Gladstone Fire Department

Oregon

COMMUNITY RISK ASSESSMENT: STANDARDS OF COVER

2017

Emergency Services Consulting International

Providing Expertise and Guidance that Enhances Community Safety

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INTRODUCTION

The following report serves as the Gladstone Fire Department Community Risk Assessment: Standards of Cover. It closely follows the Center for Fire Public Safety Excellence (CPSE) Community Risk Assessment: Standards of Cover model that develops written procedures to determine the distribution and concentration of a fire and emergency service agency's fixed and mobile resources. The purpose for completing such a document is to assist the agency in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations. Further, it sets the foundation for policy-makers to establish service levels and performance goals.

Creating a Standards of Cover document requires that a number of areas be researched, studied, and evaluated. This report will begin with an overview of both the community and the agency. Following this overview, the plan will discuss areas such as risk assessment, critical task analysis, agency service level and performance goals, and distribution and concentration measures. The report will provide analysis of historical performance and will conclude with policy and operational recommendations.

ESCI extends its appreciation to the elected officials and members of the City of Gladstone, the Gladstone Fire Department, and citizens of the city who contributed to the development of this plan.

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EXECUTIVE SUMMARY

This document describes Gladstone Fire Department's Community Risk Assessment: Standards of Cover. Community risks, response resources, deployment strategies, and service levels have been evaluated in this study. It establishes response time goals and standards for measuring the effectiveness of fire department services and the deployment of its resources. The document follows the guidance provided by the Center for Public Safety Excellence, *Community Risk Assessment: Standards of Cover 6th Edition*.

The Gladstone Fire Department (GFD) is a department of the City of Gladstone, a city established and organized under Oregon law. It provides fire protection, emergency medical, and rescue services to its community. The department's service area encompasses all of the City of Gladstone.

GFD has a resident population of approximately 11,660[1] people. The community is characterized as an urban cluster and is also considered part of the larger Portland metropolitan area. The city is small, at 2.48 square miles, which facilitates an excellent response capability. The city is served by one fire station, which is fairly centralized in its service area.

The Insurance Services Office (ISO) reviews the fire protection resources within communities and provides a Community Fire Protection Rating system from which insurance rates are often based. The rating system evaluates three primary areas: the emergency communication and dispatch system, the fire department, and the community's water system. The overall rating is then expressed as a number between 1 and 10, with 1 being the highest level of protection and 10 being unprotected or nearly so. As of the latest survey, ISO gave GFD a rating of Class 4.

The analysis completed during this study revealed a number of important findings. These include:

- Total response workload has remained fairly steady over the last five years.
- 71.5 percent of all responses are requests for emergency medical service.
- Call volume is the busiest between the hours of 8:00 a.m. and 10:00 p.m., with the highest service demand at 5:00 p.m. This is significant in that POC members are often less available during these hours.
- Almost 100% of the populated areas of Gladstone and over 95% of the service demand in Gladstone is able to be reached in four minutes travel time from the existing fire station.
- Due to Gladstone's location, a minimum of eleven fire stations are within eight minutes travel time to some portions of Gladstone, while fifteen fire stations can reach the majority of Gladstone within eight minutes.
- Squad 390 is the busiest unit in Gladstone, with a 4.7% unit utilization rate, which reflects capacity for increases in service demand over time.

[1] Portland State University, "Preliminary Annual Population Estimate," Population Research Center, July 2016.

- Concurrent demand for emergency response (simultaneous calls) occurs 9.2% of the time.
- Turnout time for Gladstone has been 5:01 minutes or less, 90% of the time since August 2015. Total response time has been 8:51 minutes or less, 90% of the time during the same period.
- Since January 2017, GFD has staffed a rescue unit 8 a.m. through 6 p.m., Monday through Friday. This improved turnout time by 1:49 minutes over the previous year and a total of 1:56 minutes for total response time, increasing effectiveness by 12.4% over the previous year.
- NFPA 1720[2] requires an effective response force (total numbers of personnel on scene of a structure fire) of fifteen personnel arriving within the first nine minutes of dispatch. Currently, Gladstone is able to assemble three units in 8:53 minutes, and a fourth unit in 9:24 minutes. Depending on unit staffing, GFD is close to achieving this standard today.

Recommendations

ESCI provided the following recommendations at the end of this report.

Formally Adopt Response Performance Goals

In order to provide a solid basis for planning future service delivery, the specific response performance goals should be adopted by the City of Gladstone.

Response Type/Element	Time Goal	Frequency
Turnout Time - Fire/Special Ops	120 seconds	≤ 80%
Turnout Time - EMS/All Others	90 seconds	< 80%
Fire - First arriving fire engine	6:00 minutes	< 80%
EMS - First arriving medical unit	5:30 minutes	< 80%
Water - First water rescue technician	8:30 minutes	< 80%
HazMat – First hazmat operations certified person	6:00 minutes	< 80%
Fire –Effective Response Force (15)	9:00 minutes	< 90%

While not required by NFPA 1720, call processing time at the dispatch center is an important element that affects incident outcomes, and therefore should be tracked by GFD. GFD should review C-COM performance reports to measure against NFPA 1221, which states in essence that:

> … (the dispatch center) shall establish a performance goal of having an alarm processing time of not more than 64 seconds for at least 90 percent of the alarms and not more than 106 seconds for at least 95 percent of the alarms.[3]

Annual Performance Reporting

The Gladstone Fire Department can reinforce policy-maker and community understanding by annually reporting on its performance in the response performance goals. By completing and scheduling the

[2] *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations & Special Operations to the Public by Volunteer Fire Departments*

[3] NFPA 1221, *Standard for the Installation, Maintenance, and Use of. Emergency Services Communications Systems*

annual report as provided in this report (Appendix A), GFD holds itself accountable for performance, informs the policy-makers and community members of its performance gaps, and works with the city council and community to develop strategies to address these gaps.

Facility Improvements

The Gladstone Fire Department is squeezed into a fire station that lacks living quarters, sufficient room around the apparatus, sufficient office space or sufficient meeting room space. Should the opportunity to add square footage to the station to address living quarters and bay space as the top priorities (and in priority order), the city should pursue that opportunity.

POC Recruitment & Maintenance

The Gladstone Fire Department should redouble its efforts to recruit new, additional POCs. It should limit expansion of the program to non-community members. Specifically, ESCI recommends the non-resident POC program be limited to no greater than 20 percent of the total POC workforce.

Implementation of Risk Based Responses

With the community risk assessment information included in this report, the Gladstone Fire Department can consider a differential response based on the risk assessment. This must be done carefully to avoid under-response to incidents, but can add efficiency and effectiveness to target hazards, such as schools and other public assembly risks.

CURRENT CONDITIONS

The Gladstone Fire Department (GFD or Department) Community Risk Assessment: Standards of Cover begins with ESCI's Evaluation of Current Conditions, an assessment of the agency as it was found to be operating upon initiation of the project in September 2017. Using organizational, operational, staffing, and geographic information system (GIS) models, this phase of the study provides the reader with GFD background and context, as well as current approach to service delivery to the community.

ESCI bases this evaluation on data provided by the agency and collected during ESCI's fieldwork. The information is compared to a combination of National Fire Protection Association (NFPA) standards, Commission on Fire Accreditation International (CFAI) self-assessment criteria, health and safety requirements, federal and state mandates relative to emergency services, and generally accepted best practices within the emergency services community, as well as the experience of ESCI's consultants.

Community Background

Gladstone, Oregon is located on the north bank of the Clackamas River at its confluence with the Willamette River. The area was home to the Chinook-speaking Clackamas tribe prior to the arrival of Jason Lee and his Methodist Mission around 1840. Lee claimed much of what is now East Gladstone and called it Klackamus Farm.[4]

In 1843, James Robb purchased Klackamus Farm. The following year, he sold the tract to the Fendel Cason family from Virginia, who migrated to Oregon the previous year. The family settled and began homesteading the area in 1844.

In 1845, Jacob Rinearson filed for a donation land claim of 640 acres that adjoined the Cason Farm to the west. His land stretched from the north shore of the Clackamas River to what is now Jennings Lodge. Jacob was accompanied west by his younger brother, Peter. Peter married Rebecca Cornelius, who migrated to Oregon with her family on the same wagon train as the Rinearson brothers. Jacob then relinquished his land claim to his brother.

On what was once the southeast corner of the Rinearson Land, Gladstone's famous Pow Wow Tree still stands. It is an important landmark in Gladstone's history and was the site of numerous native community events. The tree also marked the entrance to the first Clackamas County Fair in 1860, held on four acres of the Rinearson Land along the banks of the Clackamas River. In 1861, the first Oregon State Fair was held at the same location

[4] The "Community Background" section is excerpted from the Gladstone Historical Society, http://www.gladstonehistoricalsociety.org; obtained 10-12-2017.

On Christmas day of 1869, Ben Holladay (Overland Stage) brought the railroad to what is now Gladstone. Six-hundred Chinese laborers helped him build a railroad bridge over the Clackamas River near what is now called High Rocks. Holladay's rail line connected Oregon City to all points north, and it would later become the Southern Pacific Railroad. A depot, called the Chautauqua Station, was erected at the junction of Oatfield Road and present-day Clackamas Boulevard.

In 1882, Clackamas County Judge Harvey Cross (1856–1927), a successful Oregon City lawyer and one-time state senator, purchased the Cason house for his family. Soon after, he began buying up portions of the Cason's original 640-acre donation land claim with a view towards establishing a town, which he planned to name after his hero, William Ewart Gladstone, four-time Prime Minister of England.

In 1889, Judge Cross formed the Gladstone Real Estate Corporation and platted East Gladstone, an area that extended eastward from Portland Avenue to the 73-acre undeveloped woodland tract with lake that he called Gladstone Park. Upon the suggestion of surveyor, Sidney Smyth, Judge Harvey Cross decided to name the streets running in direction from the east to the west for American colleges or universities; and the avenues running in direction from the north to the south for English dukes and earls. Some believe the avenues were named for British universities.

The exception to the north-south rule was Portland Avenue, Gladstone's main street. This thoroughfare was named for the Interurban Electric Streetcar (1893) line that ran from Oregon City to Portland through the heart of Gladstone. Streetcars also ran on a spur line along Dartmouth Street to the entrance of Gladstone Park, location of the Chautauqua Station. In 1895, a covered auditorium was erected that seated 3,000 near Gladstone Park.[5]

With Railroad and trolley lines able to bring people from other towns and communities, appearances by such notables became common. These included the evangelist, Billy Sunday; band master, John Phillip Sousa; poet, Joaquin Miller; presidential candidate, Theodore Roosevelt; and the most popular speaker of all, William Jennings Bryan.

In 1907, the first official Clackamas County Fair was held on the Chautauqua Grounds—Gladstone Park. Judge Cross incorporated his city on January 10, 1911, and Oscar E. Freytag was elected the first mayor. The town grew steadily into a well-kept community of a few local stores and families whose wage earners worked in the mills in Oregon City and West Linn. By 1920, Gladstone had reached a population of 1,069.

In 1929, Gladstone started a Volunteer Fire Department. In 1941, a new City Hall was erected complete with a library. In 1950, Gladstone's citizens had more than doubled since its beginning. By the year 2000, over 10,000 residents populated Gladstone, and today is home to 11,660.[6]

[5] *Ibid.*
[6] Portland State University, "Preliminary Annual Population Estimate," Population Research Center, July 2016.

Governance and Lines of Authority

Policy direction for the City of Gladstone is provided by a mayor and six city council members. The mayor and council members are all elected at large by the voters of the city. Council meetings are presided over by the mayor. The mayor and city council appoint a city administrator to manage the day-to-day affairs and activities of the city on behalf of the council. Each department head, including the fire chief, reports to the city administrator, who serves at the pleasure of the council. The structure and authority of the policy-makers is set forth in the city charter and city council rules.

The authority of the city administrator is established in GMC 2.12.030 *Duties*, and the fire chief's authority is spelled out in GMC 2.32.030 *Fire Chief—Authority*. The policy and administrative roles are defined in Resolution 1028, Exhibit A—City Council Rules & City Charter.

Service Area Overview

Within the 2.48 square miles that make up the Gladstone Fire Department service area, there are 4,779 residential units, of which 4,540 are occupied. Of those occupied, 2,680 are occupied by the owner and 1,860 are renter occupied. The major area of employment in the city is not one, but numerous car dealerships. At an average population in excess of 4,700 persons per square mile, the city is 100 percent urban in character. The city is a tight-knit community made up of many long-term residents who appreciate and protect its small town charm, yet embrace its convenient location within a metropolitan region. Virtually surrounded by rivers, the city offers a bucolic feel and an urban convenience.

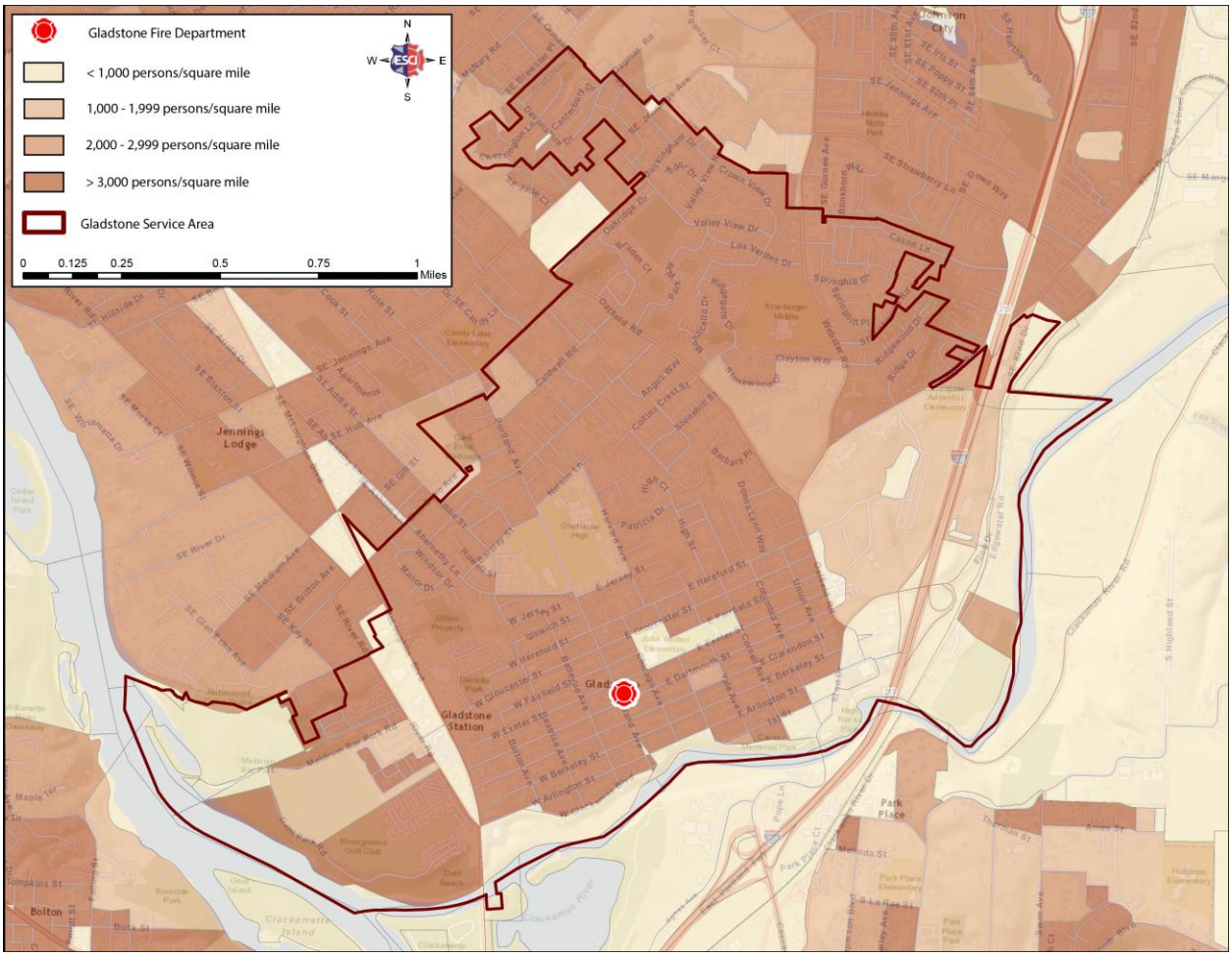
As a small city, it has limited commercial property and essentially no industrial base. The vast majority of employment opportunities exist outside of the city, but within the metropolitan region. These ample metro-area opportunities are within easy commute distances, adding to Gladstone's appeal as a great place to raise a family. The city is roughly bounded by Interstate 205 on the east and south, and bisected on the south and west by Oregon Route 99E (also known as McLoughlin Boulevard). The fire station is located at 61 feet above sea level.

Community Population Profile

The City of Gladstone is situated in northwest Oregon, just south of Portland and is considered part of the Portland metropolitan area. Despite urban level population densities and its proximity to the City of Portland, Gladstone maintains a suburban feel to the community and towards its fire department. Gladstone is bordered on the south by the Clackamas River and on the southwest by the Willamette River. The remainder of its surrounding borders blend into the Portland metropolitan area.

The following figure displays population density by census block, which provides the highest level of census population detail. As this type of detail is only updated every 10 years, the figure is based on 2010 census data. However, despite the age of data available, it provides a detailed analysis of the distribution of the population of Gladstone and the areas immediately surrounding the city.

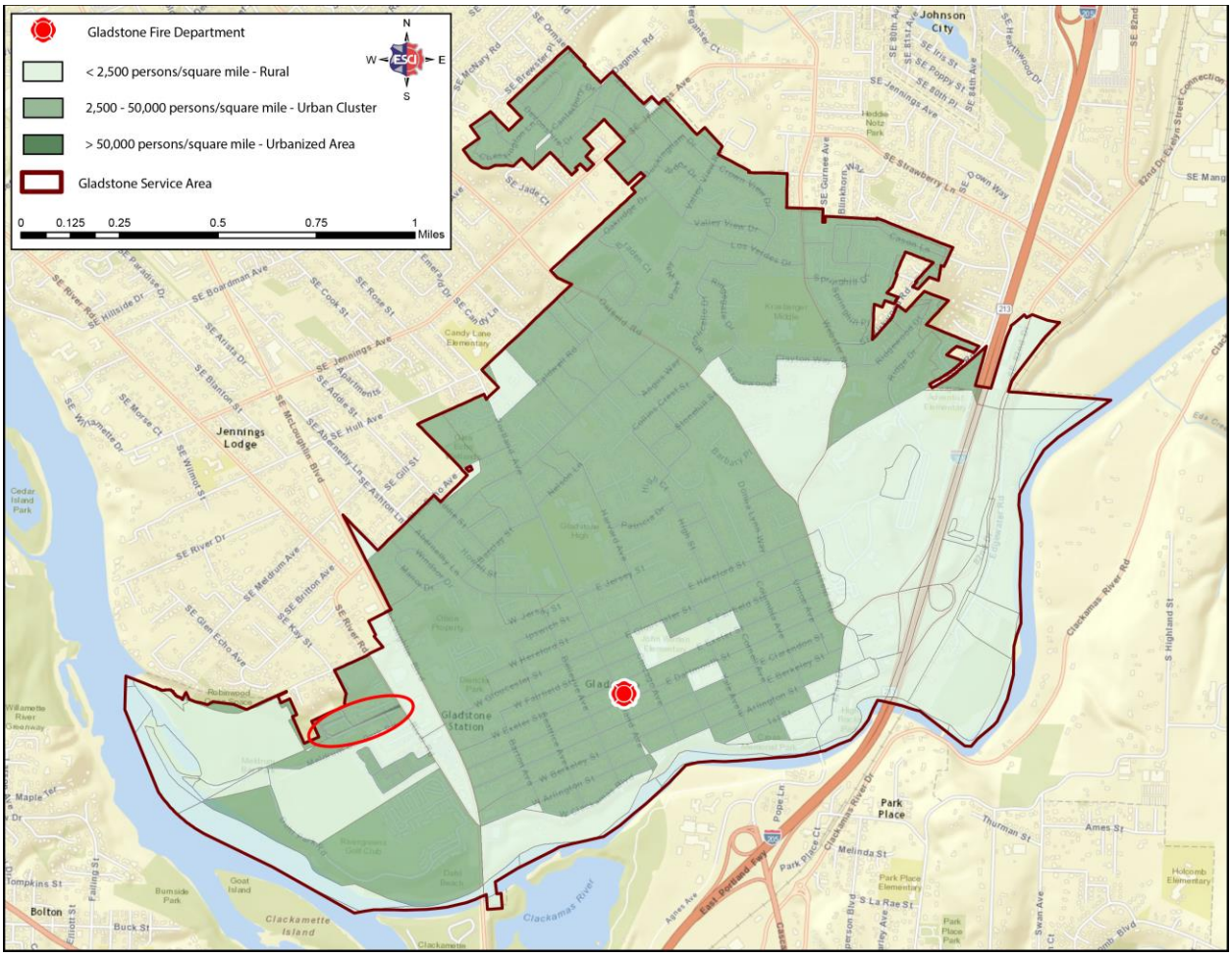
Figure 1: Population Density 2010 Census Blocks



While this information is useful in determining the distribution of population at a detailed level, additional classification is needed to reduce the complexity of the service area. The Center for Public Safety Excellence, 6th Edition Standards of Cover suggests that organizations utilize the 2010 U.S. Census Bureau guidelines for measuring response results against defined urban and rural benchmarks to classify the population density of the service area and demand zones.

This scheme contains three ranges of classification. Rural Areas are defined areas with population densities less than 2,500 per square mile. Urban Areas are defined areas that contain population densities greater than 2,500 per square mile. Urban Areas are composed of two classification sets: Urban Clusters and Urbanized Areas. Urban Clusters are areas that have a population density of 2,500 to 50,000 and Urbanized Areas contained population densities greater than 50,000. For the purposes of this analysis, population densities were calculated by the density of persons per square mile. This normalization of the data was then applied to the block groups and classified as shown in the following figure. The data is based upon 2015 U.S. Census estimates to provide the most recent information available.

Figure 2: Estimated Population Density based on U.S. Census Criteria, 2015

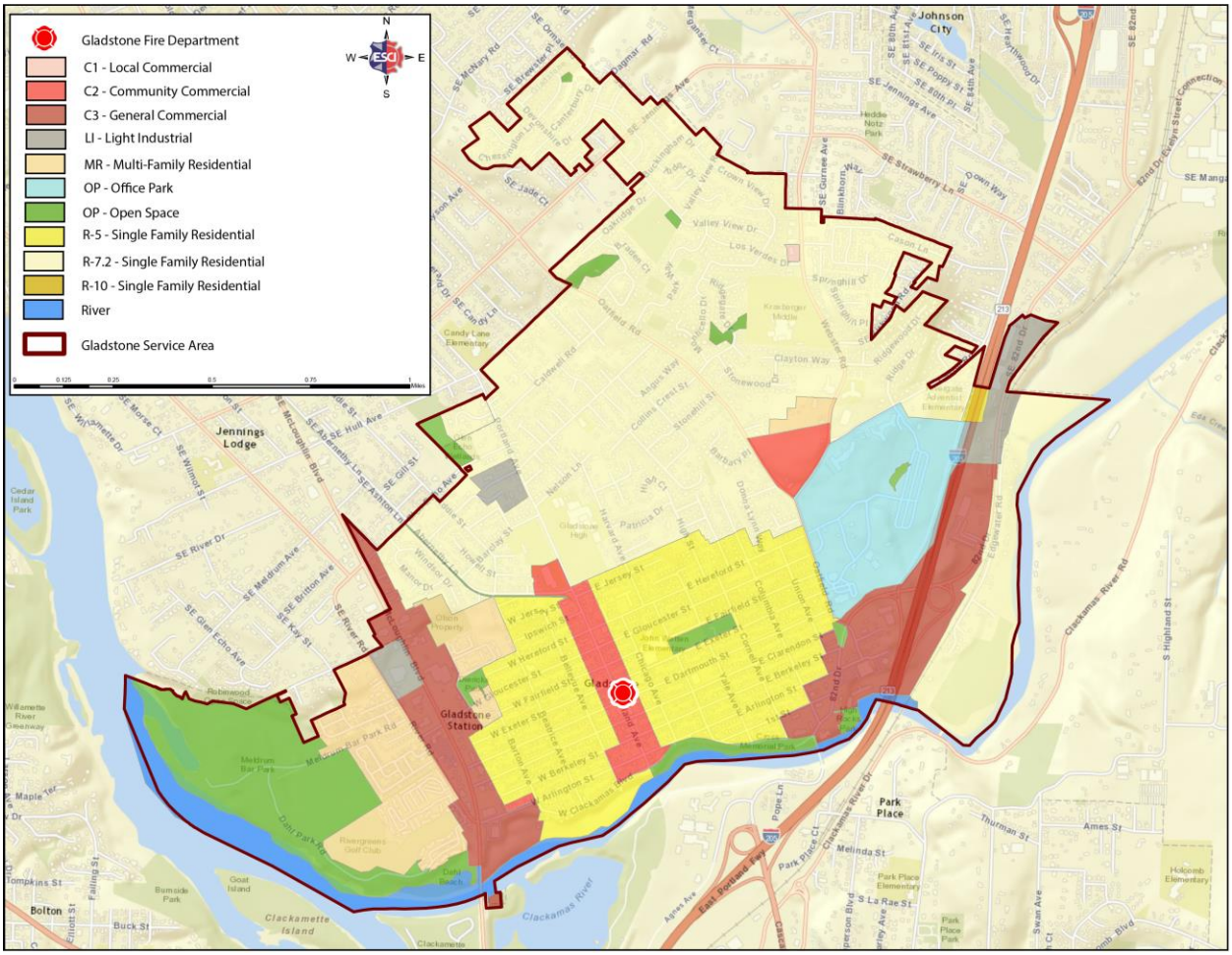


Through the application of the classification scheme, it is apparent that the jurisdictional boundaries of the City of Gladstone are comprised predominately of two classifications: urban cluster and rural. A small sliver of Urbanized Area is present in the data and is circled in red above. Further analysis of the distribution of these population density classifications showed that Gladstone's jurisdictional boundaries represent areas of 0.86 square miles of Rural, 1.6 square miles of Urban Cluster, and 0.36 acres of Urbanized Area. A more detailed assessment of the Urbanized Area revealed that this area is an apartment complex with 48 people living within the 0.36 acres (2015 U.S. Census ACS estimate), which skews the density toward urban. Additionally, this location, River Place Apartments, was identified during the site visit as a potential target risk for the department.

Planning Zones

Another method to gather information about how a community's population distribution is to examine the existing zoning classifications to discover how specific geographic areas, in this case parcels, are used. The City of Gladstone is comprised of ten zoning classifications and represents the foundation for how residents, commerce, and industry are distributed and interact. The following figure contains the current zoning map for the City of Gladstone.

Figure 3: Zoning Map



This figure allows the reader to quickly determine where residential and commercial areas of the city are located and how the zones interface each other. The majority of the city is composed of residential areas with commercial zones present in the lower middle portion of the city and adjacent to major thorough fares such as Interstate 205 and McLoughlin Boulevard.

Service Demand Zone

Gladstone Fire Department's jurisdictional boundaries are represented by a coverage area of 2.48 square miles with the department located roughly in the center of the jurisdiction. Based on the ISO definition of a first due engine response zone of a 1.5-mile radius, the most constrictive of industry standards, ESCI recommends that Gladstone Fire Department should consist of one service demand zone. This is due to the size of the jurisdiction relative to the typically first due of an engine company. A 1.5-mile radius results in an area of 7.07 square miles. With Gladstone's response area of approximately one-third that size, the department's centralized location and having only one station to respond from, ESCI recommends that one service demand zone is sufficient.

Review of Services Provided

The Gladstone Fire Department provides services consistent with an urban fire department, but some exceed what would normally be expected in such a small jurisdiction. These services include:

- Fire Suppression
- Emergency Medical Response
  - Basic Life Support, at minimum
  - Advanced Life Support, when a paramedic is available
- Swift Water Rescue/Dive Rescue
- Hazardous Materials—Operations
- Community Risk Reduction Services
  - Fire Prevention
  - Code Enforcement
  - Public Education

Gladstone Fire Department (GFD) receives and provides automatic[7] and mutual aid[8] to other agencies within the Portland–Clackamas County metropolitan area. GFD also provides technical rescue services including dive rescue due to the swift-flowing bodies of water surrounding the city. The department is expanding its rope rescue and swift water rescue programs due to these same hazards. Finally, GFD also provides hazardous materials operations certified response, which augments and supports the technician level hazardous materials teams that each region of the state manages.

GFD also provides non-response services in support of the department and city, including Training, Community Risk Reduction (which includes fire prevention, code enforcement, and public education), Logistical Support, and representation on the Disaster Preparedness Team.

The GFD is dispatched from Clackamas County 9-1-1 Center (C-COM), who is the Public Safety Answering Point (PSAP) for Gladstone and surrounding vicinity. C-COM is responsible for coordinating and dispatching all emergency and non-emergency calls for service for EMS and fire calls originating in Gladstone. The center is staffed 24 hours a day, seven days a week, 365 days a year.

[7] Automatic aid is defined as preprogrammed, immediate response assistance from an outside (neighboring) agency in response to an emergency dispatch to a host agency.
[8] Mutual aid is defined a response assistance from an outside (neighboring) agency in response to a request from a host agency. It is not a preprogrammed response.

Staffing

Gladstone Fire Department is considered a combination fire department, meaning that it is made up of mostly paid-on-call (POC) firefighters, with a small core of career personnel.[9] These resources come together to respond to and mitigate emergencies the community faces (that are consistent with the GFD mission). Because it is a majority POC-staffed organization, its staffing levels fluctuate significantly. Most combination fire departments have a difficult time internally assembling emergency responders during the weekday, when most POCs are working their full-time jobs. Thus, many combination fire departments concentrate their career staff during the work week to bolster response during those times when it is traditionally more difficult to get an adequate response from the POCs.

At the writing of this report, Gladstone Fire Department obtained three career captains through a SAFER grant to transition toward 24-hour shift work. These captains are paired with paid-on-call personnel who sign up for shift work to provide an immediate first response capability. This should reduce the turnout time for the first responding unit by several minutes.

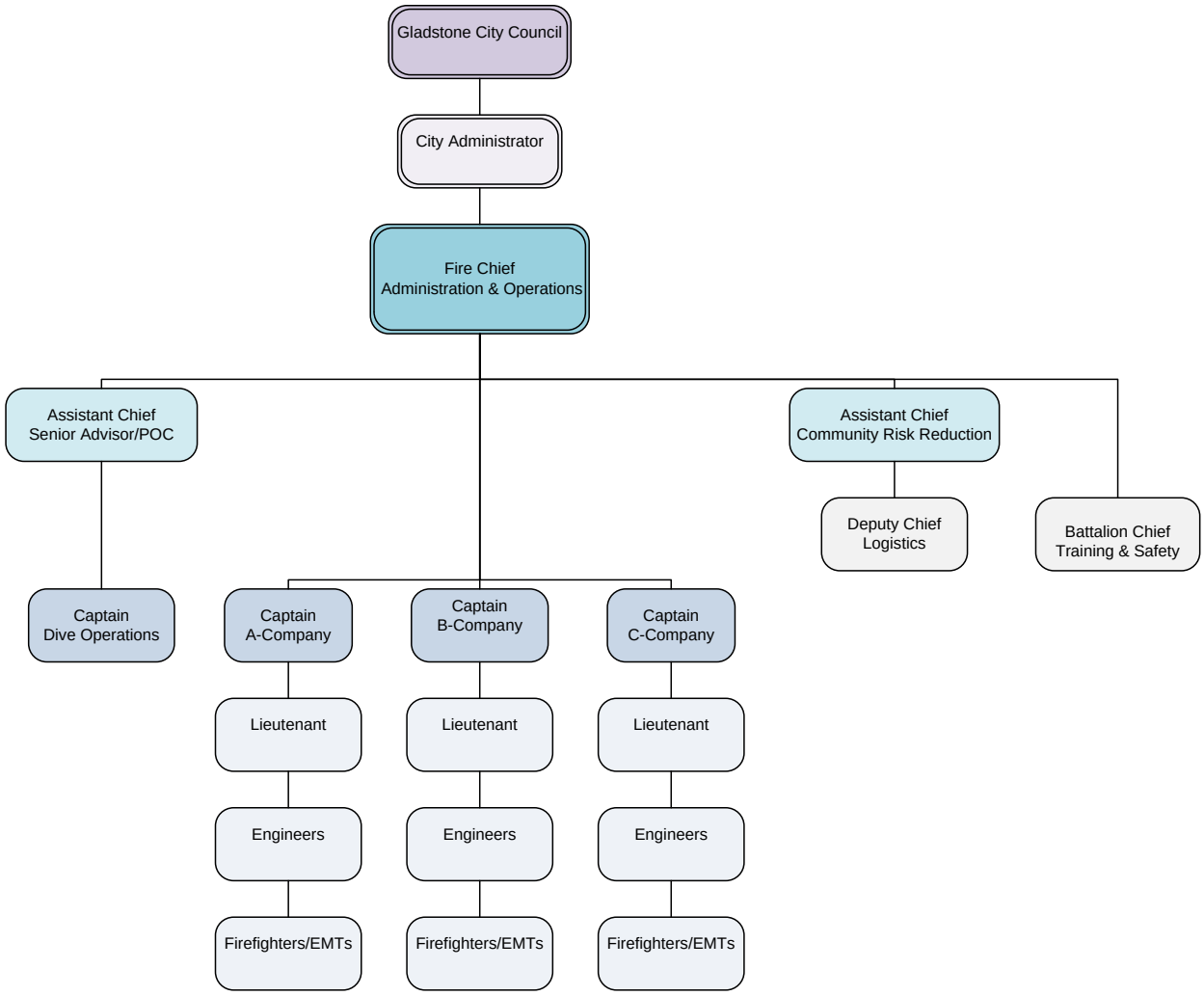
The career staff are augmented by twenty-six paid-on-call personnel. Many of the latter group responds from home when a call is received. Some of this group signs up for a duty shift (or portion thereof) at the fire station. When spending the night, these personnel stay in a leased apartment directly behind the fire station to reduce turnout time. The personnel are certified emergency medical responders at the Emergency Medical Technician level. This guarantees a basic life support response to medical emergencies.

