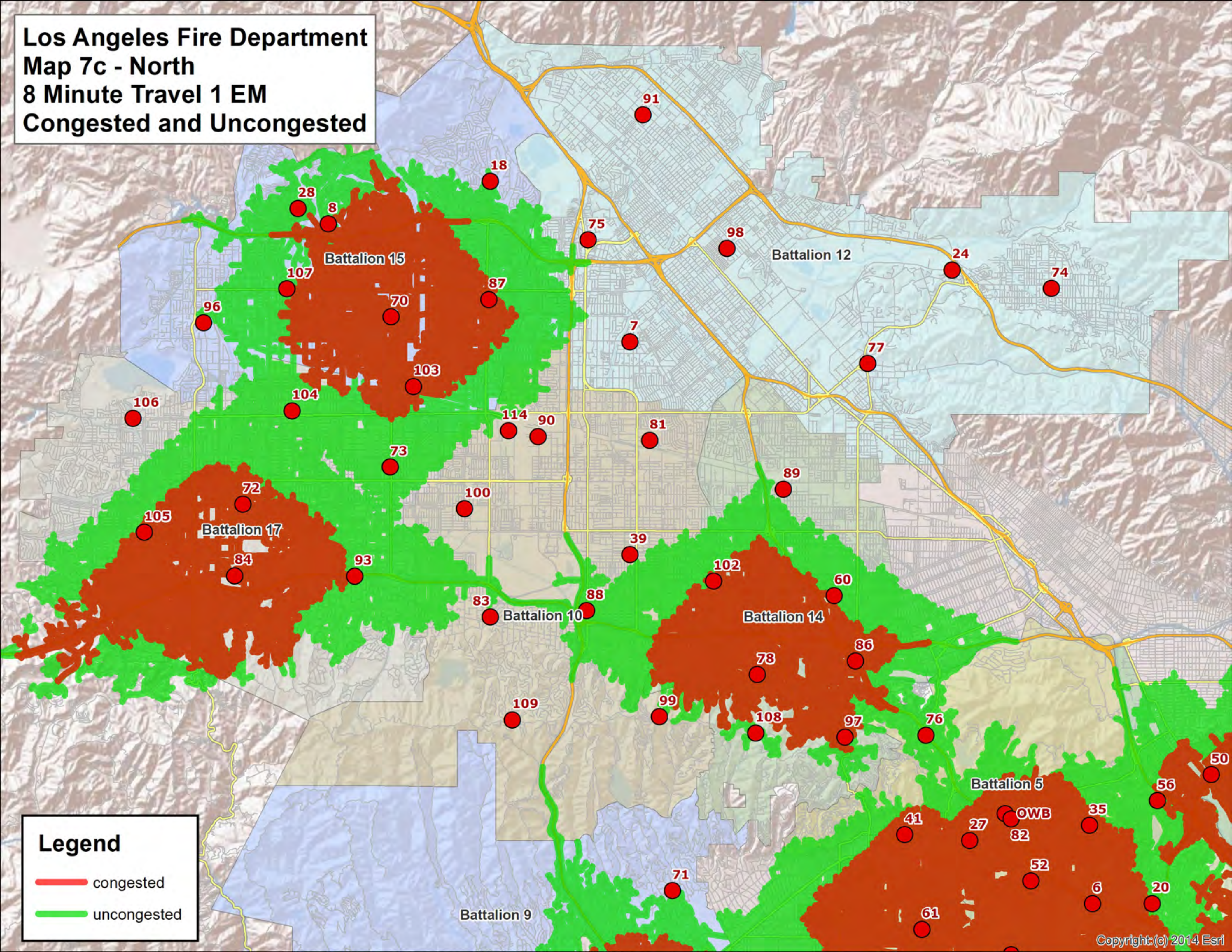
Legend
congested
uncongested
Copyright:(c) 2014 Esri



Los Angeles Fire Department
Map 7c - North
8 Minute Travel 1 EM
Congested and Uncongested
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
91
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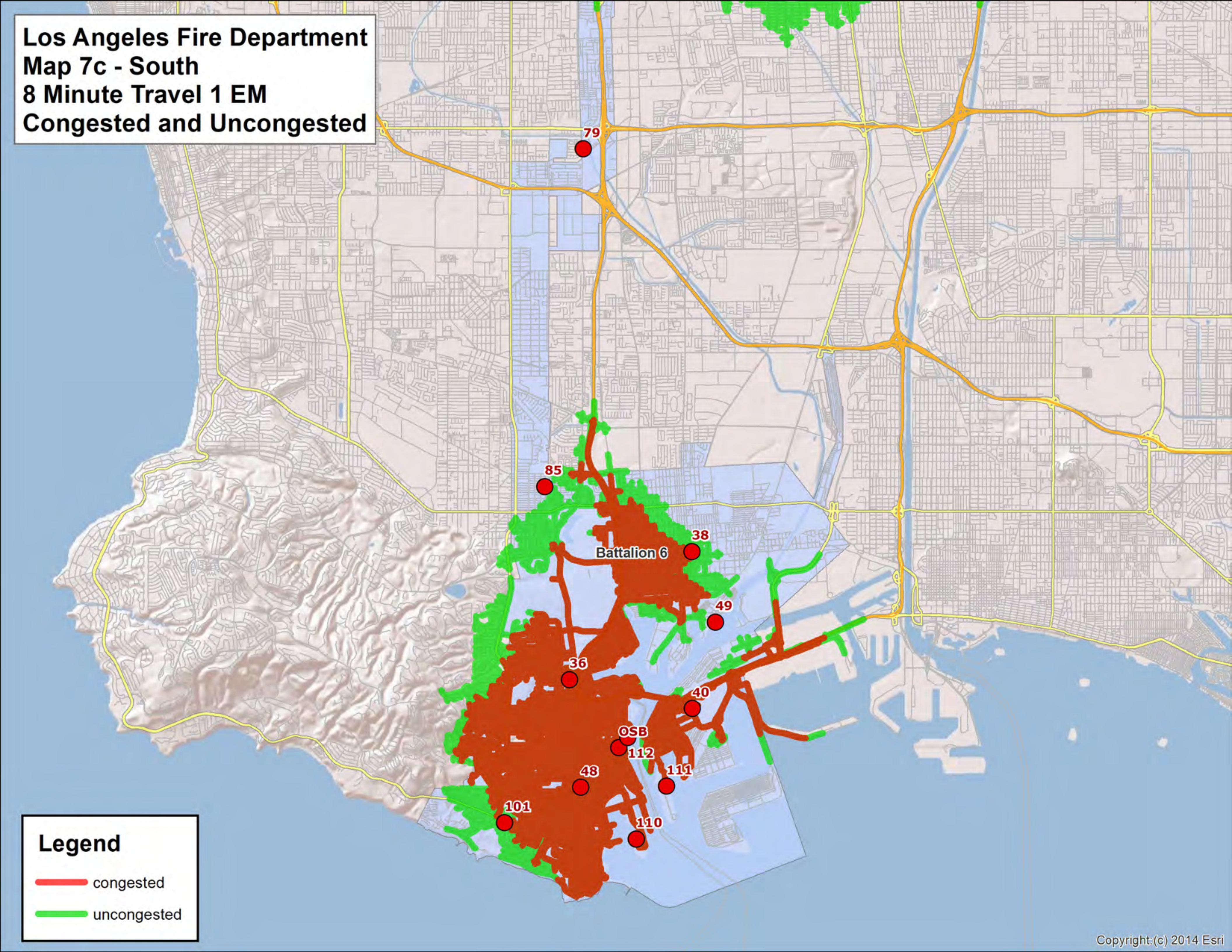
Legend
congested
uncongested
Copyright:(c) 2014 Esri



Los Angeles Fire Department
Map 7c - South
8 Minute Travel 1 EM
Congested and Uncongested
79
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Battalion 6
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OSB
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Legend
congested
uncongested
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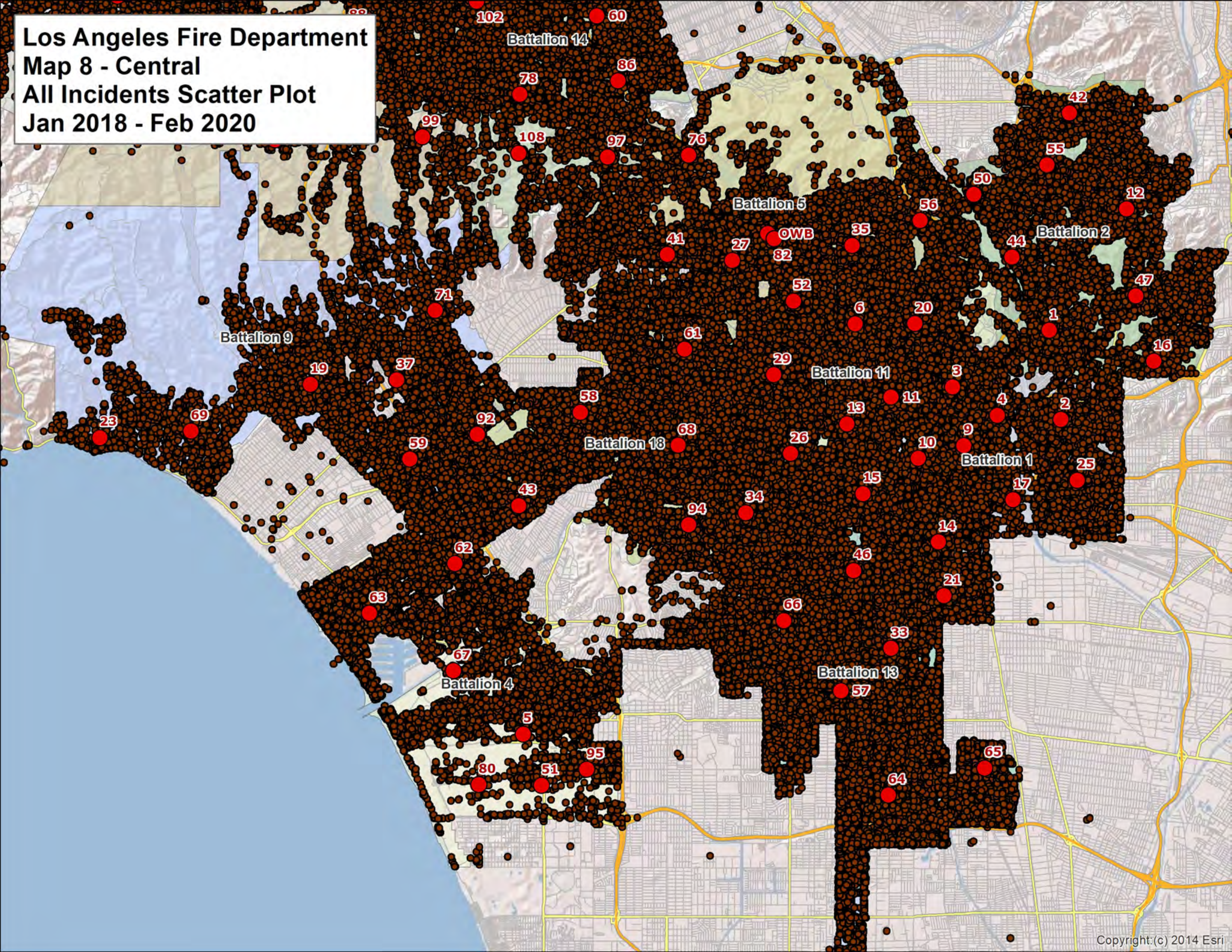

Los Angeles Fire Department
Map 8 - Central
All Incidents Scatter Plot
Jan 2018 - Feb 2020
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 4
Battalion 13
102
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108
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OWB
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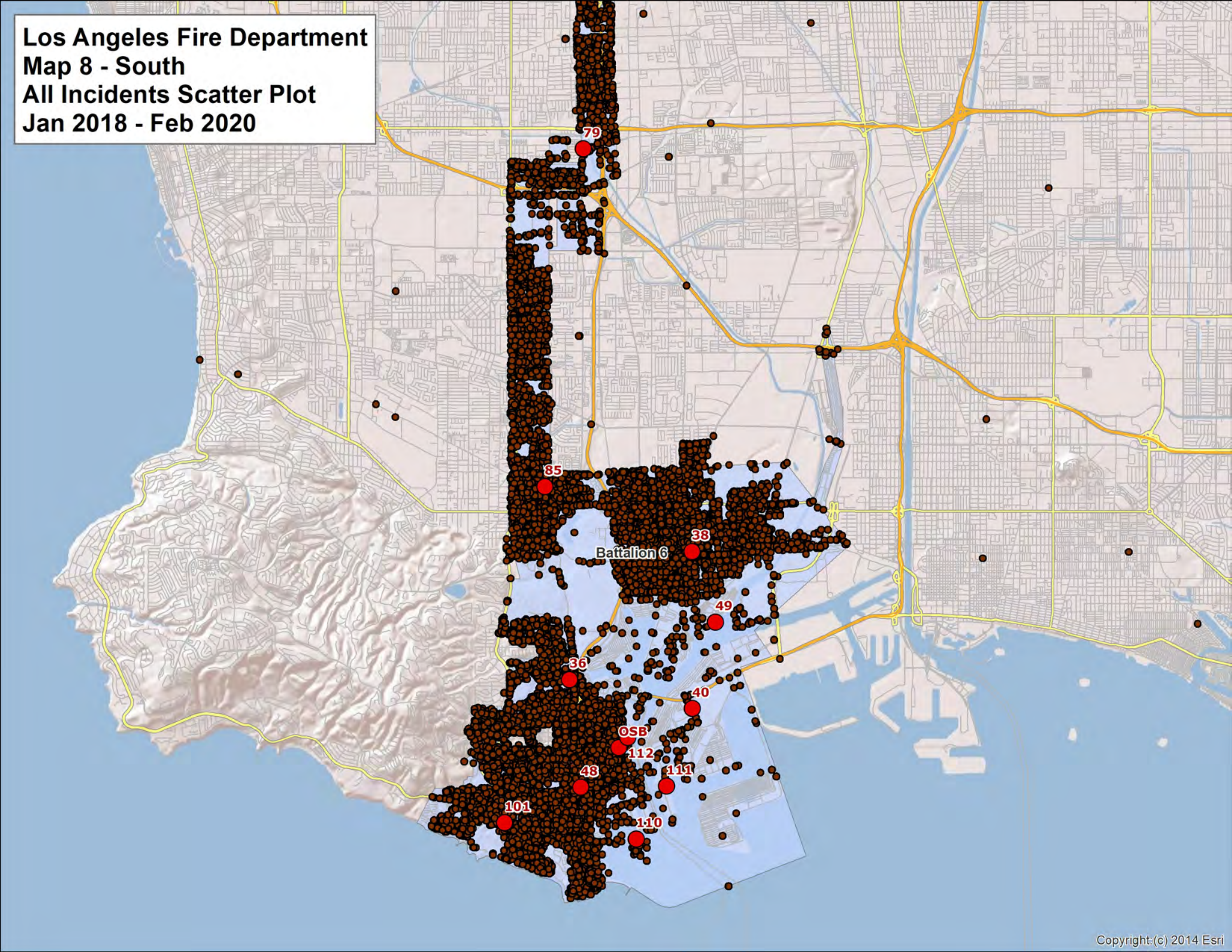
Los Angeles Fire Department
Map 8 - South
All Incidents Scatter Plot
Jan 2018 - Feb 2020
79
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Battalion 6
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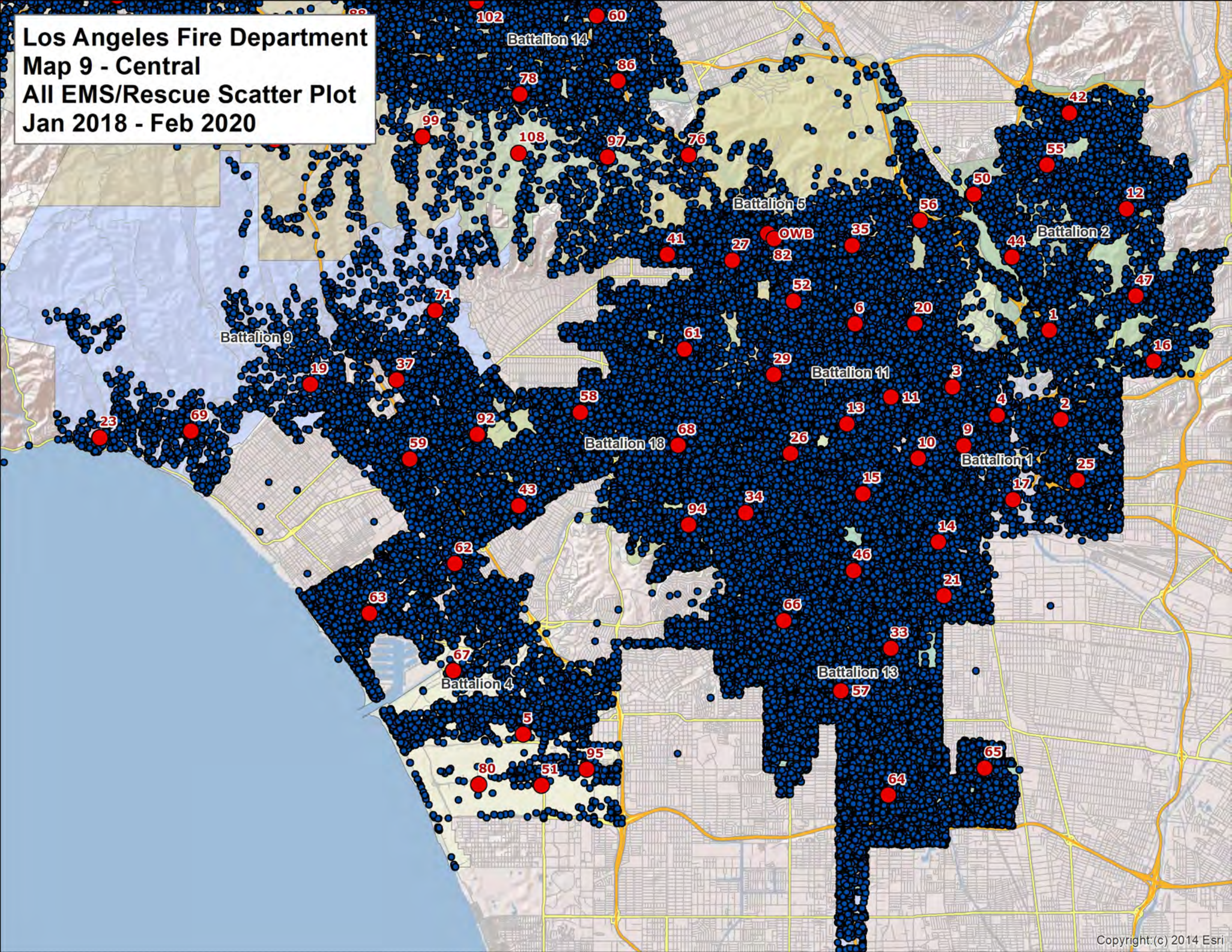

Los Angeles Fire Department
Map 9 - Central
All EMS/Rescue Scatter Plot
Jan 2018 - Feb 2020
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
102
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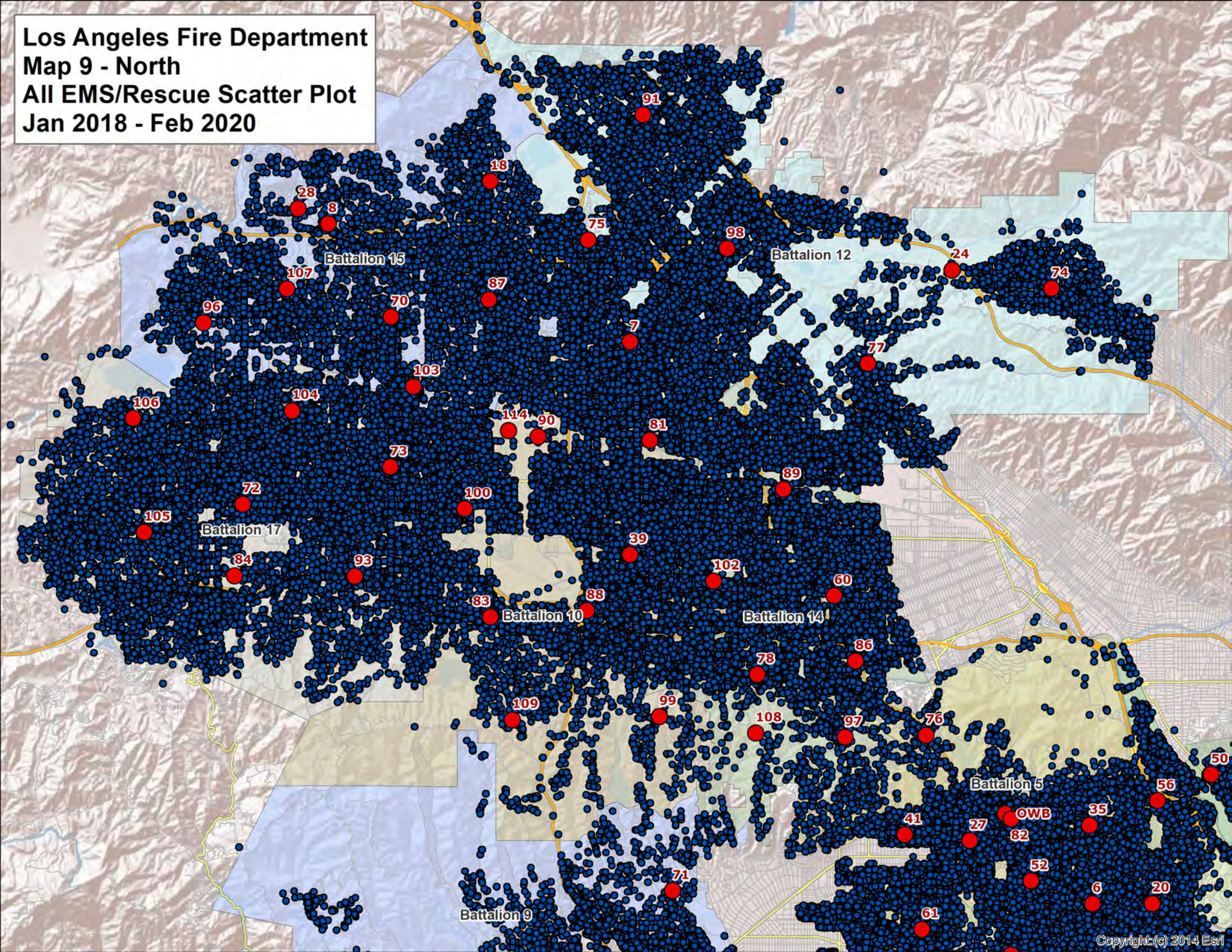
Copyright:(c) 2014 Esri


Los Angeles Fire Department
Map 9 - North
All EMS/Rescue Scatter Plot
Jan 2018 - Feb 2020
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
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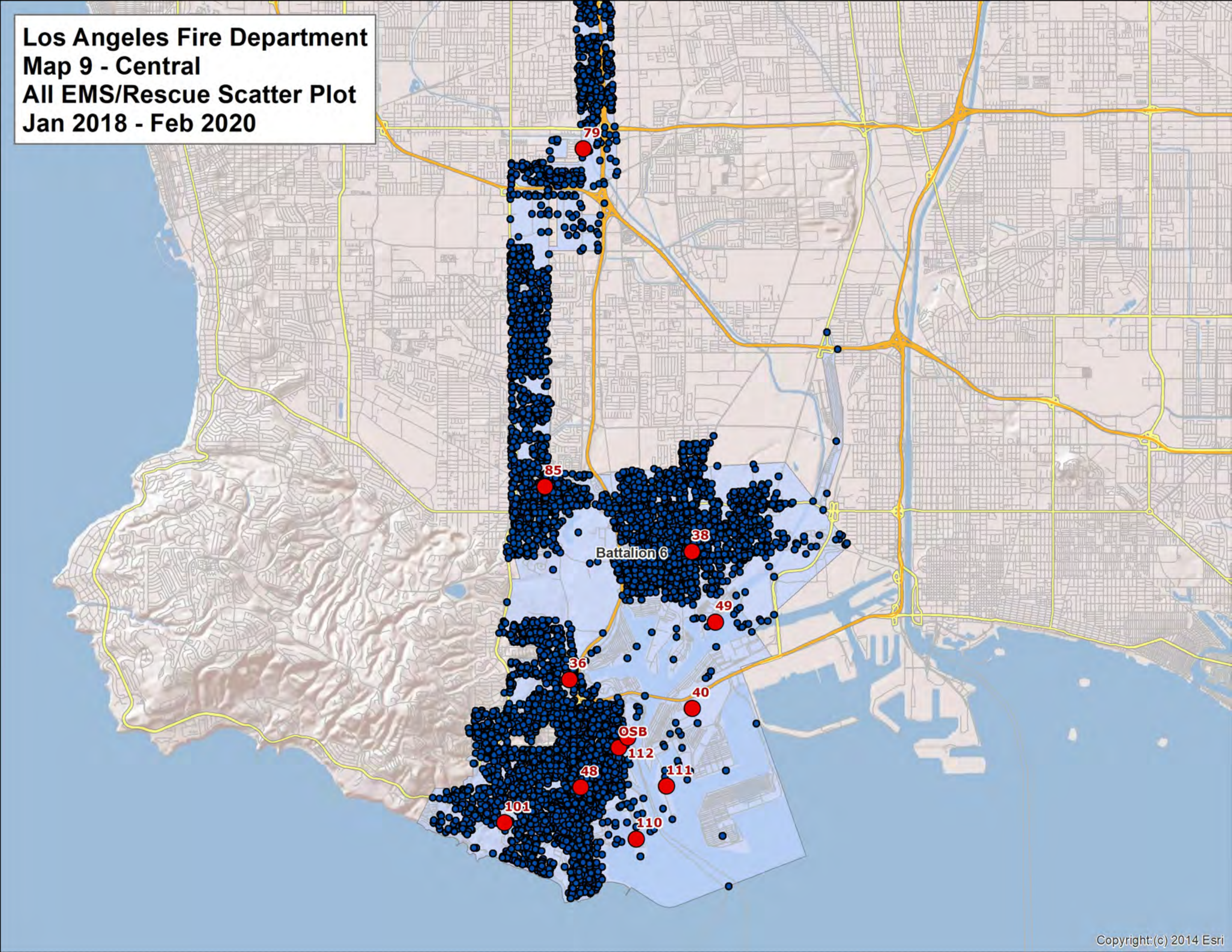

