CITYGATE
FIRE & EMS

FIRE DEPARTMENT DEPLOYMENT AND ORGANIZATIONAL ANALYSIS

VOLUME 1 OF 2: TECHNICAL REPORT

REDONDO BEACH, CA

APRIL 12, 2024

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EXECUTIVE SUMMARY

The City of Redondo Beach (City) Fire Department (Department) retained Citygate Associates, LLC (Citygate) to conduct a Fire Services Comparative Analysis of a contract for services option with the Consolidated Fire Protection District of the County of Los Angeles (District or County)and a separate Redondo Beach Fire Department Deployment and Organizational Analysis to guide the provisions of fire service decisions should the City not contract with the County.

This volume is the separate Redondo Beach Fire Department Deployment and Organizational Analysis to establish recommended minimum requirements relative to the organization and deployment of fire suppression operations, emergency medical operations, and special operations for the City to consider.

This report is presented in two volumes. This Technical Report (Volume 1) includes: this Executive Summary, which contains a summary of our analysis and suggested next steps; and a Standards of Coverage (SOC) Study with supporting response statistics. A separate Map Atlas is contained in Volume 2.

Throughout this report, Citygate provides key findings and, where appropriate, specific action item recommendations. Overall, there are 28 findings and 7 actionable recommendations.

POLICY CHOICES FRAMEWORK

There are no mandatory federal or state regulations directing the level of fire service staffing, response times, or outcomes. The level of service provided, and any resultant cost, is a local policy choice. The body of regulations on 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 investments in fire services over the past decades serve as their baseline commitment today.

The fundamental policy choices driving the City's investment in fire services should be derived from two key questions:

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

2. Should equitable response time coverage be provided to all neighborhoods with similar risks (building types and population density) to protect?

Once desired outcomes are identified, fire and emergency medical services (EMS) first responder and ambulance deployment can then be designed to cover the most geography in the fewest travel minutes to meet stated outcome goals.

FIRE DEPARTMENT SERVICES EVALUATION SUMMARY

Citygate finds the Department is adequately organized to accomplish its mission to serve a diverse urban/suburban population across the City. The Department is using best practices where possible and is committed to continuous improvement. Citygate found a caring, committed workforce that is *strongly dedicated* to anticipating and meeting the risks to be protected. There are many positive factors regarding how the Department provides quality services within the constraints of fiscal realities.

Fire service deployment, simply summarized, is about the ***speed*** and ***weight*** of response. *Speed* refers to initial response resources—typically engines, ladder trucks, squads, or ambulances—strategically deployed across a jurisdiction within a specified travel time interval to mitigate routine-to-moderate emergencies to achieve desired outcomes. *Weight* refers to multiple-unit responses for more serious emergencies such as building fires, multiple-patient medical emergencies, vehicle collisions with extrication required, or technical rescue incidents where enough firefighters must be assembled within a time interval to safely control the emergency and prevent it from escalating into an even more serious event.

Adequate incident response is not defined by the number of physical apparatus responding to a particular emergency, rather it is defined as the appropriate number of firefighters with the right training and equipment to safely mitigate the emergency. Within the fire service deployment process, positive outcomes are the goal. From that, staffing and travel time can be calculated to determine appropriate fire station spacing (distribution and concentration). Serious medical emergencies and building fires have the most severe time constraints.

Typical desired outcomes in communities with urban/suburban density include preventing death and permanent impairment from medical emergencies where possible, confining building fires to the room or compartment of origin, and safely rescuing any occupants unable to self-evacuate. To achieve these outcomes, the initial (first-due) unit should arrive within 7:30 to 8:30 minutes, before brain death becomes irreversible or an incipient building fire expands beyond the room or compartment of origin, and a full, multiple-unit Effective Response Force (ERF) should arrive within 11:30 to 12:00 minutes with enough personnel to safely perform all the critical tasks necessary to mitigate the emergency and prevent it from becoming even more serious.

Even where state or local fire codes require fire sprinklers in residential dwellings, it will be many more decades before enough homes are remodeled with automatic fire sprinklers. The City will still need both first-due unit and multiple-unit Effective Response Force (ERF or First Alarm)

coverage consistent with controlling a building fire to near the room(s) of origin and improving the chance of survival for patients with life-threatening medical emergencies.

The Department serves an urban/suburban community with a mixed zoning land-use pattern typical of other southern California coastal cities. Ongoing intensification of land uses will make some areas more urban in their population densities and traffic.

As discussed in Section 2.6.1, Stations 1 and 2 can be expected to cover 93 percent of the City's public streets within 5:00-minutes travel time, which is excellent first-unit coverage to facilitate positive outcomes. This is validated by a 90th percentile *call-to-first-unit arrival* performance of 7:19 minutes over the most recent three fiscal years, which is faster than a Citygate-recommended best practice goal of 7:30-minutes in urban/suburban communities. Prior to this study, the City had not adopted outcome driven response time goals, and doing so would allow the budget process to measure effectivness and add resources as needed.

While there is moderate demand for emergency incident reponse, including a rate of two simultanous incidents 34 percent of the time, the current staffing and units are not yet overworked.

As noted in Section 2.6.1, the northen edges of the City are just beyond 5:00 minutes travel from Station 2. The City has discussed a fourth fire station near the Northrup Grumman campus, and it has not yet committed funds for land or construction; however, that site is very near the edge of the City and response coverage from that site would cover more area outside the City than inside. As discussed in detail in the GIS map sections of this study and for response statistics in Section 2.9, there is insufficient annual incident demand with execssive travel times north of Station 2 to justify a fire station in the far north and, as the mapping measures show, these areas could also receive mutual aid support from either County fire station just north and northeast of the City limits.

The City should consider studying combing police and fire boat operations in the harbor and transferring non emergent boater services to a contractor. Additionally, because a fourth fire station in the far north City is not substantially needed, an alternative deployment improvement would be to transfer the second fire engine from Fire Station 2 to Fire Station 3 in King Harbor. Doing so provides a joint team with the two personnel assigned on the harbor boat. A five-person crew would provide additional staffing for critical harbor and landside needs with multiple response unit types, including an engine, paramedic rescue squad, and rescue boat.

Citygate's high-level review of the Department's administrative support organization finds it to be appropriately organized and staffed to meet current and anticipated near-term future responsibilities and workload except for clerical support capacity for the newly formed Administrative Division and adequate integrated workspace for the entire headquarters staff. In addition, Citygate finds the City lacks planning for the renewal or replacement of its aging fire station facilities that do not completely meet contemporary regulatory requirements or recommended best-practice safety, security, and gender separation features.

FINDINGS AND RECOMMENDATIONS

The following are the findings and recommendations from throughout this report.

Deployment Findings

Finding #1: The Department's current deployment model provides a minimum of 20 response personnel on duty daily, including a chief officer for incident command.

Finding #2: The City and Department have *not* established formal response performance goals consistent with best practice recommendations as published by the Commission on Fire Accreditation International and the National Fire Protection Association; doing so will help guide future fire crew staffing, apparatus types, and deployment methods.

Finding #3: The Department has a standard response plan that considers risk and establishes an appropriate initial response for each incident type; each type of call for service receives the combination of engines, trucks, specialty units, and command officers customarily needed to effectively control that type of incident based on Department experience.

Finding #4: Citygate finds that the City has spread out harbor operations management across multiple City departments and one City contractor: City Economic Development, a Basin 1 contractor operator for non-9-1-1 issues, and the fire and police departments. Citygate suspects there is duplication of City coordination efforts and not enough use of a private company for boater support. Reconfiguration of fire/police boat staffing could well improve public safety agency response, generate small City savings, and simplify which agency does what in the waterside community in all three basins.

Finding #5: The Department's current two fire station locations can be expected to deliver 4:00-minute first-unit travel time coverage to the most densely populated areas of the City.

Finding #6: The two fire stations should be expected to deliver 5:00-minute first-unit travel time coverage to 93 percent of the City's public streets. In Citygate's experience this is *excellent* coverage and one that many other communities can only strive for.

Finding #7: Two County fire stations could provide mutual support in the north City limit areas in 4:00 to 5:00 minutes driving time, largley negating the need for a City fire station well to the north of Fire Station 2. Even if a station were added, much of that station's sevice reach would extend into the three neighboring cities.

Finding #8: There is a constant, predictable demand for service across all hours of the month, week, and day, with overall annual demand increasing slightly.

Finding #9: While two or more simultaneous calls for service occur 34 percent of the time, three or more occur just 7.2 percent of the time. This reduction to three or more is beneficial and lessens the need for frequent automatic/mutual aid from outside of the Department for single-responder incidents.

Finding #10: Unit-hour utilization rates are not approaching Citygate's recommended 30 percent saturation rate over multiple consecutive hours, even for the EMS Rescues. If both EMS Rescues are busy, with an engine each also on their incident, there is still an engine and the ladder likely available for concurrent incidents.

Finding #11: Call processing / dispatch performance *is meeting* Citygate's recommended 1:30-minute best practice goal to facilitate positive outcomes.

Finding #12: Crew turnout performance over the three-year data set was somewhat slower than the Citygate-recommended 2:00-minute best practice goal; however, perfomance improved over the past two fiscal years and essentially met the goal for RY 22/23. Reasonable focus and accountability will help maintain this performance level.

Finding #13: At 5:46 minutes in RY 22/23, 90th percentile first-unit travel time performance to fire and EMS incidents was 1:46 minutes (44 percent) *slower* than a recommended 4:00-minute best prctice goal to facilitate best practice outcomes in urban-density communities.

Finding #14: Citywide, 82 percent of fire and EMS incidents were reached within 5:00-minutes travel time, including the harbor, oceanfront, and freeways where longer travel times always occur due to diffcult-to-reach locations.

Finding #15: 90th percentile call-to-first-unit arrival performance has slowed somewhat over the past three years from 7:01 minutes in RY 20/21 to 7:47 minutes in RY 22/23, which is only 17 seconds slower than a Citygate-recommended 7:30-minute goal for urban-density communities to facilitate positive outcomes.

Finding #16: At 12:57 minutes, reported building fire Effective Response Force (**ERF)** multi-unit call-to-arrival performance was just 1:27 minutes *slower* than a Citygate recommended 11:30-minute best practice goal in urban density communities to facilitate positive outcomes; however, there were only 58 ERF reported building fire incidents in three years and small data sets can be quite volatile.

Finding #17: The count of near or on-the-water incidents in King Harbor per year is low and, given the records available, an exact count and information regarding severity is not possible.

Finding #18: There is not a high enough annual incident demand with excessive travel times well north of Station 2 near the City limits to justify a fire station in the far north City. As the mapping measures show, these areas could also receive mutual aid support from either County fire station just north and northeast of the City limits.

Deployment Recommendations

Recommendation #1: The City would be well-served to conduct an in-depth assessment regarding using contractors to provide typical private-sector boater services in all three basins and study how to cross-staff a hybrid police and fire response team on one first responder boat. This public safety team could also have nearby harbor area landside response duties.

Recommendation #2: **Adopt Updated Deployment Policies:** The City Council should adopt complete performance measures to aid deployment planning and to monitor response performance. The measures of time should be designed to deliver outcomes that will prevent death or more serious injury for EMS patients upon arrival when possible and keep small but serious fires from becoming more serious. With this is mind, Citygate recommends the following measures.

2.1 First-Due Unit: To treat pre-hospital medical emergencies and control small fires, the first-due unit should arrive within 8:30 minutes, 90 percent of the time, from receipt of the 9-1-1 call at the Redondo Beach Emergency Communications Center to incidents in the City. This equates to a 1:30-minute call processing / dispatch time, a 2:00-minute crew turnout time, and a 5:00-minute travel time.

2.2 Multiple-Unit Effective Response Force for Serious Emergencies: To confine building fires near the room or rooms of origin and treat multiple medical patients at a single incident, a multiple-unit ERF of a mininum of 13 personnel, including one Chief Officer, should arrive within 11:30 minutes from the time of call receipt at the Redondo Beach Emergency Communications Center at 90 percent or better reliability. This equates to a 1:30-minute call processing / dispatch time, a 2:00-minute crew turnout time, and an 8:00-minute travel time, respectively.

2.3 <u>Hazardous Material Response:</u> To protect the service area from hazards associated with uncontrolled release of hazardous and toxic materials, the fundamental mission of the Department's response is to isolate the hazard, deny entry into the hazard zone, and minimize impacts on the community. This can be achieved with a first-due total response time of 8:30 minutes or less to provide initial hazard evaluation and mitigation actions. After the initial evaluation is completed, a determination can be made whether to request additional resources to mitigate the hazard.

2.4 <u>Technical Rescue:</u> To respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue, a first-due total response time of 8:30 minutes or less is required to evaluate the situation and initiate rescue actions. Additional resources should assemble as needed within a total response time of 11:30 minutes or less to safely complete rescue/extrication and delivery of the victim to the appropriate emergency medical care facility.

Recommendation #3: The City should utilize the data in this study to decide if a fourth fire station in the far north City is the best investment, or consider if moving the second engine from Fire Station 2 to Station 3 in the harbor would be a more substantial improvement.

Recommendation #4: If the second engine was moved from Station 2 to Station 3 in the harbor, that staffing would be combined with the two-person boat crew to provide improved on-the-water response. The combined team would also cross-staff a Paramedic squad. These two units would provide a substantial service improvement on the water and landside in the northwest City east of the harbor.

Administrative Support Findings

Finding #19: Some employee training records and certifications were not up to date or reflected in the current training database. California Joint Apprentice Committee (JAC) firefighter training participation started in December 2023 and has begun generating modest training cost reimbursements. Annual performance standards are now under development with the newly assigned Training Captain. The Department has implemented a new online data base for training records, tracking personnel, managing credentials, and other critical tasks.

Finding #20: The Administrative Division lacks adequate administrative clerical support capacity.

Finding #21: Two of the three fire stations are more than 60 years old and show significant signs of wear and tear despite the best efforts of City maintenance staff.

Finding #22: All three fire stations are undersized by modern fire service standards.

Finding #23: All three fire stations lack conformance with current Building Code, ADA and NFPA standards, and two of the stations were built before the Essential Services Buildings Seismic Safety Act of 1986.

Finding #24: Fire Stations 1 and 2 sleeping, locker room, and restroom facilities were developed based on historically all-male fire crews and have received minor retrofitted changes for gender inclusion and privacy. They should be completely upgraded to current standards.

Finding #25: Fire Station 1 is undersized and is not compatible for current combined headquarters and operational response functions.

Finding #26: The City's current Capital Improvement Program (CIP) identifies capital facility and infrastructure improvements over a rolling five years; however, it does not appear to plan for longer-term major facility renewal or replacement.

Finding #27: The Department's automotive fleet is in good overall condition with reliable serviceability and adequate reserve capacity to maintain operational response capacity.

Finding #28: The Department's fire apparatus replacement schedule conforms with industry-recognized best practice recommendations.

Administrative Support Recommendations

Recommendation #5: The Training Captain should continue to update and maintain training records, certifications, licenses, annual performance standards and continue participation in the Joint Apprenticeship Committee (JAC) program to ensure the department meets state and federal standards.

Recommendation #6: The City and Department should consider funding one FTE Administrative Assistant to provide additional needed clerical support for the Adminsistrative Division.

Recommendation #7: The City should find an alternative location with adequate workspace for the combined Department administrative staff.

Recommendation #8: The City should consider prioritizing the existing fire stations for substantial remodel or replacement in its Capital Improvement Plan.

NEXT STEPS

Near-Term

- Review and absorb the content, findings, and recommendations of this report.
- Adopt response performance goals as recommended.
- In lieu of a fourth fire station in the far north City, consider moving the second fire engine from Station 2 to Station 3 in King Harbor.

Long-Term

- Study further streamlining King Harbor general and public safety management and on-the-water emergency response.
- Consider adding one FTE clerical support to provide needed capacity for the Administrative Division.
- Add fire station renewal or replacement to the City's long-term Capital Improvement Plan.
- Monitor response performance against adopted goals.

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SECTION 1—INTRODUCTION AND BACKGROUND

The City of Redondo Beach (City) Fire Department (Department) retained Citygate Associates, LLC (Citygate) to conduct a Fire Services Comparative Analysis of a contract for services option with the Consolidated Fire Protection District of the County of Los Angeles (District or County) and this separate Organizational Assessment of the Redondo Beach Fire Department. This assessment is based on nationally recognized guidelines and best practices, federal and state mandates, and relevant local and regional operating procedures. This assessment is intended to provide recommendations relative to the organization and deployment of fire suppression operations, emergency medical operations, and special operations for consideration by Department and City leadership as a template for future analysis and long-term financial and deployment planning.

Citygate's Work Plan for this assessment reflects its Project Team members' cumulative experience in fire administration and deployment. Citygate utilizes various National Fire Protection Association (NFPA) and Insurance Services Office (ISO) publications as best practice guidelines, along with the self-assessment criteria of the Commission on Fire Accreditation International (CFAI). This is a systems-based approach using local risk and demographics to determine the level of protection best fitting the City's needs.

1.1 REPORT ORGANIZATION

This report is organized into the following sections.

Executive Summary: A summary of current services and significant challenges, including key findings and recommendations.

Section 1—Introduction and Background: An introduction to the study and background information about the City and Department.

Section 2—Standards of Coverage Assessment: An overview of the SOC process and detailed analysis of the Department's existing deployment model, emergency outcome expectations, community risk assessment summary, staffing needed for different emergencies (critical tasks), geographical distribution and concentration effectiveness of fire crew locations, reliability and historical response measures effectiveness, and a concluding overall deployment evaluation.

Section 3—Review of Current Facilities, Equipment, and Logistics: An analysis of the Department's administrative support functions, facilities, and automotive equipment for regulatory compliance and capacity to support an ongoing stand-alone City fire department, including configuration and lines of authority.

Section 4—Findings and Recommendations: A complete and sequential list of all Citygate's findings and actionable recommendations made throughout this report.

Appendix A—Community Risk Assessment: A comprehensive assessment of the values at risk to be protected within the community and evaluation of the fire and non-fire hazards likely to impact the service area as related to services provided by the Department.

1.1.1 Goals of the Report

This report cites findings and provides recommendations, as appropriate, related to each finding. Throughout the report, findings and recommendations are sequentially numbered.

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

The result is a firm technical foundation upon which to understand the advantages and disadvantages of the choices City leadership faces regarding the best way to provide services and, more specifically, at what level of desired outcome and expense.

1.1.2 Limitations of the Report

There are no federal or state regulations mandating the level of fire service staffing, response performance, or outcomes. Through the public policy process, each community is expected to understand local fire and non-fire risks and its ability to pay for fire services, and then choose its level of services accordingly. *If* fire services are provided at all, federal and state regulations specify how to safely provide them, both for the public and the personnel providing services.

While this report and technical explanation can provide a framework for the discussion of Department services, neither this report nor the Citygate team can make the final decisions or cost out every possible alternative in detail. Once final policy choices receive City Council direction, City staff can conduct any final cost and fiscal analyses as typically completed in the City's normal operating and capital budget preparation cycle.

1.2 Project Approach and Scope of Work

1.2.1 Project Approach and Research Methods

Citygate utilized multiple sources to gather, understand, and model information about the City and Department. Citygate requested a large amount of relevant background data and information to better understand current costs, service levels, history of service level decisions, and other prior studies.

In virtual and on-site meetings, Citygate conducted focused interviews of the Department's project team members and other key project stakeholders. Citygate reviewed demographic information about the City, including the potential for future growth and development. Citygate also obtained map and response data from which to model current and projected fire service deployment, with the goal to identify the location(s) of stations and the number of personnel required to best serve the Department's service area as it currently exists and to facilitate future deployment planning.

Once Citygate gained an understanding of the Department's service area and its fire and non-fire risks, Citygate developed a model of fire services that was tested against prior response data to ensure an appropriate fit. Citygate also considered future growth and service demand and evaluated potential alternative emergency service delivery models. Subsequently, Citygate developed a potential approach to address both current and longer-range needs. The result is a framework for enhancing Department services while meeting reasonable community expectations and fiscal realities.

1.2.2 Scope of Work

Citygate's scope of work for this assessment included:

- Reviewing data and information provided by the Department and City and conducting listening sessions with key project stakeholders.
- Utilizing StatsFD™, an incident response time analysis program, to review prior incident service demand and response performance and plot the results on graphs and geographic mapping exhibits.
- Identifying and evaluating future service area population and related development growth.
- Recommending appropriate, risk-specific response performance goals.
- Evaluating harbor patrol operations.
- Reviewing current Department facilities, equipment, and logistics support services.

1.3 CITY OVERVIEW

Located approximately 21 miles southwest of downtown Los Angeles along the southern section of Santa Monica Bay, the City of Redondo Beach is a popular resort destination known for its sandy beach, municipal pier, and large recreational and commercial harbor. Incorporated as a charter city in 1892, Redondo Beach encompasses 6.2 square miles with a 2022 population of nearly 70,000 residents.[1] The City has a robust economy with significant employment and retail

[1] Source: U.S. Census Bureau

sales activity including a large industrial complex anchored by the Northrup Grumman Corporation campus; the Harbor/Pier area; the Galleria at South Bay, and a mix of specialty shops, restaurants and services in thr Riviera Village area in the south end of the City.

The City provides a full range of urban municipal services including community development, planning, engineering, building, finance, fire, library, police, public works, and waterfront and economic development.

The City operates under a Council-Manager form of government, with the Mayor elected at large and five Council Members elected by council district to staggered four-year terms. The City's proposed FY 23/24 budget is $101.16 million.

1.3.1 Future Growth and Development

The City's 1992 General Plan Land Use Element projects slightly more than 33,000 residential dwelling units, nearly 8.1 million square feet of commercial development, and 1.86 million square feet of industrial development at buildout.[2] With 2.45 persons per household, this translates to a build-out resident population of approximately 81,400, or about 12,500 (18 percent) more than the 2022 population.[3]

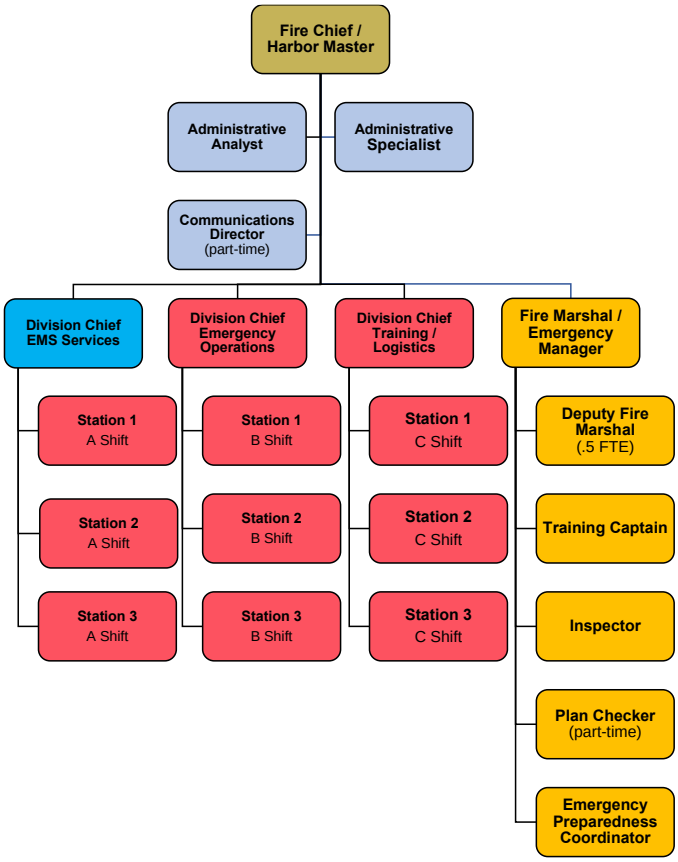
1.4 Fire Department Overview

1.4.1 Organization

The Department, operating under authority of the City Charter, provides fire suppression, Basic Life Support (BLS) and Advanced Life Support (ALS) pre-hospital emergency medical, rescue, initial hazardous materials response, fire prevention, disaster preparedness / emergency management, community outreach, and related fire and life safety services, such as the harbor patrol, with a staff of 67 personnel, organized as shown in the following figure.

[2] Source: City of Redondo Beach General Plan, Land Use Element, Table 1.
[3] Source: U.S. Census Bureau

Figure 1—Organizational Chart – Redondo Beach Fire Department



1.4.2 Facilities, Response Resources, and Staffing

The Department provides services with 20 response personnel on duty daily from three fire stations, as summarized in the following table.

Table 1—Fire Department Facilities, Response Resources, and Daily Response Staffing

Station Number	Address	Assigned Response Resources	Minimum Daily Staffing
1	401 South Broadway Ave.	Engine 61 Truck 61 Rescue 61 Batt. Chief 61	**3** **4** **2** **1**
2	2400 Grant Ave.	Engine 62 Engine 64 Rescue 62	**3** **3** **2**
3	280 Marina Way	Squad 63 Harbor Boat 63	**2** ******
Total Daily Response Staffing			**20**

** Cross-staffed as needed by on-duty personnel based on incident type

Finding #1: The Department's current deployment model provides a minimum of 20 response personnel on duty daily, including a chief officer for incident command.

1.4.3 Service Capacity

Service capacity refers to the Department's available response force; the size, type, 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 relative to the risks to be protected.

Service capacity for fire and non-fire risk consists of 20 response personnel on duty daily staffing three engines, one aerial ladder truck, two paramedic rescue squads, one marine rescue/harbor boat/squad, plus one Battalion Chief, all operating from the Department's three fire stations.