The department also has a very small administrative staff, consisting of a fire chief, an assistant chief/fire marshal, and a battalion chief/training officer. There is no support or clerical staff assigned to the fire department.

The current organizational chart for the Gladstone Fire Department is depicted in the following figure.

[9] Paid-on-call firefighters are considered equivalent to volunteers by NFPA.

Figure 4: Gladstone Fire Department Organization Chart



The following figure provides basic information on each of the department's core services, its general resource capability for that service, and information regarding staff resources for that service.

Figure 5: Core Services Summary

Service	General Resource/Asset Capability	Basic Staffing Capability
Fire Suppression	**(In Order of Response Preference)** 2 engines 1 ladder truck 1 squad unit	Day-time hours during the week; career staff available for initial response plus any paid-on-call (POC) personnel who respond. 32 DPSST qualified firefighters.
Emergency Medical Services	**(In Order of Response Preference)** 1 squad unit 2 engines 1 ladder truck	Day-time hours during the week; career staff available for initial response plus any paid-on-call (POC) personnel who respond. EMT-B – 13; EMT-I – 8; EMT-P – 3; No cert (in training) – 8
Vehicle Extrication	**(In Order of Response Preference)** 1 ladder truck 2 engines 1 squad unit	Day-time hours during the week; career staff available for initial response plus any paid-on-call (POC) personnel who respond. 32 DPSST qualified firefighters.
Rope Rescue	1 squad (rope support), 1 truck (rope support), Other units as needed to bear additional personnel.	Three (3) personnel certified to technician level, 3 in training, 26 awareness level certified.[10, 11]
Surface-Water/Dive Rescue	1 squad (dive support) Additional units as requested (all are equipped with throw bags and life jackets).	Four (4) divers certified to technician level, 4 in training, 10 operations level for shore support, 14 awareness level for shore support.[12]
Hazardous Materials Response	**(As specifically requested by Regional HazMat Team)** 2 engines 1 ladder truck 1 squad unit	All personnel trained to the operations level. 32 DPSST qualified firefighters.

[10] Technician Level – The highest technical level of competency through training and capability as outlined in the applicable NFPA Standard.

[11] Operations Level – The intermediate operational level of competency through training and capability as outlined in the applicable NFPA Standard.

[12] Awareness Level – The lowest functional level of competency through training and capability as outlined in the applicable NFPA Standard.

Assets and Resources

The location of emergency response facilities (fire stations) will dictate to a large degree the response times possible for an emergency services agency. Presuming these facilities are the primary base from which they respond, the ability of responders to arrive at an emergency is a simple matter of physics. Finally, the staffing and competency of the crews assigned to these resources has a direct impact on the effectiveness of the response. Together, properly placed facilities with the right type and number of apparatus, staffed with sufficient numbers of competent personnel combine to provide the greatest likelihood of a positive outcome for an emergency.

The City of Gladstone is served by one fire station, which acts as the response hub for the city as well as the administrative headquarters. The facility is strategically situated to serve the 2.48 square-mile service area, and is graphically illustrated in the following figure.

Facilities

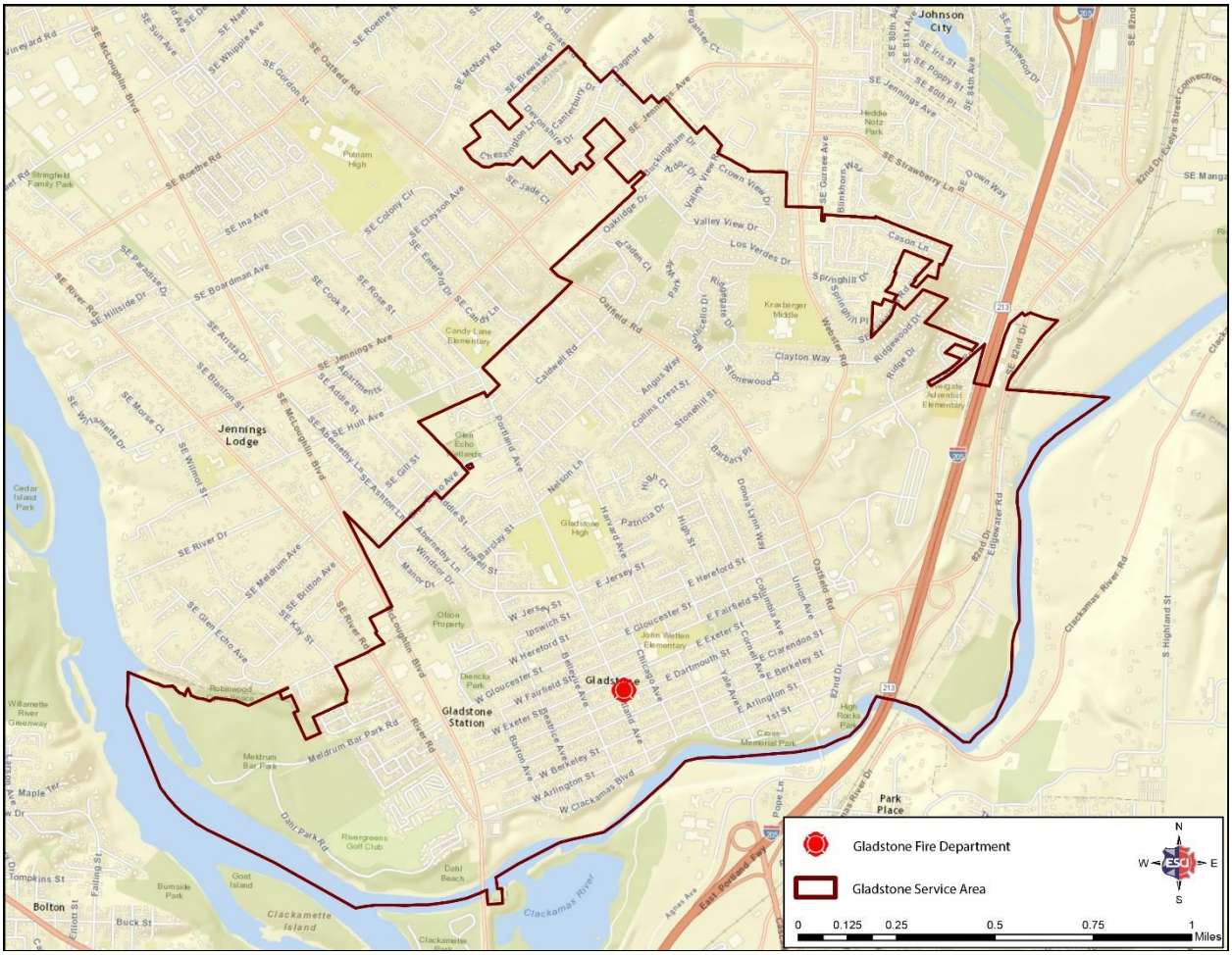
Fire Station No. 390 is the only fire facility operated by Gladstone Fire Department. It is located at 555 Portland Avenue, constructed in the 1940s, and has been remodeled numerous times, most recently in 2010 for seismic bracing. The station is a one story, unreinforced cinderblock constructed building with a concrete pad floor for a total of approximately 6,000 square feet. The truck bay is poorly designed for modern equipment and emergency response due to tight clearances for the apparatus. The station houses two fire engines, a ladder truck and a rescue unit, and the apparatus are equipped with exhaust filtration systems.

The administrative offices are co-located at this facility, for a total of 486 square feet. One small kitchen is located at the station, and there are no sleeping quarters. The station has a combination training/meeting room in the center of the facility, and has a total of 880 square feet. It also has one shower and mixed gender bathrooms. Exercise equipment is limited to a small area in the truck bay. Use of the exercise equipment exposes the users to any exhaust not filtered from the apparatus. Supply storage is severely restricted. The station is equipped with a diesel generator for emergency power. The station has an extractor washer for personal protective clothing and a normal dryer. The station does not have an automatic fire sprinkler system, but the smoke detection system is in place and integrated with the city hall system.

The station is physically attached to the police station and city hall. Currently, both city hall and the police station are planned to be relocated within the city. The portions of the building being vacated are currently planned for demolition and reconstruction for a different use. In light of its layout, condition, and design, it is recommended that Station No. 390 be expanded to provide greater apparatus bay space and living quarters, or replaced.

Gladstone's fire station location is illustrated in the following figure.

Figure 6: Gladstone Fire Station
555 Portland Avenue



Apparatus

The front-line response apparatus and their relative condition are listed in the following tables. In addition, GFD operates several command vehicles with staff. These vehicles respond to emergencies, but are not considered specialized front line response apparatus, and are thus not included in the following figures.

Rescue	Ford	F-550	2010	Squad 390
Apparatus Type	Make	Model	Year	Apparatus Designation
N/A	N/A	N/A	N/A	
Pump Size	Water Tank Size	Foam Tank Size	Generator	
N/A	N/A	N/A		
Aerial Type	Aerial Brand	Aerial Size		

Mechanical Condition ☐ Excellent ☒ Good ☐ Fair ☐ Poor

Interior Condition ☐ Excellent ☒ Good ☐ Fair ☐ Poor

Exterior Condition ☐ Excellent ☒ Good ☐ Fair ☐ Poor

☐ Scene Lighting ☒ NFPA Lighting ☐ NFPA Striping ☒ Fully Equipped

Ladders N/A

Comments:

Squad 390 is staffed with two personnel when responding to an incident. It responds to EMS incidents and dive rescue incidents. It is scheduled to be replaced in 2030.

Engine	Pierce	Velocity	2014	Engine 391
Apparatus Type	Make	Model	Year	Apparatus Designation
1500	750	N/A	Portable	
Pump Size	Water Tank Size	Foam Tank Size	Generator	
N/A	N/A	N/A		
Aerial Type	Aerial Brand	Aerial Size		

Mechanical Condition ☒ Excellent ☐ Good ☐ Fair ☐ Poor

Interior Condition ☒ Excellent ☐ Good ☐ Fair ☐ Poor

Exterior Condition ☒ Excellent ☐ Good ☐ Fair ☐ Poor

☒ Scene Lighting ☒ NFPA Lighting ☒ NFPA Striping ☒ Fully Equipped

Ladders 14-foot roof ladder, 28-foot extension ladder

Comments:

Engine 391 is staffed with three personnel when responding to an incident. It responds to all types of fires, EMS calls where additional assistance is requested, extrication, and when forcible entry is required. It is scheduled to be replaced in 2034.

Engine	Pierce	Sabre	1996	Engine 393
Apparatus Type	Make	Model	Year	Apparatus Designation

1500	750	N/A	Portable
Pump Size	Water Tank Size	Foam Tank Size	Generator

N/A	N/A	N/A
Aerial Type	Aerial Brand	Aerial Size

Mechanical Condition ☐ Excellent ☒ Good ☐ Fair ☐ Poor

Interior Condition ☐ Excellent ☒ Good ☐ Fair ☐ Poor

Exterior Condition ☐ Excellent ☒ Good ☐ Fair ☐ Poor

☒ Scene Lighting ☒ NFPA Lighting ☐ NFPA Striping ☒ Fully Equipped

Ladders 14-foot roof ladder, 28-foot extension ladder

Comments:

Engine 393 is staffed with three personnel when responding to an incident. It serves as a reserve/secondary piece of equipment, or when the incident calls for greater capacity than normal. It responds to all types of fires where additional assistance is requested. It was scheduled to be replaced in 2016.

Quint	Pierce	Velocity	2008	Truck 392
Apparatus Type	Make	Model	Year	Apparatus Designation

200	350	N/A	Onboard
Pump Size	Water Tank Size	Foam Tank Size	Generator

Straight Stick	Pierce	105’
Aerial Type	Aerial Brand	Aerial Size

Mechanical Condition ☐ Excellent ☒ Good ☐ Fair ☐ Poor

Interior Condition ☐ Excellent ☒ Good ☐ Fair ☐ Poor

Exterior Condition ☐ Excellent ☒ Good ☐ Fair ☐ Poor

☒ Scene Lighting ☒ NFPA Lighting ☒ NFPA Striping ☒ Fully Equipped

Ladders 16- and 20-foot roof ladders; 14-, 28-, 35-, and 40-foot extension ladders; and a 10-foot collapsible ladder (ISO requirement), 105-foot hydraulic ladder.

Comments:

Truck 392 is staffed as personnel are available and certified to operate the aerial device. It provides elevated access to buildings with height, with access/reach challenges, and where an off-the-ground work platform (such as water rescues). The apparatus is scheduled to be replaced in 2028.

REVIEW OF COMMUNITY EXPECTATIONS

The process of soliciting stakeholder input targeted three separate groups of stakeholders, and included a series of one-on-one private meetings with the City of Gladstone's elected officials and the acting city administrator, a community forum comprised of representative citizens, and a separate GFD Member forum. All interviews and the two forums were conducted by ESCI project team members. The goal of the stakeholder meetings was two-fold, to determine participant perceptions and level of satisfaction with current GFD services, and to understand community values as they pertain to GFD service priorities and current levels of service.

In developing an SOC report, it is important to understand the perceptions and the priorities for the policy stakeholders (Mayor, Council, and acting City Administrator), the external stakeholders (community), and the internal stakeholders (GFD members) charged with delivering fire and emergency services. This is a necessary step in assessing whether the current GFD service priorities are in line with these expectations, and to identify what adjustments, if any, are needed in the short-term, medium-term, and long-term priorities of the GFD.

Anonymous information from the interviews and forums is presented primarily in summary form in this report. For the purpose of the SOC report, summary and representative responses from the participants provides most of the necessary feedback without specifically identifying any single individual. This approach provides respondents with a more comfortable environment that hopefully leads to a more candid and honest response.

Policy-Maker Stakeholder Feedback

The process of soliciting input from the policy-makers included a series of one-on-one private meetings with the City of Gladstone's Mayor and City Council, as well as the Acting City Administrator, who was included in the policy-maker group. These meetings were scheduled during the morning and afternoon of, September 26, 2017, and conducted in one-half hour sessions. Interviews were conducted in an upstairs conference room at the City Hall building at 525 Portland Avenue, Gladstone, Oregon. The policy-makers were comprised of the following elected officials with the addition of the Acting City Administrator, Jacque Betz:

- Mayor Tammy Stempel (tstempel@ci.gladstone.or.us)
- Councilor Michael Milch, Position #1 (milch@ci.gladstone.or.us)
- Councilor Linda Neace, Position #2 (neace@ci.gladstone.or.us)
- Councilor Matt Tracy, Position #3 (tracy@ci.gladstone.or.us)
- Councilor Neal Reisner, Position #4 (reisner@ci.gladstone.or.us)
- Councilor Patrick McMahon, Position #5 (mcmahon@ci.gladstone.or.us)
- Councilor Thomas Mersereau, Position #6 (mersereau@ci.gladstone.or.us)

For the interviews, the following general questions were posed with follow-up discussions, when appropriate, to achieve an understanding of each official's perspectives and perceptions of the Gladstone Fire Department. The base level questions were as follows:

- Do you believe the GFD provides service that meets the community's expectations?
- Do you have concerns about the GFD or the services it provides to the community?
- Are there any questions you have or issues you would like to discuss?

The officials were asked to speak for themselves as city councilors, and to share information they had heard from the community as elected officials. Each was asked to wear two hats—one as an elected official charged with policy oversight, and the second to serve as a conduit of information from the community.

Overall, the policy-makers expressed a high level of support for the GFD and believed that the department enjoys a strong level of community support. At the same time, those interviewed fell into one of three basic groups. Those who supported organizational direction, those who were concerned about either the pace of change or the change itself, and those who felt they did not have enough information or data on which to base an opinion. Representative comments are organized around the three questions posed to the policy makers.

Do you believe the GFD provides service that meets the community's expectations?

- The community is very supportive of the GFD and the organization exceeds community expectations for service.
- There is council support for Chief O'Connor and the direction he is trying to lead the GFD. There is support for aligning the GFD with national standards.
- The GFD provides a high-quality service, to a high standard, that the community values.
- The GFD's service is better now, and continuing to improve under a full-time chief. Having a full-time chief has created more opportunity for professionalism, it provides more supervision and oversight, and it has provided more structure for the organization.
- Chief O'Connor is working to move the GFD in the right direction, he is providing good leadership.
- There is support for the volunteer firefighters and a belief they have been "excellent in the past." They give 100% and care about their community.

Do you have concerns about the GFD or the services it provides to the community?

- Response times need to improve, "get them there as soon as possible during time of need."
- Progress is not happening fast enough. Some people want the changes to happen now.
- There is too much change coming too quickly. Not everyone is happy with the change.
- The GFD needs to expand on the water rescue program, specifically in High Rocks Park where there have been numerous incidents. The city is surrounded by waterways.
- The GFD still has remnants of the "good old boy network," and a perceived small group is "clinging to the past" and slowing down progress.
- Concern that the GFD is moving towards becoming a career fire department and eliminating the volunteers. What is the cost of moving to a career fire department?
- The GFD is providing the right types of services and no services should be eliminated.

Are there any questions you have or issues you would like to discuss?

- As councilors, we need more information and a better understanding of how the GFD is organized and how it operates.
- What types of calls does the GFD respond to?
- At what times of day are the calls occurring?
- There is confusion on what the end goal of the change is. What is Chief O'Connor's plan? Is he trying to eliminate the volunteers?
- We do not want to lose the GFD to Clackamas Fire District #1.
- There is a level of tension in the GFD and in the council between those who support the old ways "Hometown Cowboys" versus a move towards a structured and professional fire department.
- Expanding the Water Rescue Program may redirect the "naysayers" into a more positive and productive direction.
- One councilor said they want to support Chief O'Connor and the GFD, but they don't feel like they have enough data to evaluate the department and its performance.
- One councilor expressed some concern with the SOC process and did not understand what it was intended to do. There was a concern with this report being a "rubber stamp."
- One councilor expressed concern about Oregon State Conflagration deployments. When the GFD sends resources out of the area, who is protecting our community?
- There are too many rumors and not enough information.
- When asked, one councilor acknowledged receiving a copy of the GFD's Strategic Plan, but said it "contains lots of material," but "doesn't provide enough understanding" of operation and services.

- There were several comments about a lack of trust. When these comments were probed further, they can more accurately be attributed to a feeling of need for more information, and not directed personally towards any individual.
- Some concern was expressed that the chief's direction may not be affordable for the city.
- The GFD has received a FEMA SAFER Grant for limited 24/7 staffing at one FTE per shift. It expires in three years and Chief O'Connor needs to focus on demonstrating the value of the positions, e.g., reducing response time.[13]

[13] Federal Emergency Management Administration (FEMA), Staffing for Adequate Fire and Emergency Response (SAFER) Grants (https://www.fema.gov/staffing-adequate-fire-emergency-response-grants) are designed to help a fire service agency increase its staffing levels by providing funding for firefighter positions for three years. This affords a federal, state, or local agency three years of funding for additional staffing while efforts are made to secure on going funding for the positions.

Community Stakeholder Feedback

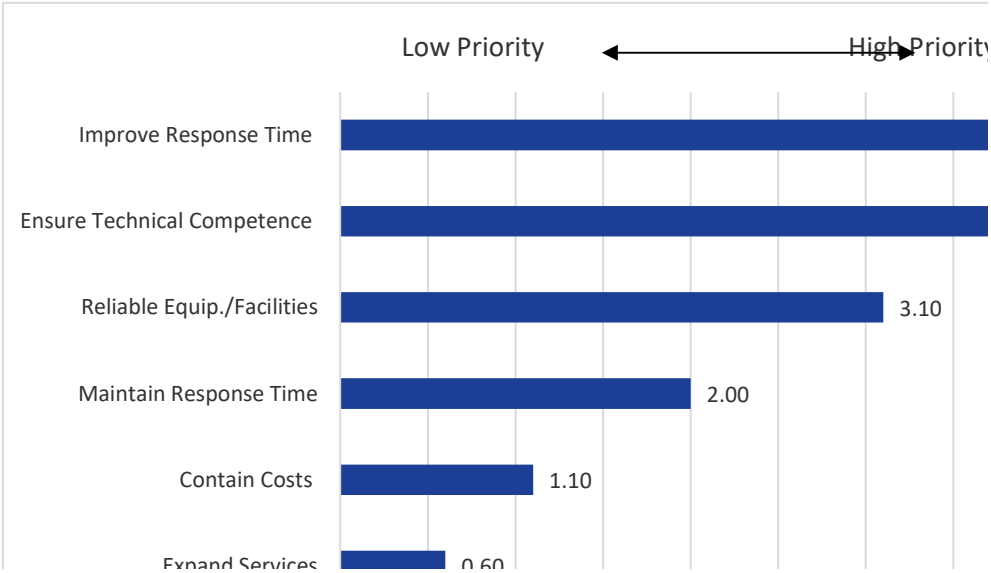
The community forum was held on the evening of October 5, 2017, in the Training Room at the Gladstone Fire Station located at 555 Portland Avenue, Gladstone, Oregon. The forum was led by ESCI Senior Consultant and project lead, Don Bivins. Ten members of the community were in attendance representing service organizations, business interests, previous recipients of GFD services, and long-standing residents.

The forum began with a GFD overview presentation conducted by Fire Chief Tom O'Connor with support from Assistant Chief Mike Funk. Upon completion of a questions and answers session between the chief and citizens, the chief was excused to allow for free and open discussion by the citizens. The community group was then led through a discussion to ascertain community priorities for the GFD. The discussion was concluded with the completion of a structured and facilitated survey that sought input on three general areas; Citizen Planning Priorities, Citizen Service Priorities, and opinions regarding Cost, Response and Staffing as they pertain to the GFD operations.

Citizen Planning Priorities

The citizen planning priorities assessment sought to identify which priorities community members felt the GFD should place the most emphasis on. The planning priorities component was a forced choice survey, where each element of the planning priorities was compared to each of the other potential planning priorities. The participants were required to select which planning element was more important as compared to each of the other potential planning elements. The results were combined with the responses of the other citizen forum participants to list the groups collective responses in priority order. The highest rating possible is a five, and the lowest is a zero. The scores are a combined average of the citizen scores submitted. The results of this portion of the survey are reflected in Figure 7 which follows.

Figure 7: Citizen Planning Priorities

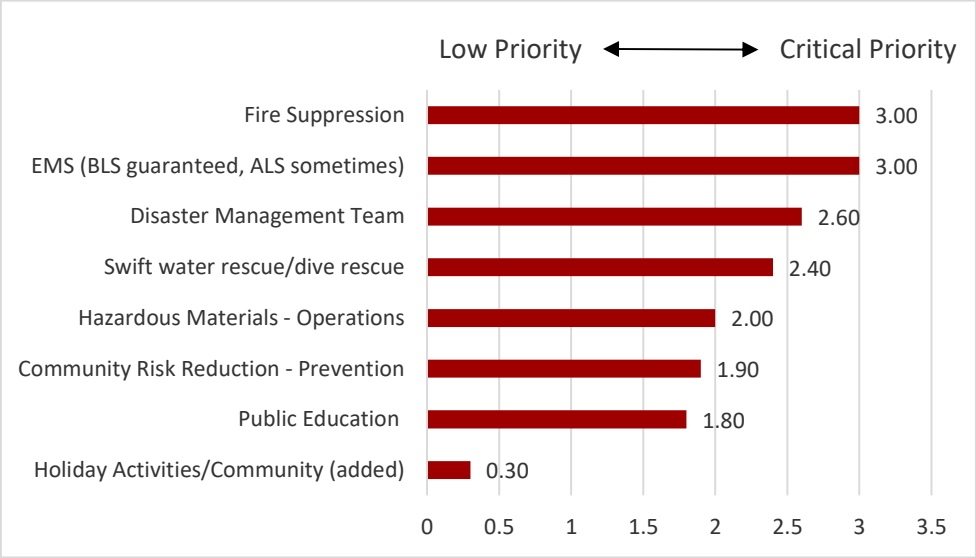


The top priority of the citizen group in attendance is to ***improve response time*** with a score of 3.90. A close second priority, valued at 3.70, is to ensure technical competence amongst GFD responders (training), and the third priority is having reliable equipment and facilities, rated at 3.10. The remaining Citizen Planning Priorities that were lower considerations included maintaining current response times (a separate consideration from improving response times), and cost containment. There was no advocacy in this portion of the survey for ***expanding services*** to the community over what is currently provided, coming in last at 0.60.

Citizen Service Priorities

The citizen service priorities assessment sought to determine what services are the most important to the community. Priorities were rated on a scale of 1-3, with 3 being a critical priority, 2 being an important priority, and 1 being a low priority. The highest score attainable is 3 (critical). The forum attendees were also afforded the opportunity to strike out any service they felt should not be provided by the fire department, and were encouraged to add any services they felt was missing. Thus, the lowest score attainable is a zero (eliminate this service). The scores are a combined average of the citizen scores submitted. The results of this portion of the survey are reflected in Figure 8 which follows.

Figure 8: Citizen Service Priorities



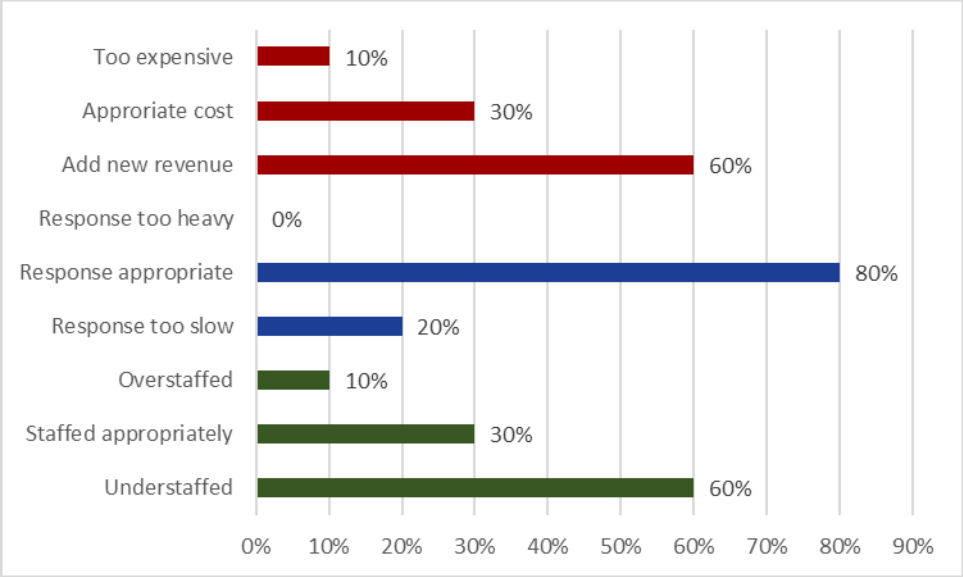
The top (most critical) priorities of those citizens in attendance were fire suppression and emergency medical services, with both receiving a score of 3.00. Disaster management and swift water rescue/dive rescue were scored at 2.60 and 2.40 respectively (between important and critical priorities). Hazardous materials (operations) was rated at 2.00 (important). Both community risk reduction (prevention) was rated and public education were scored just below important. Holiday/Community activities was a service added by two attendees. Because none of the other attendees were aware that these responses were added to the list, none of the other attendees scored tis element, accounting for the relatively low score of 0.30. However, it is unusual to have multiple attendees add the same service to the list, so this added element should not be dismissed lightly.

Written comments following this section made it clear there was a strong desire to have the fire department engage to a greater degree with the community to develop a deeper bond.

Cost, Response, and Staffing

The cost, response, and staffing assessment is an opinion poll of sorts. While the attendees were given basic information about these three elements, it is unreasonable to assume the information shared was detailed enough for the respondents to form a deeply educated judgment. This portion of the survey is intended to obtain a "pulse" on the community's perception regarding these three important factors. This evaluation attempts to identify the attendee's cost sensitivity when it comes to maintaining or improving GFD services. The results of this portion of the survey are reflected in Figure 9 which follows.

Figure 9: Cost, Response, & Staffing



In this exercise, only 10 percent of the respondents believe that the cost of service is too expensive while 30 percent consider it appropriate. At the same time, 60 percent felt that new revenue should be added to increase GFD response capabilities and performance. These same cost percentages were supported by the respondent's perspective on GFD staffing with 10 percent believing the GFD is overstaffed, 30 percent indicating their belief that staffing levels are appropriate, and 60 percent believing the GFD is understaffed. Finally, 80 percent of the community participants felt that the current GFD response is at an appropriate level, while 20 percent felt the response was too slow. No respondent indicated their belief that the GFD response is "too heavy."

The community forum affirmed a high level of support for the GFD with the top two service priorities being fire suppression and emergency medical first response. Likewise, the top community planning priority for the GFD is reducing response times, followed closely by ensuring the technical competence of the GFD responders. Community perspective on the cost reflects that 60 percent of the respondents are supportive of identifying "new" revenue and directing it towards improving GFD response times, likely through additional staffing.

However, 80 percent of those same respondents believed GFD's current response is appropriate. This conflicts with the findings in the planning priorities, where the highest priority was to improve response times. While speculative, the respondents may separate the service level from the people providing the service, not wanting to be viewed as critical toward the service providers.

Internal Stakeholder Feedback

ESCI solicited input from internal department members in a single, open forum style meeting for members spanning the ranks of firefighter through paid-on-call assistant chiefs. All members were notified of the meeting and invited to attend. There were thirteen members present at the forum.

The forum was held on the evening of September 26, 2017, and took place in the GFD Training Room located in the fire station at 555 Portland Avenue, Gladstone, Oregon. ESCI facilitated the discussion using the standard Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis approach.

Don Bivins, ESCI project manager, led the discussion with ESCI associates Stuart McCutcheon and Randy Groves in attendance. The forum began at approximately 7:00 p.m., and concluded at just after 9:00 p.m.

Strengths

There was a group perception that GFD is good at coming together and working well as a team. There was a consensus that "everyone tries to improve and get better at their craft," and there is a belief that the GFD culture centers around continuous improvement through training and education. It was felt that the GFD members are aggressive on fires, and they pride themselves in community service—with an example of spending more time with patients on medical calls than some of their career counter-parts in other regional agencies.

- One GFD member asserted that he believes that medics from the private ambulance companies prefer to work with the GFD over other area agencies because of their level of concern and involvement in medical calls that goes beyond physical patient care.
- Another GFD member described how GFD members are committed to the community, and not just coming in to work from other communities to perform a job and earn a paycheck. This pride in community service appeared to be shared and supported by all of those in attendance at the forum.

The GFD is good at helping new firefighters develop and integrate into the organization. This is accomplished through training and mentorship. It was felt that the GFD is good at providing training opportunities for members with requests made by personnel being rarely denied by management.

