CITYGATE ASSOCIATES, LLC
FOLSOM (SACRAMENTO), CA MANAGEMENT CONSULTANTS

STANDARDS OF RESPONSE COVER STUDY FOR THE CITY OF EUREKA FIRE DEPARTMENT

Final Report

VOLUME 1 OF 3 – SOC REPORT

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CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES

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EXECUTIVE SUMMARY

Citygate Associates, LLC finds that the challenge in the City of Eureka is similar to that found in all small and emerging California communities: providing an adequate level of fire services. This City has not been immune from the "perfect storm" of consequences of over ten years of the State's taking of local revenues, just as Federal and State safety regulations increased the individual time commitment and employer cost burdens on volunteer fire departments. These pressures on small career and volunteer fire departments, when combined with an increasingly two-income-based commuter society, have all but dried up the pool of available volunteer firefighters.

Citygate finds that the City Fire Department's fire, rescue, and emergency medical services (EMS) are currently *only sufficient for small building fires and singular, not simultaneous, building fires at once*. In addition, these services are under increasing pressure from declining volunteer availability and the fiscal capacity of a smaller City to provide fire, rescue, and emergency medical services outcomes more typical of suburban areas that newer residents and visitors have come from, expecting comparable services to be provided.

With regard to their fire services, Eureka's residents need to know that, at best, their Fire Department will be a modest event fire agency even with some additional fire department growth. It will be many decades, if ever, before this community will be economically large enough to have the weight and depth of fire services required to stop large, significant fires that may already be spiraling out of control when 911 is called.

As will be discussed further, even mutual aid from neighboring fire departments will not provide a full and adequate response force to "major" fires. This creates the need for good fire prevention and community-wide understanding that there is zero tolerance for unwanted fires. This is because a department with the capabilities of a mid-sized city does not exist in the region to help control fires. What regional mutual aid may do is to arrive in time to prevent the spread of a fire beyond the building of origin or sufficiently slow a vegetation fire so that it will not grow to catastrophic proportions.

Citygate will point out that continuing to rely on volunteers is problematic for several reasons. Unfortunately, over the last decade, no one could foresee the forces that would decay volunteer fire services at the same time that the City and or County is considering modest, planned growth. The result, due to inadequate City revenue sources and the decrease of volunteer firefighter resources, is a thin layer of fire protection for the community of Eureka.

POLICY CHOICES DISCUSSION

First, Eureka must understand there are no Federal or State regulations directing the level of fire service response times and outcomes. The body of regulations on the fire service provides that *if fire services are provided at all, they must be done so with the safety of the firefighters and citizens in mind.* Given this state of regulation, small agencies are challenged to properly staff, train, and equip a safe and effective response force.

FIRE DEPLOYMENT RECOMMENDATIONS IN BRIEF

The City's current fire stations can deliver a first-due unit on-scene within 09:45 (minutes/seconds) 89 percent of the time. For the risks in the City, a more desirable performance point, as will be discussed further in this report, would be 7 minutes from 911-call receipt to first unit arrival, 90 percent of the time. With some improvement to dispatch call processing time and crew turnout time, this goal can be achieved except in the southeast corner of the City.

As this report will explain, serious building fires, even when still somewhat small, take 15 plus firefighters and one to two incident commanders (chiefs) to control. With a firefighter minimum staffing of 10, the City cannot deliver this force. Thus:

- The City is totally co-dependent on its neighbor, the Humboldt Fire District (HFD) to ensure a barely adequate structure fire response;
- Even with the assistance of callback of career personnel, plus limited volunteer staffing and mutual aid from distant departments, large fires can easily escape control in the larger, non-fire sprinklered significant fire flow buildings in the waterfront and downtown areas such as the recent 226 G Street fire, December 8, 2006;
- More staffing means increased expenses, which in today's economic climate is very challenging;
- The City could be changing: development, increased traffic, and more homes in the southern area outside the City but well within its sphere of influence.

Recommended Response Time Goals

In Eureka a 4-minute road travel time is an appropriate goal. Thus, a revised total response time goal could look like:

- 1 minute for Dispatch + 2 minutes for crew turnout + 4 minutes road travel time = 7 minutes at 90 percent total response time. The service goal is for the single unit to handle minor emergencies by controlling small fires and effectively rendering patient care on medical emergencies.

For the firefighting effective response force (First Alarm), the moderate risk building fires in Eureka need an 8-minute road travel time for the additional responding units that can arrive after the first-due unit. Thus:

- 1 minute for Dispatch + 2 minutes for crew turnout + 8 minutes road travel time = 11 minutes at 90 percent total response time. The service goal of the First Alarm force should be to confine the fire near the room of origin, rescue trapped victims viable upon arrival of the first unit and to render patient care on medical emergencies of up to 5 patients.

Additional Development and Fire Station Locations

If additional suburban density growth is approved southeast of the current City limits, Maps 3b and 6b clearly show that <u>if</u> good suburban outcomes are to be provided, such as confining the fire to the room of origin and to intervening successfully in cardiac arrest patients, then there is **not**

adequate 4- or 8-minute travel coverage into this area from any of the existing City or District stations.

There are four options available if good outcomes are desired:

1. Require the developer to set aside land and build and equip a fire station, *and* provide a per-parcel assessment to meet the staffing requirements in perpetuity.
2. If the area stays in the HFD, require the same as in #1 above.
3. Mandate a zero square foot residential fire sprinkler requirement.
4. Inform the residents, via a deed recordation in escrow, that they have limited rural fire and EMS protection and to not expect a fire station to be added.

A hybrid option would be to add another fire station in this area and share the cost three ways since there is a broader benefit. Both the City and the Fire District need more daily staffing. An additional 3-person crew in this area could be cost shared across the new homeowners and the two existing jurisdictions. Either department could actually operate the stations and receive an operating expense share from the other.

Service Increase Options

An obvious question for Eureka fire deployment is how to add another responding crew. To get over the threshold to have an adequate weight of response and still have some reserve strength left, the Eureka Fire Department should consider:

1. Fully staffing the truck with three personnel, which would take 6 more total employees;
2. Staffing the three engines at 4 persons, which would take 9 more total employees;
3. Either agency, independently or together, could operate an additional station in the southeast City/County area. This would take 9 more total employees;
4. Ideally, over the build-out of the City and close-in District areas, both 1 and 2 above would occur, which would require 15 more employees, new revenue sources, and inter-agency cooperation.

Both departments have a need for better *distribution* of fire stations/crews by adding another location. This should take priority over increasing the staffing on existing units, which, while it would solve the total head count per day issue, it would not fix the southeast location and second-due unit travel time issues.

The City needs the staffing on the ladder truck, given the unusual quantity of older, higher risk buildings, which are atypical for a suburban city in this part of the state. However, this is a second priority, as there are more medical calls for service and every neighborhood needs good first-due coverage. Then, if revenue permits, the building fire issue can be addressed by adding staffing to the ladder truck.

The findings and recommendations at the conclusion of this study show that while the Eureka Fire Department is deployed to cover the City and its associated risks, the Department faces significant operational challenges due to low daily staffing and an older, historic community that presents above-average risk for serious building fires. The Department is co-dependent with the

adjoining Humboldt Fire District to provide *barely* enough firefighters to address modest structure fire incidents. Additional growth outside the current City area will not be able to enjoy suburban level response times and positive outcomes without an additional fire station to include a plan to pay for the on-going staffing costs.

STANDARDS OF COVER ANALYSIS

BACKGROUND

This report outlines Citygate Associates, LLC's findings regarding fire service deployment in the City of Eureka Sphere of Influence. Citygate engaged with the Eureka Fire Department leadership to develop an in-depth Standards of Response Cover assessment. This multifaceted approach to understanding fire crew deployment needs will serve to guide the Department and City officials as they plan for the provision of fire services.

The Commission on Fire Accreditation International recommends a systems approach known as "Standards of Response Coverage" to evaluate deployment as part of the self-assessment process of a fire agency. This approach uses risk and community expectations on outcomes to assist elected officials in making informed decisions on fire and EMS deployment levels. Citygate has adopted this methodology as a comprehensive tool to evaluate fire station location. Depending on the needs of the study, the depth of the components may vary.

Such a systems approach to deployment, rather than a one-size-fits-all prescriptive formula, allows for local determination. In this comprehensive approach, each agency can match local need (risks and expectations) with the costs of various levels of service. In an informed public policy debate, a city council or fire department governing board "purchases" the fire and EMS service levels (insurance) the community needs and can afford.

While working with multiple components to conduct a deployment analysis is admittedly more work, it yields a much better result than any singular component can. If we only look to travel time for instance, and not look at the frequency of multiple calls, the analysis could miss over-worked companies. If we do not use risk assessment for deployment, and just base deployment on travel time, a community could under-deploy to incidents.

The Standard of Response Cover process consists of eight parts:

1. Existing Deployment – each agency has something in place today.
2. Community Outcome Expectations – what is expected of the response agency?
3. Community Risk Assessment – what assets are at risk in the community?
4. Critical Task Time Study – what must be done over what timeframe to achieve the stated outcome expectation?
5. Distribution Study – the locating of first-due resources (typically engines).
6. Concentration Study – First Alarm assignment or the effective response force.
7. Reliability and Historical Response Effectiveness Studies – using prior response statistics to determine what percent of compliance the existing system delivers.
8. Overall Evaluation – proposed standard of cover statements by risk type.

Fire department deployment, simply stated, is about the ***speed*** and ***weight*** of the attack. Speed calls for first-due, all risk intervention units (engines, trucks and or rescue companies) strategically located across a department. These units are tasked with controlling everyday moderate emergencies without the incident escalating to second alarm or greater size, which then

unnecessarily depletes the department resources as multiple requests for service occur. Weight is about multiple-unit response for serious emergencies like a room and contents structure fire, a multiple-patient incident, a vehicle accident with extrication required, or a heavy rescue incident. In these situations, enough firefighters must be assembled in a reasonable time frame in order to control the emergency safely without it escalating to greater alarms.

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

EUREKA FIRE DEPARTMENT FINDINGS

Existing Deployment Situation – What the Eureka Fire Department has in Place Currently

The Eureka Fire Department serves the City with three fire stations from which it provides a full range of all risk services that include firefighting, basic emergency medical services, technical rescue and hazardous materials responses. The Department's service area consists of a current resident population of approximately 26,128 and an area of 14.4 square miles, of which 9.4 square miles are land and 5 square miles are water. The population density is 2,764 persons per square mile, which is typical of a suburban residential community. There are 11,637 housing units in the City. The Eureka Fire Department maintains a very active automatic aid agreement with the adjacent Humboldt Fire District. The fire district fields two fire stations and covers an area of 40 square miles with a resident population of 22,000. The population density of the district is about one fifth of that in Eureka.

The story of the Eureka Fire Department cannot be told without linking it to the Humboldt Fire District and vice versa. Neither department can launch an effective and immediate structure fire response without the help of the other, and the departments are co-dependent similar to Siamese twins. Moreover, even with a jurisdictional boundary drop and automatic aid agreements, together the departments barely field an adequate number of personnel to prevent an incipient fire from becoming large and damaging.

The daily staffing issue is exacerbated by the fact that Eureka has a high number of older, high-risk buildings that require large fire flows in the event of a major fire. Many of these structures are unique and irreplaceable. The EFD and HFD together are incapable of mounting a second alarm structure fire response without the callback of personnel, mutual aid from other agencies with long travel times, and the use of their volunteer components. In addition, if another call for service for the vacated stations comes during the large emergency, the coverage would come from mutual aid from other fire departments some distance from Eureka.

From 07/01/2003 – 6/30/2006, the Department responded to 9,638 calls for service, or about 3,200 per year of which approximately 61.75 percent of which were medical or rescue in nature.

The City has formally adopted a response time policy through the General Plan process. While older and not consistent with current best practices, it specifically states:

> *Policy 4.G.3- The City Fire Department shall attempt to maintain an average response time of three (3) minutes for all service calls, including emergency medical service (EMS) calls.*

The Eureka Fire Department uses a more updated response time measure (from time of fire crew notification to on-scene) in their annual Suppression Program Goals via the following statement:

> *"Maintain a response time for emergency incidents of five minutes or less."*

Unfortunately, neither of the above response policies is consistent with national best practices on how to construct a measurable policy. Response time policies need a definition of when time begins, such as the call being received or the fire crew being notified, and when time stops, such as being at the address in question or actually at the patient's side, for example. Additionally, response time polices need to state what outcome is intended for the delivery system to accomplish. An example of this would be to "confine the fire to the room or origin" or "confine the fire to the building of origin." This study will review these issues and recommend revised response time policies that meet the risks present in Eureka.

Given that the current City response policies do not state a desired outcome or clock start point, for this study, Citygate will use the response time goals found in National Fire Protection Association (NFPA) Deployment Guideline #1710. The goals in #1710 are that an all-risk initial intervention unit (engine or ladder) will arrive at the scene of a critical emergency in 6 minutes or less from the time of call receipt in fire dispatch 90 percent of the time. The First Alarm units should all arrive at critical emergencies within 10 minutes. Critical emergencies are those immediately threatening to life or likely to cause severe property damage from fire. Crew turnout time is longer in critical emergencies because more protective clothing must be donned before the fire apparatus can respond. Thus, total response time includes:

- 60 seconds or less dispatcher processing time, when pre-arrival medical directions are not given to the caller
- 60 seconds or less fire crew turnout time
- 4 or 8 minutes road travel time.

Citygate has found over many studies that the above NFPA specification on crew turnout time of 1 minute is unrealistic given current safety clothing regulations. Over a large set of clients, we see that a more achievable goal is 2 minutes, 90 percent of the time for crew turnout. Therefore, the NFPA recommendations above need to have 1 minute added, which then becomes 7 minutes at 90 percent for first-due unit and 11 minutes at 90 percent for the First Alarm units. Once the current deployment system is measured against this benchmark, the City can adopt deployment measures more specific to its risk and emergency outcome needs.

The Department does have automatic and mutual aid response agreements with its neighbors. Most partner agency stations are too far away to be "first responders" in lieu of a Eureka Fire Department crew, and they best help with second alarm or specialty incidents when multiple-units over a longer period of time are needed. As mentioned earlier, the Humboldt Fire District provides automatic aid service to the Eureka Fire Department and vice versa. Without this

agreement and close cooperation, Eureka would be without reasonable initial attack fire protection.

In 2004, the daily staffing per unit for the Eureka Fire Department was:

Per Unit			Extended
3 Engines @[1]	3	Firefighters/day	9
1 Ladder Truck			
Subtotal *firefighters:*	1	Firefighters/day	1
1 Captain II @[2] or Chief Officer	1	per day for command	1
		Total 24/hr personnel EFD:	***11***
1 Automatic aid engine	3	Humboldt FD	3[3]
1 Captain II or Chief		Humboldt FD	1
		Total Area Duty Personnel:	***15***

[1] EFD staffs the engines constantly with three career staff personnel. On volunteer drills there may be an additional one or two volunteers riding along.

[2] EFD staffs the truck with a single operator. For the majority of the time the operator is the Captain II; at other times, it will be staffed with an engineer. When this is the case, the EFD designates the Captain II as the first-due command officer. On certain periods of anticipated high activity, like Independence Day, the staffing for the truck may increase to three, identical to engine staffing.

[3] HFD only staffs two engines, each with three. Therefore, even if both HFD units respond with a total of 6, when added to the City count of 10, then in the immediate City region there are only 16 total career firefighters on duty per day, plus two chiefs.

This daily staffing is *barely* adequate for the moderate type of fire risk presented in the Department, as will be discussed later in the risk and outcomes section of this report. However, for this staffing statement to be accurate for a building fire, the assumption is that the closest crews are available and not already operating on another emergency medical call or fire, which can and does happen. For example, if one engine is committed to an EMS call, then the HFD must make up the additional required engine company. While the data shows a low level of simultaneous activity, the combined activities of the two agencies show at least two incidents occurring simultaneously 25.11 percent of the time.

There are also other staffing factors to consider. Eureka has a volunteer firefighter program, and while the authorized strength of the volunteer force is 12 members, only 7 are active. Currently, a volunteer callout will only provide 2 or 3 volunteers. They are only authorized to respond from home to structural fire calls and are not authorized to respond to EMS calls in accordance with the matrix below:

Incident Type	Eureka Response
Boat Fire	4 Engines – Truck – DO – Vol. FF
Dock Fire	4 Engines – Truck – DO – Vol. FF
Explosion	4 Engines – Truck – DO – Vol. FF
Structure Fire	4 Engines – Truck – DO – Vol. FF

The EFD encourages volunteers to ride-along on the engines at any time to increase staffing. When they do, they are eligible to respond to any and all call types as a member of that engine company.

NEWER LEGAL CHANGES TO THE PROVISION OF FIRE SERVICES

In addition to Constitutional and State Government Code restrictions on local government finance, there have been a number of new state and federal laws, regulations and court cases that limit the flexibility of cities and fire districts in determining their staffing levels, training, and safe methods of operation.

1. 1999 OSHA Staffing Policies – Federal OSHA applied the tank and underground confined space safety regulations to America's firefighters. This requires in IDLH atmospheres there be teams of two inside and two outside in constant communication and with the outside pair equipped and ready to rescue the inside pair. IDLH means "Immediately Dangerous to Life and Health," which for the fire service is interior building fire attack where the fire and smoke conditions are serious enough to require the wearing of self-contained breathing apparatus (SCBA). This is commonly called the "2-in/2-out" policy. This policy requires that firefighters enter serious building fires in teams of two, while two more firefighters are outside and immediately ready to rescue them should trouble arise.

2. May 2001 National Staffing Guidelines – The National Fire Protection Association (NFPA) Standard on Career Fire Service Deployment was issued five years ago. While advisory to local governments, as it starts to become locally adopted and used, it develops momentum, forcing adoption by neighboring communities. NFPA-1710 calls for four-person fire crew staffing, arriving on one or two apparatus as a "company." The initial attack crew should arrive at the emergency within four minutes travel time, 90 percent of the time, or the total effective response force (First Alarm assignment) shall arrive within eight minutes travel time, 90 percent of the time. NFPA #1720 for Combination and Volunteer departments requires no time minimum, but calls for assembling a "safe, effective force" before beginning fire attack.

3. October 1999 California OSHA Changes – Governor Davis signed Assembly Bill 1127, authored by Assembly member Steinberg, into law (Chapter 615, Statutes of 1999). AB 1127 makes changes to twelve (12) sections of the California Labor Code. Except for one statutory change to Labor Code Section 98.7, all of AB 1127's changes involve the California Occupational Safety and Health Act (Labor Code Section 6300 et seq.).

   This legislation made all of the OSHA regulations applicable to local government, including fines and a huge increase in criminal penalties under Cal/OSHA. Individual managers and supervisors (*Fire Chiefs – Incident Commanders*) may now be fined up to $250,000 and be imprisoned for up to four years for failure to take appropriate safety precautions. Criminal fines range up to a maximum of $3.5 million for corporations and limited liability companies (Labor Code 6423 and 6425). This makes experience, training, and education critical for supervisors

and necessitates that the fire agency have an effective, well-documented training program.

This "sea change" in personal and agency liability means that not just any firefighter can, or should be, an Incident Commander on significant, sustained incidents. Along with increasing firefighter deaths nationally with Federal OSHA citations to fire commanders, the trend starts for significant training and certification of Incident Commanders (Fire Chiefs and other chiefs).

INCREASING NEGATIVE PRESSURES ON THE USE OF VOLUNTEERS IN FIRE SERVICES

Volunteer-based fire departments are under great pressure today to maintain an adequate roster. The reasons for this are not unique to Eureka and are placing pressure on small community volunteer systems across the state and nation:

- Economic pressures result in more two-income families and less time to volunteer.
- In a commuter economy, more jobs are clustered in metropolitan and dense suburban areas. Communities like Eureka increasingly have residents who work elsewhere or they are recreational second homeowners.
- Due to the growth in society of complex systems and technology, the fire service was given more missions, like emergency medical services, hazardous materials response, and technical rescue. This dramatically increased the legally mandated training hours for volunteers, causing many to drop out as the time commitments became unbearable.
- Early in this decade, due to rising firefighter injuries and deaths, especially in the volunteer ranks, more safety regulations and training minimums were placed on all firefighters.
- January 2004 California Volunteer Firefighters –

  New laws (Assembly Bills 2118 and SB 1207) require volunteer firefighters to receive *the same level of training* that the full-time staff receives. AB 2118 was Chaptered in 2002, and was delayed to 2004. In part it "*…provides that the California Occupational Safety and Health Act applies to volunteer firefighters. Equipment and training for volunteers to meet the same requirements as regular firefighters*."

This change, coupled with all the other factors, means that volunteer firefighter programs dry up due to lack of members. Additional training and additional responses mean a significant time commitment for "true" volunteers; who are serving for love of community and to give something back. Most departments feel that it takes 100-120 hours of training per year to meet safety minimums, and this time is before a volunteer goes on a single incident.

In addition, most employers today are unwilling to allow volunteers to leave their jobs to respond to an emergency dispatch. Across the fire service, volunteer programs have been changing and adapting to a different model. The current model understands the commitment needed, and usually includes two types of volunteers: the first is the usual community-based person; the

second is a younger person who desires to be a career firefighter. While the younger person is going through community college fire science classes, after obtaining basic firefighter certification, they work "part-time" for shift stipend or for an hourly wage, without benefits. These personnel are used successfully to increase daily station staffing and are called "reserve" firefighters or part-time firefighters. They do not need to live in the community they serve, as they are often not needed to respond from home with quick travel times.