All response personnel are trained to either the emergency medical technician (EMT) level, capable of providing BLS pre-hospital emergency medical care, or the EMT-P (Paramedic) level, capable of providing ALS pre-hospital emergency medical care. All engines and the ladder truck are staffed with at least one paramedic, and the rescue squads are staffed with two paramedics. Ground ambulance transportation services are provided by McCormick Ambulance under an agreement with the Los Angeles County Emergency Medical Services Agency.

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 for a hazardous material response team. When needed, a hazardous materials technical response team is available through automatic aid from the County in Rancho Dominguez.

All response personnel are further trained in Confined Space Awareness, Low-Angle/High-Angle Rope Rescue Technician, Confined Space Operational, and Trench Rescue Operational levels. When needed, additional technical rescue services are available through automatic aid from the County in Pico Rivera.

The Department has automatic mutual aid agreements with the cities of Torrance and Manhattan Beach, as well as the County.

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SECTION 2—STANDARDS OF COVERAGE ASSESSMENT

This section provides a detailed report of the Department's current ability to deploy and mitigate emergency hazards within its service area. The response analysis uses prior response statistics and geographic mapping to help the Department and the community visualize the capabilities and limitations of the current response system.

2.1 STANDARDS OF COVERAGE PROCESS OVERVIEW

The core methodology used by Citygate in the scope of its deployment analysis work is *Standards of Cover*, fifth and sixth editions, which is a systems-based approach to fire department deployment published by the CFAI. This approach uses local risk and demographics to determine the level of protection best fitting a community's needs.

The SOC method evaluates deployment as part of a fire agency's self-assessment process. 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.

Such a systems-based approach to deployment, rather than a one-size-fits-all prescriptive formula, 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, the analysis could miss over-worked companies. If a risk assessment for deployment is not considered and deployment is based only on travel time, a community (city, district, county) could under-deploy to incidents.

The following table describes the eight elements of the SOC process.

Table 2—Standards of Coverage Process Elements

SOC Element		Description
1	Existing Deployment	Describing the current deployment model and response performance goals the agency has in place today.
2	Community Outcome Expectations	Reviewing the expectations of the community for responses to emergencies.
3	Community Risk Assessment	Identifying and quantifying the assets at risk to fire and non-fire hazards likely to impact the community. (For this report, see **Appendix A—Community Risk Assessment**.)
4	Critical Task Analysis	Reviewing the tasks that must be performed and the personnel required to deliver the stated outcome expectation.
5	Distribution Analysis	Reviewing the spacing of first-due response resources (typically engines) to control routine emergencies.
6	Concentration Analysis	Reviewing the spacing of fire stations so that more complex emergencies can receive sufficient resources and personnel in a timely manner (First Alarm Assignment or ERF).
7	Reliability and Historical Response Effectiveness Analysis	Using prior response statistics to determine the percent of compliance the existing system delivers.
8	Overall Evaluation	Proposing Standard of Coverage statements by risk type, as necessary.

Source: CFAI, *Standards of Cover*, Fifth Edition

Simply summarized, fire service deployment is about the ***speed*** and ***weight*** of the response. *Speed* refers to initial response (first-due), all-risk intervention resources (e.g. engines, ladder trucks, rescues, ambulances) strategically deployed across a jurisdiction for response to emergencies within a specified time interval to control routine-to-moderate emergencies to achieve desired outcomes and prevent the incident from escalating to greater size or severity. *Weight* refers to multiple-unit responses for more serious emergencies, such as building fires, multiple-patient medical emergencies, vehicle collisions with extrication required, or technical rescue incidents where enough firefighters must be assembled within a time interval to safely control the emergency and prevent it from escalating into a more serious event.

The following table illustrates this deployment paradigm.

Table 3—Fire Service Deployment Paradigm

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

Thus, smaller fires and less complex emergencies require a single-unit or two-unit response (*fully staffed* engine or specialty resource) within a relatively short response time. Larger or more complex incidents require more units and personnel to control. In either case, if the crews arrive too late or the total number of personnel is too few for the emergency, they are drawn into an escalating and more dangerous situation. The science of fire crew deployment is to spread crews out across a community or jurisdiction for quick response to keep emergencies small with positive outcomes without spreading resources so far apart that they cannot assemble quickly enough to effectively control more serious emergencies.

2.2 Current Deployment

SOC Element 1 of 8
Existing Deployment Policies

Nationally recognized standards and best practices suggest using several incremental measurements to define response time. Ideally, the clock starts when the Redondo Beach Emergency Communications Center dispatcher receives the emergency call. Response time increments include 9-1-1 call processing / dispatch, crew response unit boarding (commonly called crew turnout), and actual driving (travel) time. Response performance best practices include specific time goals for each of these three increments, which combined equal total response time, or call-to-arrival time, which is a fire agency's true customer service metric. Response performance goals should also address response performance to other risks within the service area, such as hazardous materials and technical rescue, as recommended by the CFAI. While the Department has not adopted a formal response time goal, it has a service-level history that can be documented in response times, number of response units and personnel, which were analyzed for this study.

Currently, NFPA Standard 1710, a recommended deployment standard for career fire departments in urban/suburban areas, recommends the initial (first-due) intervention unit arrival within a

4:00-minute travel time and arrival of all resources comprising a multiple-unit First Alarm within an 8:00-minutes travel time, all at 90 percent or better reliability.[4]

If the travel time measures recommended by the NFPA and Citygate are added to dispatch processing and crew turnout times recommended by Citygate and best practices, then a realistic 90 percent first-unit total response time goal for urban response zones is 7:30 to 8:30 minutes from the Redondo Beach Emergency Communications Center receiving the call. This includes 1:30 minutes for call processing / dispatch, 2:00 minutes for crew turnout, and 4:00 to 5:00 minutes for travel.

Finding #2:	The City and Department have *not* established formal response performance goals consistent with best practice recommendations as published by the Commission on Fire Accreditation International and the National Fire Protection Association; doing so will help guide future fire crew staffing, apparatus types, and deployment methods.

2.2.1 Current Response to Incident Types Plan

The Department is an all-risk fire agency providing the people and community it protects with services that include fire suppression, pre-hospital BLS and ALS emergency medical, rescue, and initial hazardous material response. Given these risks, the Department utilizes a tiered response plan calling for different types and numbers of resources depending on incident/risk type. The Redondo Beach Emergency Communications Center CAD system selects and dispatches the most appropriate resource types pursuant to the Department's response plan, as shown in the following table.

[4] Source: NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (2020 Edition).

Table 4—Response Plan by Incident Type

Incident Type	Resources Dispatched	Total Personnel
EMS – BLS **ALS**	1 Engine 1 Engine, 1 Rescue	3 5
Vehicle Accident	1 Engine/Truck, 1 Rescue	5-6
Vehicle Fire	1 Engine	3
Building Fire – Confirmed	4 Engines, 1 Truck, 1 Rescue, 2 BCs	20
Vegetation Fire	1 Engine	3
Water Rescue	1 Engine, 1 Truck, 1 Rescue, 1 Harbor Patrol, BC	12
Hazardous Material Release	1 Engine	3
Technical Rescue	2 Engines, 1 Truck, 2 Rescues, BC	15

Finding #3: The Department has a standard response plan that considers risk and establishes an appropriate initial response for each incident type; each type of call for service receives the combination of engines, trucks, specialty units, and command officers customarily needed to effectively control that type of incident based on Department experience.

2.2.2 Harbor Patrol Deployment

The Redondo Beach Harbor Patrol Unit has been deployed according to several operating models over the past 50 years. The Unit was originally organized as a stand-alone City department, has been a unit of the Police Department, and now serves as a branch of the Fire Department. Its mission has also shifted from a law enforcement focus to marine rescue, fire, and emergency medical services. Currently the Fire Department staffs two personnel on a smaller fire/rescue boat and a Squad truck for landside response. The harbor personnel also occasionally respond with a paramedic squad on land-based calls in the area. This high-level overview of the Department's fireboat program is based entirely on the review of various documents and conversations with Department managers.

The Department maintains two boats: one 29-foot Rescue Boat built in 2004, and a reserve boat, a 27-foot Boston Whaler built in 2008. Both boats have smaller fire pumps for pleasure boat firefighting, EMS, and rescue equipment. They also have dewatering pumps to assist boats taking on water, equipment to deploy a rescue swimmer in the water, and small firefighting foam and spilled oil containment tools.

Fire Station 3, out on a wharf, currently houses the Department's two Harbor Patrol members and two District Lifeguards for their regional Baywatch boat 24/7. Harbor Patrol members occupy the top floor area with sleeping dorms, supervisor office, and kitchen. District Lifeguards occupy the bottom floor with two dorms, a common room/gym, and apparatus bay. The apparatus bay can be reconfigured to house a full-size fire engine.

The assigned Department personnel are all fully credentialed firefighters, EMTs, or paramedics. Harbor Patrol members complete a water rescue component of their internal training program. All members complete an annual timed 400-yard qualifying ocean swim in under 8:00 minutes. This timed swim will be shifting to the United States Lifeguard Association (USLA) time standard of 500 yards in 10 minutes.

The Harbor Patrol uses an internally developed Harbor Patrol Training Guide foundational document the governs most of its operations and training. A task book for both Harbor Patrol Officer and Harbor Patrol Boat Captain validates skills performance. Some of these documents date back to the prior police operations years. All Department boat crews are required to obtain and maintain a U.S. Coast Guard Merchant Mariners Credential with a towing enhancement and a 50-ton rating. Harbor boat crew members are required to complete the District Rescue Boat Operations, Marine Firefighting Operations, Marine Accident Investigations, and Basic Coastal Boating/Operator courses. The Harbor Patrol task books for the boat crews are exceptionally complete.

There is no formal written mutual or automatic aid agreements between Redondo Beach and District lifeguards. Co-locations of Baywatch Redondo and Harbor Patrol support mutual support without a formal agreement. The Department has been allowed to go further than the three-mile City boundary limit, has been as far as 18 nautical miles west of the City for a 60-foot vessel with active fire and people in the water, and has also been involved in search and rescue missions in the shipping channel between the City and Catalina Island. There is no written policy outlining such response parameters or a formal backup plan to cover the harbor during such an occurrence.

The Harbor Patrol is an active participant in the Air/Sea Disaster Plan coordinated by LAX but designates the USCG as the primary federal agency leading any response to maritime disasters in the region. The plan is updated by LAX annually and queries Harbor Patrol for resource availability and participation in tabletop/live exercises.

In addition to the many positive attributes noted above, there are also potential challenges and areas that may need improvement. Some of those are:

- There is no known formal agreement between the USCG and the RBFD for on ocean response, beyond the LAX crash plan. Developing an agreement that clearly outlines the authority for RFBD to work in the command structure of the USCG,

while USCG retains the responsibility for the incident will create a firm legal foundation for such responses.

- RBFD documents state that their fireboat crews can make underwater/SCUBA responses. However, other RBFD documents state that SCUBA certification is not required.
- The RBFD fireboat seems to be regularly used for non-emergency towing incidents. In Basin A and in other southland harbors, this is a private sector function, given there is no emergency to the boat passengers or others nearby.
- The new boat crew task books are very detailed. Credentialed boat personnel act as field training officers and oversight compliance.

A high-level review of the harbor crew emergency incident use in **Section 2.8** of this report shows the dockside and on-the-water emergency work appears very light against the expense of two 24/7 fire personnel. Further, it appears the fire crew conducts non-9-1-1 incident customer services that in many other Southern California harbors is private sector work. This is in fact what Redondo Beach does in Basin 1. Then there is the need for police work and "landlord" work, such as rent collection, in Basin 3.

Finding #4: Citygate finds that the City has spread out harbor operations management across multiple City departments and one City contractor: City Economic Development, a Basin 1 contractor operator for non-9-1-1 issues, and the fire and police departments. Citygate suspects there is duplication of City coordination efforts and not enough use of a private company for boater support. Reconfiguration of fire/police boat staffing could well improve public safety agency response, generate small City savings, and simplify which agency does what in the waterside community in all three basins.

There are many positive aspects of the existing Harbor Patrol program. However, considering the complexities and current economics, there are overlapping technical areas which need to be reviewed more closely, including policing. In addition, a modern, integrated Harbor Patrol Master Plan should be developed.

Recommendation #1:	The City would be well-served to conduct an in-depth assessment regarding using contractors to provide typical private-sector boater services in all three basins and study how to cross-staff a hybrid police and fire response team on one first responder boat. This public safety team could also have nearby harbor area landside response duties.

2.3 OUTCOME EXPECTATIONS

SOC ELEMENT 2 OF 8
COMMUNITY OUTCOME EXPECTATIONS

The SOC process begins by reviewing existing emergency services outcome expectations. This includes determining for what purpose the response system exists and whether the governing body has adopted any response performance measures. If it has, the time measures used must be understood and sound data must be available to evaluate performance.

Current national best practice is to measure percent completion of a goal (e.g., 90 percent of responses) instead of an average measure. Mathematically, this is called a fractile measure.[5] Measuring the average only identifies the central or middle point of response time performance for all calls for service in the data set. Using an average makes it impossible to know how many incidents had response times that were far above or just above the average.

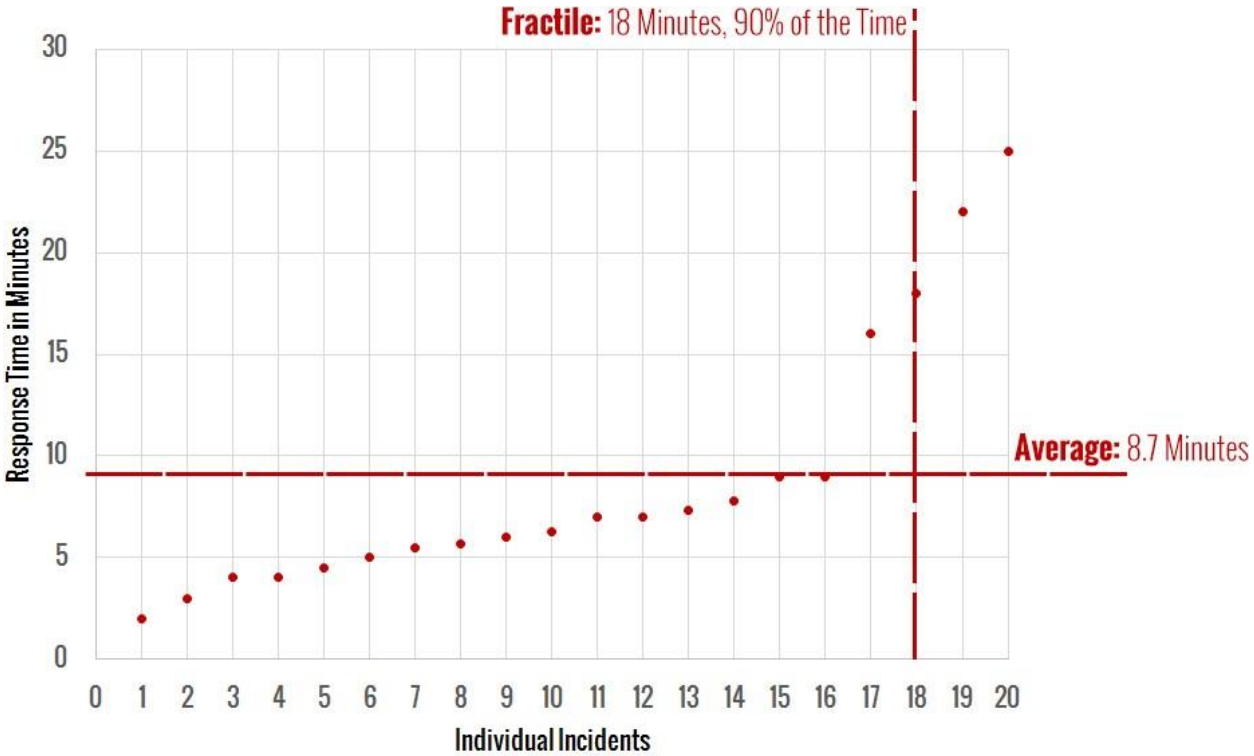
For example, the following figure shows response times for a fictitious fire department. This small agency receives 20 calls for service each month, and each response time has been plotted on the following graph from shortest response time to longest response time.

The graph shows the average response time is 8.7 minutes. However, the average response time fails to properly account for four calls for service with response times far exceeding a threshold in which positive outcomes could be expected. In fact, it is evident in that 20 percent of responses are far too slow and that this jurisdiction has a potential life-threatening service delivery problem. Average response time as a measurement tool for fire services is simply not sufficient. This is a significant issue in larger cities if hundreds or thousands of calls are answered far beyond the average point.

By using the fractile measurement with 90 percent of responses in mind, this small example jurisdiction has a response time of 18:00 minutes, 90 percent of the time. This fractile measurement is far more accurate at reflecting the service delivery situation of this small fictitious agency.

[5] A *fractile* is that point below which a stated fraction of the values lie. The fraction is often given in percent; the term percentile may then be used.

Figure 2—Fractile versus Average Response Time Measurements



More importantly, within the SOC process, positive outcomes are the goal. From that goal, crew size and response time can be calculated to allow appropriate fire station spacing (distribution and concentration). Emergency medical incidents include situations with the most severe time constraints. The human brain can only survive 4:00 to 6:00 minutes without oxygen. Cardiac arrest and other events can cause oxygen deprivation to the brain. While cardiac arrests make up a small percentage, 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 a 6:00- to 8:00-minute time frame. If fire service 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 the fire spreads beyond the room of origin.

Thus, from the time the 9-1-1 call is received by the dispatch center, 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, and the fire has grown to the point of leaving the room of origin and becoming very serious. Thus, the City needs a first-due response goal that is within a range to 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 from the time the fire engine starts to drive the response route. Ideally, the emergency is noticed immediately, and the 9-1-1 system is activated promptly. In the best of circumstances, this step of awareness—

calling 9-1-1 and giving the dispatcher accurate information—takes 1:00 minute. Crew notification and travel time take additional minutes. Upon arrival, the crew must approach the injured party or emergency, assess the situation, and appropriately deploy its skills and tools. Even in easy-to-access situations, this step can take 2:00 minutes or more. This time frame may be increased considerably due to long driveways, apartment buildings with limited access, multiple-story buildings or office complexes, or shopping centers.

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

For this report, total response time is the sum of 9-1-1 call processing / dispatch, crew turnout, and travel time, which is consistent with CFAI and NFPA best practice recommendations.

2.4 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.

2.4.1 Risk Assessment Methodology

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

- Identification of geographic planning sub-zones (risk planning 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 extent of impact* of a hazard occurrence by planning zone.
- Determination of the *probable impact severity* of a hazard occurrence by planning zone.
- Quantification of overall risk for each hazard based on *probability of occurrence* in combination with *impact extent* and *impact severity*.

2.4.2 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.

- 26 percent of the population is under 10 years or over 65 years of age.
- The service area population is predominantly White Alone (60 percent), followed Asian Alone (15 percent), Two or More Races (15 percent), Some Other Race Alone (6 percent), and Black Alone (3 percent).
- Of the population over 24 years of age, more than 96 percent has completed high school or equivalency.
- Of the population over 24 years of age, nearly 67 percent has an undergraduate, graduate, or professional degree.
- Median household income is slightly more than $128,000.
- The population below the federal poverty level is slightly more than 5 percent.

- Slightly more than 3 percent of the population does not have health insurance coverage.

Critical Infrastructure / Key Resources

The U.S. Department of Homeland Security defines critical infrastructure and 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 138 critical facilities and infrastructure, as shown in the following table. A hazard occurrence with significant consequence severity affecting one or more of these facilities would likely adversely impact critical public or community services.

Buildings

The city has over 30,000 residential housing units and 3,744 other businesses housing manufacturing, research, technology, office, professional services, retail sales, restaurants/bars, motels, churches, schools, storage, government facilities, healthcare facilities, and other occupancy types, as described in **Appendix A**.

2.4.3 Hazard Identification

Citygate utilized 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.

Subsequent to review and evaluation of the hazards identified in the City's 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:

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

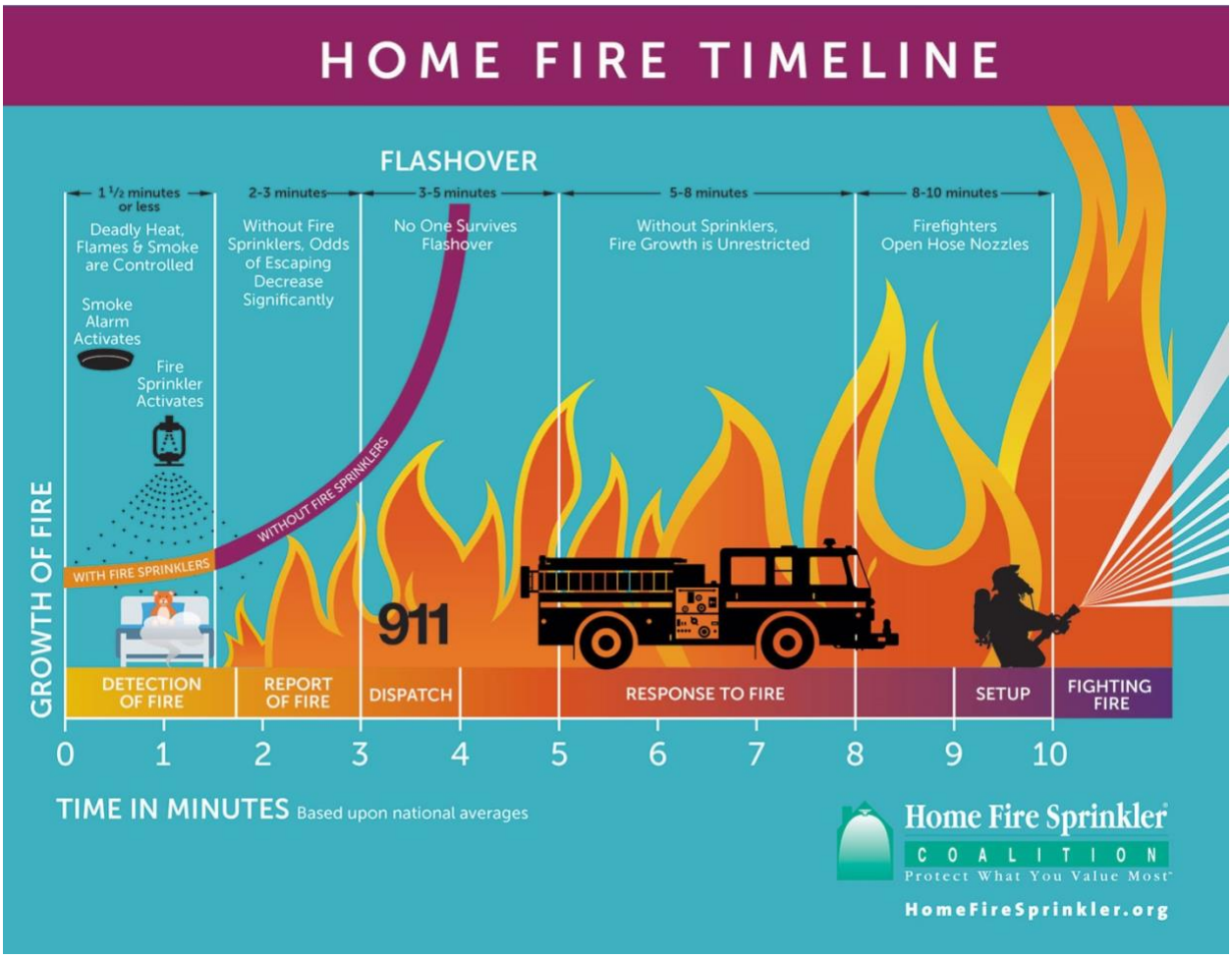
Because building fires and medical emergencies have the most severe time constraints if positive outcomes are to be achieved, the following is a brief overview of building fire and medical emergency risk. **Appendix A** contains the full risk assessment for all seven hazards.

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.

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 3—Building Fire Progression Timeline

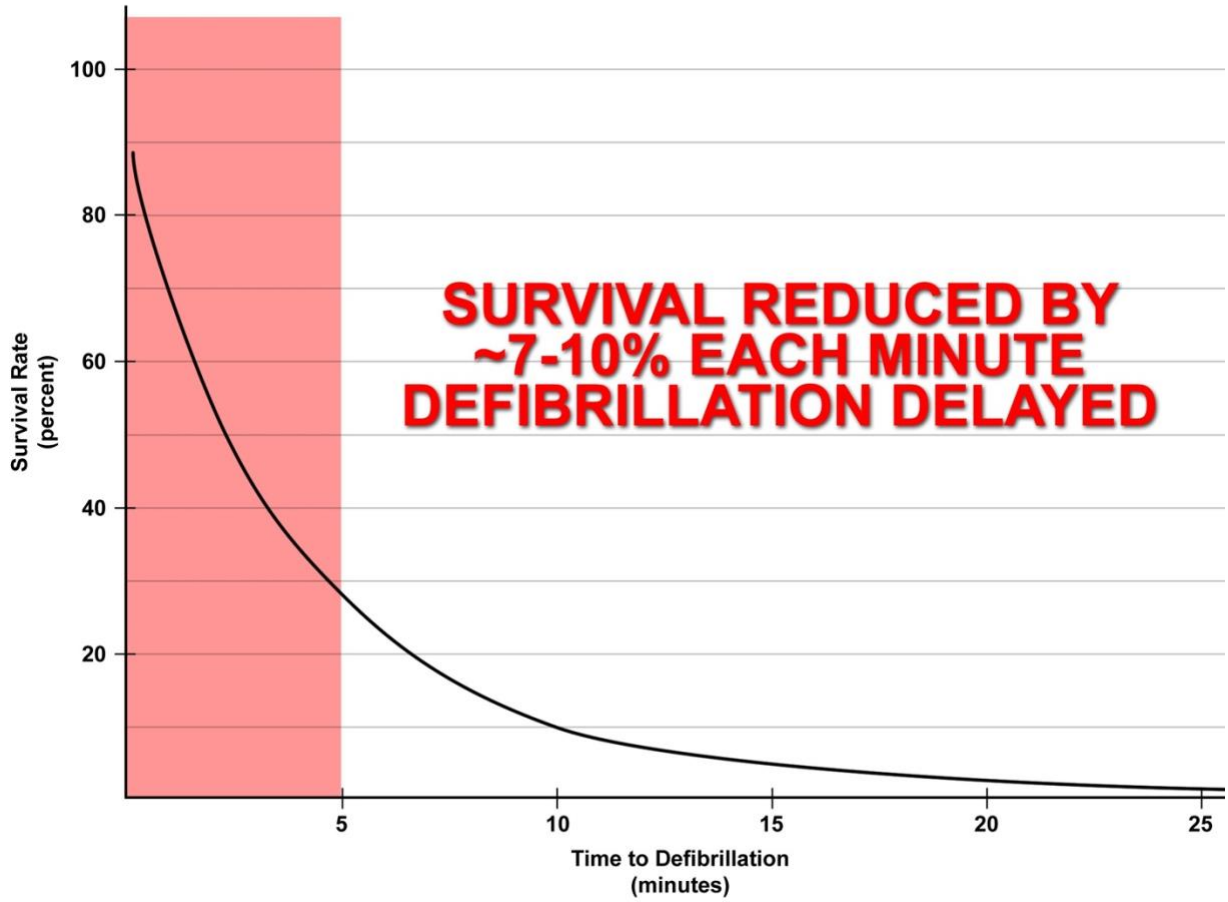


Source: http://www.firesprinklerassoc.org

Medical Emergency Risk

Fire agency service demand in most jurisdictions is predominantly for medical emergencies. The following figure illustrates the reduced survivability of a cardiac arrest victim as time to defibrillation increases.