It was identified that GFD is well equipped and has an excellent fleet of apparatus. One member described the GFD's apparatus as being in "top shape." The excellent condition of the fleet was also observed and noted by ESCI.

Several GFD members present expressed their support for the direction in which the organization is heading, and that they believe what Chief O'Connor is trying to do is necessary. There was also a recognition that change is hard but a feeling that more communication from management about where the organization is heading is needed. "What is the end goal (bigger plan), and what are the steps needed to get there (a roadmap)?"

The GFD provides a high quality of service utilizing well-trained and equipped professional responders. The fact that GFD provides the level of service for a low-cost, in comparison to other regional providers, is a strength for the organization.

Weaknesses

There is a lack of consistency amongst GFD members responding consistently to calls for service. It is felt that there are not enough people making themselves available for calls and that there is an inequity in the workload some GFD members are shouldering. Response at night is the most deficient timeframe. Multiple members expressed their belief that turn-out time during the day is adequate and generally within 60 seconds due to staff being available at the fire station. At night, turn-out time increases to five or more minutes with the assembly of fewer personnel for a response. Multiple members expressed concern about this situation and deemed it as being, "unacceptable."

Member assignments when responding to calls is based on turn-out arrival order, and as a matter of practice, not aligned with a member's qualifications or skill set. A better framework needs to be developed around response assignments. One of the challenges is the poor turn-out during periods of the day (mostly at night) that impact response assignments. It was also noted that GFD members try to specialize in too many areas resulting in a lack of mastery in any specific area.

Members discussed that there are currently four or five vacant company officer positions and that the organization is short on apparatus operators. It was felt that this is contributing to the response deficiencies at night as well as the problems associated with response assignments.

There is a feeling of separation between people who want to "pull shifts" (be on duty) at the fire station and staying in the apartment located behind the station, and those who want to respond (turn-out) exclusively from home. After some follow-up questions directed by ESCI, members further clarified that there are three categories of responders in the GFD:

1. Those members wanting to pull shifts at the fire station or apartment, and being in position ready for response.
2. Those members who want to respond "aggressively" from home.
3. Those members who do not respond from home consistently or in a timely manner. Some members described this as "responding for the pay check."

   NOTE: There was substantial dialogue about this third group of responders and much frustration expressed by those present at the meeting.

There are challenges in getting GFD members to commit to availability for response by date and time. Members at the forum expressed their need to know who is available, and when, and understand who can be counted on to respond behind them.

There was some discussion amongst members about the limitations the chief is facing, and the limited options available to him. The budget was universally identified as one of the biggest challenges and limiting factors in trying to address some of the issues identified. From this, a robust discussion ensued about cost factors including standby pay and a perception that there are health insurance requirements under the Affordable Care Act.[14] A more in-depth analysis should be performed to determine actual liabilities for the GFD under the act, if any, and other requirements should there be a change in compensation provided by the GFD through the provision of standby pay and other benefits.

There is a perception amongst some members that the GFD is not considered equal amongst neighboring career fire service agencies (paid-on-call/volunteer vs. full paid/career) and this affects some of the interactions on mutual responses.

GFD members stated that they are good at identifying problems that need to be corrected while not always being good at identifying solutions. There was a level of consensus that all GFD members have a responsibility to contribute toward problem solving as well as problem identification.

The GFD is good at performing routine operations, e.g., high-frequency/low-risk operations, while not being good at performing low-frequency/high-risk operations.

Several members talked about the difficulty of receiving face-to-face information from other members and feedback from the organization, specifically management defined as company and chief-level officers. Several of the fire officers present acknowledged that this was an issue. It was also noted that GFD members needed to do a better job of following the chain-of-command, fighters to lieutenants and captains. There was some discussion that issues or concerns get raised and then they frequently do not hear back on whether or not anything is being addressed. It was unknown where the break-down occurs, e.g., company officers back to firefighters or command officers back to company officer.

Opportunities

Members see a strength in training and mentorship opportunities from assimilating new personnel into the GFD. There was also some discussion that having the GFD serve as a training agency for career fire service agencies was not necessarily a bad thing even though it increases turn-over. It was recognized that during the training process, that a continuous flow of willing and eager volunteers will be available.

[14] The Patient Protection and Affordable Care Act (PPACA), commonly referred to as the Affordable Care Act (ACA) or colloquially Obamacare, is a United States federal statute signed into law by President Barack Obama on March 23, 2010. Under the PPACA, an employer with fewer than 50 FTE (full time equivalent employees) is not impacted.

Regarding the issue of slow turn-out at night and the low number of responders being available for calls, the members present suggested that the GFD move some of the daytime paid staff to a night shift and develop a better staffing model with some 24/7 paid staff on duty at all times. It was recognized that there would be a cost associated with this model and possibly a detrimental effect on turn-out from home presented under the threats section (which follows). It was also discussed that scheduling GFD member responsibility for response needs to be tightened up so that members start committing to either pulling shifts or at least committing to dates and times when they can be counted on for response. There was recognition that the staff member assigned the scheduling responsibility is very committed to this work, and that his challenge is in getting GFD members to commit and then keeping that commitment.

The vacant company officer positions and the perceived insufficient number of apparatus operators provides the GFD an opportunity to consider a reorganization to address some of the identified deficiencies in turn-out. When personnel are selected to fill a vacant position, it affords the organization with an opportunity to modify (reset) expectations, e.g., impose an expectation that personnel filling these positions pull a certain number of shifts, or periods of committed availability.

Although there were mixed views on the 24/7 staffing concept, one member suggested that if the GFD moves in this direction, that certain responses could be taken off the "All-Call" that is currently issued on every call.[15] This would increase the importance related to All-Call dispatching alerts, reduce the number of calls (commitment) for people responding from home, and reduce the cost of response. Any savings could then be applied to help offset the cost increase associated with a different staffing/standby model.

There was a robust discussion about better utilization of the GFD's "Active 9-1-1" system. It was felt that if this tool were highly utilized, it would be very effective.[16] There was a strong consensus that there needs to be a more consistent and full use of this tool.

Members discussed the lack of knowledge within the community about the relatively low fiscal burden on taxpayers of delivering fire service in that the GFD is primarily a paid-on-call (volunteer) organization. The GFD members felt this was a strength that should be better publicized in the community so that the community understands the full value verses the cost of delivering GFD services.

[15] All-Call is the alert activation that is sent to all GFD members, both on-duty and off, when a call for service is received by the 9-1-1 public safety answering point.

[16] Active911 (http://active911.com) is a digital messaging system that delivers alarms, maps, and other critical information instantly to first responders using cellular technology. Active911 also allows response efforts to be monitored in real time.

Threats

There is a slow and inadequate turn-out time at night. This poses a threat to community safety, a threat to firefighter safety and effectiveness, and a threat to the long-term continuation of the GFD. It was noted that if the public loses confidence in the system, the public and its elected representatives will look for an alternative service delivery model. At some point, the cost of delivering service becomes overshadowed by the lack of a consistent and adequate response.

Regarding developing a 24/7 limited or full shift staffing model, there may be a threat to the effect on members responding from home. It was felt that the opposite effect of obtaining a faster turn-out time could potentially degrade the size of the response by discouraging GFD members from responding from home if they became accustomed to finding that the fire apparatus has already left the fire station upon their arrival. At the same time, among those GFD members present, the majority expressed a belief that a better and assured turn-out time was more important than an adverse effect of discouraging turn-out from home. There were also comments about some members "over-responding" and a concern about future burn-out and discouragement from participation.

Concern was expressed that the turn-over rate of members is increasing resulting in fewer GFD members with experience. It was recognized that a ready, able, and willing pool of responders is needed to sustain the organization and serve the community.

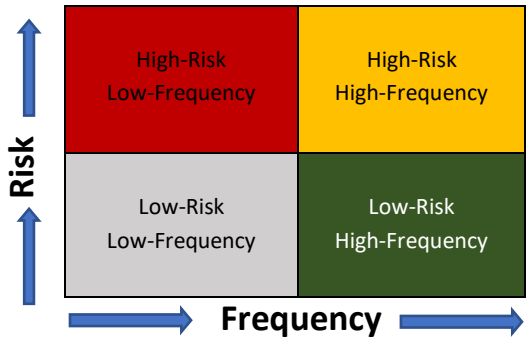
There was some concern expressed that the department has begun bringing in new members who do not reside in the community. While there was recognition that the addition of new people is an enhancement, it also has the potential to be overutilized. At some point, these out-of-area responders may become the majority of the staff and are unavailable for a prompt response after hours unless they are on duty pulling shift at the station.

GFD members participating in the forum were professional, and expressed a lot of positivity and support for the organization and its leadership. Members want to help solve problems and be involved in the organization. The GFD has dedicated members who want to provide excellent service and ensure that personnel are always available to respond. Members want to serve, and they want to promote GFD in the community.

There was a consensus that members need more information on what is going on, why positions are left open that they feel need to be filled, and a desire to understand longer-term goals of Chief O'Connor and the leadership team.

It was noted that the GFD members recognized their proficiency in high-frequency/low-risk operations, while expressing a recognition about their lesser proficiency in low-frequency/high-risk operations. It has been ESCI's observation that this condition is not unique to the GFD, but common in the fire service. In fact, standard risk management risk quadrants identify these elements and emphasize the need to repeatedly train on high-risk operations, regardless of their frequency, since they pose the greatest level of risk to the health and safety of firefighters and community members. The following figure illustrates the four general risk quadrants.

Figure 10: Risk Quadrants



There seemed to be a mature recognition by the GFD membership that many of the challenges facing the GFD do not have quick, easy, or low-cost solutions. At the same time, there was a laudable expression of support for helping to move the GFD forward as it continues to evolve.

COMMUNITY RISK ASSESSMENT

This section of the report provides information about community characteristics, hazards, and risks as determined from information provided by Gladstone Fire Department (GFD) and other sources. The intent of this assessment is to assist the City of Gladstone in its development of a Community Risk Assessment: Standards of Cover as outlined by the Center for Public Safety Excellence (CPSE) for Gladstone Fire Department, which is an industry best practice. It was developed from a broad base of information, including:

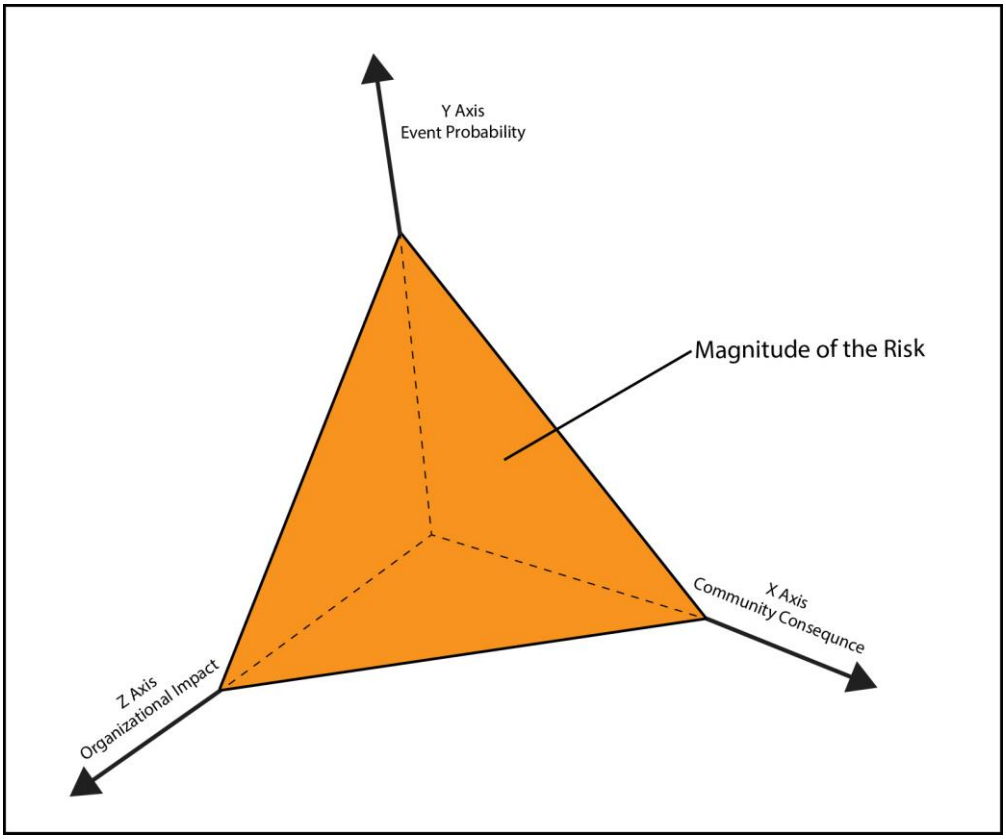
- Current hazard classification, planning, and mitigation measures from various sources;
- Specific information provided by GFD about target hazards and land use; and
- Planning zones established by GFD.

As such, it provides information to help the community: 1) identify hazards and risks by planning zone in the community; 2) prioritize risks in order to develop a community risk reduction strategy; and 3) determine the appropriate GFD resources necessary to reduce fire-related risks and attain desired outcomes. This assessment relies on the use of both quantitative and qualitative data to describe the fire/EMS protection needs of the community. As such, it is intended to provide insight into *what* needs exist, *where* those needs exist, and *how* those needs are expected to change in the future.

Risk Profile and Classification

With the information from previous sections of this report, a basis for establishing a preliminary risk assessment can be developed. Utilizing the zoning map, properties may be evaluated based upon their zoning classification and population density, and additional factors such as community value, economic impact, frequency-versus-magnitude, and the ability of the fire department to effectively mitigate the risks present with their current deployment model. The following figure represents the methodology employed to develop the risk assessment model.

Figure 11: Three Axis Risk Assessment Methodology

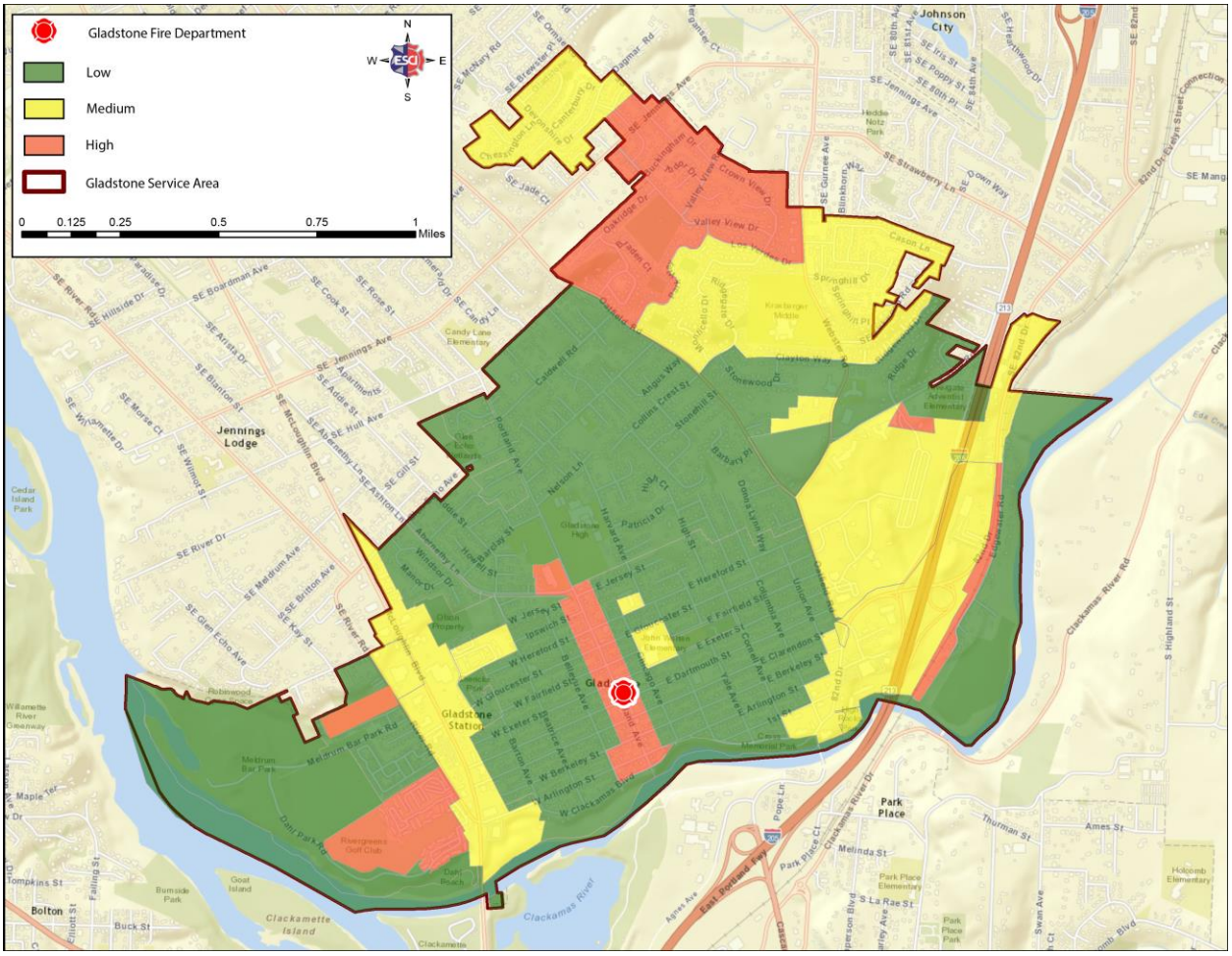


Based on these considerations, a risk assessment classification scheme and map were developed based upon these factors previously discussed. To determine an initial risk classification of individual groups of occupancies, the city was surveyed by department personnel and a general risk assessment classification model was established based on the following criteria:

1) **Event probability** – how often has the event happened historically and how likely is the event to occur again?
2) **Community consequence** – what is the significance of the occupancy and how would an event of this nature affect the community's morale, economic vitality and ability to attract and retain business?
3) **Organizational impact** – does the Gladstone Fire Department possess internal resources capable of mitigating the risk or would mutual and automatic aid resources be required on the first alarm assignment?

When the constituent components of the risk assessment are combined to form a sum of their parts, these factors combine to produce a magnitude of event that is characterized as high, medium and low risk classifications for the Gladstone Fire Department. Planning zones were utilized as the foundation for these risk zones and factors such as available water supply, ease of access, extenuating circumstances, personnel and mutual/automatic aid requirements, community loss, probability and timelines for recovery and estimated potential for occurrence were used to establish these risk assessment zones. The following figure displays the results of this risk assessment.

Figure 12: Risk Assessment Classification



Generally speaking, this map is reflective of the established planning zones and categories of residential, commercial, and industrial areas. However, several areas represent specific risks that were identified and resulted in an increase or decrease risk classification based on factors previously discussed. A specific example of this targeted risk assessment is the high-risk classification zone located in the eastern portion of the city between Interstate 205 and the Clackamas River.

Although the structures along this zone are residential, their construction profile with a split level on a sloping grade and facing the river provide a strong possibility for wind driven fires to occur. Additionally, the structures' close proximity to thick trees and vegetation, limited access to hydrants and driving lanes for suppression apparatus, steep grades, the potential for heavy smoke on the interstate, and the high personnel requirements for a fully involved structure resulted in a high-risk classification for this area.

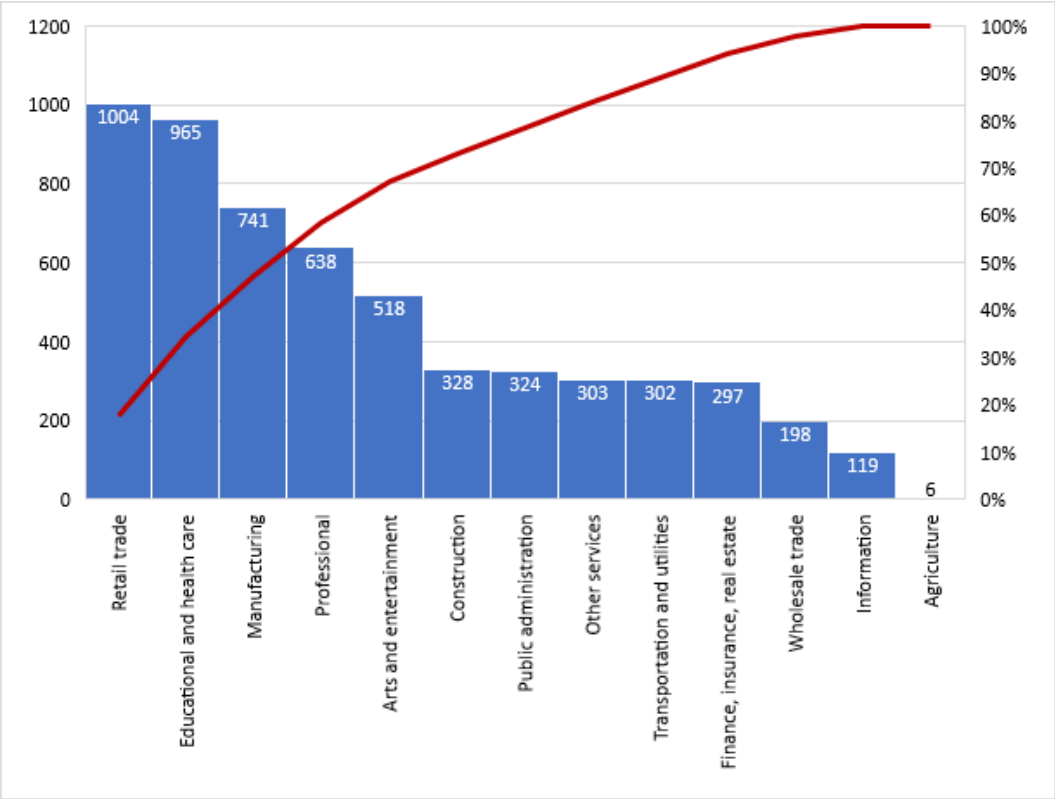
In addition to occupancy risk classifications, other factors contribute to the total risk profile of a community. Next, the economic indicators for the City of Gladstone are examined.

Economic Indicators

Many factors contribute to the nature and frequency of service demand experienced in communities across the country. While total population is often used to provide gross estimations of expected service demand, other factors such as population demographics, economic characteristics, composition of occupancies, levels of education, and cultural norms can have significant impacts on service demand within a community. The following series of figures provides an examination of socio-economic characteristics for the City of Gladstone.

The following figure presents predominant employment types of community residents with each job's representative contribution to the total. These categories are generalized by type and include many specializations within each grouping.

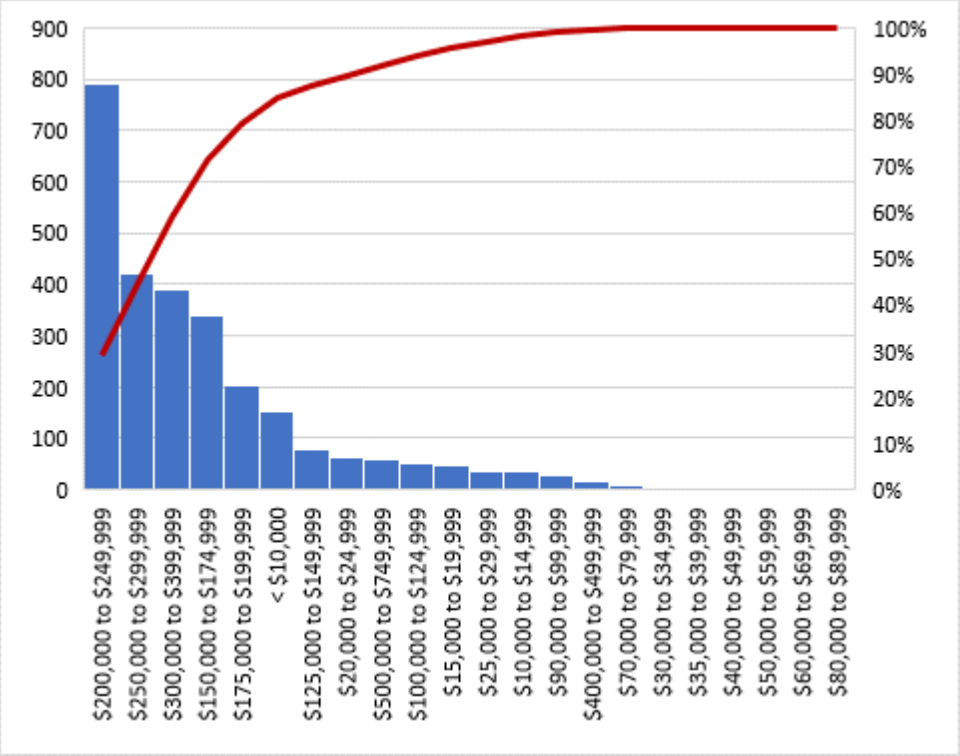
Figure 13: Employment by Type



Nearly half of the residents of Gladstone work within retail, education and health care, or in manufacturing. The remainder of the careers are composed of a wide swath of careers from professional administrators, to utility workers, to agriculture. Based upon the figure above, the loss of a retail center, school, health care facility could cause a cascade of detrimental circumstances as, for example, the closing of grocery store would result in lost income for dozens of workers, causing lost revenues for retail markets that would affect the grocery store employees and those who depend on buying groceries near their homes. Since most residents are employed within a few specific types of career fields, this information should be considered by the Gladstone Fire Department when establishing risk assessment classifications for occupancies.

Next the estimated home values along with each value classification's contribution to the total percentage of home values will be examined. This information is important to the overall understanding of the community as it provides insight in to the income and preferences of the community's residents.

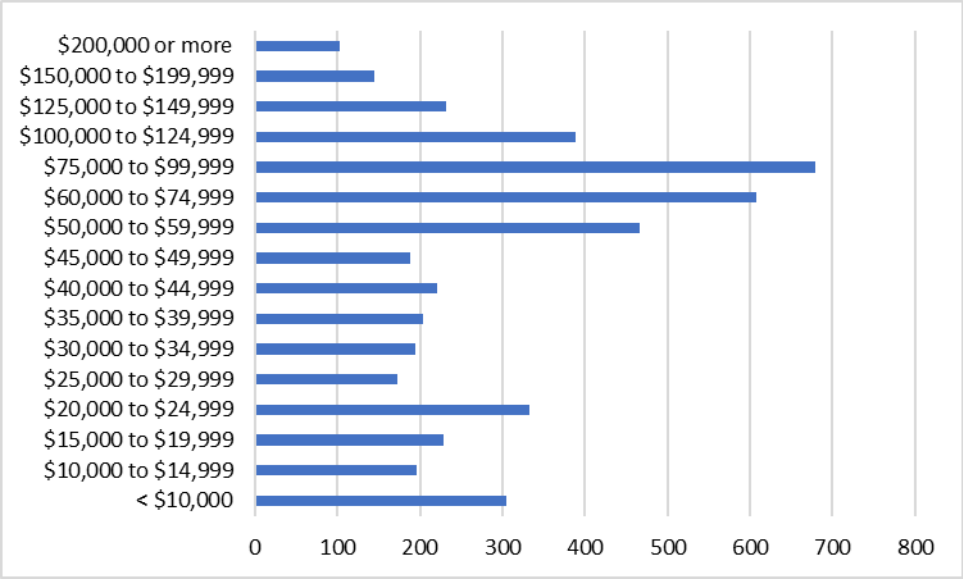
Figure 14: Estimated Household Value, All



Most homes within the city fall within the $200,000 to $250,000 range. Based on U.S. Census 2015 estimates, nearly 29 percent of all homes within Gladstone's boundaries are represented within this category and approximately 79 percent of homes have a value between $175,000 to $399,000. Another important indicator to mention are the approximately six percent of homes with values less than $10,000. Overall, 12 percent of homes in Gladstone have a value of $30,000 or less. This may provide an indication of the portion of low income levels seen within the jurisdiction and can also be used to estimate how service demand may be affected. Often, individuals living low income housing lack the resources to seek preventative care and depend more heavily on emergency services for their health care needs. A lack of preventative health care can cause chronic health issues to become acute resulting in an increased frequency of 9-1-1 calls for service.

Equally important, this information can also be used to make inferences on the types of fire losses that could be anticipated for single family homes. The next figure will examine annual income by household. This data will add to the understanding of the economic composition of Gladstone and potentially provide indicators of how service demand could be affected.

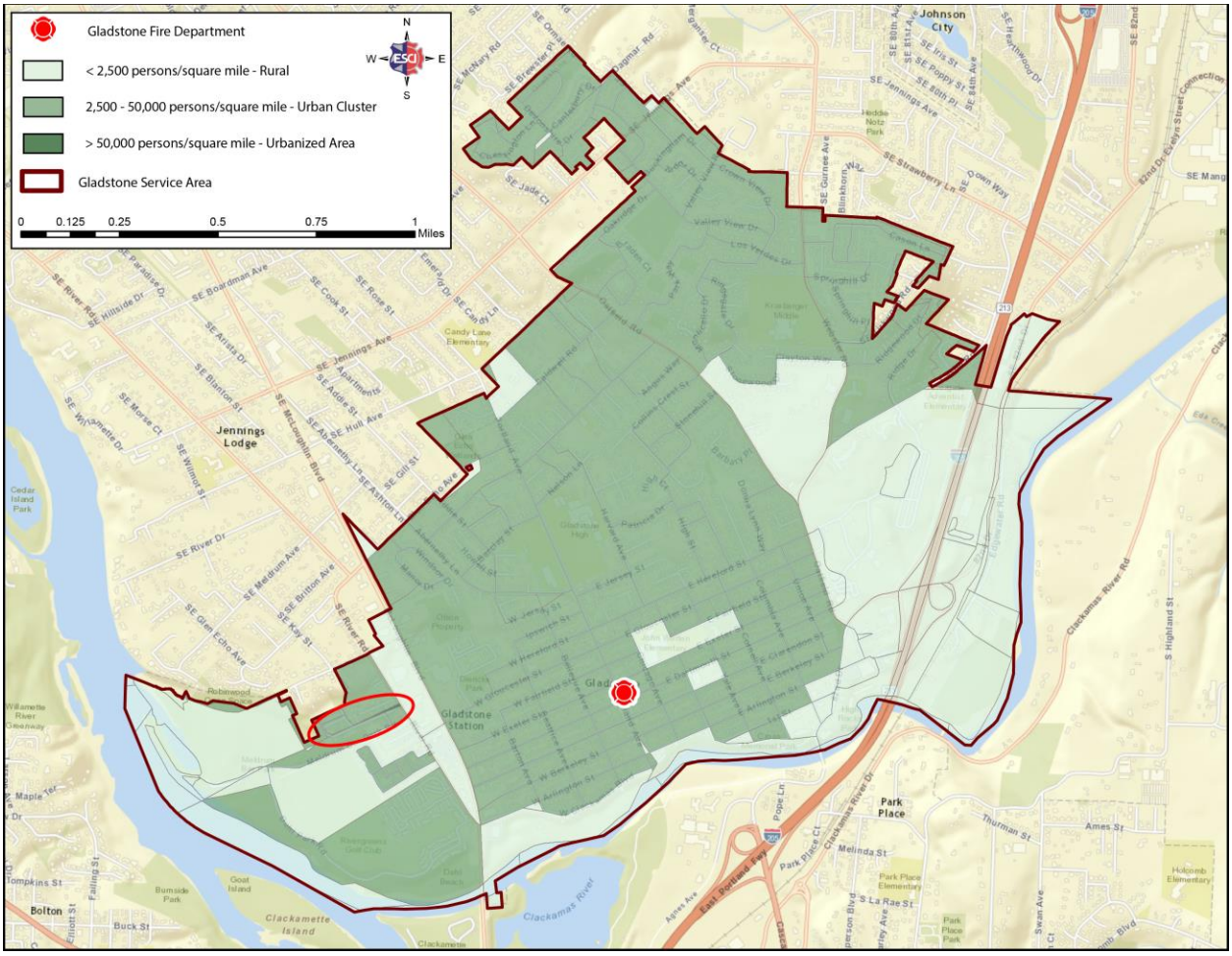
Figure 15: Annual Income by Household



According to 2015 census estimates, 46 percent of Gladstone residents earn between $50,000 to $124,999 per year, and 60 percent of residents earn more than $45,000 annually. For the purposes of this analysis, households with an annual income of $30,000 or less were considered at or below the poverty threshold as individuals living within these homes may lack or have limited access to preventative health care. Based on this assumption, 26 percent of Gladstone's residents earn an annual income near or below this threshold. Gladstone Fire Department should evaluate the distribution of these low-income areas within their jurisdiction and consider options for risk reduction strategies and preventative community outreach and education measures to reduce the overall risk profile for the community.