As will be discussed later in this report, the use of fire science student volunteers or part-time firefighters is problematic in the Eureka region as there are no close-by community college fire science programs. Older citizens in the community could be trained and used for non-firefighting functions such as public education, but this program will take management team oversight time that may not be available.

Eureka Community Outcome Expectations and Existing Response Performance Measures – What is Expected of the Fire Department?

The next step in the Standards of Response Cover Process is to review existing fire and emergency medical outcome expectations. This can be restated as follows: for what purpose does the response system exist? Has the governing body adopted any response performance measures? If so, the time measures used need to be understood and good data collected.

As previously stated, the City General Plan calls for an average response time of three minutes for all service calls. At the outset, this appears to be a very ambitious goal, but as the discussion below demonstrates, an "average" response time can be very misleading.

For the recent three years of data available for this study, the Department could have reported an *average* response time of 5 minutes for the engine companies and under 5.5 minutes for the truck. These times start with the dispatcher beginning to notify the fire crew.

Current best practice nationally, as well as in Eureka, is to measure percent completion of a goal (i.e. 90 percent of responses) instead of an average measure. This is because the measure of average just identifies the central or middle point of response time performance for all calls for service in the data set. From an average statement, it is impossible to know how many incidents had response times that were considerably over the average or just over. For example, if a department had an average response time of 5 minutes for 5,000 calls for service, it cannot be determined how many calls past the average point of 5 minutes were answered in the 6th minute or way out at 10 minutes. This is a significant issue if hundreds or thousands of calls are answered much beyond the average point.

The City's current performance goal of *"Maintain a response time for emergency incidents of five minutes or less"* is more realistic if the following caveats were included in the definition:

The first-due unit should arrive at the scene of a critical emergency within the City limits in 5 minutes from fire crew notify receipt, 90 percent of the time.

This is in the range to deliver acceptable outcomes, ***if*** all parts of the system perform as designed and are available to respond. When 1 minute is subtracted from the 5 minutes for the crew to get dressed in protective clothing and get the unit rolling, then the current City goal is a 4-minute travel time, which is consistent with the recommendations in NFPA #1710. However, as will be

discussed later in this report, even 1 minute for crew turnout is unrealistic, and the current City measure does not include call-processing time in the police communications center.

The Insurance Services Office (ISO) Fire Department Grading Schedule would like to see fire stations spaced 1.5 miles apart, which given travel speeds on surface streets, is a 3- to 4-minute travel time. The newer National Fire Protection Association (NFPA) guideline #1710 on fire services deployment, suggests a 4-minute travel time for the initial fire apparatus response and 8 minutes maximum for the follow-on units.

More importantly within the Standards of Response Coverage Process, positive outcomes are the goal, and from that crew size and response time can be calculated to allow efficient fire station spacing. Emergency medical incidents have situations with the most severe time constraint. In a heart attack that stops the heart, a trauma that causes severe blood loss, or in a respiratory emergency, the brain can only live 8 to 10 minutes maximum without oxygen. Not only heart attacks, but also other events can cause oxygen deprivation to the brain. Heart attacks make up a small percentage; drowning, choking, trauma constrictions, or other similar events have the same effect. In a building fire, a small incipient fire can grow to involve the entire room in an 8- to 10-minute time frame. If fire service response is to achieve positive outcomes in severe EMS situations and incipient fire situations, ***all*** the crews must arrive, size-up the situation and deploy effective measures before brain death occurs or the fire leaves the room of origin.

Given that the emergency started before or as it was noticed and continues to escalate through the steps of calling 911, dispatch notification of the crews, their response and equipment set-up once on scene, there are three "clocks" that fire and emergency medical crews must work against to achieve successful outcomes:

- The time it takes an incipient room fire to fully engulf a room thus substantially damaging the building and most probably injuring or killing occupants.
- When the heart stops in a heart attack, the brain starts to die from lack of oxygen in 4 to 6 minutes and brain damage becomes irreversible at about the 10-minute point.
- In a trauma patient, severe blood loss and organ damage becomes so great after the first hour that survival is difficult if not impossible. The goal of trauma medicine is to stabilize the patient in the field and get them to the trauma surgeon inside of one hour.

Somewhat coincidently, in all three situations above, the first responder emergency crew must arrive on-scene within 5 to 7 minutes of the 911 call to have a chance at a successful resolution. Further, the follow-on (additional) crews for serious emergencies must arrive within the 10-minute point.

The three event timelines above start with the emergency happening. It is important to note the fire or medical emergency continues to deteriorate from the time of inception, not the time the fire engine actually starts to drive the response route. It is hoped that the emergency is noticed immediately and the 911 system is activated. This step of awareness – calling 911 and giving the dispatcher accurate information – takes, in the best of circumstances, 1 minute. Then crew notification and travel take additional minutes. Once arrived, the crew must walk to the patient or emergency, size-up the problem and deploy their skills and tools. Even in easy to access situations, this step can take 2 or more minutes. It is considerably longer up long driveways,

apartment buildings with limited access, multi-storied office complexes or shopping center buildings such as those found in parts of the City.

Thus, from the time of 911 receiving the call, an effective deployment system is ***beginning*** to manage the problem within 7 to 8 minutes total reflex time. This is right at the point that brain death is becoming irreversible and the fire has grown to the point to leave the room of origin and become very serious. Thus, the Eureka Fire Department first-due response goal is within the range to give the situation hope for a positive outcome. The goal stated in the City's General Plan needs additional clarification and needs to include a policy for the balance of a multiple-unit firefighting force. Yes, sometimes the emergency is too severe even before the Fire Department is called in for the responding crew to reverse; however, given an appropriate response time policy and if the system is well designed, then only issues like bad weather, poor traffic conditions or multiple emergencies will slow the response system. Consequently, a properly designed system will give the citizen the hope of a positive outcome for their tax dollar expenditure.

For the response statistical aspect of this study, the Eureka Fire Department has furnished National Fire Incident Reporting System version 5 (NFIRS) data and computer-aided-dispatch (CAD) data for 9,638 incidents dated for the 36-month period from 7/1/2003 through 6/30/2006. Humboldt Fire District data for the same period was received for 4,477 incidents.

For this report, response time is "total reflex time," which is the sum of the fire dispatch, crew turnout and road travel time steps. This is consistent with the recommendations of NFPA #1710 and the Commission on Fire Accreditation International.

From the **Year 3** data set, *in the Eureka City limits*, the *average* "total reflex time" response time was 5.25 minutes. The Eureka Police Department provides the fire dispatch services in the City of Eureka and the HFD. It is also the Primary Service Answering Point (PSAP) for all 911 Calls in the City. 911 calls outside the City go to the Humboldt County Sheriff's Department and are then transferred to Eureka Police Department Dispatchers.

Below is a fractal analysis of incidents in **Year 3**, the most recent data. This fractal measure covers response times greater than 0 and less than 20 minutes. The measure is the elapsed time from police communications receiving the call until the first apparatus arrives on the scene.

There are 3,111 Incident records being analyzed for total reflex time:

1st Apparatus On Scene <= 00:05:00 59.2%
1st Apparatus On Scene <= 00**:06:00 74.6%** Current Eureka goal if 1 minute were added for dispatch
1st Apparatus On Scene <= 00:07:00 83.6% *Citygate recommended goal with 2 minutes for crew turnout*
1st Apparatus On Scene <= 00:08:00 88.8%
1st Apparatus On Scene <= 00:08:15 ***89.7%*** *Eureka's actual 90% point performance*

As can be seen the performance in the above data, the current deployment system is not meeting a desirable 7-minute at 90 percent goal point. Eureka Fire Department is part of a combination dispatch, a closest responding unit system between the three agencies that have automatic aid, Eureka Fire Department, Humboldt Fire District, and Arcata Fire Protection District (Arcata is only used in a small corner of Eureka). As such, Eureka sends out help almost daily, and receives it. Therefore, the data set above shows performance on all calls, including the automatic

aid partners. The data set above was cut off for automatic aid calls with times much longer than 20 minutes. Thus, the data above looks at performance inside and outside Eureka.

For the Year 3 data set, for Fire and EMS incidents only performance results:

If incidents are reduced to **fire and EMS incidents**, the following fractal results. Notice Eureka's response effectiveness increases dramatically when responding to fire and EMS incidents more likely to fall into the category of emergency responses. For all incidents the 90 percent first apparatus arrival is not reached until 08:15 (8 minutes, 15 seconds). However, when responding to fire and EMS incidents the 90 percent threshold is reached in just 06:30.

There are 2,111 Incident records being analyzed.

1st Apparatus On Scene <= 00:05:00 71.5%
1st Apparatus On Scene <= 00:**06:00 86.3%** Current Eureka goal if 1 minute were added for dispatch
1st Apparatus On Scene <= 00:06:30 ***89.7%*** *Eureka's actual 90% point performance*
1st Apparatus On Scene <= 00:07:00 91.9% Citygate recommended goal with 2 minutes for crew turnout

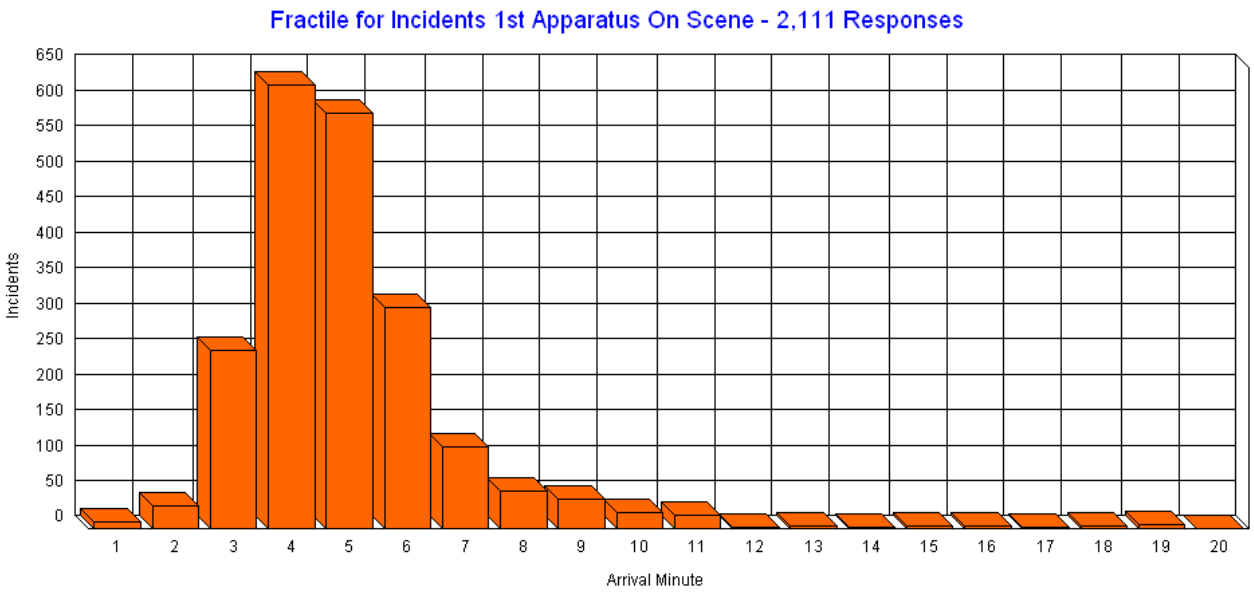
Here is a breakdown when incidents are narrowed down to **structure fires**.

There are 55 Incident records being analyzed.

1st Apparatus On Scene <= 00:05:00 61.8%
1st Apparatus On Scene <= 00:**06:00 83.6%** Current Eureka goal if 1 minute were added for dispatch
1st Apparatus On Scene <= 00:07:00 87.3% Citygate recommended goal with 2 minutes for crew turnout
1st Apparatus On Scene <= 00:08:00 87.3%
1st Apparatus On Scene <= 00:09:45 ***89.1%*** *Eureka's actual 90% point performance*

While most fire and EMS responses are handled with a single local apparatus, structure fires draw resources from more distant locations. The slower response time figures may be due to a disproportionate number of responses to or from the neighboring fire jurisdictions.

Fractal response times can also be viewed graphically. Here is a graph illustrating the number of incidents by response time minute for **fire and EMS incidents**. Incidents with a zero response time were eliminated from the graph.



Notice the minute with the most first arriving apparatus is minute 4. This is unusually good performance. It shows a large number of responses are located close to fire stations. There are, however, responses that require longer travel to more distant locations.

Why not a 100 percent measure? No department is expected or designed to cover all incidents. It is an acceptable practice to leave 10 percent for responses to fringe areas, or for the occasional periods when the Department is short of resources given multiple calls for service during peak hours. For this review, we are modeling the Department's prior performance and comparing the data results to the "ideal" per NFPA #1710 for fire service deployment. Later, this study will integrate all the SOC study elements to propose refined deployment measures that best meet the risk and expectations found in Eureka.

In addition to the above total reflex time measures, the individual time components of travel, crew turnout and dispatch time can be measured:

Dispatch Call Processing Time

The Eureka Police Department Communications Center performs fire dispatching for both Eureka Fire Department and Humboldt Fire District. The same dispatcher who receives the 911 call handles it for the Fire Department; there is no hand-off of the call to another dispatcher or dispatch center. Call Handling Time (Call Processing Time) for all fires and EMS responses in **Year 3** can be broken-down as follows:

There are 1,968 Incident records being analyzed.

*Call Processing <= **00:01:00 43.1%*** *National recommendation point*
*Call Processing <= 00:02:00 **89.5%***

Call processing performance appears to be well below the 90 percent at 1 minute standard recognized as a national call-processing goal. This is unexpected, given fast overall first company response statistics. Citygate has seen well staffed and well-operated dispatch centers perform at or near 90 percent at the 1-minute point.

If the Eureka Police Department Communications Center were to get service down to 1 minute 90 percent of the time, then on those calls that took more than a minute to handle 90 percent of the time, then 911 calls would have seen arrival times shaved by up to 1 minute, **which is significant and reduces total reflex time performance at 90 percent to 8:45.**

Call Processing should be timed and monitored manually to see what events trigger timestamps. This will provide better insight into performance and opportunities for performance enhancement.

Crew Turnout Time

Crew turnout time is a variable of the total response time that is completely within the Fire Department's control. The NFPA suggests that an ideal turnout time goal is to have the apparatus moving within 1 minute of the crew being alerted 90 percent of the time. However, until recently, the fire service has not really measured this time, and in all Citygate studies we find that 1 minute is an unrealistic goal. Citygate does find that 2 minutes at 90 percent is a very achievable goal, which is the point where Eureka is actually performing. Here is a breakdown of turnout time for Incidents in **Year 3**.

There are 2,021 Incident records being analyzed.

Turnout <= 00:01:30 **73.1%**
Turnout <= 00:02:00 ***89.6%***
Turnout <= 00:02:15 93.9%

Eureka does achieve an overall compliance percentage of nearly 90 percent at 2 minutes. This is considered good performance.

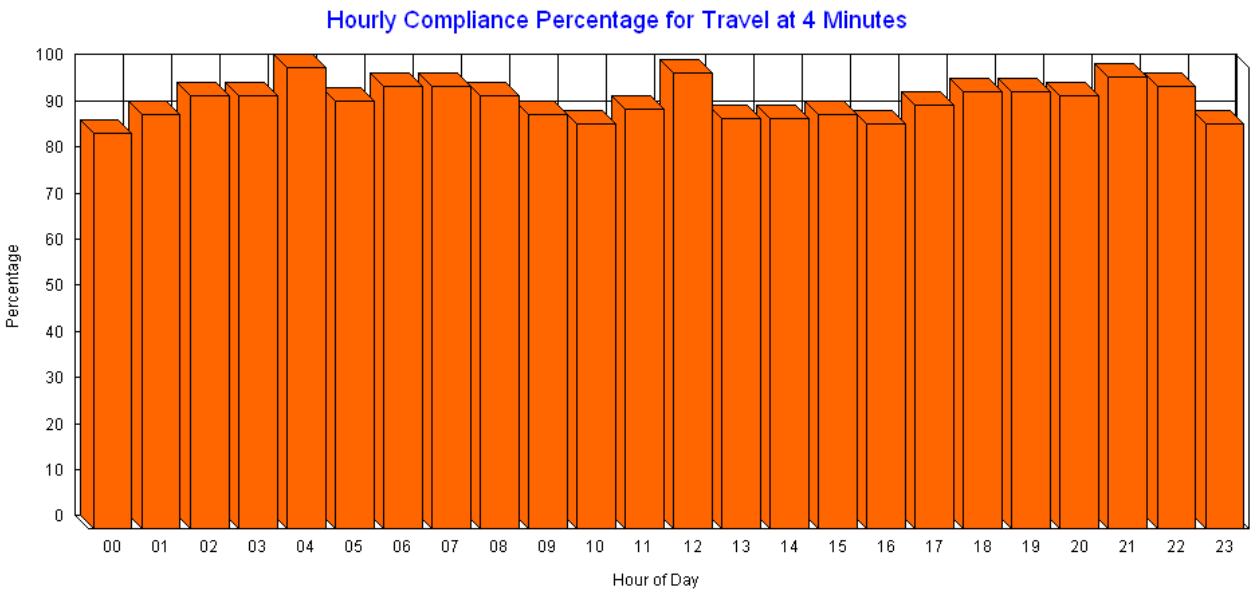
Travel Time

The traditional method of reporting time in the fire service was travel time. Here is a breakdown of travel time performance for all Eureka incidents in **Year 3**.

There are 2,052 Incident records being analyzed:

*Travel <= 00:****03:30 89.9%***
*Travel <= 00:*04:00 92.5% - Recommended goal point

Travel time performance in Eureka is impressive and indicates that the station spacing is appropriate for the street network. This also indicates the vast majority of incidents occur in areas near fire stations. The small number of simultaneous incident activity also contributes to these impressive statistics. Contributing to this success is the strong grid network of streets, typical of older, well-planned cities.



Travel time compliance appears to be slightly depressed during the workday. This could be a function of traffic in core areas or other assignments such as fire prevention moving units away from their home area. Regardless, variations in travel time by hour are very subtle.

Analysis

The point of this brief overview of response time performance is that, based on travel time measures, the City station spacing is adequate at meeting a 90 percent performance goal in many sections of the City. Further, when adopting performance measures, the Department leadership must understand and define what type of coverage is to be designed for and measured. NFPA #1710 asks that 90 percent of the historical incidents Department-wide be covered. There are two flaws to this NFPA approach:

- The Department is allowed to average unit performance across a three-station system. Thus, the higher performing units with many calls close to their fire stations generate a high percent of completion measures, typically above 90 percent. When such high performing stations are averaged with low call volume stations that may only be performing at 75 percent, the Department-wide measure will not revel the lower performing fire station areas. However, the following analysis shows that all Eureka fire department stations perform well.
- Second, measuring performance based on prior calls Department-wide does not guarantee **equity** of opportunity to receive adequate service if and when a call occurs. What a department should do is design a response system to cover 90 percent of the ***geography*** and of the actual calls. This is the approach taken in the Standards of Response Coverage process.

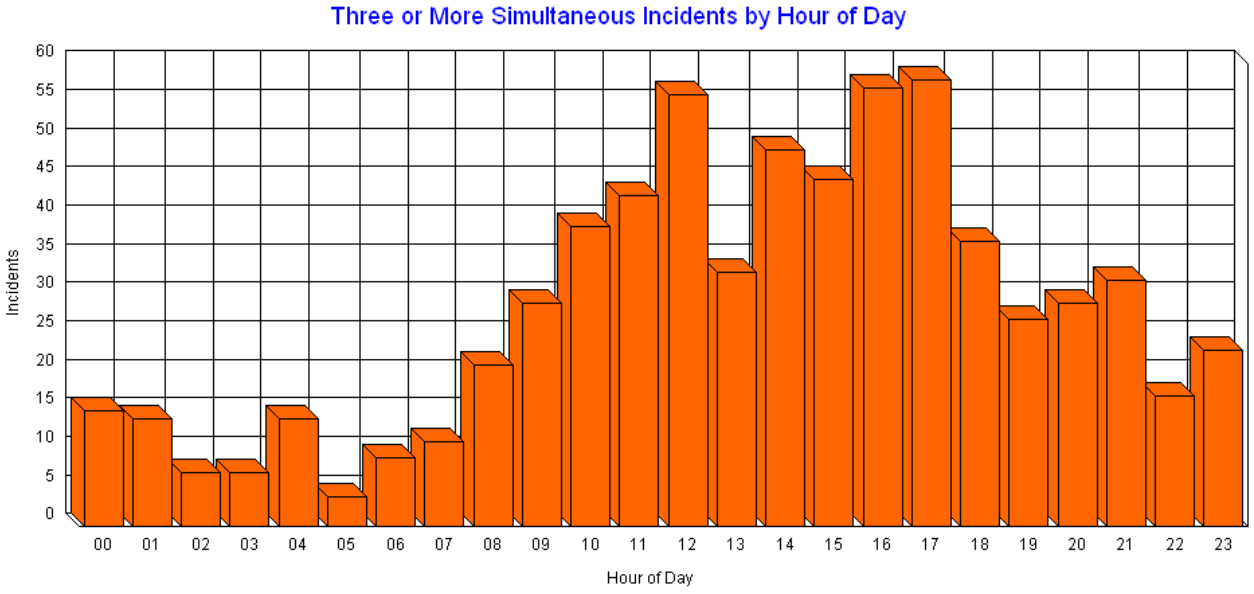
While it has been noted that dispatch time can be improved, the other issue making travel times slow is a simultaneous call for service rate of 25 percent. Obviously, incidents occurring at the same time tax fire department resources more than those occurring when there is no other fire department response activity. Since Eureka and Humboldt work closely together, the following simultaneous measurements *include both* fire departments within the 3-year dataset.