Figure 4—Survival Rate versus Time of Defibrillation



The Department provides BLS and ALS pre-hospital emergency medical services with all response personnel trained to either the EMT or EMT-P level.

2.4.4 Risk Assessment Summary

The Department's overall risk for five hazards related to emergency services provided by the Department range from **Low** to **Moderate**, as summarized in the following table. See **Appendix A** for the full risk assessment.

Table 5—Overall Risk by Hazard

Hazard	Planning Zone		
	Station 1	Station 2	Station 3
Building Fire	Moderate	Moderate	Low
Medical Emergency	Moderate	Moderate	Moderate
Hazardous Material	Low	Low	Low
Technical Rescue	Moderate	Moderate	Moderate
Marine Incident	Low	Low	Moderate

2.5 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 critical task information to determine the number of firefighters needed within a time frame to achieve desired objectives on fire and emergency medical incidents. The following tables illustrate critical tasks typical of building fire and medical emergency incidents, including the minimum number of personnel required to complete each task. These tables are composites from Citygate clients in urban departments like that in Redondo Beach, with units staffed with three or four personnel per engine or ladder truck, and two per rescue. It is important to understand the following relative critical task performance:

- It can take a considerable amount of time after a task is ordered by command to complete the task and achieve the desired outcome.
- Task completion time is usually a function of the number of personnel that are *simultaneously* available. The fewer firefighters available, the longer some tasks will take to complete. Conversely, with more firefighters available, some tasks are completed concurrently.
- Some tasks must be conducted by a minimum of two firefighters to comply with safety regulations. For example, two firefighters are required to search a smoke-filled room for a victim.

2.5.1 Critical Firefighting Tasks

The following table illustrates the critical tasks required to control a typical single-family dwelling fire with eight response units, including three engines, one ladder truck, two rescues, one squad, and one chief officer, for a total Effective Response Force (ERF) of 20 personnel. These tasks are

taken from typical fire departments' operational procedures, which are consistent with the customary findings of other agencies using the SOC process. No conditions exist to override the Occupational Safety and Health Administration (OSHA) two-in/two-out safety policy, which requires that firefighters enter atmospheres, such as building fires, that are immediately dangerous to life and health in teams of two while two more firefighters are outside and immediately ready to rescue them should trouble arise.

Scenario: Simulated approximately 2,000-square-foot, two-story, single-family residential fire with unknown rescue situation. Responding companies receive dispatch information typical for a witnessed fire. Upon arrival, they find approximately 50 percent of the second floor involved in fire.

Table 6—First Alarm Residential Fire Critical Tasks (20 Personnel)

Critical Task Description		Personnel Required
First-Due Engine (3 Personnel)		
1	Conditions report	1
2	Establish supply line to hydrant	2
3	Deploy initial fire attack line to point of building access	1–2
4	Operate pump and charge attack line	1
5	Establish incident command	1
6	Conduct primary search	2
Second-Due Engine (3 Personnel)		
1	If necessary, establish supply line to hydrant	1–2
2	Secure utilities	2
3	Deploy a backup attack line	1–2
4	Establish the first attack line or provide initial Rapid Intervention Team	2–3
First-Due Ladder Truck (4 Personnel)		
1	Conduct initial search and rescue, if not already completed	2-3
2	Deploy ladders to roof	1–3
3	Establish horizontal or vertical building ventilation	1–2
4	Open concealed spaces as required	2–3
First-Due Chief Officer		
1	Transfer of incident command	1
2	Establish exterior command and incident safety	1
Third-Due Engine (3 Personnel)		
1	Deploy the Rapid Intervention Team	2
2	Conduct secondary search	2
3	Assist suppression effort as directed	2–3
First-Due Rescue (2 Personnel)		
1	Establish Incident Rehab	2
Second-Due Rescue (2 Personnel)		
1	Assist other companies as assigned	2
First-Due Squad (2 Personnel)		
1	Assist other companies as assigned	2

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

Some studies have shown that a small fire can spread to engulf an entire room in fewer than 3:00 to 5:00 minutes after free burning has started. Once the room is completely superheated and involved in fire (known as flashover), the fire will spread quickly both vertically and horizontally throughout the structure. For this reason, it is imperative that fire suppression and search/rescue operations commence before the flashover point occurs if the outcome goal is to keep the fire damage in or near the room of origin and to rescue persons unable to self-evacuate. In addition, flashover presents a life-threatening situation to both firefighters and any occupants of the building. Fire fatalities typically include persons under 10 and over 65 years of age and those unable to self-evacuate, and 26 percent of the population falls within those age groups.

2.5.2 Critical Medical Emergency Tasks

The Department responds to more than 5,670 EMS incidents annually, including vehicle accidents, strokes, heart attacks, difficulty breathing, falls, childbirths, and other medical emergencies.

For comparison, the following table summarizes the critical tasks required for a cardiac arrest patient.

Table 7—Cardiac Arrest Critical Tasks – 1 Engine or Truck and 1 Ambulance (5–6 Personnel)

Critical Task		Personnel Required	Critical Task Description
1	Chest compressions	1–2	Compression of chest to circulate blood
2	Ventilate/oxygenate	1–2	Mouth-to-mouth, bag-valve-mask, apply O_2
3	Airway control	1–2	Manual techniques/intubation/cricothyroidotomy
4	Defibrillate	1–2	Electrical defibrillation of dysrhythmia
5	Establish I.V.	1–2	Peripheral or central intravenous access
6	Control hemorrhage	1–2	Direct pressure, pressure bandage, tourniquet
7	Splint fractures	2–3	Manual, board splint, HARE traction, spine
8	Interpret ECG	2	Identify type and treat dysrhythmia
9	Administer drugs	2	Administer appropriate pharmacological agents
10	Spinal immobilization	2–5	Prevent or limit paralysis to extremities
11	Extricate patient	3–4	Remove patient from vehicle, entrapment
12	Patient charting	1–2	Record vitals, treatments administered, etc.
13	Hospital communication	1–2	Receive treatment orders from physician
14	Treat en route to hospital	2–3	Continue to treat/monitor/transport patient

2.5.3 Critical Task Analysis and Effective Response Force (ERF) Size

The time required to complete the critical tasks necessary to stop the escalation of an emergency (as shown in Table 6 and Table 7) must be compared to outcomes. As stated, after approximately 3:00 to 5:00 minutes of free burning in an enclosed room, fire will escalate to the point of flashover. At this point, the entire room is engulfed in fire, the entire building becomes threatened, and human survival near or in the room of a fire's origin becomes impossible. Additionally, brain death begins to occur within 4:00 to 6:00 minutes of the heart stopping. Thus, the ERF must arrive in time to prevent these emergency events from becoming worse.

The Department's daily on-duty response staffing of 20 is sufficient to deliver slightly more than an NFPA minimum ERF of 16-17 personnel[6] to a low- or medium-hazard building fire.

Mitigating an emergency event is a team effort once the units have arrived. This refers to the *weight* of response analogy; if too few personnel arrive too slowly, the emergency will escalate instead of improving. The outcome times, of course, will be longer and yield less-desirable results if the arriving force is later or smaller.

[6] NFPA 1710 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations and Special Operations to the Public by Career Fire Departments (2020 Edition).

The number of personnel and the arrival timeframe can be critical in a serious fire. Fires in older or multiple-story buildings could require the initial firefighters to rescue trapped or immobile occupants. If the ERF is too small, rescue and fire suppression tasks *cannot* be conducted simultaneously. Thus, achieving good performance requires *adequate staffing* (and training).

Fires and complex medical incidents require additional units to arrive in time to complete an effective intervention. Time is one factor that comes from *proper station placement and the staffing model used*. When fire stations are spaced too far apart and one unit must cover another unit's area or multiple units are needed, the units can be too far away, and the emergency will escalate and result in a less-than-desirable outcome. Thus, some overlapping coverage between fire stations is needed.

Previous critical task studies conducted by Citygate and NFPA Standard 1710 identify that all units need to arrive at a building fire with a minimum of 17 firefighters within 11:30 minutes (from the time of a 9-1-1 call) to *simultaneously and effectively* perform the tasks of rescue, fire suppression, and ventilation.

If fewer firefighters arrive, all tasks may not be completed. Most likely, the search team would be delayed, as would ventilation. The attack lines would only consist of two firefighters, which does not allow for rapid movement of the hose line above the first floor in a multiple-story building. Because rescue is conducted with at least two two-person teams, when rescue is essential, other tasks are not completed in a simultaneous, timely manner. Therefore, effective deployment is about the **speed** *(travel time)* and the **weight** *(number of firefighters)* of the response.

The fact that the Department's 90th percentile ERF call-to-arrival performance over the three years of data studied was 12:57 minutes reflects a commitment to confining building fires to or near the room of origin and preventing the spread of fire to adjoining buildings.

2.6 Distribution and Concentration Studies—How the Location of First-Due and First Alarm Resources Affects Emergency Incident Outcomes

SOC Element 5 of 8
Distribution Study

SOC Element 6 of 8
Concentration Study

The Department's service area is currently served by two fire stations and the Harbor Patrol Boat/Squad station in the marina. When using geographic mapping tools, it is appropriate to understand what the existing station spacing does and does not cover within travel time goals; if there are any coverage gaps needing one or more 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 control routine emergencies and achieve desired outcomes before they escalate and require additional resources.

- **Concentration** – the spacing of fire stations sufficiently close to each other so that more complex emergency incidents can quickly receive sufficient resources from multiple fire stations. As indicated, this is known as the Effective Response Force (ERF) or, more commonly, the First Alarm Assignment—the collection of a sufficient number of firefighters on scene, delivered within the concentration time goal to stop the escalation of the problem.

To analyze first-due fire unit travel time coverage, Citygate used a geographic mapping tool that measures theoretical travel time over a road network. For this calculation, Citygate used the base map and street travel speeds calibrated to actual fire apparatus travel times from previous responses to simulate real-world travel time coverage. Using these tools, Citygate ran several deployment tests and measured their impact on various parts of the service area. We evualated both a 4:00-minute and 5:00-minute travel time for first-due for first due coverage across the City, consistent with best practice response performance goals for positive outcomes in urban/suburban areas. A 5:00-minute travel time is also used in congested urban areas to show how much more coverage can be gained in only one additional minute of travel.

2.6.1 Deployment Baselines

Map #1 – General Geography, Station Locations, and Response Resource Types

Map #1 shows the Department's service area boundary and fire station locations, including neighboring fire agency stations. This is a reference map for other maps that follow.

Map #2 – Risk Assessment Planning Zones

Map #2 displays the fire station primary service areas which this study also uses to quantify and assess the risks to be protected by the Department.

Map #2a – Risk Assessment: Population Density

Map #2a shows the resident population density across the City. People drive EMS incident demand, so the higher population density areas are typically the higher EMS demand locations. As the map shows, the City's fire stations are located in the most densely populated areas.

Map #3 – Distribution: 4:00 and 5:00-Minute First-Due Travel Time Coverage

The purpose of response time modeling is to determine response time coverage across a jurisdiction's geography and station locations. This geo-mapping design is then validated against dispatch time data to reflect actual response times.

Map #3 shows total public road miles in the City that a fire engine should be expected to reach within a 4:00- and 5:00-minute *travel time* assuming the respective engine is in station and encounters no traffic congestion. In Citygate's experience and opinion, this level of coverage is good for urban population density areas such as Redondo Beach.

The north-central and northeast edges of the City are just beyond the fifth minute of travel; however, these two areas are 1.5 miles *distance* or less from one of two County fire stations: Station #160 at 5323 Rosecrans Avenue, Hawthorne on the north, and Station #121 at 4312 W. 147th Street, Lawndale to the northeast.

Historically, the Insurance Service Office (ISO) has used a 1.5 mile distance radius for the spacing of fire stations and this typically converts to a little less than 4:00-minutes travel time depending on the road network design.

Map #3a – Distribution: 4:00 Minute First-Due Travel Time Coverage From Los Angeles County Fire Stations in the North City

There are two County fire stations just north and northeast of the City limits. Map #3a shows their 4:00-minute time into the City. At 4:00 minutes, the coverage only overlaps a small area (in yellow) of Fire Station 2's 4:00-minute coverage and does extend some into the Space Park business area.

Map #3b – Distribution: 5:00 Minute First-Due Travel Time Coverage From Los Angeles County Fire Stations in the North City

This map measures the travel time at 5:00 minutes from the two County stations. In just one more minute of travel, the two County fire stations cover all the way to Station 2's 5:00-minute reach; in the red highlight areas, the coverage of two or all three stations significantly overlaps.

Fire Station Distribution Travel Time Coverage – City Only Stations

The GIS model also measures the road miles covered from each station within a specified time interval, as summarized in the following table.

Table 8—4:00-Minute and 5:00-Minute Travel Time Coverage Summary

Travel Time Measure	Total Public Road Miles	Road Miles Covered	Percent Total Road Miles Covered
4:00-min First Due Engine	135	105	77.7%
5:00-min First Due Engine	135	126	93.0%

Finding #5:	The Department's current two fire station locations can be expected to deliver 4:00-minute first-unit travel time coverage to the most densely populated areas of the City.
Finding #6:	The two fire stations should be expected to deliver 5:00-minute first-unit travel time coverage to 93 percent of the City's public streets. In Citygate's experience this is *excellent* coverage and one that many other communities can only strive for.
Finding #7:	Two County fire stations could provide mutual support in the north City limit areas in 4:00 to 5:00 minutes driving time, largley negating the need for a City fire station well to the north of Fire Station 2. Even if a station were added, much of that station's sevice reach would extend into the three neighboring cities.

2.7 Statistical Analysis

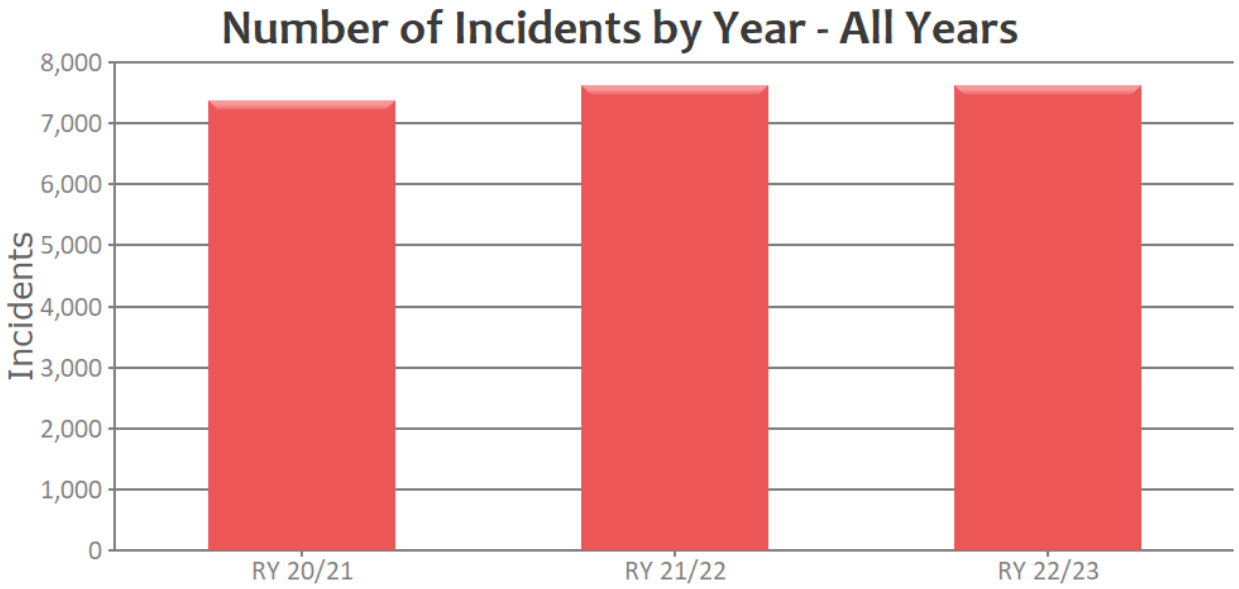
SOC Element 7 of 8
Reliability and Historical Response Effectiveness Studies

While travel time maps can show the ideal situation for response times and response effectiveness given perfect conditions, examination of the actual response time data provides a picture of actual response performance with simultaneous calls, rush hour traffic congestion, units out of position, and delayed travel time for events such as periods of severe weather. The following subsections provide summary statistical information regarding the Department and its services.

2.7.1 Demand for Service

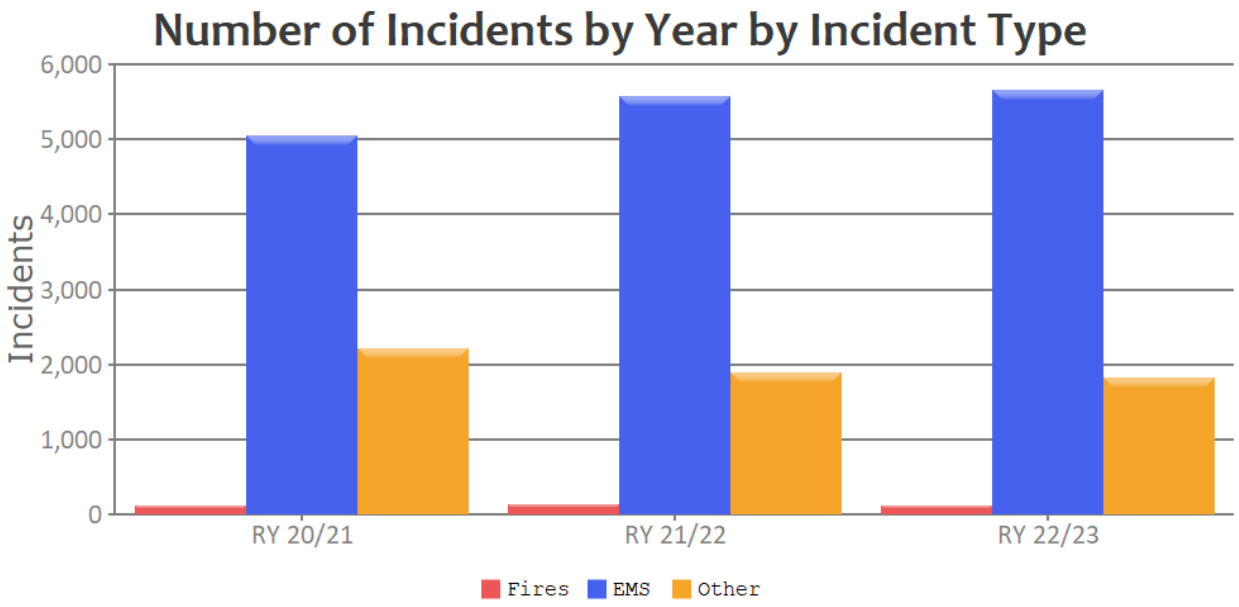
The Department responded to a total of 7,616 incidents from July 1, 2022 through June 30, 2023 for a daily demand of 20.87 incidents of which 1.65 were fire incidents, 74.45 percent were EMS incidents, and the remaining 23.9 percent were "other" incident types. The following figure summarizes total service demand over the most recent three fiscal years.

Figure 5—Annual Service Demand by Year



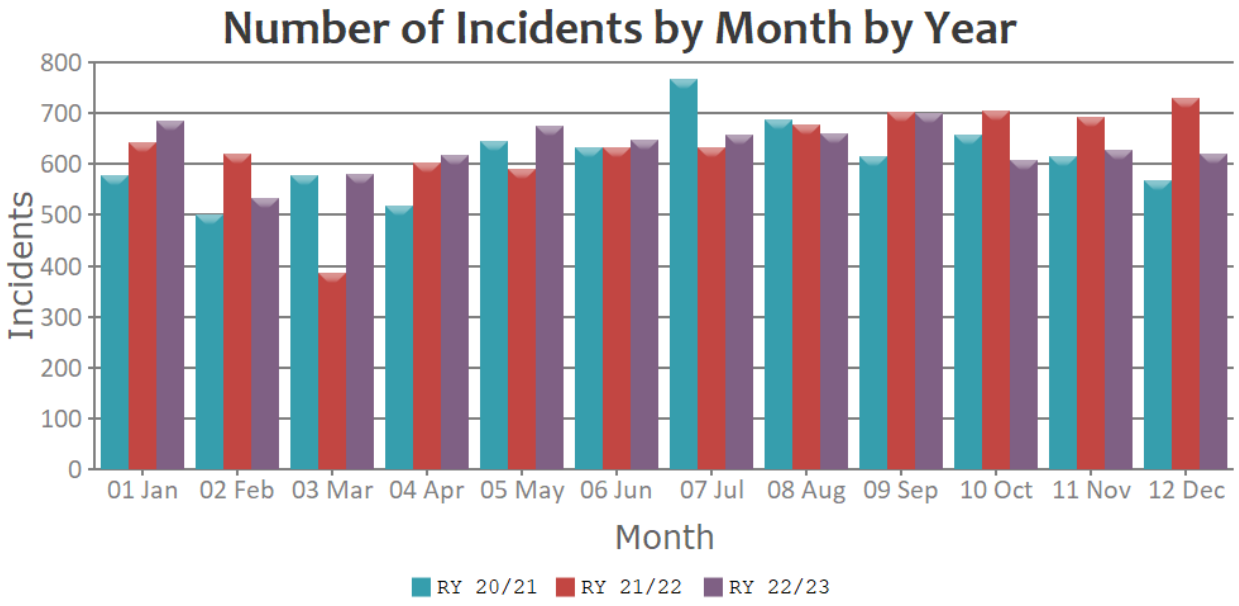
The following figure illustrates service demand by general incident type and year. Note that while the number of EMS incidents continues to increase, the number of "other" calls for service declined.

Figure 6—Annual Service Demand by Incident Type



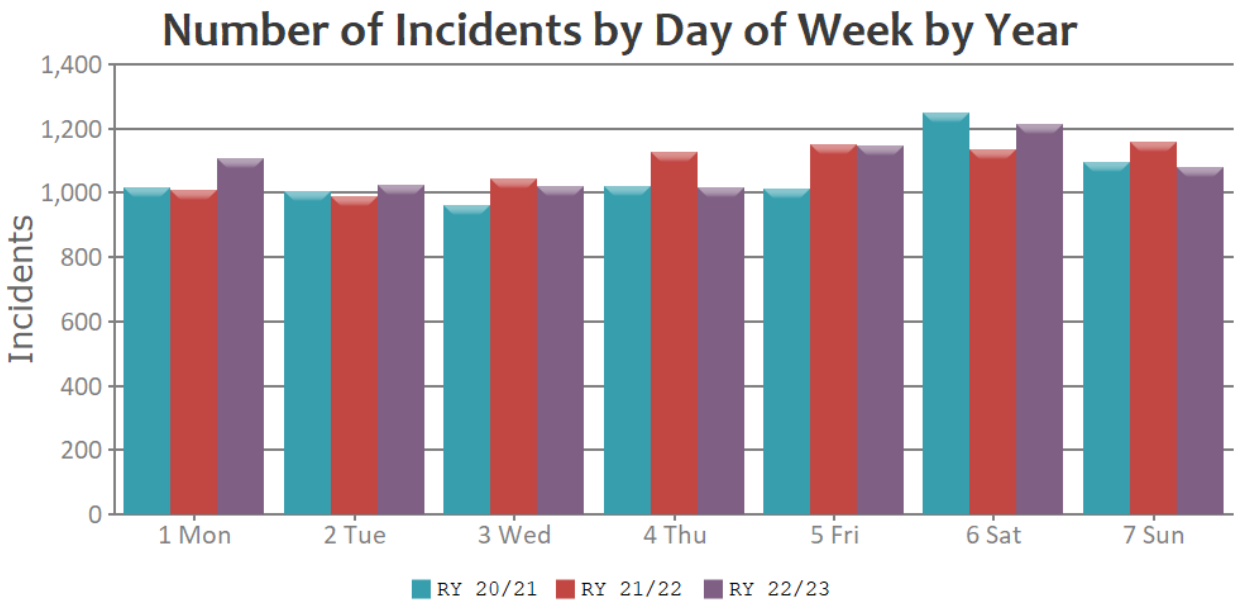
The following figure illustrates service demand by month and year.