Often, low income housing is located in areas of relatively dense concentration such as mobile home parks, zero lot line housing, and apartment complexes. A population density map can be used to assist in identifying where these locations are likely to occur and this information should be used, along with other contributing factors, to establish how risks are categorized.

Figure 16: Population Density



The circle in the figure above identifies an area of dense population and relatively low-income housing. Gladstone Fire Department has identified this area as a location that is at significant risk for fire and EMS response based on historical service demand. Gladstone Fire Department should consider establishing an increased response matrix for reports of working fires to this location to ensure that, should a fire occur, an adequate level of response will be initially dispatched and damages from fire loss can be minimized.

Another factor that influences income potential for a community is access to transportation. Individuals with lower levels of income may have trouble obtaining a reliable vehicle for commuting to and from work, which can significantly affect their ability to seek out preventative care and increase the likelihood of their dependence on emergency services. The following figure provides an overview of the public transportation system in Gladstone.

Figure 17: Public Transportation

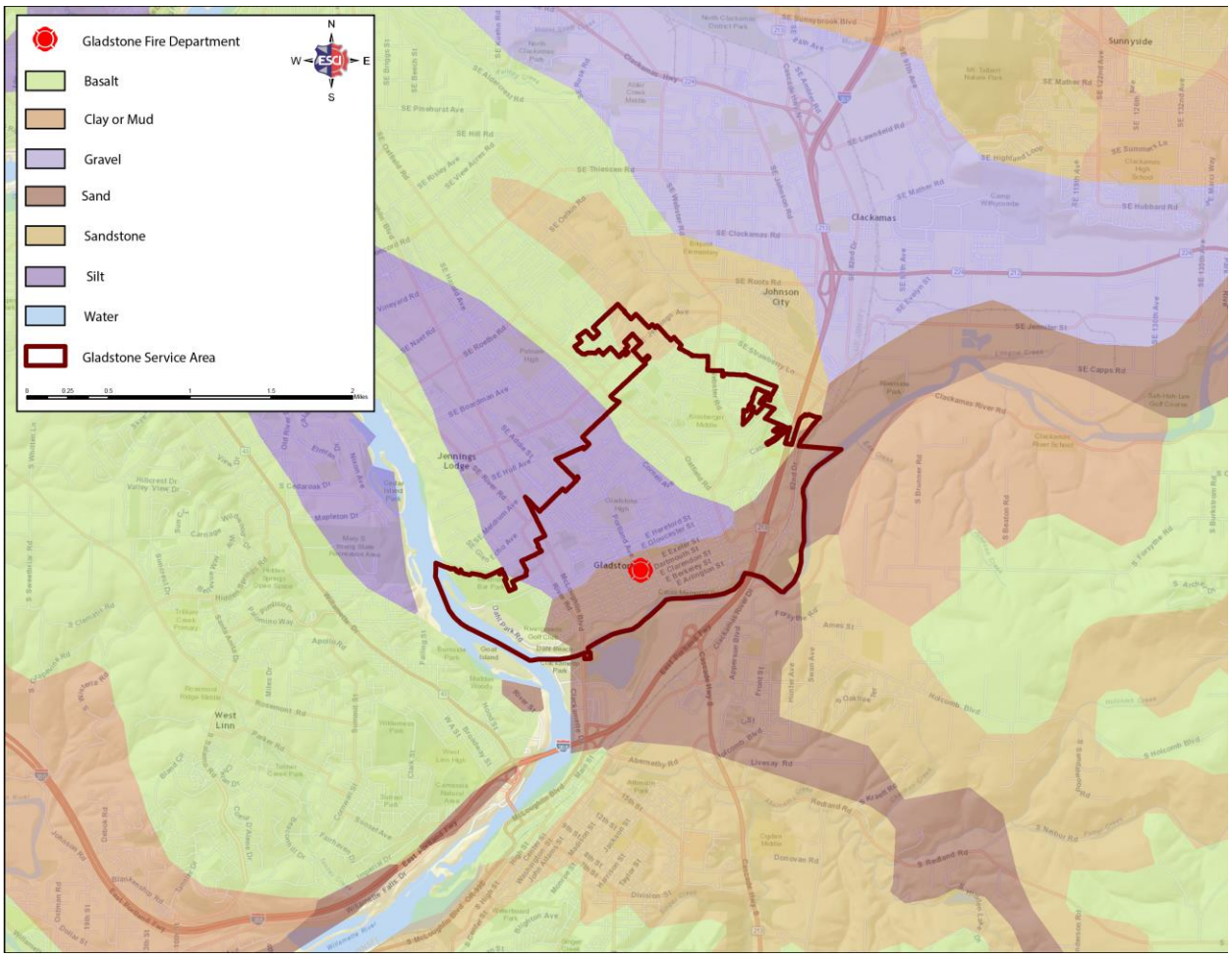
Gladstone possess a public transportation system that provides access to transportation within a reasonable distance for much of the city. Of particular interest for risk analysis are low-income areas access to this system as well as the route's proximity to places of employment and health care. While access to public transportation alone is not enough to accurately predict effects on emergency response service demand, it does provide additional supporting information to the overall risk assessment of the city. Should the department experience increased demand for emergency medical services, a potential strategy could include public education programs on the access and use of these systems.

The next series of figures provides an analysis of environmental factors present in the City of Gladstone and how these factors historically impacted the community.

Environmental Factors

While it is impossible to accurately predict or prevent risks stemming from environmental elements, it is possible to identify these factors based on historical data and apply specific mitigation strategies to reduce the level of impact experienced by the community. This section will examine environmental threats to the community and discuss possible mitigation strategies. Although this section discusses these factors to the extent that information is available, the Gladstone Fire Department should also identify and analyze any additional factors based upon their intimate knowledge of the area and the community. The first figure provides a review of geologic features and soil types that compose the area in and around the City of Gladstone. Using this information, it is possible to predict potential risks, such as where areas of flooding may occur.

Figure 18: Geologic Analysis

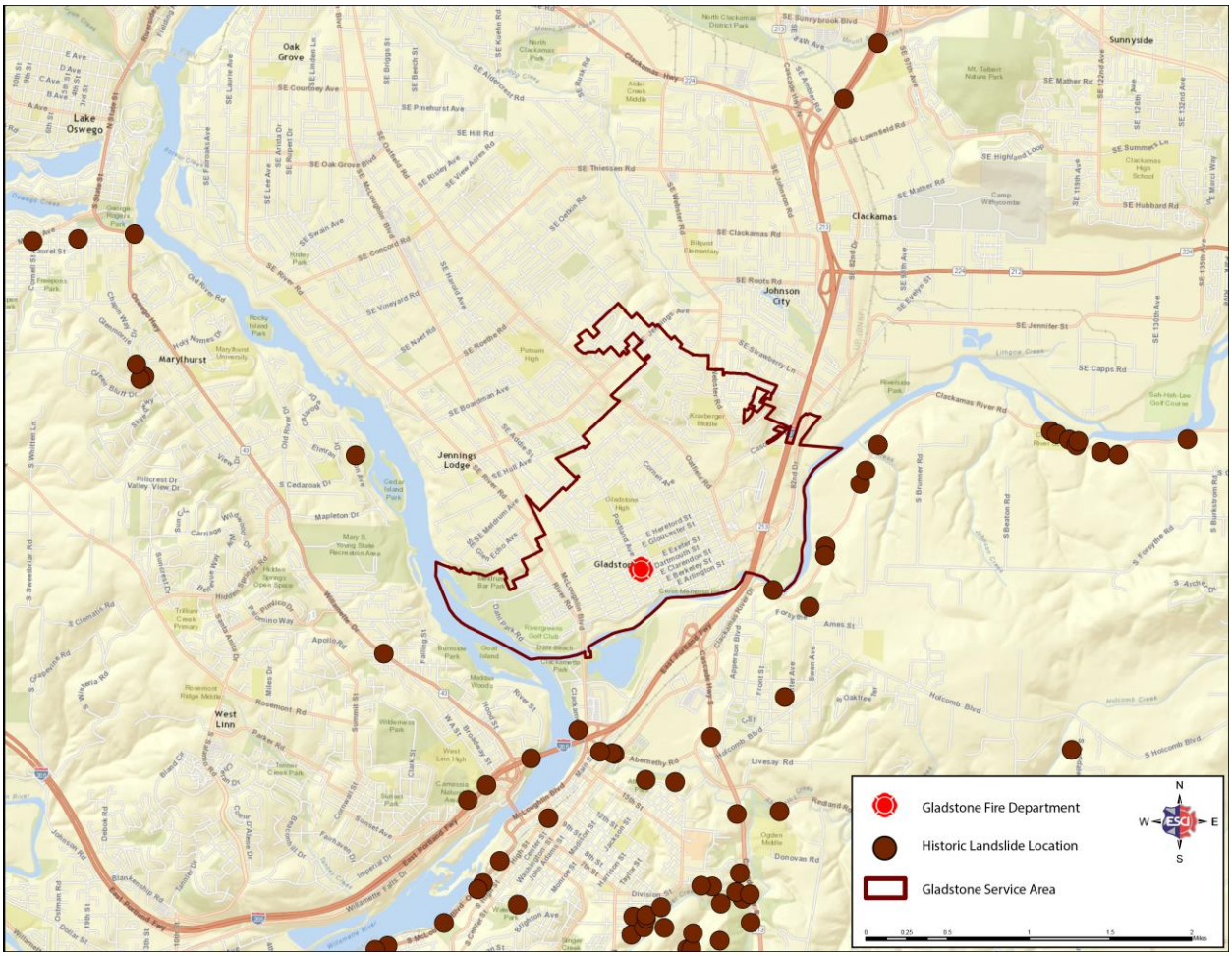


Gladstone is flanked on its southern border by the Clackamas and Willamette Rivers, which provide a geographical boundary for the city. Much of the soil for the Clackamas River is composed of sand and may indicate previous periods of high water which deposited these sediments. In contrast, the Willamette River basin is composed predominantly of basalt, suggesting that the area may possess poor drainage and could contribute to flooding conditions should periods of high water occur.

The remainder of Gladstone geologic composition within its boundaries are composed of silt, again suggesting that high flood waters may have existed at some point in history, but may not necessarily suggest that this area is prone to flooding today. Another feature present within the geology of Gladstone is the topography surrounding the river basins. Clay and sandstone lining the hills to the south of the Clackamas River and silt to the west of the Willamette River, in conjunction with slope, may contribute to the possibility of landslides.

In the following figure, historic landslide locations are identified to provide an initial assessment of the potential level of risk for this type of event in Gladstone.

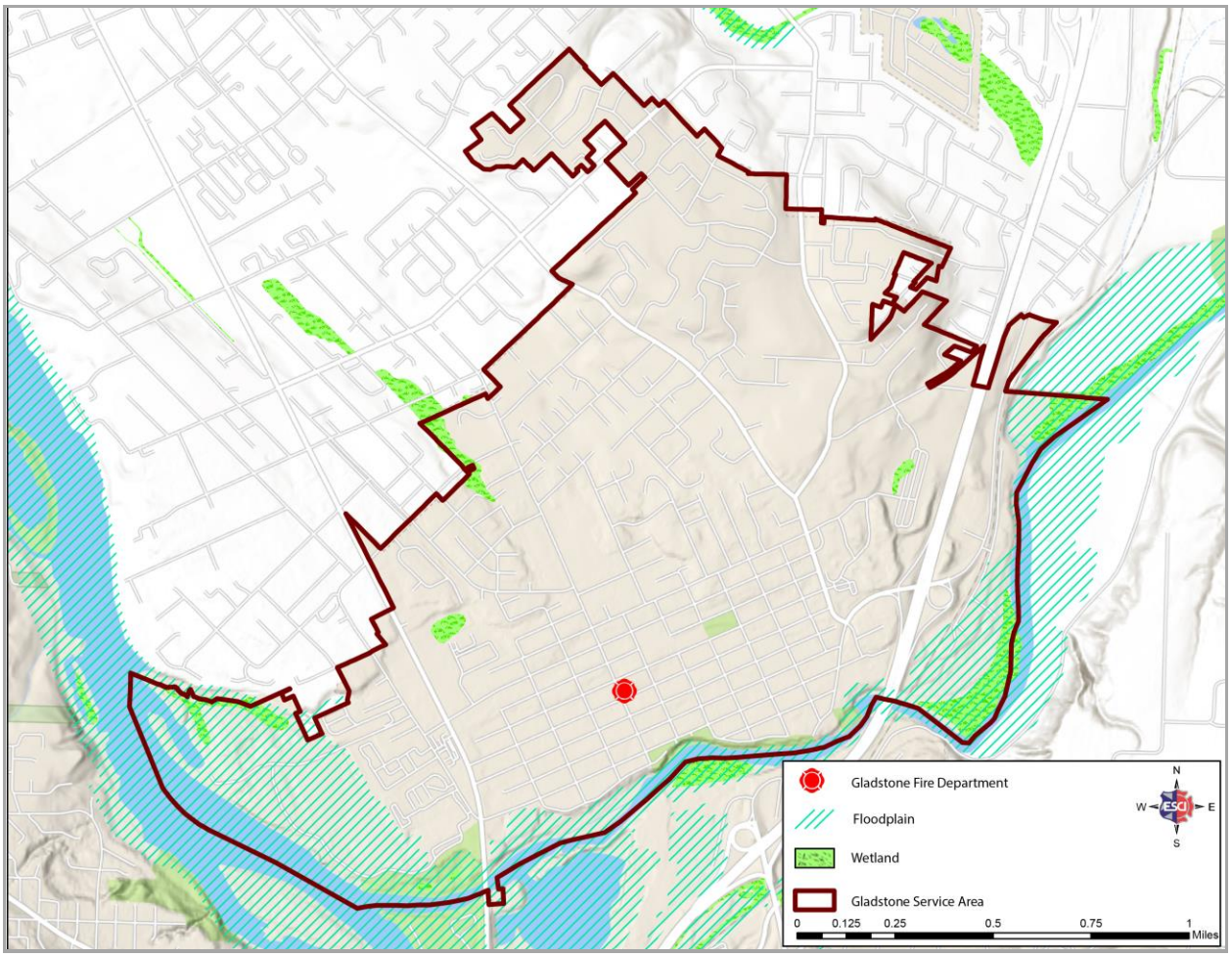
Figure 19: Historic Landslide Locations



Historically, Gladstone appears to have a slight risk for landslides, although most have occurred well beyond its boundaries. However, due to the frequency of landslides in the surrounding area, Gladstone emergency services should anticipate that they may be requested to assist other agencies in the event of a landslide. Gladstone should consider establishing policies for response protocol and provide training, as needed, to department personnel should an event of this nature occur.

Next, the susceptibility of flooding along the river basins will be reviewed.

Figure 20: Topographic and Wetland Features

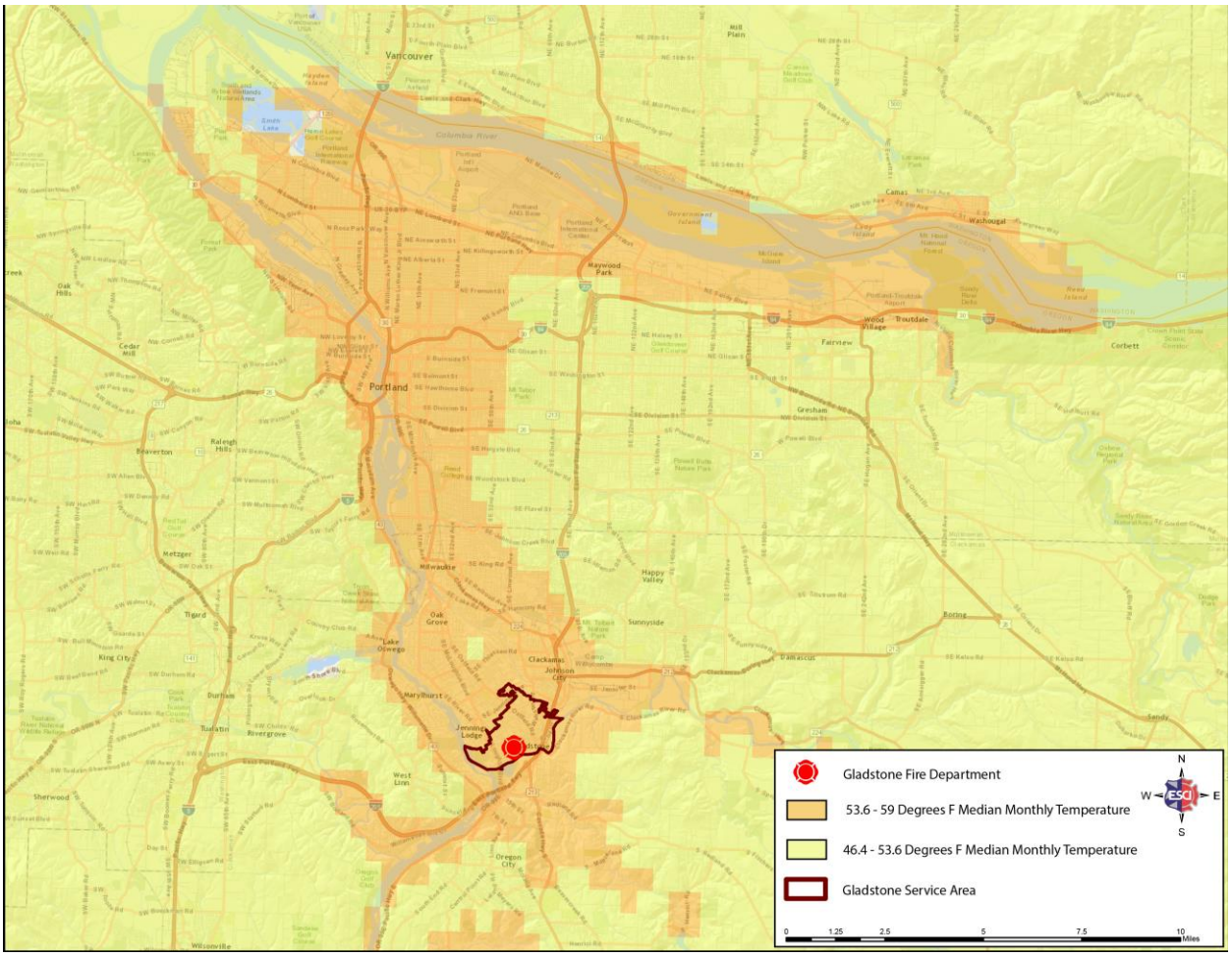


As suggested during the discussion of geologic features, the soil compositions of sand and basalt along the rivers are prone to flooding and these areas are designated as flood plains. Additionally, basalt possesses high seismic resiliency, but sand and river loam can liquify during a seismic event which could increase injuries, morbidity, and loss of property. Gladstone experiences water rescue events at an interval frequent enough to warrant special attention and this issue could be magnified should water levels begin to rise. Gladstone Fire Department should continuously review policies and provide regular, contemporary training to responders for this type of event to ensure responder safety and provide effective rescue efforts. Expansion of the current program, which is under way, is warranted.

Weather Effects

This series of figures will discuss the median monthly temperature and precipitation for the City of Gladstone and the surrounding areas. It is important to consider how these factors influence risk conditions and that significant deviations from these norms, particularly for extended periods of time, can dramatically influence the nature of events and service demand. First, median monthly temperatures are reviewed.

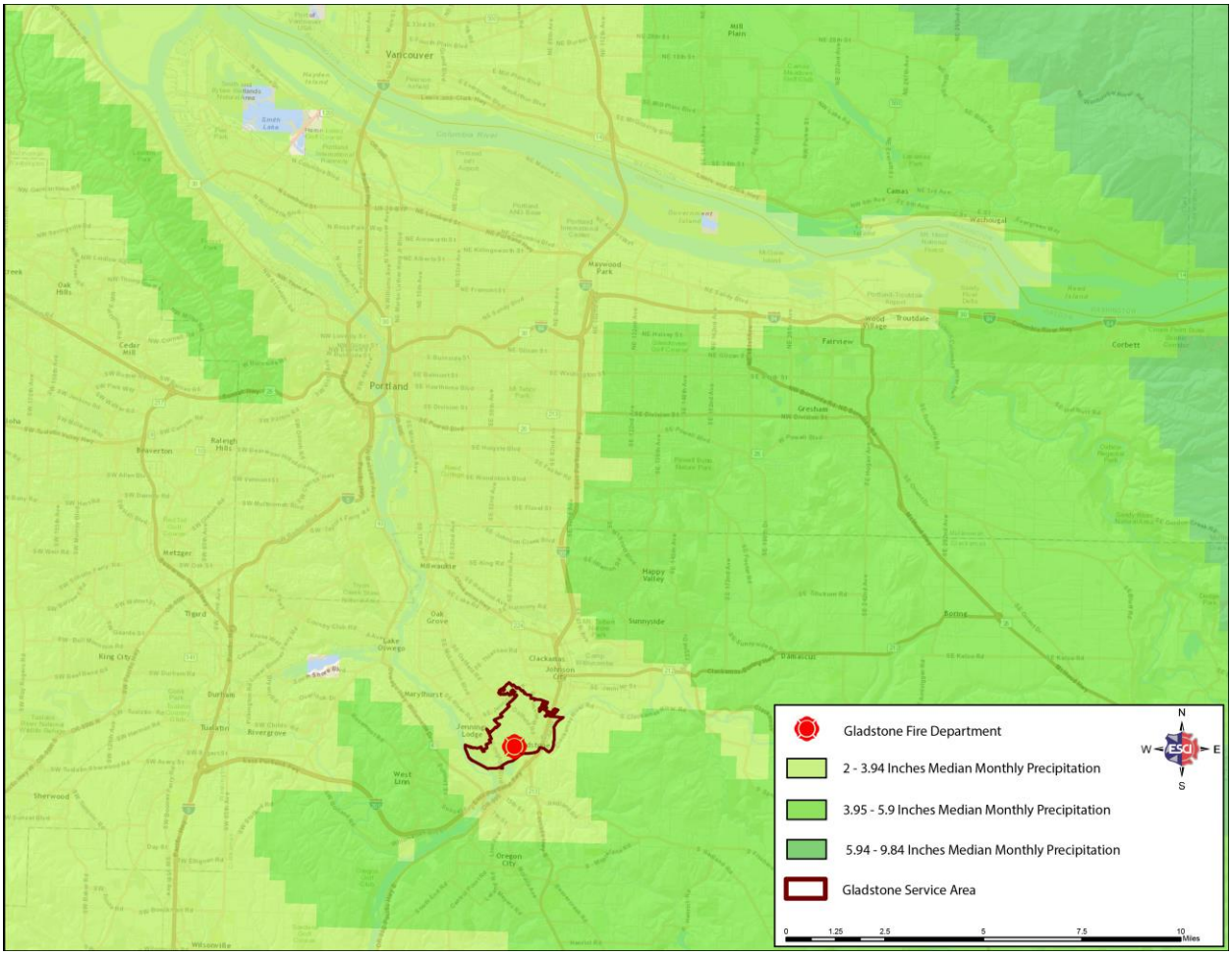
Figure 21: Median Monthly Temperature



The median monthly temperature for Gladstone ranges between 53.6 to 59 degrees Fahrenheit historically throughout the year. An examination of the topography and temperature range across the region reveal that areas immediately adjacent to river basins are on average 5 to 14 degrees warmer than the surrounding areas. The department should include a consideration of temperature and its effects on identified risks during the risk assessment process.

Next, the median monthly rainfall of the region will be examined to establish baseline totals that can be anticipated.

Figure 22: Median Monthly Precipitation

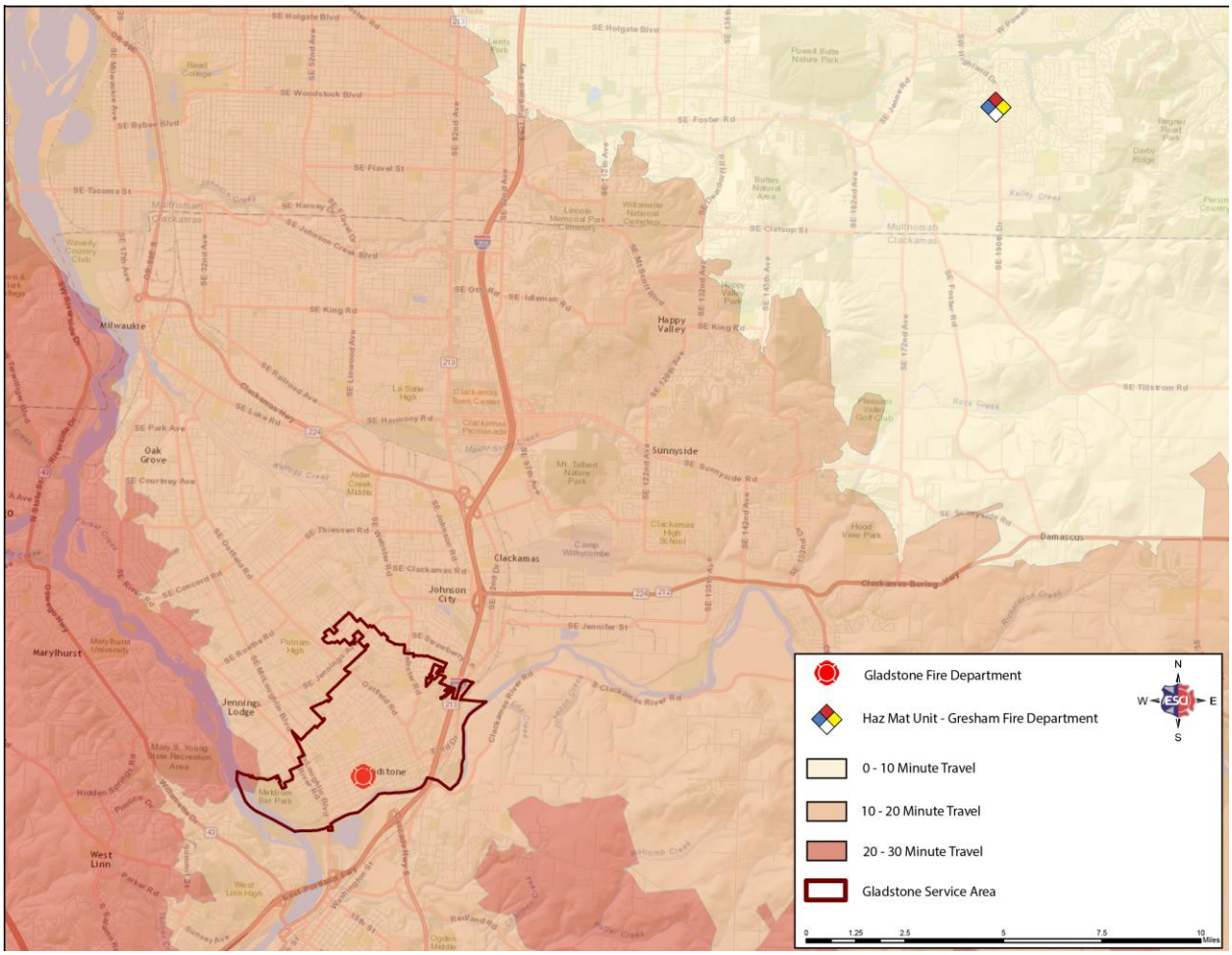


The median monthly precipitation for Gladstone falls within a range of approximately two to four inches per month. As this figure represents the average precipitation, some months will experience higher or lower totals, but this data provides the baseline for anticipated totals. Should areas of higher elevation receive excessive precipitation totals, the potential for rapidly flowing water or flooding may be a possibility.

Hazardous Materials

Using fire department pre-planning information, ESCI determined that no hazardous materials storage of any significance exists with the City of Gladstone. However, major rail and highway transportation networks pass through the municipal boundaries and a low risk of a hazardous materials accident exists. The following figure presents the approximate travel time of the closest hazardous materials response unit from the Gresham fire station. Based on the analysis below, this unit could respond to the majority of the Gladstone municipal boundaries within 10 to 20 minutes.

Figure 23: Hazardous Materials Unit Response

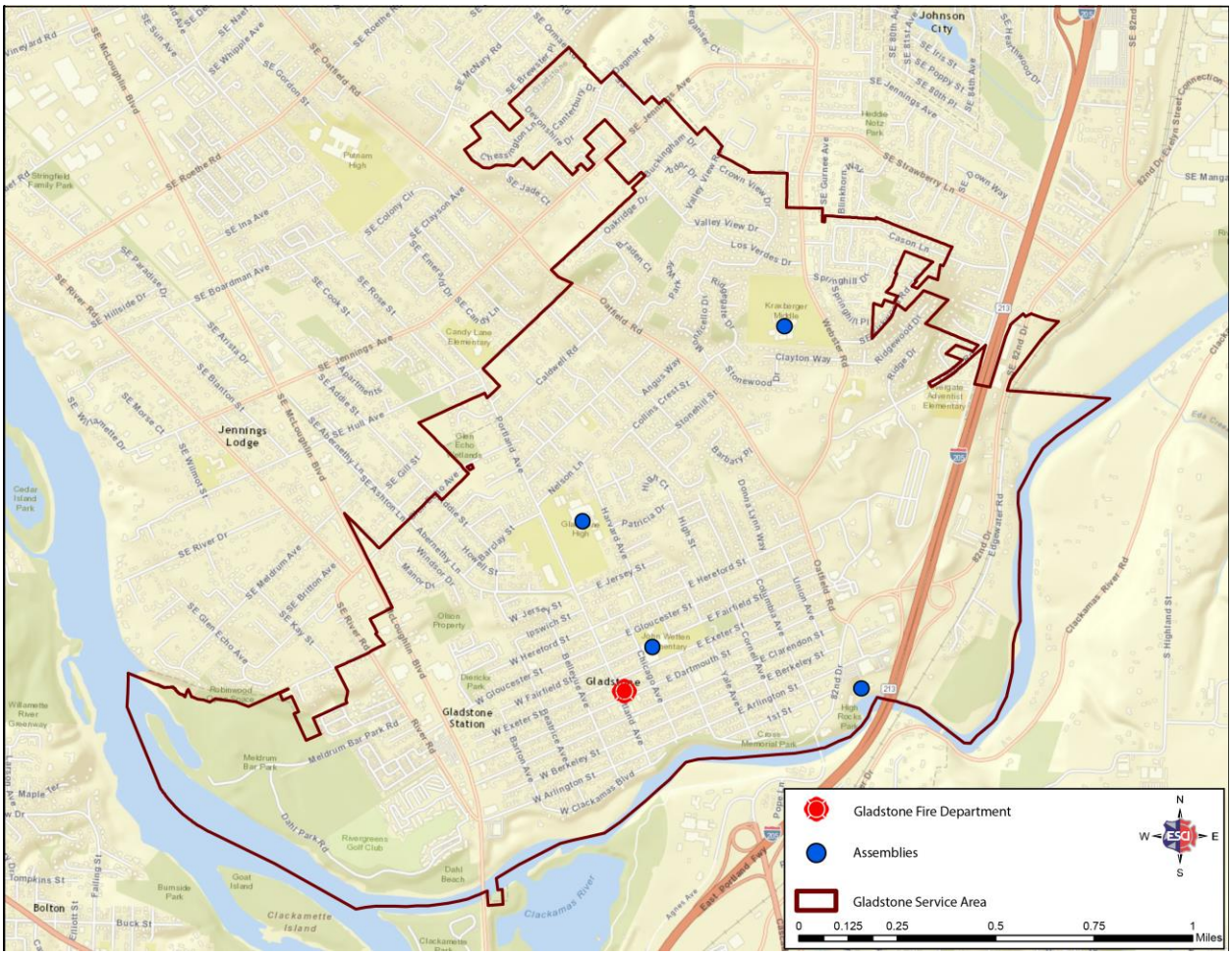


Gladstone Fire Department membership are trained at the operational level, meaning that the department has the capability of identifying the nature of the incident, requesting the appropriate mutual aid resources, and evacuating areas to provide a safe distance around the incident. Hazardous materials incidents are a low probability, moderate risk for the City of Gladstone and such an incident would require additional resources from outside of the department.

Assemblies

Several assemblies, or public buildings that hold more than 50 people, are present within the City of Gladstone. These include a high school, middle and elementary schools, as well as a five-story hotel. These assemblies represent a moderate risk for the department as a fire or other significant event would require additional resources and could potentially have significant impacts on the residents of Gladstone should a fire occur while these buildings are occupied by children. Additionally, the schools in Gladstone do not have sprinklers, further adding to the risk profile.