Los Angeles Fire Department
Map 9 - Central
All EMS/Rescue Scatter Plot
Jan 2018 - Feb 2020
79
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Battalion 6
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OSB
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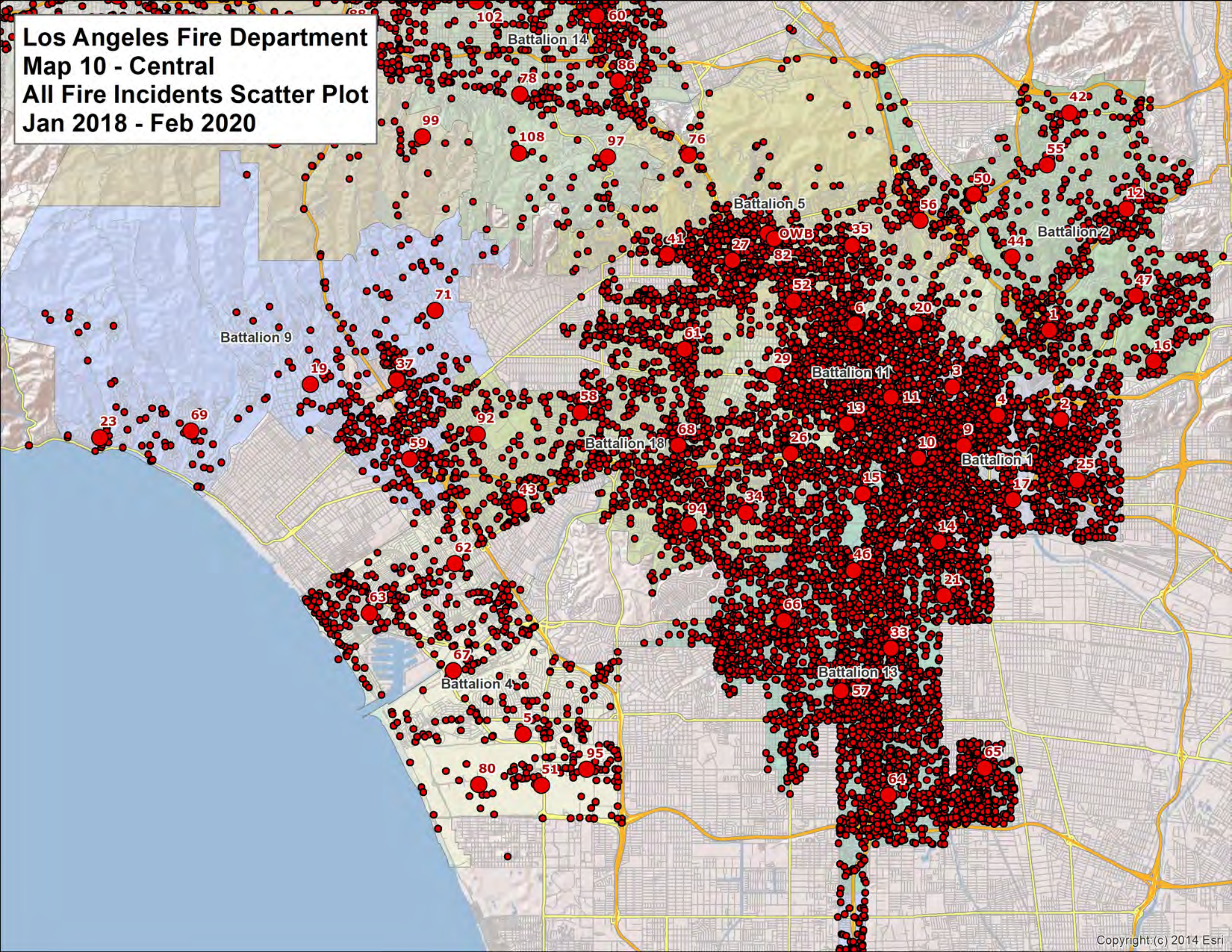
Los Angeles Fire Department
Map 10 - Central
All Fire Incidents Scatter Plot
Jan 2018 - Feb 2020
Battalion 14
Battalion 5
Battalion 2
Battalion 9
Battalion 11
Battalion 18
Battalion 1
Battalion 13
Battalion 4
102
60
86
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99
108
97
76
42
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12
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OWB
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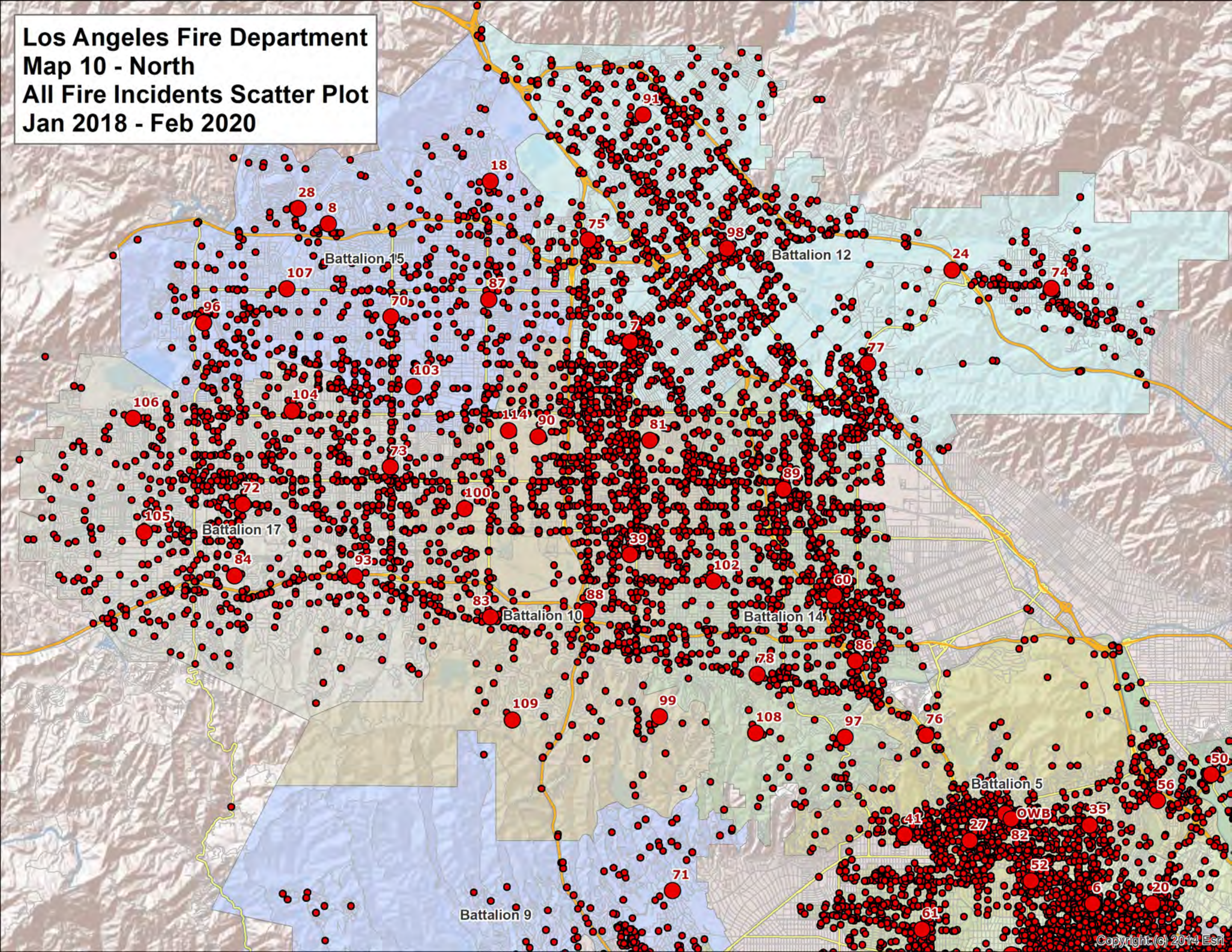
Los Angeles Fire Department
Map 10 - North
All Fire Incidents Scatter Plot
Jan 2018 - Feb 2020
Battalion 15
Battalion 12
Battalion 17
Battalion 10
Battalion 14
Battalion 5
Battalion 9
91
18
28
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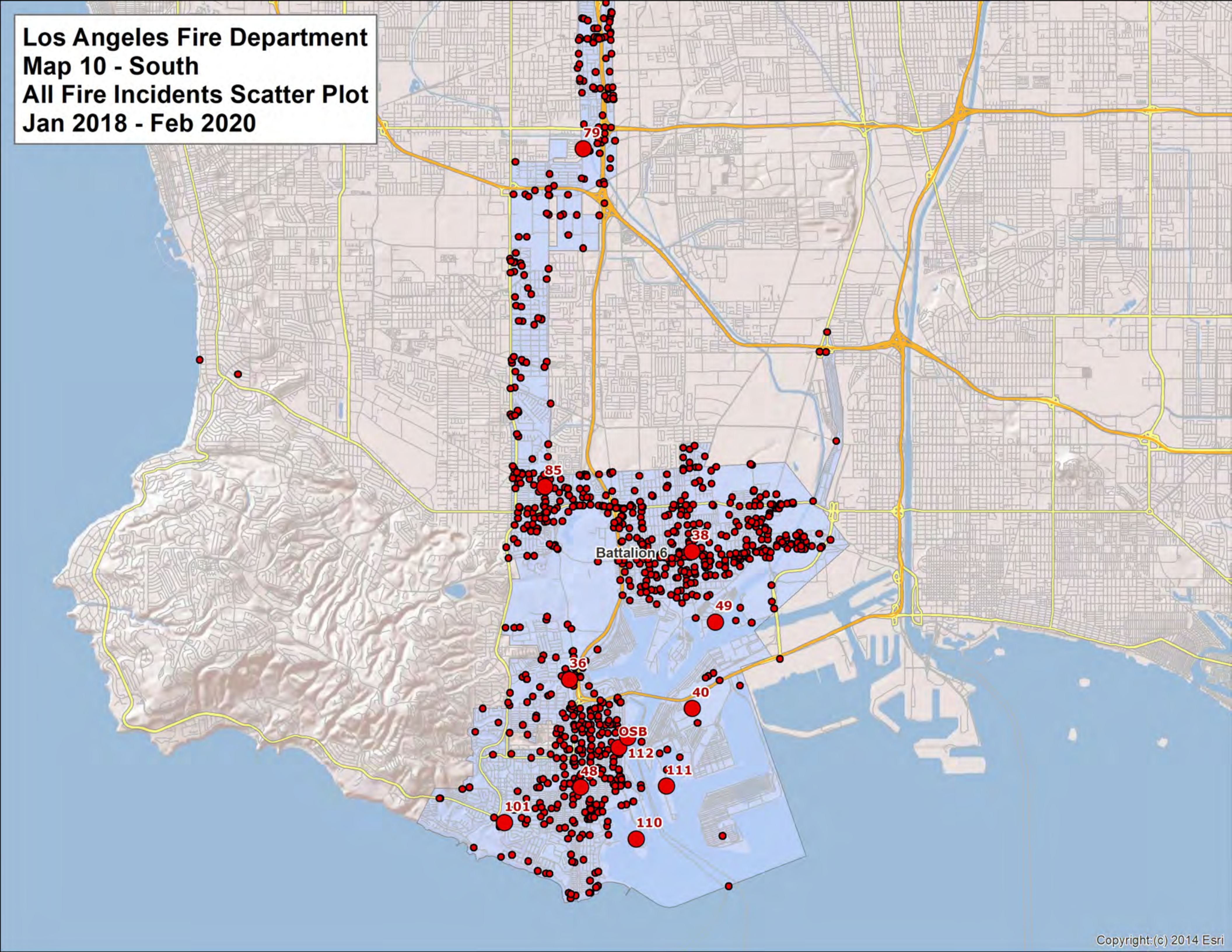

Los Angeles Fire Department
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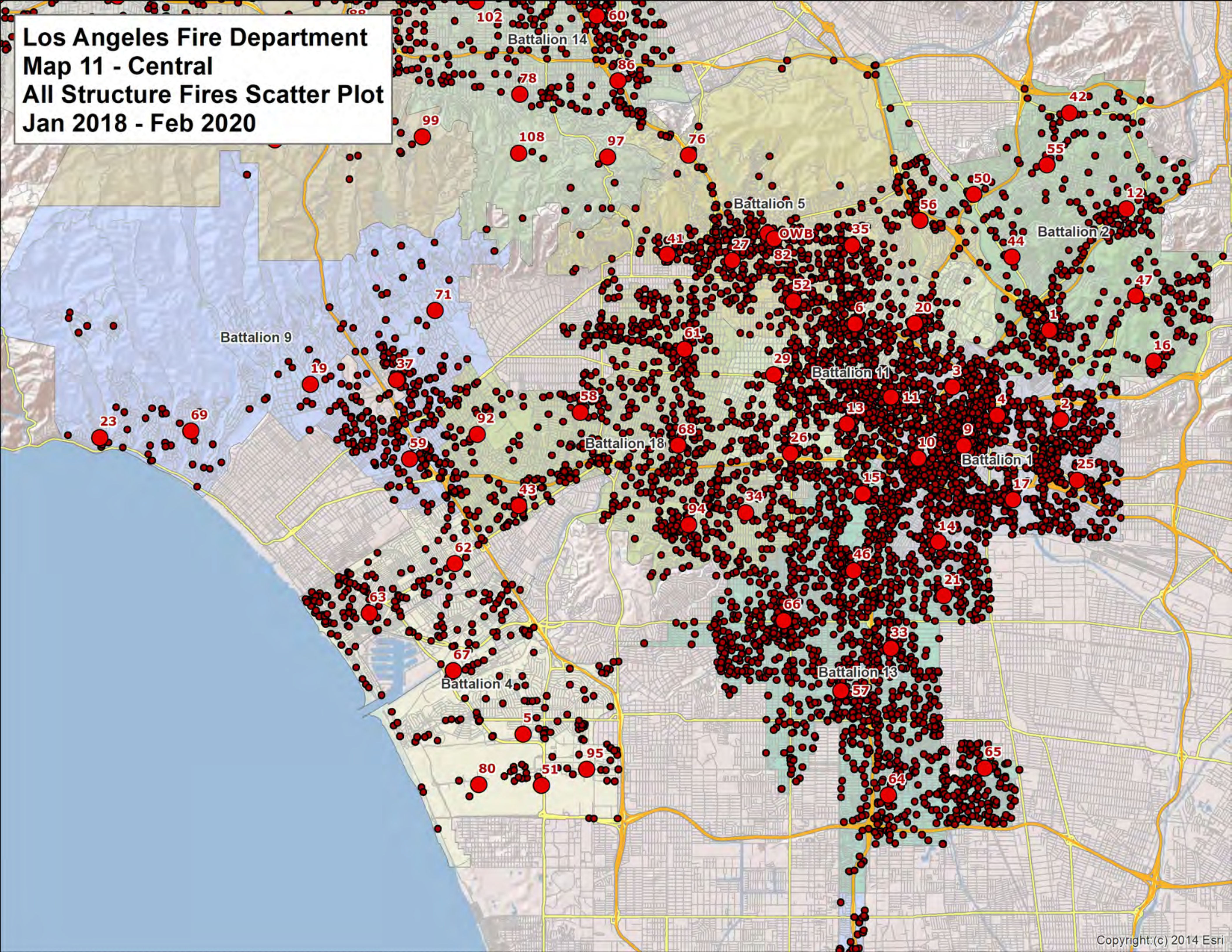
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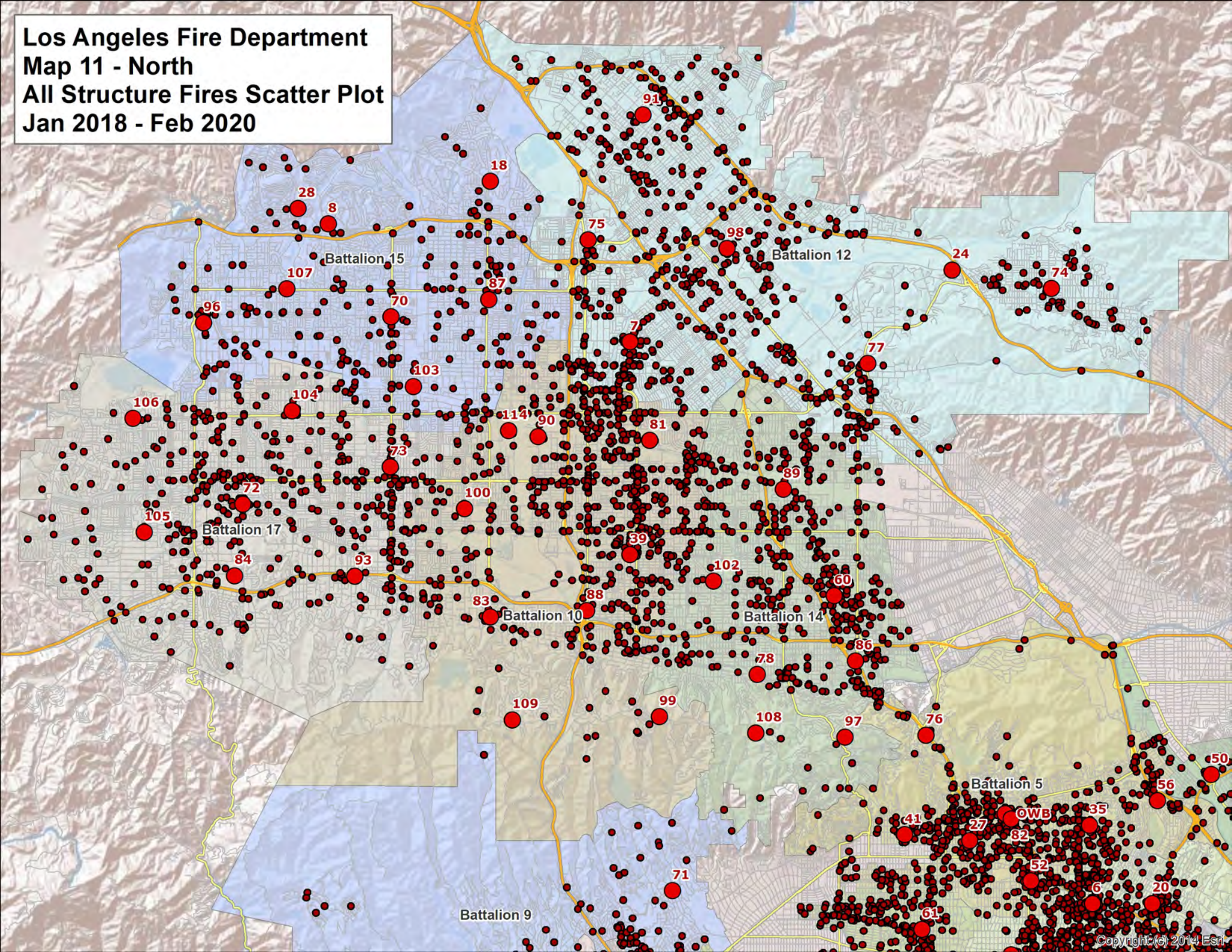
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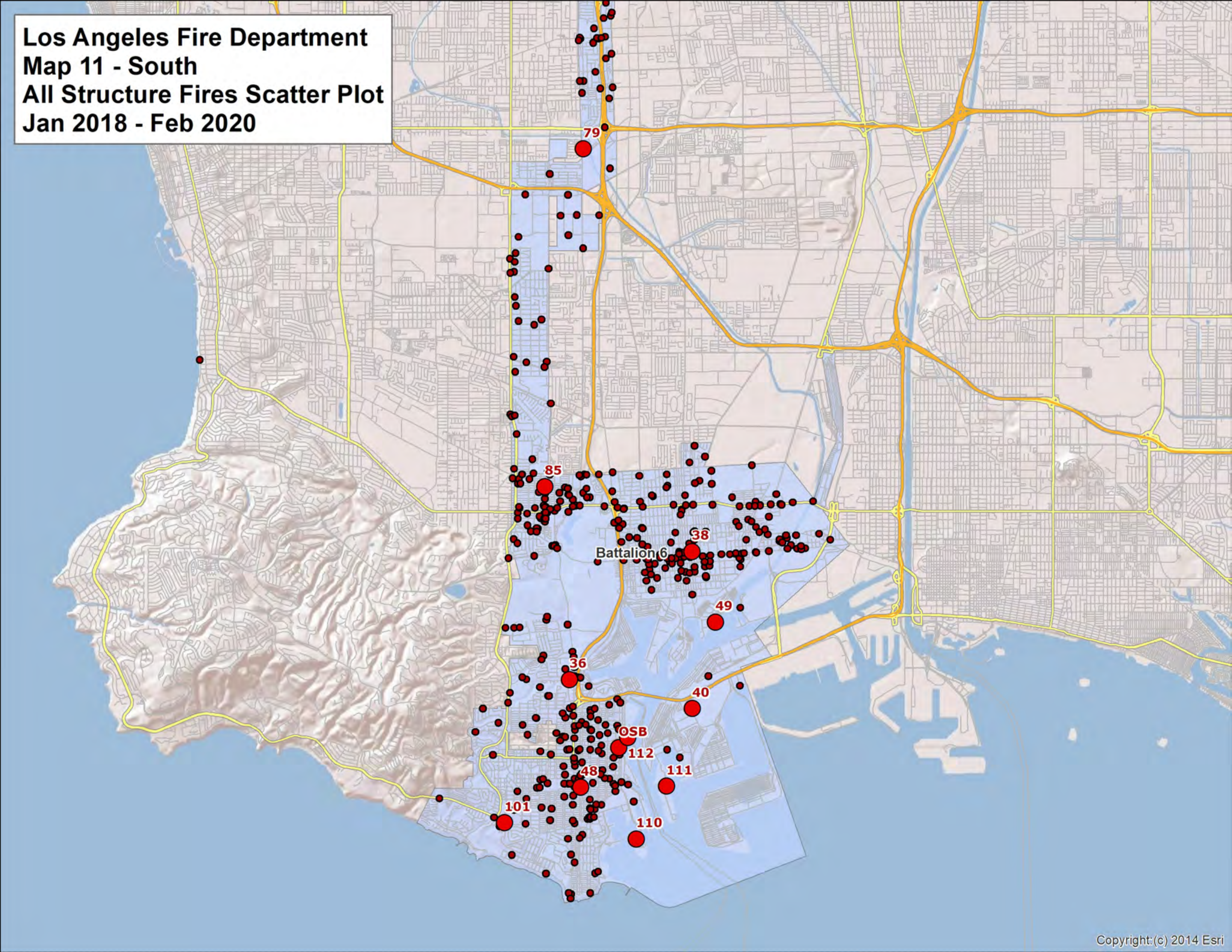
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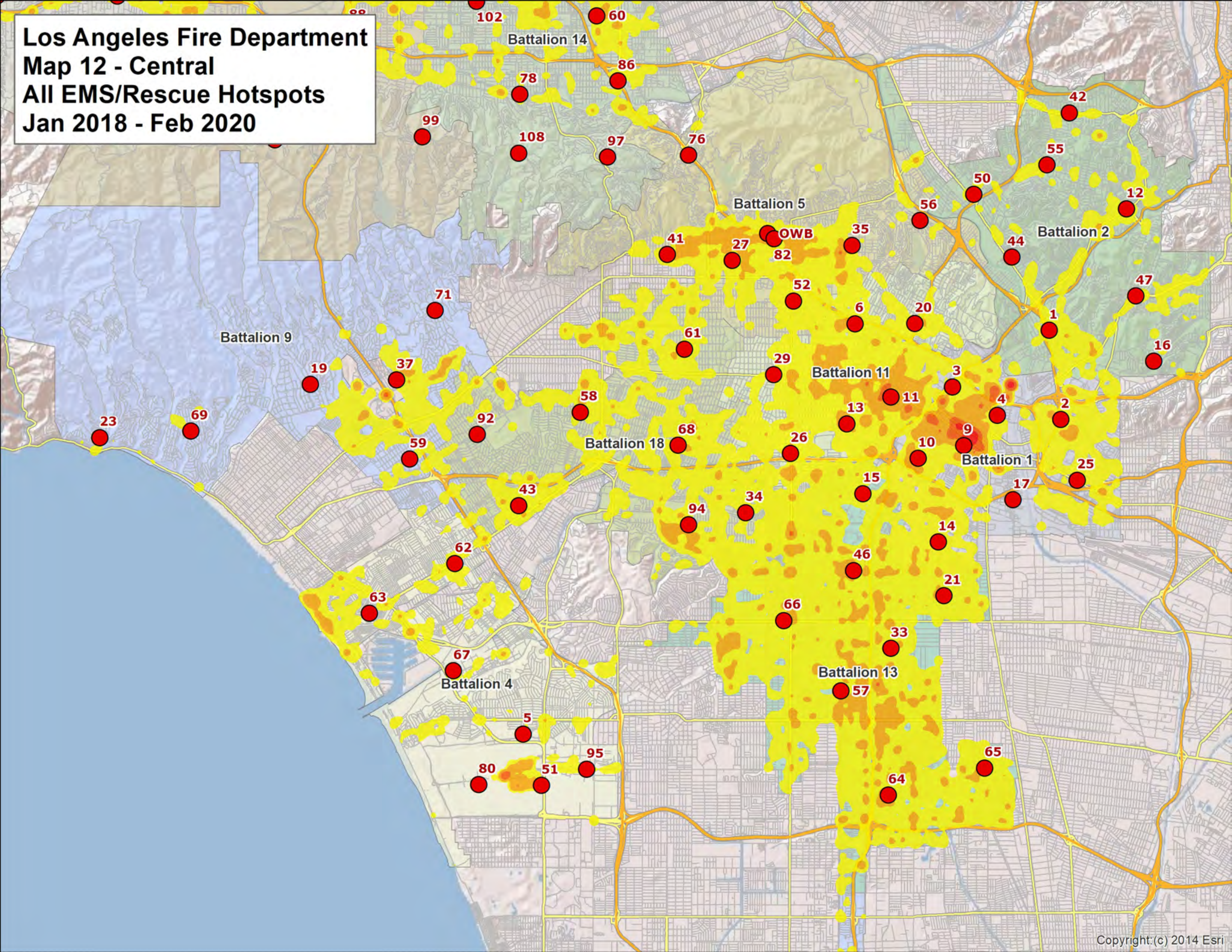

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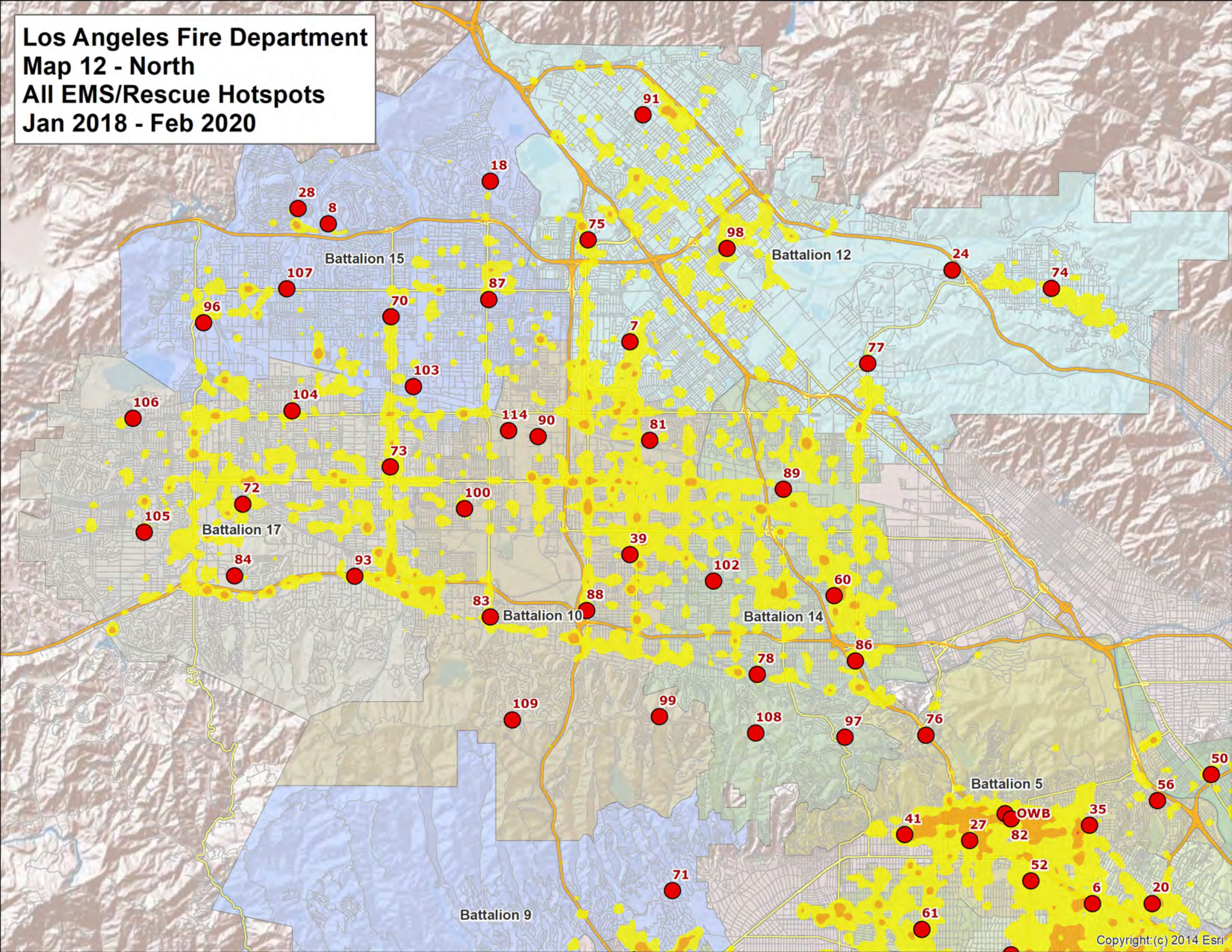
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Los Angeles Fire Department
Map 12 - South
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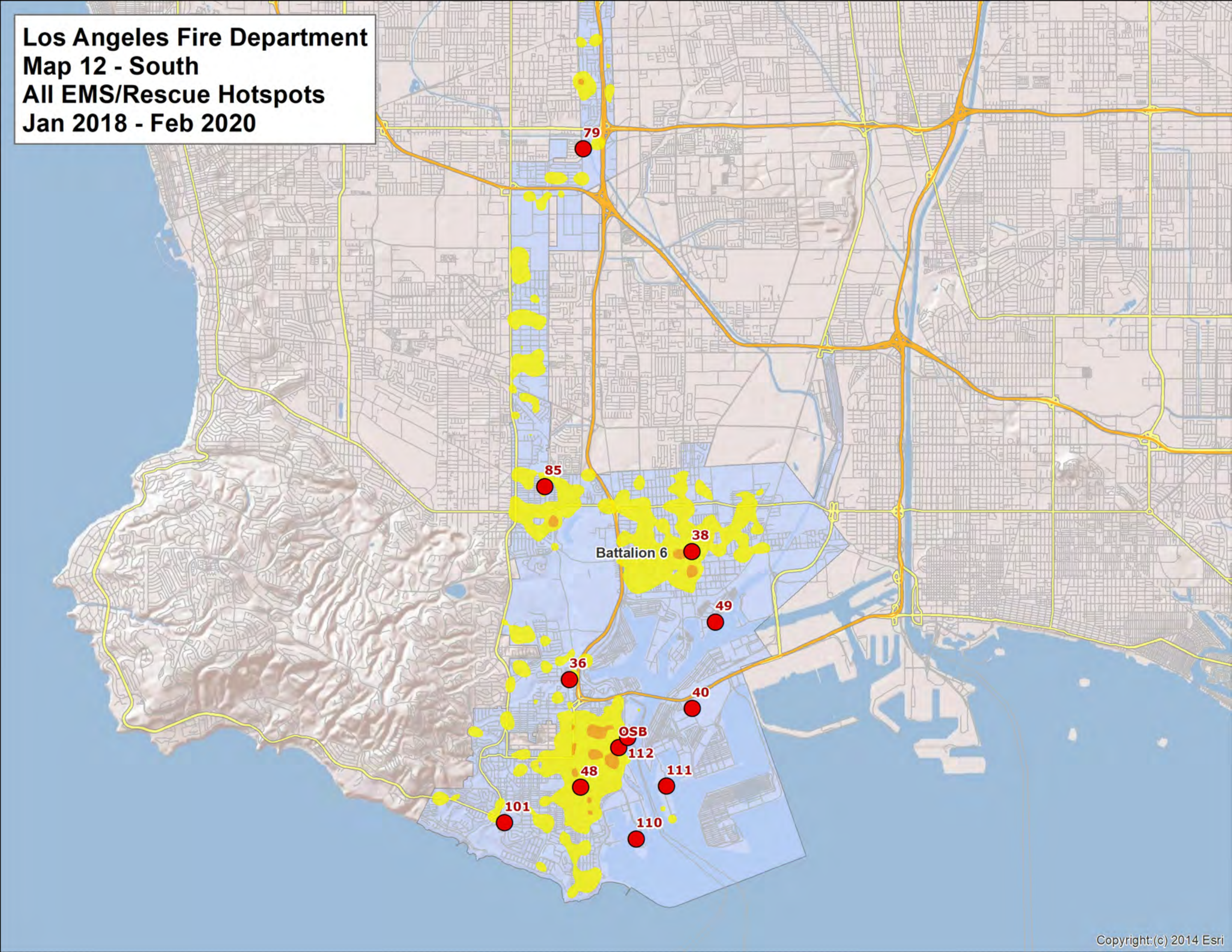