Figure 7—Service Demand by Month



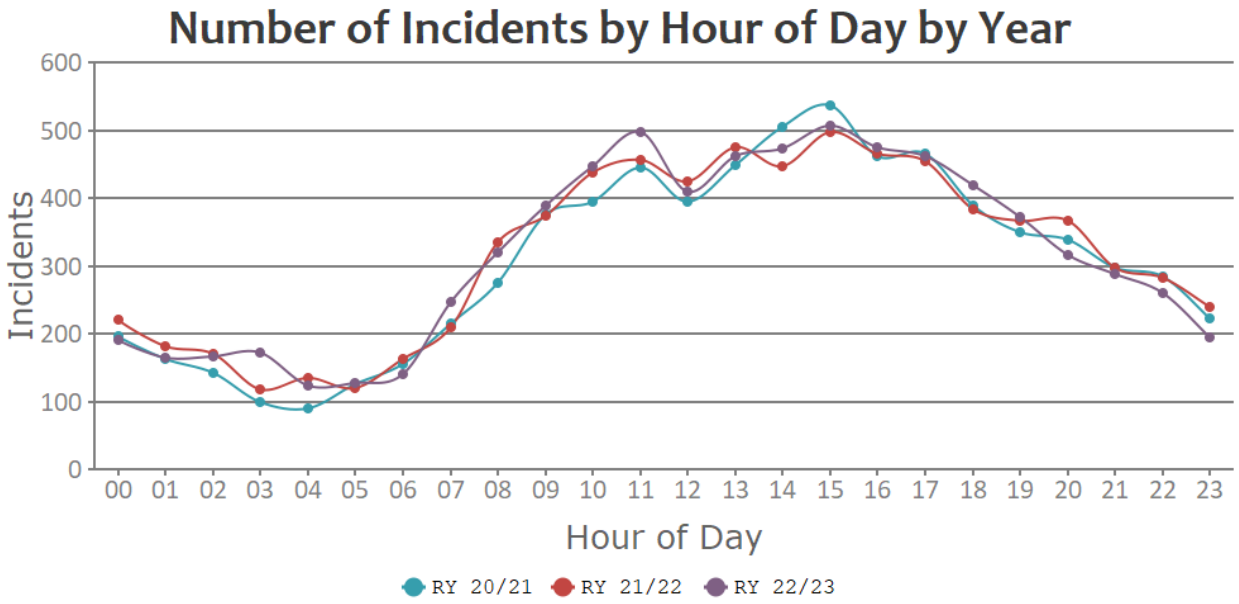
The following shows service demand by day of week, with a slight increase on weekends.

Figure 8—Service Demand by Day of Week



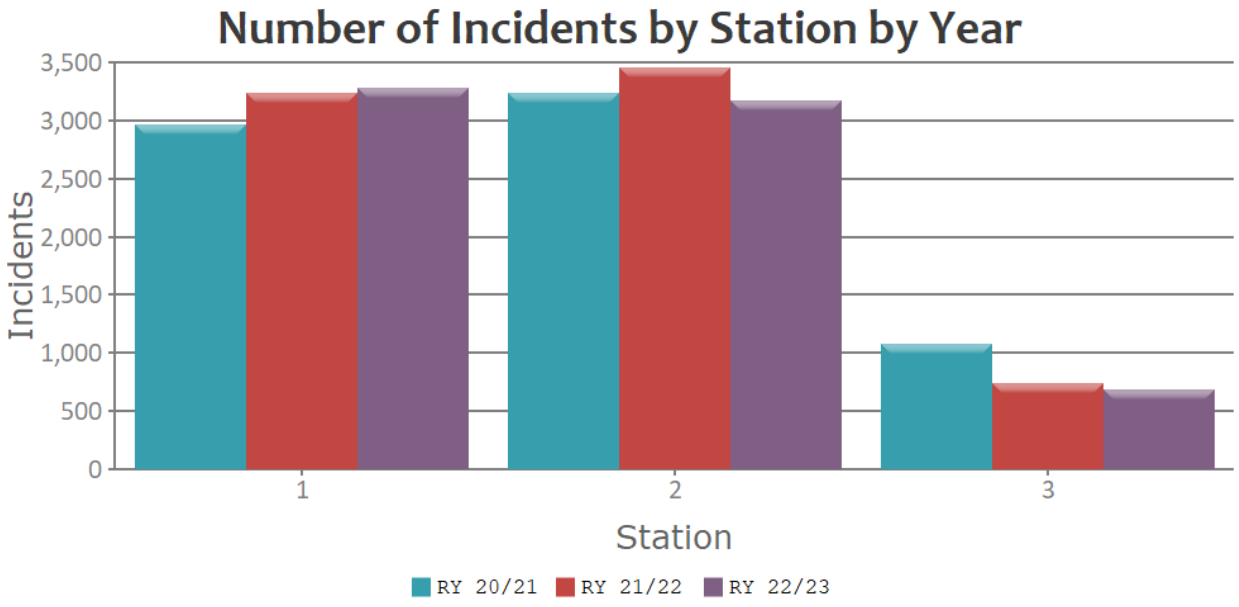
The following figure shows service demand by hour of day, illustrating that calls for service, occur at every hour of the day and night, with peak service demand occurring from approximately 9:00 a.m. through 6:00 p.m.

Figure 9—Service Demand by Hour of Day and Year



The following figure illustrates the number of incidents by station over the three-year study period. Incident volume for Station 1 is growing slightly each year. Incident volume for Station 2 peaked in RY 21/22, while documented incidents for Station 3 have shown a slight decline.

Figure 10—Service Demand by Station



Finding #8: There is a constant, predictable demand for service across all hours of the month, week, and day, with overall annual demand increasing slightly.

2.7.2 Incident Quantity by Incident and Property Types

The following table summarizes service demand by NFIRS 5 incident code that identifies the type of incident more specifically. Note the high ranking of EMS incident types. System alarms were second by frequency, followed by "canceled en route" incidents. "No incident found" ranked 10th by volume over the three-year study period, while building fires ranked 16th. Only incident types with more than 100 occurrences over the three-year period are shown.

Table 9—Incident Type Summary by Year

Incident Type	RY 20/21	RY 21/22	RY 22/23	Total
321 EMS call, excluding vehicle accident with injury	4,481	4,997	4,934	**14,412**
745 Alarm system sounded, no fire – unintentional	424	506	377	**1,307**
611 Dispatched & canceled en route	322	269	225	**816**
322 Vehicle accident with injuries	237	276	274	**787**
552 Police matter	422	213	98	**733**
365 Watercraft rescue	218	174	234	**626**
551 Assist police or another governmental agency	236	178	110	**524**
444 Power line down	197	149	168	**514**
553 Public service	137	81	110	**328**
622 No incident found on arrival of incident address	121	90	64	**275**
520 Water problem, other	61	81	84	**226**
411 Gasoline or other flammable liquid spill	50	54	57	**161**
746 Carbon monoxide detector activation, no CO	55	40	51	**146**
353 Removal of victim(s) from stalled elevator	32	56	57	**145**
550 Public service assistance, other	27	38	75	**140**
111 Building fire	28	50	41	**119**
151 Outside rubbish, trash, or waste fire	39	41	36	**116**
412 Gas leak (natural gas or LPG)	29	39	45	**113**

The following table summarizes service demand by property use. The highest rankings are residential dwellings and open ocean. Only property types with more than 100 instances over the three-year period are shown.

Table 10—Incident Type by Property Use by Year

Property Use	RY 20/21	RY 21/22	RY 22/23	Total
429 Multifamily dwellings	1,489	1,568	1,488	**4,545**
419 1- or 2-family dwelling	1,394	1,504	1,407	**4,305**
400 Residential, other	511	590	897	**1,998**
941 Open ocean, sea or tidal waters	510	278	356	**1,144**
BLANK	443	454	222	**1,119**
960 Street, other	227	300	477	**1,004**
900 Outside or special property, other	155	245	233	**633**
500 Mercantile, business, other	184	241	206	**631**
519 Food and beverage sales, grocery store	254	245	125	**624**
962 Residential street, road or residential driveway	257	160	159	**576**
449 Hotel/motel, commercial	215	163	154	**532**
361 Jail, prison (not juvenile)	143	156	123	**422**
961 Highway or divided highway	142	128	95	**365**
340 Clinics, Doctors' offices, hemodialysis centers	94	145	116	**355**
937 Beach	96	103	90	**289**
311 24-hour care Nursing homes, 4 or more persons	86	70	106	**262**
PROPERTY USE NOT DEFINED	72	97	73	**242**
161 Restaurant or cafeteria	77	61	97	**235**
599 Business office	108	75	34	**217**
439 Boarding/rooming house, residential hotels	80	78	53	**211**
965 Vehicle parking area	35	58	85	**178**
581 Department or discount store	41	43	68	**152**
580 General retail, other	43	53	52	**148**
963 Street or road in commercial area	35	55	50	**140**
898 Dock, marina, pier, wharf			136	**136**
571 Service station, gas station	49	41	37	**127**
215 High school/junior high school/middle school	25	47	43	**115**
549 Specialty shop	50	35	20	**105**
882 Parking garage, general vehicle	41	47	13	**101**

2.7.3 Simultaneous Incident Activity

Simultaneous incidents occur when other incidents are underway at the time a new incident begins. For Report Year (RY) 2022/23, 34.13 percent of calls for service occurred while one or more other incidents were underway.

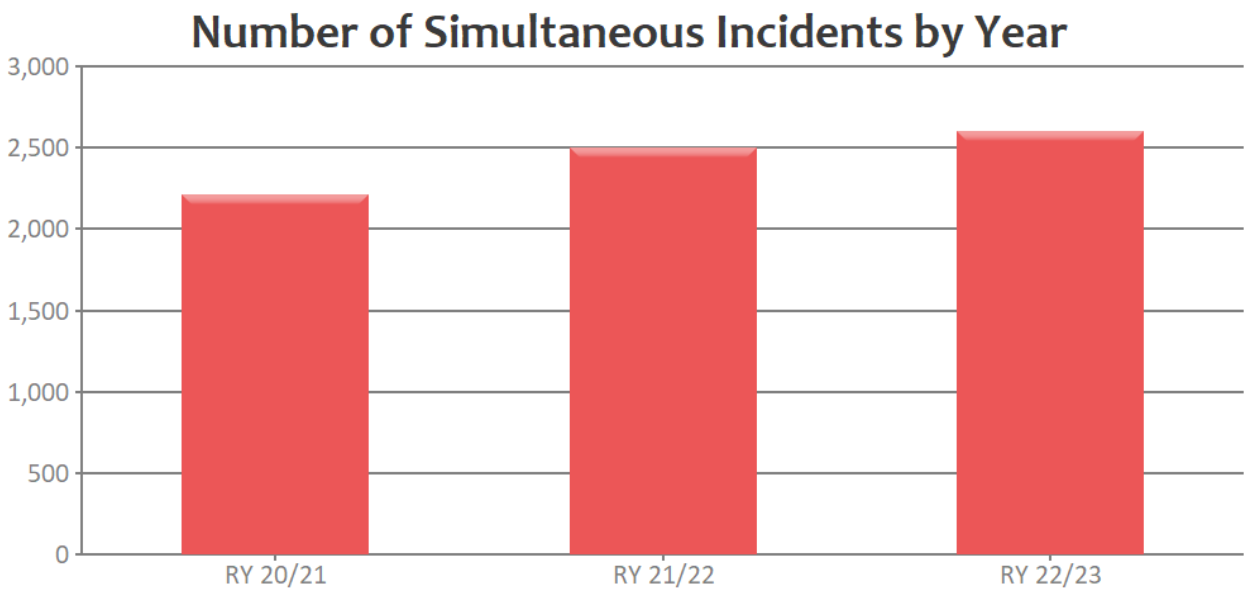
The following table summarizes simultaneous incident occurrence for RY 22/23.

Table 11—Simultaneous Incident Activity (RY 22/23)

Number of Simultaneous Incidents	Percent of Occurrence
1 or more	34.13%
2 or more	7.22%
3 or more	1.08%
4 or more	0.20%

The following figure shows that the number of simultaneous incidents is increasing each year.

Figure 11—Simultaneous Incident Activity by Year

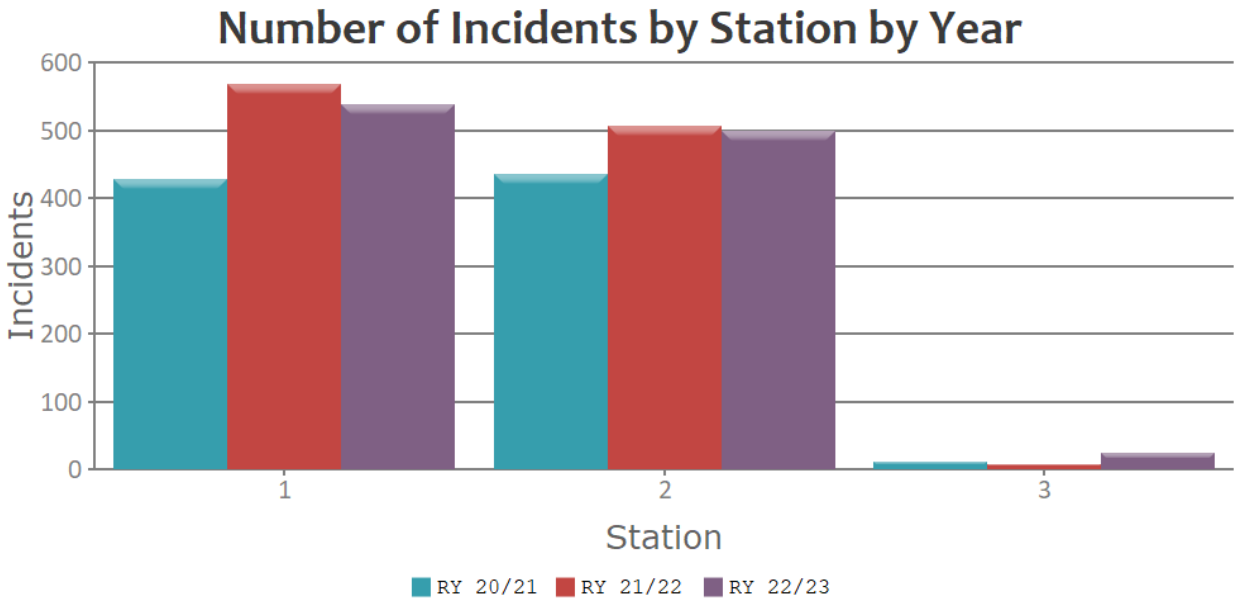


In a larger city, simultaneous incidents in different station areas have very little operational consequence. However, when simultaneous incidents occur within a single station area, there can be significant delays in response times.

The following figure illustrates the number of single-station simultaneous incidents by station area by year, with Station 1 having the greatest number of in-station-area simultaneous incidents. There

was a significant increase in simultaneous incident activity for Station 1 and Station 2 from RY 20/21 to RY 21/22.

Figure 12—Number of Incidents by Station by Year



Finding #9:	While two or more simultaneous calls for service occur 34 percent of the time, three or more occur just 7.2 percent of the time. This reduction to three or more is beneficial and lessens the need for frequent automatic/mutual aid from outside of the Department for single-responder incidents.

2.7.4 Unit-Hour Utilization

The unit-hour utilization percentage for apparatus is calculated using the number of responses and the duration of those responses to show the percentage of time a unit is committed to an active incident during a given hour of the day. In Citygate's experience, a unit-hour utilization of 30 percent or higher over *multiple consecutive hours* becomes the point at which other responsibilities, such as training, do not get completed.

The following table summarizes incident activity by unit by hour of day for the City's engine companies in RY 22/23. The utilization percentage for apparatus is calculated by two primary factors: (1) the number of responses, and (2) the duration of responses. In the table, the busiest engines are listed first.

Table 12—Unit-Hour Utilization – Engines (RY 22/23)

Hour of Day	E61	E62	E64
00:00	4.82%	5.94%	6.37%
01:00	4.25%	4.28%	4.21%
02:00	3.19%	4.17%	4.31%
03:00	3.34%	3.87%	3.32%
04:00	3.16%	4.32%	2.68%
05:00	3.40%	2.98%	2.59%
06:00	4.00%	3.54%	3.87%
07:00	5.53%	6.25%	5.09%
08:00	7.25%	6.20%	5.94%
09:00	8.26%	7.90%	7.37%
10:00	8.96%	9.18%	7.31%
11:00	9.01%	9.66%	8.34%
12:00	8.33%	7.23%	8.69%
13:00	9.60%	8.21%	8.59%
14:00	10.72%	10.29%	7.69%
15:00	9.50%	9.63%	9.00%
16:00	9.16%	10.43%	8.68%
17:00	9.46%	10.57%	9.79%
18:00	11.31%	9.13%	8.04%
19:00	7.71%	7.56%	7.40%
20:00	8.80%	7.39%	8.91%
21:00	6.98%	6.01%	7.44%
22:00	7.41%	6.43%	7.80%
23:00	4.13%	4.97%	5.63%

The following table summarizes incident activity by hour of day for the City's ladder company in RY 22/23.

Table 13—Unit-Hour Utilization – Ladder (RY 22/23)

Hour of Day	T61
00:00	3.27%
01:00	3.31%
02:00	3.63%
03:00	3.42%
04:00	1.51%
05:00	2.51%
06:00	2.64%
07:00	4.99%
08:00	5.19%
09:00	5.50%
10:00	6.75%
11:00	6.98%
12:00	6.40%
13:00	7.60%
14:00	6.41%
15:00	8.09%
16:00	7.94%
17:00	7.67%
18:00	8.59%
19:00	7.14%
20:00	6.23%
21:00	4.39%
22:00	5.31%
23:00	3.72%

The following table summarizes incident activity by hour of day for the City's EMS apparatus in RY 22/23, with the busiest units listed first.

Table 14—Unit-Hour Utilization – EMS Apparatus (RY 22/23)

Hour of Day	R61	R62	R63
00:00	10.76%	10.03%	0.47%
01:00	7.88%	8.50%	0.00%
02:00	7.60%	10.82%	0.00%
03:00	7.73%	9.36%	0.00%
04:00	5.36%	5.22%	0.00%
05:00	6.34%	6.33%	0.00%
06:00	6.68%	6.73%	0.00%
07:00	11.09%	12.53%	0.00%
08:00	13.97%	13.60%	0.09%
09:00	15.99%	16.83%	0.43%
10:00	20.75%	20.73%	6.37%
11:00	20.81%	16.63%	0.26%
12:00	17.47%	18.27%	1.16%
13:00	21.52%	20.68%	0.65%
14:00	22.57%	21.89%	1.98%
15:00	22.40%	21.42%	0.45%
16:00	23.54%	19.42%	0.96%
17:00	22.34%	20.63%	1.61%
18:00	18.27%	18.99%	2.56%
19:00	20.18%	19.32%	1.13%
20:00	18.00%	15.51%	1.31%
21:00	12.15%	13.03%	0.62%
22:00	9.42%	14.26%	0.16%
23:00	8.60%	10.25%	0.00%

Finding #10: Unit-hour utilization rates are not approaching Citygate's recommended 30 percent saturation rate over multiple consecutive hours, even for the EMS Rescues. If both EMS Rescues are busy, with an engine each also on their incident, there is still an engine and the ladder likely available for concurrent incidents.

2.7.5 Operational Performance

Measurements for the performance of the first response apparatus to arrive at emergency incidents are the number of minutes and seconds necessary for 90 percent completion of the following response components:

- Call processing / dispatch
- Crew turnout
- Travel
- Call to arrival

In the measures to follow, only fire and EMS incidents are used, and not others. This ensures an analysis of the most acute emergencies.

Call Processing / Dispatch

Call processing measures the time interval from the first incident timestamp in the Redondo Beach Police Department Emergency Communications Center until completion of the dispatch notification. Call processing performance depends on what is being measured. If the first incident timestamp takes place at the time the public-safety answering point (PSAP) physically answers a 9-1-1 call (at times, calls can briefly be held in queue), then call processing begins at *PSAP time*, which is the case in Redondo Beach.

In addition, not all requests for assistance are received via landline 9-1-1. Generally, there are numerous ways that requests for assistance are received, including landline telephone, cellular telephone, SMS text message, fire, or police officer-initiated requests, TTY/TDD operator, etc., that each have a separate 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 15—Call Processing Analysis by Station by Year

Station	Overall	RY 20/21	RY 21/22	RY 22/23
Department-Wide	1:32	2:25	1:37	1:25

Finding #11: Call processing / dispatch performance *is meeting* Citygate's recommended 1:30-minute best practice goal to facilitate positive outcomes.

Crew Turnout

Crew turnout measures the time interval from completion of the dispatch notification until the start of vehicle movement to the emergency incident. While the NFPA[7] recommends 1:00 to 1:20 minutes for crew turnout depending on the type of protective clothing that must be donned, Citygate has found that few agencies can meet that performance standard, and thus has long recommended 2:00 minutes (averaged across a 24-hour day) as an achievable goal for on-duty station personnel.

The following table summarizes 90th percentile crew turnout performance and shows that while overall performance over the three-year study period is somewhat slower than the 2:00-minute goal, performance has improved each of the last two years and met the goal in RY 22/23.

Table 16—90th Percentile Crew Turnout Performance (Urgent EMS Incidents)

Station	Overall	RY 20/21	RY 21/22	RY 22/23
Department-Wide	2:16	2:30	2:08	2:01

Finding #12: Crew turnout performance over the three-year data set was somewhat slower than the Citygate-recommended 2:00-minute best practice goal; however, perfomance improved over the past two fiscal years and essentially met the goal for RY 22/23. Reasonable focus and accountability will help maintain this performance level.

First-Unit Travel

First-unit travel measures the time interval from the start of apparatus travel until arrival at the emergency incident. In most urban/suburban jurisdictions, a 90th percentile first-unit travel time goal of 4:00 minutes[8] would be considered highly desirable to achieve desired outcomes.

As the following table shows, 90th percentile first unit travel performance was slightly more than 1:30 minutes (40 percent) *slower* than the 4:00-minute goal.

Table 17—90th Percentile First-Unit Travel Performance

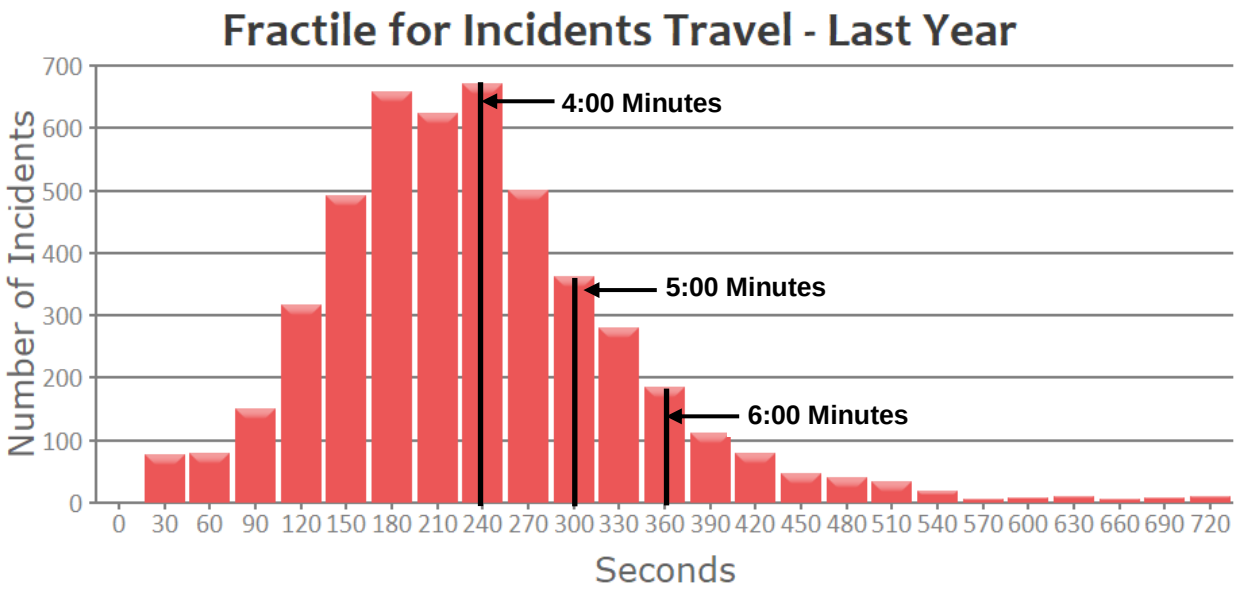
Station	Overall	RY 20/21	RY 21/22	RY 22/23
Department-Wide	**5:35**	5:24	5:35	5:46

The following figure shows fractile first-unit travel performance in 30-second increments for RY 22/23, with peak performance occurring at 240 seconds (4:00 minutes). There is, however, a

[7] NFPA 1710 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operation to the Public by Career Fire Departments (2020 Edition).

significant number or incidents after the 240-second mark indicating that while many incidents can be reached within the first 4:00 minutes of travel, there are still some incidents that require a travel time into the fifth minute and longer.

Figure 13—Travel Fractile Analysis (RY 22/23)



In RY 22/23, Station 1 had reached 88.9 percent of its incidents by the end of the fifth minute, and Station 2 had reached 75 percent. In the area of Station 3 at the harbor, 90 percent of the incidents were reached by 7:30 minutes.