Examining incident data for the 36-month period shows **25.11 percent** of incidents occurred when Eureka or Humboldt were already engaged in other response activity. Despite combining data from two fire departments, this number illustrates a modest level of simultaneous activity across only five fire stations.

Here is the breakdown by number of incidents:

At least 2 Incidents occurring at the same time	25.11%
At least 3 Incidents occurring at the same time	4.78%
At least 4 Incidents occurring at the same time	.88%

The graph below illustrates the hourly distribution of 3 or more (4.78%) simultaneous incidents. This graph roughly follows the distribution frequency of incidents in general. This means the percentage of simultaneous incidents remains relatively constant during a 24-hour day.



Risk Assessment for Building Fires in the Eureka Fire Department Communities – What Assets Are at Risk in the Community?

The community, if asked, would probably expect that fires be confined to the room or nearby area of fire origin and those medical patients salvageable upon arrival have their injuries stabilized and be transported to the appropriate final care location. Thus, the challenge faced by the Department is to maintain an equitable level of fire service deployment across the entire City area without adding significantly more resources as demand for services grows and traffic congestion increases, slowing response times.

Fire loss history for the prior three years using fire department estimates, not insurance payouts:

2003 7/1/2003—6/30/2004	2004 7/1/2004—6/30/2005	2005 7/1/2005—6/30/2006
222 fires -loss $2,598,375	242 fires - loss $1,484,671	190 fires - loss $3,455,975

According to the Eureka Finance Department, the assessed valuation of the City is $2,034,763,063. By comparison, this level of fire loss is very modest. Most recent building fires in Eureka have started small and allowed the small on-duty force to catch them. As the critical task measures and response time performance components of this study will show, Eureka is not staffed with enough firefighters to contain a fire that is very serious and threatening lives when it is reported.

In order to understand the importance of response time in achieving satisfactory outcomes, the deployment of resources must be based upon assessment of the values at risk. There are actually many different *types* of values at risk depending upon the nature of the emergency. At a very basic level, a fire in a structure is among the most frequent events with a measurable outcome. A medical aid is a different event, and while it is the most frequent, it is not as threatening to life and property as the structure fire.

From a hazard, risk and value perspective, the number of structural fires is usually linked to the distribution and concentration of different building types in the community. As is expected in an urban area, communities have a very specific growth and development pattern consistent with past decisions or land use. As would be anticipated, there are pockets of various densities of housing stock ranging from low cost, high density housing to high cost, medium density neighborhoods. There is widespread distribution of neighborhood retail and commercial facilities. Along the main transit routes are typical commercial, mixed and public uses. Then, of course, there are areas of high concentration of values in areas that exist in the traditional "downtown" areas. There are areas in which many job provider and sales tax businesses are located.

The incident reporting system indicates a wide variety of events that can result in a call for service, but it is a reported fire in a building that is the essence of a fire department's deployment plan. This same reporting system is often the only statistically significant evidence of the frequency and consequence regarding the values at risk in any community.

Citygate reviewed the Department response performance information, its operational plans, community zoning, interviewed Fire Department members and drove through some of the community. As is expected in a small California city, much of the City consists of low- and medium-density residential housing. There are some pockets of higher density residential housing and newer commercial development. Housing areas are, of course, complimented by retail/commercial/industrial development zones. In addition, the downtown core area contains many multi-story, older buildings. The entire community contains most of the risks present in any older suburban area in the United States today.

The City population is approximately 26,128 residents. Service populations, such as employment base and visitors, are difficult to count and have varying impacts on emergency medical incidents.

Eureka is less affluent than some other communities, with a year 2000 median income for a household in the City at $25,849, and the median income for a family at $33,438. By comparison, the family median income in California, according to the Census Bureau is $67,814. There are many residents at or below the poverty level and without health insurance coverage. Populations at all ages without health insurance also drive EMS calls for service, as the public EMS system and the local emergency room are the only forms of health care easily available.

Building Fire Risk

In a Standards of Response Coverage study, building fire risk is typed using a standard classification tool. For this study, the Fire Department staff used the building fire classification tool jointly developed by the Commission on Fire Accreditation and the U.S. Fire Administration. The tool is called RHAVE or "Risk Hazard and Value Evaluation." It is a multi-part analysis tool built in a database format that allows fire personnel to identify key issues about a building such as size, construction type, fire flow, and occupant safety factors. Based on those factors, the tool generates a point value on a categorization scale that ranges from low to maximum.

The Fire Department staff used this tool to RHAVE score the predominating building type found in each of the 40 Fire Department response grid areas. These areas are smaller than a single first-due fire company area and allow the Department to locate types of calls for service and fire prevention activities in small segments of the community, which allows better planning than a macro, community-wide approach. On map set #2, the response grid sections are color coded to show the different building fire risk values. The Eureka Fire Department is no different from most suburban communities where housing and neighborhood low-rise commercial uses comprise most of the building types.

We can see on the map exhibit that most of the Eureka Fire Department buildings are of low to moderate fire risk. However, there are three grid areas in the older downtown waterfront area that scored as significant for building fire risk as seen in Map #2. Many of the significant risk buildings are older without fire sprinklers.

As an additional risk assessment step, Citygate and the Department asked the national Insurance Services Organization (ISO) to provide its data on the Eureka Fire Department. The ISO evaluates fire departments for the insurance underwriting industry. One of their methods is to send an evaluation engineer to assess significant buildings in a community to determine their risk of serious fire. On the same risk Map #2, those buildings in the City that the ISO has specially assessed are plotted; there are 201 in all. There are 44 buildings where the calculated fire flow needed is 3,000 gallons per minute or greater if the building was heavily involved in fire. This is a significant amount of firefighting water to deploy, and a major fire at any one of these buildings would outstrip the on-duty Eureka ***and*** Humboldt Fire District fire force. It is no coincidence that many of the buildings are in the one significant risk area and just south of it is where the older commercial section of the City exists. If the RHAVE significant area is taken together with the ISO sites, this is where an "effective response force" or First Alarm assignment must be located. An effective response force is deployment of multiple units so they can arrive close enough together to combat serious ***building*** fires. Fortunately this is where both the engine and the truck apparatus are located at the headquarters station, but the ladder truck only has one person assigned to it.

However, it is the significant risk posed by these buildings that causes Citygate the most concern. If a fire in a large building is above the ground floor or the reporting time is slow and the fire is well seated, the current fire defense system cannot cope except in fully sprinklered buildings. There is no depth in the current system to handle a large fire without significant callback and mutual aid response, the arrival time of which can be long and/or uncertain.

Special Hazard Risks

Eureka has some businesses that use hazardous materials. Examples are gasoline stations, dry cleaners, the ice plant, water treatment facilities, and garden shops with chemicals. These businesses are highly regulated by the building, fire and environmental codes. The County Environmental Health Department supervises and inspects these facilities. Specialized hazardous materials response is provided via the mutual aid system. The Humboldt/Del Norte County hazardous material unit is located at the EFD Headquarters Station and staffed by EFD personnel.

Wildland Fire Risk

Eureka has pockets of grass and native trees in between developed areas and on the outskirts of the City. Because of the cool climate and summer fog, the threat of wildfire in Eureka is quite low. On those rare occasions when the summer weather is hot, there is some risk of wildland fire in the City proper and on its perimeter. To combat this occasional risk, the Eureka Fire Department works closely with its mutual aid partner fire departments. Eureka enjoys a good working relationship with the Humboldt Fire District on its perimeter and with the California Department of Forestry and Fire Protection. The City does not have any State Responsibility Lands in it that the Department of Forestry would be the primary responder for. As such, the Eureka Fire Department is trained and equipped for wildfire responses in the City. The Department does use CDF on occasion, but CDF's response distances into the City are longer than those of other mutual aid departments.

Critical Tasks Time Measures - What Must be Done Over What Timeframe to Achieve the Stated Outcome Expectation?

Fires and complex medical emergencies require a timely, coordinated effort in order to stop the escalation of the emergency. In this phase of the Standards of Response Cover process, time studies must be performed to determine how many personnel are required over what timeframe to achieve the stated outcome expectation. Once the tasks and time to accomplish them to deliver a desired outcome are set, from that travel time station spacing can be calculated to deliver the requisite number of firefighters over an appropriate timeframe.

Offensive vs. Defensive Strategies in Structure Fires Based on Risk Presented

Most fire departments use a strategy that places emphasis upon the distinction between offensive or defensive methods. These strategies can be summarized as follows:

> *"It is important to have an understanding of the duties required at a structural fire to meet the strategic goals and tactical objectives of the Fire Department response, and fireground operations fall in one of two strategies –* ***offensive or defensive.***
>
> - *We may risk our lives a lot to protect* ***savable*** *lives*
> - *We may risk our lives* ***a little*** *to protect* ***savable*** *property*
> - ***We will not risk our lives at all to save what is already lost****.*
>
> *Considering the level of risk, the Incident Commander will choose the proper strategy to be used at the fire scene. The Incident Commander must take into*

consideration the available resources (including firefighters) when determining the appropriate strategy to address any incident. The strategy can also change with conditions or because certain benchmarks (i.e., "all clear") are achieved or not achieved.

*Once it has been determined that the structure is safe to enter, an **offensive** fire attack is centered on life safety. When it is safe to do so, departments will initiate offensive operations at the scene of a structure fire. Initial attack efforts will be directed at supporting a primary search – the first attack line will go between the victims and the fire to protect avenues of rescue and escape.*

*The decision to operate in a **defensive** strategy indicates that the offensive attack strategy, or the potential for one, has been abandoned for reasons of personnel safety, and the involved structure has been conceded as lost (the Incident Commander makes a conscious decision to write the structure off). The announcement of a change to a defensive strategy means all personnel will withdraw from the structure and maintain a safe distance from the building. Captains will account for their crews. Interior lines will be withdrawn and repositioned. Exposed properties will be identified and protected."*

Many fire department deployment studies using the Standards of Response Coverage process, as well as NFPA guidelines, arrive at the same fact – that a moderate risk structure fire needs a minimum of 14-15 firefighters, plus one incident commander. The NFPA recommendation used as an initial reference point by Citygate in this report is that the first unit should be on-scene within 6 minutes of call receipt (1-minute dispatch, 1-minute crew turnout and 4-minute travel), 90 percent of the time. The balance of the units should arrive within 10 minutes of call receipt (8-minute travel), 90 percent of the time, if they hope to keep the fire from substantially destroying the building. It must be pointed out that a 1-minute turnout time is not realistic with current protective clothing that must be donned under OSHA regulations. An achievable goal is 2 minutes at 90 percent.

For an extreme example, to confine a fire to one room in a multi-story building requires many more firefighters than in a single-story family home in a suburban zone. The amount of needed staffing can be derived from the desired outcome and risk class. If the City of Eureka desires to confine a one-room fire in a residence to the room or area of origin, that effort will require, at the minimum, the entire on-duty force of 10 line firefighters plus one 3-person Humboldt Fire District unit. This number of 13, plus two incident command officers, is the minimum needed to safely conduct the simultaneous operations of rescue, fire attack, and ventilation plus providing for firefighter accountability *in a low to moderate risk, one attack line fire*. A serious fire in a two-story residential building, an old historic house or a one-story commercial or multi-story building would require at a minimum an additional 2-3 engines, an additional Truck and Battalion Chief, for upwards of 12 plus additional personnel. A typical auto accident requiring patient extrication or other specialty rescue incidents will require a minimum of 9 firefighters plus the chief for accountability and control.

Given the firefighter safety accountability regulations in place today, it would not be uncommon that even a serious house fire is drawing in one or two additional mutual aid units. When this occurs, the Department's reserve units are staffed with call back personnel and mutual aid must cover any secondary calls for service that occur. Examining the incident data in this study

showed 25 percent of the incidents occurred when the Department was already engaged in another response activity[1]. This factor must be taken into account when developing a total response system in an environment akin to Eureka's. Since the availability of trained career, staffed, mutual aid units is almost non-existent, the reliability of the back-fill system is always suspect. The quantity and response time of volunteer units cannot be predicated or guaranteed. The fact that calls for service occur during times of peak human activity, means that even 2 medical calls occurring at once remove from service two engines and possibly the Duty Chief if one call is a rescue call. Thus, from a total on-duty firefighter count of 11, if 7 of the personnel are committed, this only leaves 4 City firefighters, which is an inadequate attack force on anything more than a simple fire, even if augmented by 3-firefighters from the Humboldt Fire District.

If the fire goes beyond the initial alarm stage, the Department must activate mutual aid and recall career personnel after committing all on-duty resources. Staffing of the first reserve engine and the reserve ladder truck generally takes 30-40 minutes with recall personnel. After that, the Department can generally staff additional units if they get a reasonable turnout. The average response of off-duty recalled personnel is 13.5 firefighters, based on a review of data from the last eight recalls over a four-year period. This is barely sufficient to staff three engines and a truck also assuming that qualified engineers and captains return to drive and supervise the reserve units.

Keep in mind that a firefighter can only deliver about 50 gallons per minute of the required fire flow. This includes all the officers, rapid intervention crews, personnel in rehabilitation, etc. Thus, a 3,000-gallon per minute required fire flow structure would need at least 60 firefighters.

The other 47 firefighters required in a 3,000-gallon per minute structure would have to come from mutual aid. What will be the mutual aid response?

Eureka Fire Department Mutual Aid Response:

Department / Station Name	Travel Distance in miles	Travel Time in minutes w/ turnout time	Engine companies they would send	Truck companies they would send	Total personnel they would send	Cumulative personnel from mutual aid
Arcata	10	20	1	1	3 per unit	6
Loleta	13	20	1		3	9
Blue Lake	18	20	1		3	12
Fieldbrook	20	25	1		3	15
Ferndale	20	25	1		3	18
Fortuna	20	25	1	1	3 per unit	24
Rio Dell	26	32	1		3	27

[1] As occurred at the fire at the foot of "F" Street, October 2005. EFD engine 1 and the HFD E-11 and E-12 were the second and third arriving engines due to the closer EFD E-3 and E-4 engines being delayed due to other calls.

Without adding the dispatch time lag time by about 32 minutes into the mutual aid request, if the volunteer based units can be staffed to respond, there will be about 40 firefighters on scene to handle and incident that requires at least 60 if there is to be any progress made. This time factor now is so far into the fire that conditions would prohibit interior firefighting and rescue operations in many buildings.

The more realistic conclusion is that the Fire Department would go into the "defensive" mode of fire attack, essential writing off the building on fire and protecting the neighborhood from a structural conflagration. The Fire Department would achieve this using "master" stream appliance (capable of applying up to 1,000 gallons per minute) on the ground or mounted on engines and aerial ladder trucks. This approach would still require upwards of thirty to forty firefighters.

Critical Time Task Measures

In order to understand the time it takes to complete all the needed tasks on a residential moderate to high risk fire and a modest traffic collision rescue, the Department conducted timed trials using their standard operating procedures to demonstrate how much time the entire operations take. The following table starts with the time of 911-call receipt and finish with the outcome achieved. There are several important themes contained in the charts below:

1. The test building was a vacant two-story residential structure, typical of the higher risk residential structures found in Eureka.
2. It is noticeable how much time it takes after arrival or command orders an event to actually accomplish key tasks to arrive at the actual outcome. This is because it takes firefighters to carry out the ordered tasks. The fewer the firefighters, the longer some task completion times will be. *Critical steps* are highlighted in ***grey*** in the table.
3. The time for task completion is usually a function of how many personnel are ***simultaneously*** available.
4. Some tasks have to be assigned to a minimum of two firefighters to comply with safety regulations. An example would be searching a smoke filled room for a victim.

The following table of individual duties is required at a First Alarm fire scene in a moderate risk building. This set of duties is taken from the Eureka Fire Department operational procedures. This set of needed duties is entirely consistent with the usual and customary findings of other agencies using the Standards of Response Cover process and that found in NFPA #1710.

The scenario represents a two-story, single-family dwelling fire, with approximately 500 square feet of fire involvement. No condition existed to override the OSHA 2-in-2-out safety requirement:

Full response to a two-story Victorian style residence, fire showing first floor

Engine Unit ID	Bench Marks	Total Time On-Scene	Total Reflex Time from 911 Call
	Total Call Process, Turnout and Travel Time:		7:00
E-3	On Scene TIME BEGINS – Engine 3 at hydrant	0:00	
E-3	Size-up by captain & assumes command	1:48	
E-1	Assigned as Rapid Intervention Crew	2:00	
E-3	Lays supply line and line charged	2:01	
	Chief - Transfer of command from E-3 to 3F1	2:34	
E-4	Assigned as "Ventilation Group"	3:00	
T-1	Merge with E-4 as "Ventilation Group"	3:00	
E-3	Attack line pulled and charged (150' 2 ½" + 100' 1 ¾" high rise pack)	5:35	
E-1	RIC established	5:50	
E-3	Forcible Entry through front door	**5:59**	**12:59**
E-12	2nd Chief Assigned "Safety"	6:00	
E-3	Assigned as "Search Group"	6:10	
	Attack line advanced interior	6:35	
E-1	Secures Utilities	6:37	
E-4/T-1	Ladder to roof	8:05	
E-3	Fire Attack reports fire knock down division 1	**9:15**	**16:15**
E-4/T-1	Roof cut and ceiling opened	10:15	
E-12	Primary search all clear division 1	**12:26**	**19:00**
E-4/T-1	Reassigned to division 2 to check for extension/ overhaul	15:26	
E-12	Primary all clear division 2	17.24	
E-12	Secondary search all clear division 1	19:29	
E-12	Secondary search all clear division 2	22:40	
E-4/T-1	Ceiling pulled and walls opened up	23:51	
E-3	Advises they have Fire Control	**32:10**	**39:00**
	Overhaul operations started		
	Total Time On-Scene for Fire Control:	**32:10**	**39:00**

The task times were combined with the NFPA ideal times for dispatch, turnout and travel times for a "typical" building fire response. This gives an arrival time for the first-due unit at about minute 7. As this study noted above in the response times section, on many Eureka calls for service, this has actually taken 9:45 minutes, or 2:45 minutes longer (reference Structure Fire data on page 14). Thus, all the total reflex times in the table above could actually take 2:25 minutes *longer*.

The above duties grouped together form an *effective response force or First Alarm Assignment*. Remember that the above discrete tasks must be performed simultaneously and effectively to achieve the desired outcome. Just arriving on-scene does not stop the escalation of the emergency. Firefighters accomplishing the above tasks do, but as they are being performed, the clock is still running, and has been since the emergency first started. The above tasks also do not show the time it takes after fire control to overhaul and ensure final extinguishment and building safety for turnover back to the owner.

The lesson from the above table is that when arriving with only 13 firefighters and two chiefs, fire attack and search are not completed until after total reflex minute 19, which is long after a serous fire has left the room of origin at minute 8-10 according to national fire research and data studies. Thus, the on-duty force is hard-pressed to keep a serious fire upon arrival from spreading to the walls and attic, by which time the building is essentially destroyed. Fire victims will not survive after the room of origin becomes completely involved and the hot fire gasses traverse the floor of origin. Therefore, rescue must occur before total reflex minute 10.

For comparison purposes, the critical task table below reviews the tasks needed on a typical auto accident rescue call that requires multiple units using 14 firefighters total:

Engine Unit ID	Bench Marks	Total Time On-Scene	Total Reflex Time from 911 Call
	Total Dispatch, Turnout and Travel Time:		7:00
	TIME BEGINS	0:00	
E-4	Size-up by captain & assumes command	0:20	
E-4	Protection line pulled & charged by Engineer	1:06	
E-4	FF makes patient contact (patient #1, car #1)	1:07	
E-1	Assigned "Extrication Group"	1:38	
E-1	**Stabilizes vehicle**	**3:24**	**10:24**
E-11	Assigned as "Patient Care Group"	3:40	
E-1	Hydraulic tools moved to vehicle area & hydraulic pump started	3:44	
T-1	Assigned to "Extrication Group"	4:12	
E-11	Patient #1 Cervical collar applied	4:47	
E-3	Assigned to "Patient Care Group" (car #2)	5:03	
E-3	FF into car #2 via back window	6:28	

Engine Unit ID	Bench Marks	Total Time On-Scene	Total Reflex Time from 911 Call
E-3	C-collar placed onto patient #2	6:30	
E-11	Patient #1 removed from car #1 on backboard	7:00	
E-11	**Patient #1 packaged and ready for transport**	**7:07**	**14:07**
Chief	Transfer of command from E-4 to 3F2	9:46	
E-1/T-1	Driver's side door removed	10:09	
E-1/T-1	Roof removed/ windshield removed	17:28	
E-3	Patient #2 removed by backboard	19:28	
E-3	**Patient #2 packaged and ready for transport**	**21:04**	**28:04**

The EMS rescue times above are adequate to get the patients to definitive trauma medical care within the trauma medicine goal of 1-hour.

Critical Task Measures Evaluation

What does a deployment study derive from a response time and crew task time analysis? The total completion times above to stop the escalation of the emergency have to be compared to outcomes. We know from nationally published fire service "time versus temperature" tables that after about 8-10 minutes of free burning a room fire will grow to the point of flashover where the entire room is engulfed, the structure becomes threatened, and human survival near or in the fire room becomes impossible. We know that brain death occurs within 6 to 10 minutes of the heart having stopped. Thus, the effective response force must arrive in time to stop these catastrophic events from occurring.

The response and task completion times discussed above show that the citizens of Eureka are able to expect good outcomes and have a better chance than not of survival in a *modest* fire or medical emergency, when the closest responding units *are* available. Having stated this, the measured control times are at the outer edge of acceptable performance. With the staffing available, in a normal training simulation, it still takes 13:45 minutes after the 911 call to *begin* to place water on the fire. The total control time of 39 minutes noted above (after the 911 call is received) still occurs too long after flashover to prevent the fire from substantially destroying the area of origin, if not the building.