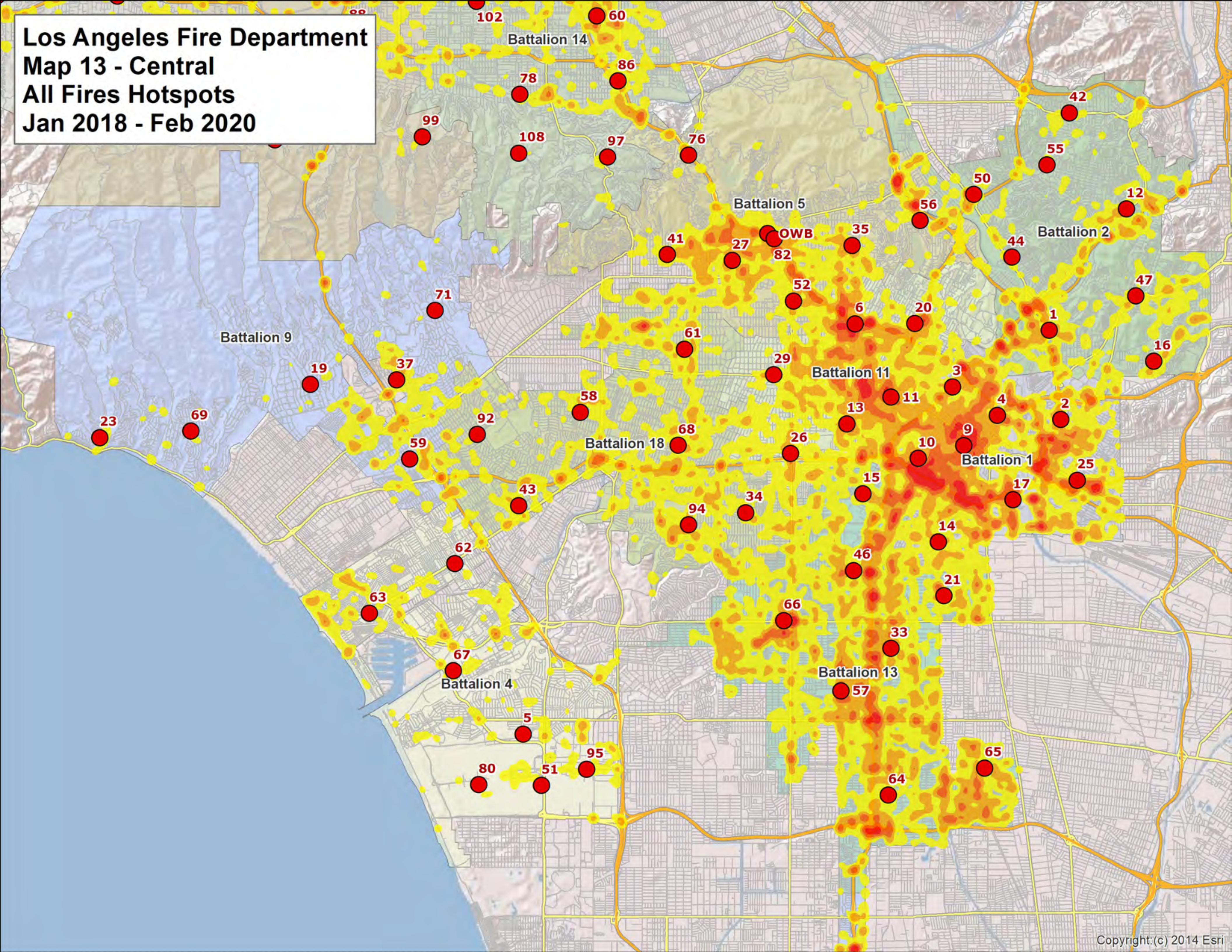
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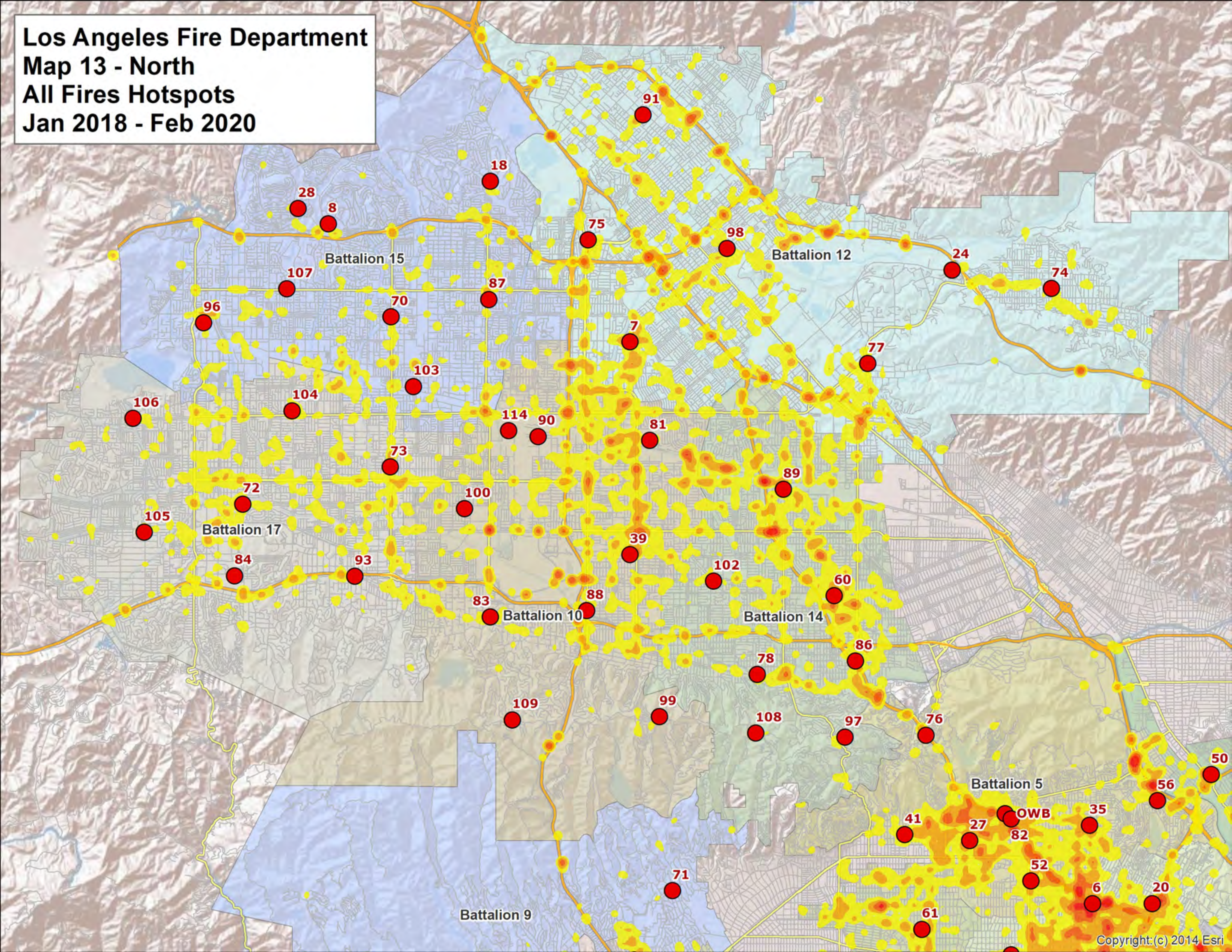

Los Angeles Fire Department
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Los Angeles Fire Department
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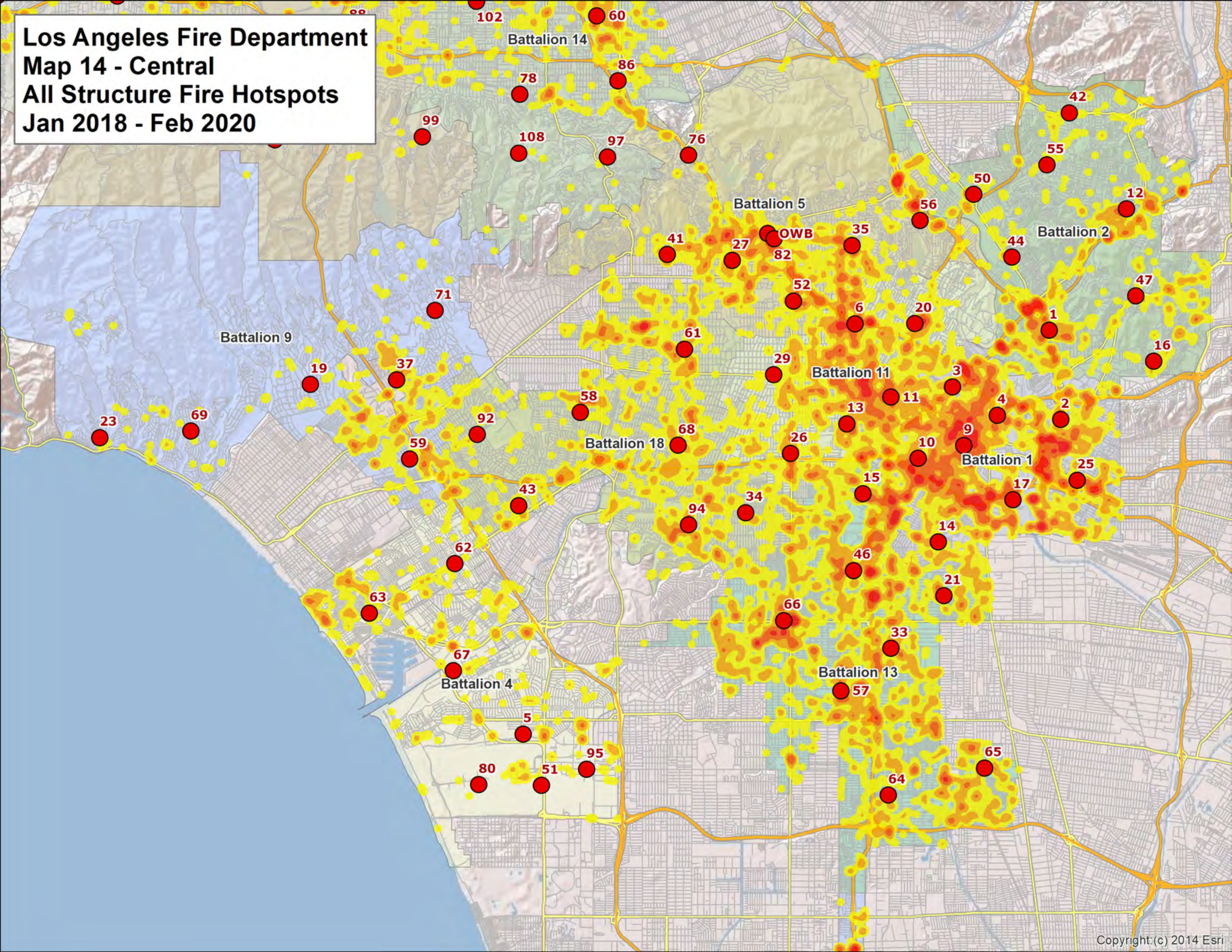

Los Angeles Fire Department
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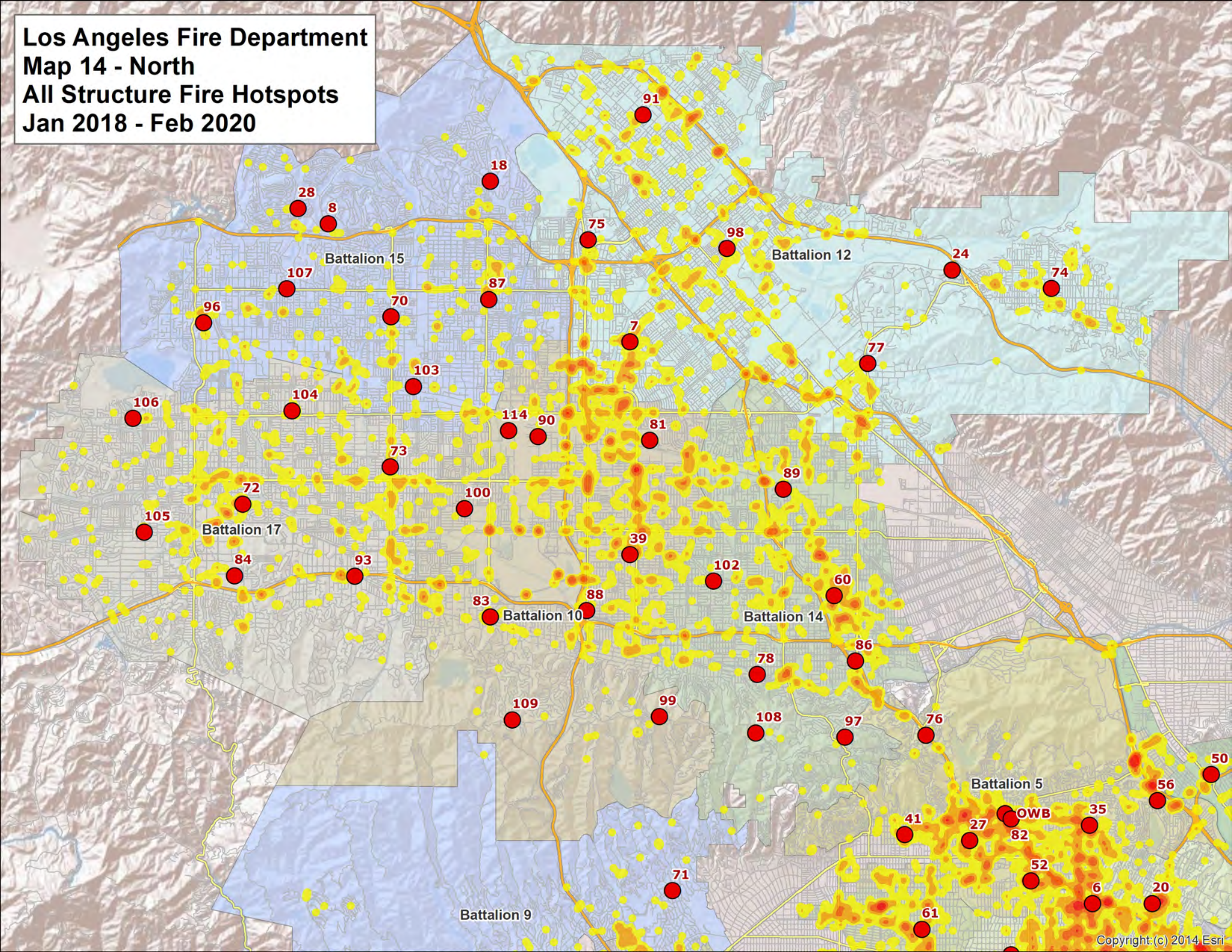
Los Angeles Fire Department
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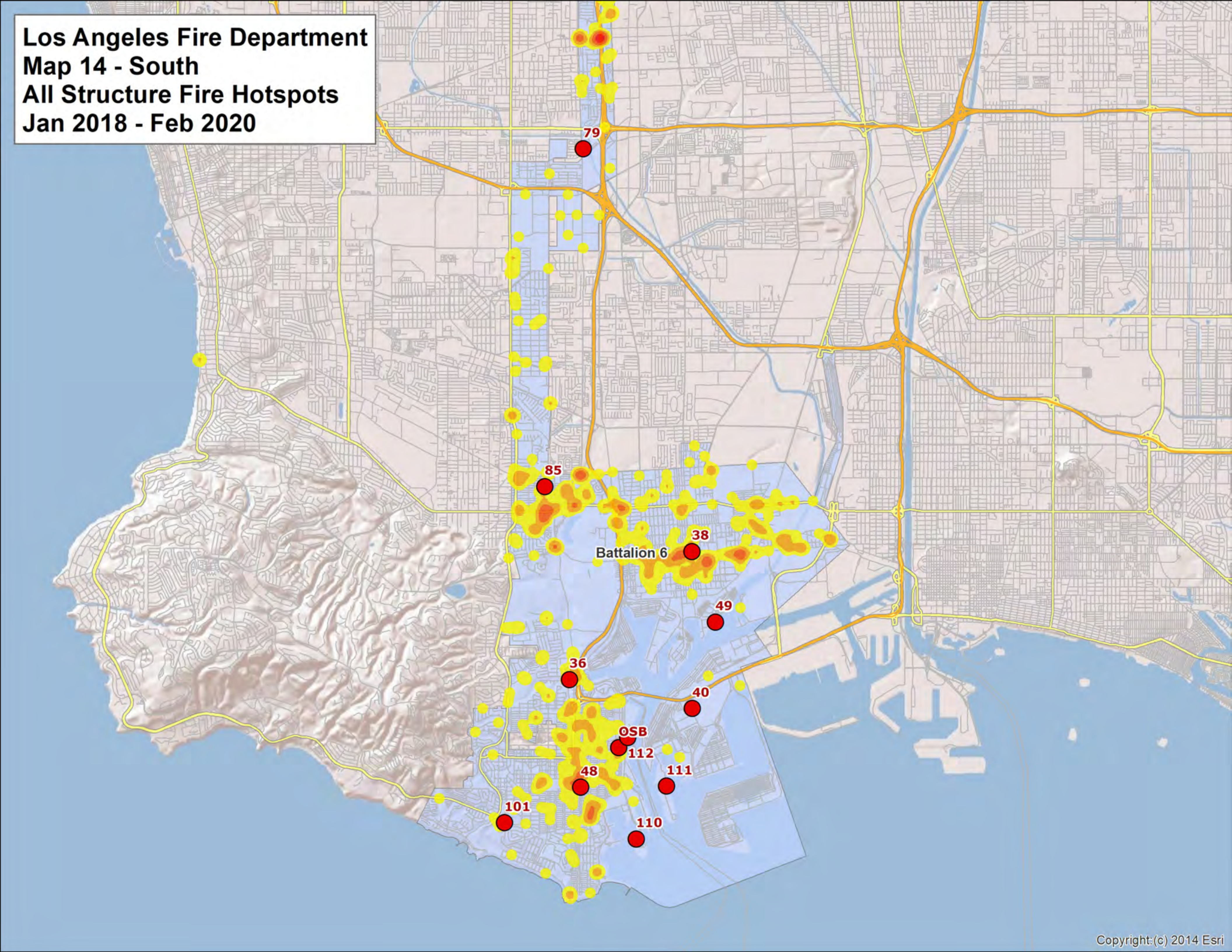

Los Angeles Fire Department
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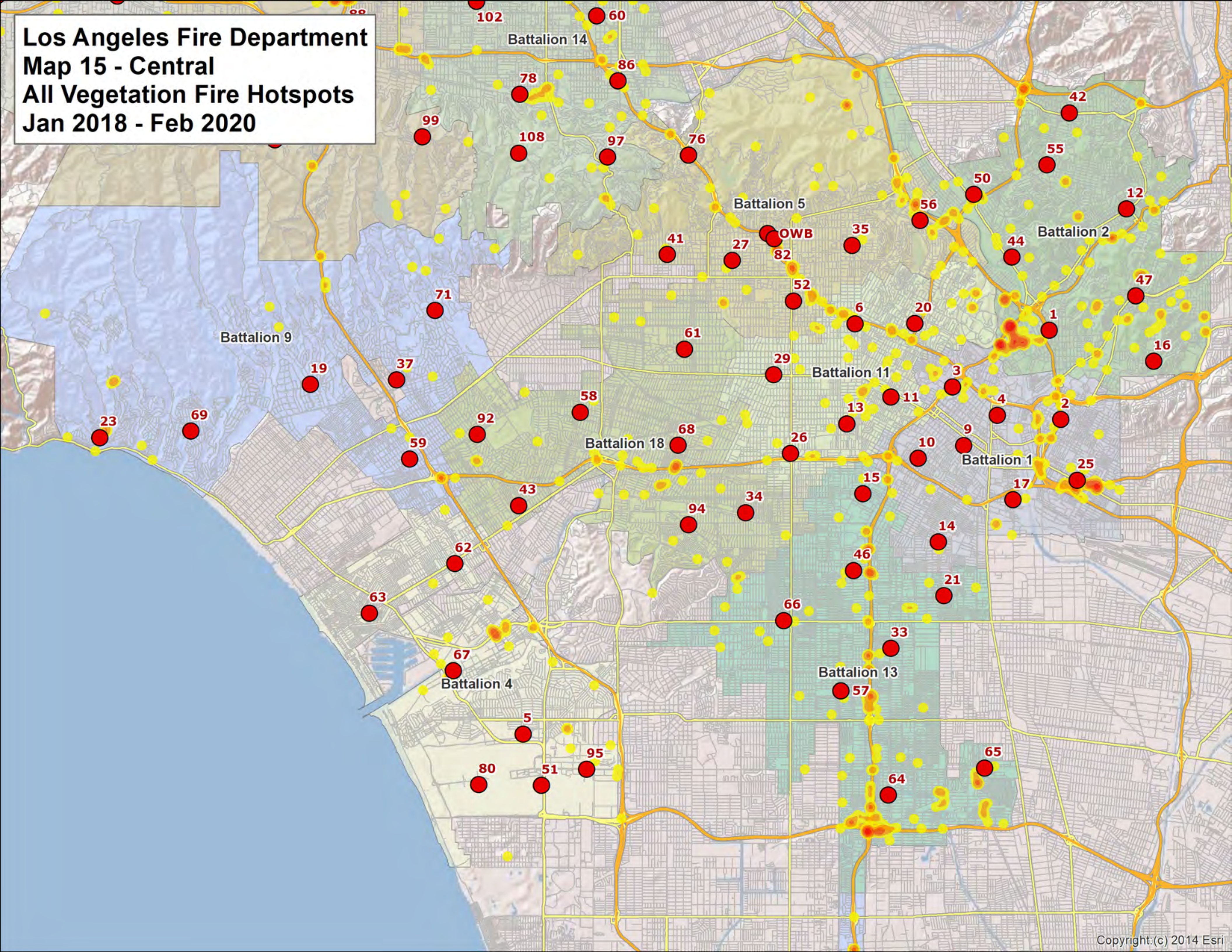

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Battalion 2
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Battalion 1
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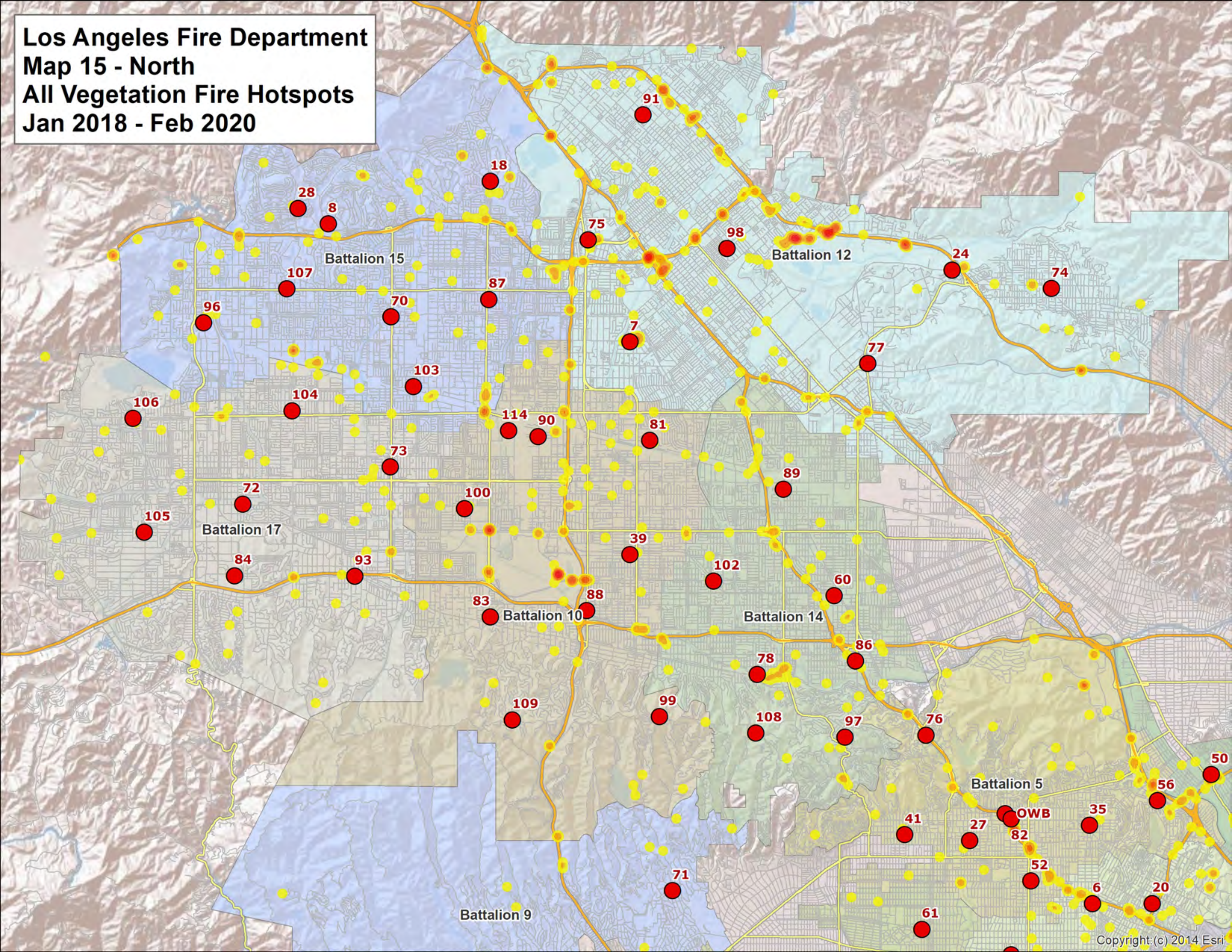

Los Angeles Fire Department
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Los Angeles Fire Department
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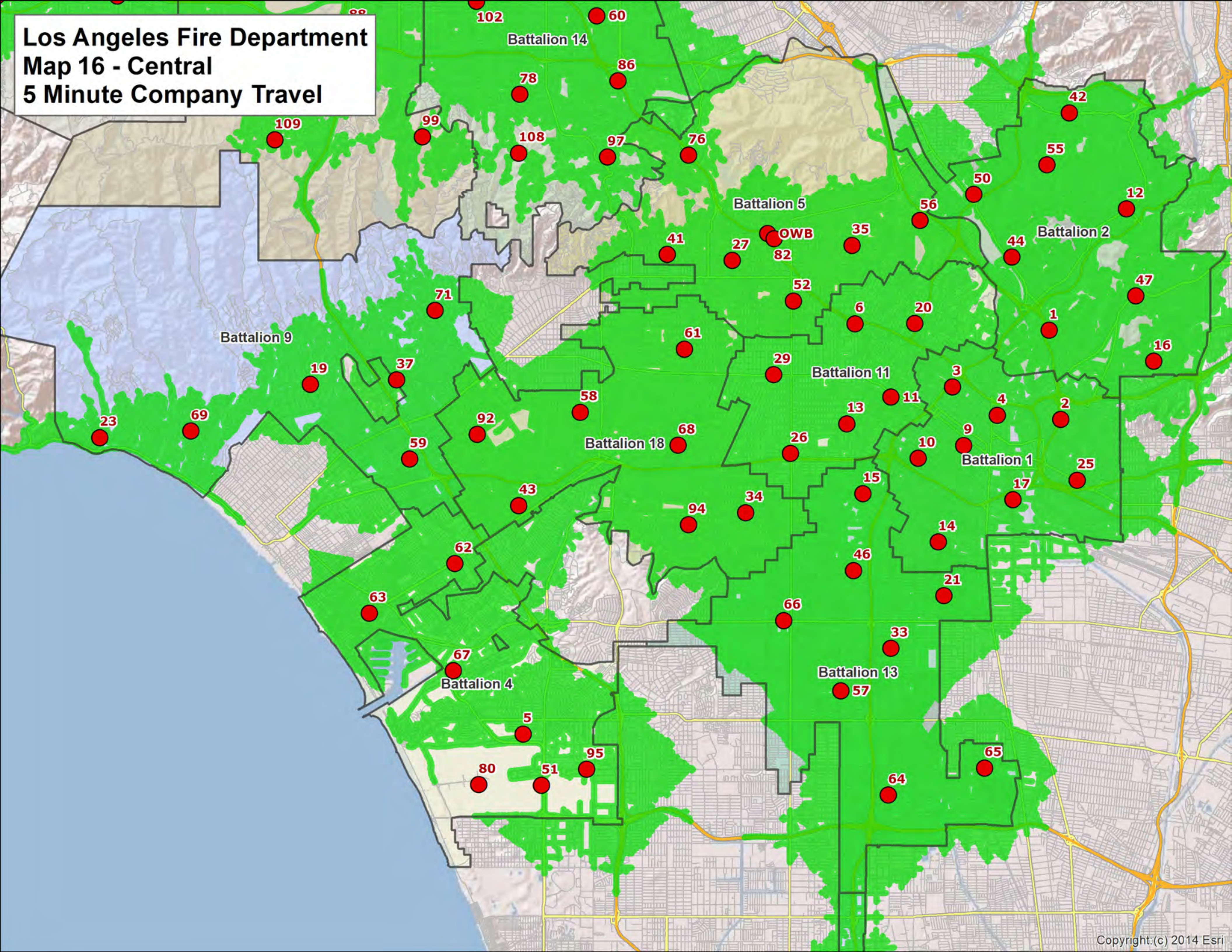
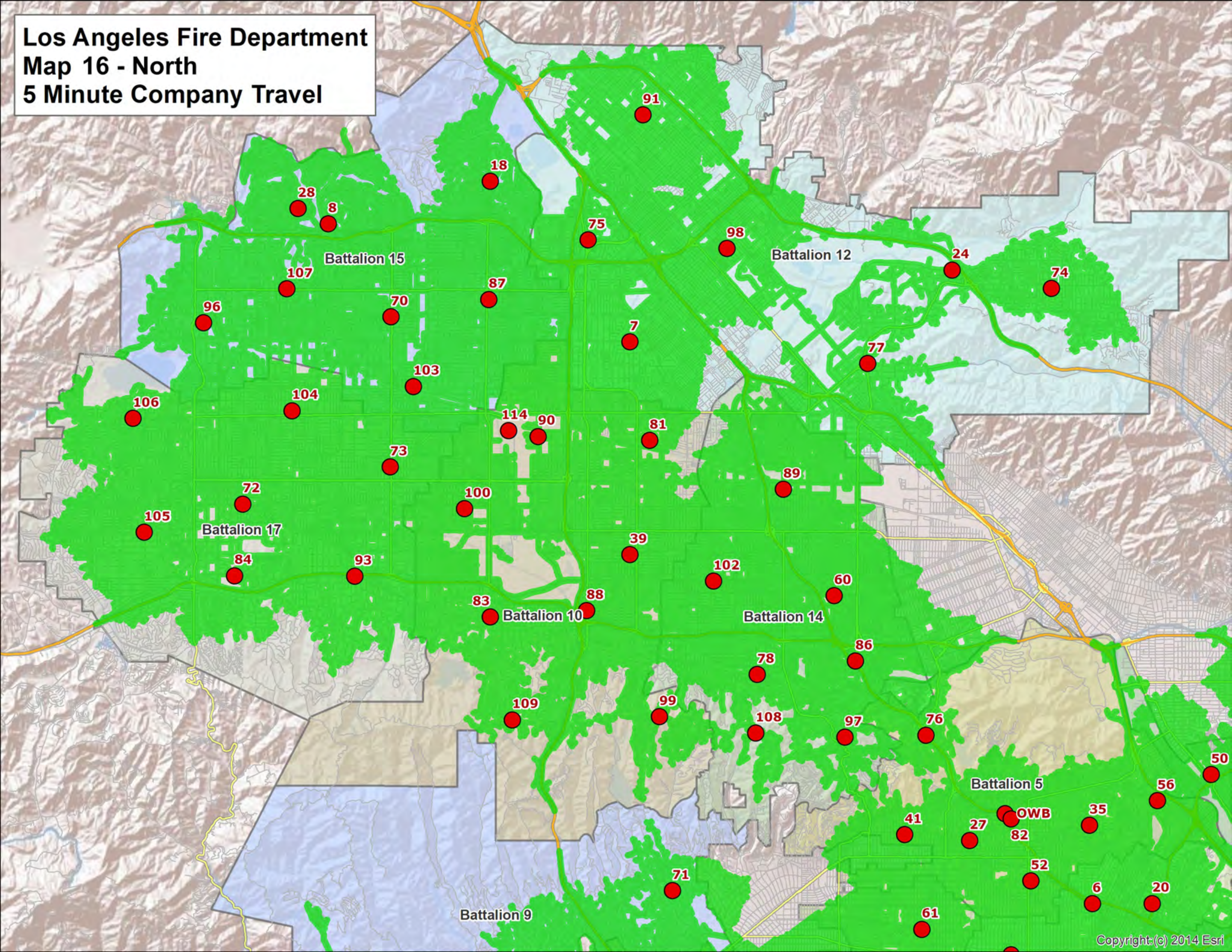
Los Angeles Fire Department
Map 16 - Central
5 Minute Company Travel