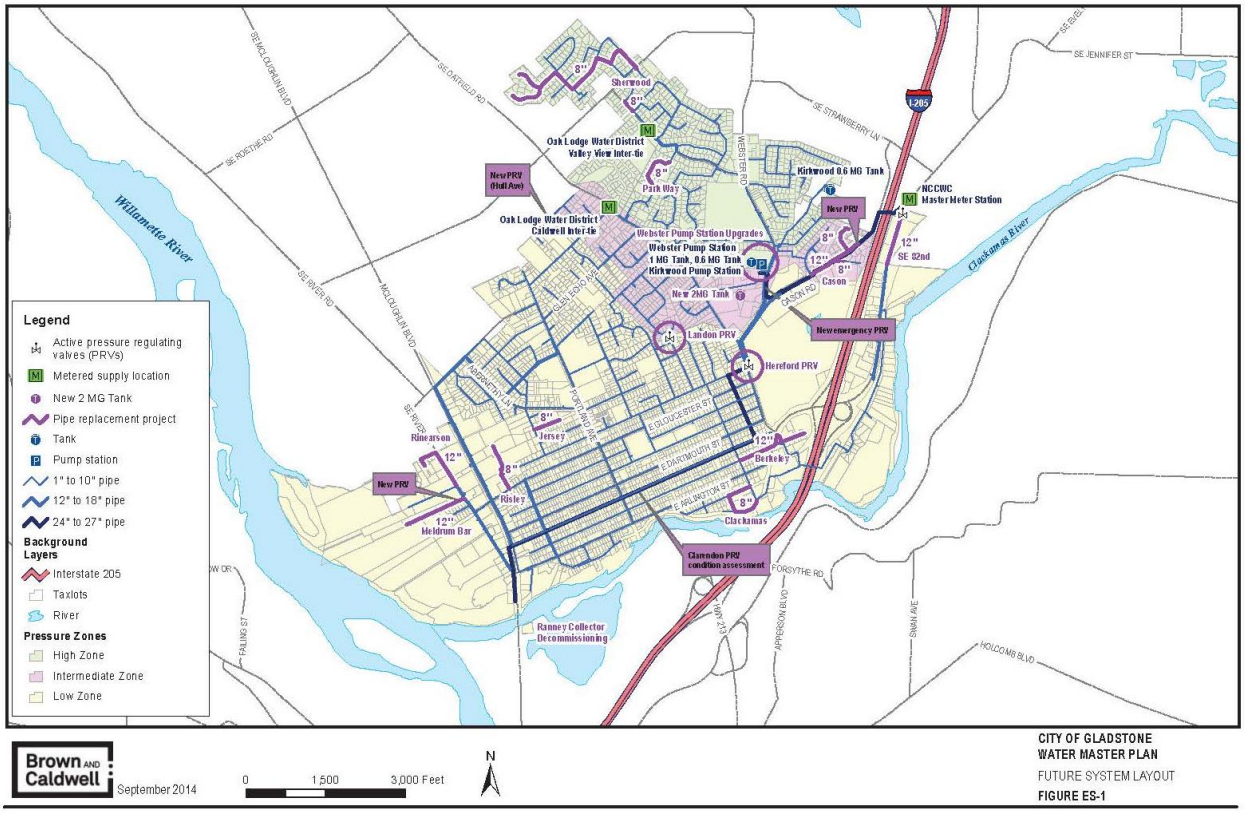
Figure 24: Assembly Structures



Water Distribution System

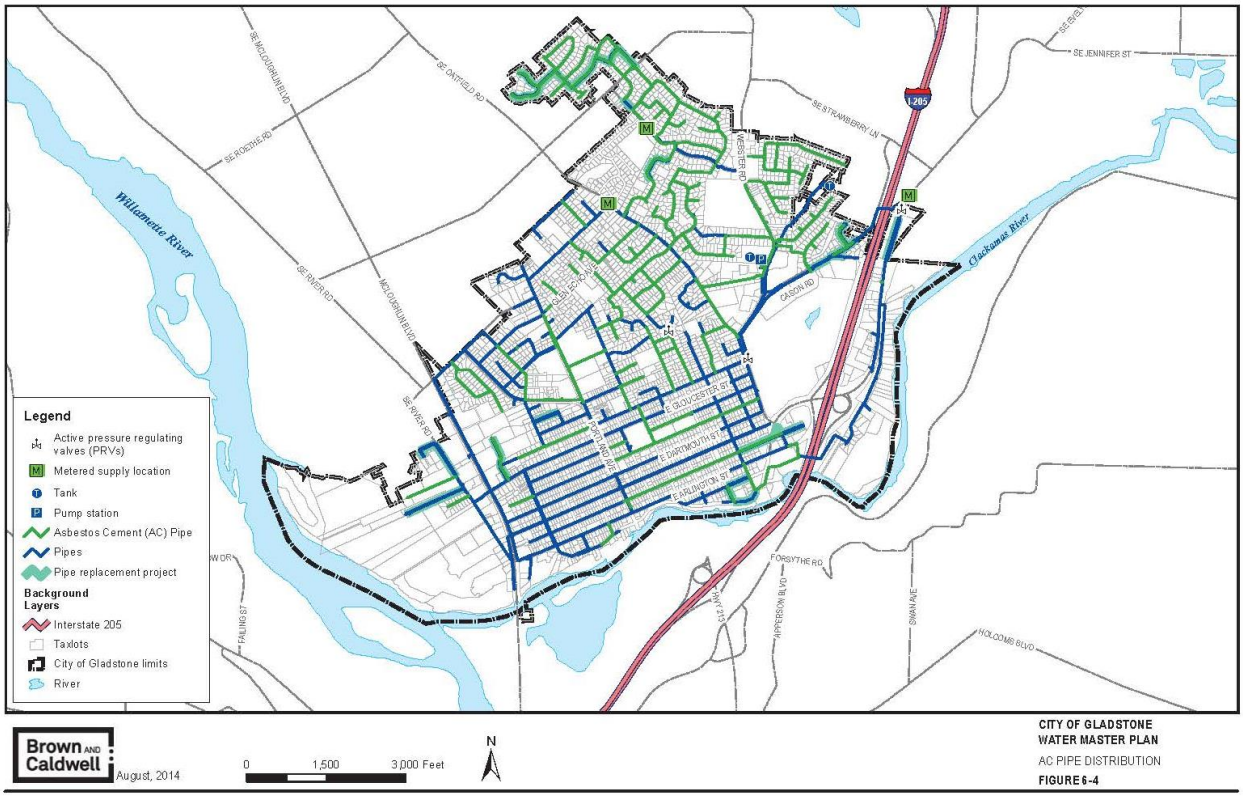
No matter how well trained or equipped a fire department may be, without an adequate and reliable water supply system it cannot be effective. The current condition of Gladstone's water supply system was evaluated for potential failure that may exist. In November 2014, a master plan study was completed for the city's water supply system and several deficiencies identified. Throughout the evaluation of the system, 49 deficiencies were identified, and several capital improvement recommendations provided to the city. The greatest risk potential, regarding the fire department, are undersized pipes that feed fire hydrants in residential areas. Additionally, many of these pipes, approximately 17 miles, are constructed of Asbestos Cement (AC) and are unreliable to meet the needs required to handle the demand during situations such as structure fires when lines are rapidly opened and closed. The following figure, taken from the master plan report, depicts the current condition and major deficiencies within the Gladstone water supply system.

Figure 25: Water Distribution Map from Gladstone Water System Master Plan



Although many of the commercial areas of Gladstone have piping, flow and pressure are sufficient for fire suppression operations, other areas of the city, as seen in the following figure, possess a higher risk potential for fire due to the possibility of line failure should an AC pipe fail.

Figure 26: Asbestos Cement Piping Locations from Gladstone Water System Master Plan



City staff have acknowledged the severity of the issue and its associated risk; however, at this time the funding to proceed with a total replacement of the susceptible sections of the system does not exist. Gladstone Fire Department should consider this a contributing factor when compiling the risk assessment for areas supplied by AC piping as a system failure could easily result in the doubling or tripling of resources required to effectively mitigate an incident such as a structure fire. Additionally, the department may consider training staff in conjunction with water department staff to ensure the capabilities, limitations, and operating procedures are understood by all.

Seismicity

According to the Oregon Department of Geology and Mineral Industries, "earthquakes from four different sources threaten communities in Oregon and the Pacific Northwest. These sources are crustal, subduction zone, intraplate, and volcanic earthquakes."[17] The mechanics of earthquakes are less important for communities to understand than recognizing the damage and destruction that can occur, and how to prepare for them.

Oregon has experienced two large crustal earthquakes in 1993; one in Scotts Mills, (magnitude 5.6) and one in Klamath Falls (magnitude 5.9 and magnitude 6.0). But the worst-case scenario that emergency management officials prepare for and spend energy educating the public about is the Cascadia Subduction Zone earthquake. These types of earthquakes effect large regions because, "tectonic plates that make up the surface of the earth collide."[18] The Cascadia Subduction Zone (CSZ) spans over 620 miles, from Northern Vancouver Island in British Columbia to Cape Mendocino in northern California. Scientists estimate that the CSZ, and indeed any subduction zone earthquake, has the potential to cause magnitude 9.0 or greater earthquakes. Subduction zones are the site of some of the most powerful earthquakes ever recorded, such as the 1960 Chilean (magnitude 9.5) and the 1964 Great Alaska (magnitude 9.2) earthquakes.

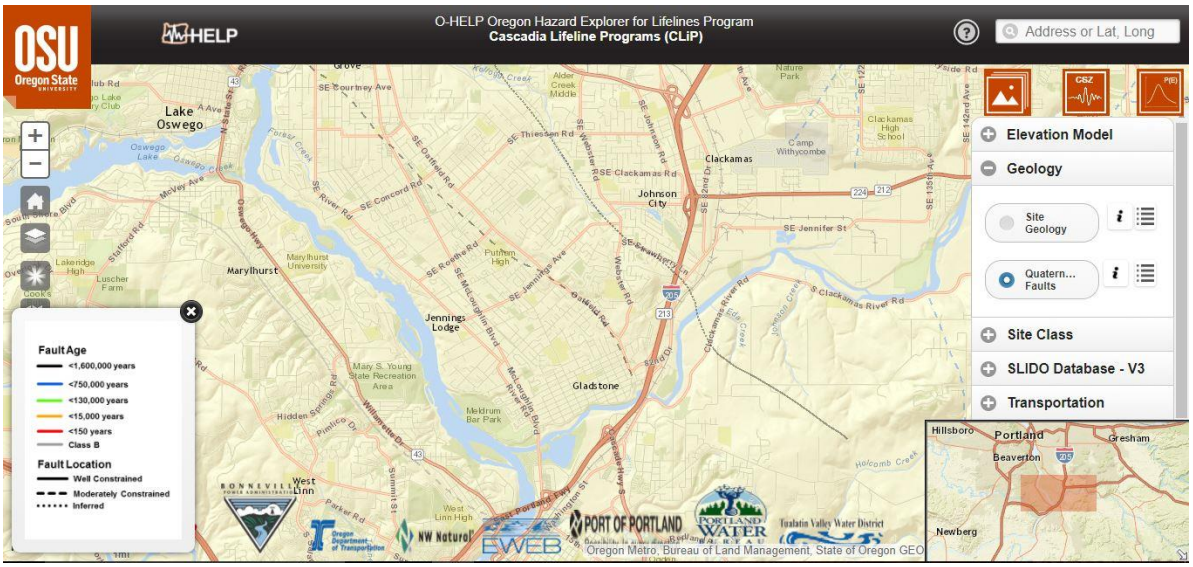
Without regard to the type of earthquake experienced, it is important to understand the potential impact to communities. The following figures map the relative risks in Gladstone.

The following series of figures were obtained from Oregon State University's Cascadia Lifeline Program and depict the potential impacts for Gladstone and the surrounding areas should a significant seismic event occur. The following figure presents fault lines in and around the City of Gladstone.

[17] http://www.oregongeology.org/sub/earthquakes/EQs.htm. Obtained 10-31-2017.

[18] *Ibid*.

Figure 27: Seismic Fault Lines



A moderately constrained and an inferred fault line bisects Gladstone from the northwest to southeast, as well as a well constrained, class B fault line immediately west of Gladstone across the Willamette River. The faults running through Gladstone are less than 1.6 million years in age. Several other moderately constrained faults also exist to the east of Gladstone and are less than 750,000 years in age. The next figure reviews the likelihood of ground motion.

Figure 28: Two Percent Likelihood of Ground Motion in 50 Years

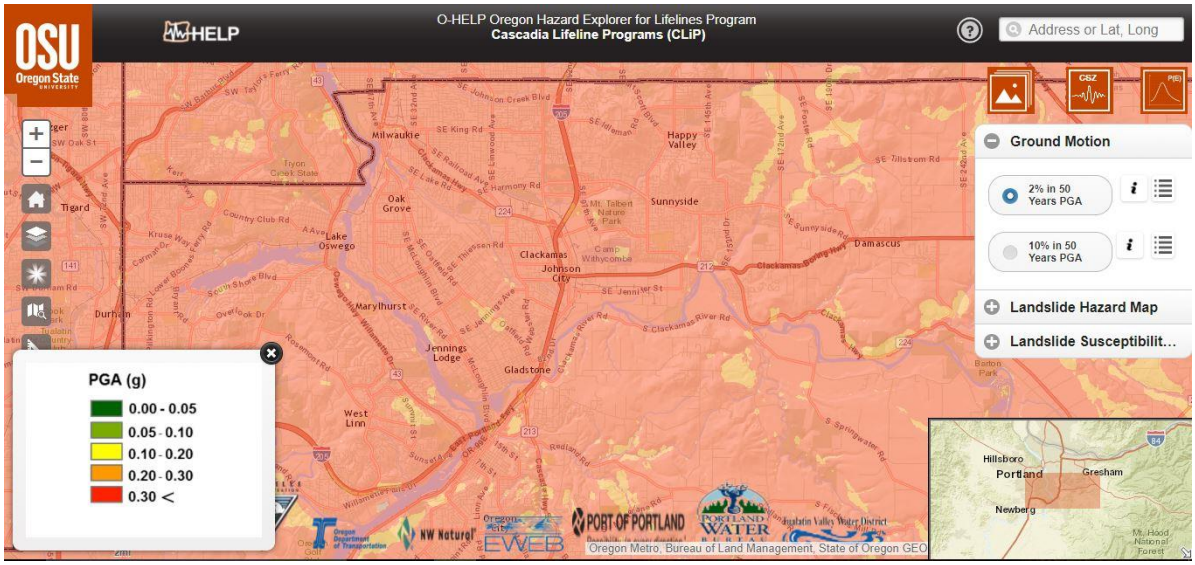
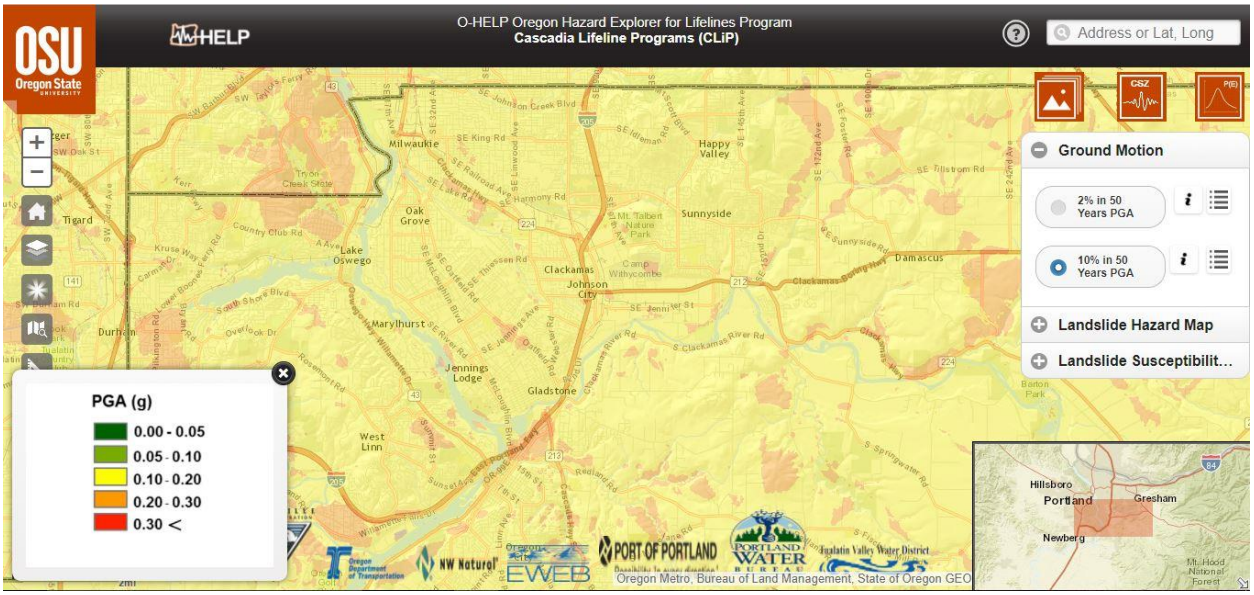


Figure 28: Two Percent Likelihood of Ground Motion in 50 Years demonstrates the magnitude of Peak Ground Acceleration (PGA), or how quickly the rate of displacement speed changes, that Gladstone and the surrounding area are likely to experience. In this model, most of the area has a two percent likelihood of experiencing a PGA of 20 to 30 percent of the peak magnitude resulting from a seismic

event during the next 50 years. The next figure presents the same analysis, but at a 10 percent likelihood for the same event during the next 50 years.

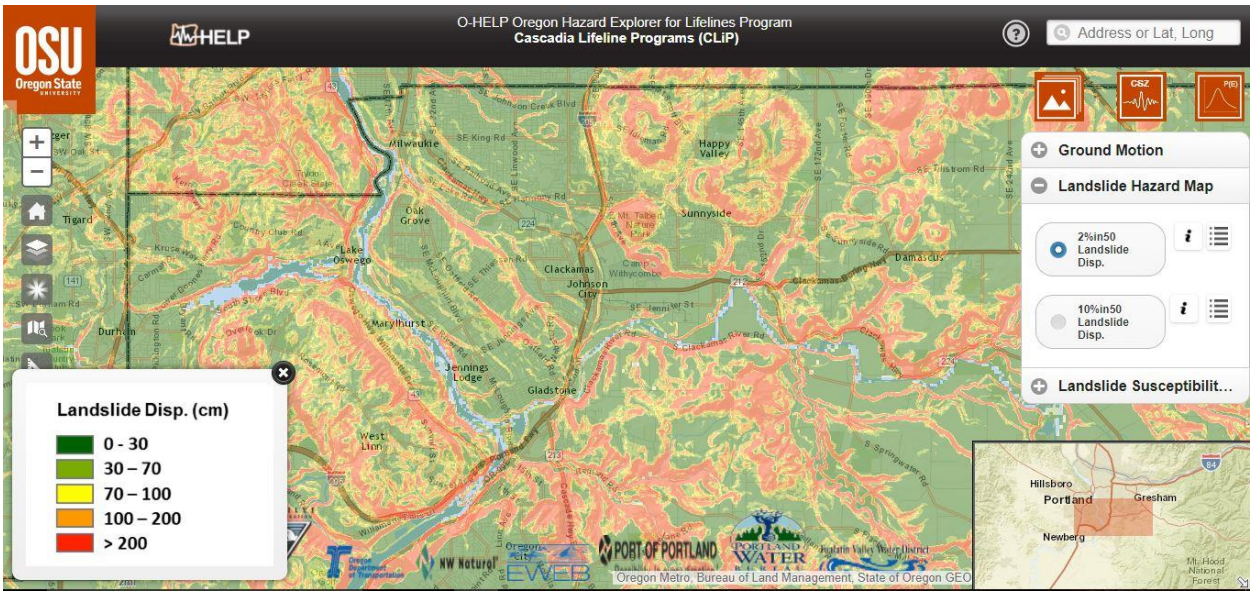
Figure 29: Ten Percent Likelihood of Ground Motion in 50 Years



The results of this model find that Gladstone is more likely to experience a PGA at 10 to 20 percent of the maximum magnitude of a seismic event during the next 50 years.

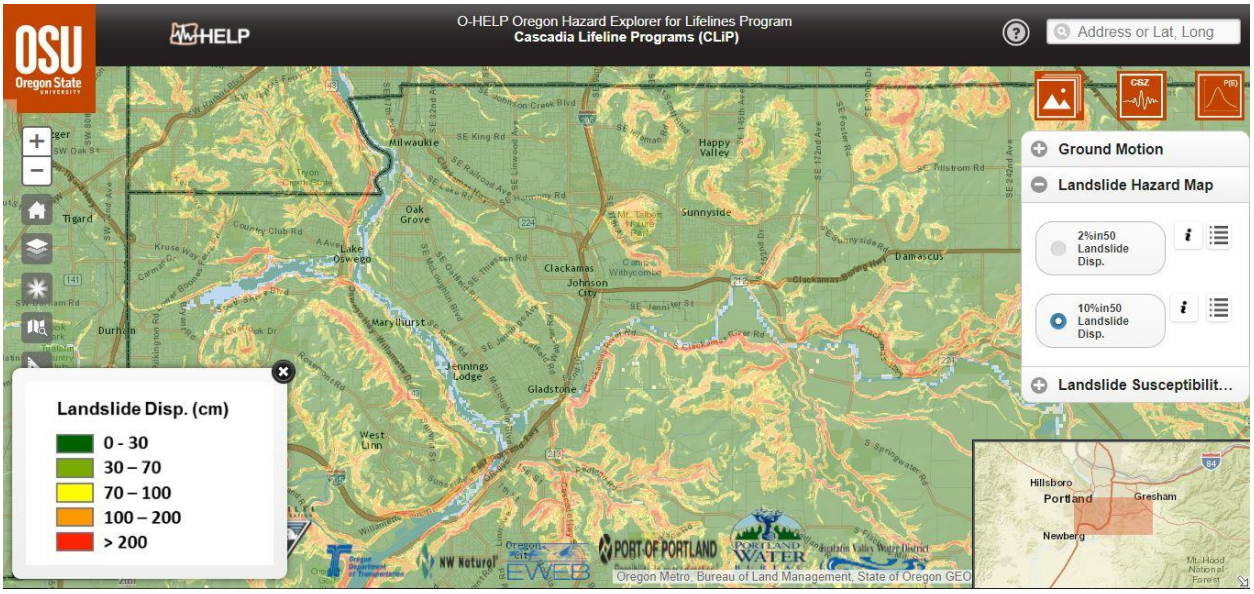
In this and the following figure, the probability and amount of surface displacement over the next 50 years due to seismic activity are estimated. Using a two percent likelihood, Gladstone could experience ground surface displacement at rates as high as 200 centimeters (cm) in some areas; however, most locations within Gladstone would see lower rates of displacement ranging between 30 to 70 cm.

Figure 30: Two Percent Likelihood of Landslide Risk in 50 Years



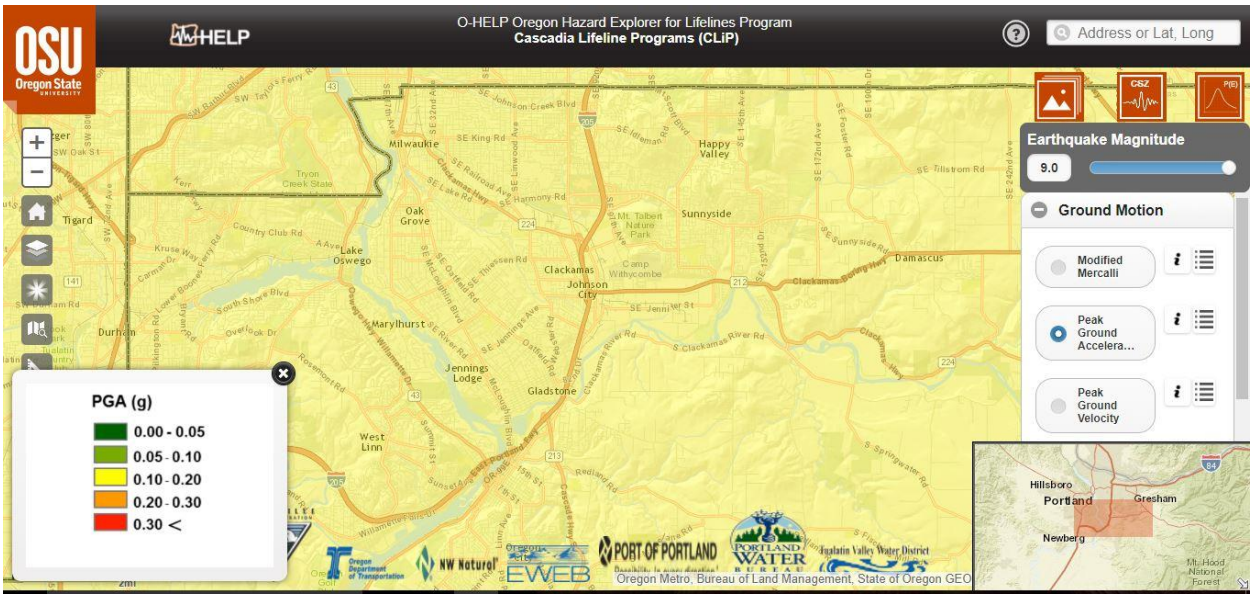
If the probability of occurrence is increased to 10 percent over the next 50 years, Gladstone's risk profile remains consistent with most areas at risk for displacement rates of 30 to 70 cm; however, while some areas are still at risk for surface displacement rates of 100 to 200 cm, fewer areas are as likely to experience this magnitude of event.

Figure 31: Ten Percent Likelihood of Landslide Risk in 50 Years



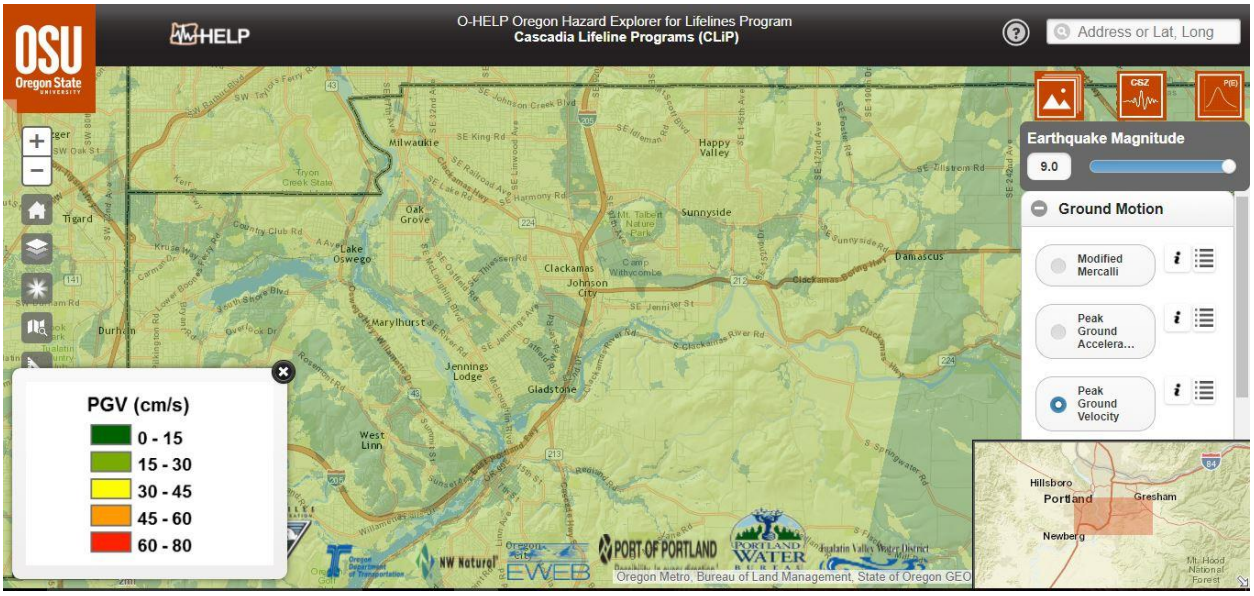
In the following figure, peak ground acceleration based upon a 9.0 magnitude earthquake are estimated. Based on this analysis, should a seismic event of 9.0 occur along a fault in the Portland area, Gladstone and the surrounding area can anticipate a Peak Ground Acceleration of 10 to 20 percent of the maximum magnitude.

Figure 32: Seismic Peak Ground Acceleration



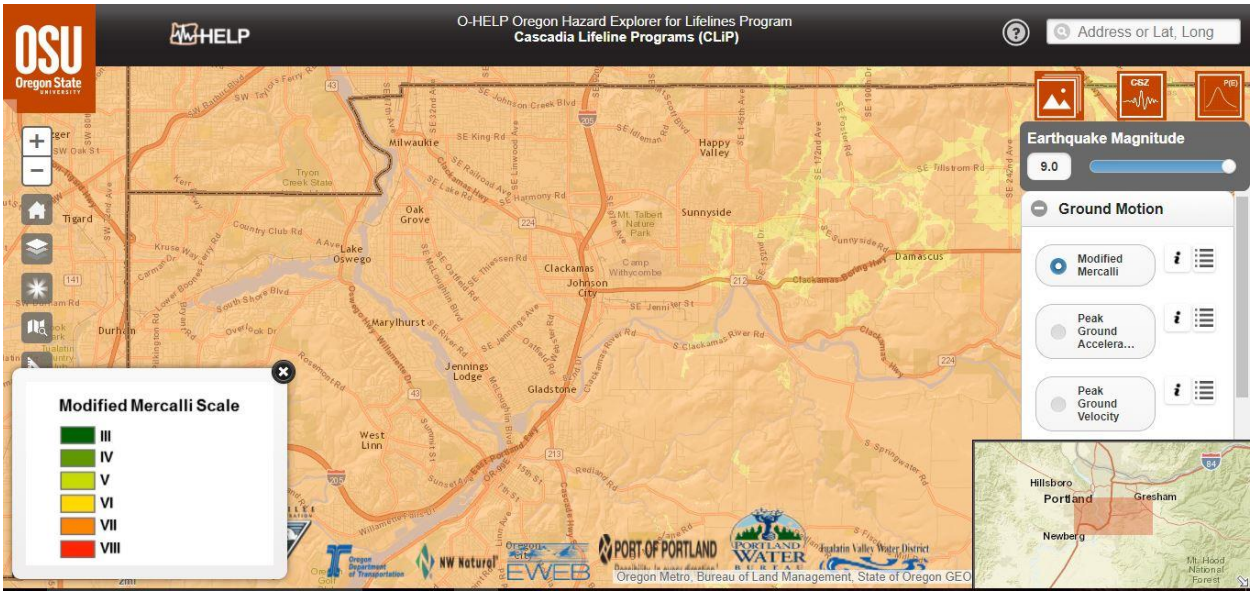
Peak Ground Velocity, or the maximum speed of movement, is shown in the following figure based upon a 9.0 magnitude event. The majority of Gladstone and the surrounding area could experience displacement speeds of 15 to 30 cm per second, with some areas seeing slightly slower rates.