Finding #13:	At 5:46 minutes in RY 22/23, 90th percentile first-unit travel time performance to fire and EMS incidents was 1:46 minutes (44 percent) *slower* than a recommended 4:00-minute best prctice goal to facilitate best practice outcomes in urban-density communities.
Finding #14:	Citywide, 82 percent of fire and EMS incidents were reached within 5:00-minutes travel time, including the harbor, oceanfront, and freeways where longer travel times always occur due to diffcult-to-reach locations.

2.7.6 Call to First-Unit Arrival

Call to first-unit arrival measures the time interval from receipt of the 9-1-1 call until the first response apparatus arrives at the emergency incident and is a fire agency's true customer service measure. Citygate's best practice recommendation for 90th percentile call-to-first unit-arrival to fire and EMS incidents, derived over many years of fire service deployment analysis, is within

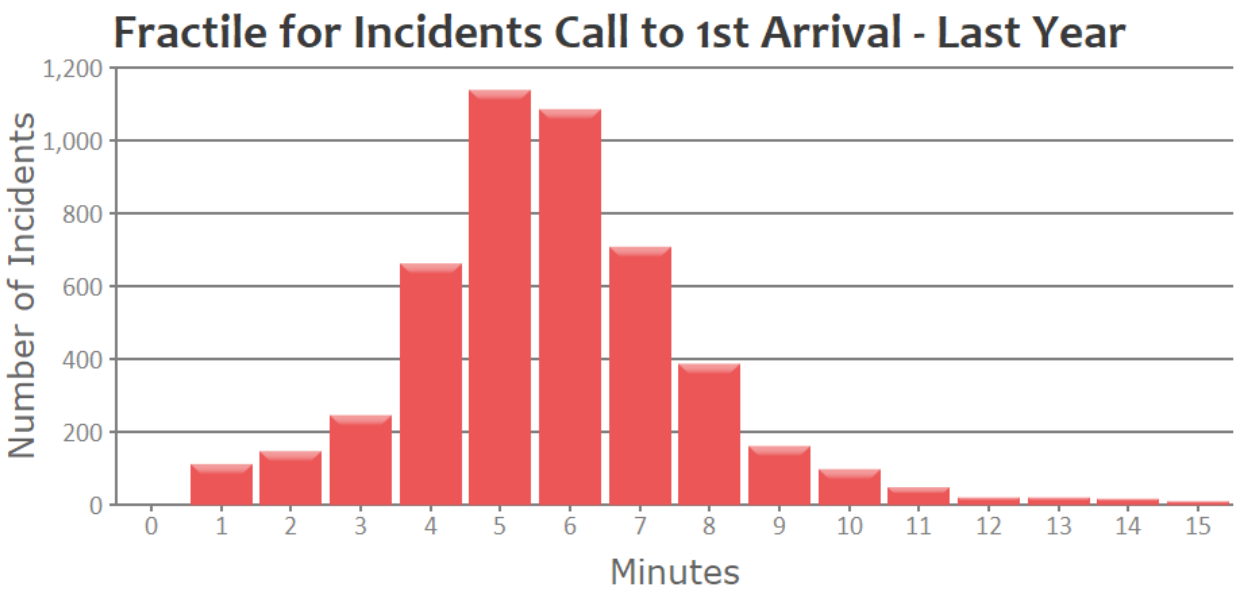
7:30-minutes from the point of 9-1-1 answering the call. The following table shows the Department's overall performance over the three-year study period as meeting this goal; however, performance slowed nearly 40 seconds in RY 22/23.

Table 18—90th Percentile Call to First-Unit Arrival Performance

Station	Overall	RY 20/21	RY 21/22	RY 22/23
Department-Wide	**7:19**	7:01	7:09	7:47

The following figure shows fractile call to first-unit arrival performance peaking at 5:00 minutes in RY 22/23; however, the right-shifted graph indicates several incidents with longer call-to-arrival times.

Figure 14—Call-to-First-Unit-Arrival Fractile Analysis (RY 22/23)



Finding #15: 90th percentile call-to-first-unit arrival performance has slowed somewhat over the past three years from 7:01 minutes in RY 20/21 to 7:47 minutes in RY 22/23, which is only 17 seconds slower than a Citygate-recommended 7:30-minute goal for urban-density communities to facilitate positive outcomes.

2.7.7 Effective Response Force (ERF) Concentration Measurements

The Department's ERF for a modified (meaning not-fully confirmed) building fire is two engines, one ladder truck, one rescue, and one Battalion Chief for a total of 13 personnel. Over the three-

year study period, there were 85 building fire incidents, 58 of which where the *reported* ERF force all arrived at the incident. The following tables show 90th percentile ERF travel time and ERF call-to-arrival time for those 58 incidents.

Table 19—90th Percentile ERF Travel Time Performance

Station	Overall	RY 20/21	RY 21/22	RY 22/23
Department-Wide	**12:08**	10:43	12:33	11:42

Best practice and Citygate's recommendations are an ERF *travel* time of 8:00 minutes for the last-due unit to arrive and a call-to-arrival time of 11:30 minutes or less for all units to arrive. As the table above shows, overall 90th percentile ERF travel was 4:08-minutes past the recommended 8:00 minute goal over the three-year study period; however, travel time performance improved signficantly in the most recent year (RY 22/23); showing how small data sets can be quite volatile.

As shown in the following table, overall ERF *call-to-arrival* performance was 1:27 minutes *slower* than a Citygate recommended 11:30-minute best practice based goal in urban density communities to facilitate positive outcomes.

Table 20—90th Percentile ERF Call-to-Arrival Performance

Station	Overall	RY 20/21	RY 21/22	RY 22/23
Department-Wide	**12:57**	11:26	13:33	12:56

Finding #16: At 12:57 minutes, reported building fire Effective Response Force (**ERF**) multi-unit call-to-arrival performance was just 1:27 minutes *slower* than a Citygate recommended 11:30-minute best practice goal in urban density communities to facilitate positive outcomes; however, there were only 58 ERF reported building fire incidents in three years and small data sets can be quite volatile.

2.8 Harbor Area Incidents and Fire Crew Staff Use

Over the three years of data analyzed, there were 738 incidents in the Department's incident records marked as "marine." While all "watercraft rescue" incidents were marked in the data as "M" for "marine," there were approximately 50 of these incidents which occurred away from the water and were clearly not "marine" in nature.

The following table breaks down incidents marked "marine" by incident type.

Table 23—Marine Demand by Incident Type by Year (RY 20/21–22/23)

Incident Type	RY 20/21	RY 21/22	RY 22/23	Total
552 Police matter	83	72	46	**201**
365 Watercraft rescue	64	58	58	**180**
321 EMS call, excluding vehicle accident with injury	58	78	21	**157**
553 Public service	37	31	16	**84**
361 Swimming/recreational water areas rescue	9	5	6	**20**
551 Assist police or another governmental agency	9	8	1	**18**
745 Alarm system sounded, no fire - unintentional	6	8		**14**
541 Animal problem	5	3	5	**13**
411 Gasoline or other flammable liquid spill	1	6	4	**11**
322 Vehicle accident with injuries		3	2	**5**
111 Building fire		4		**4**
342 Search for person in water	1	2	1	**4**
813 Windstorm, tornado/hurricane assessment	3	1		**4**
364 Surf rescue	1		2	**3**
520 Water problem, other	1	2		**3**
151 Outside rubbish, trash, or waste fire	1	1		**2**
444 Power line down	1	1		**2**
550 Public service assistance, other		1	1	**2**
331 Lock-in (if lock out, use 511)			1	**1**
353 Removal of victim(s) from stalled elevator		1		**1**
412 Gas leak (natural gas or LPG)			1	**1**
460 Accident, potential accident, other	1			**1**
461 Building or structure weakened or collapsed	1			**1**
510 Person in distress, other		1		**1**
542 Animal rescue		1		**1**
561 Unauthorized burning	1			**1**
571 Cover assignment, standby, move up		1		**1**
740 Unintentional transmissions of alarm, other			1	**1**
815 Severe weather or natural disaster standby		1		**1**
Total	**283**	**289**	**166**	**738**

Most incidents occurred in Station 3's area. The following table shows marine demand by station.

Table 24—Marine Demand by Station by Year (RY 20/21–22/23)

Station	RY 20/21	RY 21/22	RY 22/23	Total
3	274	243	164	**681**
1	5	21	1	**27**
2	4	22		**26**
-Blank-		3	1	**4**
Total	**283**	**289**	**166**	**738**

Some Marine incidents assigned within Station 2 and Station 3 appear to be geocoded to locations and incident types not considered to be "marine." Citygate cannot determine if there are many more given the subjective way these incidents are being labeled. The following map illustrates the distribution of marine incidents in or near Station 3's area.

Figure 15—Marine Incident Distribution Near Station 3

As the incident distribution map shows, it appears "watercraft rescues" were assigned to a number of street addresses. The street address was used for the GIS location of the incident. Multiple incidents may be represented by a single point on the map.

Finding #17:	The count of near or on-the-water incidents in King Harbor per year is low and, given the records available, an exact count and information regarding severity is not possible.

2.9 NORTH CITY INCIDENT ANALYSIS

Citygate's incident data analysis shows that Station 2 has longer 90 percent travel times than Station 1. To understand this issue, and where and how many longer-travel-time incidents occur, a selection of apparatus records was assembled and analyzed by direction and distance from Fire Station 2.

2.9.1 The Data Set

The incident data records reviewed for this analysis included Station 2 NFIRS fire and EMS incident types involving first-arriving Station 2 apparatus for RY 22/23. All responses involving mutual *Aid Given* were removed from the data set.

To compare time against a distance, Citygate used a 1.5-mile radius from the fire station since the legacy Insurance Service Office (ISO) measure for fire station spacing is 1.5 miles.

Table 25—90th Percentile Travel Time Performance – Spatial Direction per Spatial Miles

Spatial Miles	Spatial Direction / Time / Count			
	1 North	2 East	3 South	4 West
0.5	4:06 (136)	4:24 (176)	5:36 (96)	4:23 (133)
1	5:51 (250)	04:55 (367)	5:15 (191)	5:07 (323)
1.5	6:15 (195)	06:32 (5)	6:07 (152)	6:46 (91)
2	8:16 (173)		3:49 (1)	9:31 (3)
2.5	16:25 (2)		6:12 (3)	
3	8:02 (1)		3:05 (4)	
3.5			4:10 (3)	
4				10:22 (1)
4.5	00:00 (1)			

Figure 15—Spatial Incident Map within a 0.5-Mile Radius of Station 2

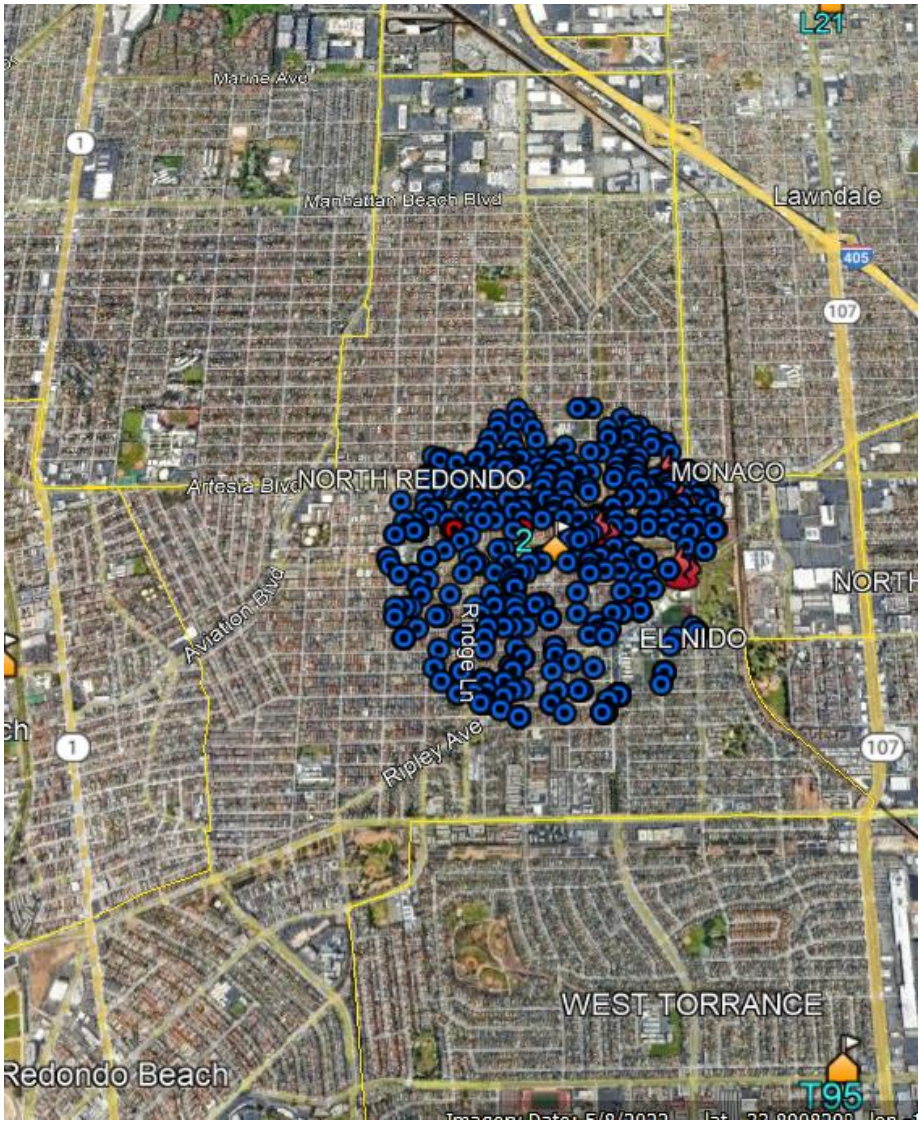


Table 26—90th Percentile Station 2 Travel Time Performance – Spatial Direction per Spatial Miles (within .5 Miles)

Spatial Miles	Spatial Direction			
	1 North	2 East	3 South	4 West
Within .5 Miles	**4:06** (136)	**4:24** (176)	**5:36** (96)	**4:23** (133)

Incident quantity is generally balanced with fewer incidents to the south of Station 2. Travel time to the south takes more than a minute longer to reach 90 percent compliance.

Figure 16—Spatial Incident Map within a 0.5 and 1.0-Mile Radius of Station 2

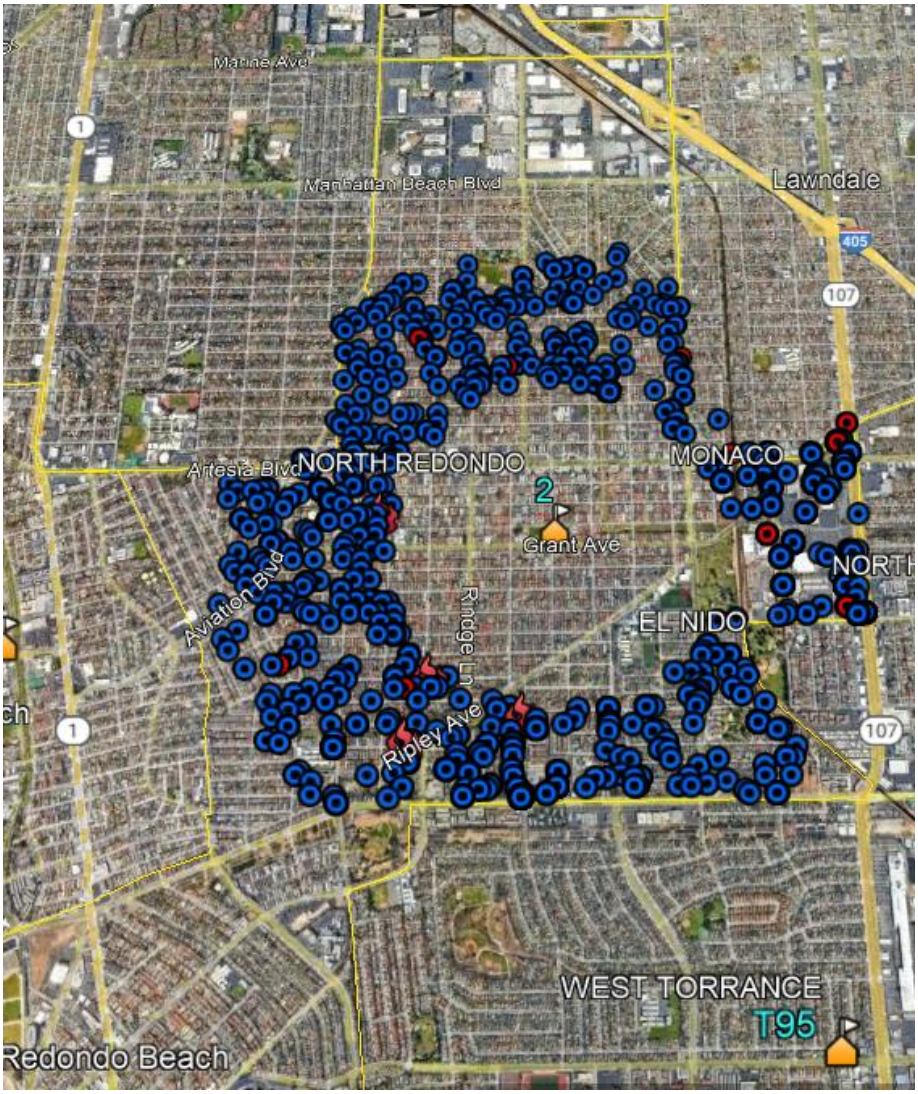


Table 27 —90th Percentile Station 2 Travel Time Performance – Spatial Direction per Spatial Miles (.5 – 1.0 Miles)

Spatial Miles	Spatial Direction			
	1 North	2 East	3 South	4 West
0.5 – 1.0 Miles	**5:51** (250)	**4:55** (367)	**5:15** (191)	**5:07** (323)

Incident quantity is generally balanced, with fewer incidents to the south. Travel time is balanced as well.

Figure 17-Spatial Incident Map within a 1.0 and 1.5-Mile Radius of Station 2

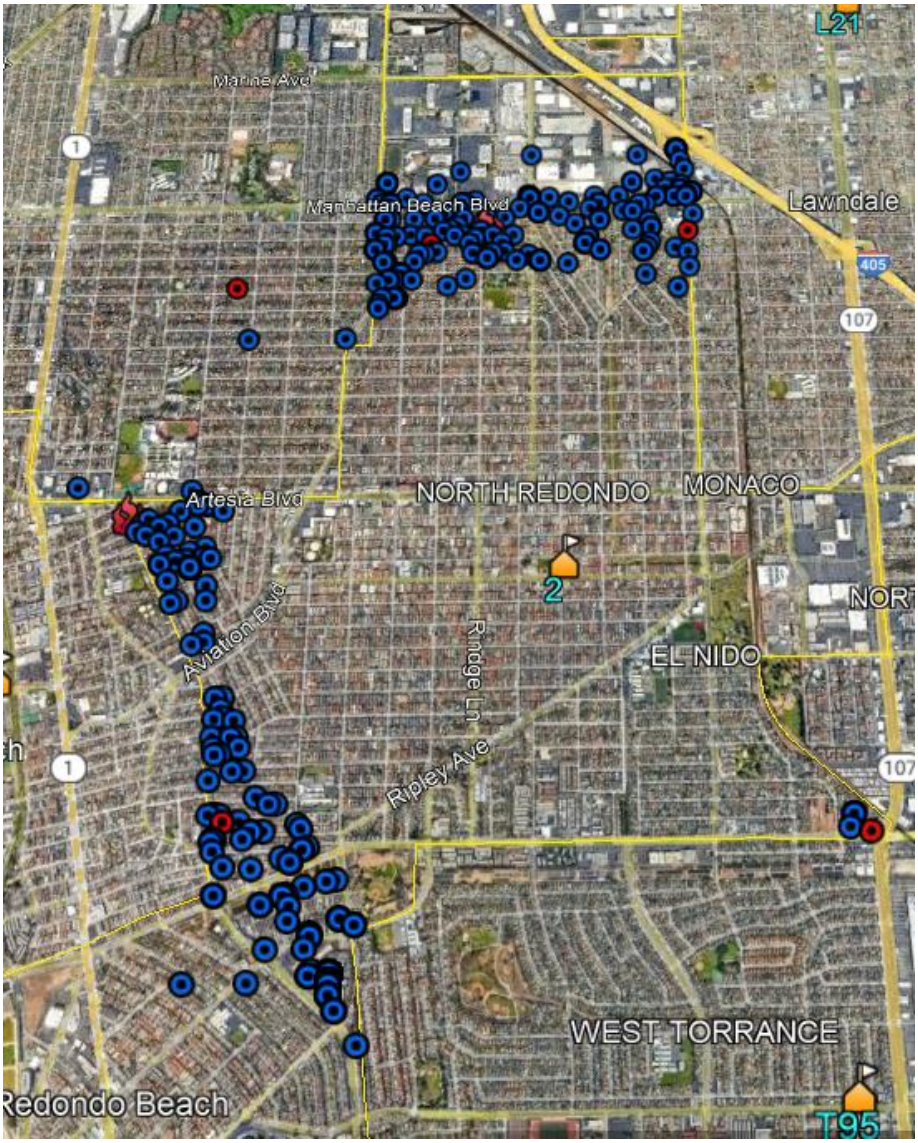


Table 28—90th Percentile Station 2 Travel Time Performance – Spatial Direction per Spatial Miles (1.0 – 1.5 Miles)

Spatial Miles	Spatial Direction			
	1 North	2 East	3 South	4 West
1.0 – 1.5 Miles	**6:15** (195)	**6:32** (5)	**6:07** (152)	**6:46** (91)

As the previous table shows, incident quantity to the east decreases dramatically beyond one mile, with most incidents to the north and south of Station 2. Travel time is balanced.

Figure 18—Spatial Incident Map within a 1.5 and 2.0-mile Radius of Station 2

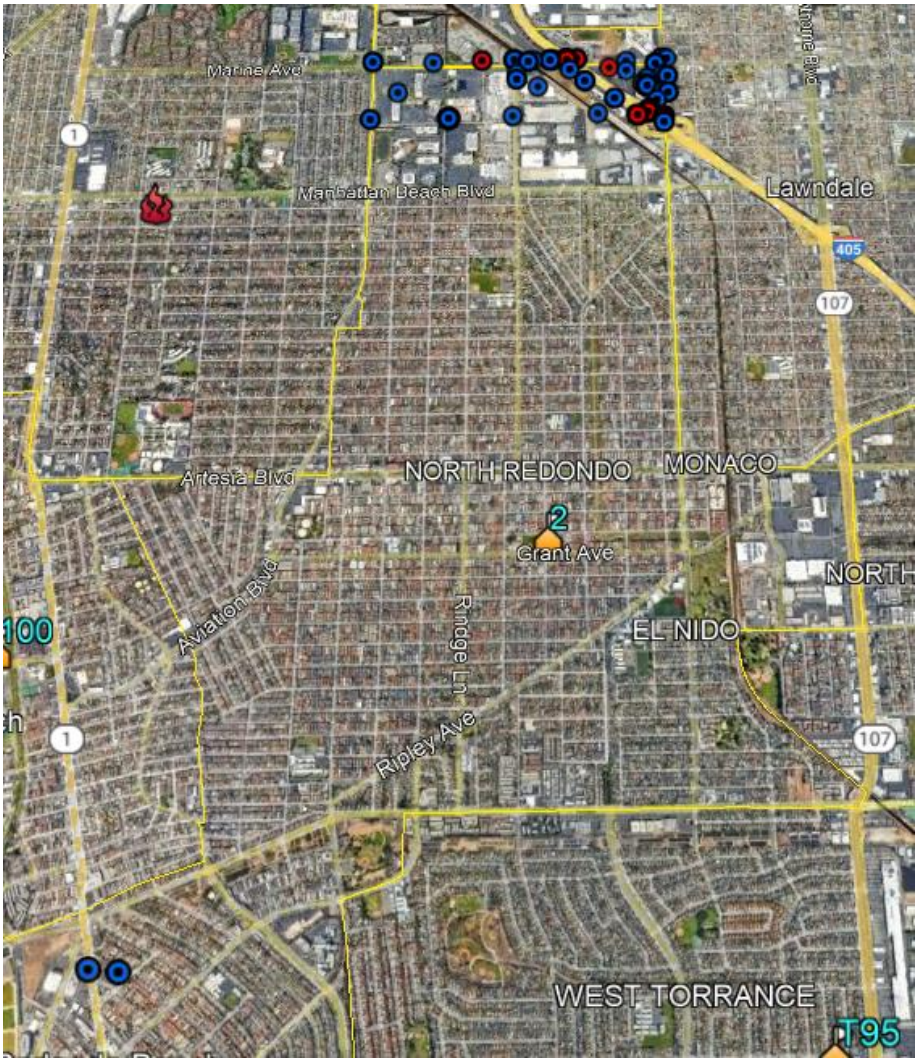


Table 29—90th Percentile Station 2 Travel Time Performance – Spatial Direction per Spatial Miles (1.5 – 2.0 Miles)

Spatial Miles	Spatial Direction			
	1 North	2 East	3 South	4 West
1.5 – 2.0 Miles	**8:16** (173)		**3:49** (1)	**9:31** (3)

As this table shows, incident quantity in every direction except to the north decreases substantially beyond 1.5 miles. 90th percentile travel time is 8:54 minutes when freeway incidents are included.

Note the number of apparatus responses from Station 2 by Station 2 apparatus in the area north of Station 2 between 1.5 miles and 2.0 miles. In this area, response times are well over 90 seconds

longer than areas .5 miles closer to Station 2. This area is basically one street aside the freeway with motels on it.

Low volume responses of 2.0 miles or greater have very few incidents, making 90 percent travel time estimates statistically meaningless. The following figure shows a heat map of the location of these incidents with long response times.