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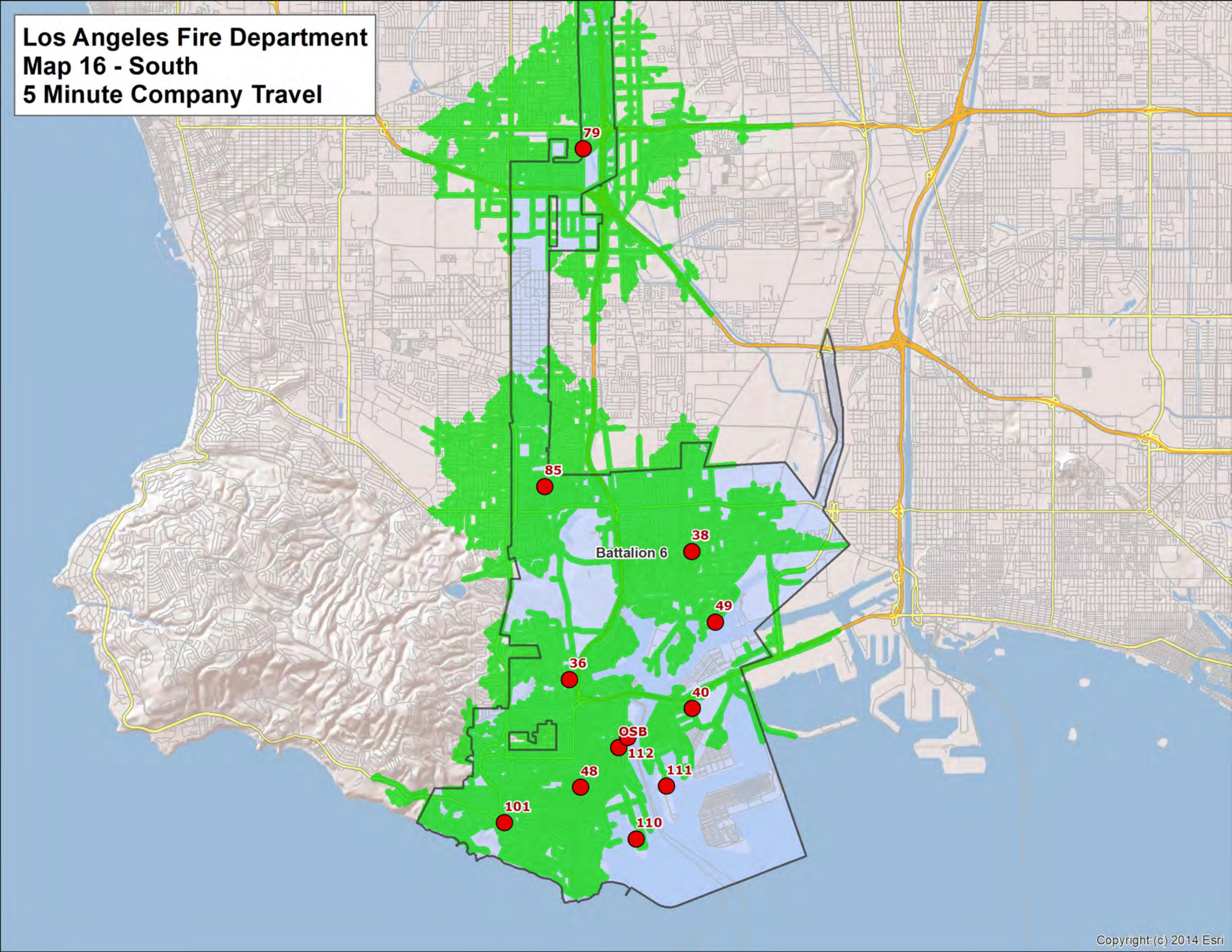
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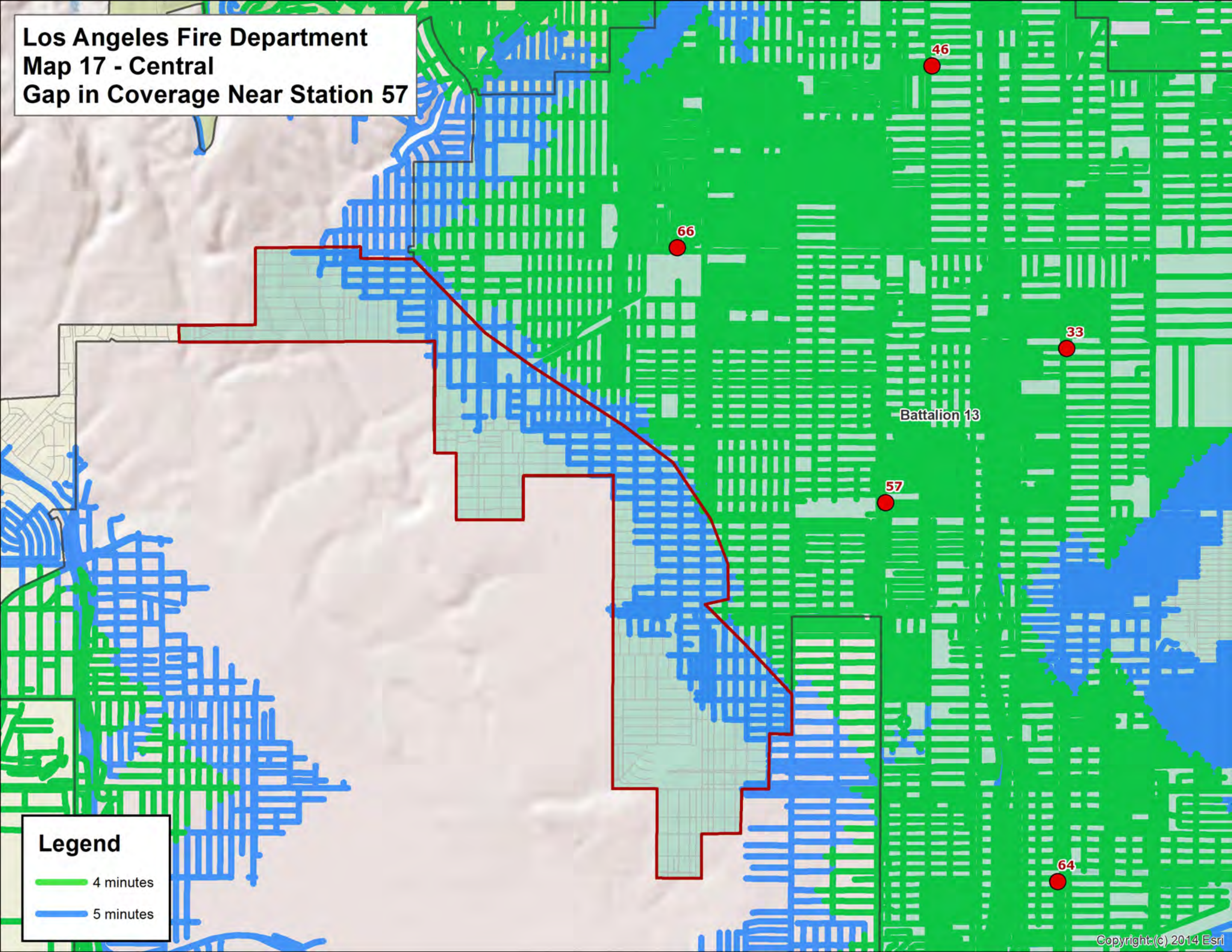
Los Angeles Fire Department
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Legend
4 minutes
5 minutes
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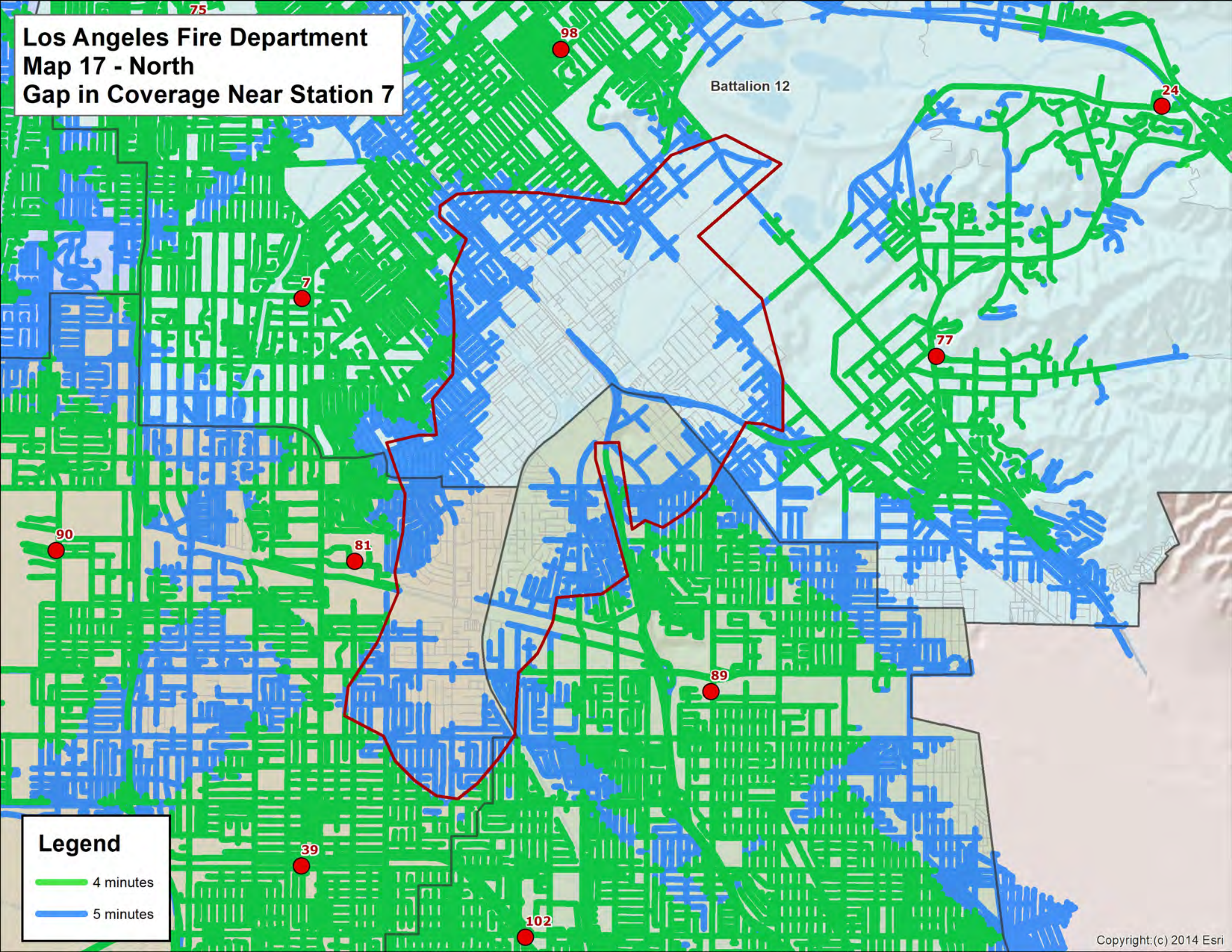
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Legend
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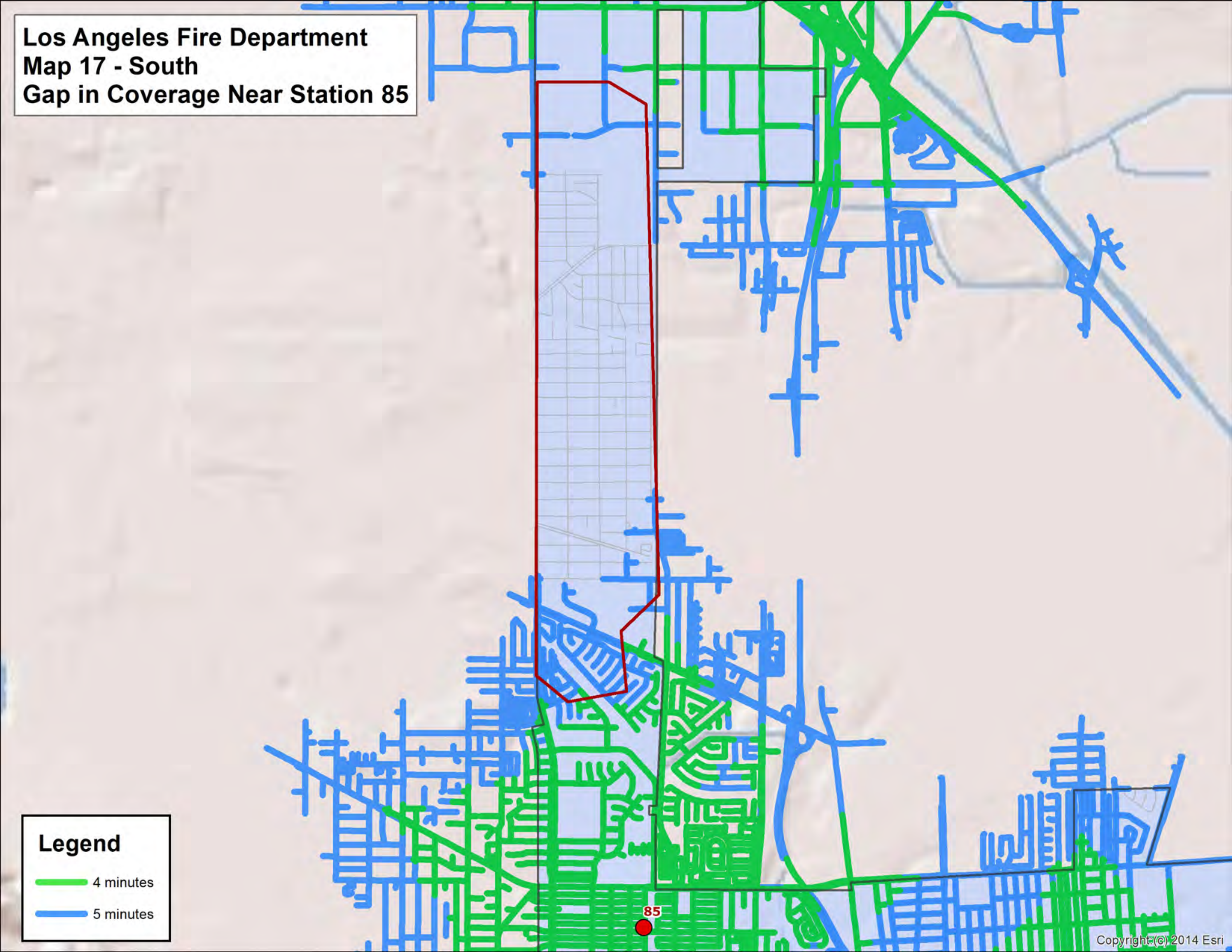
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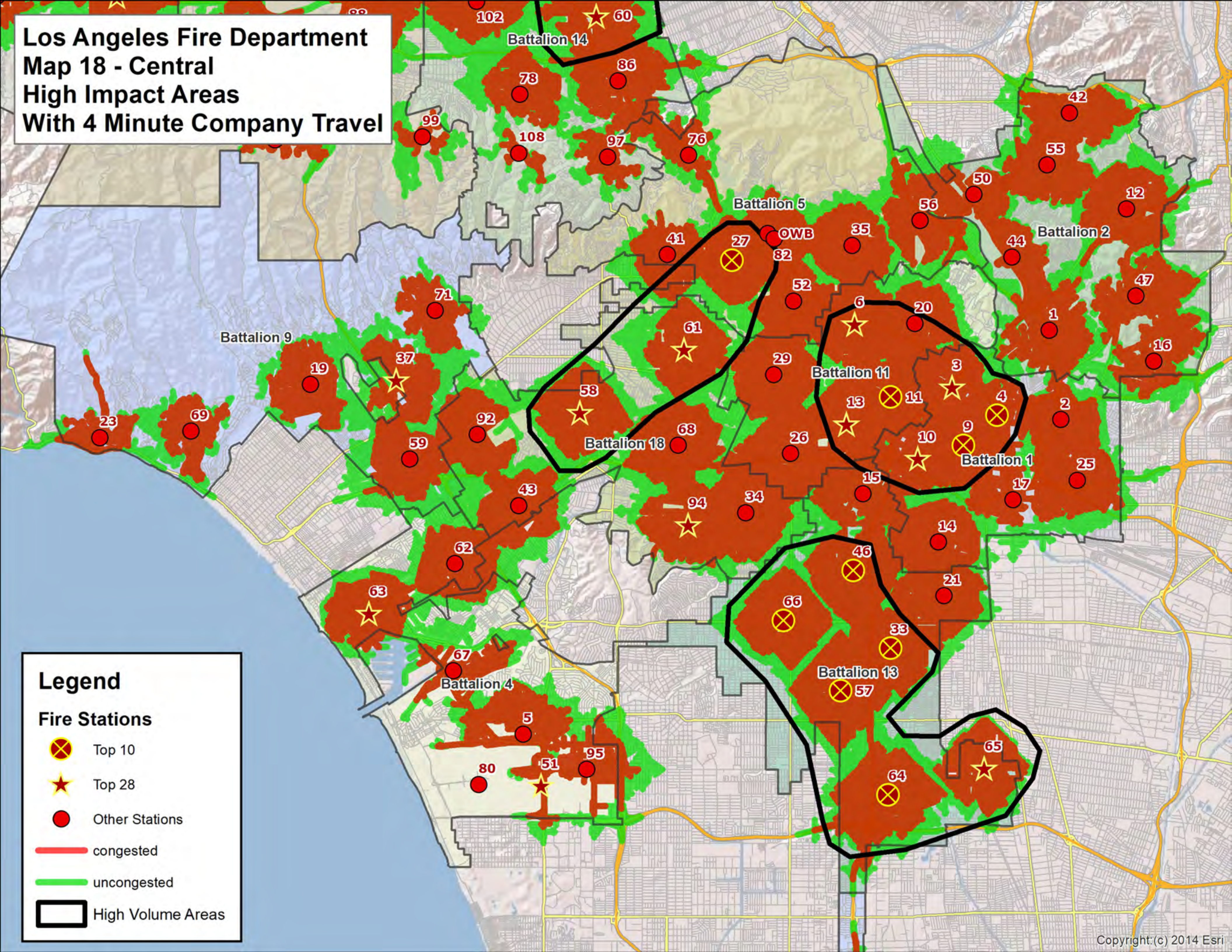

Los Angeles Fire Department
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Legend
Fire Stations
Top 10
Top 28
Other Stations
congested
uncongested
High Volume Areas
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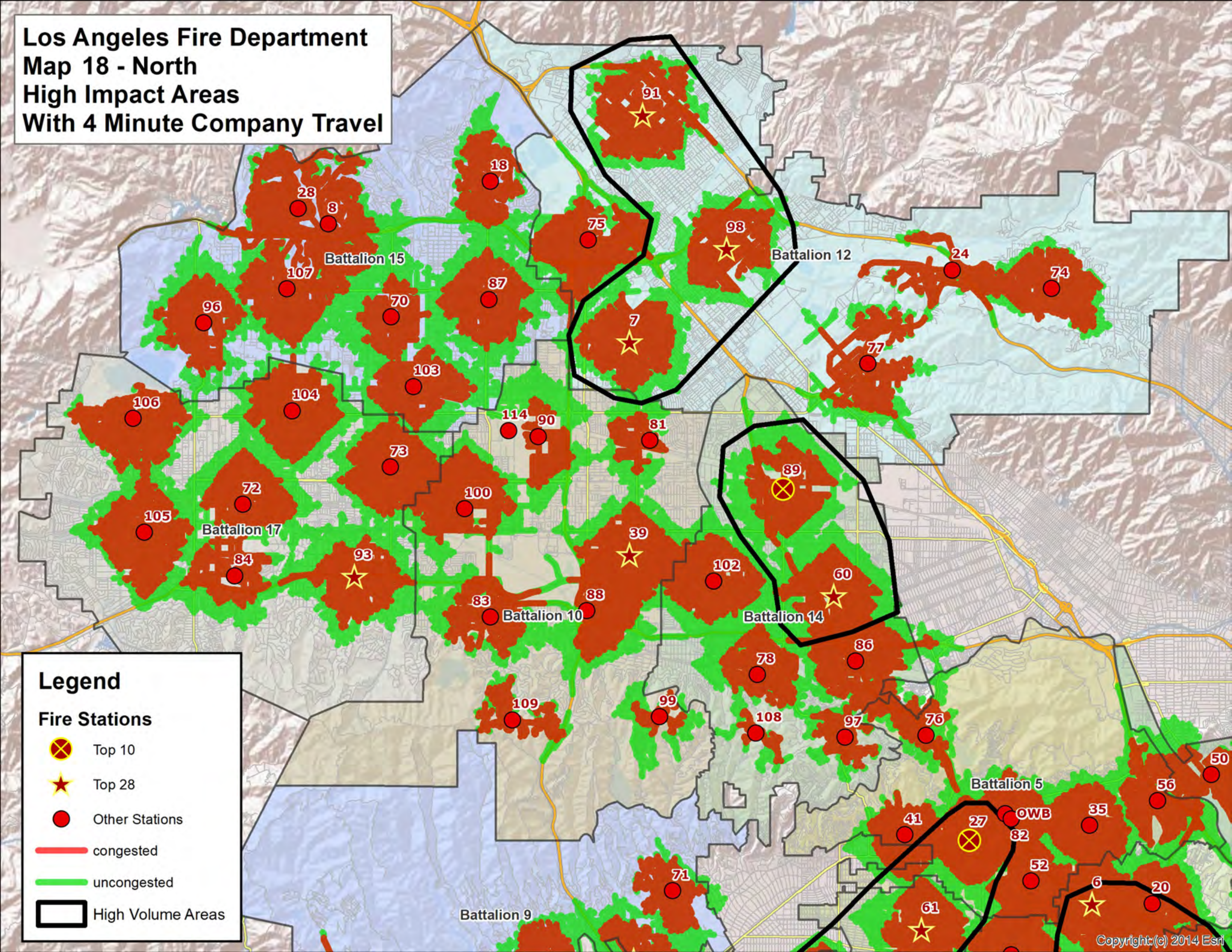

Los Angeles Fire Department
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Top 10
Top 28
Other Stations
congested
uncongested
High Volume Areas
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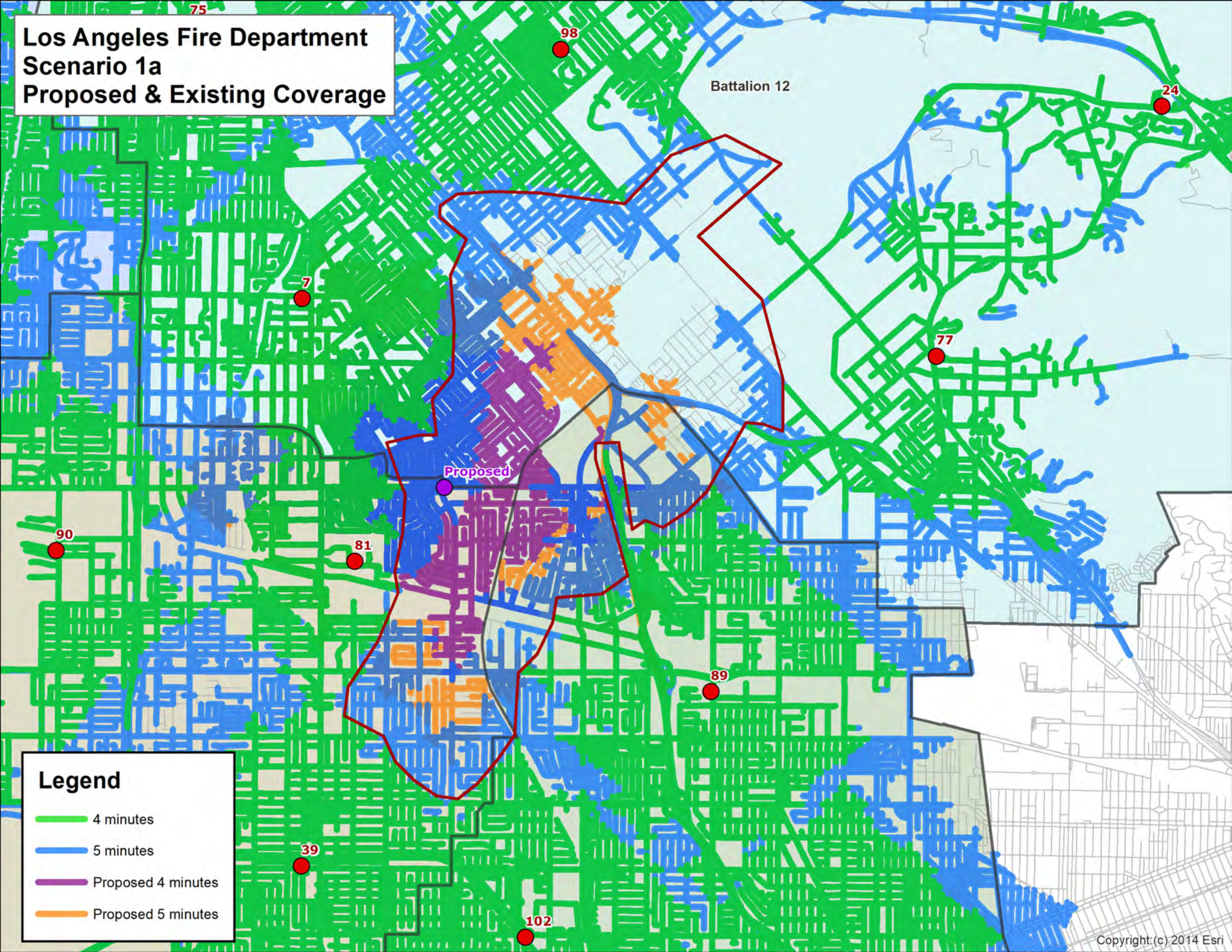
Los Angeles Fire Department
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Proposed
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102
Legend
4 minutes
5 minutes
Proposed 4 minutes
Proposed 5 minutes
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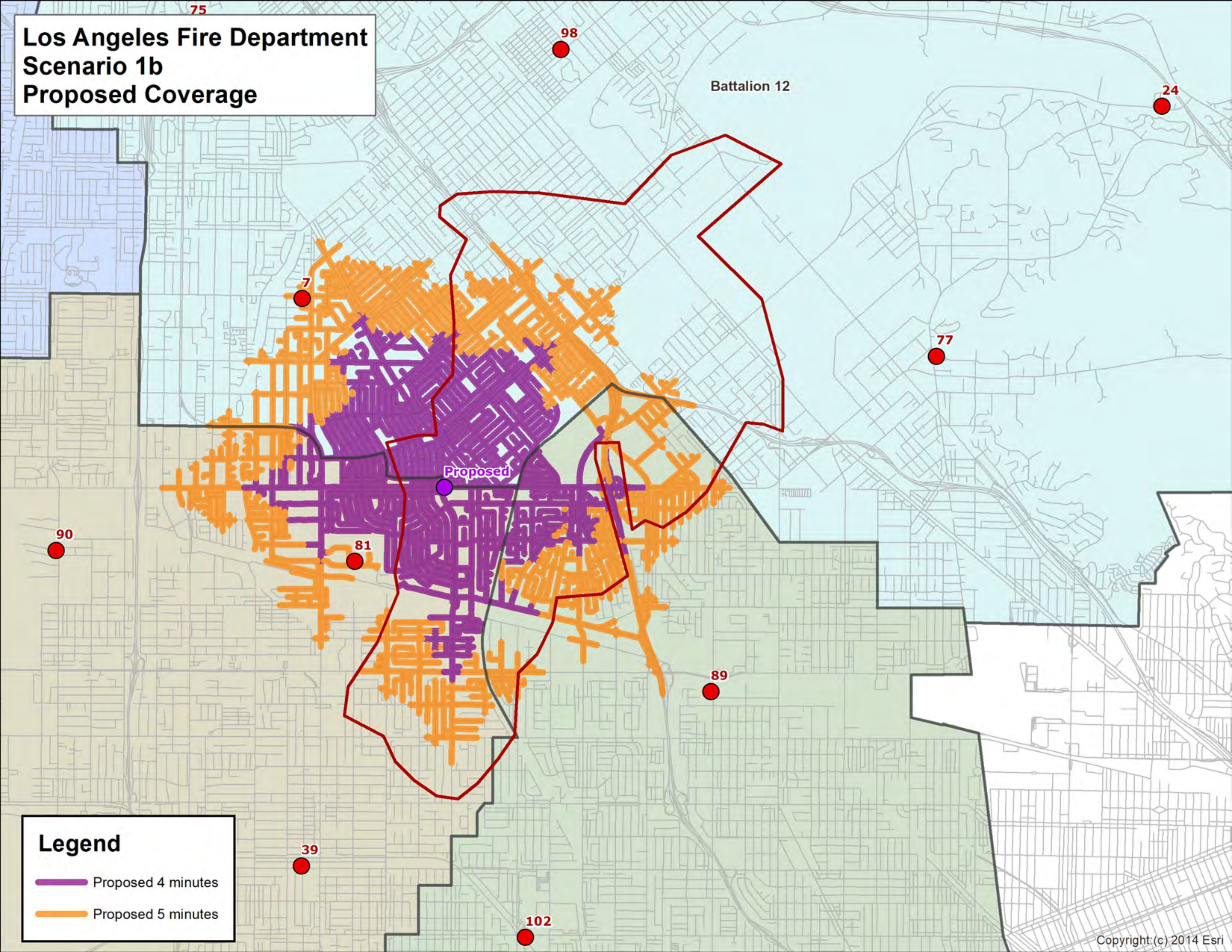

Los Angeles Fire Department
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102
Legend
Proposed 4 minutes
Proposed 5 minutes
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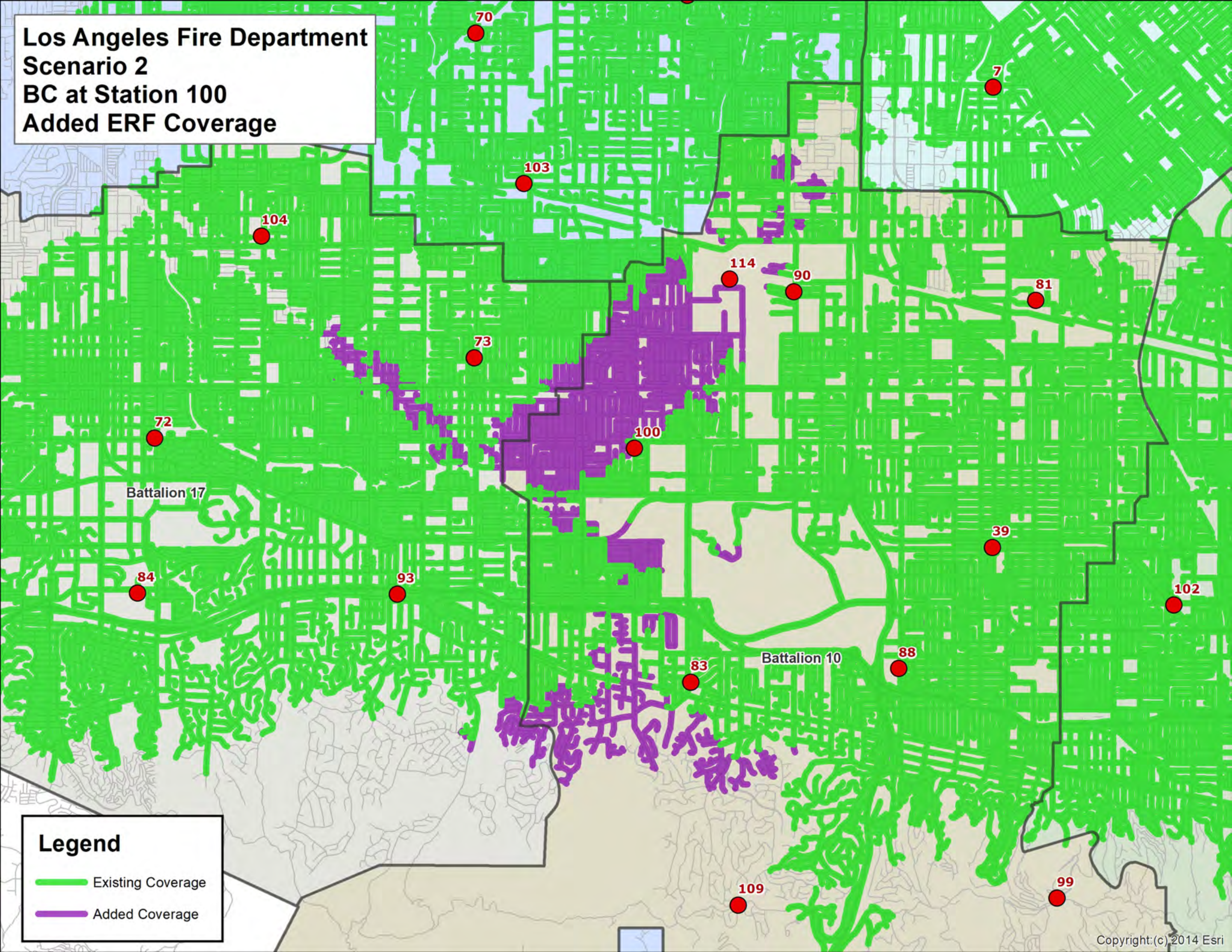
Los Angeles Fire Department
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Battalion 17
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Battalion 10
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99
Legend
Existing Coverage
Added Coverage
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CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES

LOS ANGELES FIRE DEPARTMENT

STANDARDS OF COVER ANALYSIS

VOLUME 3 OF 3: RISK ASSESSMENT

MAY 17, 2023

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COMMUNITY RISK ASSESSMENT

1.1 COMMUNITY RISK ASSESSMENT

SOC ELEMENT 3 OF 8
COMMUNITY RISK ASSESSMENT

The third element of the Standards of Coverage (SOC) process is a community risk assessment. Within the context of an SOC study, the objectives of a community risk assessment are to:

- Identify the values at risk to be protected within the community or service area.
- Identify the specific hazards with the potential to adversely impact the community or service area.
- Quantify the overall risk associated with each hazard.
- Establish a foundation for current/future deployment decisions and risk-reduction/hazard-mitigation planning and evaluation.