It was noted earlier in this report that 87 percent of the calls for service is arrived at by total reflex minute 7. Therefore, the current Eureka Fire Department deployment model works well in most areas. In the fringe areas, or when the first-due station is not available, a serious fire could grow to dangerous proportions.

In traffic collision incidents the times are good for trauma patients, when all the needed units can arrive by minute 12, which is not always possible at the outer edges of the Department, or when multiple calls for service occur.

However, each of these incidents, while only being moderate in size, required 10-13 personnel, or effectively the **entire on-duty** City force **and** 50 percent of the Humboldt Fire District force.

When this occurs, only one unit with a total of 3 personnel from the Humboldt Fire District is left for other emergencies. Thus, the total on-duty force cannot handle two serious emergencies at once; for that, the departments must recall off-duty personnel and/or request mutual aid from adjoining departments.

Fires and complex medical incidents require that the other needed units arrive in time to complete an effective intervention. Time is one factor that comes from great station placement. Good performance also comes from ***adequate staffing***. On the fire and rescue time measures above, the Eureka Fire Department can do a good job, in terms of time, on small fires and routine medical incidents. This is typical of suburban departments that staff 3-person crews for average, routine emergencies. However, serious fires and medical emergencies where the closest unit is not available to respond ***will*** challenge the Eureka Fire Department response system to deliver good outcomes. This factor **must** be taken into account when we look at fire station locations.

Previous critical task studies conducted by Citygate, the Standard of Response Cover documents reviewed from accredited fire departments, and NFPA recommendations all arrive at the need for 15+ firefighters arriving within 10 minutes (from the time of call) at a room and contents structure fire to be able to ***simultaneously and effectively*** perform the tasks of rescue, fire attack and ventilation.

With City staffing of its engines at 3 and the ladder truck with a minimum of 1, three outcomes will occur. First, only 13 firefighters (using the current 4-engine, 1-truck response model) will arrive on the initial (not recalled personnel) effective response force. If all four engines are sent as in the task table on page 20, then the only uncommitted unit in the combined EFD/HFD configuration is one, 3-firefighter engine, which is usually re-located at the center of Eureka so that it can respond in any direction quickly. With a force of only 13, the task completion times listed above take too long, because the tasks that need to be done by two firefighters for safety have to be done in a linear order, not in parallel as is possible when a four-person crew can be split into two teams. Third, the moderate to large working fires and serious rescues will consume more engines to obtain the needed personnel. At peak demand times of the day, this approach to staffing becomes self-defeating as the additional units being dispatched leave deployment gaps, which then create longer response times for other incidents.

If fewer firefighters arrive, what from the list of tasks mentioned will not be done? Most likely, the search team will be delayed as will ventilation. The attack lines only have two firefighters, which does not allow for rapid movement above the first floor deployment and multi-story residences are common in Eureka. Rescue is done with only two-person teams, thus when rescue is essential, other tasks are not done in a simultaneous, timely manner. Remember what this report stated in the beginning – effective deployment is about the **speed** *(travel time)* and the **weight** *(firefighters)* of the attack.

Yes, 13 initial firefighters can handle a low to moderate risk house fire (especially on the first floor), but only if they do not need, at the same time, to perform rescue, fire attack and ventilation. An effective response force of even 15 (15+1 Command Officer) will be seriously slowed if the fire is in a large older multi-story single-family residence, multi-story apartment building or commercial/industrial building.

Given the Eureka Fire Department response times and staffing levels, compared with mostly moderate building fire risk, the current structure fire response system ***only*** meets the community's needs for *low to moderate risk one room fire on the first or second floor without*

challenging rescue, ventilation or exposure problems. Obviously, in bad traffic or weather, even a properly designed system will have delays.

Thus, today, the Eureka Fire Department has enough on-duty personnel to handle a low to moderate one to two room building fire in a single-story building or a few emergency medical incidents occurring at the same time. The Department would be seriously challenged to handle a working building or grass fire at the same time as an EMS incident. Recall that 25 percent of the time one or more engines are already committed to another incident. The City has been well served by its existing staffing, equipment capabilities and training. When the on-duty staffing is stretched thin, the Department can bring in automatic or mutual aid equipment, but from a distance.

Distribution and Concentration Studies – The Locating of First-Due and First Alarm Resources

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

- **Distribution** – the spreading out or spacing of first-due fire units to stop routine emergencies.
- **Concentration** – the clustering of fire stations close enough together so that building fires can receive enough resources from multiple fire stations quickly enough. This is known as the **Effective Response Force** or commonly the "First Alarm Assignment" **–** the collection of a sufficient number of firefighters on-scene delivered within the concentration time goal to stop the escalation of the problem.

To analyze first-due fire unit travel time coverage for this study, Citygate used a geographic mapping tool from ESRI Corporation called *Network Analyst* that can measure travel time over the street network. For this next portion of the study, Citygate used the basemap and street travel speeds programmed by the Department and Citygate to simulate real world fire truck travel times. Using these tools, Citygate ran several deployment studies and measured their impact on various parts of the community. The time measure used was 4 minutes travel over the road network, which is consistent with the Citygate recommended first-due unit response goal of 7 minutes, 90 percent of the time from the time of 911 notification (1 minute dispatch + 2 minutes turnout + 4 minutes travel). The maps effectively show the area covered within 7 minutes for first-due and 11 minutes for a First Alarm assignment.

Map #1a – Station Locations

This view shows the existing Eureka Fire Department fire station locations, with City boundaries as well as the automatic aid stations that belong to the Humboldt Fire District. This is a reference map view for the other map displays that follow.

Map #1b – Station Locations Enlarged view

This view is simply an enlargement of Map 1 and shows more detail for when the Humboldt Fire District areas are reviewed.

Map #2 – Building Fire Risks and ISO Surveyed Buildings

Map 2 displays risk zones to be related later to the distribution and concentration travel time of the fire crews. This map uses the City response grid zone areas factored by color as to the type of building fire risk present in each zone. Risk determines how many pieces of equipment and how much staffing must arrive to effectively stop a building fire from escalating to greater alarms. Much of the community is urban residential and as such, under a nationally used typing system, is rated low to moderate risk for possible severity of building fires. There are three response areas of significant risk in the community, located in the older historic waterfront downtown area.

Also displayed on this map are the locations of the buildings that the Insurance Service Office (ISO) has evaluated as representing the more significant commercial properties in the Department. The significance of these locations is that these larger buildings are typically the economic and employment heart of the communities. Fires in these buildings must be contained quickly, or the fire will spread to greater alarm proportions.

For the EFD, this map is very noteworthy. Probably the greatest weakness of the fire defense system in Eureka is the ability to mount a strong initial alarm attack on the significant risk buildings. This inability will lead to second and third alarm fires, which will further stretch the capabilities of the fire defense system.

Map #3a – First-Due Unit Distribution at 4-Minute Travel

This map shows in green colored street segments the *distribution* or first-due response time for each station per the current Eureka Fire Department response goal of 4 minutes travel time. Thus, the computer shows how far each company travels within 7 minutes fire department response time from the time of the fire communications center receiving the call prior to dispatch. Therefore, the limit of color per station area is the time an engine could reach, ***assuming*** they are in-station and encounter no unusual traffic delays. In addition, the computer uses mean speed limits per roadway type. Thus, the projection is optimal or "perfect" world. Real dispatch data shows *travel* times to be very similar in the City.

It is not possible to serve every road segment out to the edge of the community in 4 travel minutes; however, these maps show most of the City's streets as well as some of the streets in the fire district are covered.

The purpose of computer response mapping is to determine and balance station locations. This geo-mapping design is then checked in the study against actual dispatch time data, which reflects the real world. There also should be some overlap between station areas so that a second-due unit can have a chance of an adequate response time when they cover a call in another station's area.

Map #3b Fire Stations 4-Minute Travel

This map is a wide area view of Map 3. Displayed here is where the fire district can cover south of the Headquarters Station and how far up the bay that the City stations can cover. At best, very little of the Humboldt Fire District can be reached in 4 minutes of travel.

Map #4 – ISO Coverage Areas

This map exhibit displays the Insurance Service Office (ISO) requirement that stations cover a 1.5-mile distance response area, but without the 4-minute travel streets turned on. This makes it easier to see what the traditional 1.5-mile measure covers. Depending on the road network in a department, the 1.5-mile measure usually equates to a 3 to 3.5-minute travel time. However, a 1.5-mile measure is a reasonable indicator of station spacing and overlap.

This map shows there is adequate coverage in the higher risk core areas of the City, as evidenced by the City being almost totally green within the City proper, as well as adjoining areas.

What this map shows, as well with Map 3, is that Eureka's stations are generally properly located to provide the City with adequate distribution of resources to provide rapid response by the first due company. However, this effectiveness depends on the Humboldt Fire District resources in the Lunbar Hills and southeast Eureka areas.

The only areas that may cause some concern are those areas located in the southeast of the City and in the areas of the Cutten and Ridgewood neighborhoods. Clearly these areas are inadequately served for positive suburban outcome levels, such as keeping the fire to the room of origin, and the lack of a grid street network makes appropriate station location(s) more difficult.

Map #5 – Concentration (First Alarm)

This map exhibit shows the *concentration* or massing of fire crews for serious fire or rescue calls. Building fires in particular require 13 firefighters plus 2 incident commanders arriving within a reasonable time frame to work together and effectively to stop the escalation of the emergency. Otherwise, if too few firefighters arrive, or arrive too late in the fire's progress, the result is a greater alarm fire, which is more dangerous to the public and the firefighters.

The concentration map exhibits look at the Department's ability to deploy four engines, one Ladder Truck Company, and one Incident Command Officer (Chief or Captain II) to building fires within 8 minutes travel time (11 minutes total Fire Department response time). This measure ensures that a minimum of 13 (4-engine/1-truck response) firefighters and one Command Officer deployed can arrive on-scene to work ***simultaneously*** and effectively to stop the spread of a *small* fire.

The colors in the map show the area in **green** color where the Eureka Fire Department current fire deployment system should deliver the initial effective response force. Streets without the green highlights are less than 4 unit coverage.

Map #6a – Effective Firefighting Force – Firefighter Density

This map shows a different view of concentration by only showing the 8-minute travel coverage by the number of personnel on the arriving firefighting force. The dark green area is 16 firefighters, the medium green is 13 or 14 firefighters, 12 or less firefighters is shown in shades of red. This effective force of 16 is based on the First Alarm consisting of five engines (two from the HFD) and one truck (staffed with one) plus a command officer. This map assumes that **both** the HFD units respond and that *all* the combined fire stations are available.

Map #6b—Effective Firefighting Force – Firefighter Density

This is the same as Map 6, but showing the larger Fire District view. It is again important to note that areas southeast of the current City limits do not receive a full First Alarm and only some of the streets receive 8 firefighters in 8 travel minutes.

Map #7 – Ladder Truck Coverage

This map set displays the 8-minute travel time coverage for the ladder truck. It shows that the Truck is properly located at the Headquarters Station, providing coverage to virtually the entire City. Again, as with engines, there is inadequate truck coverage southeast of the City.

Map #8 – Battalion Chief Coverage

This map shows the 8-minute travel time coverage for the Incident Command Officer from the Headquarters Station during the workweek. Duty Chief officers must respond from home after hours. As with the Ladder Truck Company coverage, the Incident Command Officer provides coverage to virtually the entire City when responding from the Headquarters Station. This does not occur when responding from home.

Map #9 – Engine Concentration Density

Map #5 showed the concentration coverage for 4 engines, 1 truck and a command officer, as one color. Here, using color bands, the areas receiving the least to most multiple *engine* coverage are shown. The important finding in this map is that the central core of the City where all five of the stations – 3 EFD and 2 HFD – come together receive adequate engine coverage. By referring back to Map #2, all five engines can respond into the significant risk areas with the exception of the newer commercial development along Highway 101 leading south from Eureka. Part of this is a function of appropriate station location and part is a result of the excellent street grid system.

Map #10 – All Incident Locations

This is an overlay of the exact location for all Fire Department incident types for the 36-month data set. It is apparent that there is a need for Fire Department services on almost every street segment of the City. Given the shared police dispatch system, also shown are locations in the HFD area where Eureka units responded to under the automatic aid agreements.

Map #11 – EMS Incident Locations

This map set further breaks out only the emergency medical and rescue call locations. Again, with the majority of the calls for service being emergency medical, almost all areas need Fire Department services.

Map #12 – All Fire Type Locations

This map set identifies the location of all fires in the City. All fires include any type of fire call from auto to dumpster to building. There are obviously fewer fires than medical or rescue calls. Even given this, it is evident that all first-due engine districts experience fires. However, notice that the concentration of fires is higher in the significant risk area of the City.

Map #13 – Structure Fire Locations

This map is similar to the previous map, but only displays structure fires for the 36-month data set. While the structure fire count is a smaller subset of the total fire count, there are two meaningful findings to this map. There are still structure fires in every first-due fire company district. The location of many of the building fires parallels the higher risk and older building type commercial areas of the City where we find more of the significant risk and the ISO evaluated buildings. These areas and buildings are of significant fire and life loss risk to the City. Fires in the more complicated building types must be controlled quickly or the losses will be very large. Fortunately, concentration (First Alarm) coverage is good in the downtown waterfront core of the City.

Map #14 – All Incident Location Densities

This map set examines by two types of mathematical density where clusters of incident activity occurred. In this set, all incidents are plotted by the density and then within that, the contour lines and spots show the most specific locations of high-density workload. For each density measure, the darker the color, the greater the quantity of incidents. This type of map makes the location of frequent workload more meaningful than just mapping the dots of all locations as done in Map #10.

Why is this perspective important? Overlap of units and ensuring the delivery of a good concentration for the effective response force. When we compare this type of map with the concentration map, we want the best concentration to be where the greatest density of calls for service occurs. For the Eureka Fire Department, this mostly occurs in between and around the Headquarters Station, which is where the current stations, both EFD and HFD, come together the best. The Headquarters Station has both an engine and a truck, albeit the truck staffing is one firefighter.

Map #15 – EMS Incident Location Densities

This map set is similar to Map #14, but only the medical and rescue hot spots of activity are plotted. The clusters of activity look very similar to the all-incident set in Map #14 because medical calls are such a large part of the total.

Map #16 – All Fire Location Densities

This map sets shows the hot spot activity for all fires. Again, the call for service density is highest in the Headquarters Station's area, where there is support from the other four stations. This is also the area with the most significant fire risk.

Map #17 – Structure Fire Densities

This map only shows the building fire workload by density. Here, once more, the activity cluster is in the older downtown waterfront area of Eureka nearest the Headquarters Station. This is why even with longer than desirable response times, the Department is holding its own for fire loss, as most of the structure fires occur in the one area of the City that can receive adequate First Alarm multiple-unit coverage. This concentration of building fires is also in the significant risk and ISO areas as shown on Risk Map #2.

Additional Development and Fire Station Locations

If additional suburban density growth is approved southeast of the current City limits, Maps 3b and 6b clearly show that if good suburban outcomes are to be provided, such as confine the fire to the room of origin and to intervene successfully in cardiac arrest patients, then there is **not adequate** 4- or 8-minute travel coverage into this area from any of the existing City or District stations.

There are four options available if good outcomes are desired:

1. Annex the area to the City, build to City standards, require the developer to set aside land and build and equip a fire station, *and* provide a per parcel assessment to meet the staffing requirements in perpetuity.
2. If the area stays in the HFD, require the same as in #1 above.
3. Mandate a zero square foot residential fire sprinkler requirement.
4. Inform the residents via a deed recordation in escrow that they have limited, rural fire and EMS protection and to not expect a fire station to be added.

A hybrid option would be to add another fire station in this area and share the cost three ways since there is a broader benefit. Both the City and the Fire District need more daily staffing. An additional 3-person crew in this area could be cost shared across the new homeowners and the two existing jurisdictions. Either department could actually operate the stations and receive an operating expense share from the other.

Response Historical Effectiveness and Reliability – What Statistics Say About Existing System Performance

In this section of the Standards of Response Cover process, prior response statistics are used to determine what percent of compliance the existing system delivers. In other words, if the geographic map measures say the system will respond with a given travel time, does it actually deliver to expectations?

The Distribution and Concentration sections of this report used geographic mapping tools to estimate travel time over the street network. Thus, the maps show what *should* occur from the station placements. However, in the real world, traffic, weather, and units being out of quarters on other business such as training or fire prevention duties affect response times. Further, if a station area has calls for service at the same time, the cover engine must travel much further. Thus, a complete Standards of Response Coverage study looks at the actual response time performance of the system from incident records. Only when combined with map measures, can the system fully be understood.

As a review of actual performance occurs, there are two perspectives to keep in mind. First, NFPA #1710 only requires that a Department-wide performance measure of 90 percent of the historical incidents (not geography) be maintained. As discussed earlier in this report, this allows the possibility that a few high performing stations can "mask" the performance of stations with poorer travel times. In the Standards of Response Coverage approach, it is recommended that the performance of each station area also be determined to ensure equity of coverage. However, even this approach is not perfect – a station area may well have under 90 percent performance, but be low risk or under developed thus not yet have an economic justification for

better performance. In addition, the study must discuss just what is measured within the under performing statistic. For example, a station area with a first-due performance of 88 percent with only 50 calls in the 88th to 90th percentile is far different from an area with 500 calls for service in that 88th to 90th percentile.

All measures then must be understood in the complete context of geography, risk, and actual numbers of calls for service "under performed on." The Department's response time performance must be compared to outcomes such as fire loss or medical cases and be contrasted to the community's outcome expectations. A community could be well deployed and have poor outcomes or the reverse. A balanced system will avoid such extremes and strive for equity of service within each category of risk.

Data for this section of the study was extracted from the Eureka Police Department dispatch system and the Department's incident records management system. Response time is measured from the time of fire dispatch receiving the call to the unit being on-scene. Thus, a 4-minute travel time when 2 minutes is added for turnout time and 1 minute for dispatch processing is a 7-minute total reflex (customer) measure. For multiple-unit calls, the outer measurement is 8 travel minutes, plus minutes for turnout and 1 minute for dispatch, which is an 11-minute total reflex measure. Data was "cleaned" to eliminate records without enough time stamps or records with impossible times such as a 23-hour response. The data was modeled in a new fire service analysis tool called NFIRS 5 Alive.

For this review, we are modeling the Department's prior performance and comparing the data results to the "ideal" per NFPA #1710 for fire service deployment. Later, this study will integrate all the SOC study elements to propose refined deployment measures that best meet the risk and expectations found in Eureka.

Statistical Overview

For the Fire Department Management Team's use, there is an in-depth statistical appendix attached to this report. Earlier in this report, the response time statistics were summarized. Below is a summary of other findings from the response statistics study.

While the 36-months of data partially cover the years of 2002 through some of 2005, it is possible to break the 36-months of data into three 12-month fiscal years. This will allow for monthly graphing with each month appearing once in each fiscal year.

	FY2004	***FY2005***	***FY2006***
	7/1/2003 – 6/30/2004	*7/1/2004 – 6/30/2005*	*7/1/2005 – 6/30/2006*
Incidents	3,316	3,107	3,215

There was a slight variation in the total number of incidents over the period. This is not unusual in a department serving what is essentially a built out area. The total number of apparatus responses decreased by less than 3 percent during the same period, indicating a fairly static response situation. Below is a list of the top incident types for the 36-month period:

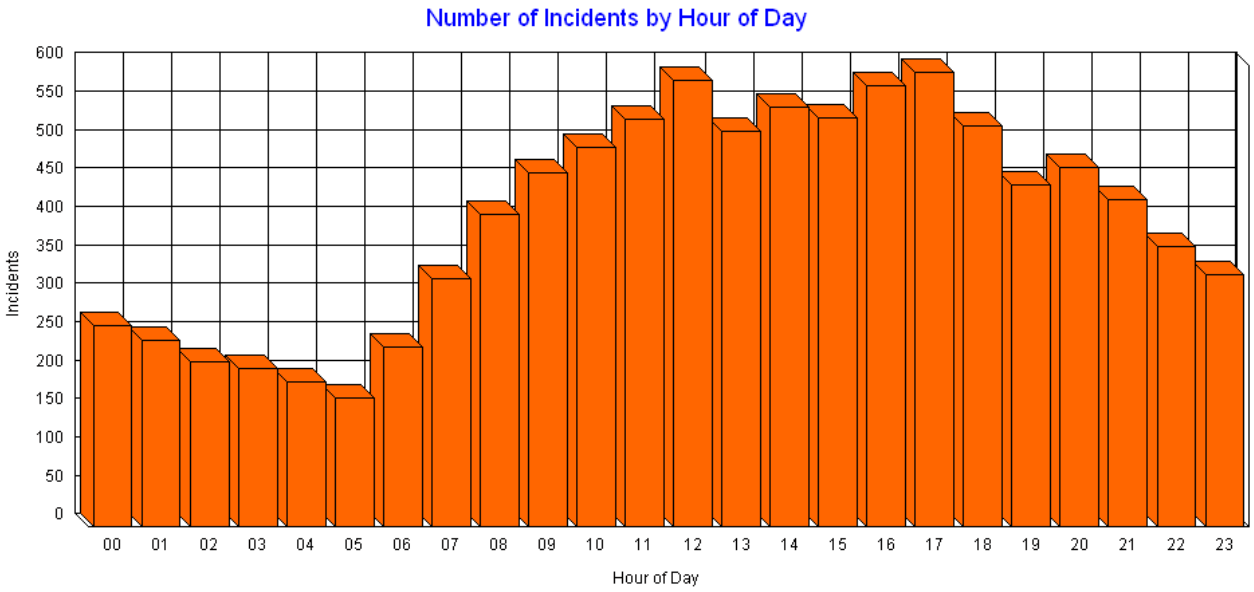
Incident Type	Count
EMS call, excluding vehicle accident with injury	4,945
Medical assist, assist EMS crew	642
Dispatched & canceled en route	526
False alarm or false call, other	405
Good intent call, other	306
Person in distress, other	253
Vehicle accident with injuries	252
Assist invalid	231
Building fire	181
Power line down	124
Unauthorized burning	108
Assist police or other governmental agency	107
Passenger vehicle fire	87
Smoke or odor removal	82
Service Call, other	72
Motor vehicle/pedestrian accident (MV Ped)	68
Hazardous condition, other	60
EMS call, party transported by non-fire agency	57
Brush, or brush and grass mixture fire	54
Outside rubbish, trash or waste fire	46
Authorized controlled burning	46
Gas leak (natural gas or LPG)	45
Oil or other combustible liquid spill	45
Smoke scare, odor of smoke	43
Dumpster or other outside trash receptacle fire	37
Electrical wiring/equipment problem, other	36
Lock-out	31
Gasoline or other flammable liquid spill	30
Fire, other	29
Hazmat release investigation w/ no hazmat	29
Water or steam leak	27
Natural vegetation fire, other	26
Arcing, shorted electrical equipment	25
Steam, vapor, fog or dust thought to be smoke	25
Grass fire	24
Extrication of victim(s) from vehicle	22
Cooking fire, confined to container	21
Outside rubbish fire, other	21
Special outside fire, other	21
Chimney or flue fire, confined to chimney or flue	20

Here is a chart showing the top types of property receiving service from the Eureka Fire Department during the 36-month data period. Property types with fewer than 20 responses were eliminated from the list.