Figure 33: Seismic Peak Ground Velocity



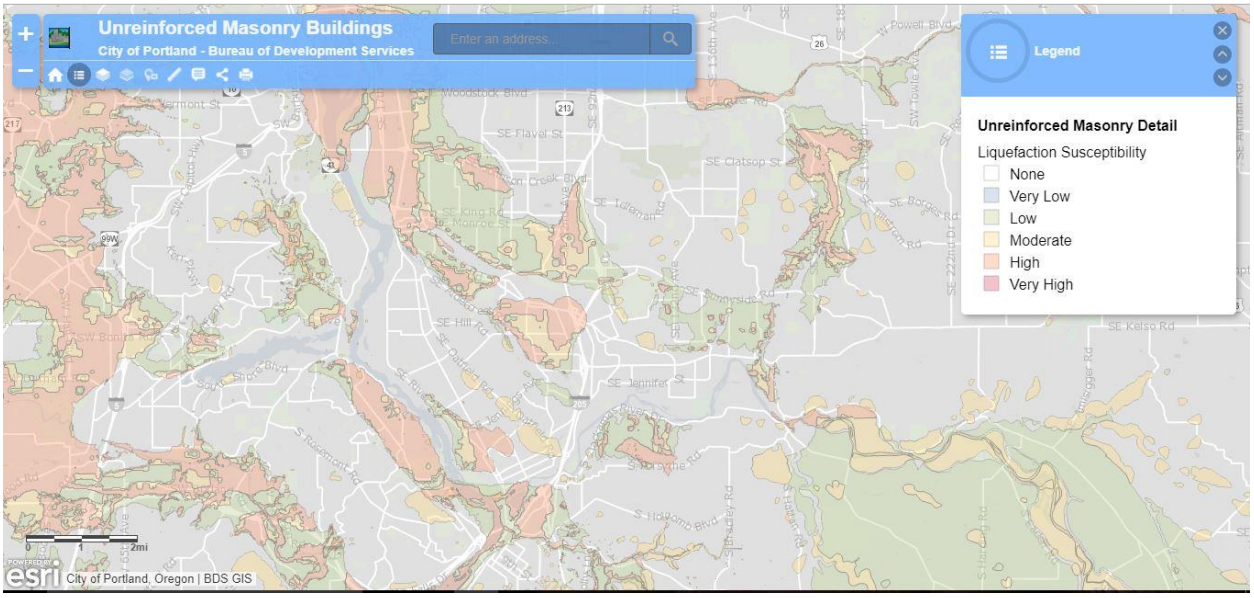
The impact of a 9.0 magnitude earthquake based on the Modified Mercalli Scale is shown in the following figure. The Modified Mercalli Scale estimates the projected intensity felt during the event. This scale incorporates factors such as detecting movement, to the movement of furniture, up through total destruction. To quantify these effects, a rating system is applied and ranges from a Level I: Not Felt, through a Level X: Extreme. If a 9.0 magnitude quake should occur in the Portland area, the majority of Gladstone can anticipate intensity effects of a Level VII: Very Strong. This means that the intensity of the event would include extreme damage to poorly built or designed buildings, chimney damage, and slight to moderate damage to well-built ordinary construction.

Figure 34: Modified Mercalli Scale



Finally, the risk of damage due to liquefaction during a seismic event was examined. This information was obtained through the City of Portland's interactive mapping site. Liquefaction occurs when water saturates soils and causes the soil to behave as a liquid. The risk for liquefaction is shown in the following figure.

Figure 35: Risks Profile for Liquefaction



Gladstone has several areas within the city that are at risk for moderate to high susceptibility for experiencing liquefaction and potentially causing damage to structures.

Emergency Management

In 2012, Clackamas County completed the Natural Hazards Mitigation Plan, a comprehensive evaluation of risks and their associated levels throughout the county. In addition to the risks already identified in this report, other risks were evaluated by Clackamas County. Critical infrastructure identified within the report included City Hall, Gladstone Senior Center, Tri-City Baptist, Gladstone Center for Children and Families, Seventh Day Adventist Camp, and the sanitary sewer collection and pump station. The Olsen Wetlands was also identified as a critical environmental area. Severe winter weather was identified as a potential risk and drought and volcanic events were not seen as risks in which the city would pursue mitigative actions.

The evaluation and classification of risks present within a community and their effect on emergency response and service demand is as individual as the community served. Several factors contribute to the total risk assessment profile of a community and often several indicators will contribute to the overall effects experienced. While the intent of this review is to include, to the extent possible, all identifiable contributions to the risk profile, the city and its first responders are in the best position to add or modify any risk category or recommendation based upon their unique knowledge of the area.

The following section will analyze the historical system performance of the Gladstone Fire Department and provide an analysis of the multiple factors that contribute to distribution and performance.

SERVICE DELIVERY AND PERFORMANCE

Service Demand

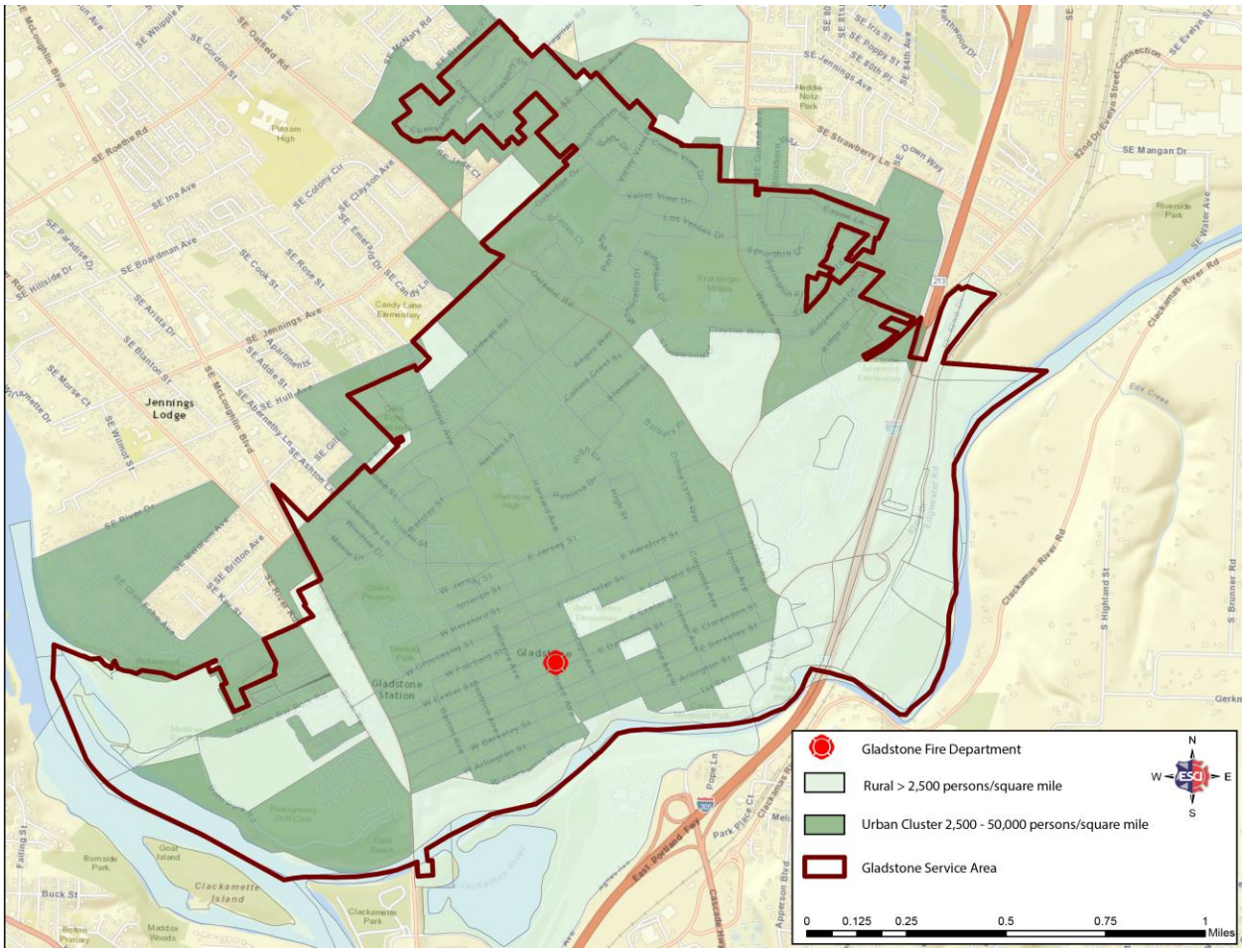
The City of Gladstone Fire Department (GFD) provides fire suppression and emergency medical and rescue services to the residents of Gladstone, Oregon. The department jurisdiction is composed of the municipal boundaries of Gladstone and has a total area of 2.48 square miles. The department is operated from one facility located approximately in the southcentral portion of the city. Gladstone Fire Department has the capability to deploy a ladder company, two engine companies, a rescue company, and command vehicles as needed based on the nature of the response. During the work week, Monday through Friday from 8:00 a.m. until 6:00 p.m., GFD staffs a rescue company and day staff personnel are available to respond as incidents occur. The remainder of the time, GFD attempts to maintain low turnout times by housing paid on-call personnel next door to the fire department in a small apartment, and, as available, depends upon paid on-call responders to deploy fire suppression and rescue resources when other responders are not available at the fire station.

The Gladstone Fire Department serves a community of 11,741 residents, based on U.S. Census, American Community Survey (ACS) estimates 2015[19], with an overall population density of 4,715 persons per square mile. Based on 2010 U.S. Census Bureau guidelines for defining population density,

[19] Falls within the margin as estimated by Portland State University, "Preliminary Annual Population Estimate," Population Research Center, July 2016.

the City of Gladstone is an "Urban Cluster" with a population density in excess of 2,500 but less than 50,000 persons per square mile. The following figure displays the distribution of the population of Gladstone based on census block groups and ACS 2015 estimates.

Figure 36: Population Density



Gladstone is predominantly composed of urban clusters with some block groups possessing densities of less than 2,500, occurring mostly in the areas adjacent to the rivers and interstate. Continuing the review of the department, the following figure presents an overview of GFD's historical service demand between the period of January 2012 through the end of calendar year 2016.

Figure 37: Five-Year Historical Response Summary

Alarms Per Year					
	2012	**2013**	**2014**	**2015**	**2016**
False alarm	51	72	82	63	59
Fire	45	30	46	39	50
Good intent	171	173	158	235	241
Hazardous condition	35	6	16	26	11
Medical	1,144	1,164	1,107	1,072	1,014
Overpressure	3	1	2	1	0
Public service	116	121	103	138	84
Rescue	Included in Medical	Included in Medical	Included in Medical	Included in Medical	Included in Medical
Non-categorized	4	4	4	3	1
Total	**1,569**	**1,571**	**1,518**	**1,577**	**1,460**

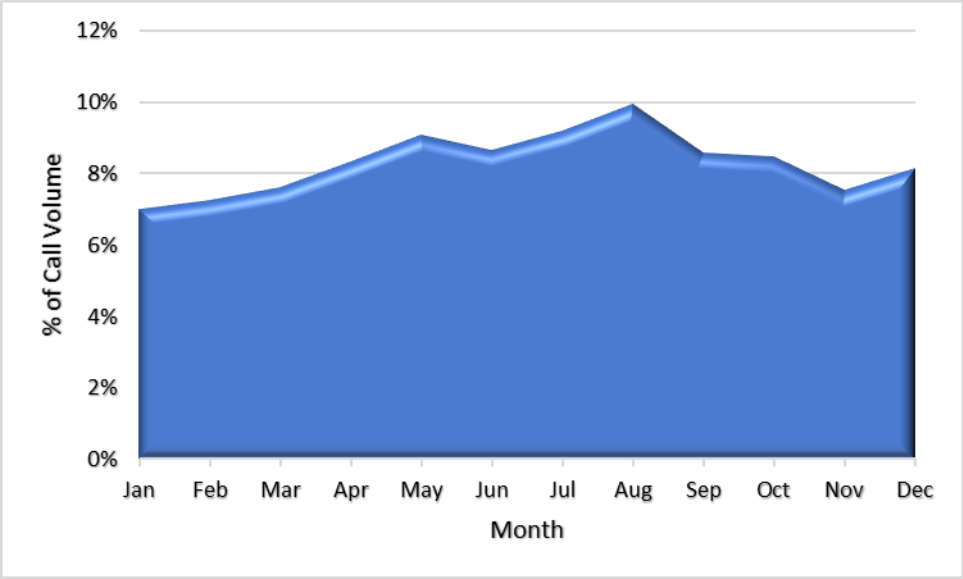
Overall, GFD's service demand was consistent during the five-year analysis period. Although slight fluctuations occurred in each category, the net effect of any variation amounted to a range of three to 83 calls, or an effect of less than one response every three days. Service demand for emergency medical and rescue appear to be rising gradually, but at a rate the department should have the capability to absorb with current resources.

Demands for service tend to occur in predictable patterns over time. The next section will review these cycles as they occur by month of year, day of week, and hour of day. These cyclical patterns can be useful in determining when periods of greater service demand may occur and may also provide insights as to how and why the fluctuations in demand are experienced.

Temporal Variation

The temporal analysis of Gladstone Fire Department reviewed patterns present in historical service demand data. The first figure examines how service demand was affected by month of year. Data for the following series of analysis used call data from January 2014 through December 2016 to provide accurate representation of each period of examination.

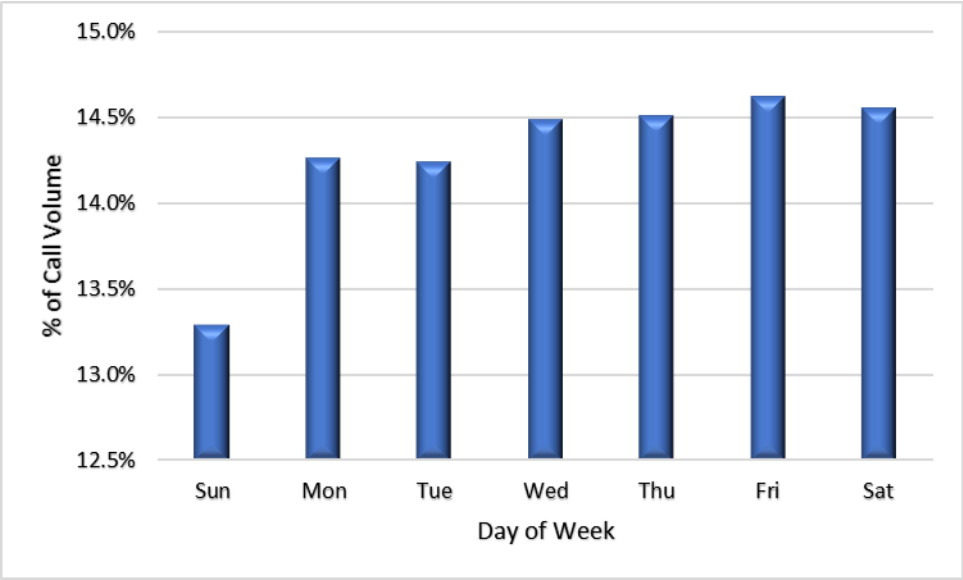
Figure 38: Call Volume by Month, 2014–2016



Gladstone's service demand generally increased during warmer months, May through September, and decreased slightly during cooler months of the year. The exception to this observation occurred in December when call volume increased to levels seen during summer months. Overall, fluctuations in service demand by month were minor with a total range of 2.9 percent from the low in January at 7 percent, to the high in August at 9.9 percent.

The next figure will examine temporal variation by day of week.

Figure 39: Call Volume by Day of Week, 2014–2016

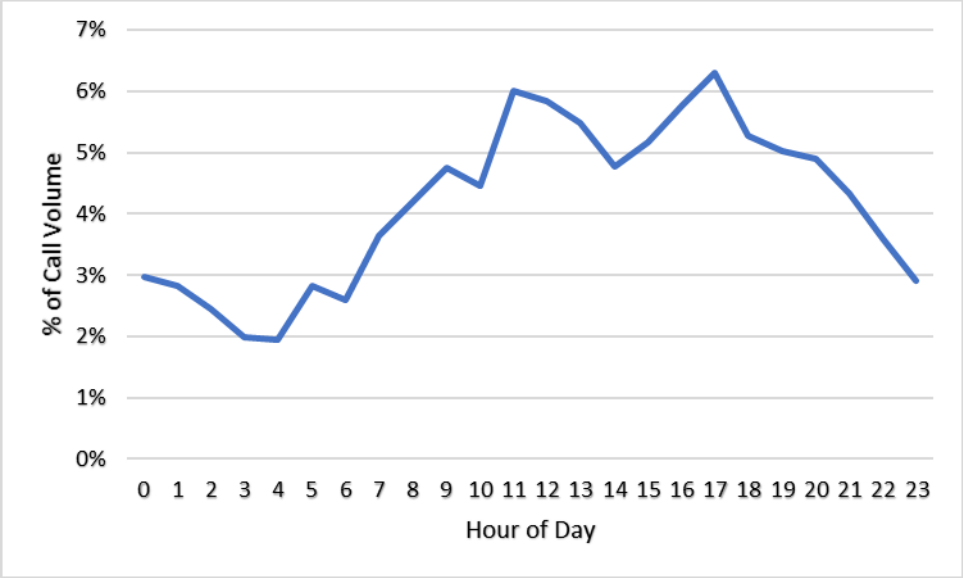


Service demand for GFD was greatest from Wednesday to Saturday, waned slightly on Sunday and began to increase Monday and Tuesday. The range of variation across days of the week was 1.3 percent,

with Sundays representing the lowest service demand volume and Fridays representing the highest demand.

The final figure in this series examines service demand by the hour of day.

Figure 40: Call Volume by Hour of Day, 2014–2016



The temporal pattern for Gladstone follows a typical diurnal pattern of activity which increases after 6 a.m. and decreases after 5 p.m. The lowest periods of activity occurred between 1 a.m. and 4 a.m. The range of variation for this data was 4.4 percent with peak service demand occurng during the 5 p.m. hour and the least amount of demand occuring during the 4 a.m. hour. These levels of calls for service conincide with the predominant hours of human activity generally experienced in most communities. The activity spike coincides with the presumed lack of availability by a majority of the paid-on-call staff for response due to outside career obligations.

The next section examines the distribution of the Gladstone Fire Department and the location of resources relative to service demand.

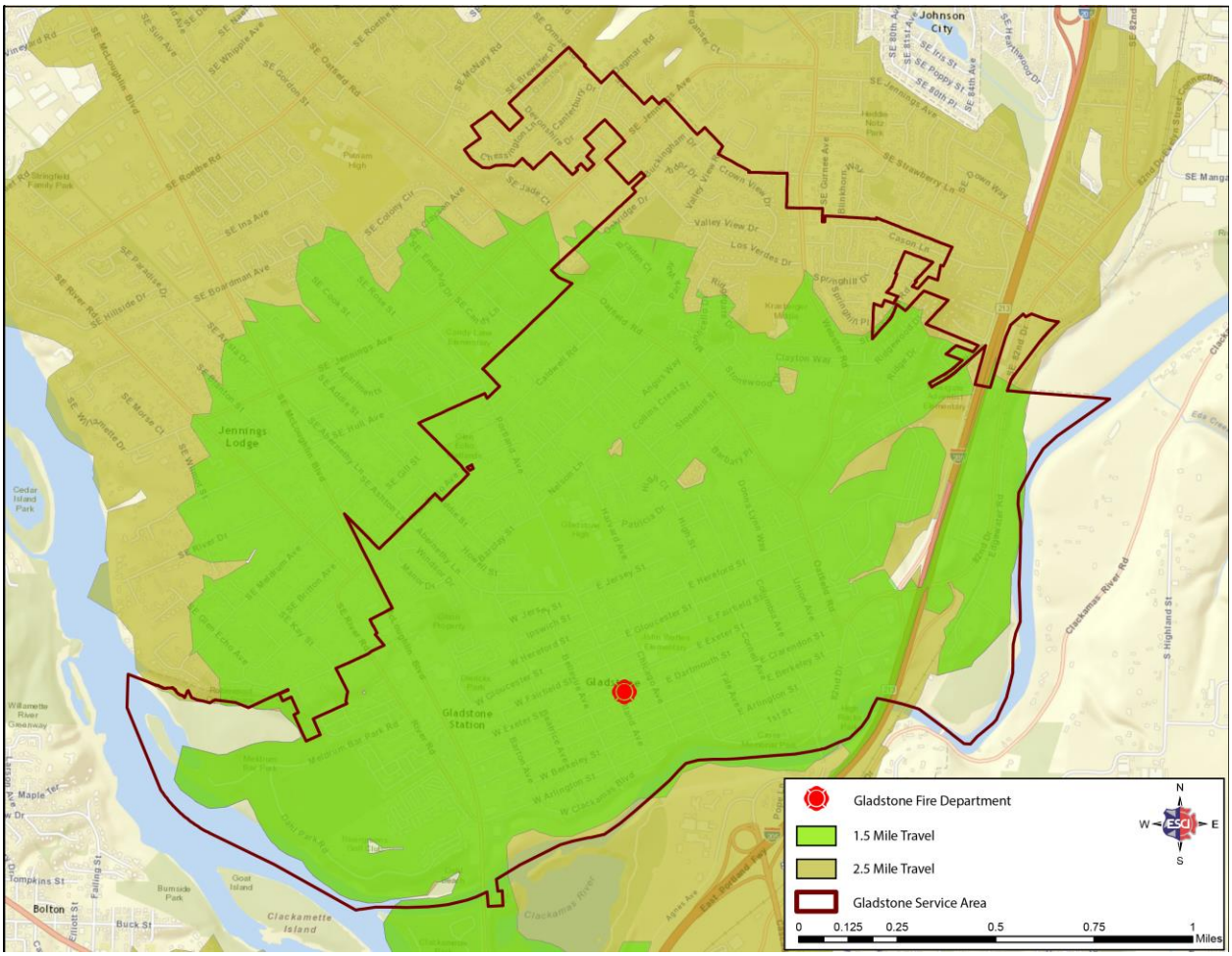
Resource Distribution

The section provides an analysis of Gladstone Fire Department's current deployment strategy based upon facility location and apparatus types stationed at that facility, and identifies any potential gaps. National consensus standards provided by the NFPA and evaluation criteria used by the Insurance Services Office (ISO) will be utilized to provide benchmarks for performance and quantification of service gaps.

Figure 41 displays Gladstone Fire Department's ability to provide effective coverage based on ISO criteria. In order to receive maximum credit for deployment, ISO specifies in part that engine companies shall have an effective range of 1.5 road miles away from the fire station and that ladder companies will have an effective range of 2.5 road miles away from the fire station. Gladstone Fire Department

operates from one centrally located station and has the capability of deploying an engine and a ladder company based on the nature of the emergency. Due to the dual capabilities present, Gladstone's service area is based upon ladder company deployment and a service area of 2.5 road miles is applied. This figure demonstrates the boundaries of both the engine company and ladder company service areas for comparison. Based on this information, no significant gaps exist.

Figure 41: ISO Travel Distance, Engine and Ladder



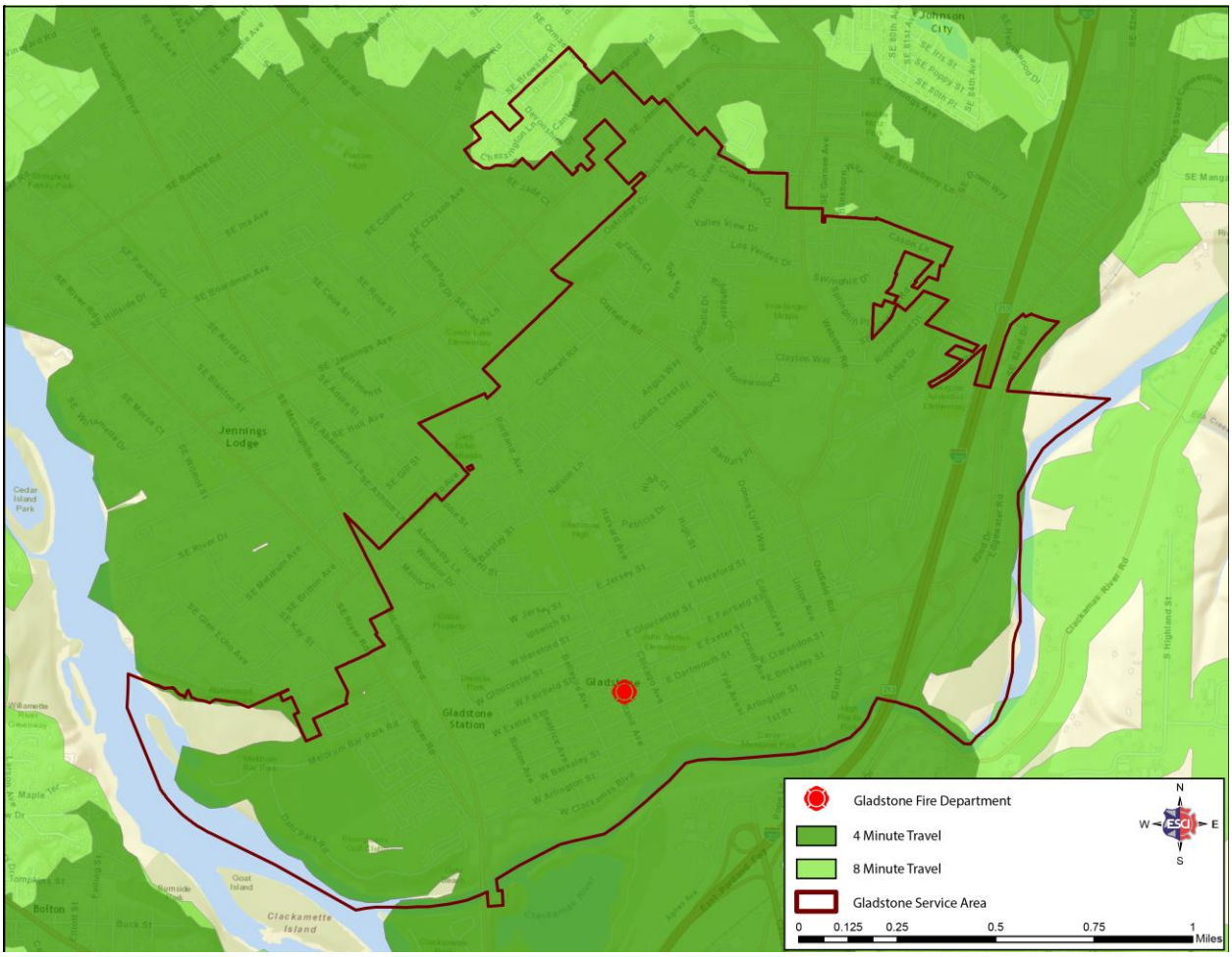
The next figure examines Gladstone's distribution capabilities based on NFPA criteria. Due to the location and size of Gladstone's jurisdiction, GFD has the ability to respond to most, if not all, calls for service within a four-minute travel window. This four-minute standard, derived from NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, for travel was selected as it is the consensus standard for fire department travel times. Although Gladstone Fire Department meets the definition of a combination fire department (the standard also applies to a volunteer organization), this standard provides a benchmark for the organization to compare its performance to surrounding career organizations. The purpose for referencing the NFPA's career fire department standard is to provide a level of equal comparison. NFPA has also produced a national consensus standard for volunteer (and combination) fire departments, NFPA 1720, *Standard for the Organization and*

Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments. This is the standard applicable to Gladstone Fire Department and the remainder of this report will utilize this as the benchmark to GFD's performance. In Gladstone's case, the Paid-on-Call (POC) system is still considered a volunteer department for NFPA 1720 purposes. Where "volunteer" is mentioned in this section, it is intended to also mean POC. Because career and volunteer departments respond to calls for service differently—career responding from 24-hour staffed stations and many volunteer departments responding from various places dispersed throughout a community—no time standard is provided for travel in NFPA 1720.

The standard allows for the differences in how volunteer organizations respond by providing a benchmark time for volunteer personnel and apparatus to arrive on scene and commence firefighting operations. The benchmark used is based on population density of the community served. The standard for communities with population densities greater than 1,000 persons per square mile (GFD) is to provide 15 firefighters within nine minutes of the initial dispatch, 90 percent of the time, and initiate suppression operations within two minutes of the assembly of these resources on the emergency scene, 90 percent of the time.

NFPA measures performance at the 90th percentile, meaning that service delivery capabilities are not averaged, but instead measure baseline performance that occurred 90 percent of the time or better. NFPA recommends a maximum travel time of four minutes, 90 percent of the time for career departments and all necessary equipment to arrive on scene from the initial point of dispatch within nine minutes, 90 percent of the time for volunteer organizations. To provide a baseline for comparison, ESCI will use a four-minute travel time from Gladstone Fire Department's facility and an eight-minute travel time for all other incoming units. The following figure presents this distribution information solely for Gladstone Fire Department resources.

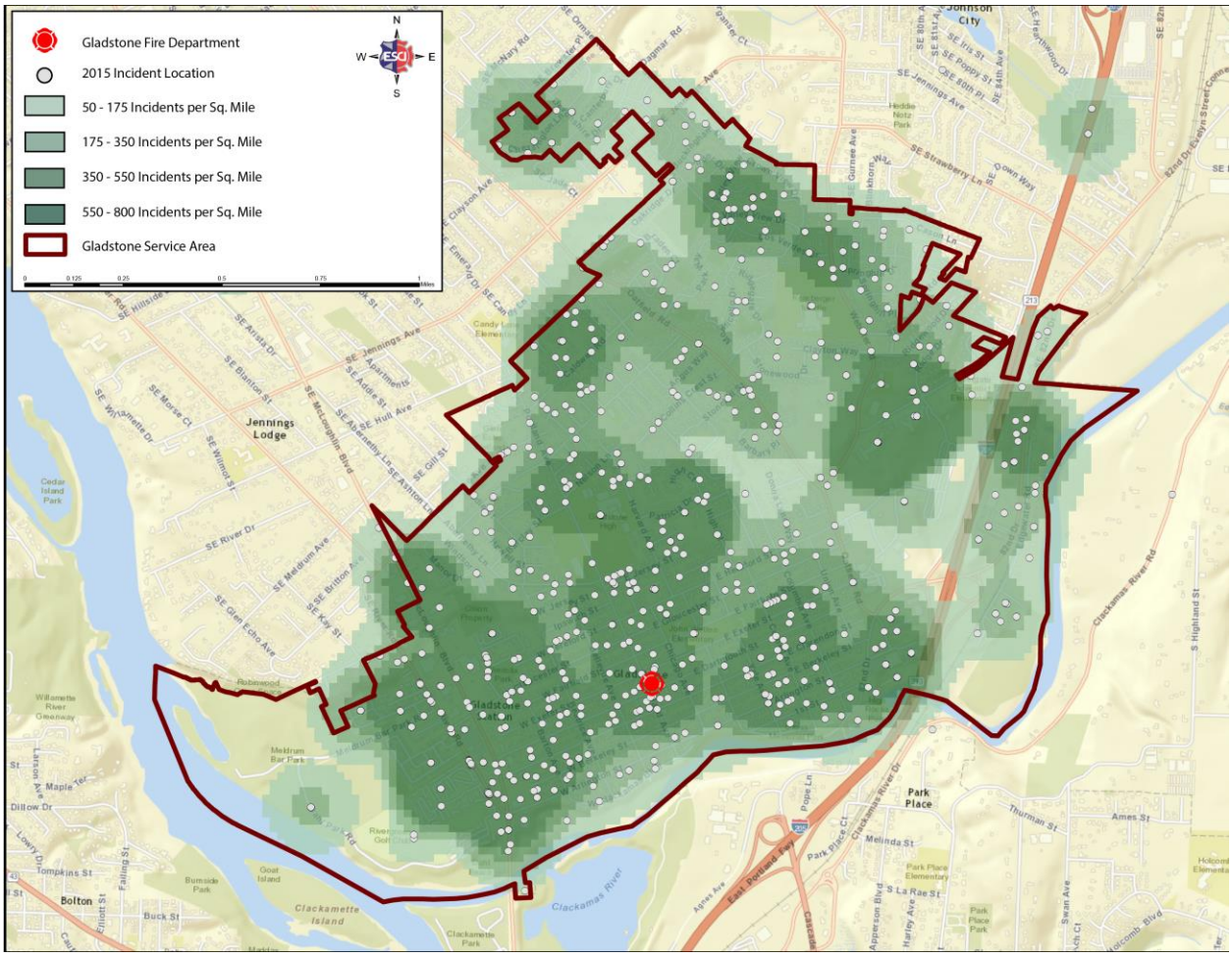
Figure 42: Four- and Eight-Minute Travel



The results from this figure demonstrate that nearly all areas of Gladstone lie within a four-minute travel time of its single fire station.