A hazard is broadly defined as a situation or condition that can cause or contribute to harm. Examples include fire, medical emergency, vehicle collision, earthquake, flood, etc. Risk is broadly defined as the *probability of hazard occurrence* in combination with the *likely severity of resultant impacts* to people, property, and the community.

1.1.1 Risk Assessment Methodology

The methodology employed by Citygate to assess community risks as an integral element of an SOC deployment analysis incorporates the following elements:

- Identification of geographic planning sub-zones (risk zones) appropriate to the community or jurisdiction.
- Identification and quantification, to the extent data is available, of the specific values to be protected within the community or service area.
- Identification of the fire and non-fire hazards to be evaluated.
- Determination of the *probability of occurrence* for each hazard.
- Determination of the *probable consequence severity* of a hazard occurrence.
- Determination of the *impact severity* of a hazard occurrence on the fire agency's overall response capacity.
- Quantification of overall risk for each hazard based on *probability of occurrence* in combination with *probable consequence severity* and agency *impact severity*.

For this assessment, Citygate used the following data sources to understand the hazards and values to be protected in the City of Los Angeles (City):

- Esri and US Census Bureau population and demographic data
- City Geographical Information Systems (GIS) data
- City General Plan and Zoning information
- City Local Hazard Mitigation Plan
- Fire Department and other City data and information

1.1.2 Risk Assessment Summary

Citygate's evaluation of the values at risk and hazards likely to impact the City yields the following:

1. The Department serves a very diverse urban population with densities ranging from less than 5,000 to more than 40,000 people per square mile over a widely varied urban land use pattern.
2. The City's population is projected to grow by 18 percent over the next 18 years to 2040.
3. The City has a large inventory of residential and non-residential buildings to protect.
4. The City has significant economic and other resource values to be protected, as identified in this assessment.
5. The City has multiple mass emergency notification options available to effectively communicate emergency information to the public in a timely manner.
6. The City's risk for five hazards related to emergency services provided by the Department range from **Low** to **Extreme** as summarized in the following table.

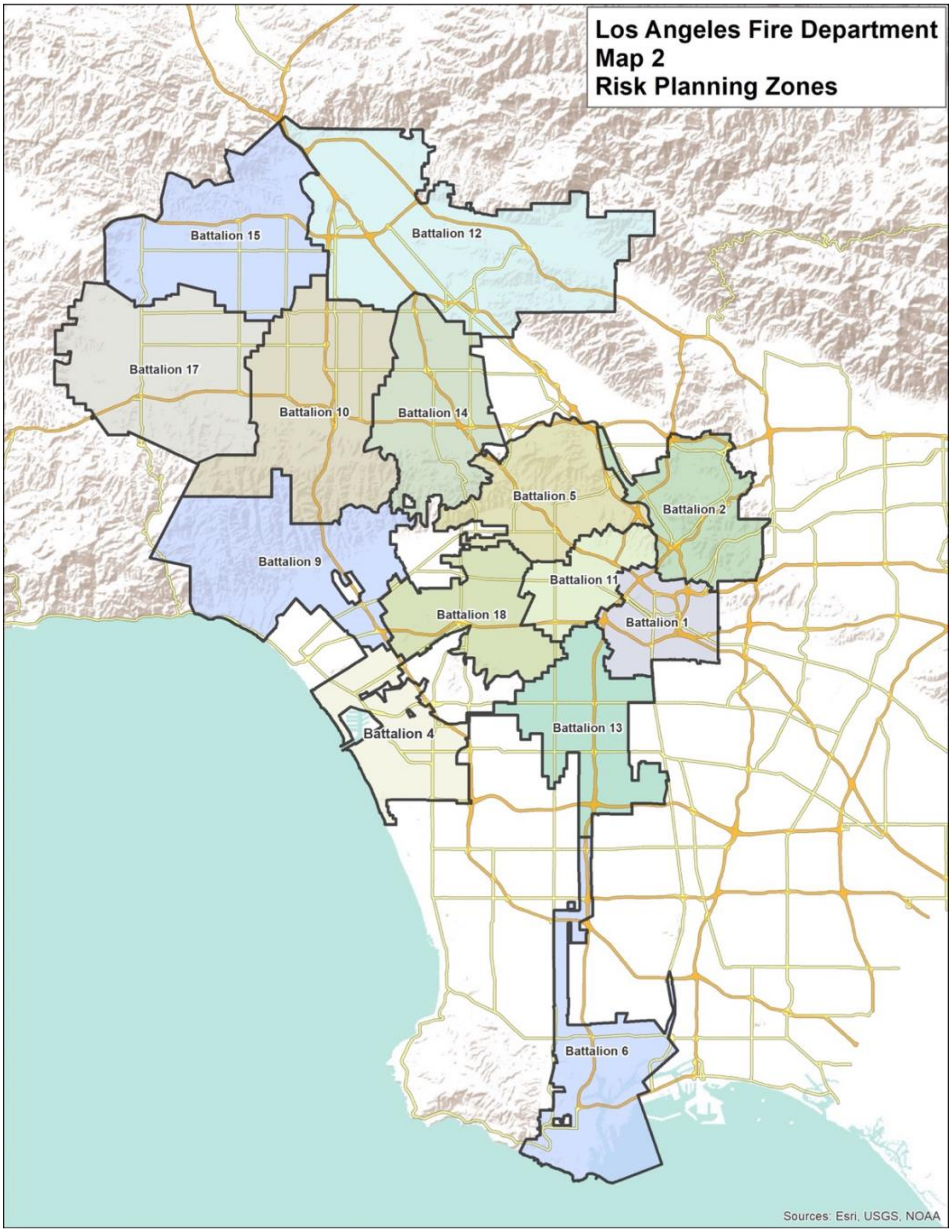
Table 1—Overall Risk by Incident Type

	Hazard	Hazard Sub-Type	Risk Rating
1	Building Fire	Outbuilding/ADU	Moderate
		Single-Family Dwelling	High
		Multi-Family Residence	High
		Light Commercial	High
		Heavy Commercial/Industrial	High
2	Vegetation/ Wildland Fire	Grass	Low
		Brush	Moderate
		Grass/Brush (High/Very High Hazard Areas)	High
		Wildland-Urban Interface	Extreme
3	Medical Emergency	BLS Only	Moderate
		BLS/ALS	High
		ALS	High
		Active Shooter / Mass Casualty Incident	High
		Weapon of Mass Destruction	Extreme
4	Hazardous Materials	Alarm / Odor Investigation	Low
		Hazmat Level 1	Moderate
		Hazmat Level 2 Biological/Chemical Threat Natural Gas Leak	High
		Hazmat Level 3 Biological/Chemical Release Railroad Incident	High
		Explosion / WMD	Extreme
5	Technical Rescue	Elevator Rescue	Low
		Trauma / Pin-In / Potential Jumper Rope Rescue	Moderate
		Confined Space / Trench Rescue	Moderate
		Building Collapse / Natural Disaster	Extreme

1.1.3 Risk Planning Zones

The Commission on Fire Accreditation International (CFAI) recommends that jurisdictions establish geographic risk planning zones to better understand risk at a sub-jurisdictional level. For example, portions of a jurisdiction may contain predominantly moderate risk building occupancies, such as detached single-family residences, while other areas contain high- or maximum-risk occupancies, such as commercial and industrial buildings with a high hazard fire load. If risk was to be evaluated on a jurisdiction-wide basis, the predominant moderate risk could outweigh the high or maximum risk and may not be a significant factor in an overall assessment of risk. If, however, those high- or maximum-risk occupancies are a larger percentage of the risk in a smaller planning zone, then it becomes a more significant risk factor. Another consideration in establishing planning zones is that the jurisdiction's record management system must also track the specific zone for each incident to be able to appropriately evaluate service demand and response performance relative to each specific zone. For this assessment, Citygate utilized 14 planning zones corresponding with Fire Department battalions as shown on the following map.

Figure 1—Risk Planning Zones



1.1.3.1 Battalion Risk Profiles[1]

Following is a map and risk profile for each battalion.

[1] Risk data provided by the Los Angeles Fire Department Planning Section

Figure 2—Battalion 1

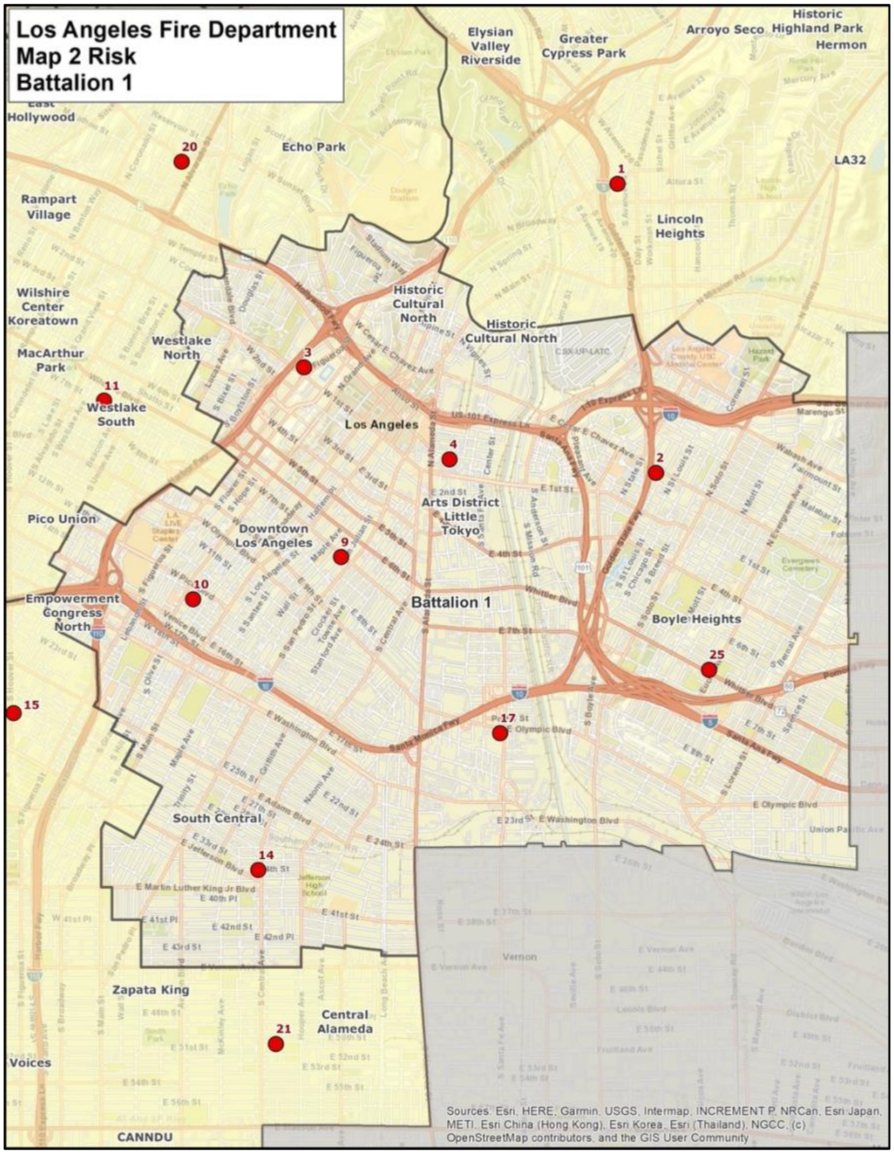


Table 2—Risk Profile – Battalion 1

Risk Factors			
Area (sq. mi.)	**16.75**	Total Buildings	**40,461**
Population	**239,404**	Residential	70.70%
Disabled Population	**29,738**	Commercial/Industrial	25.98%
Population Density per Sq. Mi.	**40,461**	Other	3.00%
Critical Facilities/Infrastructure	**48**	High-Rise (>75 feet)	**709**
Permitted Hazmat Facilities	**1,252**	Building Density per Sq. Mi.	**2,416**
Assessed Valuation ($B)	**$35.15**		

Figure 3—Battalion 2

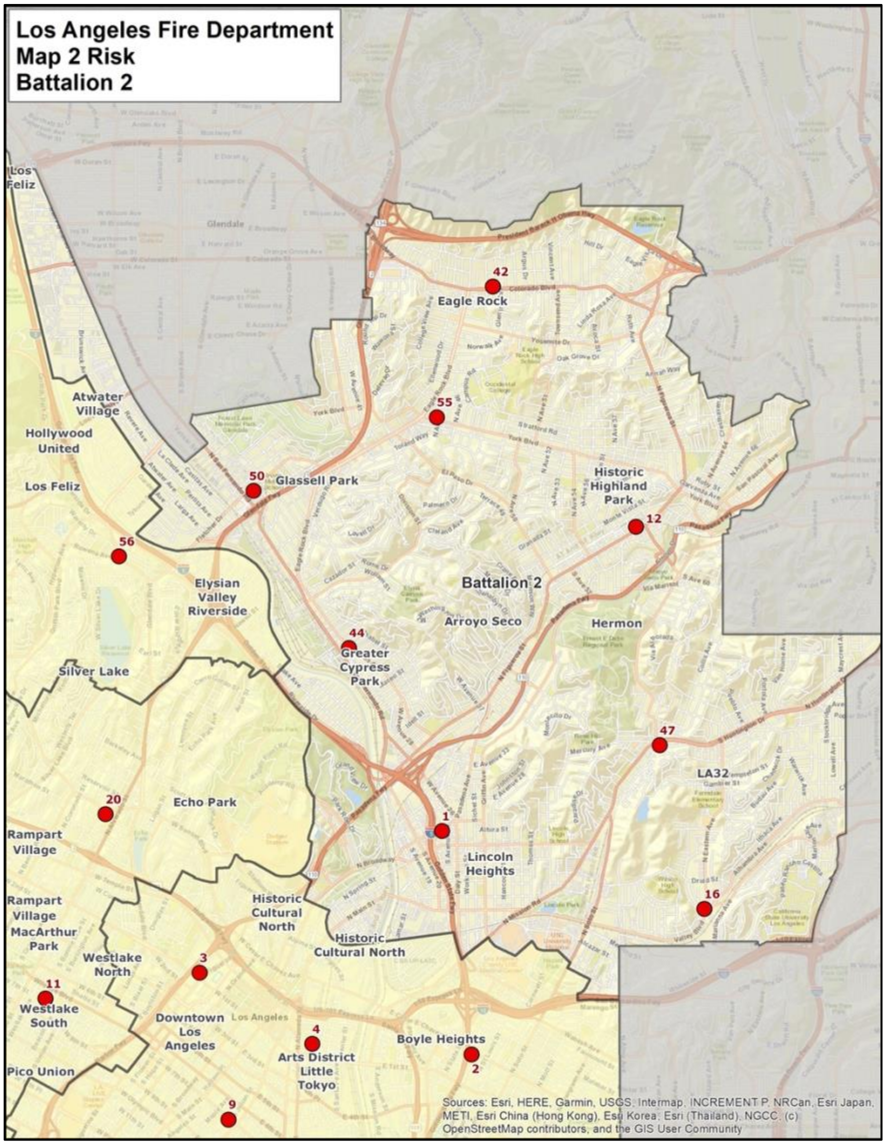


Table 3—Risk Profile – Battalion 2

Risk Factors			
Area (sq. mi.)	**24.79**	Total Buildings	**82,242**
Population	**231,563**	Residential	89.72%
Disabled Population	**28,097**	Commercial/Industrial	7.33%
Population Density per Sq. Mi.	**9,341**	Other	2.80%
Critical Facilities/Infrastructure	**5**	High-Rise (>75 feet)	**260**
Permitted Hazmat Facilities	**534**	Building Density per Sq. Mi.	**3,318**
Assessed Valuation ($B)	**$9.80**		

Figure 4—Battalion 4

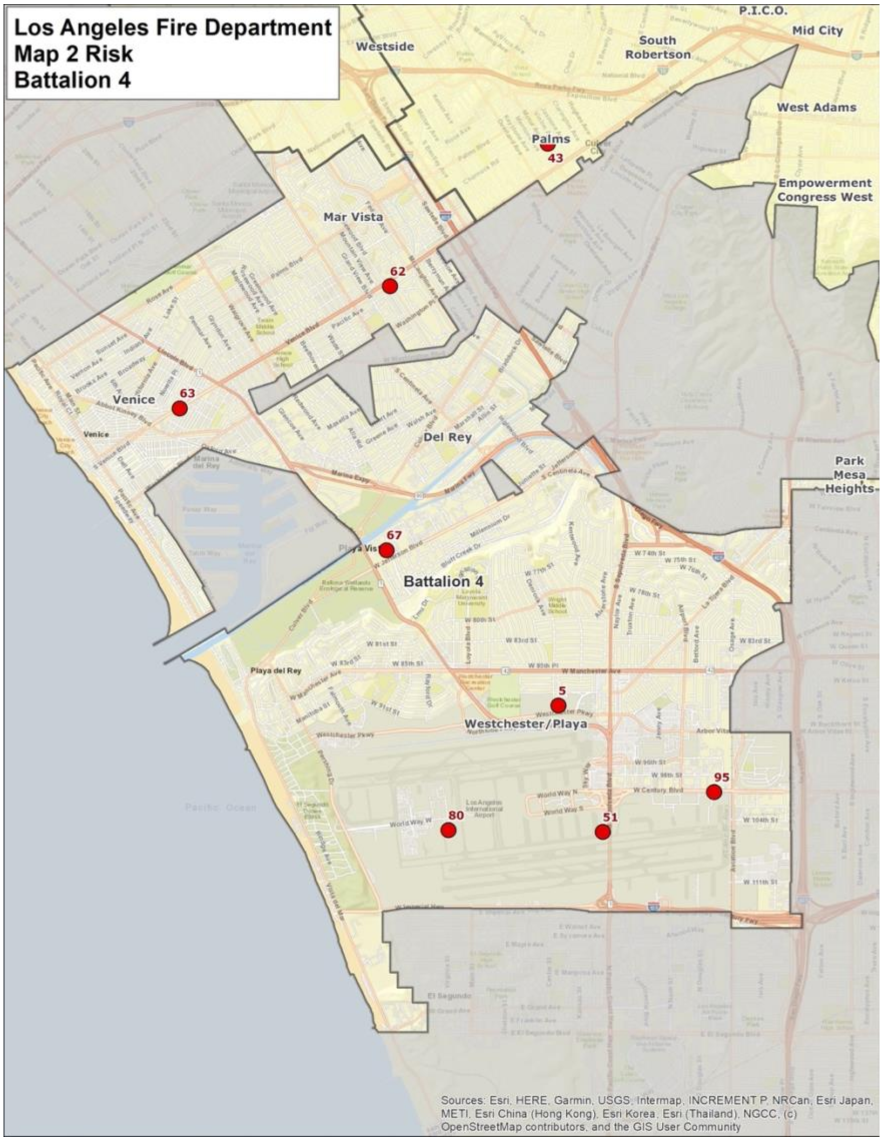


Table 4—Risk Profile – Battalion 4

Risk Factors			
Area (sq. mi.)	**23.2**	Total Buildings	**59,716**
Population	**176,914**	Residential	91.01%
Disabled Population	**13,238**	Commercial/Industrial	6.29%
Population Density per Sq. Mi.	**7,626**	Other	1.86%
Critical Facilities/Infrastructure	**6**	High-Rise (>75 feet)	**128**
Permitted Hazmat Facilities	**587**	Building Density per Sq. Mi.	**2,574**
Assessed Valuation ($B)	**$23.01**		

Figure 5—Battalion 5

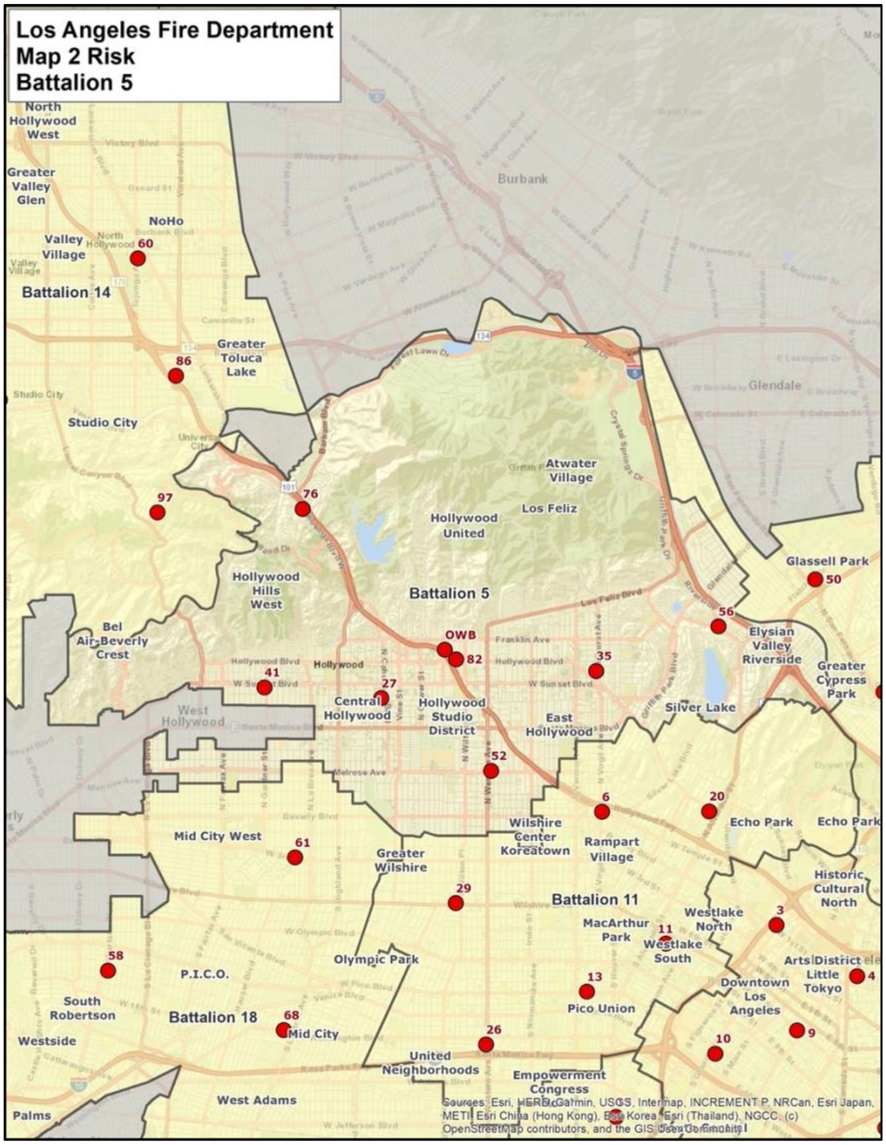


Table 5—Risk Profile – Battalion 5

Risk Factors			
Area (sq. mi.)	**28.5**	Total Buildings	**59,816**
Population	**231,887**	Residential	88.91%
Disabled Population	**21,196**	Commercial/Industrial	8.79%
Population Density per Sq. Mi.	**8,136**	Other	2.04%
Critical Facilities/Infrastructure	**8**	High-Rise (>75 feet)	**252**
Permitted Hazmat Facilities	**507**	Building Density per Sq. Mi.	**2,099**
Assessed Valuation ($B)	**$26.54**		

Figure 6—Battalion 6

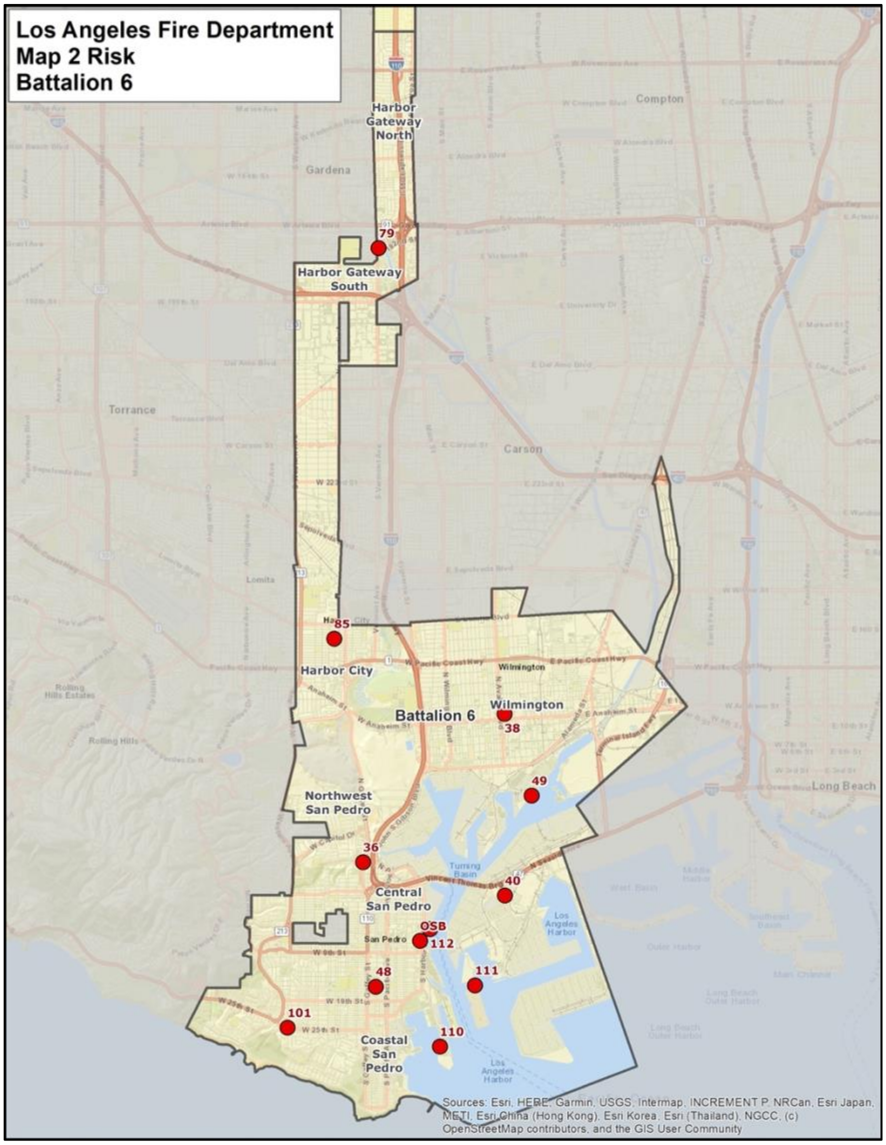


Table 6—Risk Profile – Battalion 6

Risk Factors			
Area (sq. mi.)	**33.34**	Total Buildings	**63,356**
Population	**192,785**	Residential	83.97%
Disabled Population	**20,627**	Commercial/Industrial	13.17%
Population Density per Sq. Mi.	**5,782**	Other	2.71%
Critical Facilities/Infrastructure	**2**	High-Rise (>75 feet)	**232**
Permitted Hazmat Facilities	**933**	Building Density per Sq. Mi.	**1,900**
Assessed Valuation ($B)	**$9.47**		

Figure 7—Battalion 9

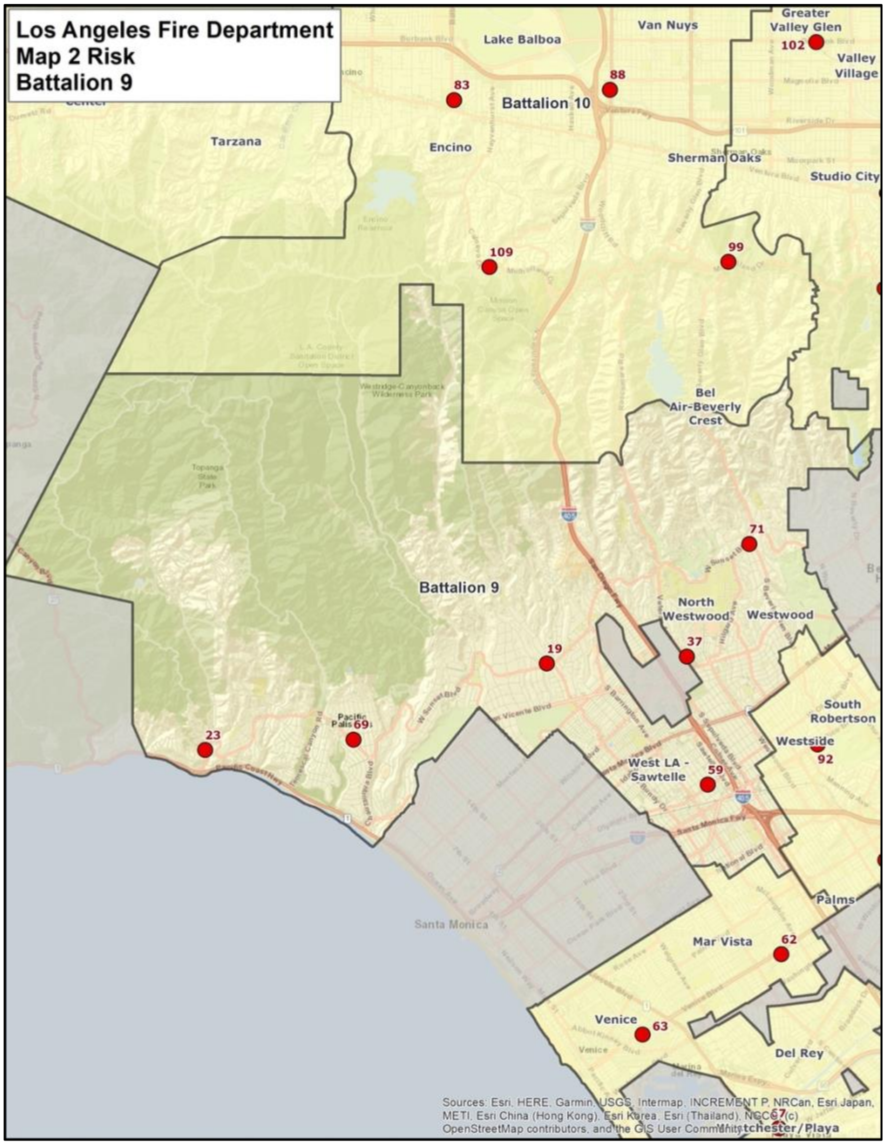


Table 7—Risk Profile – Battalion 9

Risk Factors			
Area (sq. mi.)	**43.5**	Total Buildings	**43,619**
Population	**159,058**	Residential	92.42%
Disabled Population	**11,818**	Commercial/Industrial	4.76%
Population Density per Sq. Mi.	**3,657**	Other	2.42%
Critical Facilities/Infrastructure	**1**	High-Rise (>75 feet)	**184**
Permitted Hazmat Facilities	**471**	Building Density per Sq. Mi.	**1,003**
Assessed Valuation ($B)	**$37.54**		