Property Type	Count
1 or 2 family dwelling	3,161
Multifamily dwellings	1,346
Street or road in commercial area	614
Residential street, road or residential driveway	550
Boarding/rooming house, residential hotels	301
Vehicle parking area	285
Hotel/motel, commercial	248
Outside or special property, other	207
Street, other	179
Food and beverage sales, grocery store	165
Highway or divided highway	149
Residential board and care	145
Residential, other	126
Mercantile, business, other	106
Business office	97
24-hour care Nursing homes, 4 or more persons	90
Open land or field	77
Service station, gas station	71
Alcohol or substance abuse recovery center	68
Undetermined	68
Dormitory type residence, other	59
Restaurant or cafeteria	58
General retail, other	55
Jail, prison (not juvenile)	52
Department or discount store	46
Eating, drinking places	45
Motor vehicle or boat sales, services, repair	44
High school/junior high school/middle school	41
Vacant lot	40
Professional supplies, services	38
Hospital - medical or psychiatric	35
Convenience store	35
Asylum, mental institution	31
None	25
Health care, detention, & correction, other	24
Elementary school, including kindergarten	23
Specialty shop	22
Manufacturing, processing	22
Railroad right of way	21

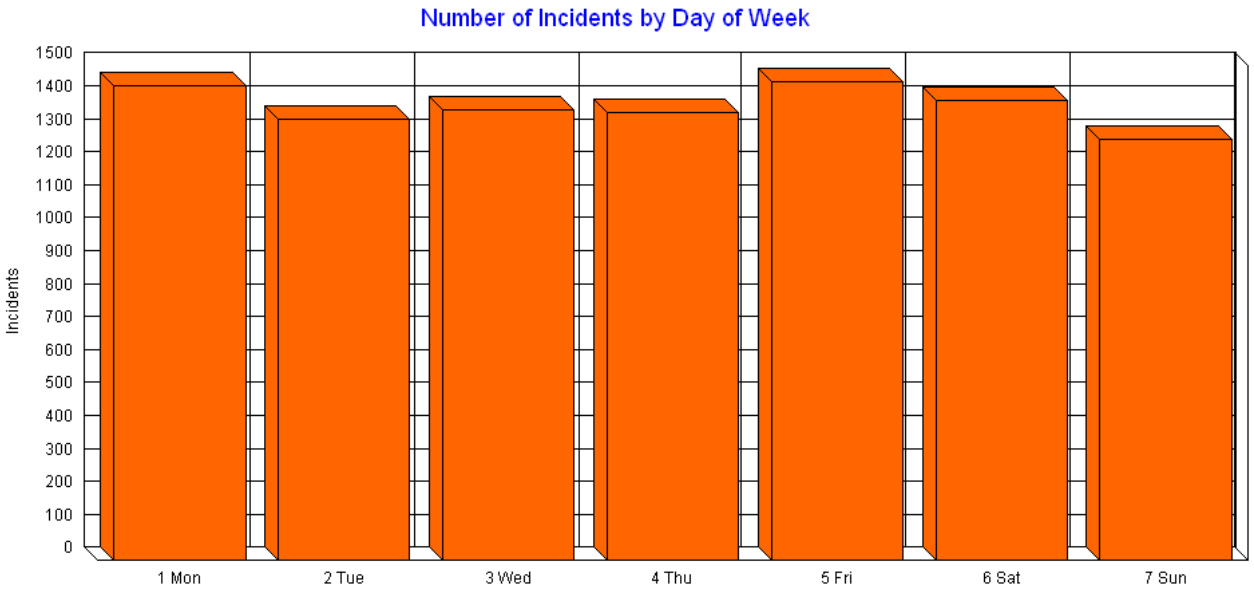
Chronological Distributions

The following graph illustrates the number of incidents by hour of the day, day of week and month of year for the three-years of available data.

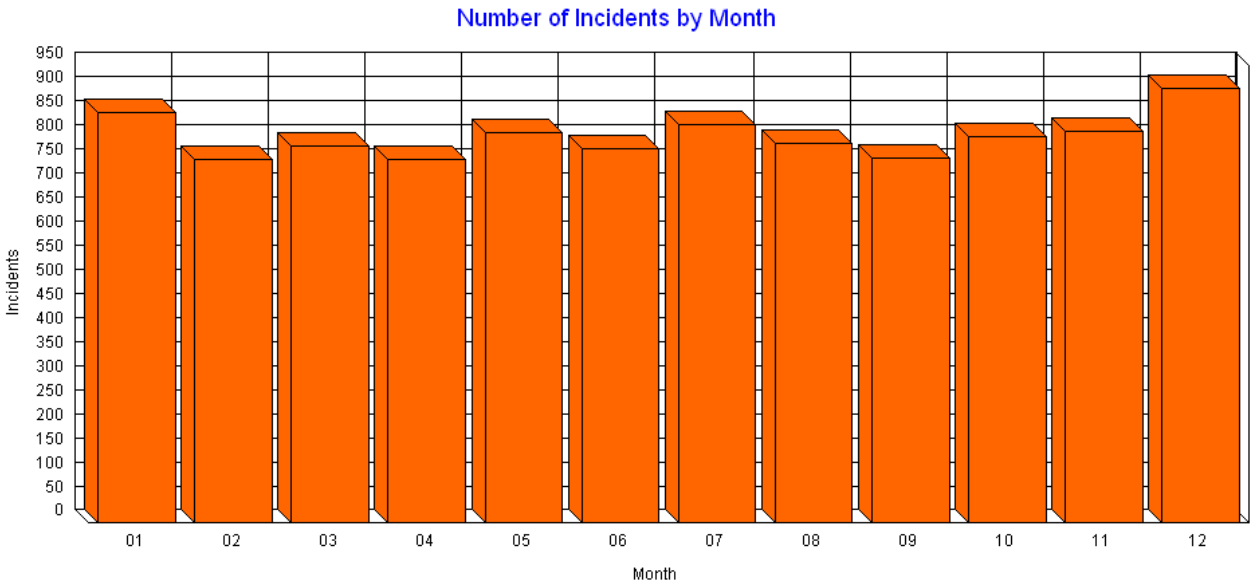


Notice a minimal number of incidents in the early morning. After 5:00am the number of incidents grow through the late morning remaining fairly consistent through an evening drop-off. This response graph is a fairly typical representation of fire department activity.

The number of incidents tends to remain relatively constant by day of week with a slight increase in incident activity on Friday and Monday. This trend is illustrated in the following graph.

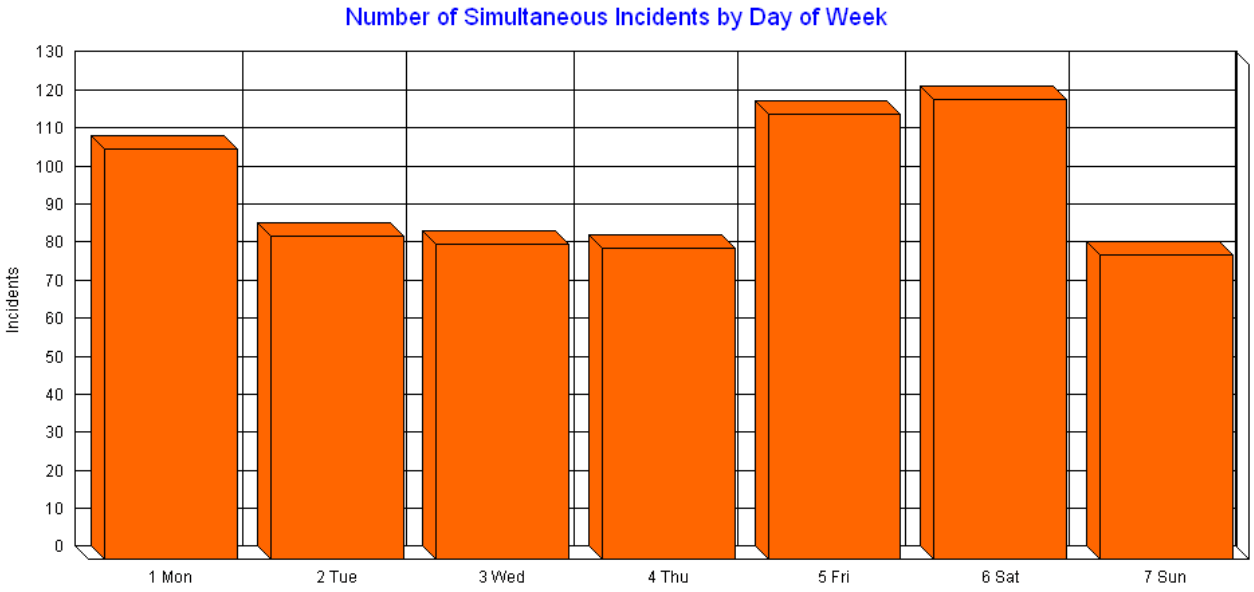


The following graph illustrates the monthly number of incidents. While monthly totals remain fairly consistent there is a slight spike of activity in December and January.

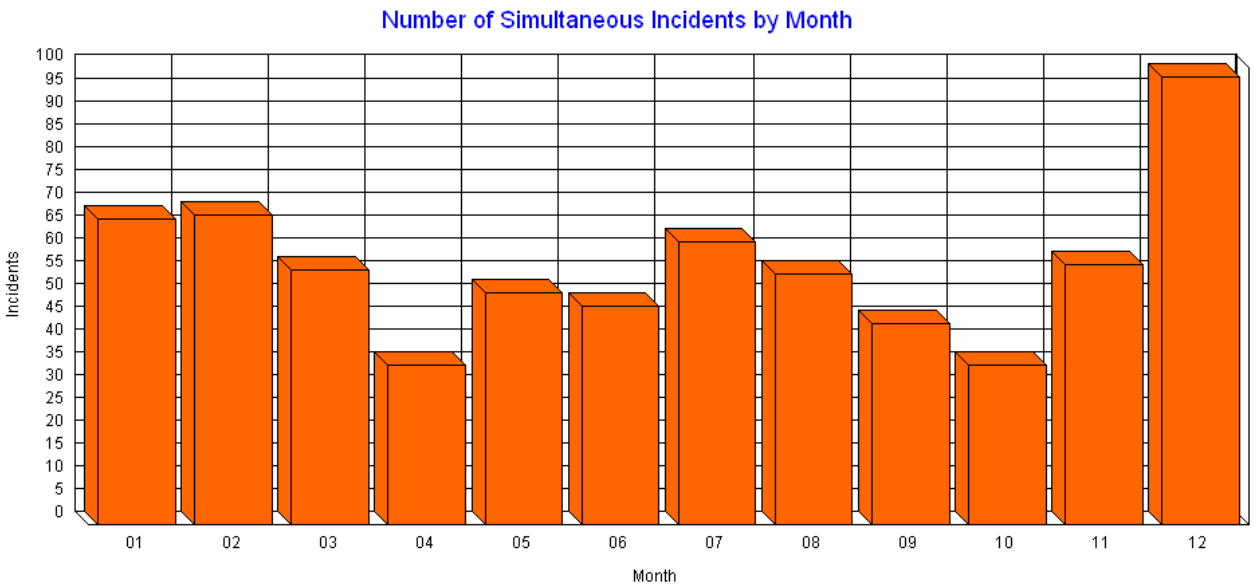


Simultaneous Incident Demand

Earlier in the report, the rate of simultaneous incidents was discussed by total frequency and hour of the day. Here is the pattern by day-of-the-week.



The occurrence of simultaneous incidents is greatest on Saturday and Friday with minimum simultaneous activity on Sunday. This is roughly in line with overall activity levels.



Simultaneous activity increases greatly in the month of December. It is at its minimum in April and October.

Deployment Compliance

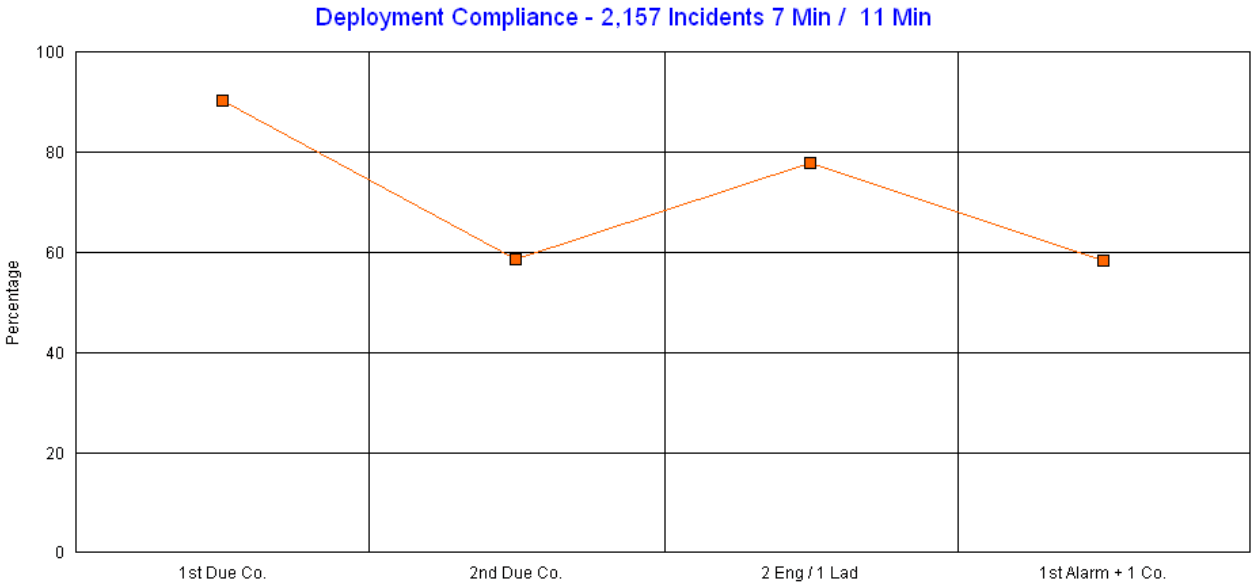
Another measure of deployment is the arrival of the effective response force or "First Alarm" on the scene within 11 minutes from the time of receiving the 911 call for help.

In this case a First Alarm assignment of 3 City engines and 1 truck with a first unit arrival at 7 minutes and a *City only* First Alarm of 3/1 arriving by 11 minutes across the 36-month data set. Also shown as the "+ 1 Company" is the arrival of an additional engine from the Humboldt Fire District.

The following charts plot compliance for the first-due company (first column) as well as a 3-Engine, 1-Truck First Alarm assignment (third column). The second and fourth plots illustrate compliance level for additional resources, the second company and an augmented First Alarm assignment after 11 minutes.

Note: The following charts may not exactly match the response time total numbers above. This is because first-due is calculated only for incidents where all companies arrived at a call.

Citywide First Alarm Measure:



Here we see a "fast" initial response with over 87 percent of incidents having the first apparatus arrive on scene within the 7-minute compliance goal. However, the first company will have to handle the situation for a while, since the arrival of the second company within 7-minutes only occurs 60 percent of the time. Here we see the speed of the response is quite satisfactory, but the "weight" of the response (multiple apparatus, quickly) is much lighter.

The compliance graphs for each individual station area are found in the statistical appendix. Due to the little to no overlap between station areas, none of the station areas have good performance for multiple-unit response. The poorest area is Station 4 due to the few cross connect roads into the area from downtown in the open space (the least street grid area of the City).

There are two significant lessons from this type of measure. First, the Department-wide graph above shows that the First Alarm fractile compliance falls short of 90 percent at the national ideals for the best possible outcomes. **An additional staffed station in the southeast City/District area would help this situation.**

Interdepartmental Aid

As discussed at the beginning of this report, the EFD and HFD are like conjoined twins and rely regularly on each other for aid in filling out alarms. The structure fire response plan for EFD, calls for four engines, one truck, and a duty officer (command officer). EFD normally staffs three engines; the fourth engine comes from HFD. HFD's structure fire response plan calls for three engines, and a duty officer. HFD normally staffs two engines; the third engine and the truck come from EFD. EFD also maintains an automatic aid agreement with Arcata Fire Protection District into the community of Manila and Simpson Timber Company (formerly Arcata Redwood) northeast of the City proper for fire responses. In addition, EFD and HFD give mutual aid to other departments.

Automatic aid is a specialized case of mutual aid. Mutual aid depends on the willingness of the partner giving the aid and that is normally based on the reciprocity of the aid. In other words, is

each agency getting a "fair shake" out of the deal or does one agency provide aid more that it receives aid by a substantial amount?

During 3-years of available data aid types breakdown as follows:

Eureka	**Count**
Mutual Aid Received	5
Automatic Aid Received	408
Mutual Given	22
Automatic Aid Given	317
Other Aid Given	19
None	8,867

Humboldt	**Count**
Mutual Received	0
Automatic Aid Received	182
Mutual Given	16
Automatic Aid Given	901
Other Aid Given	14
None	3,364

Data suggests the Eureka Fire Department, over the past 3 years, was slightly more likely to receive aid than give it, but they have an overall higher call for service volume. When interdepartmental aid is totaled, it was received 53.56 percent of the time and given 46.44 percent of the time. 83.64 percent of the Humboldt Fire District's aid is given, 16.36 percent is received. Since Humboldt gave Automatic Aid 901 times but Eureka received 408 times, it is not clear from the data who received the remaining 493 times.

Here is a summary of Aid Activity by fire department:

Department Aid Report for Eureka Fire Department

Total Incidents: 9,638

Incident	**Count**	**Percentage**
Incidents Involving Aid:	771	8.00%
Aid Incidents for Fires:	328	42.54%
Aid Incidents for EMS:	110	14.27%
Aid Incidents for Others:	333	43.19%
Incidents Involving Aid Received:	413	53.56%
Incidents Involving Requested Aid Received:	5	.65%
Incidents Involving Automatic Aid Received:	408	52.92%
Incidents Involving Aid Given:	358	46.44%
Incidents Involving Requested Aid Given:	22	2.85%
Incidents Involving Automatic Aid Given:	317	41.12%
Incidents Involving Other Types of Aid Given:	19	2.46%

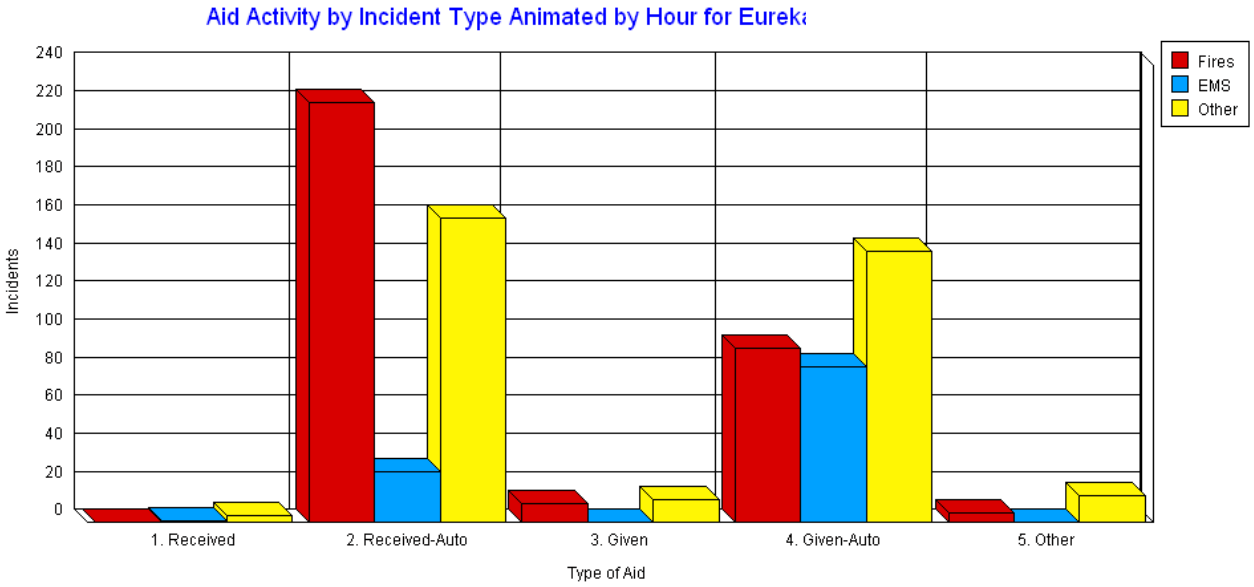
Department Aid Report for Humboldt Fire District

Total Incidents: 4,477

Incident	Count	Percentage
Incidents Involving Aid:	1,113	24.86%
Aid Incidents for Fires:	273	24.53%
Aid Incidents for EMS:	384	34.50%
Aid Incidents for Others:	456	40.97%
Incidents Involving Aid Received:	182	16.36%
Incidents Involving Requested Aid Received:		.00%
Incidents Involving Automatic Aid Received:	182	16.35%
Incidents Involving Aid Given:	931	83.64%
Incidents Involving Requested Aid Given:	16	1.44%
Incidents Involving Automatic Aid Given:	901	80.95%
Incidents Involving Other Types of Aid Given:	14	1.26%

The low number of EMS aid received by EFD would indicate that on those single engine response, EFD covers most of the City quite well, and it is likely that that the EMS aid is for those times when there is simultaneous activity in the response areas where HFD is more convenient.