Figure 19—Heat Map – Incidents with Long Response Times

In the following table, freeway responses were removed, which decreases overall travel times by about 45 seconds.

Table 30—90th Percentile Station 2 Travel Time Analysis

Vehicle ID	Overall
Department-Wide	**7:39** (134)
E62	7:31 (10)
E64	7:36 (83)
R62	7:51 (41)

The areas north of 1.5 miles from Station 2 have 3 types of incident demand – residential neighborhoods with very low demand, and the Space Park area and motel section with higher demand. These pockets of demand are both within 1.5 miles of a County station if they were to be dispatched.

Finding #18: There is not a high enough annual incident demand with excessive travel times well north of Station 2 near the City limits to justify a fire station in the far north City. As the mapping measures show, these areas could also receive mutual aid support from either County fire station just north and northeast of the City limits.

2.10 Overall Deployment Evaluation

The Department serves an urban coastal city with a mixed zoning land-use pattern typical of other cities on the Los Angeles County coastline. Infill growth intensification of land uses will make some areas very urban for population densities and traffic. The City should maintain robust firefighting and first responder EMS programs suitable for an urban fire department in staffing, unit types, and facility locations.

Even as State or local fire codes require fire sprinklers in residential dwellings, it will be many more decades before enough homes are built or remodeled with automatic fire sprinklers. The City for decades to come will still need both first-due unit and multiple-unit ERF coverage consistent with controlling a building fire to near the room(s) of origin and improving the chance of survival for patients with life-threatening medical emergencies.

The Department's deployment system is strong, and has opporunities for improvement to align with the City's needs as it evolves. The two landside fire stations can cover 93 percent of the City's public streets within 5:00-minutes travel time, which is excellent first-unit coverage to facilitate positive outcomes. While there is a moderate demand for emergency incident reponse, including a rate of two simultanous incidents 34 percent of the time, the current staffung and units are not yet overworked.

Prior to this study the City had not adopted outcome driven response time goals. Doing so would allow the budget process to measure effectivness and add resources as needed.

As noted in Section 2.6.1, the northen edges of the City are just beyond 5:00 minutes travel from Station 2. The City has discussed a fourth fire station near the Northrup Grumman campus, and it has not yet committed funds for land or construction; however, that site is very near the edge of the City and response coverage from that site would cover more area outside the City than inside. In addition, there are two County fire stations 1.5 miles or less from those areas, which equates to approximately 4:00-minutes travel time, and response units from those two stations could be available through the mutual aid agreement between the City and County.

The City should consider studying combing police and fire boat operations in the harbor and transferring non emergent boater services to a contractor. Additionally, because a fourth fire station in the far north City is not substantially needed, an alternative deployment improvement would be to transfer the second fire engine from Fire Station 2 to Fire Station 3 in King Harbor. Doing so

provides a joint team with the two personnel assigned on the harbor boat. A five-person crew would provide additional staffing for critical harbor and landside needs with multiple response unit types, including an engine, paramedic rescue squad, and rescue boat.

2.11 DEPLOYMENT RECOMMENDATIONS

Based on the technical analysis and findings contained in this assessment, Citygate makes the following deployment recommendations.

Recommendation #2:	**Adopt Updated Deployment Policies:** The City Council should adopt complete performance measures to aid deployment planning and to monitor response performance. The measures of time should be designed to deliver outcomes that will prevent death or more serious injury for EMS patients upon arrival when possible and keep small but serious fires from becoming more serious. With this is mind, Citygate recommends the following measures. **2.1 First-Due Unit:** To treat pre-hospital medical emergencies and control small fires, the first-due unit should arrive within 8:30 minutes, 90 percent of the time, from receipt of the 9-1-1 call at the Redondo Beach Emergency Communications Center to incidents in the City. This equates to a 1:30-minute call processing / dispatch time, a 2:00-minute crew turnout time, and a 5:00-minute travel time. **2.2 Multiple-Unit Effective Response Force for Serious Emergencies:** To confine building fires near the room or rooms of origin and treat multiple medical patients at a single incident, a multiple-unit ERF of a mininum of 13 personnel, including one Chief Officer, should arrive within 11:30 minutes from the time of call receipt at the Redondo Beach Emergency Communications Center at 90 percent or better reliability. This equates to a 1:30-minute call processing / dispatch time, a 2:00-minute crew turnout time, and an 8:00-minute travel time, respectively.

2.3 <u>Hazardous Material Response:</u> To protect the service area from hazards associated with uncontrolled release of hazardous and toxic materials, the fundamental mission of the Department's response is to isolate the hazard, deny entry into the hazard zone, and minimize impacts on the community. This can be achieved with a first-due total response time of 8:30 minutes or less to provide initial hazard evaluation and mitigation actions. After the initial evaluation is completed, a determination can be made whether to request additional resources to mitigate the hazard.

2.4 <u>Technical Rescue:</u> To respond to technical rescue emergencies as efficiently and effectively as possible with enough trained personnel to facilitate a successful rescue, a first-due total response time of 8:30 minutes or less is required to evaluate the situation and initiate rescue actions. Additional resources should assemble as needed within a total response time of 11:30 minutes or less to safely complete rescue/extrication and delivery of the victim to the appropriate emergency medical care facility.

Recommendation #3: The City should utilize the data in this study to decide if a fourth fire station in the far north City is the best investment, or consider if moving the second engine from Fire Station 2 to Station 3 in the harbor would be a more substantial improvement.

Recommendation #4: If the second engine was moved from Station 2 to Station 3 in the harbor, that staffing would be combined with the two-person boat crew to provide improved on-the-water response. The combined team would also cross-staff a Paramedic squad. These two units would provide a substantial service improvement on the water and landside in the northwest City east of the harbor.

SECTION 3—REVIEW OF FACILITIES, EQUIPMENT, AND LOGISTICS

As an element of this Deployment and Organizational Analysis, Citygate was tasked to review and evaluate the Department's administrative support functions, facilities, and automotive equipment for regulatory compliance and capacity to support an ongoing stand-alone City fire department, including configuration and lines of authority.

NFPA 1201[8] states, in part, "the [Department] shall have a leader and organizational structure that facilitates efficient and effective management of its resources to carry out its mandate as required [in its mission statement]." Best practices call for a management organization and headquarters programs with adequate staffing capacity to provide a properly trained, equipped, and supported response force to ensure prompt response and safe, competent service delivery. Compliance regulations for fire services operations are increasing, so the proper hiring, training, and supervision of operational personnel require a significant leadership and general management commitment.

3.1 ASSESSMENT METHODOLOGY

For this assessment, Citygate reviewed all Department administrative support functions and conducted interviews with individual personnel as needed to identify and evaluate:

- Key program responsibilities for each function
- Administrative support organizational structure and staffing, including configuration and lines of authority
- Critical workload capacity gaps, including what key responsibilities are not being met, or are not being performed at the desired or expected levels or within the expected timeline
- Available redundant critical business services capability (e.g., Departmental-level timecard/payroll processing, accounts payable, personnel issues tracking, etc.)
- Workload capacity gaps relative to critical business systems and assigned key primary and secondary responsibilities
- Single points of failure, if any, for critical business functions, processes, or services
- Annual hours and associated FTE capacity needed to close identified workload gaps.

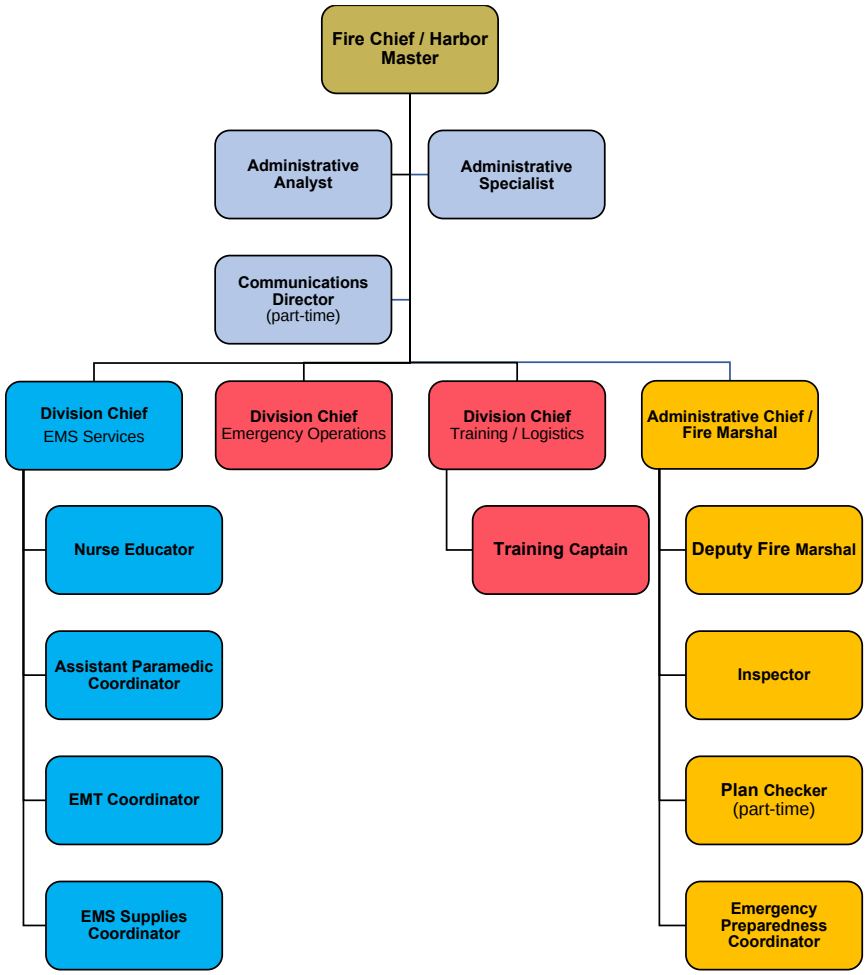
[8] NFPA 1201 – Standard for Providing Emergency Services to the Public (2015 Edition).

3.2 FIRE DEPARTMENT ADMINISTRATIVE ORGANIZATION

The Department's administrative support organization is responsible for the overall administration and management of all Department-level programs and services and most administrative support functions, including general administration, fire prevention, training, health and safety, emergency preparedness and management, public education/information, policies and procedures, coordination with other local or regional service providers and stakeholders, and other related administrative and program responsibilities.

The City's FY 23/24 budget authorizes 15.0 FTE administrative support personnel to support the EMS, Operations, Training/Logistics, and Fire Prevention/Emergency Management Divisions as shown in the following figure.

Figure 16—Redondo Beach Fire Department Administrative Support Organization



3.3 EMS DIVISION

The Department began providing paramedic services to the community in 1972. All response personnel are trained and certified to provide Basic Life Support (BLS) or Advanced Life Support (ALS) pre-hospital emergency medical care.

EMS support staff includes a Division Chief, Nurse Educator, Assistant Paramedic Coordinator, EMT Coordinator, and EMS Supplies Coordinator to ensure program compliance with County and State standards and regulations. Key program responsibilities include:

- EMT continuing education requirements
- Paramedic continuing education requirements
- EMS program quality assurance / quality improvement
- Infection control program
- EMS supplies management
- EMS equipment management

The EMS program operates under the scope of the Medical Director who approves the scope of practice under which response personnel provide field services. The EMS Division Chief maintains close communications with the Medical Director and ensures all staff are equipped with the information, resources, and equipment needed to complete their ongoing assignments and projects. The EMS Division Chief is the Department liaison to the California State Emergency Medical Services Agency (CAEMSA), Los Angeles County Emergency Medical Services Agency (LAEMSA), all local receiving hospitals, area fire departments, private ambulance transportation providers, and community service partners. The EMS Division Chief supports the delivery of medical service services and is responsible for coordination and compliance of all elements of the EMS program to include, but not limited to provision of training; policy compliance; controlled substances inventory restock requests, intake, and distribution to field units; licensure and accreditations; quality assurance/improvement; compliance with regulatory entities; area collaborations; and community engagement.

The Department contracts with the UCLA Center for Pre-Hospital Education for Nurse Educator services. The Nurse Educator is contracted for 40 hours of service per month and provides nine hours of continuing education (CE) each calendar month of the year (three hours per shift x three shifts = nine hours). The Nurse Educator provides all additional training as required by the LAEMSA and/or the Department to include, but not be limited to, new hire firefighter/paramedics in-service training (ex/provider impression, treatment, patient destination protocols/policies); incumbent remediation; and policy update training. The Nurse Educator completes Quality

Assurance/Quality Improvement (QA/QI) analysis of responses through review of electronic patient records including all cardiac arrest responses; establishes CE curriculum based on QA/QI indicators; and presents annually required EMS update for all response personnel. Pursuant to this high-level review, Citygate believes the Department is compliant with all regulatory training as required by the CAEMSA and LAEMSA.

The Assistant Paramedic Coordinator completes monthly audits of the EMS program controlled substance logs for accountability of all inventories on field units and the controlled substances safe; manages all licensure and accreditation renewal schedules to ensure lapses do not occur; assists with CAEMSA license renewal CE audits; performs data reporting to the LAEMSA as assigned by the EMS Division Chief; functions as a liaison between field personnel and the EMS Division Chief; coordinates maintenance services for the cardiac monitor and Auto Pulse inventory; and provides staff and logistical support to other EMS Division staff as needed.

The EMS staff maintain department-wide inventories of all medical equipment (all response units and stock locations at fire stations); presents proposals on new equipment and receives inputs from the field regarding new equipment options; performs research for potential beta-testing and intake field input on test results as assigned; ensures equipment inventories are compliant with LAEMSA mandates and performs department-wide skills training in collaboration with the Nurse Educator; and coordinates replacement of any recalled equipment or supplies.

The EMT Coordinator, a collateral suppression Captain assignment, manages records for all Department EMTs; schedules biennial certification skills testing; submits certification renewal documents to the LAEMSA; and audits EMT program requirements.

3.3.1 Workload Capacity Assessment

Citygate's high-level assessment of the Department's EMS administrative support capacity found it to be adequately staffed to meet its responsibilities and workload, with sufficient administrative support capacity available from the Administration Division to meet anticipated EMS Division needs as well as county and state regulations.

In addition, Citygate found the EMS program is meeting State and County EMS Agency standards and regulations relative to continuing education and continuous quality improvement, and the Assistant Paramedic Coordinator and EMS Supply Coordinator are ensuring EMS equipment and supplies are appropriately controlled, accounted for, and compliant with state and county standards and regulations.

3.4 Emergency Operations Division

The Department supports its emergency operations program with each of the three Division Chiefs serving as the daily Duty Chief for their assigned platoon on a rotating 56-hour work week shift schedule. Each platoon also has a Battalion Chief assigned to provide primary supervision and

incident command, as well as management of key operational programs such as communications equipment, self-contained breathing apparatus, personal protective equipment, etc. Key responsibilities of the Emergency Operations Division Chiefs include:

- Acting Fire Chief: In the absence of the Fire Chief, the Emergency Operations Chief serves as the lead for all Department matters
- Deputy Harbor Master and management of the specialized Harbor Patrol Unit
- Communication Unit (Police Dispatch) liaison
- Management of Department-level platforms including records management (First Due), Inventory (PSTrax), and Policy and Procedure (Lexipol)
- Approve all training and equipment for Operations
- Self-contained breathing apparatus program
- Development/maintenance of target hazard and pre-incident plans
- Communications equipment and procedures
- Department Safety Officer
- Monitoring response performance and districts to reduce response times.
- Coordination of the California Incident Command Certification System (CICCS) and wildland program
- Explorer Program
- Serve as the Public Information Officer for media inquiries with the Fire Department
- Coordinate annual fit testing and respiratory protection program

3.4.1 Workload Capacity Assessment

The Department's annual budget process includes an estimation of staff hours needed for the various program responsibilities and projects. Citygate's high-level assessment of the Department's Emergency Operations Division found it to be adequately staffed to meet its responsibilities and workload, with sufficient administrative support capacity available from the Administration Division to meet anticipated needs. While no single points of failure were identified, the following could use additional attention to enhance service delivery efficacy.

- The current law-centric Computer Aided Dispatch (CAD) system and the challenges associated with appropriate fire response resource recommendations
- Automatic and mutual aid agreements not recently reviewed or updated
- Administrative staff assigned to providing customer services for the Harbor Patrol

3.5 TRAINING/LOGISTICS DIVISION

The Department supports its training and logistics functions with one Division Chief and one 40-hour Training Captain.

3.5.1 Training

The Training/Logistics Division Chief provides oversight of department's training program with assistance from a 40-hour Training Captain. Key administrative training responsibilities include:

- Coordination and delivery of mandated and discretionary training curriculum and manipulative drills to maintain operational skills and proficiency
- Department-wide administrative oversite using the APS software platform
- California Firefighter Joint Apprenticeship Committee (JAC) oversight and reporting
- California Incident Command Certification System certifications (CICCS)
- OSHA respirator fit testing
- Department health and wellness program
- National Incident Management System (NIMS) training compliance
- Operations and maintenance coordination for the Regional Fire Training Center facilities and maintenance, and the purchasing and outfitting of fire apparatus and light vehicles. The Operations Chief provides oversight of the fire boats due to prior marine safety experience.

Workload Capacity Assessment

Citygate's high-level review of the Department's training function found many employee training records, certifications, and required licenses were not up to date or missing, and JAC participation and annual performance standards were also out of date or not available at all.

To address these deficiencies, a newly assigned Training Captain is developing a master training calendar to ensure consistency and coordination of all local, state, and federal mandated training. In addition, the Department recently re-entered the JAC program, and participation is expected to increase as the organization gains experience in the program and documentation requirements.

Finding #19:	Some employee training records and certifications were not up to date or reflected in the current training database. California Joint Apprentice Committee (JAC) firefighter training participation started in December 2023 and has begun generating modest training cost reimbursements. Annual performance standards are now under development with the newly assigned Training Captain. The Department has implemented a new online data base for training records, tracking personnel, managing credentials, and other critical tasks.

Recommendation #5:	The Training Captain should continue to update and maintain training records, certifications, licenses, annual performance standards and continue participation in the Joint Apprenticeship Committee (JAC) program to ensure the department meets state and federal standards.

3.5.2 Logistics

The Training/Logistics Division Chief coordinates the Department's facilities and automotive fleet needs with other City departments, including Finance and Public Works. Key administrative logistics responsibilities include:

- Coordination of purchasing, outfitting, and maintenance of the Department's automotive fleet
- Coordination of facility maintenance and capital improvement projects

3.5.3 Workload Capacity Assessment

Citygate's high-level assessment of the Department's Training/Logistics Division administrative support capacity found it to be adequate to meet Division needs with sufficient administrative support capacity available from the Administrative Analyst and Administrative Secretary.

3.6 ADMINISTRATIVE CHIEF / FIRE MARSHAL / EMERGENCY PREPAREDNESS

An Administrative Division Chief position was implemented on July 1, 2023, to manage the Department's fire prevention and emergency preparedness responsibilities.

3.6.1 Fire Prevention

Fire prevention staff includes one 40-hour Division Chief, one 40-hour Deputy Fire Marshal (Fire Captain), one 40-hour civilian Fire Inspector, and one part-time civilian Plan Checker with the following key responsibilities.

- Adoption and enforcement of the California Fire Code
- Review of all new development projects and building permits for conformance with applicable fire and life safety codes, ordinances, and regulations
- Participation in pre-construction meetings
- Inspection of new building construction for conformance with applicable fire and life safety codes, ordinances, and regulations
- Plan review and inspection of fire protection and detection systems for conformance with applicable codes, ordinances, and regulations, and for appropriate design, installation, and operation
- Inspection of designated building occupancies for conformance with applicable fire and life safety codes, ordinances, and regulations
- Certificate of Occupancy inspections
- Daycare inspections
- Public fire and life safety education
- Fire/arson investigations
- KNOX lockbox program

Beginning in 2018, the Department began charging a fee for fire and life safety inspections, for which every residential property with three or more units and every business occupancy received a yearly inspection. In 2023, the Department implemented a new Risk-Based Fire inspection (RBFi) program to increase efficiency and enhance fire prevention services to the community. This program reduced the inspection cycle for approximately 25 percent of these occupancies to every three years and focuses annual inspection capacity on the 2,670 higher risk residential and public assembly occupancies as determined by state law and the RBFi program. This new approach is

intended to enhance public safety, reduce some inspection costs, and apply a risk-based approach to fire inspections in keeping with best practices.

Key stakeholders, including residents, business owners, and Department staff have expressed satisfaction with the program change, and inspection data also supports the effectiveness of the RBFi program.

Workload Capacity Assessment

The Department completed 100 percent of approximately 1,990 mandated inspections in 2023. On-duty suppression crews conduct residential inspections, and the Deputy Fire Marshal and a civilian Fire Inspector perform the business inspections. Fire inspection fees are collected from a third-party service, Fire Recovery USA, with a 95 percent collection rate.

Citygate's high-level assessment of the Department's fire prevention workload capacity found it to be adequately staffed to meet its current responsibilities and workload with no single points of failure identified. In the future, a risk reduction officer would be a good addition if the Department desires to increase public education and community risk reduction efforts.

3.6.2 Emergency Preparedness

The Emergency Preparedness Coordinator is a new position to be hired and will report to the Administrative Chief. Key emergency preparedness responsibilities include:

- Coordination of City disaster preparation activities
- Maintaining operational readiness of the City's primary and secondary Emergency Operations Centers (EOCs)
- Coordination and delivery of Community Emergency Response Team (CERT) training
- Serve as liaison to the CERT Alumni Board
- City representative on the South Bay Area G Partners Group for regional disaster preparation
- Management of any state or federal emergency management grants

Workload Capacity Assessment

Currently, the City EOC is activated as deemed necessary by City management; however, no EOC training is currently being conducted or scheduled until the Emergency Management Coordinator is hired. The City's Local Hazard Mitigation Plan (LHMP) and Safety Element Plans are up to date; however, Department staff was unable to determine if the City has its own Emergency

Operations Plan (EOP) and no EOP was found on the City website. There is no emergency preparedness education currently being conducted, and the Department is not managing any state or federal grants at this time.

Citygate's high-level assessment of the Department's emergency management workload capacity found it to be adequately staffed to meet its current responsibilities and workload once the newly approved Emergency Management Coordinator position is filled.

3.6.3 Overall Administrative Division Assessment

Overall, Citygate's review of the Administrative Division finds it to be appropriately organized and staffed to meet current workload and responsibilities except for adequate lower-level clerical capacity. Citygate thus recommends the City consider funding an administrative assistant position to support this function.

Finding #20:	The Administrative Division lacks adequate administrative clerical support capacity.

Recommendation #6:	The City and Department should consider funding one FTE Administrative Assistant to provide additional needed clerical support for the Adminsistrative Division.

3.7 Fire Station Facilities

While Citygate conducted an on-site assessment of the Department's three fire station facilities primarily to verify District estimates to convert those facilities should the City choose to contract with the District, additional findings were made that should be considered if the City chooses to maintain its current stand-alone fire department.

3.7.1 Assessment Methodology

For its high-level assessment of the Department's fire station facilities, Citygate utilized the following regulatory standards and industry-recognized best practice guidelines as well as available City/Department records and anecdotal evidence.

- California Building Code
- Americans with Disabilities Act (ADA)
- NFPA 1500 Standard on Fire Department Occupational Safety, Health, and Wellness Program

- NFPA 1851 Standard on the Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting
- NFPA 1710 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments

3.7.2 Regulatory Standards and Recognized Best Practice Guidelines

California Building Code

The International Code Council launched the International Codes Series (I-codes) at the end of the 1990s as a singular replacement for the regional building codes. Locally, the California Building Code is borne out of the International Building Code and local jurisdictions adopt the California Building Code as their own guidance.

The International Building Code provides a tiered approach for the required structural performance of a building, and as an essential facility, fire stations are subject to the strictest structural requirements. While an office building is required to be built to protect life in the event of a disaster, which means the occupants survive but the building may be condemned, a fire station must be designed to protect life and be immediately occupiable post-disaster. This means a fire station will be better able to resist the shaking of an earthquake or the high winds of a hurricane.

Americans with Disabilities Act (ADA)

The ADA, enacted in 1990, establishes a series of standards for accessibility for persons with identified disabilities (e.g., 2010 ADA Standards). Requirements for fire stations as public buildings are scoped under Title 2 of the Act, and public facilities are subject to higher accessibility standards than commercial and residential developments.

With a few exceptions for building support spaces, fire station facilities, as Title 2 public buildings, are required to be fully accessible for disabled staff and the public. Cogent arguments have been made for why some areas within a fire station should not be considered public or accessible, like a sleeping room. Similarly, convincing cases have been made relative to the mandatory fitness requirements for firefighters. Nonetheless, the ADA law is clear: spaces are not exempt based on a policy that excludes persons with disabilities from certain work, and a fire facility is considered a public building in its entirety.

California Essential Services Buildings Seismic Safety Act (ESBSSA)

In 1986, the California Legislature determined that buildings providing essential services should be capable of providing those services to the public after a disaster. Their intent in this regard was defined in legislation known as the Essential Services Buildings Seismic Safety Act of 1986 and

includes requirements that such buildings shall be "designed and constructed to minimize fire hazards and to resist…the forces generated by earthquakes, gravity, and winds" (Excerpt from Health and Safety Code section 16001).The enabling legislation can be found in the California Health and Safety Code, Chapter 2, sections 16000 through 16022. In addition, the California Building Code cited above defines how the intent of the act is to be implemented in Title 24, Part 1 of the California Building Standards Administrative Code, Chapter 4, Articles 1 through 3.

NFPA 1500

NFPA 1500 – Standard on Fire Department Occupational Safety, Health, and Wellness Program is a non-mandated, generally accepted best practice consensus standard for fire station design relative to cancer prevention, firefighter fitness, and space for firefighters to unwind from the stresses of the job.