Figure 8—Battalion 10

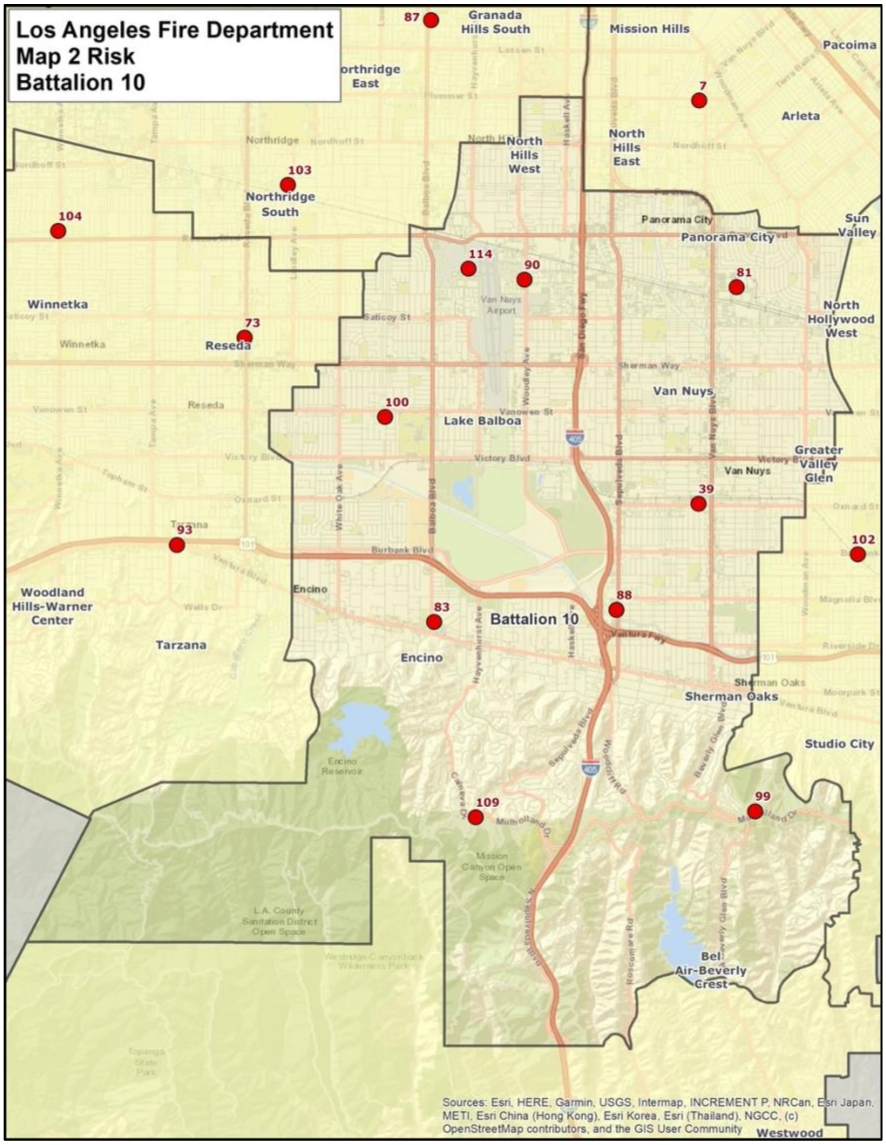


Table 8—Risk Profile – Battalion 10

Risk Factors			
Area (sq. mi.)	**49.53**	Total Buildings	**82,650**
Population	**311,505**	Residential	91.21%
Disabled Population	**31,385**	Commercial/Industrial	6.52%
Population Density per Sq. Mi.	**6,289**	Other	1.92%
Critical Facilities/Infrastructure	**6**	High-Rise (>75 feet)	**99**
Permitted Hazmat Facilities	**867**	Building Density per Sq. Mi.	**1,669**
Assessed Valuation ($B)	**$25.86**		

Figure 9—Battalion 11

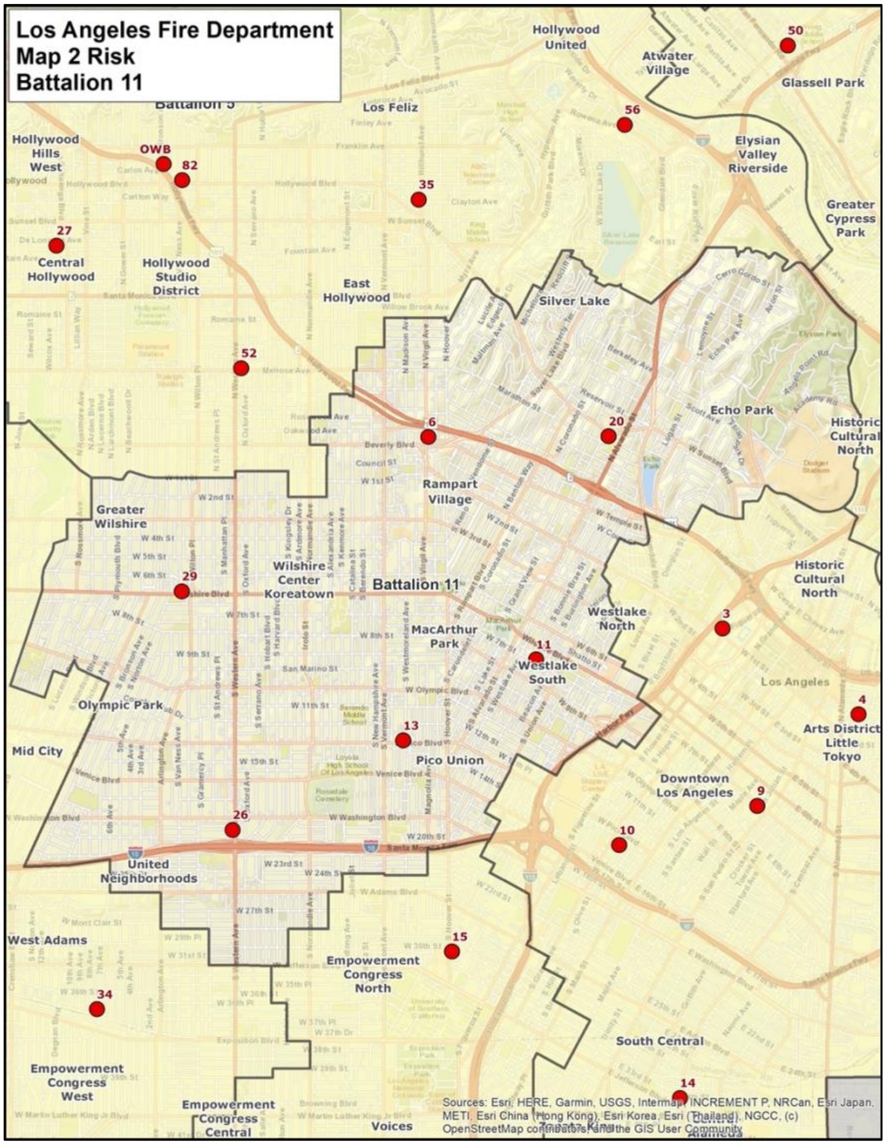


Table 9—Risk Profile – Battalion 11

Risk Factors			
Area (sq. mi.)	**14.71**	Total Buildings	**47,659**
Population	**355,048**	Residential	85.80%
Disabled Population	**35,092**	Commercial/Industrial	12.58%
Population Density per Sq. Mi.	**24,137**	Other	1.45%
Critical Facilities/Infrastructure	**8**	High-Rise (>75 feet)	**294**
Permitted Hazmat Facilities	**473**	Building Density per Sq. Mi.	**3,240**
Assessed Valuation ($B)	**$20.78**		

Figure 10—Battalion 12

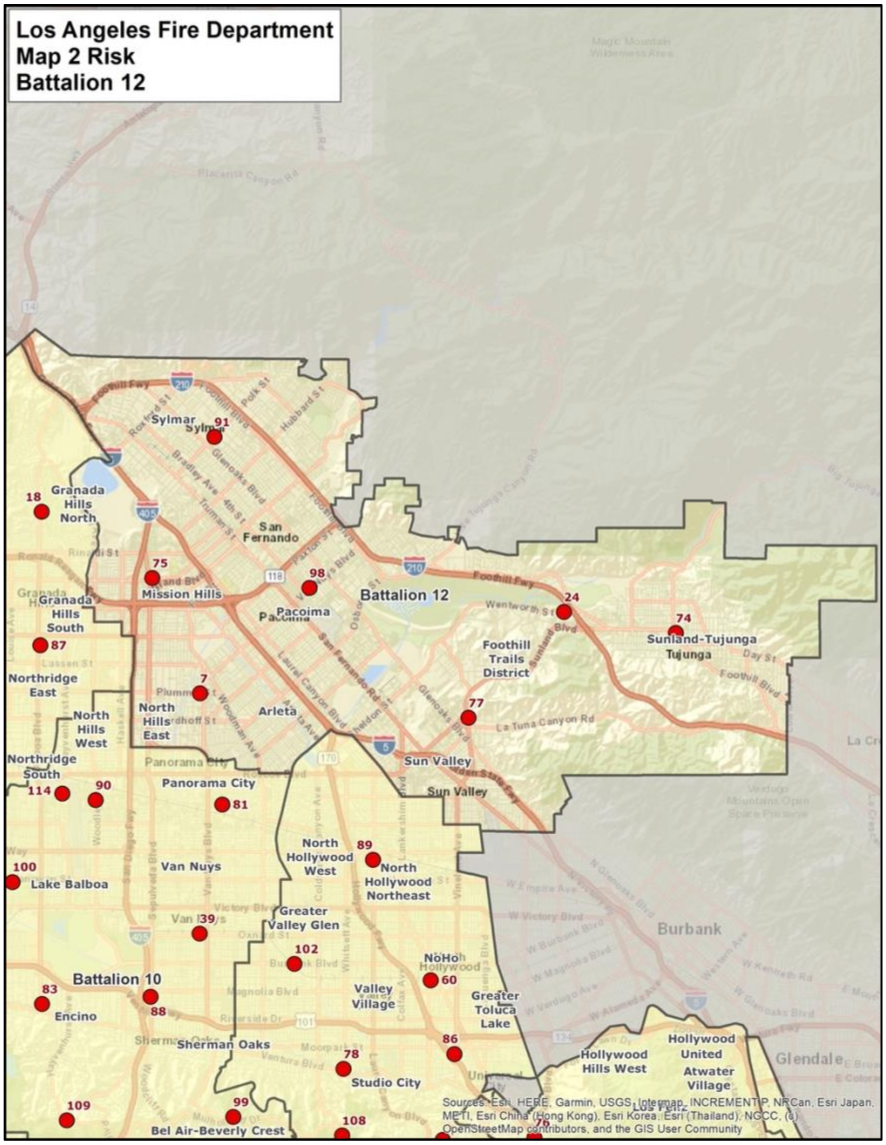


Table 10—Risk Profile – Battalion 12

Risk Factors			
Area (sq. mi.)	**71.77**	Total Buildings	**133,368**
Population	**410,654**	Residential	91.71%
Disabled Population	**49,839**	Commercial/Industrial	5.86%
Population Density per Sq. Mi.	**5,722**	Other	2.43%
Critical Facilities/Infrastructure	**7**	High-Rise (>75 feet)	**29**
Permitted Hazmat Facilities	**994**	Building Density per Sq. Mi.	**1,858**
Assessed Valuation ($B)	**$17.74**		

Figure 11—Battalion 13

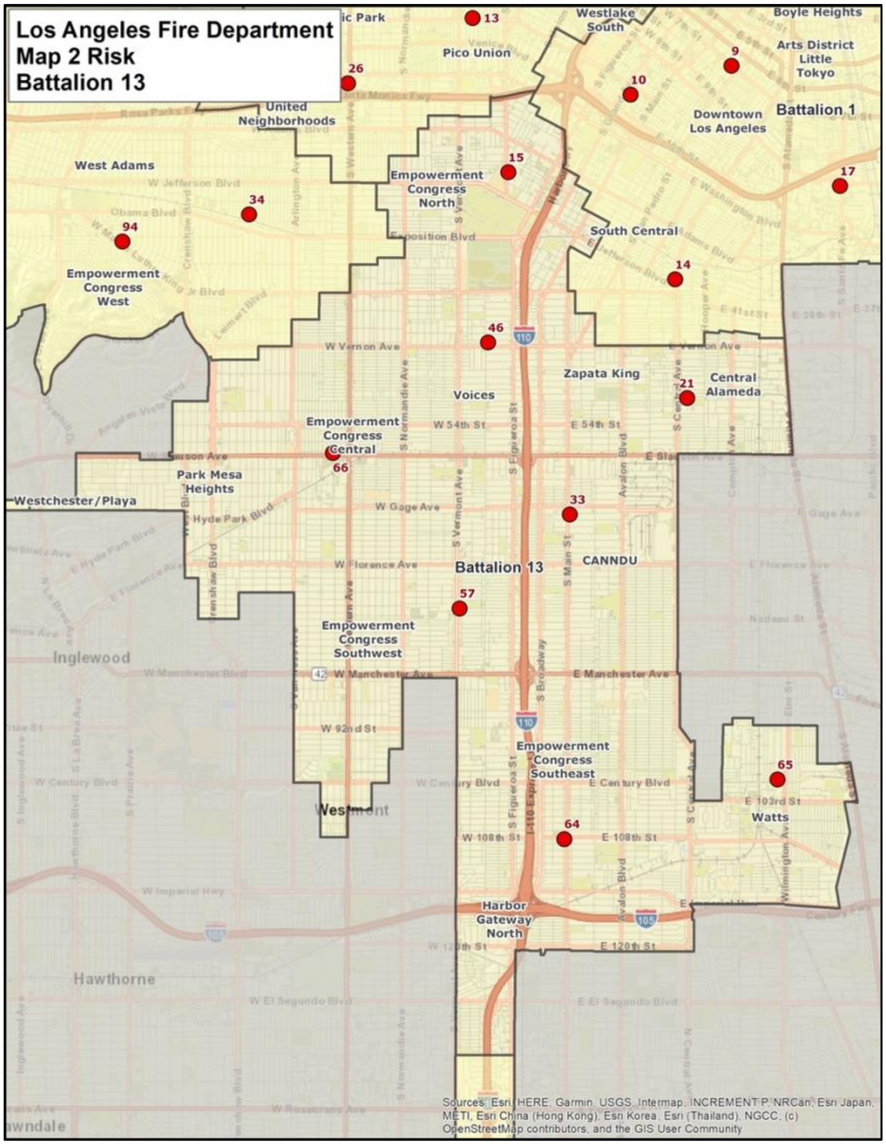


Table 11—Risk Profile – Battalion 13

Risk Factors			
Area (sq. mi.)	**27.91**	Total Buildings	**141,874**
Population	**489,654**	Residential	88.69%
Disabled Population	**55,068**	Commercial/Industrial	10.10%
Population Density per Sq. Mi.	**17,544**	Other	1.18%
Critical Facilities/Infrastructure	**4**	High-Rise (>75 feet)	**87**
Permitted Hazmat Facilities	**729**	Building Density per Sq. Mi.	**5,083**
Assessed Valuation ($B)	**$13.56**		

Figure 12—Battalion 14

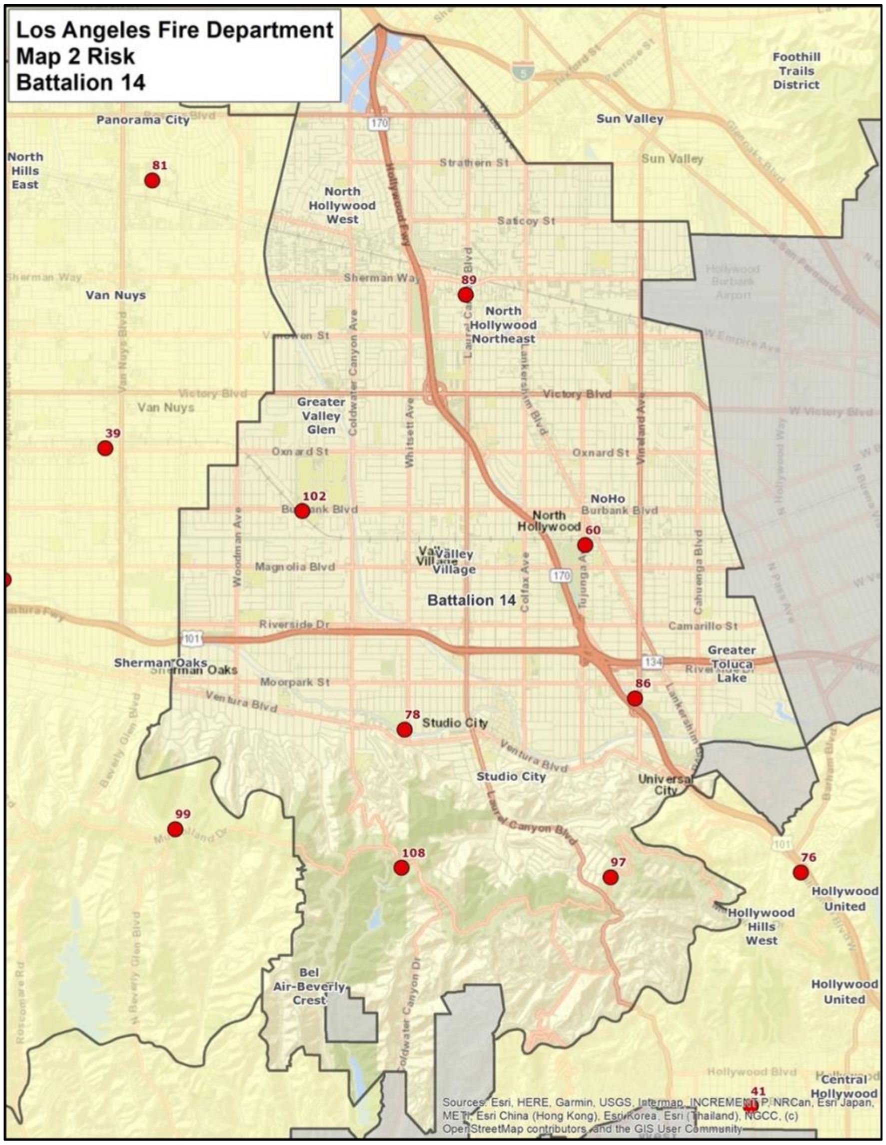


Table 12—Risk Profile – Battalion 14

Risk Factors			
Area (sq. mi.)	**32.31**	Total Buildings	**86,297**
Population	**277,384**	Residential	92.47%
Disabled Population	**26,777**	Commercial/Industrial	6.05%
Population Density per Sq. Mi.	**8,585**	Other	1.68%
Critical Facilities/Infrastructure	**1**	High-Rise (>75 feet)	**62**
Permitted Hazmat Facilities	**627**	Building Density per Sq. Mi.	**2,671**
Assessed Valuation ($B)	**$25.19**		

Figure 13—Battalion 15

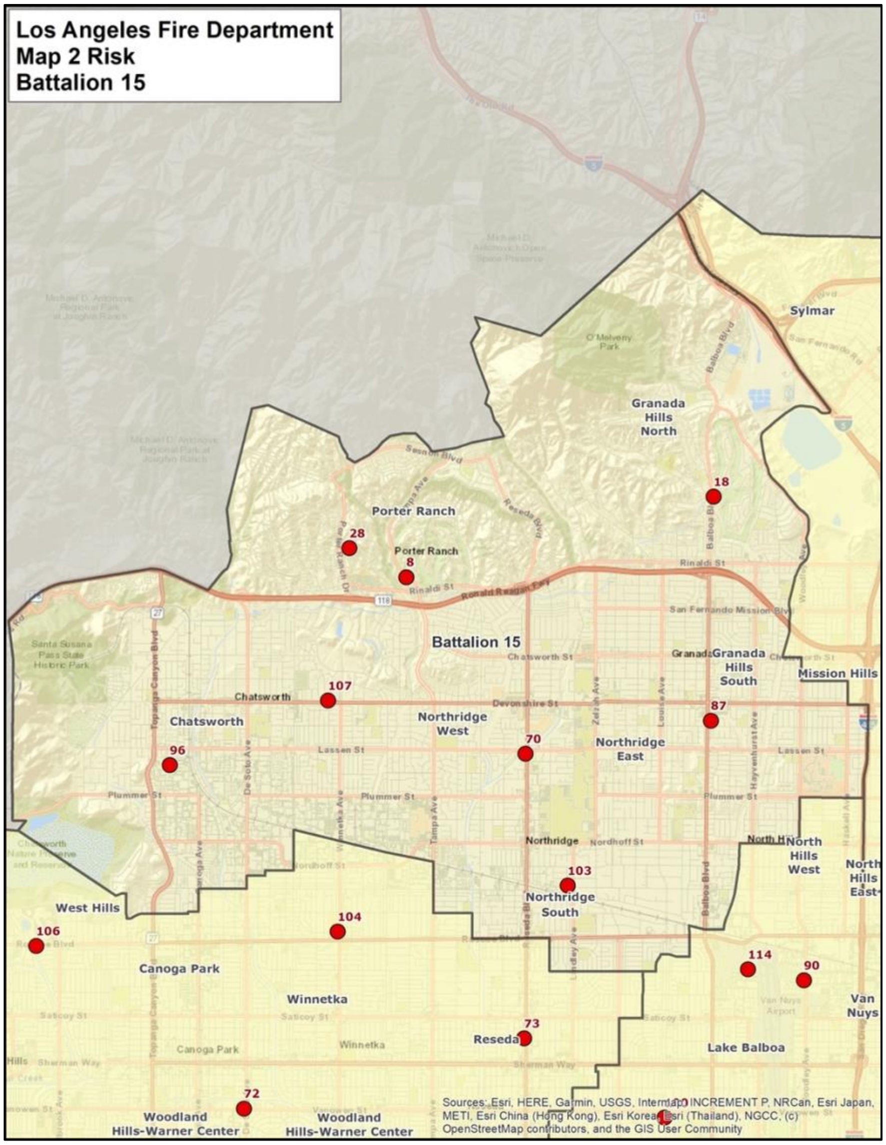


Table 13—Risk Profile – Battalion 15

Risk Factors			
Area (sq. mi.)	**43.97**	Total Buildings	**70,741**
Population	**210,991**	Residential	90.30%
Disabled Population	**22,434**	Commercial/Industrial	6.93%
Population Density per Sq. Mi.	**4,797**	Other	2.60%
Critical Facilities/Infrastructure	**3**	High-Rise (>75 feet)	**5**
Permitted Hazmat Facilities	**635**	Building Density per Sq. Mi.	**1,608**
Assessed Valuation ($B)	**$17.56**		

Figure 14—Battalion 17

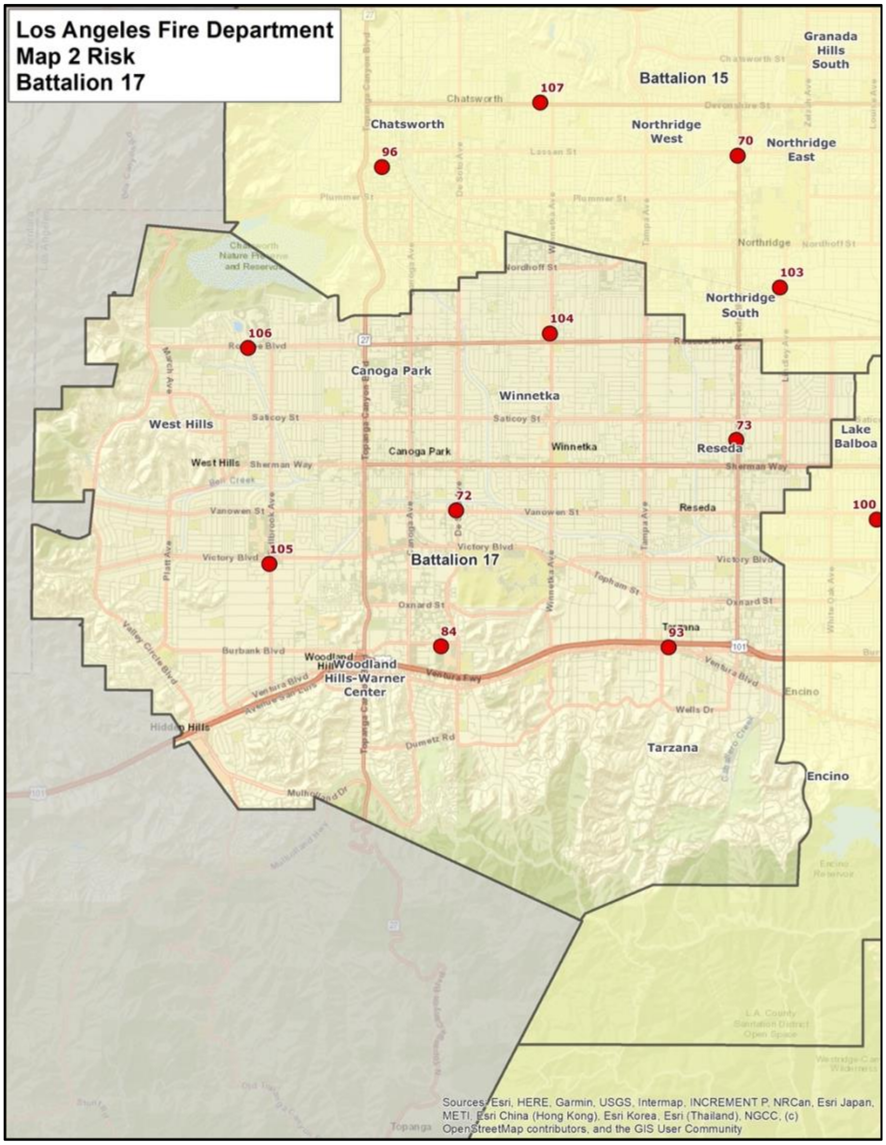


Table 14—Risk Profile – Battalion 17

Risk Factors			
Area (sq. mi.)	**46.11**	Total Buildings	**98,061**
Population	**322,716**	Residential	93.35%
Disabled Population	**34,455**	Commercial/Industrial	4.81%
Population Density per Sq. Mi.	**6,999**	Other	1.71%
Critical Facilities/Infrastructure	**1**	High-Rise (>75 feet)	**77**
Permitted Hazmat Facilities	**766**	Building Density per Sq. Mi.	**2,127**
Assessed Valuation ($B)	**$26.93**		

Figure 15—Battalion 18

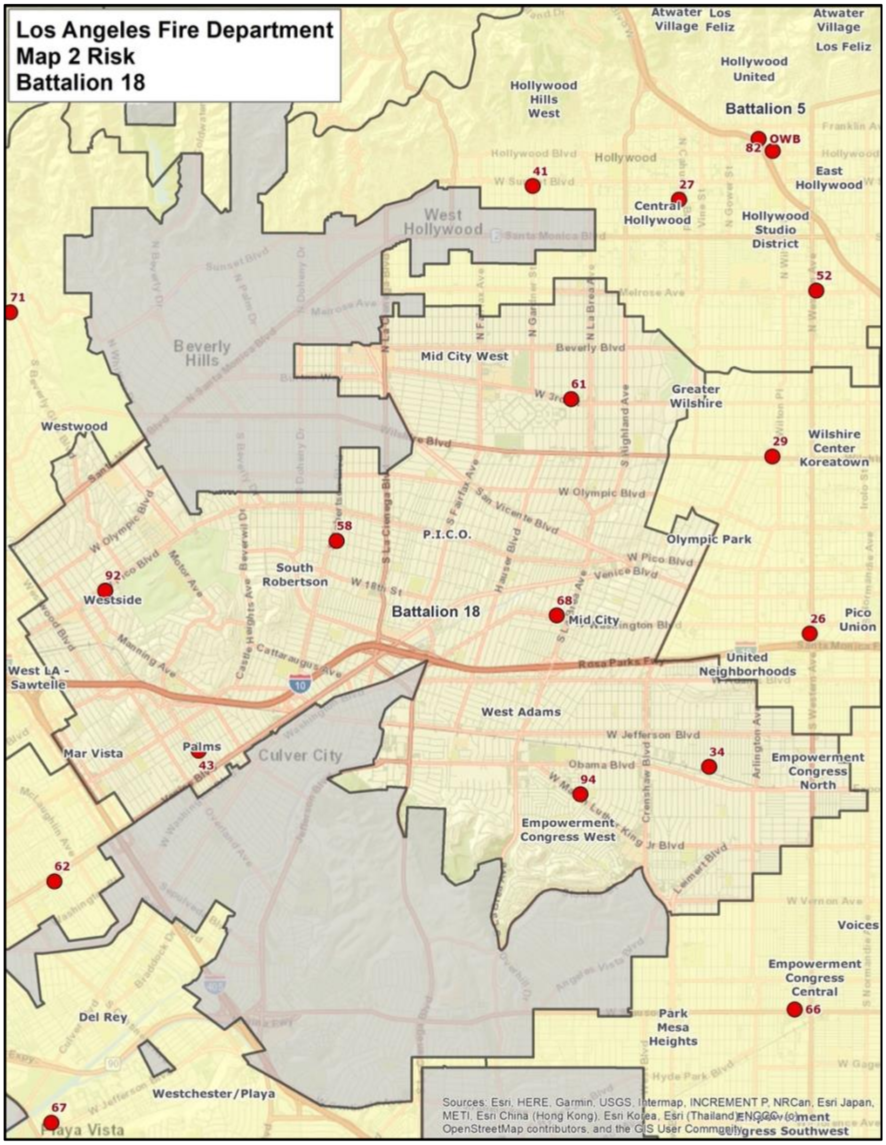


Table 15—Risk Profile – Battalion 18

Risk Factors			
Area (sq. mi.)	**24.27**	Total Buildings	**101,156**
Population	**324,998**	Residential	92.53%
Disabled Population	**29,592**	Commercial/Industrial	6.64%
Population Density per Sq. Mi.	**13,391**	Other	0.80%
Critical Facilities/Infrastructure	**8**	High-Rise (>75 feet)	**189**
Permitted Hazmat Facilities	**675**	Building Density per Sq. Mi.	**4,168**
Assessed Valuation ($B)	**$34.10**		

1.1.4 Values at Risk to Be Protected

Values at risk, broadly defined, are tangibles of significant importance or value to the community or jurisdiction potentially at risk of harm or damage from a hazard occurrence. Values at risk typically include people, critical facilities/infrastructure, buildings, and key economic, cultural, historic, or natural resources.

People

Residents, employees, visitors, and travelers in a community or jurisdiction are vulnerable to harm from a hazard occurrence. Particularly vulnerable are specific at-risk populations, including those unable to care for themselves or self-evacuate in the event of an emergency. At-risk populations typically include children less than 10 years of age, the elderly, people housed in institutional settings, households below the federal poverty level, and people living unsheltered. The following table summarizes key demographic data for Los Angeles.