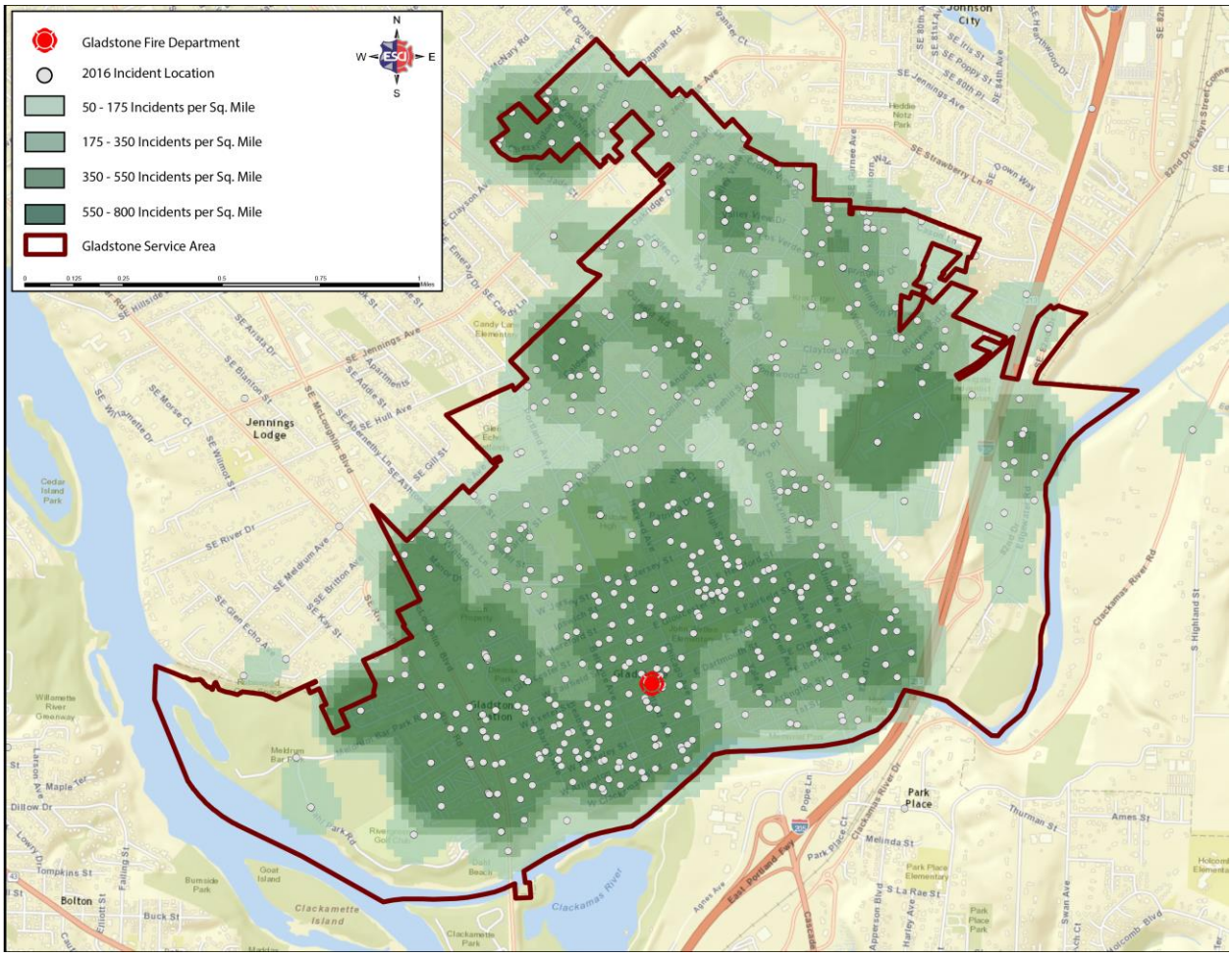
The following three figures demonstrate calculated call density based upon actual responses by year.

Figure 43: Service Demand Density, 2015



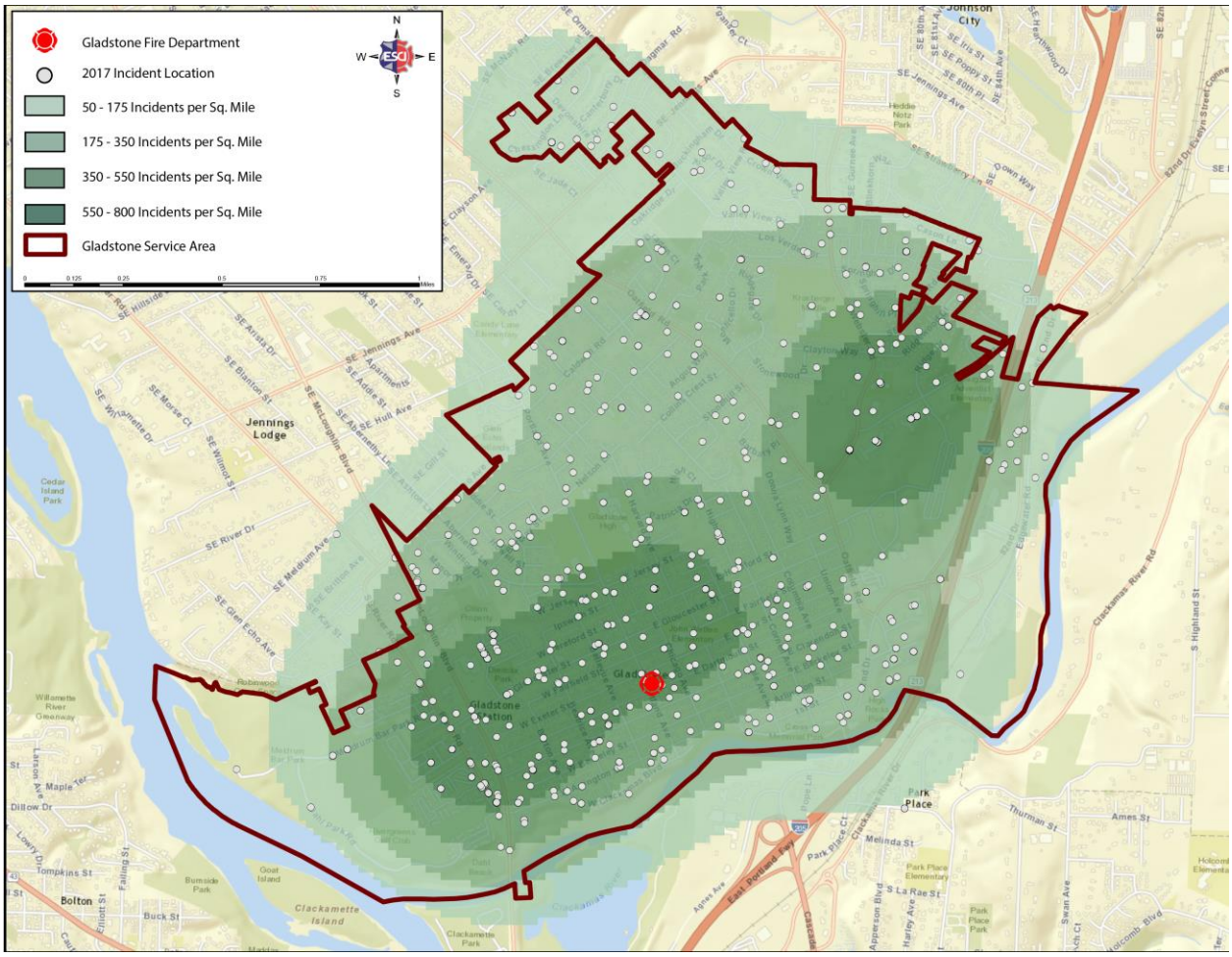
Service demand for 2015 occurred mostly around the city center and surrounding areas. ESCI uses geographical software to calculate the incident density per square mile based on the proximity of surrounding calls to formulate the calculated call density, or hot spots, within given areas of the jurisdiction. A comparison of 2015 and 2016 data reveal that the frequency and location of service demand were similar, indicating that little change occurred for service demand year to year. The following figure presents 2016 incident density information.

Figure 44: Service Demand Density, 2016



The last of the three figures represents service demand for 2017 through August of that year. Due to the incomplete nature of the data and the methodology used to calculate spatial proximity and density, the pattern is presented slightly differently than the previous figures; however, the overall pattern of where service demand occurs, near the city center, remains constant.

Figure 45: Service Demand Density, January–August, 2017



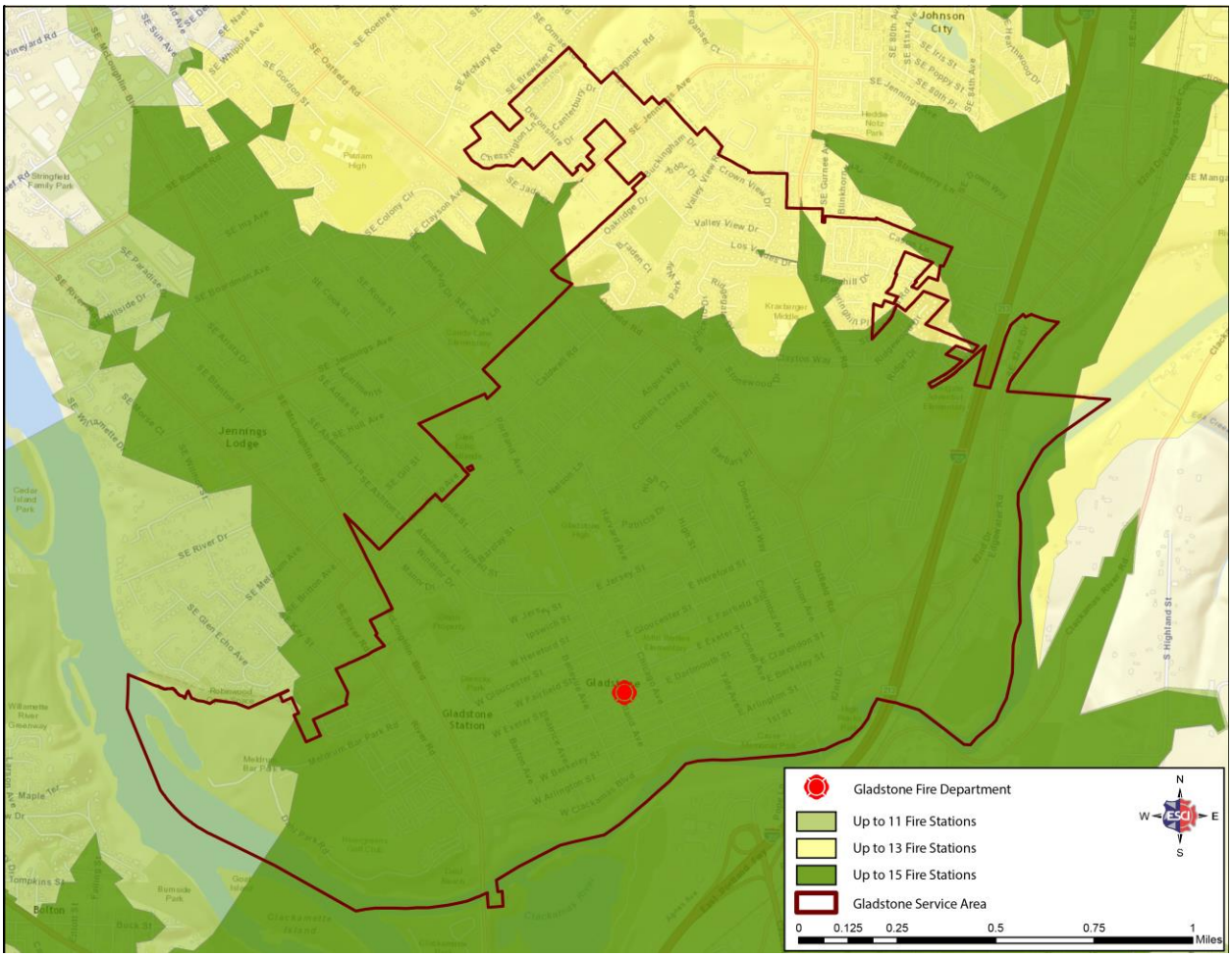
Due to the size and geographic distribution of Gladstone, coupled with surrounding automatic aid resources, no identifiable service gaps exist within the jurisdiction for first alarm responses, or responses that can be handled by the first responding units. However, should an event occur that requires additional staffing and resources, gaps in service may appear initially as Gladstone Fire Department currently relies on staff to request additional resources based on judgement as opposed to dispatching units based upon risk profile.

Resource Concentration

This section will examine Gladstone Fire Department's ability to assemble resources in numbers sufficient to mitigate hazards that require more than a single unit or two-unit response. The majority of Gladstone's service demand, approximately 70 percent in 2016, is medical in nature and typically requires only one unit. However, instances do occur that require a significantly larger response force. Gladstone is currently able to respond an engine company, ladder company, rescue company, and chief officer resources to an emergency. While this response force can mitigate the majority of incidents, moderate risk and greater incidents will require aid from other departments outside Gladstone.

Gladstone is uniquely situated for this type of automatic or mutual aid request. Gladstone possesses a tremendous capability to assemble outside aid in the event it is required. As shown below, the municipal boundaries lie completely within an eight-minute travel distance of 11 other fire stations. Additionally, the northern tip of Gladstone is within an eight-minute range of 13 fire stations and the western tip is within the same reach of 15 fire stations. Given the size of the city, it is reasonable to assume that even in the event of a catastrophic incident, resources could be readily available to assist with mitigation provided in the incident is not a regional event such as flooding or seismic activity.

Figure 46: Resource Concentration, Eight-Minute Travel Time for Incoming Units



Despite the availability of additional automatic and mutual aid resources, in the event of any moderate incident or greater, the department is wholly dependent upon these neighboring resources to assemble an effective response force to safely and effectively mitigate the incident. With that said, this scenario is common as very few, if any, organizations possess all of the resources needed to respond to every type of incident. However, Gladstone Fire Department's ability to assemble enough firefighters to effectively combat a moderate risk, such as a single story residential structure fire, without outside assistance is questionable.

Response Reliability

This section will examine the reliability of the system established in Gladstone for fire and emergency medical services and rescue. To accomplish the reliability study two key indicators were utilized, Unit Hour Utilization (UHU) and Call Concurrency.

Unit Hour Utilization

Unit hour utilization (UHU) provides a figure, expressed as a percentage, that each unit was in service during the year and unavailable to respond to other calls. This is achieved by dividing the total number of hours, minutes, and seconds the unit was committed to another response annually and divides that figure by the total number of hours in one year. This percentage can then be interpreted and compared to other units within the system to determine how often the unit was utilized, how this compares to other units within the system, and how these totals compare to national recommendations for UHU thresholds.

The following figures displays the workload factor for each unit. It is important to remember that individual unit workloads can often be greater than those experienced by the home station. This is because incidents such as structure fires will demand several units, as opposed to single unit responses to other types of calls. Total hours include the time a unit was initially dispatched until the time that the unit cleared from the emergency scene.[20]

Unit hour utilization is an important statistic to monitor for those fire agencies using percentile-based performance standards, where performance is measured at the 80th or 90th percentile, unit hour utilization greater than ten percent means that the response unit will not be able to provide on-time response to its 90 percent target even if response is its only activity.

Figure 47: Unit Hour Utilization, Jan. 1, 2014–Aug. 17, 2017

Unit	Total Calls	Total Hours	Average	UHU
C100/C390	31	20:04:02	0:38:50	0.1%
1009/DO109/DO394	580	327:42:40	0:33:54	1.0%
FM100, 1010, C391	290	211:17:52	0:43:43	0.7%
E101/E391	1004	492:07:17	0:29:25	1.5%
E102	166	96:11:00	0:34:46	0.3%
E103/ E393	133	225:40:39	1:41:49	0.7%
R101/SQ390	3768	1501:22:51	0:23:54	4.7%
T106/T392	455	269:40:34	0:35:34	0.8%

The busiest unit is Squad 390 and is utilized at a rate of 4.7 percent per year. This is expected as the majority of service demand for GFD is medical in nature. Following the rescue, response by staff

[20] Not factored into this equation are apparatus restocking, report writing, and crew and equipment prep for the next response.

personnel, 1.7 percent, and E391 (formerly E101), 1.5 percent, represent the greatest UHU rates for GFD.

Units that exceed a ten percent UHU begin to fail to achieve the desired response time criteria and should be reviewed for an alternative response strategy. The CPSE/CFAI *Standards of Cover, 6th Edition* suggests that UHU rates in the range of 25 to 30 percent for fire and EMS units can lead to employee burnout issues and can negatively affect station and unit reliability. Note that as unit hour utilization increases, not only are units less available for emergency responses but also less likely to complete other duties, such as inspections, training, public education, and maintenance. Currently, UHU rates in the study area do not approach these levels.

Concurrent Incidents

The second key indicator in assessing system reliability is call concurrency. Call concurrency examines the frequency of multiple calls occurring during the same time that units are still committed to a previous call. This situation affects the ability of the organization to commit additional resources to respond to additional calls as they occur. The following figure displays call concurrency rates for Gladstone Fire Department.

Figure 48: Call Concurrency, Jan. 1, 2014–Aug. 17, 2017

Concurrent Incidents	GFD
Single Incident	90.8%
2 Incidents	7.4%
3 Incidents	0.4%

Call concurrency occurs at a relatively low rate, less than eight percent, and the occurrence of more than two incidents simultaneously is extremely low, less than one-half percent.

Historical Performance Summary

At the heart of every emergency service delivery organization is the ability to deliver rapid and effective services. This section provides an analysis of Gladstone Fire Department's ability to respond and benchmarks this performance against the national consensus standard NFPA 1720. The analysis of response performance is critical to determine whether the organization is meeting its community's expectations for performance, as well as to identify any trends that could indicate successful programs or potential issues.

To accomplish a meaningful analysis of Gladstone Fire Department's response performance data and provide a comparison to the national standard, then following assumptions were made: the period of study spanned two years from August 18, 2015 through the final date available in the dataset obtained August 17, 2017; only emergency call data was included in the analysis, all coded non-emergency, mutual or automatic aid responses, calls for service and public assists were excluded; only service demand that occurred within Gladstone jurisdiction were included; and all data was utilized to the extent that analysis was possible.

Next, the data was compared to the national consensus standard NFPA 1720. This standard was chosen as Gladstone Fire Department is composed of both career and paid on call staff with neither group representing more than 85 percent of the total department composition.

Based on the population density of Gladstone, the urban response performance criterion was selected to benchmark the department's performance. The following figure presents the categorization of criteria contained in NFPA 1720. It is important to note that it is the department's discretion to determine whether the same criteria or different criteria will be applied to emergency calls other than fires and special operations.

Figure 49: NFPA 1720 Staffing and Response Times

Demand Zone	Demographics	Minimum Staff to Respond	Response Time (minutes)	Meets Goal (%)
Urban Area	> 1000 people/mi^2	15	9	90
Suburban Area	500–1000 people/mi^2	10	10	80
Rural Area	< 500 people/mi^2	6	14	80
Remote Area	Travel distance ≥ 8 mi	4	Directly dependent of travel distance	90
Special Risks	Determined by AHJ	Determined by AHJ based on risk	Determined by AHJ	90

A jurisdiction can have more than one demand zone.

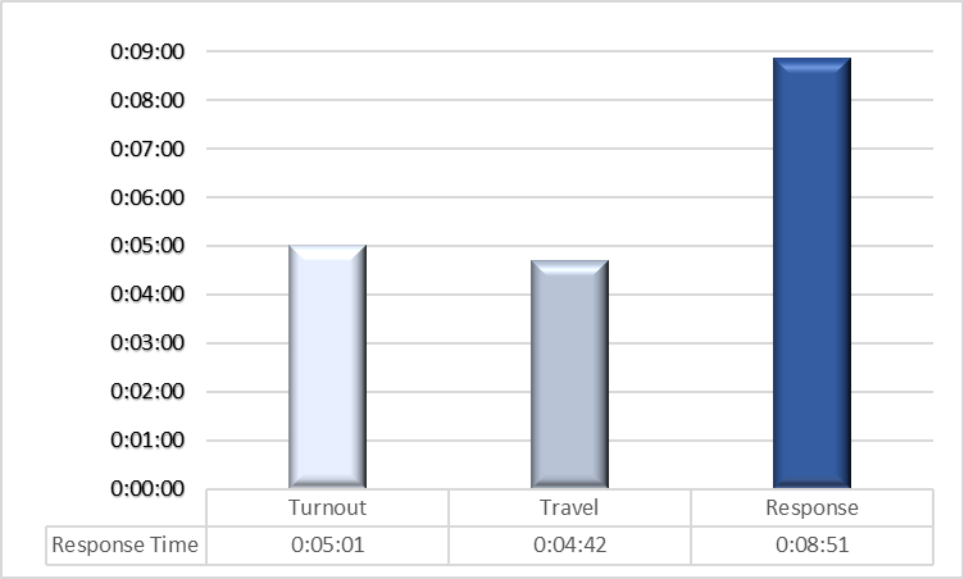
Minimum staffing includes members responding from AHJ's department and automatic aid.

Response time begins upon completion of the dispatch notification and ends at the time interval shown in the table.

As shown illustrated in Figure 49, jurisdictions with population densities at or above 1,000 persons per square mile meet the urban demand zone criteria. This means that for a moderate risk, such as a 2,000-square foot residential structure fire, the department must attempt to meet the benchmark of delivering 15 firefighters on scene within nine minutes of the initial notification, 90 percent of the time.

The next figure displays the historical performance of Gladstone Fire Department at the 90th percentile from August 2015 through August 2017. As shown in the next figure, the overall response time, from initial notification to arrival, was eight minutes, fifty-one seconds, at the 90 percent of the time. This performance meets the benchmark established by NFPA 1720 and exceeds the national standard for response performance.

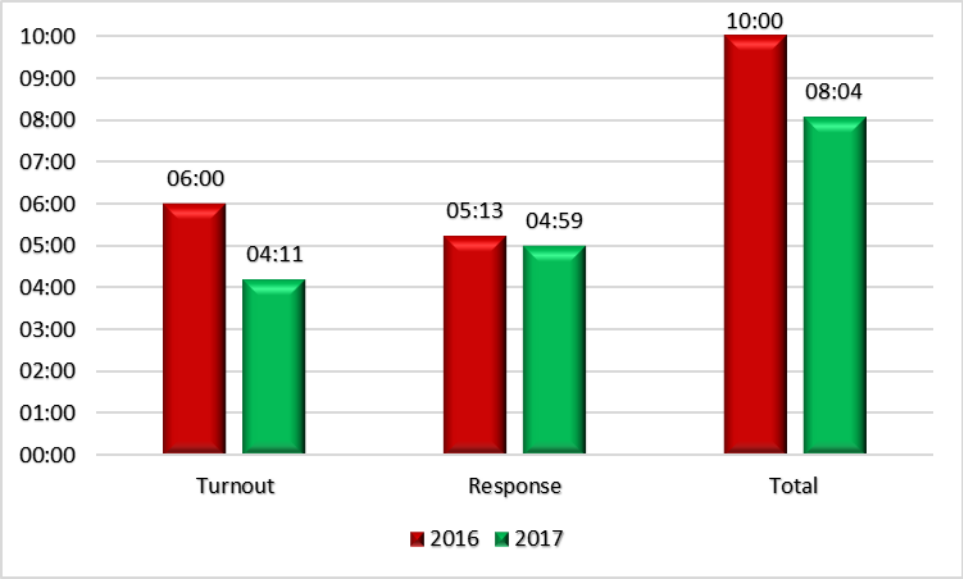
Figure 50: Performance at 90th Percentile, August 2015–August 2017



Travel time for Gladstone Fire Department was measured at four minutes, forty-two seconds, at the 90th percentile. This performance nearly meets the career fire department consensus standard NFPA 1710. The final component of response time is turnout, or the amount of time between the initial notification of an alarm to the point that the unit begins to drive to the scene. Turnout time for Gladstone was measured at five minutes, one second, at the 90th percentile. NFPA 1720 does not provide for a recommended turnout time for combination and volunteer fire departments unless the unit is staffed. Since January 2017, the department has staffed a rescue unit during the work day during the work week (8 a.m. through 6 p.m., Monday through Friday). The authority having jurisdiction (AHJ-the policy-makers for the city), determines whether a station is considered staffed or unstaffed from a standards compliance standpoint. While crew members are available during the day and during the week, it is unstaffed for all other hours. The addition of a nearby apartment to act as a crew quarters improves turnout time, but also does not rise to the level of a staffed fire station in ESCI's opinion. Therefore, ESCI recommends that Gladstone continue to consider its station an unstaffed station from an NFPA compliance point of view.

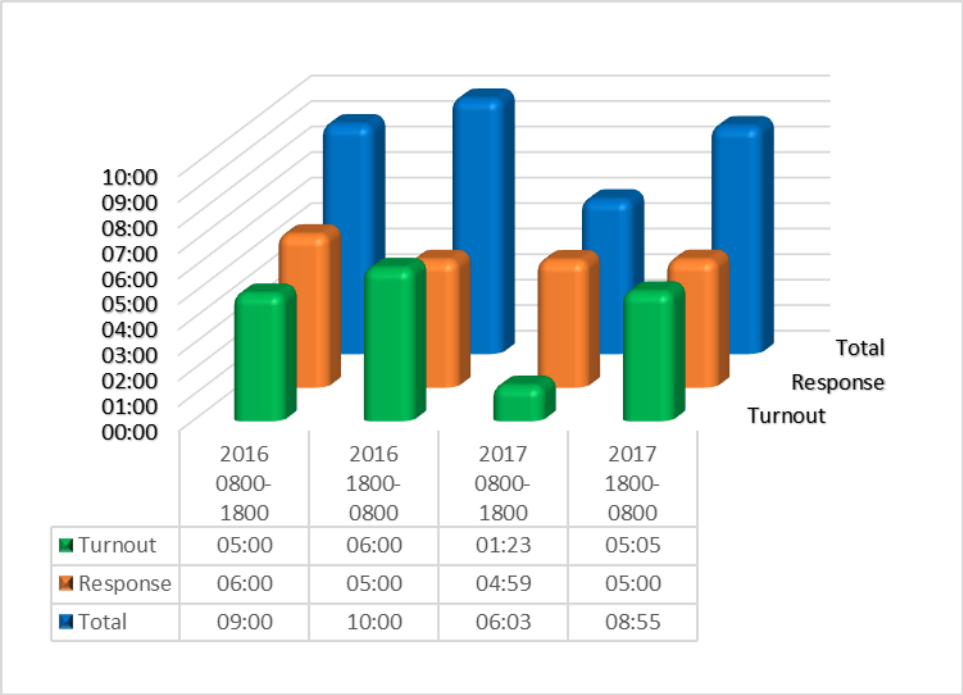
To determine the effect of this new deployment model, response performance for the rescue unit in 2017 was compared with the performance in 2016. The following figure demonstrates the results of the comparative analysis. The parameters for the analysis were identical to the previously stated methodology, with the additional restriction that only call data for the rescue unit was used.

Figure 51: Comparison of All Emergency Rescue Unit Responses, 2016 versus 2017



As shown, turnout and total response performance was dramatically improved by nearly two minutes at the 90th percentile. Travel performance improved slightly, but as expected, remained similar to the previous year's performance. Next, an in-depth analysis comparing the specific performance within time frames that the unit was staffed were compared for 2016 and 2017 and measured at the 90th percentile.

Figure 52: Comparison of Staffed versus Unstaffed Rescue, Emergency Calls, 2016 versus 2017



	2016 0800-1800	2016 1800-0800	2017 0800-1800	2017 1800-0800
Turnout	05:00	06:00	01:23	05:05
Response	06:00	05:00	04:59	05:00
Total	09:00	10:00	06:03	08:55

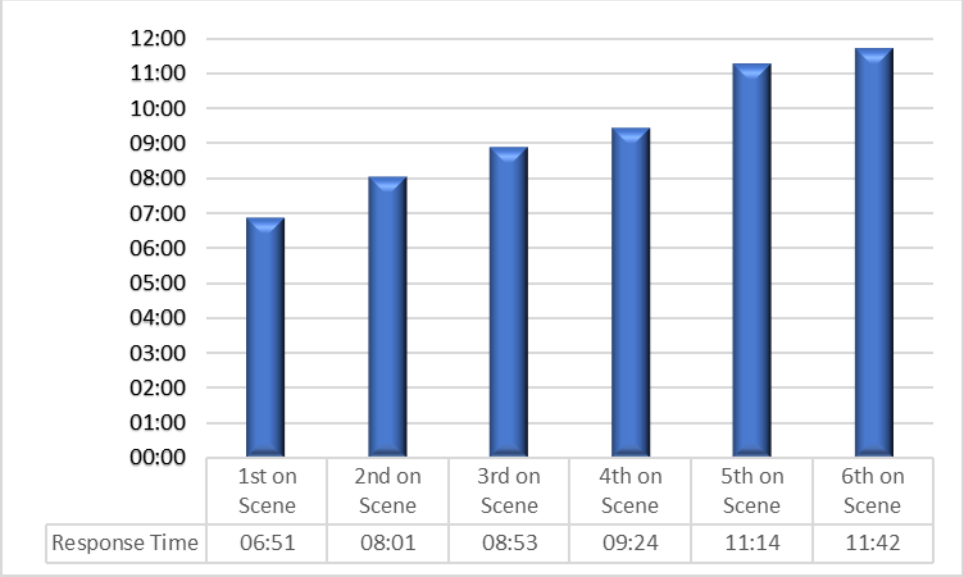
The results of the analysis showed that during the performance during the rescue units staffed periods had improved more dramatically than previously demonstrated with a nearly three minute

improvement in overall response time. Additionally, when each set of comparative data are examined another pattern was revealed, turnout performance and total performance improved by approximately one minute from 2016 to 2017. While this improvement may be related to multiplle factors such as improved data management practices, changes in staff, or simply that personnel were aware that performance was being monitored, an improvement in performance occurred. However, it should be noted that depending on the nature of cause, this improvement may begin to degrade over time without monitoring and supervision by management. Finally, turnout performance during the rescue units staffed periods was measured at one minute and twenty-three seconds at the 90th percentile, three seconds greater than the NFPA standard; however, performance was extremely close to the national benchmark and this goal should be easily obtainable by the department.

As this report is being finalized, the department began staffing units with two personnel on a continuous 24-hour basis as a result of acquiring a SAFER grant that allowed three captains to be hired. The assignment of these captains to 24- hour shifts and pairing them with POCs will improve initial response performance by as much as two to three minutes around the clock.

Finally, the response performance for establishing an effective response force at structure fires was examined to determine how much time was required to assemble a multi-unit response. The results are displayed in the following figure.

Figure 53: GFD Structure Fire Response Performance (90th Percentile) by Arrival, August 2014–August 2017

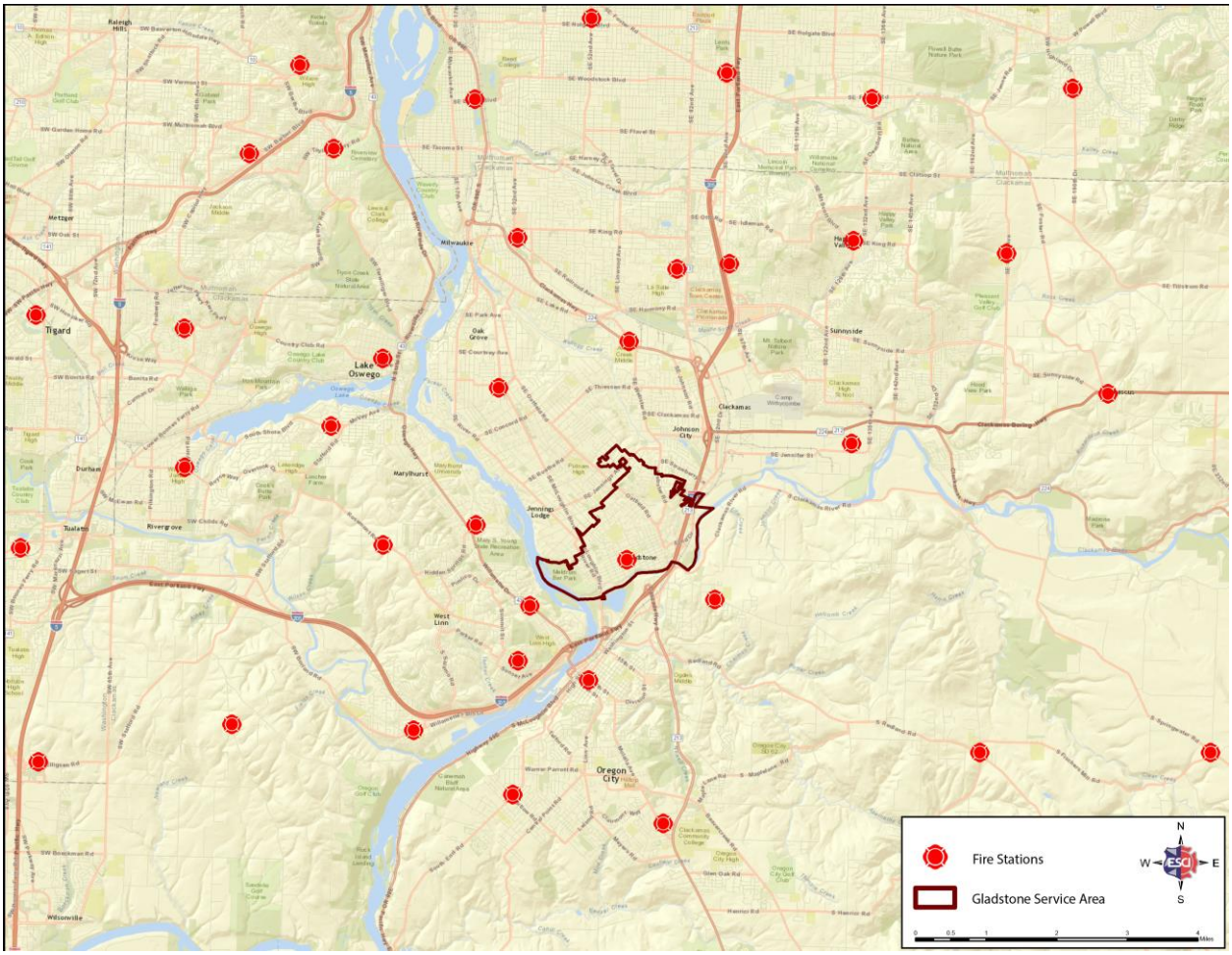


Due to the location and size of Gladstone, the department was able to place three units on scene within the NFPA 1720 nine-minute threshold, and place a fourth unit on scene within twenty-four seconds of that benchmark at the 90th percentile. Additionally, the fifth and sixth units arrived on scene between eleven and twelve minutes.