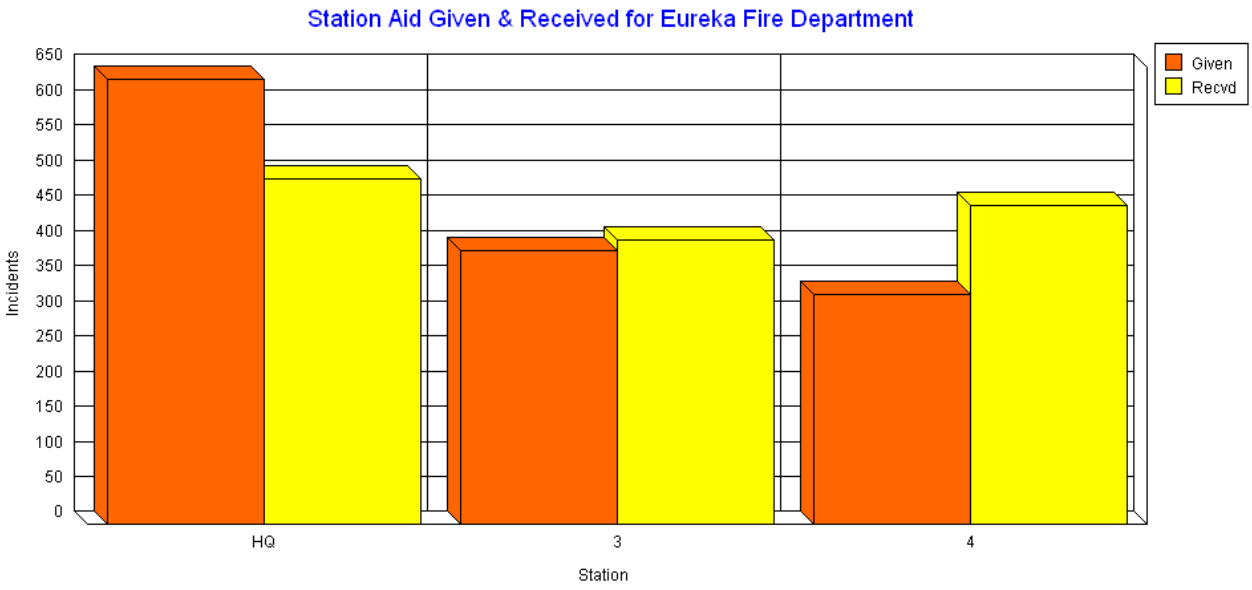
By contrast, the higher amount of EMS aid is when an EFD engine is closer or when HFD, with only two staffed engines, is already committed and an EFD engine is available and closer.



Aid Given and Received Between Eureka Stations

Within the EFD aid is given across first-due boundaries of stations. This is due to simultaneous response activity and the fact that a given engine is already committed to an incident in its first-due area and another engine needs to provide the response.

The graph below illustrates aid distribution between fire stations in Eureka for the 3-year data period. If the orange and yellow bars associated with each fire station were of equal height, each of the fire stations would be sending apparatus into other districts and having apparatus responding into their district at an even rate. Unequal orange and yellow bars illustrate a lack of response "balance." Here we see a very even distribution of workload with the higher aid given in HQ due to it housing the truck company.



Statistical Conclusions

Several observations can be made from this overview of historical, actual response time performance:

1. The spacing of fire stations, when measured with the geographic computer time/distance, is close to real world statistics with much of the "grid" street areas receiving good first-due unit travel times. This does not occur in the outer, hilly areas or for multiple unit coverage outside the downtown core.

2. The Eureka Fire Department's response times are acceptable. While some improvement is possible with focus on dispatch time, the real issue in Eureka is simply not having enough firefighters in total on-duty and not having good station coverage in the emerging southeast corner of the City.

3. What can be learned from the hour-of-the-day and day-of-the-week views are that workload is fairly evenly spread across the weekdays and months. The workload by hour of the day follows the trend seen in most departments where the hours just before dawn are the lowest in volume. The volume of calls may vary by station area, but the 24-hour trends all stay pretty much the same. Thus, the Department does not see a one or two day of the week spike where adding a part time unit would help cover simultaneous calls for service. Unfortunately, where high workload might justify more unit coverage, the need is seven days a week.

In summary, the statistical analysis also demonstrates that both the City and Fire District are co-dependent on each other to deliver a barely adequate structure fire force, and even then, the

response can only keep smaller fires upon arrival small, as there is not a quick follow-up or second alarm force.

The impact of simultaneous calls for service in a small department is the effect on available staffing for a serious structure fire. Eureka only staffs 10 firefighters per day plus a command officer. Each medical emergency takes one engine or 3 personnel out-of-service. Thus, two medical incidents will remove 6 personnel from service. The remaining 4 firefighters and the command officer ***are not enough*** firefighters should a serious structure fire occur at the same time. A small department has little depth when it call stacks 25 percent of the time, and just two calls take 60 percent of the on-duty force. Once again, the automatic aid program is the only consolation.

OVERALL EVALUATION

The Eureka Fire Department is a well-trained and equipped department with a deployment plan that is under challenge from several issues:

- The City is totally co-dependent on its neighbor, the HFD, to ensure a barely adequate structure fire response;
- Even with the assistance of callback of career personnel, plus limited volunteer staffing and mutual aid from distant departments, large fires can easily escape control in the larger, non-fire sprinklered significant fire flow buildings in the waterfront and downtown areas such as the recent 226 G Street fire, December 8, 2006;
- There is a need for an assessment of the Eureka Police Departments fire dispatch call processing time procedures. This may lead to a change in procedures and training;
- More staffing means increased expenses, which in today's economic climate, is very challenging;
- The City could be changing – development, increased traffic, and more homes in the southern area outside the City but well within its sphere of influence.

The Department is fortunate to have had the foresight to work towards a regional fire dispatch at Eureka Police Department. This system really helps when serious or multiple calls for service occur. Multiple calls for service do occur in the Department 25 percent of the time, which in Citygate's experience is fairly high for a department of this size. When this occurs, and a serious fire or medical rescue occurs, the Department must send all its remaining force and or heavily use automatic aid to maintain coverage. Automatic and mutual aid coverage is handled in a timelier manner by a regional fire dispatch center. Mutual aid response comes from stations too far away to be primary responders to Eureka in many areas, so this help does not solve the response adequacy issue in the Eureka Fire Department.

The current staffing per apparatus plan only provides the minimum number of firefighters for smaller fires and modest multiple patients medical or rescue situations. Serious fires will draw in more units, placing serious demands and limitations in responding to other emergencies in a system that has two or more calls for service occurring 25 percent of the time. The Department

as deployed is doing an adequate job with modest emergencies and less severe, simultaneous calls for service.

When major incidents occur, the Department must deploy all its resources and depend on mutual aid. Given the high number of significant risk structures, many of which have considerable historical and emotional value as well as commercial viability, focus of the Department's efforts should be on increasing the weight of response to every fire. Under the current staffing situation this could only be achieved by having every fire unit in both jurisdictions respond to a structure fire. This would be a 16 firefighters response level with a command officer; however, the fifth unit would, in many cases, respond from such a distance that its value would be low and its response would strip both departments of all immediately available units.

Deployment/Staffing Recommendations

An obvious question for Eureka fire deployment is how to add another responding crew. To get over the threshold to have an adequate weight of response and still have some reserve strength left, EFD should consider:

1. Fully staffing the truck with three personnel, which would take 6 more total employees;
2. Staffing the three engines at 4 persons, which would take 9 more total employees;
3. Either agency independently or together could operate an additional station in the southeast City/county area. This would take 9 more total employees;
4. Ideally, over the build out of the City and close in District areas, both 1 and 3 above would occur, which would require 15 more employees, new revenue sources and inter-agency cooperation.

Both departments have a need for better ***distribution*** of fire stations/crews by adding another location. This should take priority over increasing the staffing on existing units, which while it would solve the total head count per day issue, it would not fix the location and second-due unit issues.

The City needs the staffing on the ladder truck, given the unusual quantity of older, higher risk buildings, which are atypical for a suburban city in this part of the state. However, this is a second priority, as there are more medical calls for service and every neighborhood needs good first-due coverage. Then, if revenue permits, the building fire issue can be addressed by adding staffing to the ladder truck.

Recommended Response Time Goals

In those areas of Eureka with the moderate fire and medical risks, a 4-minute road travel time is an appropriate goal. Thus, a revised total response time goal could look like:

- 1 minute for Dispatch + 2 minutes for crew turnout + 4 minutes road travel time = 7 minutes at 90 percent total response time. The service goal is for the single unit to handle minor emergencies by controlling small fires and effectively rendering patient care on medical emergencies.

For the firefighting effective response force (First Alarm), the moderate risk building fires in Eureka need an 8-minute road travel time for the additional responding units that can arrive after the first-due unit. Thus:

- 1 minute for Dispatch + 2 minutes for crew turnout + 8 minutes road travel time = 11 minutes at 90 percent total response time. The service goal of the First Alarm force should be to confine the fire near the room of origin, rescue trapped victims viable upon arrival of the first unit and to render patient care on medical emergencies of up to 5 patients.

Of greater concern in the significant hazard area is how will the Eureka Fire Department handle the staffing of a major alarm fire in one of the large, older, non-sprinklered buildings with a fire flow in excess of 3,000 gallons per minute. For this type of fire there will be a callback of personnel to staff reserve apparatus, there will be activation of the mutual aid system and there will be activation of the volunteer fire force. This should be a well-orchestrated and planned activity with some career staff designated on a daily basis to be prepared for callback. Reserve apparatus is available for use while regular apparatus is in for maintenance. This use makes it unavailable for callback staffing. Department policy should limit the number of reserves placed in front line service, or the Department should explore the possibility of owning a larger fleet.

The Department has to continue its good efforts on maintaining a viable volunteer force as the community will never be able to provide the revenue for a substantially larger, all career fire force.

The region's Fire Departments in the long-term need to try to develop a reserve or apprentice firefighter program using students from both Redwood Community College and Humboldt State University. This would require financial, space and instructor help from the colleges. If such a program could be built as has occurred elsewhere in the State, then the entire region could implement a part-time apprentice firefighter program. While there is currently no fire science program or fire academy at College of the Redwoods, program development assistance could come from the Statewide Training and Education Advisory Committee of the Office of State Fire Marshal to develop a regional accredited fire academy. This would fill a huge hole in the State's regional fire academy map. Granted that career fire service opportunities are limited in Humboldt County, however such an academy would provide another opportunity for career technical training.

The departments could pay the students and recent graduates an hourly, part-time wage as limited term, un-benefited employees. Forestry students from the University might be interested, particularly if they plan to go into the fire suppression end of the business.

From this program a reserve firefighter program could be developed that would serve Eureka and provide a pool of trained personnel for departments in Humboldt and Mendocino counties. This would also ensure that most of Humboldt County's career firefighters came from Humboldt County.

GENERAL OPERATING RECOMMENDATIONS

Existing Eureka

1. Finish the countywide mutual aid agreements and plan updates.
2. Consider dispatching all five City/District engines and the truck to serious structure fires upon a verified 911 call or first-due unit report in order to have a slightly larger workforce to hold small fires to the room of origin.
3. Increase the weight of the response to significant fire buildings:
    a. Immediately selectively activate callback of career staff for any fire involving a building of significant risk, required fire flow of 2,000 gpm or greater.
    b. Immediately activate mutual aid for any fire involving a building of significant risk, required fire flow of 2,000 gpm or greater.
4. If funding were to become available, add a fourth fire station in the southeast City area. Depending on location and future growth, determine if sharing the staffing cost with the Humboldt Fire District could work.

Development Growth Areas

If suburban type housing density is built southeast of the current City limits, Maps 3b and 6b clearly show that <u>if</u> good suburban outcomes are to be provided such as confine the fire to the room of origin and to intervene successfully in cardiac arrest patients, then there is **not adequate** 4- or 8-minute travel coverage into this area from any of the existing City or District stations.

There are four options available <u>if</u> good outcomes are desired:

1. Require the developer to set aside land and build and equip a fire station, ***<u>and</u>*** provide a per parcel assessment to meet the staffing requirements in perpetuity.
2. If the area stays in the HFD, require the same as in #1 above.
3. Mandate a zero square foot residential fire sprinkler requirement.
4. Inform the residents via a deed recordation in escrow that they have limited, rural fire and EMS protection and to <u>not</u> expect a fire station to be added.

A hybrid option would be to add another fire station in this area and share the cost three ways since there is a broader benefit. Both the City and the Fire District need more daily staffing. An additional 3-person crew in this area could be cost shared across the new homeowners and the two existing jurisdictions. Either department could actually operate the stations and receive an operating expense share from the other.

Additionally, care should be taken during the design of the street circulation elements to provide as much of a grid street system as is possible to lessen the number of fire stations.

NEXT STEPS AND RECOMMENDED PRIORITIES

1. The response weight problem Eureka must be fixed first. The efforts by the fire chief to complete written agreements with neighboring departments will help. Beyond that, multi-company drills should be conducted using the realistic anticipated mutual aid response system to coordinate activities and test the weight of the response.
2. After understanding the findings in this report, the Department should come back to the City Council with new deployment time measures meeting the City's needs and amend the General Plan to more closely align with the realistic capability of the City.
3. Eureka needs to understand the economic burden of staffing one more fire station in the development area and be sure the General Fund and new development revenue sources can sustain the operating expenses after the community is fully developed.

If substantial suburban type density housing projects are approved southeast of the City, the agencies involved should either require a fire station and staffing revenue or clearly and legally notify the final homeowners that they live in a rural protected area with long response times, weak outcomes and that they should not expect the agencies to ever be able to fund a closer fire station.