Table 16—Key Demographic Data – Los Angeles

Demographic	2022
Population	**3,903,648**
Under 10 years	11.80%
10 – 14 years	5.90%
15 – 64 years	68.60%
65 – 74 years	7.90%
75 years and older	5.90%
Median age	35.8
Daytime population	3,948,032
Housing Units	**1,513,840**
Owner-Occupied	34.80%
Renter-Occupied	58.90%
Vacant	6.30%
Average Household Size	2.67
Median Home Value	$736,691
Ethnicity	
White Only	34.10%
Black/African American Only	8.50%
Asian Only	12.30%
Other/Two or More Races	45.10%
Hispanic/Latino Origin	47.00%
Diversity Index	87.7
Education (population over 24 yrs. of age)	**2,663,659**
High School Graduate	81.00%
Undergraduate Degree	39.20%
Graduate/Professional Degree	13.10%
Employment (population over 15 yrs. of age)	**2,072,308**
In Labor Force	92.90%
Unemployed	7.10%
Median Household Income	$75,564
Population Below Poverty Level	16.90%
Population without Health Insurance Coverage	12.10%

Source: Esri Community Analyst (2022) and U.S. Census Bureau

Of note from the previous table is the following:

- Nearly 26 percent of the population is under 10 years or over 65 years of age.
- The City's population is predominantly Other Ethnicity / Two or More Races (45 percent), followed by White Only (34 percent), Asian Only (12 percent), and Black

/ African American Only (9 percent). In addition, 47 percent of the population is Hispanic/Latino in origin.

- Of the population over 24 years of age, 81 percent has completed high school or equivalency.
- Of the population over 24 years of age, slightly more than 39 percent has an undergraduate, graduate, or professional degree.
- Of the population 15 years of age or older, nearly 93 percent is in the workforce; of those, 7 percent are unemployed.
- Median household income is slightly more than $75,500.
- The population below the federal poverty level is nearly 17 percent.
- Slightly more than 12 percent of the population does not have health insurance coverage.

Projected Growth

The Southern California Association of Governments (SCAG) projects the City's population will grow by 18 percent over the next 18 years to 2040.[2]

Buildings

The City has more than 1.1 million buildings[3] with an assessed valuation of more than $774 billion to protect, including more than 1.5 million residential housing units[4] and approximately 200,000 businesses.[5]

Building Occupancy Risk Categories

The CFAI identifies the following four risk categories that relate to building occupancy:

Low Risk – includes detached garages, storage sheds, outbuildings, and similar building occupancies that pose a relatively low risk of harm to humans or the community if damaged or destroyed by fire.

Moderate Risk – includes detached single-family or two-family dwellings; mobile homes; commercial and industrial buildings less than 10,000 square feet without a high hazard fire load;

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[2] Source: College Station Project, Draft Environmental Impact Report, March 2018, Table 4.8-1.

[3] Source: Los Angeles Fire Department Planning Section.

[4] Source: Esri Community Analyst – Community Profile (2022).

[5] Source: Esri Community Analyst – Business Summary (2022).

aircraft; railroad facilities; and similar building occupancies where loss of life or property damage is limited to the single building.

High Risk – includes apartment/condominium buildings; commercial and industrial buildings more than 10,000 square feet without a high hazard fire load; low-occupant load buildings with high fuel loading or hazardous materials; and similar occupancies with potential for substantial loss of life or unusual property damage or financial impact.

Maximum Risk – includes buildings or facilities with unusually high risk requiring an Effective Response Force (ERF) involving a significant augmentation of resources and personnel and where a fire would pose the potential for a catastrophic event involving large loss of life, significant economic impact to the community, or both.

Critical Infrastructure / Key Resources

The U.S. Department of Homeland Security defines Critical Infrastructure / Key Resources as those physical assets essential to the public health and safety, economic vitality, and resilience of a community, such as lifeline utilities infrastructure, telecommunications infrastructure, essential government services facilities, public safety facilities, schools, hospitals, airports, etc. The City has identified 3,023 critical facilities and infrastructure in its 2018 Local Hazard Mitigation Plan as summarized in the following table. The Battalion Risk Profiles previously provided use different data and counting criteria provided by the Department than do the Local Hazard Mitigation Plan. A hazard occurrence with significant consequence severity affecting one or more of these facilities would likely adversely impact critical public or community services.

Table 17—Critical Facilities/Infrastructure

Critical Facility/Infrastructure Category	Count[1]
Critical Operating Facilities	20
Education	847
Evacuation Centers	9
Healthcare	47
Infrastructure – Transportation	1,306
Infrastructure – Utilities	664
Public Safety	130
Total	**3,023**

Source: City of Los Angeles 2018 Local Hazard Mitigation Plan, Table 4-5

Economic Resources

With the 16th largest economy worldwide and regarded as the entertainment capital of the world, the City of Los Angeles economy is led by the education/healthcare/social services industry (22 percent), followed by the professional/scientific/management/administrative industry (15 percent), arts/entertainment/recreation industry (13 percent), public administration (3 percent), and other industries (47 percent).[6] The City's Adopted Budget for Fiscal Year 2022/23 is $11.76 billion, with a total assessed valuation of $723.6 billion.[7]

Natural Resources

Some of the key natural resources within the City of Los Angeles include the following.

- Pacific Ocean/Los Angeles Harbor
- Los Angeles River
- Griffith Park
- Santa Monica Mountains National Recreation Area

Cultural/Historic Resources

As a vibrant multicultural city, Los Angeles boasts a tremendous inventory of cultural and historic resources, some of which include the following.

- Natural History Museum
- Walt Disney Concert Hall
- Los Angeles County Museum of Art
- The Underground Museum
- The Museum of Jurassic Technology
- Museum of Tolerance
- Getty Art Museum
- Discovery Cube
- The Banning Museum

Special/Unique Resources

The City contains many special or unique resources to be protected, some of which include the following.

- Los Angeles International Airport

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[6] Source: City of Los Angeles 2018 Local Hazard Mitigation Plan, Figure 4-20.

[7] Source: County of Los Angeles Auditor-Controller's Office website

- Multiple internationally known universities, colleges, and their sports venues
- Occidental College
- Dodger Stadium
- Griffith Observatory
- Crypto.com Arena

1.1.5 Hazard Identification

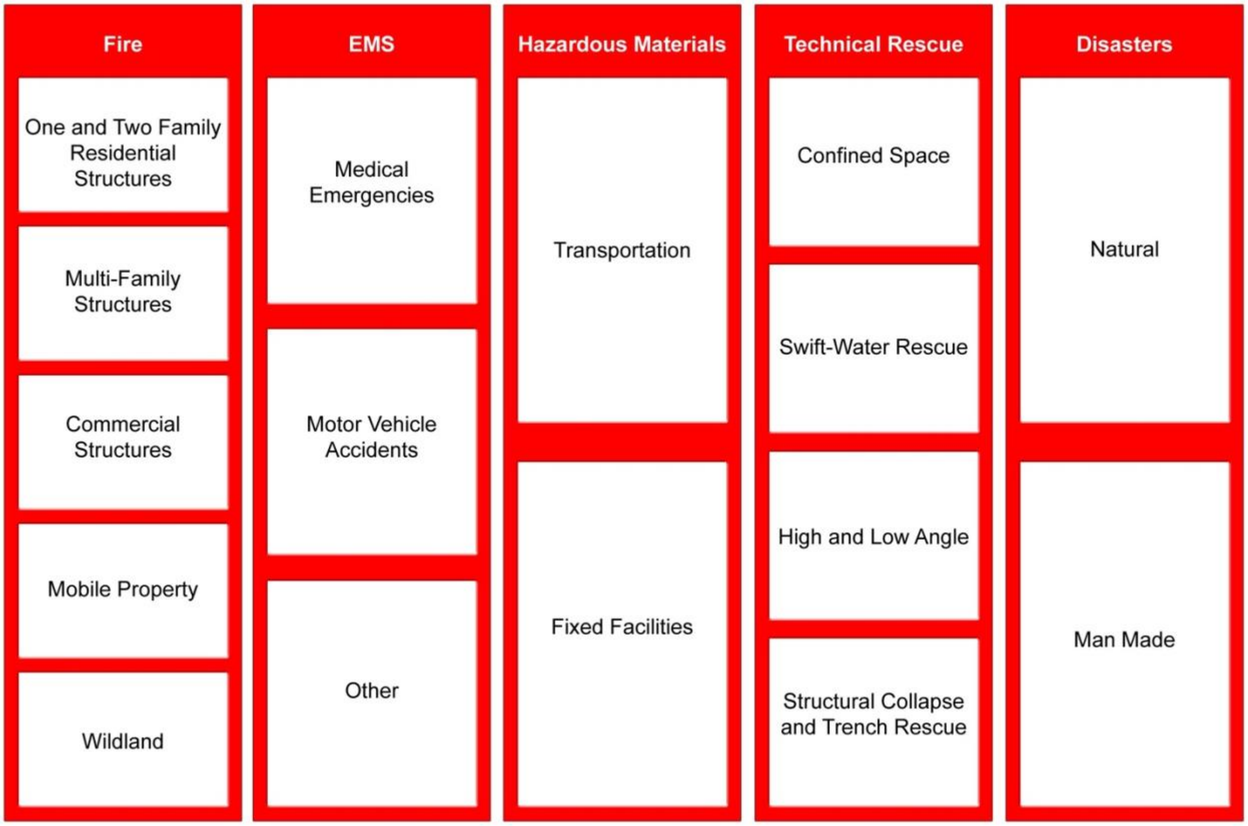
Citygate utilizes prior risk studies where available, fire and non-fire hazards as identified by the CFAI, and agency/jurisdiction-specific data and information to identify the hazards to be evaluated for this study. The 2018 City of Los Angeles Local Hazard Mitigation Plan identifies the following ten hazards of concern:

1. Adverse weather
2. Climate change / sea level rise
3. Dam failure
4. Drought
5. Earthquake
6. Flood
7. Landslide
8. Tsunami
9. Wildland/Urban Interface (WUI) fire
10. Human-caused hazards

LAFD provides some hazard mitigation services, such as fire prevention, code enforcement, and wildland fuel reduction programs. In addition, it must provide response services related to multiple hazards, including fire suppression, emergency medical services, technical rescue, and hazardous materials response.

The CFAI groups hazards into fire and non-fire categories, as shown in the following figure. Identification, qualification, and quantification of the various fire and non-fire hazards are important factors in evaluating how resources are or can be deployed to mitigate those risks.

Figure 16—Commission on Fire Accreditation International Hazard Categories



Source: CFAI *Standards of Cover* (Fifth Edition).

Subsequent to review and evaluation of the hazards identified in the City's 2018 Local Hazard Mitigation Plan, and the fire and non-fire hazards as identified by the CFAI as they relate to services provided by the Department, Citygate evaluated the following five hazards for this risk assessment[8]:

1. Building fire
2. Vegetation/wildland fire
3. Medical emergency
4. Hazardous material release/spill
5. Technical rescue

[8] Although the City of Los Angeles has aviation and marine risk exposure, these two hazards have been evaluated in other studies and were excluded from the scope of this assessment.

1.1.6 Service Capacity

Service capacity refers to an agency's available response force; the size, types, and condition of its response fleet and any specialized equipment; core and specialized performance capabilities and competencies; resource distribution and concentration; availability of automatic or mutual aid; and any other agency-specific factors influencing its ability to meet current and prospective future service demand and response performance relative to the risks to be protected.

The Department's service capacity for fire and non-fire risk consists of 1,023 response personnel on duty daily staffing 98 engines, 42 aerial ladder trucks (28 are staffed with at least one paramedic), 93 paramedic ambulances, 43 Basic Life Support (BLS) ambulances, 8 Aircraft Rescue Fire Fighting (ARFF) apparatus, 7 helicopters, 5 fireboats, 5 bulldozers/loaders, 1 heavy rescue, 1 hazardous materials company, 1 Urban Search and Rescue company plus 14 Battalion Chiefs and 2 platoon duty Assistant Chiefs for incident command, all operating from the Department's 106 fire stations. The Department also has 15 brush patrols, 3 hazardous materials companies, 5 Urban Search and Rescue (USAR) companies, and 4 firefighting foam tenders that can be cross-staffed with on-duty or call-back personnel as needed.

All response personnel are trained to either the Emergency Medical Technician (EMT) level, capable of providing Basic Life Support (BLS) pre-hospital emergency medical care, or EMT-Paramedic (Paramedic) level, capable of providing Advanced Life Support (ALS) pre-hospital emergency medical care. The Department also provides both ALS and BLS ground ambulance service.

Response personnel are also trained to the U.S. Department of Transportation Hazardous Material First Responder Operational (FRO) level to provide initial hazardous material incident assessment, hazard isolation, and support the Department's four hazardous material response teams from Stations 21 (fully-staffed), 48, 87, and 95 (cross-staffed).

All response personnel are further trained to the Confined Space Awareness and first responder operational level. The Department also deploys a heavy rescue at Station 3; six Urban Search and Rescue (USAR) companies at Stations 88 (fully-staffed), 3, 5, 27, 85, and 89 (cross-staffed); and cross-staffs four swift water rescue teams at Stations 5, 44, 86, and 88. Technical rescue personnel are trained to the trench rescue, low angle rope rescue, rescue systems 1, intermediate rope rescue, and confined space rescue level.

1.1.7 Probability of Occurrence

Probability of occurrence refers to the probability of a future hazard occurrence during a specific period. Because the CFAI agency accreditation process requires annual review of an agency's risk assessment and baseline performance measures, Citygate recommends using the 12 months following completion of an SOC study as an appropriate period for the probability of occurrence evaluation. The following table describes the five probability of occurrence categories and related general characteristics used for this analysis.

Table 18—Probability of Occurrence Categories

Category	General Characteristics	Anticipated Frequency of Occurrence
Rare	• Hazard ***may occur*** under exceptional circumstances.	25+ years
Unlikely	• Hazard ***could occur*** at some time. • No recorded or anecdotal evidence of occurrence. • Little opportunity, reason, or means for hazard to occur.	5–24 years
Possible	• Hazard ***should occur*** at some time. • Infrequent, random recorded or anecdotal evidence of occurrence. • Some opportunity, reason, or means for hazard to occur.	1–4 years
Probable	• Hazard will ***probably occur*** occasionally. • Regular recorded or strong anecdotal evidence of occurrence. • Considerable opportunity, reason, or means for hazard to occur.	1–12 months
Frequent	• Hazard is ***expected to occur*** regularly. • High level of recorded or anecdotal evidence of regular occurrence. • Strong opportunity, reason, or means for hazard to occur. • Frequent hazard recurrence.	1–4 weeks

Citygate's SOC assessments use recent multiple-year incident response data to determine the probability of hazard occurrence for the ensuing 12-month period.

1.1.8 Consequence Severity

Consequence severity refers to the magnitude or reasonably expected loss a hazard occurrence has on people, buildings, lifeline services, the environment, and the community as a whole. The following table describes the five consequence severity categories and general characteristics used for this analysis.

Table 19—Consequence Severity Categories

Category	General Characteristics
Insignificant	• No injuries or fatalities • None to few persons displaced for short duration • Little or no personal support required • None to inconsequential damage • None to minimal community disruption • No measurable environmental impacts • None to minimal financial loss • No wildland Fire Hazard Severity Zones
Minor	• Few injuries; no fatalities; minor medical treatment only • Some displacement of persons for less than 24 hours • Some personal support required • Some minor damage • Minor community disruption of short duration • Small environmental impacts with no lasting effects • Minor financial loss • No wildland Fire Hazard Severity Zones
Moderate	• Medical treatment required; some hospitalizations; few fatalities • Localized displaced of persons for less than 24 hours • Personal support satisfied with local resources • Localized damage • Normal community functioning with some inconvenience • No measurable environmental impacts with no long-term effects, or small impacts with long-term effect • Moderate financial loss • Less than 25% of area in *Moderate* or *High* wildland FHSZ
Major	• Extensive injuries; significant hospitalizations; many fatalities • Large number of persons displaced for more than 24 hours • External resources required for personal support • Significant damage • Significant community disruption; some services not available • Some impact to environment with long-term effects • Major financial loss with some financial assistance required • More than 25% of area in *Moderate* or *High* wildland FHSZ; less than 25% in *Very High* wildland FHSZ
Extreme	• Large number of severe injuries requiring hospitalization; significant fatalities • General displacement for extended duration • Extensive personal support required • Extensive damage • Community unable to function without significant external support • Significant impact to environment and/or permanent damage • Catastrophic financial loss; unable to function without significant support • More than 50% of area in *High* wildland FHSZ; more than 25% of area in *Very High* wildland FHSZ

1.1.9 Agency Impact Severity

Agency impact severity refers to the extent a hazard occurrence impacts the Department's ability to (1) provide an Effective Response Force (ERF) appropriate to prevent escalation of the emergency incident and (2) to maintain sufficient response capacity throughout the City to control other concurrent incidents within desired response goals. The following table describes the five agency impact categories and related general characteristics used for this analysis.

Table 20—Agency Impact Severity Categories

Category	Typical Characteristics
Insignificant	• Hazard occurrence has ***none to minimal*** impact on the agency's ability to maintain full ERF response capacity *and* at least one minor concurrent incident response capacity within each battalion • Typically requires only a single unit response committed for less than 1 hour • Single concurrent incident rate less than 5% • None to insignificant EMS Emergency Department wait times
Minor	• Hazard occurrence has ***minor*** impact on the agency's ability to maintain full ERF response capacity *and* at least one minor concurrent incident response capacity within each battalion • Typically requires 1- or 2-unit response committed for less than 2 hours • Single concurrent incident rate less than 10% • Minimal EMS Emergency Department wait times (<15 minutes)
Moderate	• Hazard occurrence has a ***moderate*** impact on the agency's ability to maintain full ERF response capacity *and* at least one minor concurrent incident response capacity within each battalion • Typically requires 3- to 5-unit response and less than 20 personnel committed for up to 6 hours • Single concurrent incident rate less than 25% • EMS Emergency Department wait times frequently up to one hour
Major	• Hazard occurrence has a ***major*** impact on the agency's ability to maintain full ERF response capacity *and* at least one minor concurrent incident response capacity within each battalion • Typically requires 6- to 10-unit response and up to 40 personnel committed for up to 12 hours • Single concurrent incident rate less than 50% • EMS Emergency Department wait times frequently up to three hours
Extreme	• Hazard occurrence has an ***extreme*** impact on the agency's ability to maintain full ERF response capacity *and* at least one minor concurrent incident response capacity within each battalion • Typically requires more than a 10-unit response and more than 40 personnel committed for more than 12 hours • Single concurrent incident rate greater than 50% • EMS Emergency Department wait times frequently > three hours

1.1.10 Overall Risk

Overall risk was determined by considering the probability of occurrence, reasonably expected consequence severity, and agency impact according to the following tables.

Table 21—Overall Risk Categories – Insignificant Agency Impact

Probability of Occurrence	Consequence Severity				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	*Low*	*Low*	*Low*	*Low*	*High*
Unlikely	*Low*	*Low*	*Low*	*Low*	*High*
Possible	*Low*	*Low*	*Low*	*Moderate*	*High*
Probable	*Low*	*Low*	*Low*	*Moderate*	*High*
Frequent	*Low*	*Low*	*Low*	*Moderate*	*Extreme*

Table 22—Overall Risk Categories – Minor Agency Impact

Probability of Occurrence	Consequence Severity				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	*Low*	*Low*	*Low*	*Moderate*	*High*
Unlikely	*Low*	*Low*	*Low*	*Moderate*	*High*
Possible	*Low*	*Low*	*Moderate*	*High*	*High*
Probable	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Frequent	*Low*	*Moderate*	*High*	*High*	*Extreme*

Table 23—Overall Risk Categories – Moderate Agency Impact

Probability of Occurrence	Consequence Severity				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	*Low*	*Low*	*Low*	*Moderate*	*High*
Unlikely	*Low*	*Low*	*Moderate*	*High*	*High*
Possible	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Probable	*Low*	*Moderate*	*Moderate*	*High*	*Extreme*
Frequent	*Low*	*Moderate*	*High*	*High*	*Extreme*

Table 24—Overall Risk Categories – Major Agency Impact

Probability of Occurrence	Impact Severity				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Unlikely	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Possible	*Low*	*Moderate*	*High*	*High*	*Extreme*
Probable	*Low*	*Moderate*	*High*	*High*	*Extreme*
Frequent	*Moderate*	*Moderate*	*High*	*High*	*Extreme*

Table 25—Overall Risk Categories – Extreme Agency Impact

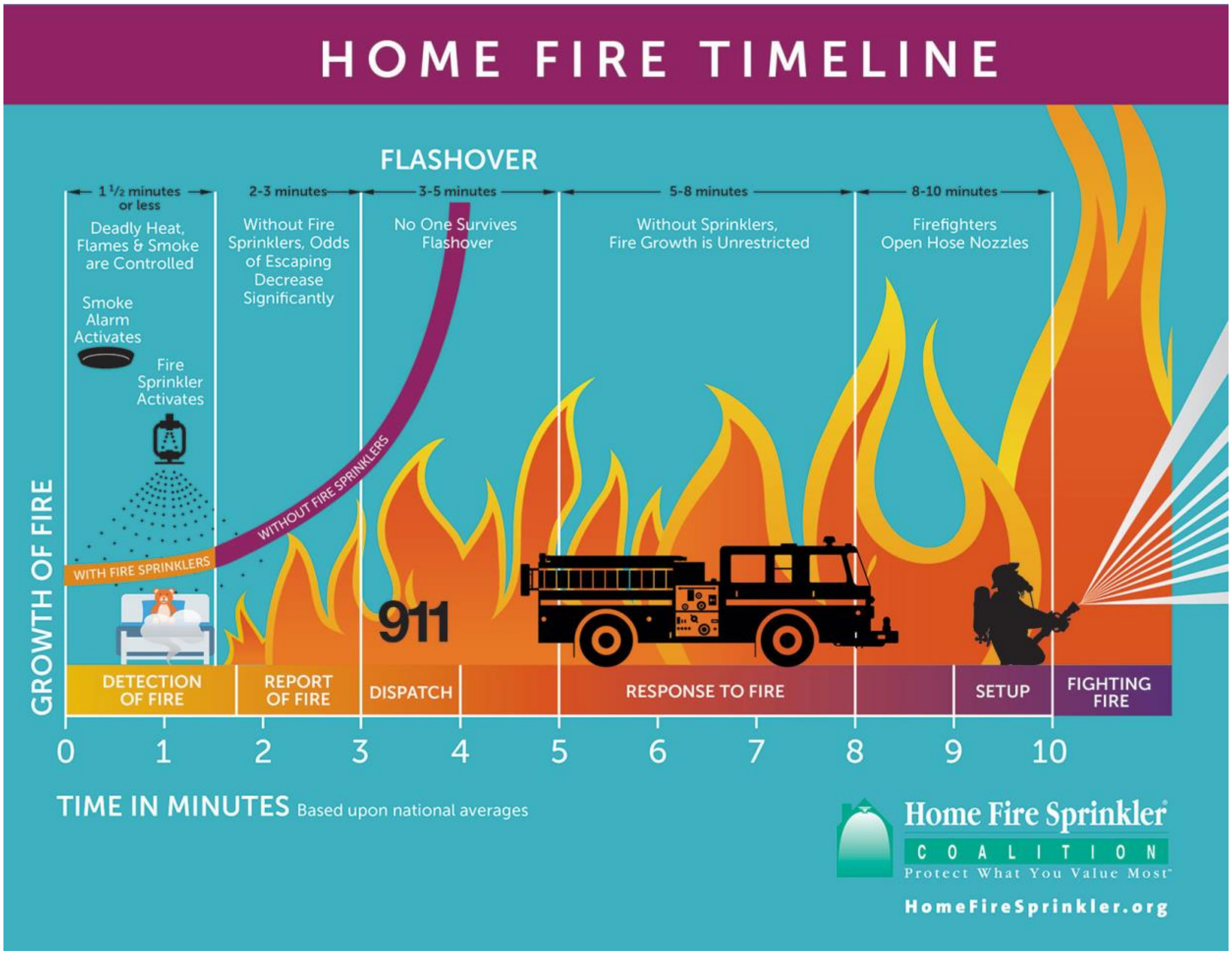
Probability of Occurrence	Impact Severity				
	Insignificant	Minor	Moderate	Major	Catastrophic
Rare	*Low*	*Moderate*	*High*	*High*	*Extreme*
Unlikely	*Low*	*Moderate*	*High*	*High*	*Extreme*
Possible	*Low*	*Moderate*	*High*	*Extreme*	*Extreme*
Probable	*Moderate*	*Moderate*	*High*	*Extreme*	*Extreme*
Frequent	*Moderate*	*Moderate*	*High*	*Extreme*	*Extreme*

1.1.11 Building Fire Risk

One of the primary hazards in any community is building fire. Building fire risk factors include building size, age, construction type, density, occupancy, and height above ground level; required fire flow; proximity to other buildings; built-in fire protection/alarm systems; available fire suppression water supply; building fire service capacity; and fire suppression resource deployment (distribution/concentration), staffing, and response time. Citygate used available data from LAFD and the 2018 Local Hazard Mitigation Plan in determining the City's building fire risk.

The following figure illustrates the building fire progression timeline and shows that flashover, which is the point at which the entire room erupts into fire after all the combustible objects in that room reach their ignition temperature, can occur as early as three to five minutes from the initial ignition. Human survival in a room after flashover is extremely improbable.

Figure 17—Building Fire Progression Timeline



Source: http://www.firesprinklerassoc.org.

Population Density

Population density within the City ranges from less than 5,000 to more than 40,000 people per square mile. Although risk analysis across a wide spectrum of other Citygate clients shows no direct correlation between population density and building fire *occurrence*, it is reasonable to conclude that building fire *risk* relative to potential impact on human life is greater as population density increases, particularly in areas with high density, multiple-story buildings.

Water Supply

A reliable public water system providing adequate volume, pressure, and flow duration in close proximity to all buildings is a critical factor in mitigating the potential consequence severity of a community's building fire risk. For Los Angeles, potable water is provided by the City and according to Department of Water and Power (LADWP) staff, available fire flow is adequate throughout the City, however some areas have low static pressure. The Fire Department is familiar with these areas and has standard operating procedures (drafting from fire hydrant) to effectively mitigate this.

Building Fire Service Demand

For the three-year period from January 1, 2018, through December 31, 2020, the Department responded to nearly 16,000 building fire incidents comprising 1.08 percent of total service demand over the same period as summarized in the following table.

Table 26—Building Fire Service Demand

Hazard	Year	Risk Planning Zone (Battalion)							
		1	2	4	5	6	9	10	11
Building Fire	2018	812	280	164	327	210	167	350	470
	2019	854	309	166	404	262	131	344	501
	2020	939	337	191	475	249	151	359	596
	Total	2,605	926	521	1,206	721	449	1,053	1,567
Percent Total Battalion Demand		1.39%	1.63%	0.67%	1.21%	1.15%	0.80%	1.07%	1.25%

Hazard	Year	Risk Planning Zone (Battalion						Total	Percent Total Annual Demand
		12	13	14	15	17	18		
Building Fire	2018	376	847	243	123	222	394	4,985	1.01%
	2019	338	865	266	141	230	394	5,205	1.04%
	2020	334	960	376	104	240	356	5,667	1.18%
	Total	1,048	2,672	885	368	692	1,144	15,857	1.08%
Percent Total Battalion Demand		1.02%	1.11%	1.02%	0.62%	0.73%	0.94%		

As the previous table illustrates, building fire service demand varies significantly by battalion with Battalion 13 having the highest demand and Battalion 15 having the lowest. Overall, building fire service demand increased nearly 14 percent over the three-year period.

Building Fire Risk Assessment

The following table summarizes Citygate's assessment of building fire risk by incident sub-type.

Table 27—Building Fire Risk Assessment

Building Fire Risk	Incident Type				
	Outbuilding / ADU	Single-Family Dwelling	Apartment / Multi-Family Residence	Commercial	Heavy Commercial / Industrial
Probability of Occurrence	*Probable*	*Frequent*	*Frequent*	*Frequent*	*Frequent*
Consequence Severity	*Moderate*	*Moderate*	*Moderate*	*Moderate*	*Moderate*
Agency Impact Severity	*Minor*	*Moderate*	*Major*	*Major*	*Major*
Overall Risk	***Moderate***	***High***	***High***	***High***	***High***

1.1.12 Vegetation/Wildland Fire Risk[9]

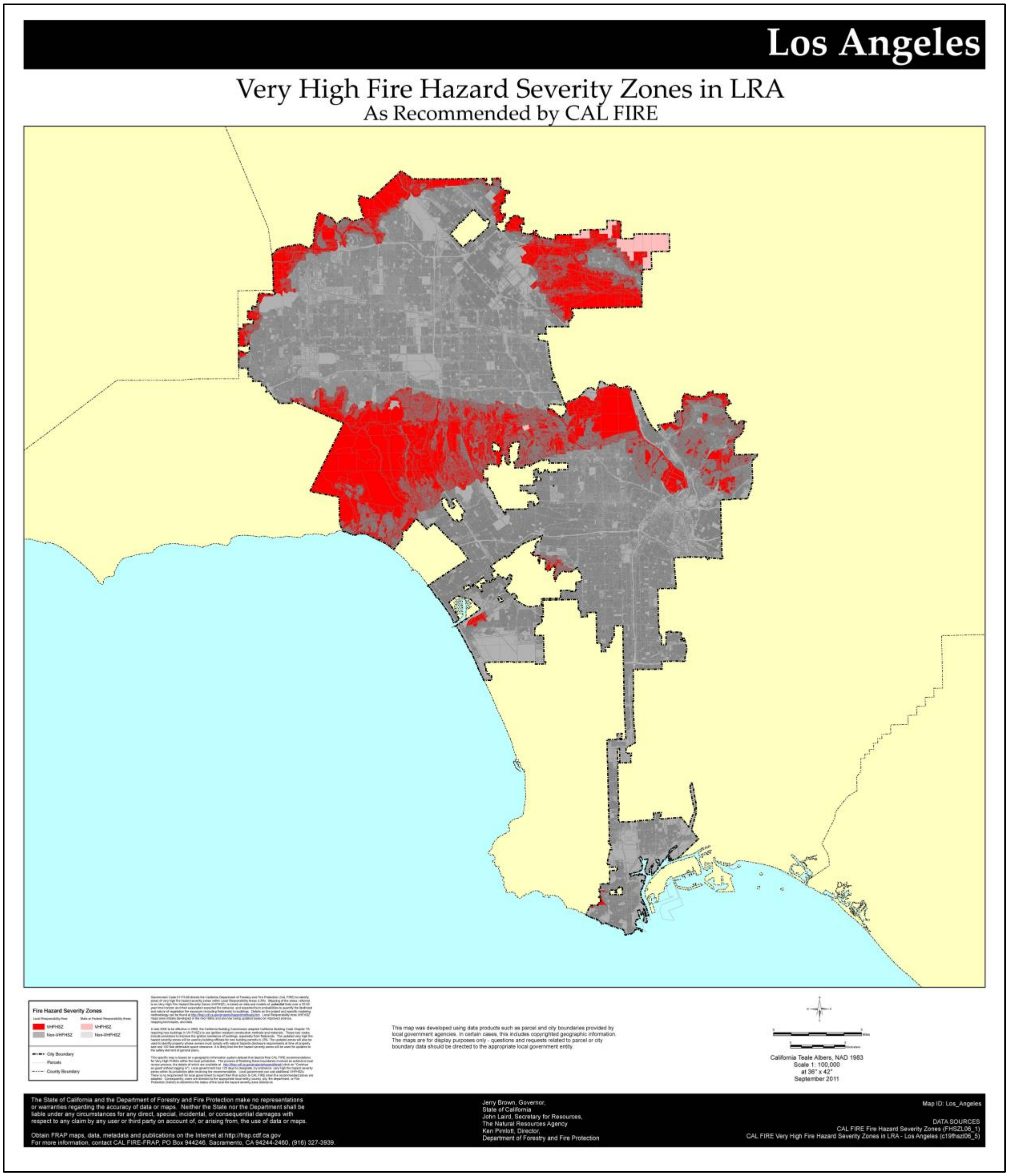
Many areas of the City are susceptible to a vegetation/wildland fire, particularly the northwestern to northeastern border areas, and west central to east central areas as highlighted in Figure 18 and Figure 19. Vegetation/wildland fire risk factors include vegetative fuel types and configuration, weather, topography, prior service demand, water supply, mitigation measures, and vegetation fire service capacity.