Mutual and Automatic Aid Systems

Gladstone Fire Department possesses tremendous access to automatic aid resources in the event that these additional resources are needed. As displayed in previous figures, multiple fire stations are located within an eight-minute travel distance of the city. The following figure provides an overview of automatic aid resources available to Gladstone in the immediate area.

Figure 54: Automatic Aid Fire Station Locations



While the availability of automatic aid personnel, equipment, and resources provide Gladstone with the assurance that, should a high-risk incident occur, resources are available to provide assistance. While the availability of these resources is reassuring, the relationship should be mutually beneficial for all parties involved. The following figure provides an examination of mutual aid calls given and received.

Figure 55: Mutual Aid Calls Given/Received, Aug. 2015–Aug 2017

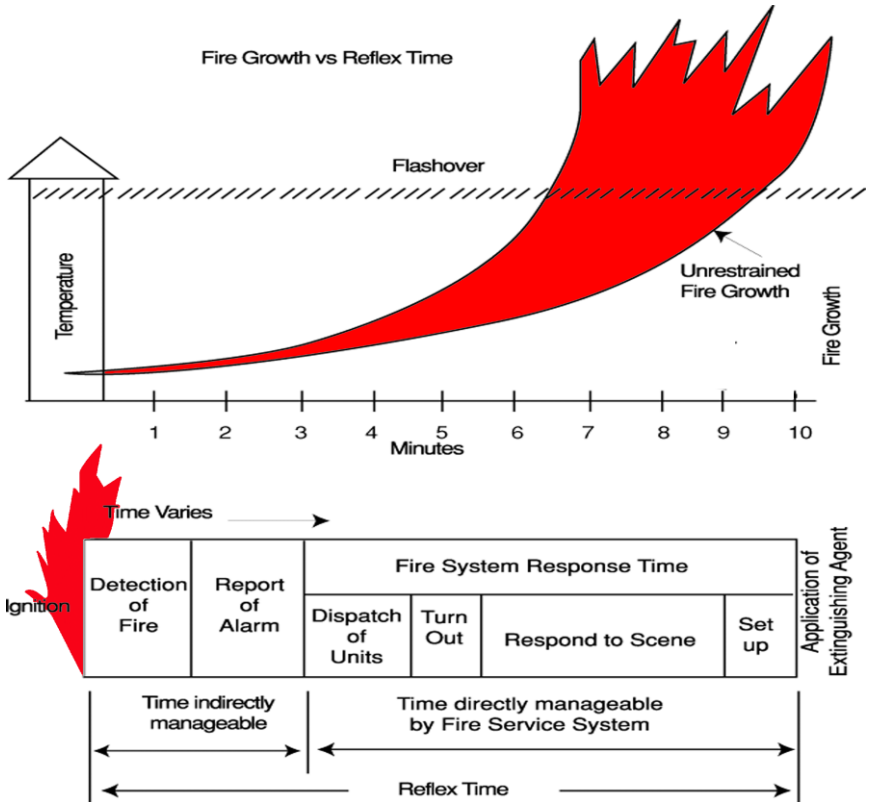
Mutual Aid Calls	Number of Incidents
Mutual Aid Received	72
Mutual Aid Given	175

As shown in Figure 55, Gladstone Fire Department contributes resources to assist neighboring agencies more frequently than those resources are requested into Gladstone. Both mutual and automatic aid agreements are in effect for Gladstone. In a mutual aid agreement, the department will respond in to another service area when requested, whereas in an automatic aid agreement, the resources are automatically dispatched to areas based upon the closest unit available and the number of resources required.

PERFORMANCE GOALS AND MEASURES

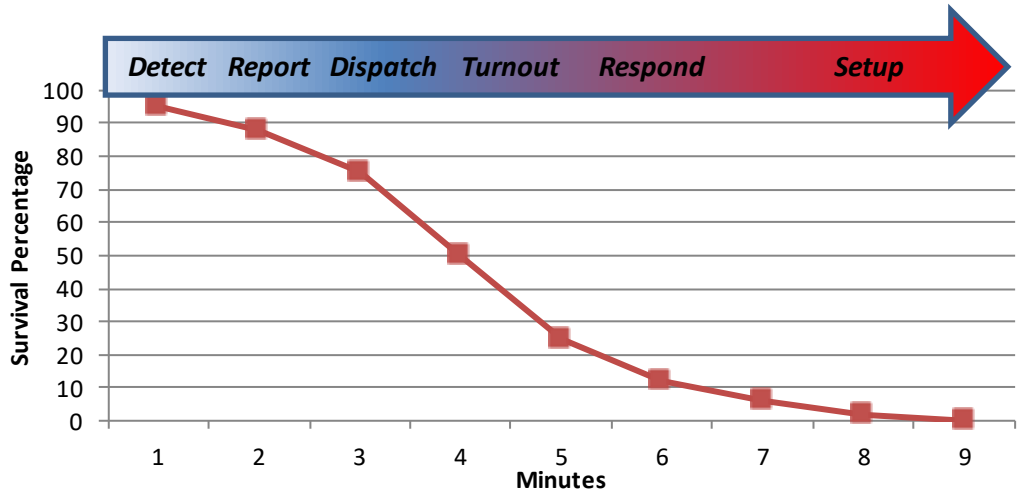
ESCI conducted a separate agency survey update and service delivery options analysis for Gladstone in February 2017. In that report, ESCI identified the need for GFD to identify the Critical Tasks necessary to address the various risks the community faces. In that way, the department can determine the staffing and response time components necessary to mitigate emergencies that are likely to occur in the city. The report makes clear that a formula of time + resources + risk type = mitigation potential. The following graphics reflect the element of time for fires and for cardiac arrest and bears repeating here.

Figure 56: Fire Growth vs. Reflex Time



As the preceding figure illustrates, time geometrically increases the intensity of fire, with the latter stages of the fire being directly manageable by the fire service system, with the correct deployment of facilities, equipment, and personnel. Uncontrollable is the discovery and reporting of the fire, and some elements are only indirectly manageable by the fire service system (call processing at the 9-1-1 center). The following figure illustrates the time sequence for cardiac arrest.

Figure 57: Cardiac Arrest Event Sequence



As is clear in the previous two figures, time is a critical component for both fire and the most serious type of medical emergency. At approximately the same timeframe (eight to nine minutes), the likelihood of a successful outcome is greatly diminished. However, time is not the only critical component to successful mitigation. The number of personnel arriving—on the correct types of apparatus and with the proper equipment—within that timeframe also have significant impact on the probability of a successful outcome. This section of the report integrates the two elements to provide policy guidance for the city.

The performance goals discussed in this section of the report will be measured against standards that apply to an urban setting for a combination fire department. This is defined in NFPA 1720 as a population density of 1,000 or greater per square mile.[21] According to the definition used by NFPA, Gladstone is urban. This requires a minimum of fifteen personnel response within nine minutes, 90 percent of the time. This is based on a 2,000-square foot, two-story, single-family home without basement and exposures.[22] Gladstone is fortunate to be surrounded by other urban density communities with greater depth of resources. Despite these automatic assistance resources, the GFD must determine what the expectations of the community are as well as what the "acceptable" level of risk is. Acceptable risk is defined as, "the potential fire loss a community is willing to accept rather than provide resources to reduce such losses."[23]

The ESCI team convened a group of citizen representatives of Gladstone to determine their expectations. They prioritized these three key elements:

- Quick responses from the fire department for fire and medical emergencies;
- Trained and capable personnel; and
- Reliable and appropriate facilities and equipment.

[21] National Fire Protection Association, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments,* 2014 Edition.
[22] *Ibid*.
[23] Firewise Communities, 2007.

Within the City of Gladstone, a number of risks exist, as was discussed within the "Community Risk Assessment" section of this report. The specific risk categories contained within the GFD response area fall into one of four risk categories: Fire, Medical, Technical Rescue, and Hazardous Materials. Within each risk category, there are four levels of risk; low, moderate, high, and maximum.

As the actual or potential risk increases for each of the risk categories, the necessity for higher numbers of personnel and apparatus also increases. With each type of incident and corresponding risk, specific critical tasks need to be accomplished. The next portion of this section of the report considers the aforementioned risk categories and illustrates the number of personnel that are necessary to accomplish the critical tasks.

Tasks that must be performed at a fire can be broken down into two key components: life safety and fire flow. Life safety tasks are based on the number of building occupants, and their location, status, and ability to take self-preservation action. These tasks also involve the search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water to extinguish the fire and create an environment within the building that allows entry by firefighters and in some cases, survival of those victims sheltering in place. These two key components are not intended to minimize such important tasks as property conservation (commonly referred to as salvage) and environmental protection. These factors must play into the decision-making process for the incident commander.

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

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

Critical tasks must be conducted in a timely manner in order to control a fire or to treat a patient. Three scenarios routinely encountered are commonly utilized by fire departments when conducting field validation and critical tasking. They are a medium risk structure fire, a traffic collision with a trapped victim, and a cardiac arrest. Each scenario is conducted using standard operating procedures and realistic response times based on actual system performance. Each scenario is normally run multiple times with a variety of fire companies to validate and verify observations and times.

To further validate the analysis process, results are compared with records from actual working fires and similar incidents from previous years. Overall results are reviewed to determine if the actions taken within the early minutes of an incident resulted in a stop loss or not, and if additional resources were required. The critical task analysis process demonstrates the rate at which the current deployment plan results in stopping loss a high percentage of time within initial critical time goals.

The critical task analyses may demonstrate important differences based on apparatus configuration and staffing in the ability to enter a building on a working structure fire when it comes to complying with the *two in, two out* rule for fire ground operations.[24] In firefighting, the policy of two-in, two-out mandates that firefighters never go into a dangerous situation in a fire or rescue incident alone, and that there be two firefighters outside the hazard area to initiate a rescue of the firefighters inside, should they become in trouble, during the initial stages of the incident where only one crew is operating in the hazard area. Once a second crew is assigned or operating in the hazard area, the incident is no longer considered in the initial stages and a dedicated firefighter assist and search team or rapid intervention crew is required.

Again, critical tasks are those activities that must be conducted in a timely manner by firefighters at emergency incidents in order to control the situation, stop loss, and to perform necessary tasks required for a medical emergency. GFD is responsible for assuring that responding companies are capable of performing all of the described tasks in a prompt, efficient, and safe manner. Gladstone's dispatch run cards (protocol) for a structure fire calls for four engines, one truck, and a battalion chief. This brings anywhere from 15 to 18 personnel to the scene of a structure fire, relying significantly on automatic aid resources to reach those numbers. The role of neighboring agencies is discussed in more detail in the mutual aid section of this report.

Critical tasking for fire operations is the minimum number of personnel required to perform the tasks necessary to effectively control an incident in the listed risk category. Major fires beyond the initial alarm will require additional personnel and apparatus, likely from outside GFD. Critical tasking for emergency medical incidents is the minimum number of personnel necessary to perform the tasks required to support an identified strategy based on the department's adopted medical protocol.

The following critical tasking analyses for the number of personnel required on scene for various levels of risk are recommended by ESCI. These tasks should be validated by GFD personnel using timed training scenarios and the methods described herein. The numbers should be tested against actual field performance trials and adjusted as necessary. "Risk," as defined by the Center for Public Safety Excellence (CPSE), is an exposure or chance of injury or loss.[25] The terms used to quantify levels of risk are further defined by CPSE as follows:

> **Low Risk:** A risk category measurement at a low level where threats are measured considering the probability of occurrence, and the hazard, danger or loss is measured in consequence.
>
> **Moderate Risk:** A risk category measurement at a moderate level where threats are measured considering the probability of occurrence, and the hazard, danger or loss is measured in consequence.

[24] United States Occupational Safety and Health Administration (OSHA) policy 29 CFR 1910.134(g)(4)(i)[1].

[25] Community Risk Assessment: Standards of Cover, 6th Edition, Appendix E: Glossary, page 106.

High Risk: A risk category measurement at a high level where threats are measured considering the probability of occurrence, and the hazard, danger or loss is measured in consequence.

Maximum Risk: A risk category measurement at a maximum level where threats are measured considering the probability of occurrence, and the hazard, danger or loss is measured in consequence.

Each of the critical task matrices which follow projects the minimum number of personnel needed to address all of the foreseeable tasks required to successfully mitigate the incident for each level of risk.

Figure 58: Minimum Staffing Levels By Risk & Incident Type

Incident Type	Maximum Risk	High Risk	Moderate Risk	Low Risk
Non-structure fire	15	9	6	4
Structure Fire	41	23	15	8
EMS, no entrapment	32	16	7	5
EMS, entrapment	36	22	11	7
Water Rescue	48	35	24	11
Hazardous Materials	46	35	18	13

The first 15 minutes is the most crucial period in the suppression of a fire. Historically, GFD achieves the necessary staffing level—with significant reliance upon automatic response agencies—for a moderate risk structure fire (a 2,000-square foot, two-story, single-family home) in under 12 minutes, 90 percent of the time. Significantly, GFD's latest addition and reconfiguration of personnel (3 captains on shift paired with POCs) will substantially improve turnout time. How effectively and efficiently firefighters perform enroute and once on scene has a significant impact on the overall outcome of the event. This general concept is applicable to fire, rescue, and medical situations. In order to meet the NFPA 1720 standard for these fires, GFD must assemble a minimum of fifteen personnel on the scene in nine minutes travel time (or less), 90 percent of the time. This is the only specific staffing level-to-risk and type outlined in the standard. All other elements are projected in this report and must be validated.

All Risk Critical Resource Tasking

Fire departments respond to many incidents other than structure fires, including hazardous materials (dangerous goods) releases, motor vehicle collisions, basic and advanced life support medical emergencies, technical (complex) rescues, and non-structural fires. Personnel responding to these types of incidents should be assigned tasks similar to structure fires.

The following figures are provided as an example for these types of incidents, although ESCI recommends GFD conduct field validation exercises with its crews and mutual aid companies to verify the critical task analyses provided. After field validation is complete, the department may find that the critical tasking can be adjusted appropriately upward or downward for each incident type.

Figure 59: Critical Tasks – Non-Structure Fire

Task	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command/Safety	2	1	1	1
Pump Operations	3	2	1	1
Attack Line	10	6	4	2
Total	**15**	**9**	**6**	**4**

Figure 60: Critical Tasks – Structure Fire

Task	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command/Safety	3	2	1	1
Back-up Line	6	4	2	–
Attack Line	8	4	2	2
Pump/Ladder Operations	4	3	2	1
Search and Rescue	4	2	2	–
Ventilation	4	2	2	–
Rapid Intervention	4	2	2	2
Water Supply	2	1	1	1
Rehab	2	1	1	–
Division/Group Supervisors	4	2	0	1
Total	**41**	**23**	**15**	**8**

Figure 61: Critical Tasks – Emergency Medical Critical Tasks, No Entrapment

Task	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command/Safety	2	2	1	1
Triage	4	2	–	–
Treatment	12	6	4	2
Ambulance Transport	8	6	2	2
Division/Group Supervisors	2	–	–	–
Support	4	–	–	–
Total	**32**	**16**	**7**	**5**

Figure 62: Critical Tasks – Emergency Medical with Entrapment

Task	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command/Safety	2	2	1	1
Triage	4	2	–	–
Treatment	12	6	4	2
Ambulance Transport	8	6	2	2
Division/Group Supervisors	2	–	–	–
Support	4	4	2	–
Extrication	4	2	2	2
Total	**36**	**22**	**11**	**7**

Figure 63: Critical Tasks – Hazardous Materials

Task	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command/Safety	4	3	2	1
Entry Team	6	4	2	2
Back-up/Rescue	6	4	2	2
Research/Support	10	8	4	2
Decontamination	10	8	4	2
Isolate/Evacuate	10	8	4	4
Total	**46**	**35**	**18**	**13**

Figure 64: Critical Tasks – Water Rescue

Task	Maximum Risk	High Risk	Moderate Risk	Low Risk
Command/Safety	4	3	2	1
Rescue Team	6	4	2	2
Backup Team	6	4	2	2
Patient Care	4	4	2	2
Rope Tender	8	8	4	–
Upstream	8	4	4	–
Downstream	8	4	4	2
Support	4	4	4	2
Total	**48**	**35**	**24**	**11**

The aforementioned minimum staffing criteria for these critical tasks should be validated with actual timed performance during training exercises with Gladstone and automatic aid personnel. Adjustments, if any, should be made in setting the specific service level goals for each of the incident types.

Turnout Time Performance Criterion

Turnout time is one area that the fire department can significantly improve with creative approaches. Turnout time, or the time between when the call is received by the response units (dispatched) and when the unit is actually enroute to the scene (responding), can have dramatic effects on overall response times. Reducing this single response time component reduces total response time.

NFPA 1720 recommends a turnout time performance goal only for staffed fire stations.[26] If a station is not staffed, there is no turnout time standard, but a total response time standard for an effective response force (15 firefighters) in urban communities is nine minutes, 90 percent of the time (not including call processing time). In ESCI's opinion, GFD is close to achieving this today.

Changes are being implemented in Gladstone Fire Department as of the writing of this report, which will significantly improve the turnout time. The program consists of leasing a nearby apartment to keep duty personnel next door to the station. This does not technically meet the definition of a staffed fire station, since the crew is not physically in quarters. The crew will have to secure the apartment, navigate the sidewalk, enter the secured fire station, and then get on the proper response apparatus. However, this is a vast improvement over POCs responding from home, which is highly varied and distant from the station. Further, GFD's current budget only allows dedicated staffing of two personnel, which is effective for medical response but often times is not enough to immediately respond on a fire or special operations call. ESCI therefore recommends the following performance goal for turnout time:

Recommendation:

- Gladstone Fire Department will achieve a turnout time goal of one hundred twenty (120) seconds for fires and special operations responses, and ninety (90) seconds for all other response types, both 80 percent of the time.

Distribution Performance Criterion

A fire department's *distribution* is essentially the location of resources to assure an initial intervention within the specific time frame identified in the community's performance goals. It is ESCI's opinion that the current single station configuration and its current location are optimum for service delivery to the entire City of Gladstone. By adding shift staffing, thus shortening turnout times, the department should be able to achieve the following response time goals for the first arriving engine on a fire, the first arriving medical unit on an EMS emergency, the first arriving water rescue technician at a water rescue incident, and hazardous materials operations certified personnel to a hazardous materials incident:

[26] NFPA 1720, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations & Special Operations to the Public by Volunteer Fire Departments, Staffing & Deployment, Section 4.3.3, page 7.*

Recommendations:

- Gladstone Fire Department will achieve a response time goal of six minutes (6:00) or less for the **first arriving fire engine for fire incidents**, 80 percent of the time.
- Gladstone Fire Department will achieve a response time goal of five minutes, thirty seconds (5:30) or less for the **first arriving medical unit for medical emergencies**, 80 percent of the time.
- Gladstone Fire Department shall achieve a response time goal of eight minutes, thirty seconds (8:30) for the arrival of the **first water rescue technician at a water rescue incident**, 80 percent of the time.
- Gladstone Fire Department shall achieve a response time goal of six minutes (6:00) or less for the arrival of **hazardous materials operations certified personnel to a hazardous materials incident**, 80 percent of the time.

Concentration Performance Criterion

A fire department's *concentration* is the deployment of multiple resources close enough together so that an initial Effective Response Force (ERF) for a given risk can be assembled on the scene of an emergency within the specific time frame identified in the community's performance goals for that risk type. An initial effective response force is defined as that which will most likely be sufficient to stop the escalation of the emergency. The ERF for a moderate (typical) structural fire risk in Gladstone is programmed for 15 to 18 personnel on four engines, one truck, and one battalion chief, which also relies upon mutual aid agencies. This coincides with the requirements of NFPA 1720. ESCI recommends the following performance goals for assembly of all resources to a structure fire (ERF):

Recommendations:

- Gladstone Fire Department shall achieve an **effective response force** of 15 personnel for structure fires in nine minutes, (9:00) or less, 90 percent of the time.

OVERVIEW OF COMPLIANCE METHODOLOGY

This report conducts a thorough analysis of the risks and response performance of the Gladstone Fire Department, and compares those performance elements to national standards, specifically NFPA 1720. However, it is important for the department to continue to monitor performance and ensure continued compliance with these standards over time. The following discussion is aimed at positioning GFD to ensure that detailed performance analysis is continued, and with great accuracy.

Records Management Systems (RMS) Usage Policies

The accurate and consistent documentation of incident records is a critical component of ensuring that an organization is meeting the expectations of the community. Without these records, it will be impossible to identify trends in service delivery, make improvements, or anticipate future service demand. While the Gladstone Fire Department maintains incident data record history that provides sufficient documentation, improvements to this data are possible.

A key area of improvement that the department recently made was to record the hour, minutes, and seconds related to each call, instead of rounding to the nearest minute. This change allowed for a highly accurate analysis of the department's performance and with this information new data trends were identified. However, an area of improvement still needed is the documentation of call processing records by the dispatch center. Call processing time, the amount of time between when the emergency call is received by the dispatch center and when the initial notification is sent to the fire department, is one of the three critical elements of service delivery performance, the other two being turnout and travel time.

Currently, this period of time is not recorded by the department and no assessment of call processing performance was conducted in this report. NFPA 1221, the consensus standard to which NFPA 1720 refers to for call processing information, suggests that 95 percent of calls received by emergency lines should be answered within 15 seconds and that alarm processing and notification be completed within 60 seconds, 80 percent of the time. Without the key piece of information, Gladstone Fire Department will not have the ability to assess their overall service delivery performance beyond the initial notification and will lack the ability to work with their partners in the dispatch center to achieve response improvement. ESCI strongly recommends that Gladstone Fire Department begin recording this information within their RMS and CAD systems so that the data may be evaluated in the future. Additionally, a quality assessment program is recommended for call data accuracy to ensure that extraneous or inaccurate call data is not retained within the data records.

Risk Based Response

The nature of the response to emergency incidents should be based on the risk associated with that location. Locations of low risk and high frequency incidents should correspond to single unit or two-unit responses on the initial dispatch while high risk incidents should entail an initial response capable of initiating all the critical tasks required for that incident. This report has provided the framework for Gladstone Fire Department to finalize the risk assessment profiles for the city and to begin the process of customizing their response matrix accordingly.

As previously discussed, due to size and structure of Gladstone Fire Department, moderate to high risk incidents will require automatic or mutual aid resources to assist with the establishing initial control of the incident and begin the mitigation process. Without these resources, Gladstone will lack the personnel required to accomplish critical tasks that occur during the initial phases of life saving and property protection.

Tracking Individual Unit Response Times

Gladstone Fire Department recently began tracking the individual response times of each unit responding to emergency scenes. This change greatly improved the department's ability to track turnout times for multiple unit responses, the amount of time to establish an effective response force, and how resource drawdown affects the department. With the department moving towards 24/7 staffing, the requirements for call processing and turnout will be benchmarked by NFPA 1720 and record keeping for these individual units will be essential for Gladstone Fire Department.

OVERALL CONCLUSIONS AND RECOMMENDATIONS

It should be understood that this analysis has been conducted while the fire department continues to evolve and adjust to constantly changing circumstances. The GFD added captains—who are shift supervisors and act as the officer in charge of the initial unit responding—who are paired with POCs and assigned to shift work just as this report was being completed. This analysis represents performance prior to that change. ESCI fully expects the department to achieve a faster turnout time and ultimately a faster response to the citizens of Gladstone as a result. The department is commended for its focus on continuous quality improvement. However, performance data reflecting this important change is not available yet, thus, this report reflects the deployment model used prior to the addition of shift personnel.

Further, it is impossible to include or predict all aspects and indicators of hazards and risk in a community. There are simply too many variables of weather, human behavior, and systems malfunction. ESCI recommends that GFD routinely and consistently review and update the Community Risk Assessment contained in this report. In this way, the department can ensure the assessment contains the most accurate and up-to-date information available about community hazards, risks, and needs.

Fire Department Goals

ESCI recommends that the City of Gladstone policy-makers adopt the performance metrics as fire department goals as outlined in the *Performance Goals and Measures* section of this report. There are several influences on these fire department goals. The following are resources relied upon for influencing the recommended fire department goals. They are:

- NFPA 1720;
- Feedback from the community;
- Risks identified in this report and as subsequently identified by the fire department.

Validation of the goals should be conducted by actual timed testing of the response components.

Annual Performance Reporting

Further, ESCI recommends the city council task the fire department to annually report to the council and the community their actual performance for the preceding year as compared to the goals, describe the causal factors for failure to achieve any goals not met, the likely consequences of continued failure to meet those goals it is not currently meeting, and identify steps planned to address the gaps, if any. This annual reporting should follow a format similar to Appendix A in this report.

Compilation of multiple annual reports following the same format year over year will allow the department to establish trends once the data has been compiled for five years or more. At that time, the fire department should evaluate the data for trends, making deployment adjustments as necessary. It is important that the format and data collection remain consistent year over year to ensure comparability.

Facility Improvements

The GFD fire station is hemmed in on all sides, and does not lend itself to significant addition to address the lack of living quarters. The department has found a creative way to accommodate shift personnel by leasing apartment space directly behind the fire station. The station is in an advantageous location for response, but the apartment lease is not an optimum solution. Should the city find itself in a position to add living quarters to the fire station as a result of the relocation of the police facility, city hall, or the apartment building, it should be pursued.

POC Recruitment & Maintenance

Gladstone Fire Department will likely continue to rely upon paid-on-call (volunteer) firefighters as the key component to its critical response staffing infrastructure. Nationally, it is exceedingly difficult to recruit, train, and maintain a large pool of these dedicated community servants. To maintain a sufficient force, recruitment must be continuous, retention programs must be in place with incentives and continually refined, and the leadership must actively and continuously engage with the force to keep a pulse on the attitudes of the members. This is no small undertaking, and finding the balance between leadership and popularity is more an art than a science. However, there are aids which can help an organization attract and retain an appropriate cadre of POCs.

In an effort to add to a sagging cadre of POCs, GFD has recently added POCs who live outside of the City of Gladstone, some a substantial distance away. This is becoming a common practice as fire chief's search for creative ways to bolster their fire department staffing when the ranks of in-city resident POCs dwindle. One of the challenges to this practice, however, is that as the size of the non-resident group of POCs grows and the group of in-city resident POCs shrinks, the department's ability to respond to staffing challenges during a significant incident in a timely manner becomes more difficult. Non-resident personnel who are distant to the city will arrive to assist in a delayed manner, negatively impacting response time for greater alarms, or during busy periods with multiple events. While these incidents and conditions are rare, this can become a serious issue.

ESCI recommends that the non-resident POC program be limited to no greater than 20 percent of the total POC workforce. Further, the citizens of Gladstone must be made aware of the department's reliance upon resident POCs to keep costs down, response effective, and outcomes positive. In this way, residents will be more inclined to assist in their own protection.

Implementation of Risk Based Responses

With the inclusion of the community risk assessment contained in this report, Gladstone Fire Department is now positioned to adjust their responses by risk (often referred to as target hazards within the fire service). GFD dispatches the same response package for a structure fire, whether commercial or residential. A large portion of that package relies on automatic aid resources to accomplish. If the response package is adjusted to reflect its risk profile (low, moderate, high, or maximum), wear and tear on POCs, apparatus, and potential over-use of automatic aid resources can be avoided. This, of course, must be done to match the level of risk tolerance the city is willing to accept.

ESCI recommends that the department adjust its response packages to reflect the relative risk posed by the incident type and target hazards. Resources should match the level of risk the address or incident type poses to the city and its residents.

APPENDIX A

Gladstone Fire Department Annual Performance Report

Turnout time – the period of time from initial dispatch to initiation of travel towards the incident.

Performance Goal:

- *Gladstone Fire Department will achieve a **turnout time** goal of ninety (120) seconds for fires and special operations responses, and ninety (90) seconds for all other response types, both 80 percent of the time.*

Actual Fire Department Performance For Review Period	Causal Factors & Predictable Consequences For Failure to Achieve Goal
____ Met Goal ____Did Not Meet Goal Achieved **Fire** Turnout Time ___% of the time. Achieved **Special Ops** Turnout Time ___% of the time. Achieved **EMS** Turnout Time ___% of the time.	
Planned Steps to Address Gaps, if any.	

Response time for the first arriving engine company at a fire suppression incident or medical unit at a medical emergency – the period from notification of fire department response personnel of the incident to the arrival of the first unit at the scene of the incident.

Performance Goal:

- *Gladstone Fire Department will achieve a response time goal of six minutes (6:00) or less for the **first arriving fire engine for fire incidents**, 80 percent of the time.*
- *Gladstone Fire Department will achieve a response time goal of five minutes, thirty seconds (5:30) or less for the **first arriving medical unit for medical emergencies**, 80 percent of the time.*

Actual Fire Department Performance For Review Period	Causal Factors & Predictable Consequences For Failure to Achieve Goal
____ Met Goal ____Did Not Meet Goal Achieved Response Time for **1st Engine** ___% of the time. Achieved Response Time for **1st Medical Unit** ___% of the time.	
Planned Steps to Address Gaps, if any.	

Response time for full effective response force at a structure fire incident – the period of time from notification of fire department response personnel of the incident to the arrival of all dispatched units to the scene of the incident.

Performance Goal:

- *Gladstone Fire Department shall achieve an **effective response force** of 15 personnel for structure fires in nine minutes, (9:00) or less, 90 percent of the time.*

Actual Fire Department Performance For Review Period	Causal Factors & Predictable Consequences For Failure to Achieve Goal
____ Met Goal ____Did Not Meet Goal Achieved **Effective Response Force** Response Time ___% of the time.	
Planned Steps to Address Gaps, if any.	

Response time for arrival of the first certified Water Rescue Technician at a water rescue incident – the period from notification of fire department response personnel of the water rescue incident to the arrival of the first certified water rescue technician.

Performance Goal:

- *Gladstone Fire Department shall achieve a response time goal of eight minutes, thirty seconds (8:30) for the arrival of the first **water rescue technician** at a **water rescue incident**, 80 percent of the time.*

Actual Fire Department Performance For Review Period	Causal Factors & Predictable Consequences For Failure to Achieve Goal
____ Met Goal ____Did Not Meet Goal Achieved **water rescue technician** response time ___% of the time.	
Planned Steps to Address Gaps, if any.	

Response time for arrival of first fire department unit at a hazardous materials incident – the period from notification of fire department response personnel of the hazardous materials incident to the arrival of the first fire department unit.

Performance Goal:

- *Gladstone Fire Department shall achieve a response time goal of six minutes (6:00) or less for the arrival **of haz-mat operations certified personnel** to a **hazardous materials incident**, 80 percent of the time.*

Actual Fire Department Performance For Review Period	Causal Factors & Predictable Consequences For Failure to Achieve Goal
____ Met Goal ____Did Not Meet Goal Achieved **hazardous materials-operations certified** **personnel** response time ___% of the time.	
Planned Steps to Address Gaps, if any.	