CITYGATE ASSOCIATES, LLC
FOLSOM (SACRAMENTO), CA
MANAGEMENT CONSULTANTS

STANDARDS OF RESPONSE COVER STUDY FOR THE CITY OF EUREKA FIRE DEPARTMENT

Final Report

VOLUME 2 OF 3 – MAP ATLAS

February 9, 2007

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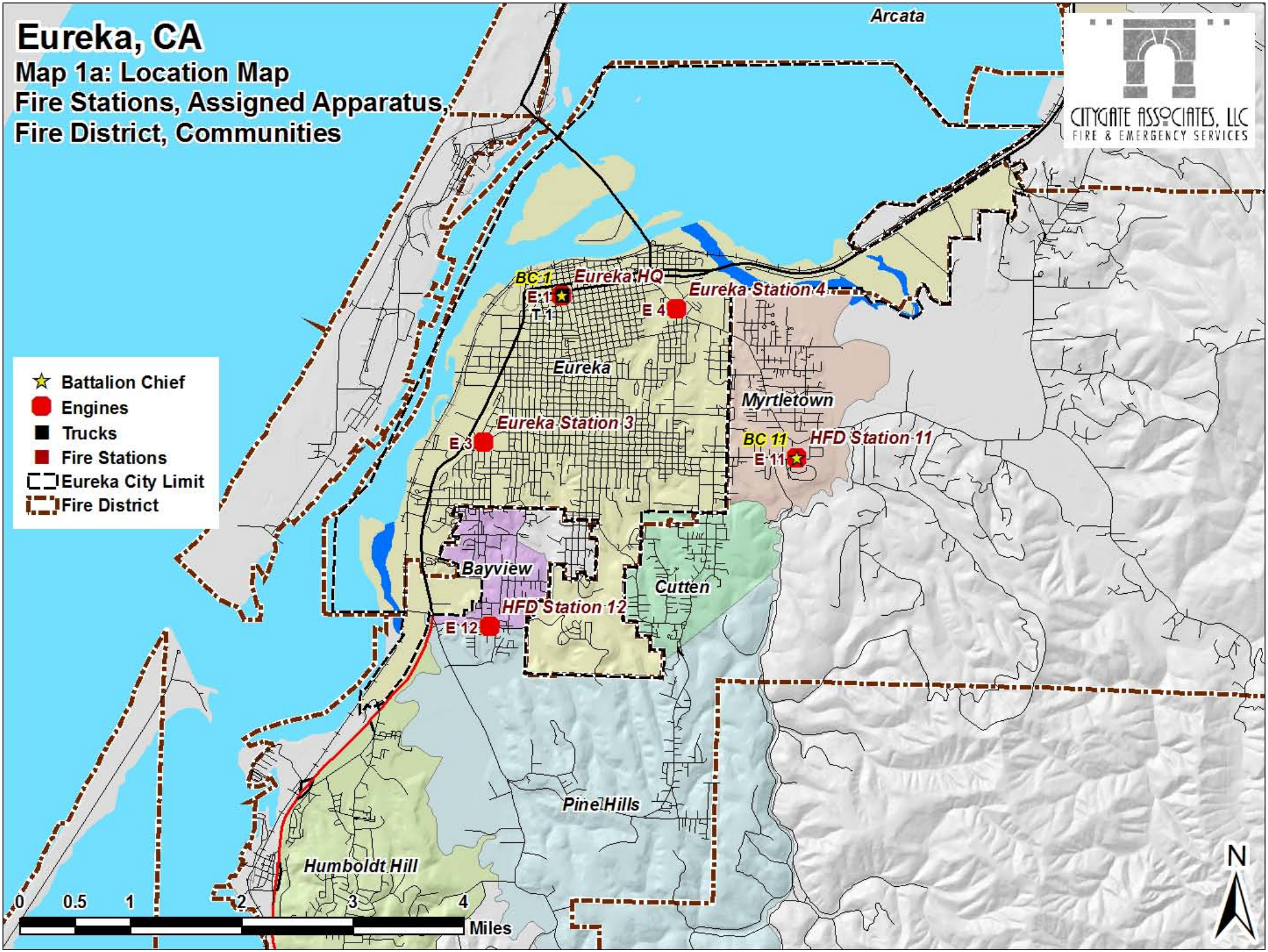
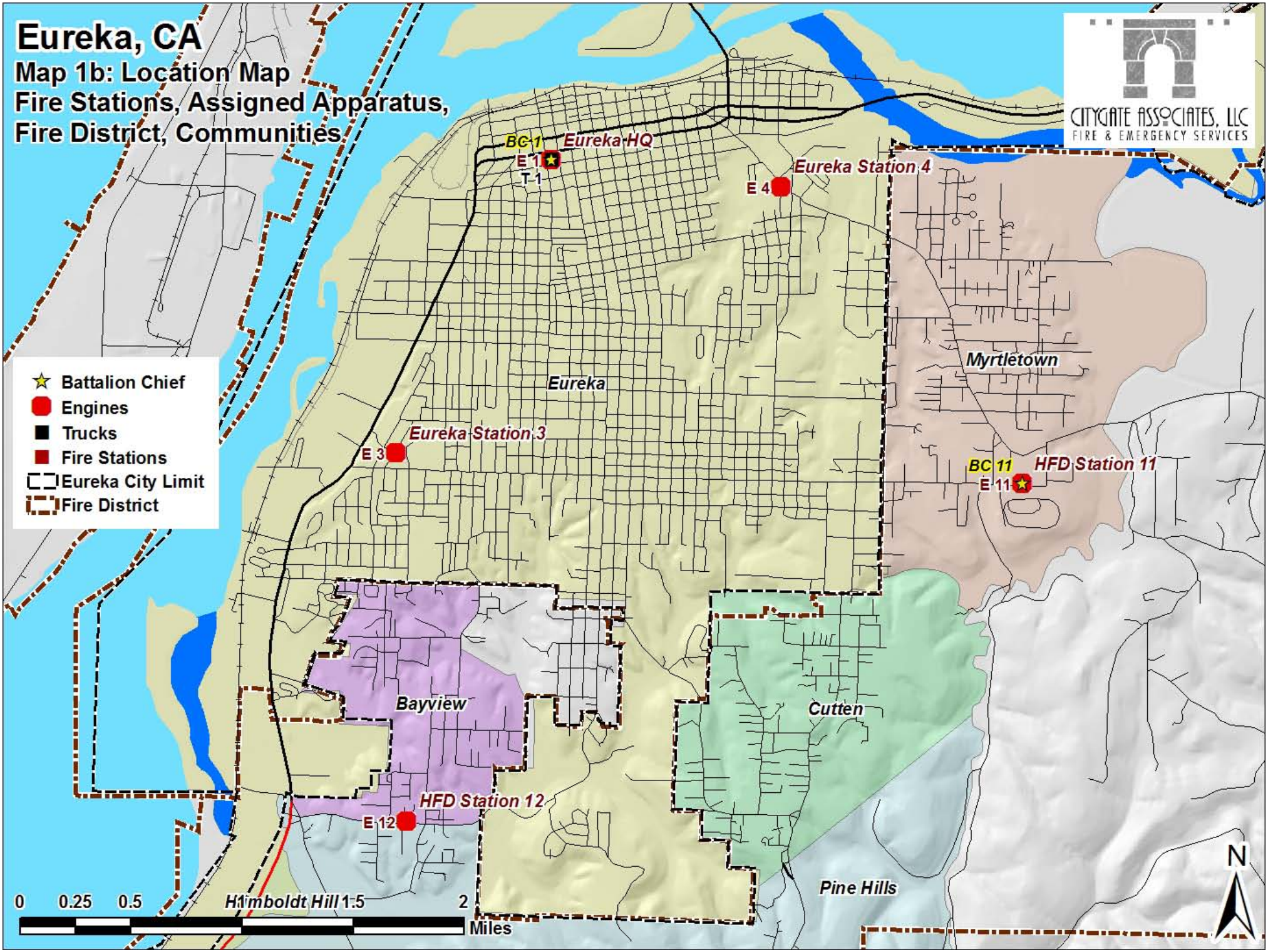
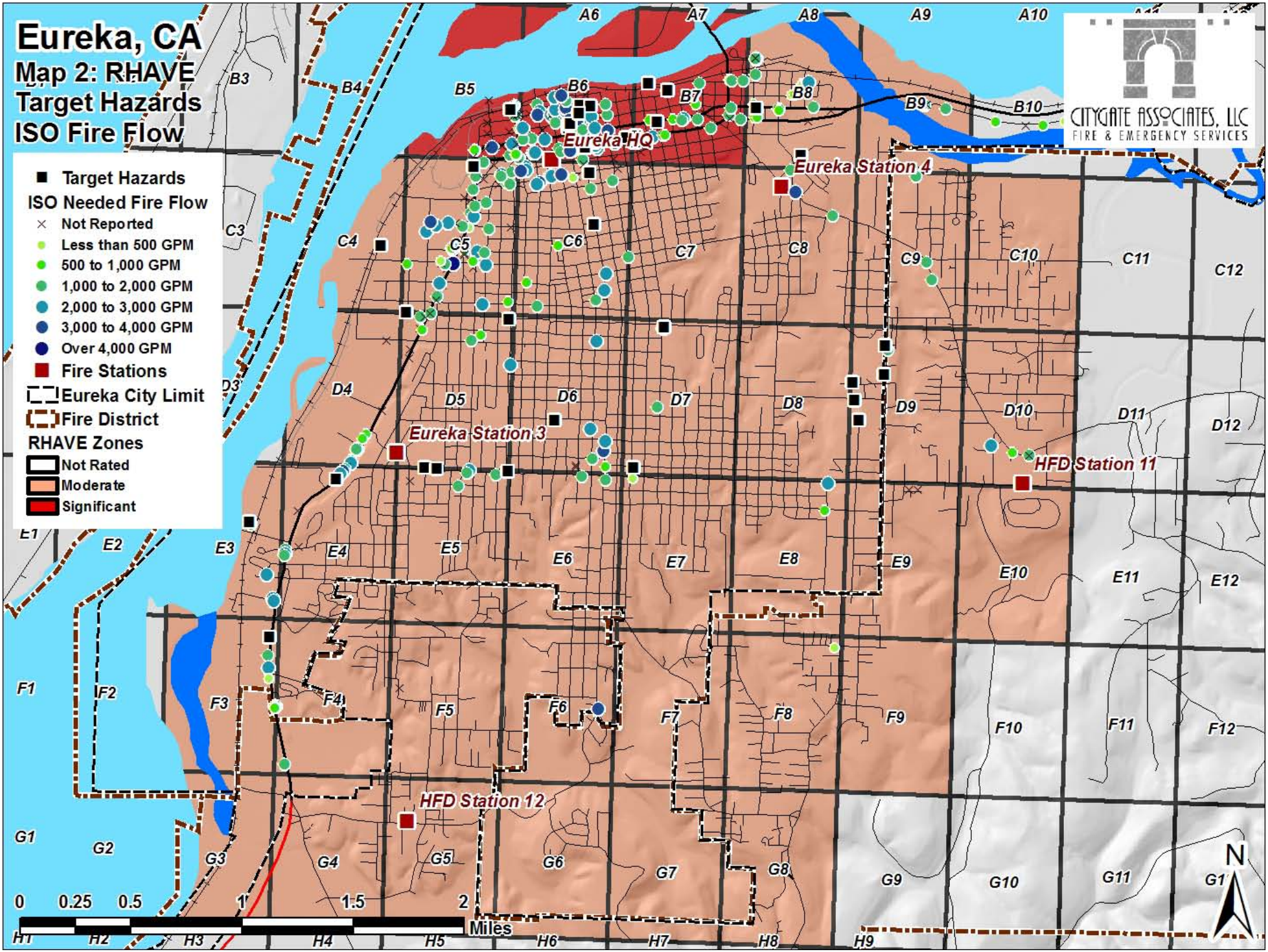
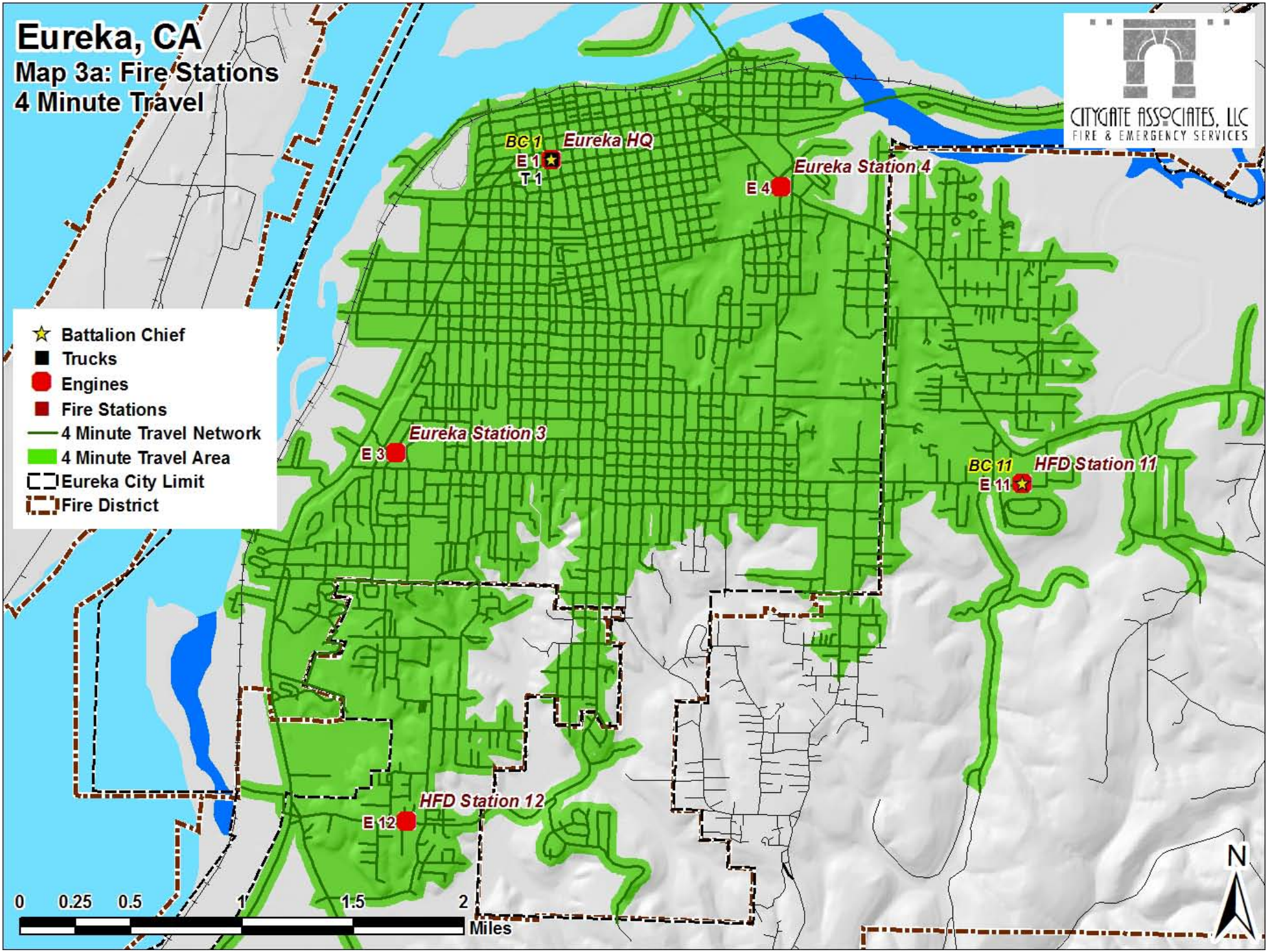
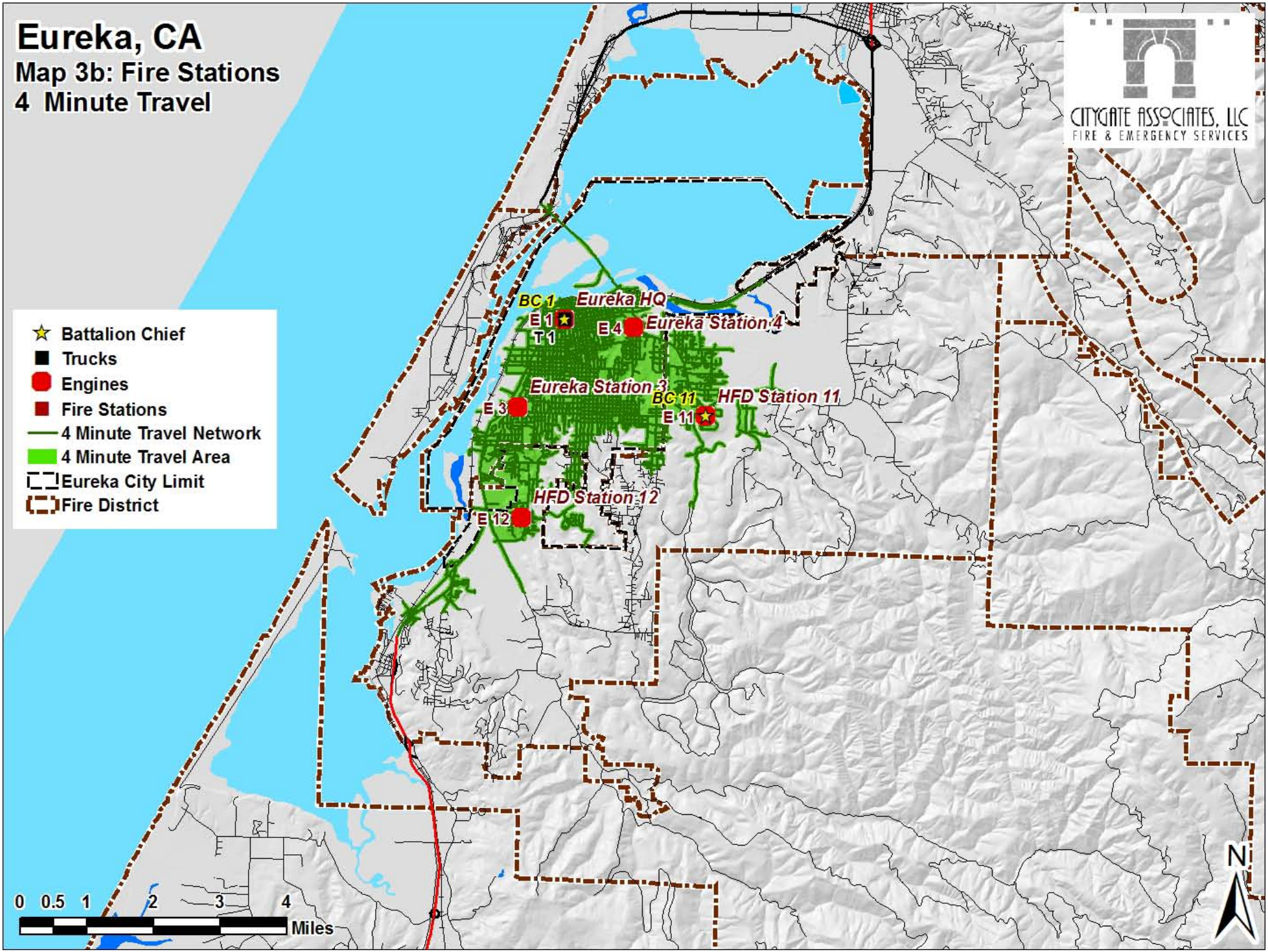
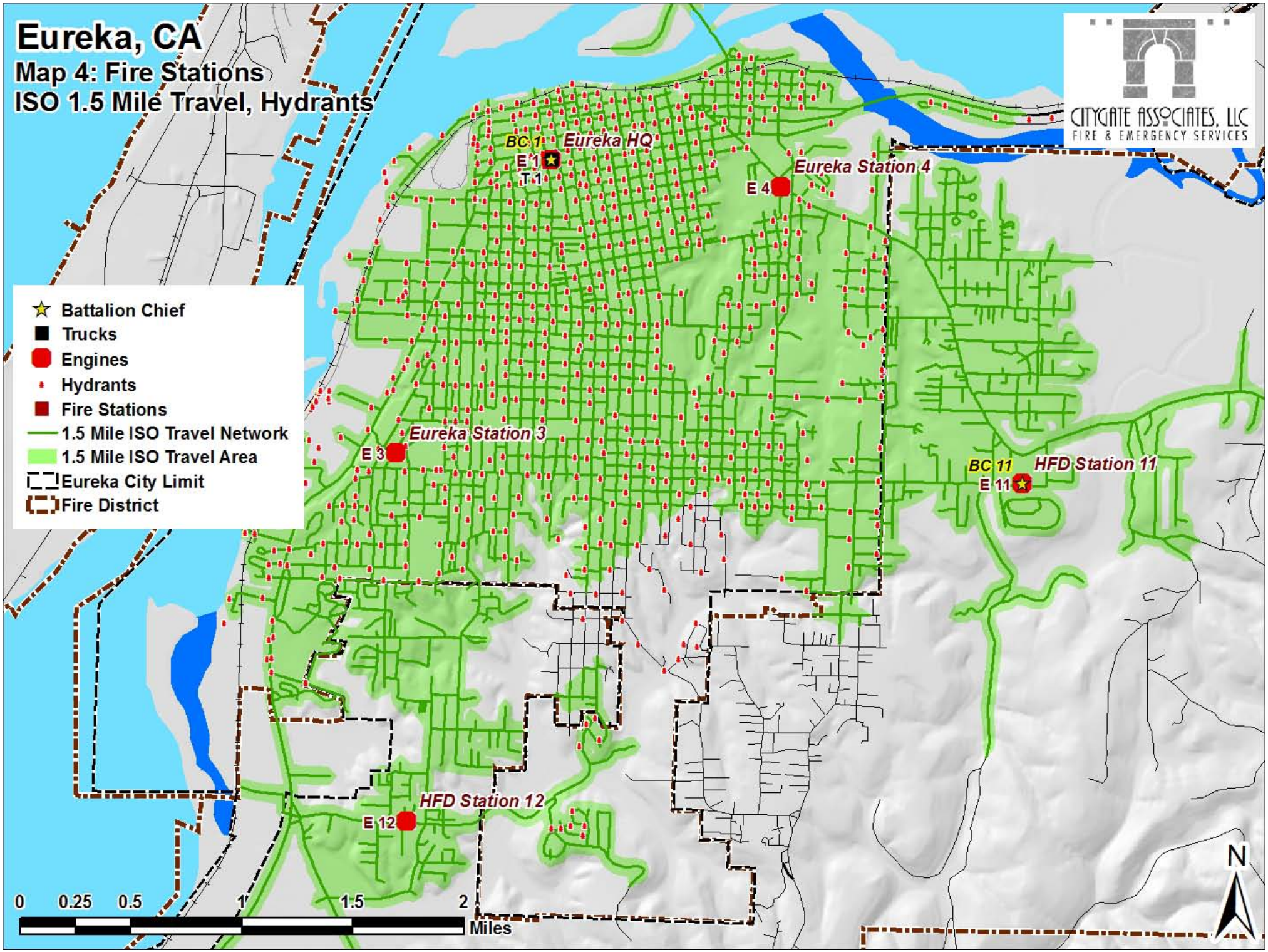

Eureka, CA
Map 1a: Location Map
Fire Stations, Assigned Apparatus,
Fire District, Communities
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Arcata
BC 1
Eureka HQ
E 1
T 1
E 4
Eureka Station 4
Eureka
Myrtletown
Eureka Station 3
E 3
BC 11
HFD Station 11
E 11
Bayview
Cutten
HFD Station 12
E 12
Pine Hills
Humboldt Hill
Battalion Chief
Engines
Trucks
Fire Stations
Eureka City Limit
Fire District
0
0.5
1
2
3
4
Miles
N

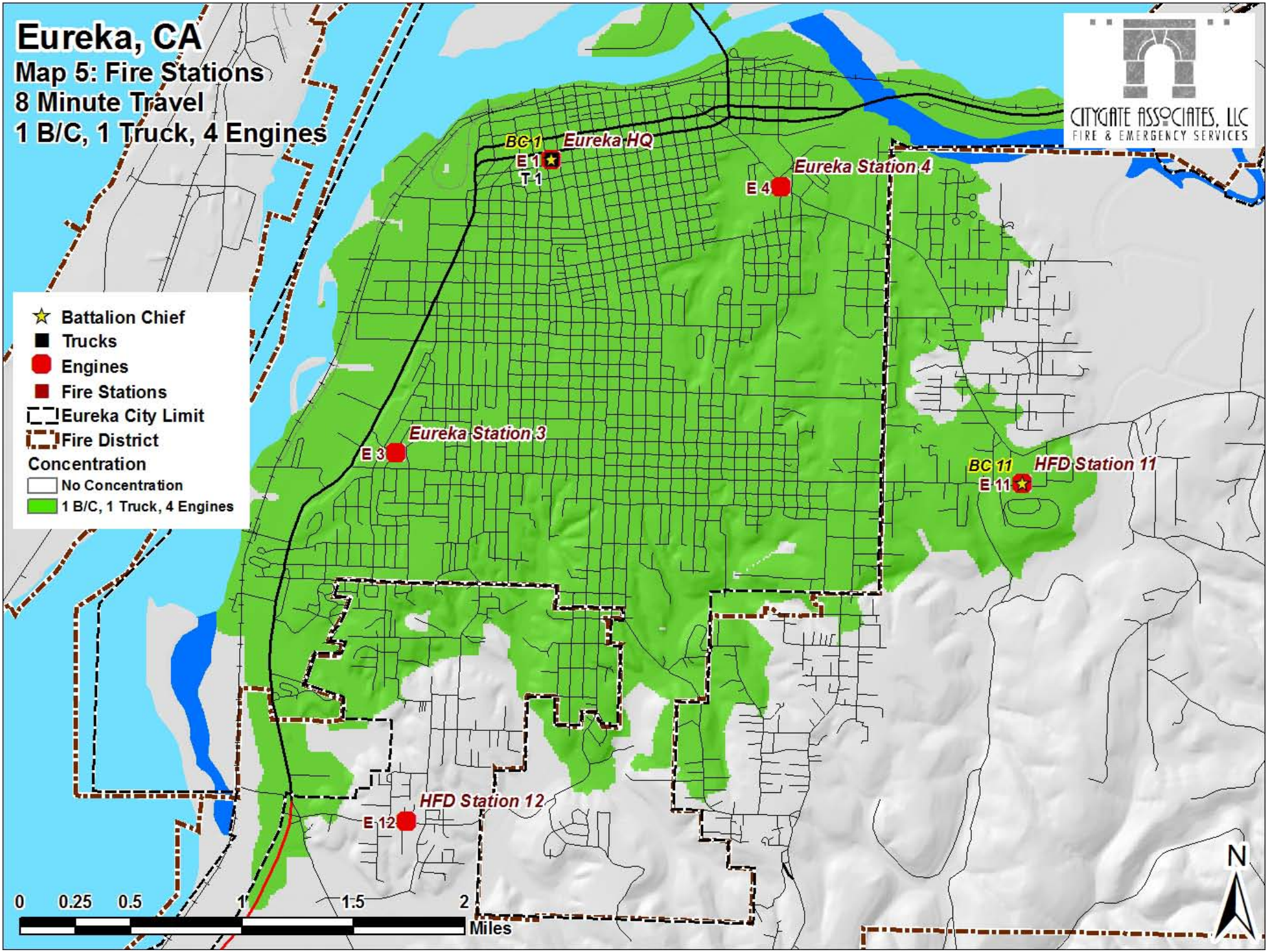

Eureka, CA
Map 1b: Location Map
Fire Stations, Assigned Apparatus,
Fire District, Communities
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Battalion Chief
Engines
Trucks
Fire Stations
Eureka City Limit
Fire District
BC 1
Eureka HQ
E 1
T 1
Eureka Station 4
E 4
Eureka
Myrtletown
Eureka Station 3
E 3
BC 11
HFD Station 11
E 11
Bayview
Cutten
HFD Station 12
E 12
Pine Hills
Humboldt Hill
0
0.25
0.5
1
1.5
2
Miles
N