Newly built fire stations include differential air pressure zones where positive-pressure airflow, or an air curtain can prevent contaminants in the apparatus bays from entering the station living and work areas.

Since departments are required to have fitness programs, many departments opt for a separate physical fitness space. Indoor and outdoor fitness areas have been used when space is limited; however, they should have easy access to the apparatus bays in the event of a dispatch while exercising.

Training rooms allow crews to learn about the latest safety and health programs, so ample space that provides a functional learning space is part of this standard.

Personal protective equipment (PPE) needs to be stored in areas away from the sun and with little fluorescent lighting. The space also needs ventilation to remove particulates from the area and needs to be physically isolated from indoor living, sleeping, and work areas. All the PPE storage spaces at Department fire stations are in the apparatus bays.

NFPA 1851

NFPA 1851 – Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting provides non-mandated, consensus best practice guidelines for the maintenance and care of firefighter PPE. This standard recommends separate laundry facilities for contaminated PPE from facilities used to launder personal clothing/uniforms, bedding, and bath towels. Laundry areas continue to evolve and are being separated where personal belongings can be cleaned in the living areas, and PPE is laundered in a separate room or adjacent to the apparatus bays, so it does not enter the living spaces of the facility. None of the laundry spaces at Redondo fire stations are in the apparatus bays. There is one PPE extractor in a dedicated room at Station 2.

NFPA 1710

NFPA 1710 – Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments provides guidelines for fire station design to include access to the apparatus bays from first and second floor (as applicable) interior living/work areas.

3.7.3 Other Facility Design Considerations

Fire departments have the primary goals of providing safe, responsive services to the communities they protect while providing a safe environment for the firefighters to work in. Following are common fire station design considerations to facilitate achieving these goals.

Location and Floorplan

Fire stations are in neighborhoods based on careful analysis of response times to reach locations in a service area to provide service within established time frames. Location is the first criteria to support response. Site circulation across the front apron and connection to roadways determines the ability for rapid response for the apparatus once fire fighters are in the vehicle. Clear lines of sight and traffic control at busy roadways contribute to fast response. Alerting systems with clear signalization and visual and audible direction provide firefighters with the information they need to respond. Apparatus bay doors that operate quickly and automatically allow the apparatus to exit the station when the crew is ready. A plan layout of the facility should be organized to provide firefighters with the direct access to the apparatus bay as quickly as possible from all areas of the station. Priority should be given to the areas the firefighters may be in most such as office areas and living areas. Sleeping areas should be prioritized with a direct path to the apparatus bay as longer internal response to the apparatus occurs when the firefighters are sleeping. Areas that may need to be visited as part of response should be placed on the path to that apparatus bay, such as radio charging stations and response alcoves providing information for the call.

Community Access

A fire station is a connection to the community to provide service and a destination for assistance and care for those in danger. The fire station should be accessible to the community. Parking and walkways to the lobby of the station and emergency phone should follow ADA requirements to allow all members of the community to be able to approach the station for assistance. Redondo fire stations are also surrender sites under California's Safely Surrendered Baby Program. Station site configuration, building orientation and exterior facade should provide a clear understanding of the location a community member should go to receive help, often the primary entry of the facility.

Vehicular Circulation Safety

Site pathways and features should provide access and direction from the parking and pedestrian way to the pedestrian entry without crossing the path of department vehicle response. This provides community safety and more rapid response ability. When a station's front apron is near a street sidewalk, the apron should have enough depth for the fire apparatus to be fully out of the station with the ability to stop before entering the roadway without blocking the pedestrian way. In cases where this is not possible, warning beacons and paving marking are recommended for pedestrians during a response. Response Egress and Roadway Entry – Traffic analysis should be performed on roadways that fire stations respond onto. Traffic control or notification devises may be required depending on lines of sight or traffic volumes. Some conditions may need "keep clear" striping to avoid vehicles blocking egress of the apparatus if near an intersection where vehicles may be stopped. Flashing beacons may be needed to alert oncoming vehicles that a response is occurring if there is impairment to the line of sight. Control of adjacent signalization may be required to clear and control an adjacent intersection as the apparatus is entering. Return drive-through / fire station return of apparatus should have a safe means of entering the apparatus bay. Whenever possible, providing drive-through capability for all apparatus is the safest process for returning to the station. This requires adequate circulation to the rear of the station to enter through rear bay doors. This avoids any reason to back the vehicle up, which is a higher risk maneuver. Only in circumstances where there is no other option and when there is a large enough front apron to allow for a safe three-point back in operation without utilizing the public roadway should a back in return be considered. Careful site planning and warning features should be used to separate any public visitor vehicles or pedestrians from the back-in area if this is to occur. Bollards should be located at door entry points and around items to protect on site equipment.

Hazardous Material Decontamination Safety

Firefighter health and safety is a top priority to protect personnel from the hazardous materials that they encounter when fighting fires and from the vehicle exhaust from the apparatus. A facility can encourage the proper decontamination process a firefighter must follow when returning from a call. Placing the decontamination room, turnout cleaning and turnout storage along a linear and unobstructed path to the apparatus bay supports the process of decontamination and turnout cleaning prior to entering the app bay. The addition of hand washing sinks and boot cleaning stations at any entrance to the living area in addition to the decontamination zone helps firefighters maintain a clean-living area called the "Clean Zone" that is separated from the "Hot Zone" of the apparatus bay and support area. A facility also should provide an air-lock vestibule as a "Transition Zone" at the connection points of the "Clean" and "Hot" zones to keep the vehicle exhaust from the apparatus bay from infiltrating the firefighters' living and sleeping quarters. Firefighter processes for decontamination when returning from a call and when entering the "Clean" living area will help protect the long-term health of the firefighters living at the station. At the same time,

the station layout can encourage these proper cleaning processes to help embed healthy practices into the culture of the department.

Public To Private Separation

Fire stations are not only a beacon and refuge to the community in times of emergency, but they are also the home to the firefighters while on duty. A separate lobby space should be provided to allow for the public to come to the station. This lobby should be secure and separate from the private living area of the fire station. Ideally, the office function of the fire station should be as close as possible to the lobby so on-duty firefighters can monitor the lobby and to provide a transition from the public space to the public interaction office area to the living area.

Site and Building Security

The building and site of a fire facility should be secure from theft and unauthorized visitors to protect equipment and personnel so they can perform their service to the community unhindered. The special equipment is an asset to the community and requires special training to operate. The rear apron provides an area to locate this equipment as well as parking of firefighter personal vehicles while on duty. This area should be protected with a security fence and vehicle gate. Visitor entry and parking can be located outside this secure fence. The entry of the building itself should have a lobby with a secure door that allows visitors to come to the station without having access to the firefighter living areas. This allows firefighters to serve the community in a safe way.

Equity And Inclusion

Traditional fire stations provided facilities with limited privacy and open floor plans in dormitories, locker rooms, and restrooms. This reduced the opportunity for a diverse staff by not providing equitable and inclusive accommodations. The traditional open dorm fire station sleeping, and restroom facilities were developed based on historically all-male fire crews. For the fire department to be inclusive and recruit, retain and support a diverse staff, facilities need to be provided that accommodate all. Private sleeping areas and individual private restrooms and showers allow for any firefighter to maintain equitable living conditions. This encourages diversity within the department by providing a facility that has a layout that is inclusive to all.

Organizational Culture

Because the profession of firefighting relies heavily on the collaboration and teamwork of each crew to be able to perform together and live together in the firehouse, the opportunities for privacy should be balanced with spaces that encourage a culture of teamwork and collaboration. The apparatus bay and apparatus support spaces are areas where firefighters work together in daily duties on the job. The living area should be configured to foster informal, casual, and more formal collaboration with areas of meeting, relaxing and eating together. The kitchen, dining and day room areas should be organized to maintain the traditional collaborative culture of the fire

department, while the firefighter sleeping areas provide the equitable space to allow each firefighter to maintain their own desired level of privacy.

3.7.4 Facilities Overview

The Department utilizes the following three City-owned fire station facilities.

Table 21—Fire Department Facilities

Facility	Address/Location	Size (Square Feet)	Age (Years)
Fire Station 1	401 South Broadway Ave.	5,600	64
Fire Station 2	2400 Grant Ave.	3,000	63
Fire Station 3	280 Marina Way	3,500	11

3.7.5 Facilities Assessment

Citygate's high-level assessment of the Department's three fire station facilities found the following.

Finding #21: Two of the three fire stations are more than 60 years old and show significant signs of wear and tear despite the best efforts of City maintenance staff.

Finding #22: All three fire stations are undersized by modern fire service standards.

Finding #23: All three fire stations lack conformance with current Building Code, ADA and NFPA standards, and two of the stations were built before the Essential Services Buildings Seismic Safety Act of 1986.

Finding #24: Fire Stations 1 and 2 sleeping, locker room, and restroom facilities were developed based on historically all-male fire crews and have received minor retrofitted changes for gender inclusion and privacy. They should be completely upgraded to current standards.

Finding #25: Fire Station 1 is undersized and is not compatible for current combined headquarters and operational response functions.

Finding #26: The City's current Capital Improvement Program (CIP) identifies capital facility and infrastructure improvements over a rolling five years; however, it does not appear to plan for longer-term major facility renewal or replacement.

Recommendation #7:	The City should find an alternative location with adequate workspace for the combined Department administrative staff.
Recommendation #8:	The City should consider prioritizing the existing fire stations for substantial remodel or replacement in its Capital Improvement Plan.

3.8 FIRE DEPARTMENT FLEET

3.8.1 Assessment Methodology

For its high-level assessment of the Department's automotive fleet, Citygate utilized the following regulatory standards and industry-recognized best practice guidelines as well as available City/Department records and anecdotal evidence.

- NFPA 1901 Standard for Automotive Fire Apparatus – built prior to 2017
- NFPA 1911 Standard for the Inspection, Testing, Maintenance, and Retirement of In-Service Emergency Vehicles – built after 2017
- NFPA 1912 Standard for Fire Apparatus Refurbishing
- NFPA 1914 Standard for Testing Fire Department Aerial Devices

3.8.2 Fleet Overview

Fire services generally group fire apparatus into two categories: (1) engine companies, whose primary functions are to pump and deliver water, and provide basic firefighting functions including search and rescue; and (2) truck companies whose primary functions are forcible entry, ventilation, search and rescue, aerial operations for water delivery and rescue, utility control, illumination, salvage, and overhaul work. Other types of apparatus include water tenders, who's main function is to carry larger quantities of water, squads or rescue companies that carry a variety of rescue and emergency medical equipment, medic units or ambulances, command vehicles, and other auxiliary apparatus.

The Department utilizes 20 vehicles to provide services as summarized in the following table.

Table 22—Fire Department Fleet

Vehicle Number	CAD Radio Identifier	Make / Model	In-Service Year	Fire Pump Size (GPM)	Assignment
124	E-61	Pierce	2018	1500	Station 1
116	E-62	Pierce	2015	1500	Station 2
121-07	E-64	Pierce	2017	1500	Station 2
114	T-61	Pierce	2018	N/A	Station 1
135	R-61	RAM	2019	N/A	Station 1
136	R-62	RAM	2019	N/A	Station 2
137	Squad-63	Chevy Tahoe	2008	N/A	Station 3
107	Battalion-61	RAM	2019	N/A	Command
801	Boat 63	Crystal Liner	2004	N/A	Station 3
808	Boat	Boston Whaler	2008	N/A	Station 3
121-03	E-65	American La France	2001	1500	Reserve
115	T-62	American La France	2003	N/A	Reserve
104	Battalion-62	Chevy Suburban	2008	N/A	Reserve
135-12	R-63	Ford Van	2012	N/A	Reserve
100		Dodge Charger	2013	N/A	Fire Chief
101		Ford F-150	2009	N/A	Training Chief
102		Dodge Charger	2013	N/A	Admin. Chief
106		Ford F-150	2013	N/A	Utility
129		Ford Fusion	2014	N/A	Staff
130		Ford Fusion	2014	N/A	Staff

The Department also has the following vehicles currently on order:

Table 23—Vehicles on Order

Vehicle Type	Make / Model	Fire Pump Size (GPM)	Expected Delivery
Engine	Seagrave	1500	FY 23/24
Engine	Seagrave	1500	FY 23/24
Rescue Squad	Ram 4500 Quad Cab	N/A	FY 23/24
Command Vehicle	Ram 3500 4WD Pickup	N/A	FY 23/24
Utility Pickup	Chevy Silverado	N/A	FY 23/24

3.8.3 Fleet Maintenance

Most automotive maintenance is performed by the City's Fleet Maintenance Division. Fleet mechanics are ACE certified and have specialty training to perform routine repairs on fire apparatus. Major repairs including body work and ladder testing are outsourced. All engines are pump-tested annually, and ladders are tested annually, meeting NFPA standards.

According to Department staff, not all required apparatus testing, preventive maintenance, and repairs are performed in a timely manner due to a lack of qualified fire service mechanics working for the City. Currently, there is not any documented data kept on out of service time for fire apparatus.

3.8.4 Fleet Assessment

Citygate's high-level review of the Department's automotive fleet found it to be of the appropriate types and sizes to protect against expected hazards and provide appropriate command and support staff capacity. Citygate also found the reserve apparatus fleet appropriately sized to maintain daily front-line capacity. The Department also has a fleet replacement plan that allows the Department to keep the average years and mileage within recommended fire service guidelines and maintain an adequate number of reserve apparatus in each vehicle class. Older fire apparatus typically need more maintenance and repair work resulting in longer out of service intervals. As shown in Table 22, all the Department's front-line apparatus are under 10 years old, and most of the support/staff vehicles are under 12 years of age. This year, the Department will receive a new fire engine, placing a nine-year-old engine in excellent condition into reserve status. Sometime later this year, the Department will receive a second new engine and place a seven-year-old engine in excellent condition into reserve status. The current vehicle replacement cycle is 19 years, well below NFPA standards, and will be reduced with these new additions.

Fire apparatus must be relied on to transport firefighters safely to and from an incident and to operate reliably and properly to support the mission of the Department. Citygate's review of the Department's fleet found it to be in good condition with reliable serviceability and an appropriate replacement schedule.

Finding #27:	The Department's automotive fleet is in good overall condition with reliable serviceability and adequate reserve capacity to maintain operational response capacity.
Finding #28:	The Department's fire apparatus replacement schedule conforms with industry-recognized best practice recommendations.

3.9 Overall Administrative Support Functions Review Summary

Overall, Citygate finds the Department's administrative support organization to be appropriately organized and staffed to meet current and anticipated near-term future responsibilities and workload except for clerical support capacity for the newly formed Administrative Division and adequate integrated workspace for the entire administrative team. In addition, Citygate finds the City lacks current planning for the renewal or replacement of its aging fire station facilities that do not completely meet contemporary regulatory requirements or recommended best-practice safety, security, and gender separation features.

APPENDIX A—COMMUNITY RISK ASSESSMENT

A.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 as a whole.

A.1.1 Risk Assessment Methodology

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

- Identification of geographic planning sub-zones (risk planning 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 extent of impact* of a hazard occurrence by planning zone.

- Determination of the *probable impact severity* of a hazard occurrence by planning zone.
- Quantification of overall risk for each hazard based on *probability of occurrence* in combination with *impact extent* and *impact severity*.

For this assessment, Citygate used the following data sources to understand the hazards and values to be protected in the City of Redondo Beach:

- Esri and U. S. Census Bureau population and demographic data
- City Geographical Information Systems (GIS) data
- City General Plan and Zoning information
- City and County Hazard Mitigation Plans
- Department and other City data and information.

A.1.2 Risk Assessment Summary

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

1. The Department serves a diverse urban population with densities ranging from less than 8,200 to more than 18,000 people per square mile over a varied urban land use pattern.
2. The service area has a large inventory of residential and non-residential buildings to protect.
3. The service area has significant economic and other resource values to be protected, as identified in this assessment.
4. The Department has multiple mass emergency notification options available to effectively communicate emergency information to the public in a timely manner.
5. The service area's risk for five hazards related to emergency services provided by the Department range from **Low** to **Moderate** as summarized in the following table.

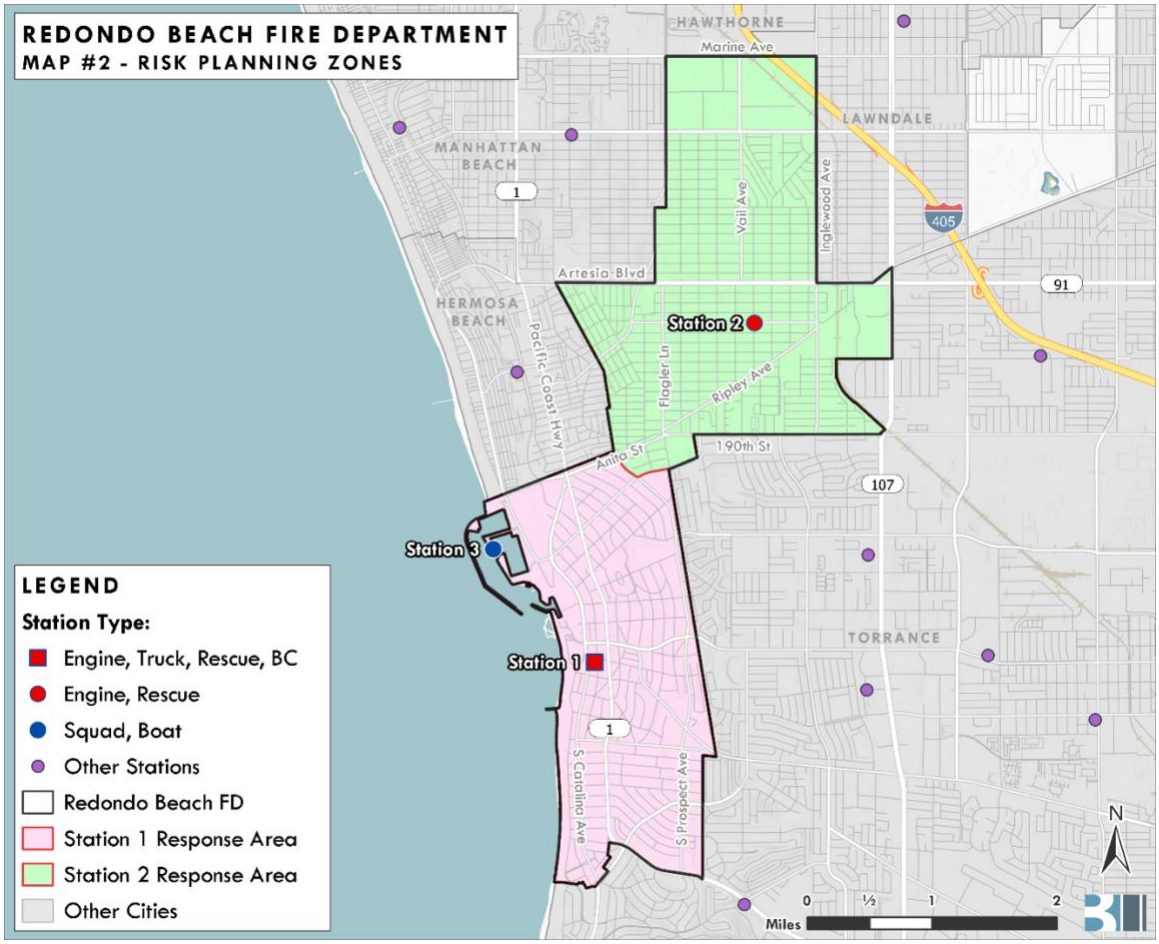
Table 24—Overall Risk by Planning Zone

Hazard	Planning Zone		
	Station 1	Station 2	Station 3
Building Fire	Moderate	Moderate	Low
Medical Emergency	Moderate	Moderate	Moderate
Hazardous Material	Low	Low	Low
Technical Rescue	Moderate	Moderate	Moderate
Marine Incident	Low	Low	Moderate

A.1.3 Planning Zones

The Commission on Fire Accreditation International (CFAI) recommends jurisdictions establish geographic 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 were 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, high- or maximum-risk occupancies are a larger percentage of the risk in a smaller planning zone, then they become 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 appropriately evaluate service demand and response performance relative to each specific zone. For this assessment, Citygate utilized three planning zones corresponding with fire station first-due response areas as shown on the following map.

Figure 17—Risk Planning Zones



A.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 under the age of 10, the elderly, people housed in institutional settings, and households below the federal poverty level. The following table summarizes key demographic data for the City of Redondo Beach.

Table 25—Key Demographic Data – City of Redondo Beach

Demographic	2023
Population	**70,415**
Under 10 Years	10.1%
10–14 Years	5.7%
15–64 Years	68.4%
65–74 Years	9.9%
75 Years and Older	6.0%
Median Age	41.8
Daytime Population	61,436
Housing Units	**30,724**
Owner-Occupied	49.1%
Renter-Occupied	45.7%
Vacant	5.20
Average Household Size	2.36
Median Home Value	$1,143,967
Ethnicity	
White Alone	59.6%
Black / African American Alone	3.2%
Asian Alone	15.4%
Other / Two or More Races	15.3%
Hispanic / Latino Origin	18.9%
Diversity Index	71.8
Education (Population over 24 Years of Age)	**52,122**
High School Graduate or Equivalent	9.3%
Undergraduate Degree	42.1%
Graduate/Professional Degree	24.3%
Employment (Population over 15 Years of Age)	
In Labor Force	40,699
Unemployed	3.40%
Median Household Income	$128,326
Population below Poverty Level	5.90%
Population with Disabilities	8.50%
Population without Health Insurance Coverage	3.10%

Source: ESRI and U.S. Census Bureau

Of note from the previous table is the following:

- 26 percent of the population is under 10 years or over 65 years of age.
- The service area population is predominantly White Alone (60 percent), followed Asian Alone (15 percent), Two or More Races (15 percent), Some Other Race Alone (6 percent), and Black Alone (3 percent).
- Of the population over 24 years of age, more than 96 percent has completed high school or equivalency.
- Of the population over 24 years of age, nearly 67 percent has an undergraduate, graduate, or professional degree.
- Median household income is slightly more than $128,000.
- The population below the federal poverty level is slightly more than 5 percent.
- Slightly more than 3 percent of the population does not have health insurance coverage.

Buildings

The city has over 30,000 residential housing units and 3,744 other businesses housing manufacturing, research, technology, office, professional services, retail sales, restaurants/bars, motels, churches, schools, storage, government facilities, healthcare facilities, and other occupancy types.[9]

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 smaller than 10,000 square feet without a high hazard fire load; 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 larger than 10,000 square feet without a high hazard fire load; low-occupant load buildings with

[9] Source: Esri Community Analyst – Community Profile (2023).

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 or significant economic impact to the community.

Critical Facilities

The U.S. Department of Homeland Security defines critical infrastructure and 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 138 critical facilities and infrastructure, as shown in the following table. A hazard occurrence with significant consequence severity affecting one or more of these facilities would likely adversely impact critical public or community services.

Table 26—Critical Facilities/Infrastructure

Critical Facility Category	Quantity
City Government	12
Communications facility	1
Electricity/power	57
Medical facility	2
Parks and Recreation	31
School	15
Senior Facility	4
Transit Station	2
Wastewater pump/lift station	13
Water supply or treatment	1
Total	**138**

Source: City of Redondo Fire Department

Economic Resources

The service area has nearly 3,800 businesses employing over 24,000 people. Key economic industries include retail, industrial and tourism.[10]

[10] Source: City of Redondo Beach Local Hazard Mitigation Plan (July 2020)

- Redondo Beach Unified School District
- Hotels
- Northrup-Grumman
- South Bay Galleria

Natural Resources

Key natural resources within the service area include:[11]

- King Harbor
- 1.5 miles of beachfront
- 14.l miles of bike paths, lanes, and routes
- 56 acres of City-owned parks and open space

Special/Unique Resources

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

- Redondo Beach Marinas
- Redondo Beach Pier
- Light Rail

A.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 2020 City of Redondo Beach Local Hazard Mitigation Plan identifies the following six hazards likely to impact the service area:

1. Coastal Inundation
    a. Coastal flooding
    b. Storm Surge
    c. Sea level rise

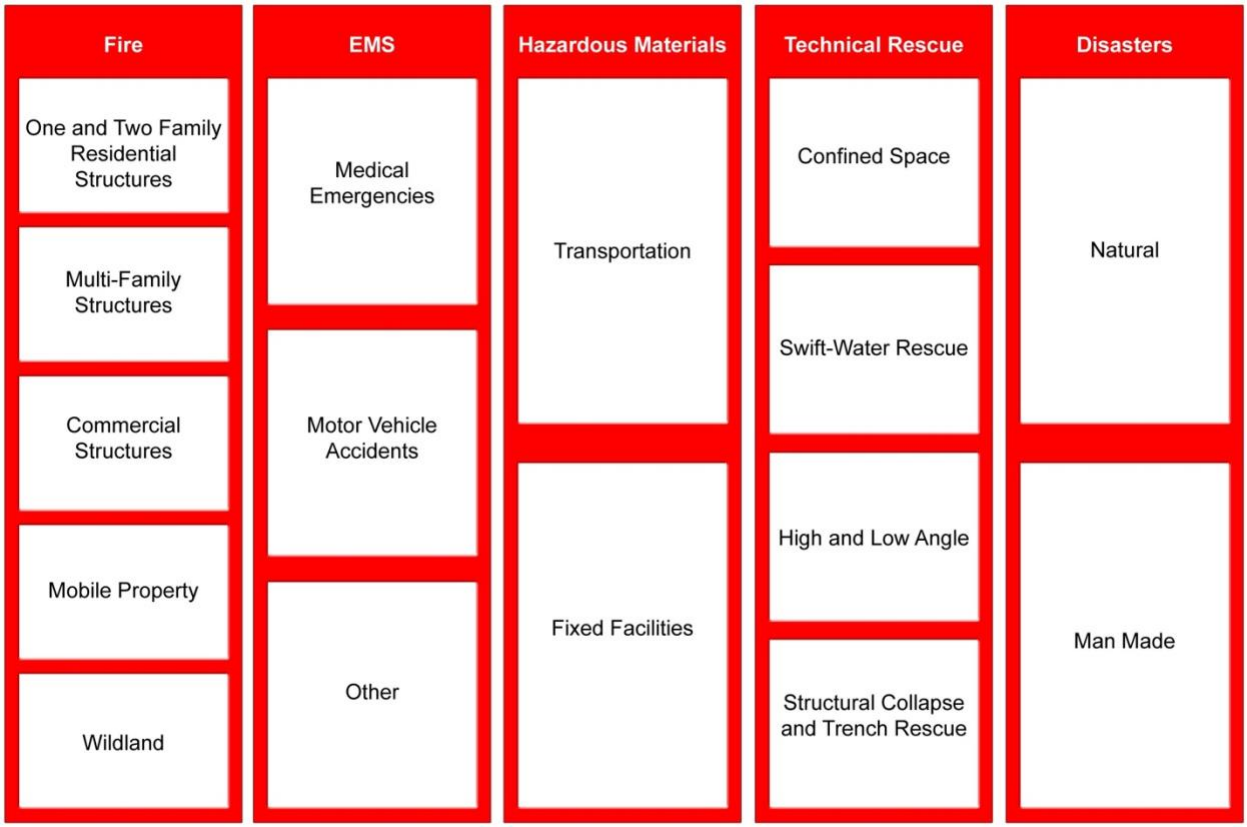
[11] Source: Redondo Community Services Department

2. Coastal erosions
3. Flooding
4. Hazardous materials release
    a. Methane-containing soils
    b. Hazardous materials release
5. Seismic
    a. Shaking
    b. Liquefaction
    c. Landslide
    d. Tsunami
6. Severe Weather
    a. Heat
    b. Wind
    c. Storms

Although the Department has no legal authority or responsibility to mitigate any hazards, it does provide services related to many 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 18—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 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:

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

A.1.6 Service Capacity

Service capacity refers to the Department's available response force; the size, type, 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 relative to the risks to be protected.