Wildland Fire Hazard Severity Zones

The California Department of Forestry and Fire Protection (CAL FIRE) designates wildland Fire Hazard Severity Zones (FHSZ) throughout the State based on analysis of multiple wildland fire hazard factors and modeling of potential wildland fire behavior. For State Responsibility Areas (SRAs) where CAL FIRE has fiscal responsibility for wildland fire protection, CAL FIRE designates ***Moderate***, ***High***, and ***Very High*** FHSZs by county. CAL FIRE also identifies recommended ***Very High*** FHSZs for Local Responsibility Areas (LRAs), where a local jurisdiction is responsible for wildland fire protection, including incorporated cities, as shown in red in the following map for Los Angeles City.

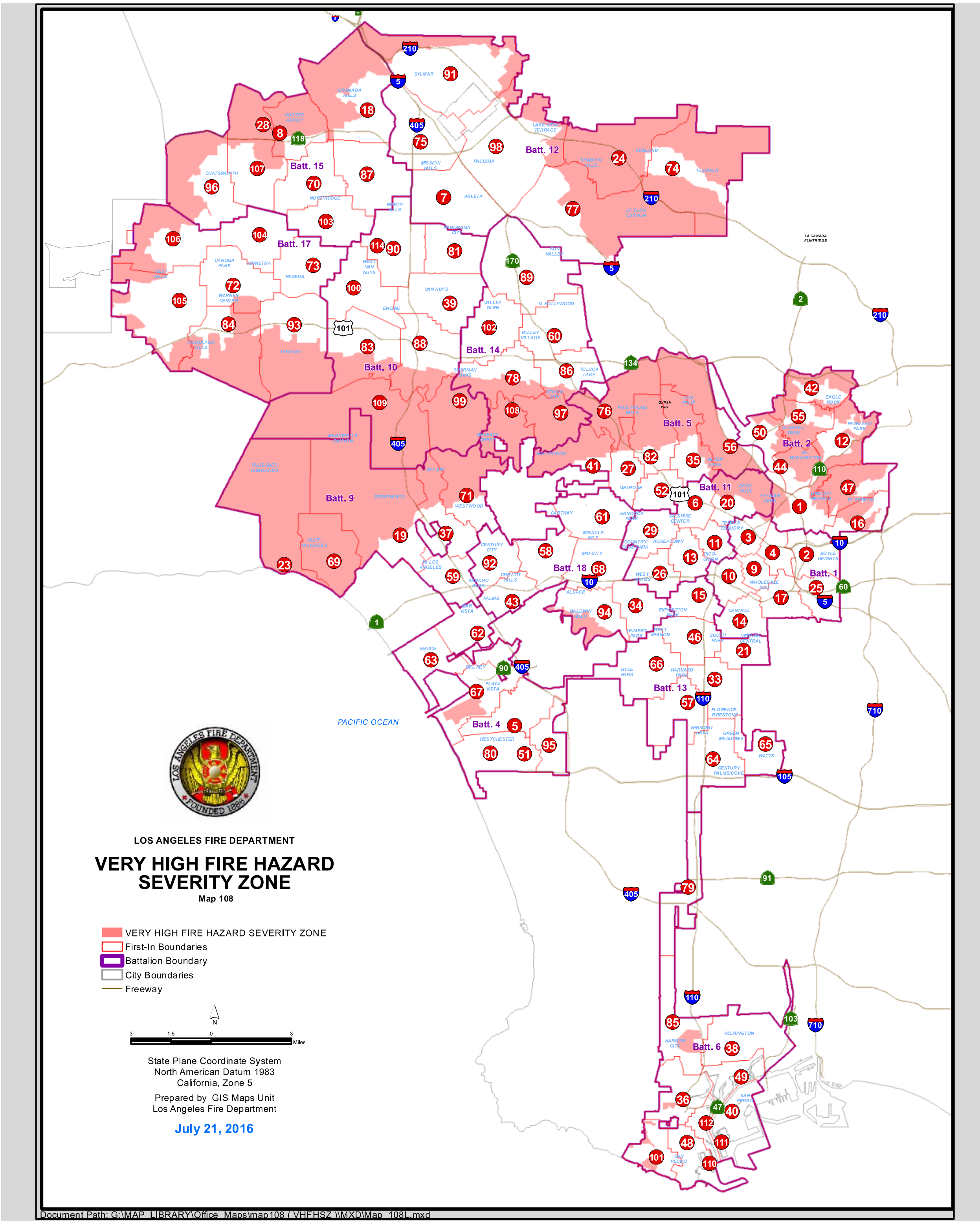
[9] Source: City of Los Angeles 2018 Local Hazard Mitigation Plan, Section 13

<u>Figure 18—CAL FIRE Wildland Fire Hazard Severity Zones – Los Angeles City</u>



The City also mapped the same ***Very High*** Wildfire Severity Zones as shown in the following figure.

Figure 19—Wildfire Severity Zones – City of Los Angeles



Vegetative/Wildland Fuels

Vegetative fuel factors influencing fire intensity and spread include fuel type (vegetation species), height, arrangement, density, and moisture. In addition to decorative landscape species, vegetative fuels within the City consist of a mix of annual grasses and weeds, brush, invasive species, and mixed deciduous, evergreen, conifer, and palm tree species. Once ignited, vegetation fires can burn intensely and contribute to rapid fire spread under the right fuel, weather, and topographic conditions.

Weather

Weather elements, including temperature, relative humidity, wind, and lightning, also affect vegetation/wildland fire potential and behavior. High temperatures and low relative humidity dry out vegetative fuels, creating a situation where fuels will more readily ignite and burn more intensely. Wind is the most significant weather factor influencing vegetation/wildland fire behavior, with higher wind speeds increasing fire spread and intensity.

Los Angeles has a two-season Mediterranean climate characterized by dry, warm summers and mild winters with an annual average of 14 inches of rainfall. Fuel and weather conditions most conducive to vegetation/wildland fires generally occur from about May through October; however, with global warming and climate change, vegetation fires can occur nearly year-round in Southern California.

Topography

Vegetation/wildland fires tend to burn more intensely and spread faster when burning uphill and up-canyon, except for a wind-driven downhill or down-canyon fire. The areas of the City with hilly terrain contribute more to vegetation/wildland fire behavior and spread.

Water Supply

Another significant vegetation fire consequence severity factor is water supply immediately available for fire suppression. As noted in the building fire risk section, all areas of the City have adequate available flow capacity and the Department has standard operating procedures in place to effectively mitigate areas with low static pressure.

Vegetation/Wildland Fire Service Demand

Over the three-year study period, the Department responded to 1,928 vegetation/wildland fires comprising 0.13 percent of total service demand over the same period, as summarized in the following tables.

Table 28—Vegetation/Wildland Fire Service Demand

Hazard	Year	Risk Planning Zone (Battalion)							
		1	2	4	5	6	9	10	11
Vegetation/Wildland Fire	2018	46	71	19	49	35	10	61	31
	2019	35	80	14	31	26	16	87	27
	2020	38	95	7	40	45	12	78	29
	Total	119	246	40	120	106	38	226	87
Percent Total Battalion Demand		0.06%	0.43%	0.05%	0.12%	0.17%	0.07%	0.23%	0.07%

Hazard	Year	Risk Planning Zone (Battalion						Total	Percent Total Annual Demand
		12	13	14	15	17	18		
Vegetation/Wildland Fire	2018	109	62	42	57	37	15	644	0.13%
	2019	109	69	27	40	28	19	608	0.12%
	2020	125	72	54	34	26	21	676	0.14%
	Total	343	203	123	131	91	55	1,928	0.13%
Percent Total Battalion Demand		0.33%	0.08%	0.14%	0.22%	0.10%	0.05%		

As the previous tables illustrate, annual vegetation/wildland fire service demand increased 5 percent over the three-year study period, with the highest demand in Battalion 12 and the lowest in Battalion 9.

Vegetation/Wildland Fire Risk Assessment

The following table summarizes Citygate's assessment of the City's vegetation/wildland fire risk by incident sub-type.

Table 29—Vegetation/Wildland Fire Risk Assessment

Vegetation/Wildland Fire Risk	Incident Type			
	Grass	Brush	Grass/Brush (High/Very High Hazard Areas)	WUI
Probability of Occurrence	*Probable*	*Probable*	*Probable*	*Possible*
Consequence Severity	*Minor*	*Moderate*	*Major*	*Major*
Agency Impact	*Minor*	*Moderate*	*Major*	*Extreme*
Overall Risk	***Low***	***Moderate***	***High***	***Extreme***

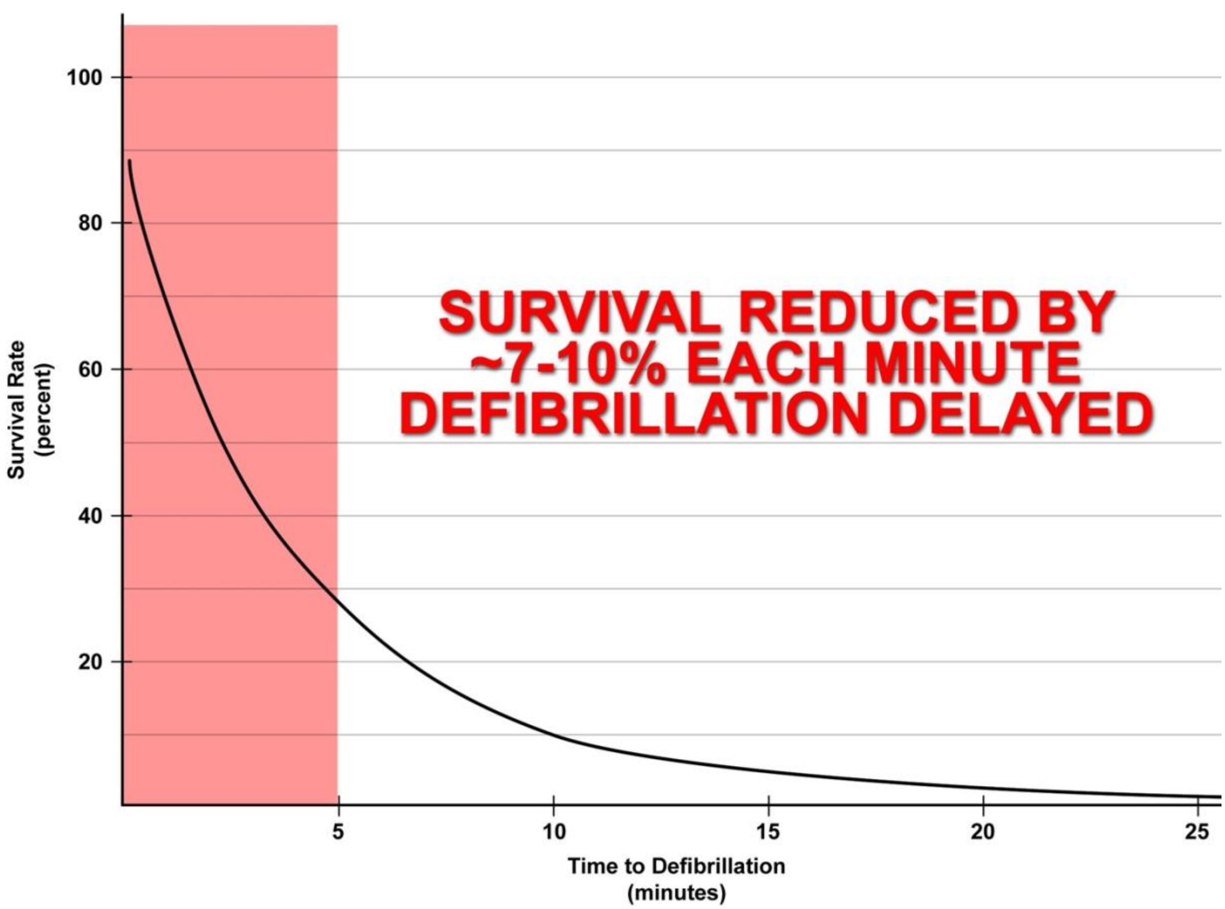
1.1.13 Medical Emergency Risk

Medical emergency risk in most communities is predominantly a function of population density, demographics, violence, health insurance coverage, and vehicle traffic.

Medical emergency risk can also be categorized as either a medical emergency resulting from a traumatic injury or a health-related condition or event. Cardiac arrest is one serious medical emergency among many where there is an interruption or blockage of oxygen to the brain.

The following figure illustrates the reduced survivability of a cardiac arrest victim as time to defibrillation increases. While early defibrillation is one factor in cardiac arrest survivability, other factors can influence survivability as well, such as early CPR and pre-hospital ALS interventions.

Figure 20—Survival Rate versus Time to Defibrillation



Source: www.suddencardiacarrest.org.

Population Density

Los Angeles' population density ranges from less than 5,000 to more than 40,000 per square mile as shown in Map #2 (**Volume 2—Map Atlas**). Risk analysis across a wide spectrum of other

Citygate clients shows a direct correlation between population density and the *occurrence* of medical emergencies, particularly in high urban population density zones.

Demographics

Medical emergency risk tends to be higher among older, poorer, less educated, and uninsured populations. As shown in Table 16, nearly 14 percent of the City's population is 65 and older; 19 percent of the population over 24 years of age has less than a high school education or equivalent; nearly 17 percent of the population is at or below poverty level; and slightly more than 12 percent of the population under age 65 does not have health insurance coverage.[10] In addition, the City has a large transient and homeless population.

Vehicle Traffic

Medical emergency risk tends to be higher in those areas of a community with high daily vehicle traffic volume, particularly those areas with high traffic volume traveling at high speeds. The City's transportation network includes Interstates 5; 10, 105, 110, 210, 405 and 710; US Routes 66 and 101 and State Highways 2, 27, 90, 134 and 170, carrying an aggregate annual average daily traffic volume of nearly 2.5 million vehicles, with a peak hour volume of more than 200,000 vehicles.[11]

Medical Emergency Service Demand

Medical emergency service demand over the three-year study period included more than 1.2 million calls for service comprising 83.14 percent of total service demand over the same period as summarized in the following table.

Table 30—Medical Emergency Service Demand

Hazard	Year	Risk Planning Zone (Battalion)							
		1	2	4	5	6	9	10	11
Medical Emergency	2018	50,142	15,460	22,736	27,145	17,033	14,949	27,652	33,770
	2019	52,197	15,000	23,552	27,488	17,098	15,001	27,678	33,994
	2020	46,854	15,258	17,329	24,568	17,106	13,039	26,256	34,799
	Total	**149,193**	**45,718**	**63,617**	**79,201**	**51,237**	**42,989**	**81,586**	**102,563**
Percent Total Battalion Demand		79.48%	80.65%	82.11%	79.35%	81.44%	76.64%	82.89%	82.08%

[10] Source: ESRI and U. S. Census Bureau (2022)

[11] Source: California Department of Transportation (2020)

Hazard	Year	Risk Planning Zone (Battalion						Total	Percent Total Annual Demand
		12	13	14	15	17	18		
Medical Emergency	2018	28,537	71,381	23,933	17,398	27,525	36,057	**413,718**	84.16%
	2019	28,467	70,912	24,302	17,071	27,568	34,538	**414,866**	83.02%
	2020	29,767	70,845	23,535	16,339	26,860	32,004	**394,559**	82.22%
	Total	**86,771**	**213,138**	**71,770**	**50,808**	**81,953**	**102,599**	**1,223,143**	**83.14%**
Percent Total Battalion Demand		84.59%	88.66%	82.50%	86.28%	85.94%	84.24%		

As the previous table show, medical emergency service demand varies significantly by battalion, and overall medical emergency service demand *decreased* nearly 5 percent over the three-year study most if not all of which was due to the COVID-19 pandemic.

Medical Emergency Risk Assessment

The following table summarizes Citygate's assessment of the City's medical emergency risk by incident sub-type.

Table 31—Medical Emergency Risk Assessment

Medical Emergency Risk	Incident Type				
	BLS Only	BLS/ALS	ALS	Active Shooter / Mass Casualty	WMD
Probability of Occurrence	*Frequent*	*Frequent*	*Frequent*	*Probable*	*Possible*
Consequence Severity	*Minor*	*Moderate*	*Moderate*	*Major*	*Catastrophic*
Agency Impact	*Major*	*Moderate*	*Moderate*	*Major*	*Extreme*
Overall Risk	***Moderate***	***High***	***High***	***High***	***Extreme***

1.1.14 Hazardous Material Risk

Hazardous material risk factors include fixed facilities that store, use, or produce hazardous chemicals or waste; underground pipelines conveying hazardous materials; aviation, railroad, maritime, and vehicle transportation of hazardous commodities into or through a jurisdiction; vulnerable populations; emergency evacuation planning and related training; and specialized hazardous material service capacity.

Fixed Hazardous Materials Sites

For this study, the Fire Departmenmt Planning Section identified 10,050 facilities within the city requiring a state or local hazardous material operating permit. The City also has large-diameter pipelines transporting petroleum products, and high-pressure natural gas distribution pipelines are also located throughout the City.

Transportation-Related Hazardous Materials

The City also has transportation-related hazardous material risk from its aviation, harbor, road, and rail transportation system, with hazardous commodities transported into, from, and through the city via all four systems.

Population Density

Because hazardous material emergencies have the potential to adversely impact human health, it is logical that the higher the population density, the greater the potential population exposed to a hazardous material release or spill. As shown in Map #2 (**Volume 2 – Map Atlas**), the City's population density ranges from less than 5,000 to more than 40,000 people per square mile.

Vulnerable Populations

Persons vulnerable to a hazardous material release/spill include those individuals or groups unable to self-evacuate, generally including children under the age of 10, the elderly, and persons confined to an institution or other setting where they are unable to leave voluntarily. Emergency Evacuation Planning, Training, Implementation, and Effectiveness

Another significant hazardous material consequence severity factor is a jurisdiction's shelter-in-place / emergency evacuation planning and training. In the event of a hazardous material release or spill, time can be a critical factor in notifying potentially affected persons, particularly at-risk populations, to either shelter-in-place or evacuate to a safe location. Essential to this process is an effective emergency plan that incorporates one or more mass emergency notification capabilities, as well as pre-established evacuation procedures. It is also essential to conduct regular, periodic exercises involving these two emergency plan elements to evaluate readiness and to identify and remediate any planning or training gaps to ensure ongoing emergency incident readiness and effectiveness.

The City of Los Angeles has an Evacuation Plan Annex to its citywide Emergency Operations Plan that outlines operational concepts, responsibilities, and procedures for emergency evacuations. The City also has a free subscription and reverse 9-1-1-based mass emergency notification system (NotifyLA) that is used to provide emergency alerts, notifications, and other emergency information to email accounts, cell phones, smartphones, tablets, and landline telephones. The City also utilizes Federal Communications Commission (FCC) Wireless Emergency Alerts (WEA), the Emergency Alert System (EAS), Nixle, and social media (Facebook, Twitter) to provide emergency notifications and information to the public. The City also has a multi-year Emergency Management Training and Exercise Plan focused on maintaining core capabilities including operational coordination; situational assessment; public information and warning; mass care services; operational communications, logistics, and supply chain management; critical transportation; and recovery for different hazard occurrences. The Emergency Management Department conducts training including focused exercises each quarter.

Hazardous Material Service Demand

The City experienced nearly 4,000 hazardous material incidents over the three-year study period, comprising 0.27 percent of total service demand over the same period, as summarized in the following tables.

Table 32—Hazardous Material Service Demand

Hazard	Year	Risk Planning Zone (Battalion)							
		1	2	4	5	6	9	10	11
Hazardous Material	2018	94	45	101	119	50	60	100	90
	2019	86	56	96	118	56	54	89	116
	2020	133	45	61	108	70	66	118	95
	Total	313	146	258	345	176	180	307	301
Percent Total Battalion Demand		0.17%	0.26%	0.33%	0.35%	0.28%	0.32%	0.31%	0.24%

Hazard	Year	Risk Planning Zone (Battalion						Total	Percent Total Annual Demand
		12	13	14	15	17	18		
Hazardous Material	2018	56	163	117	57	91	169	1,312	0.27%
	2019	69	180	110	64	91	160	1,345	0.27%
	2020	80	176	117	61	80	132	1,342	0.28%
	Total	205	519	344	182	262	461	3,999	0.27%
Percent Total Battalion Demand		0.20%	0.22%	0.40%	0.31%	0.27%	0.38%		

As the previous tables show, hazardous material service demand also varies significantly by battalion, however overall service demand was generally consistent over the three years, varying less than 3 percent.

Hazardous Materials Risk Assessment

The following table summarizes Citygate's assessment of the City's hazardous materials risk by incident sub-type.

Table 33—Hazardous Materials Risk Assessment

Hazardous Materials Risk	Incident Type				
	Alarm / Odor Investigation	Hazmat Level 1	Hazmat Level 2 / Biological or Chemical Threat / Natural Gas Leak	Hazmat Level 3 / Biological or Chemical Incident / Railroad Incident	Explosive Incident / WMD
Probability of Occurrence	*Frequent*	*Frequent*	*Frequent*	*Probable*	*Possible*
Consequence Severity	*Insignificant*	*Minor*	*Moderate*	*Moderate*	*Major*
Agency Impact	*Minor*	*Minor*	*Moderate*	*Major*	*Extreme*
Overall Risk	***Low***	***Moderate***	***High***	***High***	***Extreme***

1.1.15 Technical Rescue Risk

Technical rescue risk factors include active construction projects; structural collapse potential; confined spaces, such as tanks and underground vaults; bodies of water, including rivers and streams; industrial machinery use; transportation volume; and earthquake, flood, and landslide potential.

Construction Activity

There is ongoing residential, commercial, industrial, and infrastructure construction activity occurring within the City of Los Angeles.

Confined Spaces

There are numerous confined spaces within the City, including tanks, vaults, open trenches, etc.

Bodies of Water

In addition to some Pacific Ocean frontage and the Port of Los Angeles, Los Angeles has numerous open stream channels including the Los Angeles, Rio Hondo, San Gabriel, and Santa Ana rivers; Arroyo Seco, Pacoima, Tujunga, and Verdugo washes, and numerous smaller waterways and bodies of water.

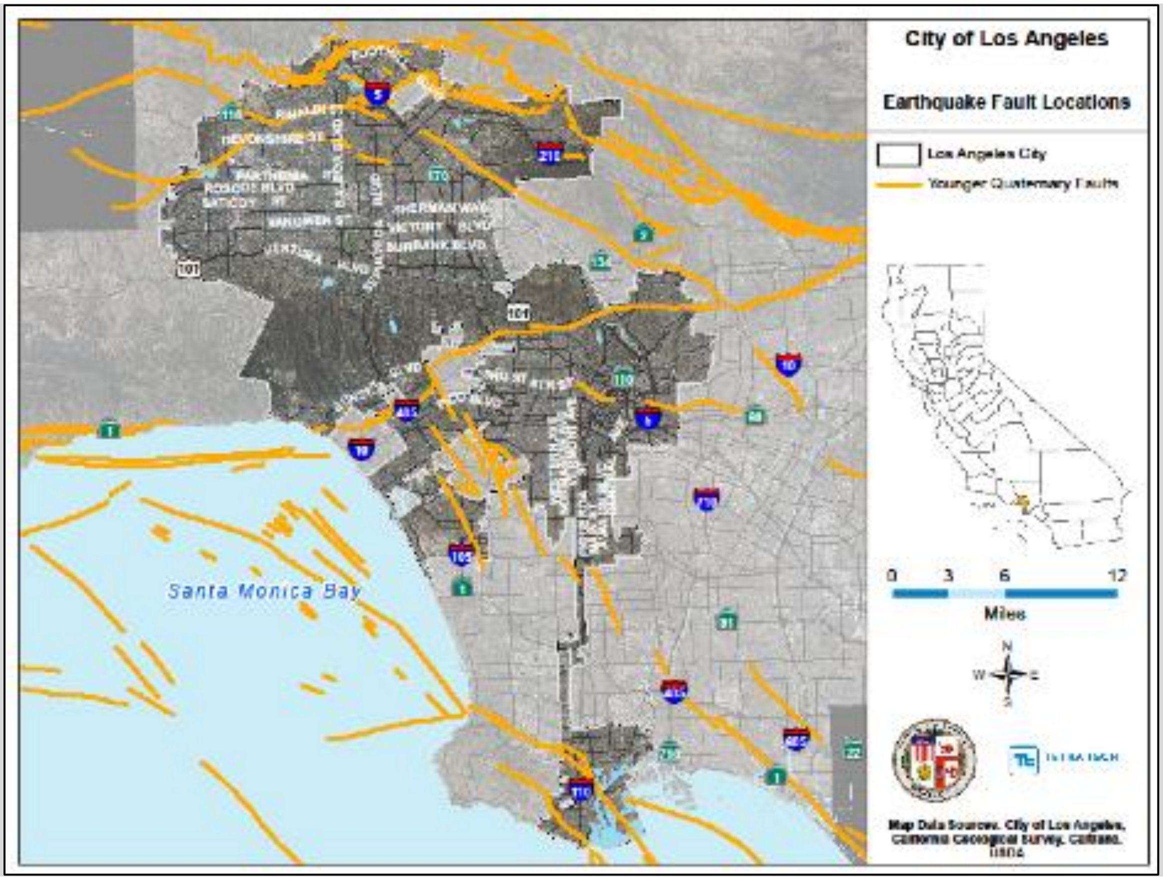
Transportation Volume

Another technical rescue risk factor is transportation-related incidents requiring technical rescue. This risk factor is primarily a function of vehicle, railway, maritime, and aviation traffic. Vehicle traffic volume is the greatest of these factors within the City with Interstates 5; 10, 105, 110, 210, 405 and 710; US Routes 66 and 101 and State Highways 2, 27, 90, 134 and 170 carrying an aggregate annual average daily traffic volume of nearly 2.5 million vehicles with a peak hour volume of more than 200,000 vehicles. The City also has heavy aviation, railway, and maritime traffic contributing to its transportation-related rescue risk.

Earthquake Risk[12]

The City of Los Angeles is in a region of high seismic activity with numerous known faults, including the Newport-Inglewood, Palos Verde, Puente Hills, San Andreas, and Santa Monica faults as shown in the following figure.

Figure 21—Earthquake Fault Locations



The primary hazards are ground shaking and potential resultant liquefaction from shaking. Since 1970, there have been 14 earthquakes of Magnitude 5.0 or greater within a 100-mile radius of Los Angeles, including the Magnitude 6.7 Northridge event in 1994 that caused 57 fatalities and more than $1.6 Billion in property and infrastructure damage. The California Hazard Mitigation Plan projects a greater than 99 percent probability of a Magnitude 6.7 earthquake event over the next 26 years, and a 94 percent probability of a Magnitude 7.0 event.

[12] Source: 2018 City of Los Angeles Local Hazard Mitigation Plan, Section 9.

Flood Risk[13]

The Federal Emergency Management Agency (FEMA), through its National Flood Insurance Program (NFIP), has designated Special Flood Hazard Areas (SFHA) Areas of the City susceptible to:

- Shallow flooding
- Regulated floodway flooding
- Alluvial fan flooding
- Coastal flooding

There are also areas of the City outside of designated SHFAs that are susceptible to flooding, including some hillside, non-hillside, urban drainage, and coastal areas. The principal flooding source in Los Angeles is heavy precipitation over one or two days overwhelming the City's drainage systems.

The City has experienced 14 flooding events since 1969 that resulted in a federal disaster declaration. Large floods occur approximately every 5-6 years in the City.

Tsunami Risk[14]

Due to its location on the Pacific Coast, many low-lying coastal areas of the City are susceptible to a tsunami, particularly San Pedro, Los Angeles Harbor and Pacific Palisades. Since 1927, nine tsunami events have impacted Los Angeles County, including the March 2011 tsunami that originated in Japan and caused minor damage in Marina Del Rey.

Technical Rescue Service Demand

The Department responded to slightly more than 9,000 technical rescue incidents over the three-year study period, comprising 0.62 percent of total service demand for the same period as summarized in the following tables.

[13] Source: 2018 City of Los Angeles Hazard Mitigation Plan, Section 10.

[14] Source: 2018 City of Los Angeles Hazard Mitigation Plan, Section 12.

Table 34—Technical Rescue Service Demand

Hazard	Year	Risk Planning Zone (Battalion)							
		1	2	4	5	6	9	10	11
Technical Rescue	2018	614	52	152	376	82	257	223	488
	2019	619	83	173	367	96	248	204	461
	2020	509	49	139	292	67	212	151	356
	Total	**1,742**	**184**	**464**	**1,035**	**245**	**717**	**578**	**1,305**
Percent Total Battalion Demand		0.93%	0.32%	0.60%	1.04%	0.39%	1.28%	0.59%	1.04%

Hazard	Year	Risk Planning Zone (Battalion						Total	Percent Total Annual Demand
		12	13	14	15	17	18		
	2018	68	163	169	54	154	361	**3,213**	0.65%
	2019	67	150	196	59	213	374	**3,310**	0.66%
	2020	59	106	164	32	130	295	**2,561**	0.53%
	Total	**194**	**419**	**529**	**145**	**497**	**1,030**	**9,084**	**0.62%**
Percent Total Battalion Demand		0.19%	0.17%	0.61%	0.25%	0.52%	0.85%		

As the previous tables show, technical rescue service demand also varies widely by battalion, with Battalion 1 having the highest demand and Battalion 15 the lowest. Overall, technical rescue service demand fluctuated 20 percent over the three-year study period, with a 23 percent decrease in demand in 2020 from the previous year.

Technical Rescue Risk Assessment

The following table summarizes Citygate's assessment of the City's technical rescue risk by incident sub-type.

Table 35—Technical Rescue Risk Assessment

Technical Rescue Risk	Incident Type			
	Elevator Rescue	Trauma / Pin-In / Potential Jumper / Rope Rescue	Confined Space / Trench Rescue	Building Collapse / Natural Disaster
Probability of Occurrence	*Probable*	*Frequent*	*Possible*	*Unlikely*
Consequence Severity	*Insignificant*	*Moderate*	*Moderate*	*Catastrophic*
Agency Impact	*Insignificant*	*Minor*	*Moderate*	*Extreme*
Overall Risk	***Low***	***High***	***Moderate***	***Extreme***

1.1.16 Aviation Risk

While the City has aviation risk exposure, particularly from the Los Angeles International Airport, that risk has been evaluated in other study(s) and was excluded from the scope of this study.

1.1.17 Marine Risk

The City of Los Angeles also has marine risk exposure at the Port of Los Angeles and city beaches, however, that risk has been evaluated in other study(s) and was excluded from the scope of this study.