Service capacity for fire and non-fire risk consists of 20 response personnel on duty daily staffing three engines, one aerial ladder truck, two paramedic rescue squads, one marine rescue/harbor boat/squad, plus one Battalion Chief, all operating from the Department's three fire stations.

All response personnel are trained to either the emergency medical technician (EMT) level, capable of providing BLS pre-hospital emergency medical care, or the EMT-P (Paramedic) level, capable of providing ALS pre-hospital emergency medical care. All engines and the ladder truck are staffed with at least one paramedic, and the rescue squads are staffed with two paramedics. Ground ambulance transportation services are provided by McCormick Ambulance under an agreement with the Los Angeles County Emergency Medical Services Agency.

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 for a hazardous material response team. When needed, a hazardous materials technical response team is available through automatic aid from the Los Angeles County Fire Department in Rancho Dominguez.

All response personnel are further trained in Confined Space Awareness, Low-Angle/High-Angle Rope Rescue Technician, Confined Space Operational, and Trench Rescue Operational levels. When needed, additional technical rescue services are available through automatic aid from the Los Angeles County Fire Department in Pico Rivera.

The Department has automatic mutual aid agreements with the cities of Torrance and Manhattan Beach, as well as the Los Angeles County Fire Department.

A.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 the 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 characteristics used for this analysis.

Table 27—Probability of Occurrence Categories

Category	General Characteristics	General Frequency of Occurrence
Rare	• Hazard ***may occur*** under exceptional circumstances.	> 10 years
Unlikely	• Hazard ***could occur*** at some time. • No recorded or anecdotal evidence of occurrence. • Little opportunity, reason, or means for hazard to occur.	2–10 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.	1–23 months
Probable	• Hazard will ***probably occur*** occasionally. • Regular recorded or strong anecdotal evidence of occurrence. • Considerable opportunity, reason, or means for hazard to occur.	1–4 weeks
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.	Daily to weekly

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

A.1.8 Impact Extent

Impact extent refers to the probable geographic area and/or number of persons likely to be impacted by a specific hazard occurrence. The following table describes the four impact extent categories and general characteristics used for this analysis.

Table 28—Impact Extent Categories

Category	General Characteristics
Negligible	• Less than 1 percent of planning area likely impacted • No persons impacted
Limited	• Less than 10 percent of planning area likely impacted • 1-5 people impacted
Significant	• 10-50 percent of planning area likely impacted • 6-50 people impacted
Extensive	• More than 50 percent of planning area likely impacted • More than 50 people impacted

A.1.9 Impact Severity

Impact 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 29—Impact 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

A.1.10 Overall Risk

Overall risk was determined by considering the probability of occurrence, likely impact extent, and reasonably expected impact severity using to the following tables.

Table 30—Overall Risk Categories – Negligible Impact Extent

Probability of Occurrence	Impact Severity				
	Insignificant	Minor	Moderate	Major	Extreme
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*	*High*

Table 31—Overall Risk Categories – Limited Impact Extent

Probability of Occurrence	Impact Severity				
	Insignificant	Minor	Moderate	Major	Extreme
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	Low	Moderate	High	Extreme

Table 32—Overall Risk Categories – Significant Impact Extent

Probability of Occurrence	Impact Severity				
	Insignificant	Minor	Moderate	Major	Extreme
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 33—Overall Risk Categories – Extensive Impact Extent

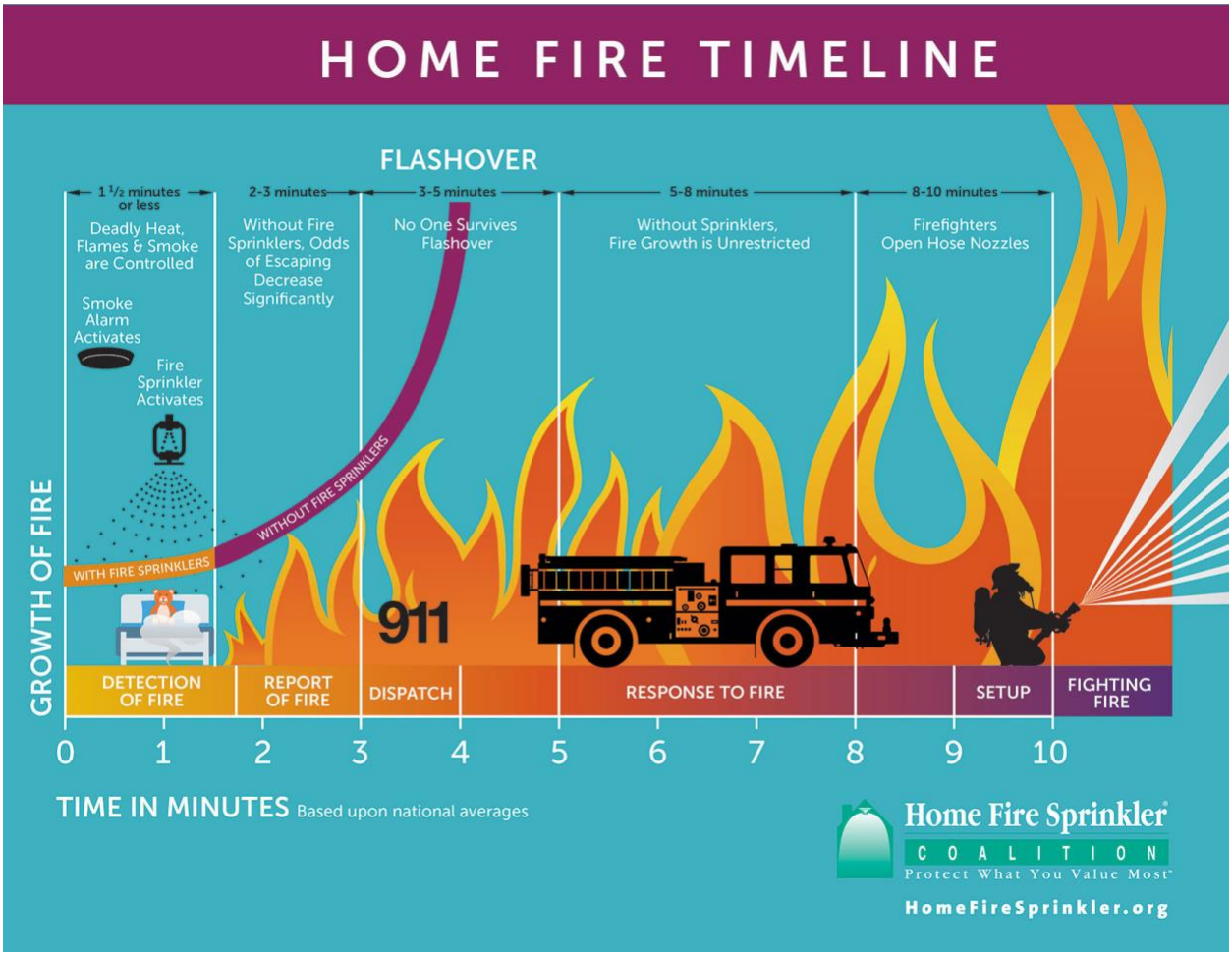
Probability of Occurrence	Impact Severity				
	Insignificant	Minor	Moderate	Major	Extreme
Rare	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Unlikely	*Low*	*Low*	*Moderate*	*High*	*Extreme*
Possible	*Low*	*Moderate*	*High*	*High*	*Extreme*
Probable	*Low*	*Moderate*	*High*	*Extreme*	*Extreme*
Frequent	*Moderate*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

A.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 the Department and the U.S. Census Bureau to assist in determining the service area'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 19—Building Fire Progression Timeline



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

Population Density

Population density within the service area ranges from less than 8,200 to more than 18,000 people per square mile.[12] 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. Potable water is provided by the California Water Service

[12] Source: ESRI 2023

Company (Cal Water) and according to Fire Department staff, available fire flow volume and pressure are adequate throughout the service area.

Building Fire Service Demand

For the three-year period, the service area experienced 146 building fire incidents comprising 0.65 percent of total service demand over the same period, as summarized in the following tables.

Table 34—Building Fire Service Demand

Hazard	Year	Planning Zone				Total	Percent Total Annual Demand
		Sta. 1	Sta. 2	Sta. 3	Other		
Building Fire	RY 20/21	21	19	0	0	**40**	0.54%
	RY 21/22	27	28	1	3	**59**	0.77%
	RY 22/23	13	25	0	9	**47**	0.62%
	Total	**61**	**72**	**1**	**12**	**146**	**0.65%**
Percent Total Station Demand		0.64%	0.73%	0.04%	1.60%		

Building Fire Risk Assessment

The following table summarizes Citygate's assessment of the service area's building fire risk by planning zone.

Table 35—Building Fire Risk Assessment

Building Fire Risk	Planning Zone		
	Station 1	Station 2	Station 3
Probability of Occurrence	Probable	Probable	Unlikely
Impact Extent	Significant	Significant	Limited
Impact Severity	Moderate	Moderate	Moderate
Overall Risk Rating	**Moderate**	**Moderate**	**Low**

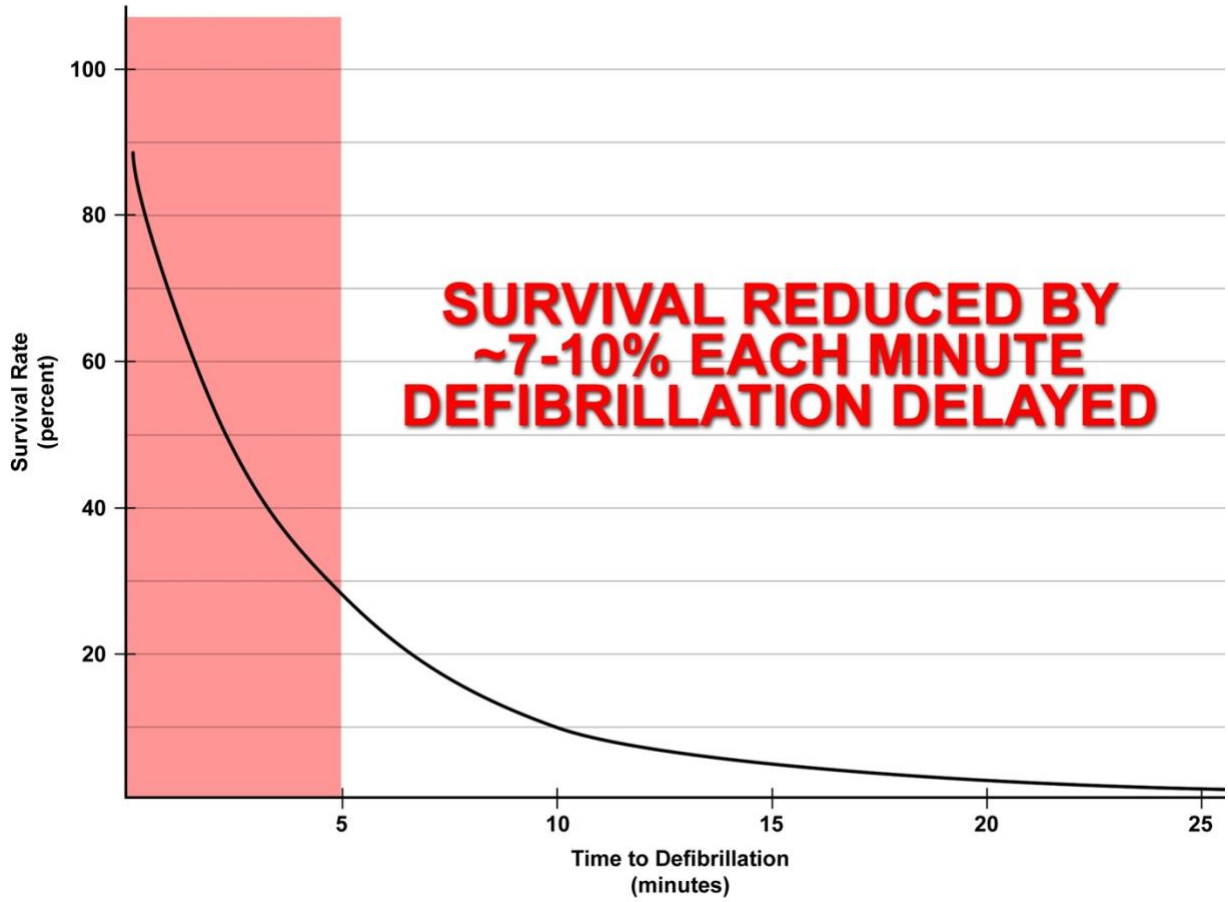
A.1.12 Medical Emergency Risk

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 advanced life support interventions.

Figure 20—Survival Rate versus Time to Defibrillation



Population Density

Population density in the service area ranges from less than 8,200 to more than 18,000 people per square mile, as shown in Map #2a (**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 25, 16 percent of the service area population is 65 and older; 4 percent of the population over 24 years of age has less than a high school education or equivalent;

just over 5 percent of the population is at or below poverty level; and a little over 3 percent of the population does not have health insurance coverage.[13]

Vehicle Traffic

Medical emergency risk tends to be higher in areas of a community with high daily vehicle traffic volume, particularly areas with high traffic volume traveling at high speeds. The service area's transportation network includes Highways 1, 107, and 405 carrying an aggregate annual average daily traffic volume of more than 306,000 vehicles.[14]

Medical Emergency Service Demand

Medical emergency service demand over the three-year study period includes more than 15,000 calls for service comprising over 67 percent of total service demand over the same period, as summarized in the following tables.

Table 36—Medical Emergency Service Demand

Hazard	Year	Planning Zone				Total	Percent Total Annual Service Demand
		Sta. 1	Sta. 2	Sta. 3	Other		
Medical Emergency	RY 20/21	2,196	2,376	152	0	**4,724**	64.12%
	RY 21/22	2,387	2,611	146	136	**5,280**	69.31%
	RY 22/23	2,396	2,397	112	331	**5,236**	68.75%
	Total	**6,979**	**7,384**	**410**	**467**	**15,240**	**67.43%**
Percent Total Station Demand		73.59%	74.87%	16.35%	62.43%		

Medical Emergency Risk Assessment

The following table summarizes Citygate's assessment of the service areas medical emergency risk by planning zone.

[13] Source: ESRI and US Census Bureau.
[14] Source: CalTrans (2021).

Table 37—Medical Emergency Risk Assessment

Medical Emergency Risk	Planning Zone		
	Station 1	Station 2	Station 3
Probability of Occurrence	Frequent	Frequent	Frequent
Impact Extent	Limited	Limited	Limited
Impact Severity	Moderate	Moderate	Moderate
Overall Risk Rating	**Moderate**	**Moderate**	**Moderate**

A.1.13 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 Facilities

The Department identified 46 sites requiring a state or county hazardous material operating permit or Hazardous Materials Business Plan. In addition, high-pressure natural gas distribution pipelines are located throughout the service area.

Transportation-Related Hazardous Materials

The service area also has transportation-related hazardous material risk because of its road transportation network, including Highways 1, 107, and 405 carrying an aggregate annual average daily truck traffic volume of more than 10,500 vehicles, some of which are transporting hazardous materials, as summarized in the following table.[15]

[15] Source: Caltrans GIS (2021).

Table 38—Average Annual Daily Traffic Volume

Highway	Crossing	AADT[1]	Truck AADT by Axles				Percentage of Truck AADT by Axles			
			2	3	4	5+	2	3	4	5+
1	Manhattan	1,382	1053	185	91	57	76.2	13.4	6.4	4
101	Torrance	933	820	67	21	25	87.9	7.2	2.2	2.7
405	Lawndale	8,336	3,970	772	472	3,122	47.6	9.3	5.7	37.5
	Total	**10,651**	**5,843**	**1,024**	**584**	**3,204**	**70.6**	**10.0**	**4.8**	**14.7**

[1] Average Annual Daily Trips

Source: Caltrans GIS (2021)

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 #2b (**Volume 2 – Map Atlas**), the service area population density ranges from less than 8,2000 to more than 18,000 people per square mile.

Vulnerable Populations

Persons vulnerable to a hazardous material release/spill include 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. As shown in Table 25, nearly 26 percent of the population is under age 10 or is 65 years and older.

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 has a formal evacuation plan; however, the Emergency Manager position is currently vacant and there has not been recent exercises to ensure familiarity and effective utilization.[16] The City also has a free subscription and reverse 9-1-1-based mass emergency notification system

[16] City of Redondo Safety Element (2023).

(Alert South Bay) that is used to provide emergency alerts, notifications, and other emergency information to email accounts, cell phones, smartphones, tablets, and landline telephones. Federal Communications Commission Wireless Emergency Alerts and social media (Facebook, Twitter) are also used to provide emergency notifications and information to the public.

Hazardous Material Service Demand

The service area experienced 311 hazardous material incidents over the three-year study period, comprising 1.38 percent of total service demand over the same period, as summarized in the following tables.

Table 39—Hazardous Material Service Demand

Hazard	Year	Planning Zone				Total	Percent Total Annual Service Demand
		Sta. 1	Sta. 2	Sta. 3	Other		
Hazardous Material	RY 20/21	44	25	20	0	**89**	1.21%
	RY 21/22	37	39	24	1	**101**	1.33%
	RY 22/23	49	51	15	6	**121**	1.59%
	Total	**130**	**115**	**59**	**7**	**311**	**1.38%**
Percent Total Station Demand		0.64%	0.73%	0.04%	1.60%		

Hazardous Material Risk Assessment

The following table summarizes Citygate's assessment of the service area's hazardous materials risk by planning zone.

Table 40—Hazardous Materials Risk Assessment

Hazardous Materials Risk	Planning Zone		
	Station 1	Station 2	Station 3
Probability of Occurrence	Probable	Probable	Probable
Impact Extent	Limited	Limited	Limited
Impact Severity	Minor	Minor	Minor
Overall Risk Rating	**Low**	**Low**	**Low**

A.1.14 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 within the service area.

Confined Spaces

There are multiple confined spaces within the service area, including tanks, vaults, and open trenches.

Bodies of Water

The service area has an active set of marinas and 1.5 miles of beachfront attracting a high volume of visitors.

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 service area, with Highways 1, 107, and 405 carrying an aggregate annual average daily traffic volume of more than 306,000 vehicles.[17]

Earthquake Risk[18]

According to the City's Mitigation Action Plan, though faults run close to Redondo Beach, no active faults with the potential for fault rupture are in the City. However, Redondo Beach is in a seismically active area and has been impacted by earthquakes in the past. Based on probabilistic modeling of simulated earthquakes in the greater Los Angeles area, the City of Redondo Beach is expected to experience shaking acceleration between 0.85 and 1.25 percent gravity.

[17] Source: CalTrans 2023
[18] Source: City of Redondo Beach Local Hazard Mitigation Plan (July 2020)

Figure 21—Earthquake Fault Locations

Flood Risk[19]

All the coastal areas in Redondo are at the risk of seal level rise. The coastal southern half of the City is the most vulnerable to storm surges. In 1988, storm surge destroyed 16 waterfront businesses located along the piers.

Tsunami Risk[20]

Due to its location on the Pacific Coast, many low-lying coastal areas of the service area are susceptible to a tsunami. Since 1927, nine tsunami events have impacted Los Angeles County, including the March 2011 tsunami that originated in Japan and run-up amplitudes ranging from two to three feet along the waterfront, damaging docks and boats.

Technical Rescue Service Demand

The Department responded to 935 technical rescue incidents over the three-year study period, comprising 4.14 percent of total service demand for the same period, as summarized in the following tables.

Table 41—Technical Rescue Service Demand

Hazard	Year	Planning Zone				Total	Percent Total Annual Service Demand
		Sta. 1	Sta. 2	Sta. 3	Other		
Technical Rescue	RY 20/21	42	21	223	0	**286**	3.88%
	RY 21/22	53	32	173	1	**259**	3.40%
	RY 22/23	60	20	294	16	**390**	5.12%
	Total	**155**	**73**	**690**	**17**	**935**	**4.14%**
Percent Total Station Demand		0.64%	0.73%	0.04%	1.60%		

As the previous table shows, overall service area technical rescue service demand is significant and increased considerably over the three-year study period.

Technical Rescue Risk Assessment

The following table summarizes Citygate's assessment of the service area's technical rescue risk by planning zone.

[19] Source: California Coastal Commission Statewide Seal Level Rise Vulnerability Synthesis (2016).
[20] Source: 2020 City of Los Angeles Hazard Mitigation Plan, Section 4.6.

Table 42—Technical Rescue Risk Assessment

Technical Rescue Risk	Planning Zone		
	Station 1	Station 2	Station 3
Probability of Occurrence	Probable	Probable	Frequent
Impact Extent	Limited	Limited	Limited
Impact Severity	Moderate	Moderate	Moderate
Overall Risk Rating	**Moderate**	**Moderate**	**Moderate**

A.1.15 Marine Incident Risk

Marine incident risk factors include waterway and near-shore recreational activities and watercraft storage and use in or on waterways within the service area.

Waterways

The City has an active set of marinas and 1.5 miles of beachfront attracting a high volume of visitors.

King Harbor

Constructed in the 1960s, the breakwater wall creates about 112 acres of protected water area containing approximately 825 boat slips with adjacent development including apartments, office, and retail. The harbor is separated into three basins serving small craft to boats 90 feet in length. Frequently, the harbor is susceptible to damage when large winter storms occur in conjunction with high water levels.[21]

Recreational Activity

The breakwater wall and beachfront are popular for water recreation activities, including swimming, snorkeling, fishing, paddle boarding, kayaking, etc.

Watercraft Storage

There are numerous marinas within the service area.

[21] Redondo Beach King Harbor, California, Development of Design Harbor Improvement, USACE 1990

Marine Incident Service Capacity

The Department's marine safety service capacity includes two cross-trained, constantly staffed personnel at Fire Station 3 providing service as a harbor patrol in the primary vessel and a fireboat when needed. Capabilities include towing, dewatering, fixed and portable pumps and rescue swimmer equipment. The vessels carry limited equipment and supplies to confine hydrocarbon spills while awaiting remediation from the responsible party.

Two Los Angeles County Lifeguards are co-located at Station 3 but operate independently.

Marine Incident Service Demand

Over three-year study period, the Department responded to 788 marine incidents, comprising 3.49 percent of total service demand for the same period, as summarized in the following table.

Table 43—Marine Incident Service Demand

Hazard	Year	Planning Zone				Total	Percent Total Annual Service Demand
		Sta. 1	Sta. 2	Sta. 3	Other		
Marine Incident	RY 20/21	1	0	260	0	**261**	3.54%
	RY 21/22	4	1	194	0	**199**	2.61%
	RY 22/23	3	0	311	14	**328**	4.31%
	Total	**8**	**1**	**765**	**14**	**788**	**3.49%**
Percent Total Station Demand		0.64%	0.73%	0.04%	1.60%		

As the previous table shows, overall service area marine incident service demand is significant but varied over the three-year study period.

Marine Incident Risk Assessment

The following table summarizes Citygate's assessment of the service area's marine risk by planning zone.

Table 44—Marine Incident Risk Analysis

Marine Incident Risk	Planning Zone		
	Station 1	Station 2	Station 3
Probability of Occurrence	Possible	Unlikely	Frequent
Impact Extent	Limited	Limited	Limited
Impact Severity	Minor	Minor	Moderate
Overall Risk Rating	**Low**	**Low**	**Moderate**