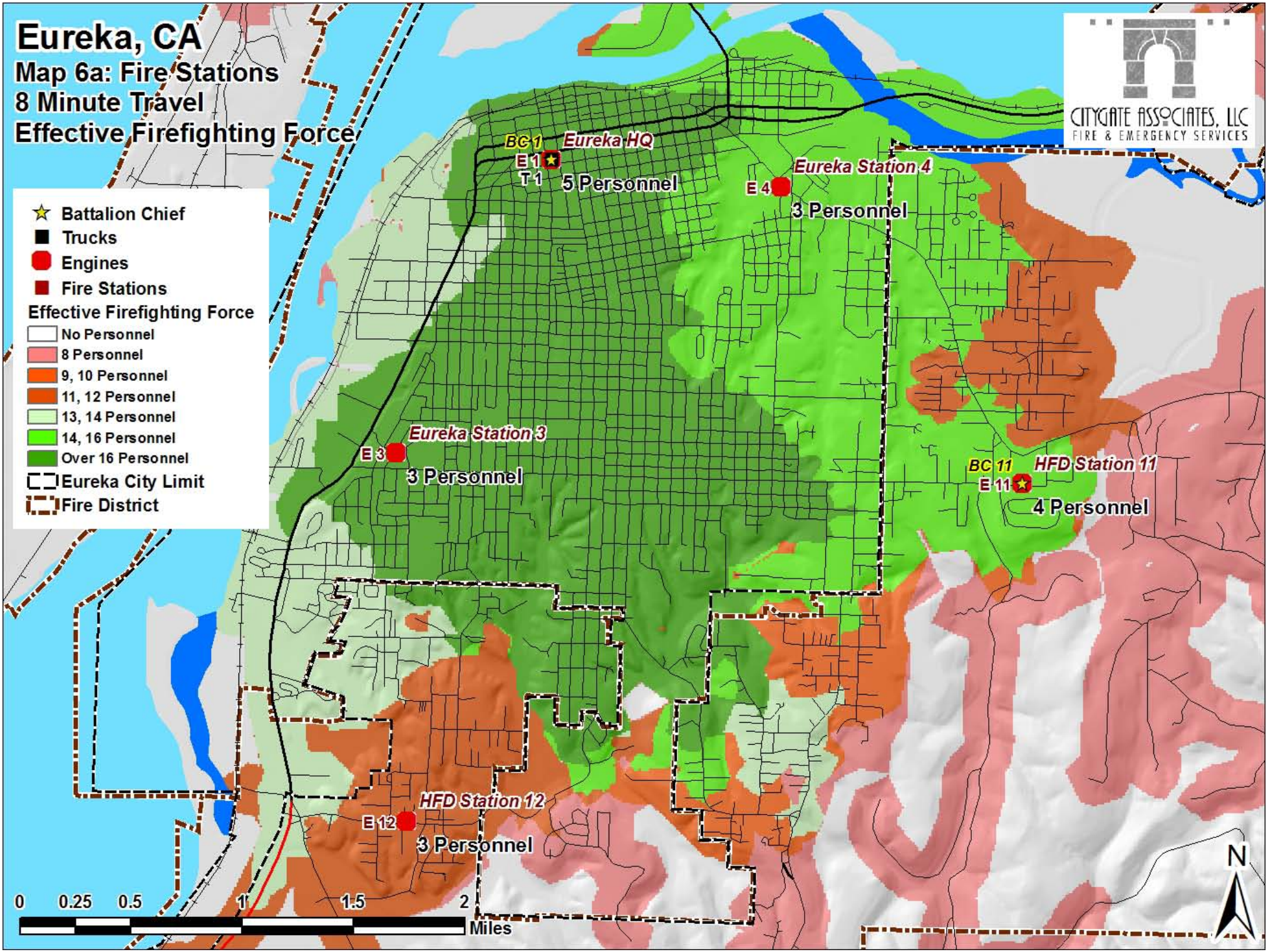

Eureka, CA
Map 2: RHAVE
Target Hazards
ISO Fire Flow
Target Hazards
ISO Needed Fire Flow
Not Reported
Less than 500 GPM
500 to 1,000 GPM
1,000 to 2,000 GPM
2,000 to 3,000 GPM
3,000 to 4,000 GPM
Over 4,000 GPM
Fire Stations
Eureka City Limit
Fire District
RHAVE Zones
Not Rated
Moderate
Significant
Eureka HQ
Eureka Station 4
Eureka Station 3
HFD Station 11
HFD Station 12
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
0 0.25 0.5 1 1.5 2
Miles
N

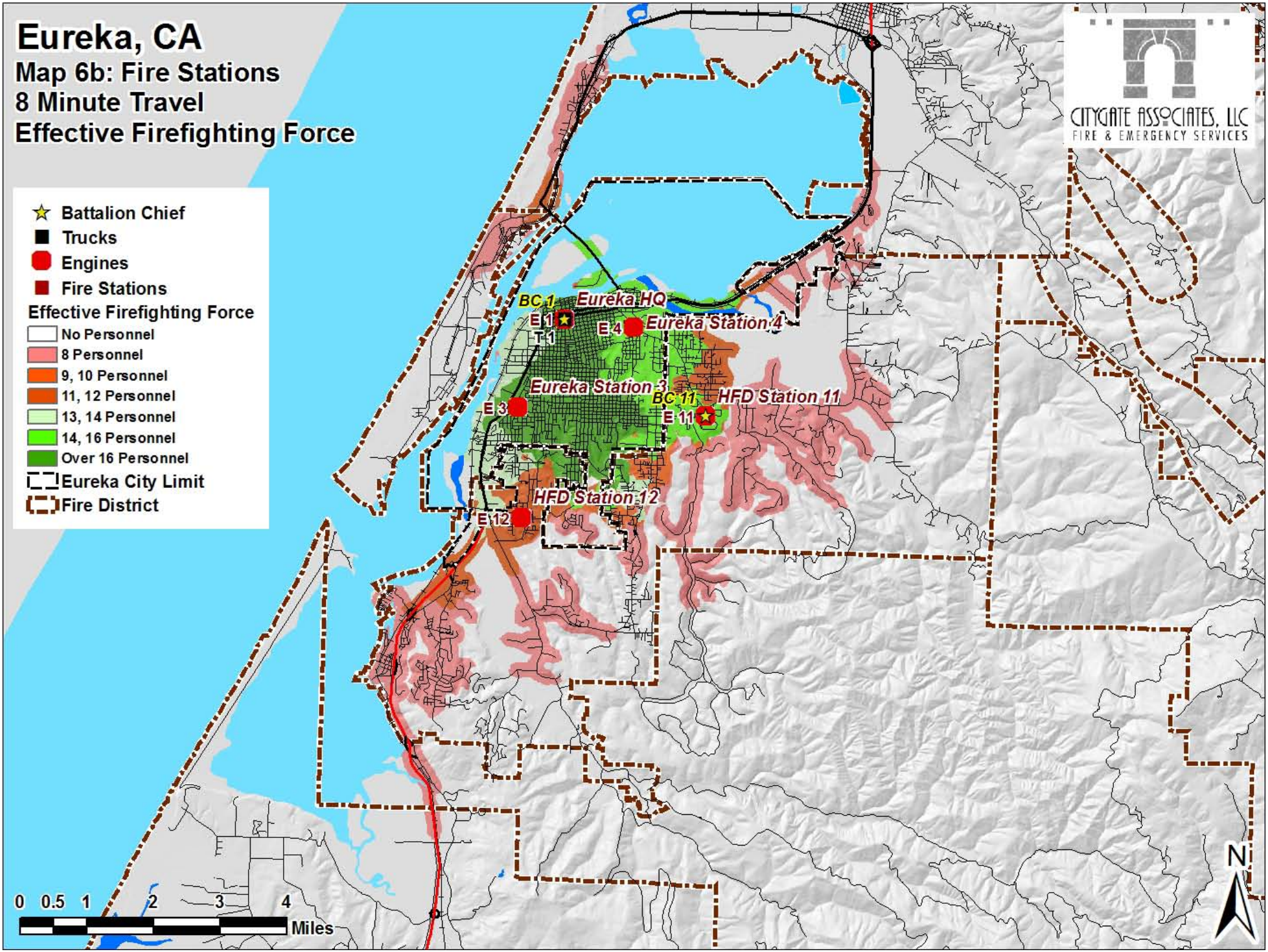

Eureka, CA
Map 3a: Fire Stations
4 Minute Travel
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
BC 1
Eureka HQ
E 1
T 1
Eureka Station 4
E 4
Eureka Station 3
E 3
BC 11
HFD Station 11
E 11
HFD Station 12
E 12
Battalion Chief
Trucks
Engines
Fire Stations
4 Minute Travel Network
4 Minute Travel Area
Eureka City Limit
Fire District
0
0.25
0.5
1
1.5
2
Miles
N

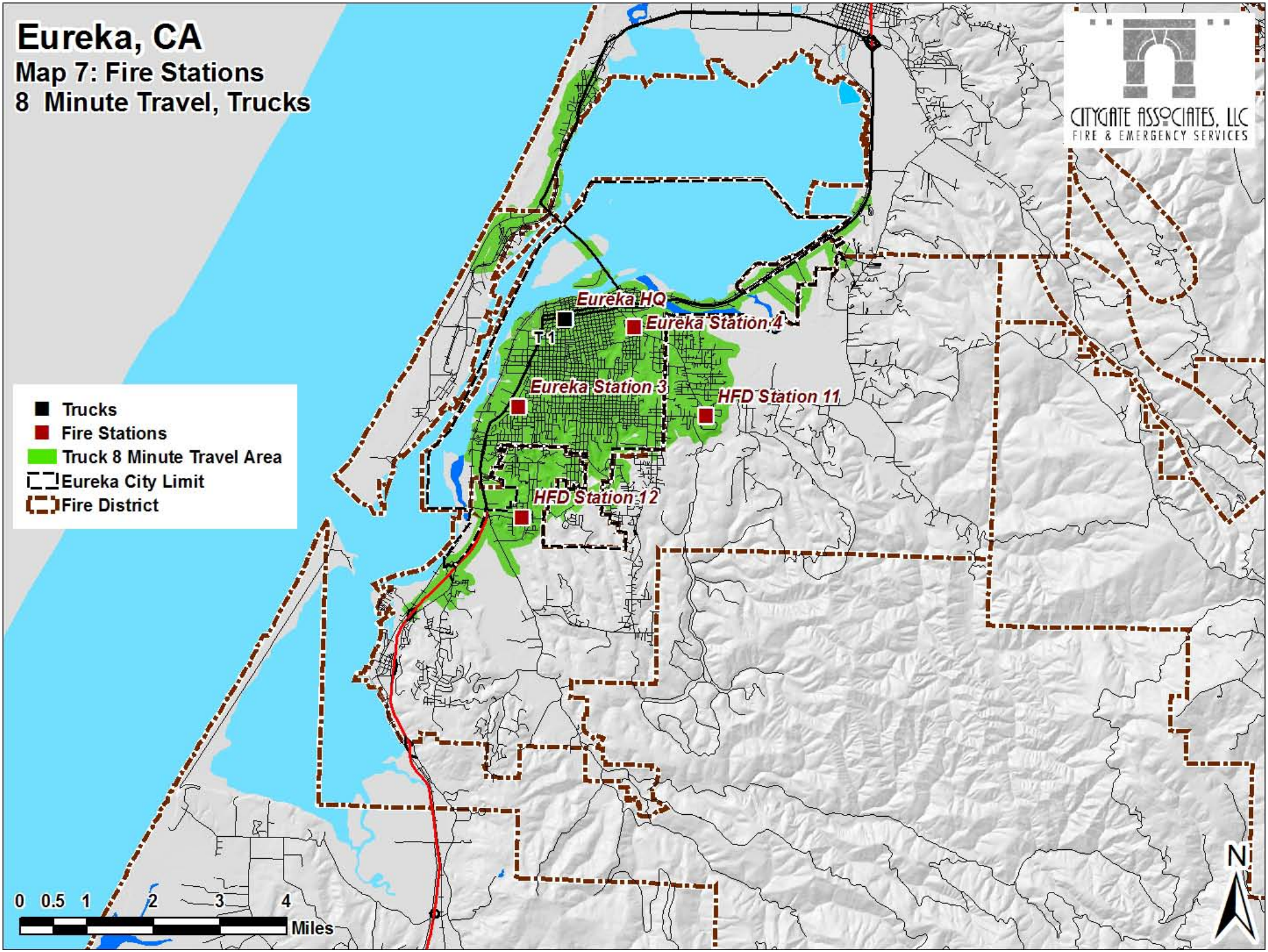

Eureka, CA
Map 3b: Fire Stations
4 Minute Travel
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Battalion Chief
Trucks
Engines
Fire Stations
4 Minute Travel Network
4 Minute Travel Area
Eureka City Limit
Fire District
BC 1
Eureka HQ
E 1
T 1
E 4
Eureka Station 4
Eureka Station 3
BC 11
HFD Station 11
E 3
E 11
HFD Station 12
E 12
0 0.5 1 2 3 4
Miles
N

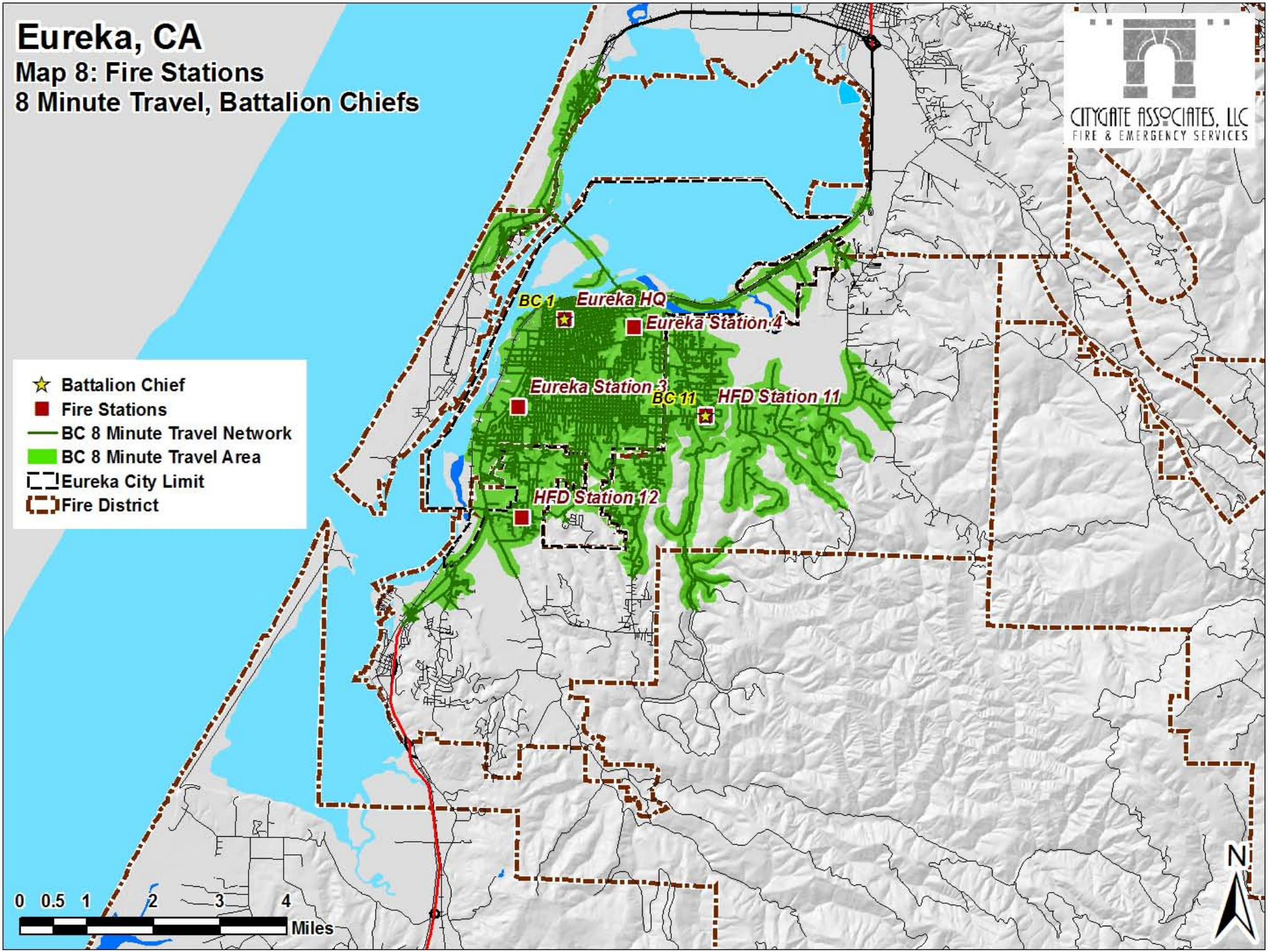

Eureka, CA
Map 4: Fire Stations
ISO 1.5 Mile Travel, Hydrants
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Battalion Chief
Trucks
Engines
Hydrants
Fire Stations
1.5 Mile ISO Travel Network
1.5 Mile ISO Travel Area
Eureka City Limit
Fire District
BC 1
Eureka HQ
E 1
T 1
Eureka Station 4
E 4
Eureka Station 3
E 3
BC 11
HFD Station 11
E 11
HFD Station 12
E 12
0
0.25
0.5
1
1.5
2
Miles
N

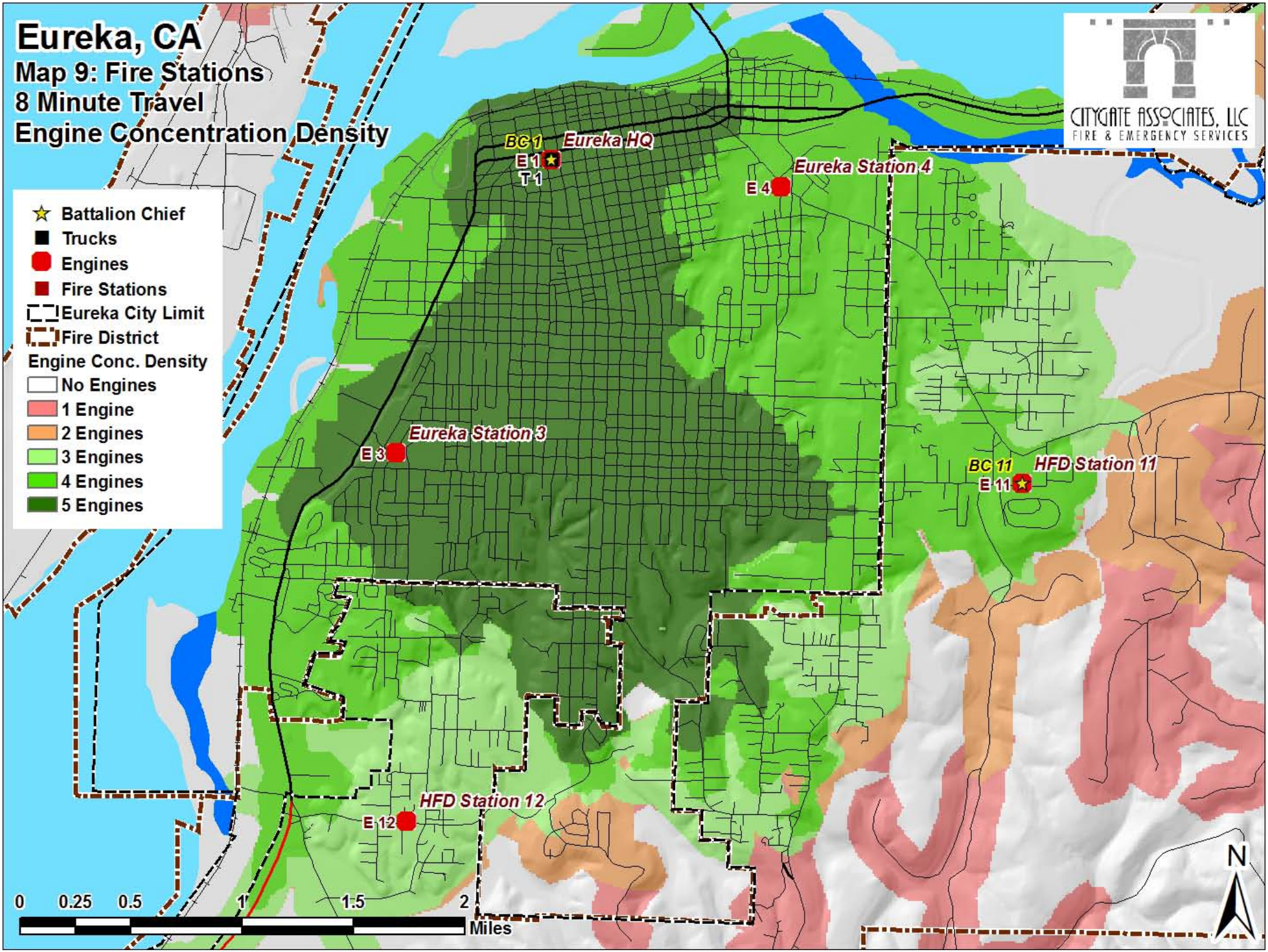

Eureka, CA
Map 5: Fire Stations
8 Minute Travel
1 B/C, 1 Truck, 4 Engines
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Battalion Chief
Trucks
Engines
Fire Stations
Eureka City Limit
Fire District
Concentration
No Concentration
1 B/C, 1 Truck, 4 Engines
BC 1
Eureka HQ
E 1
T 1
Eureka Station 4
E 4
Eureka Station 3
E 3
BC 11
HFD Station 11
E 11
HFD Station 12
E 12
0
0.25
0.5
1
1.5
2
Miles
N

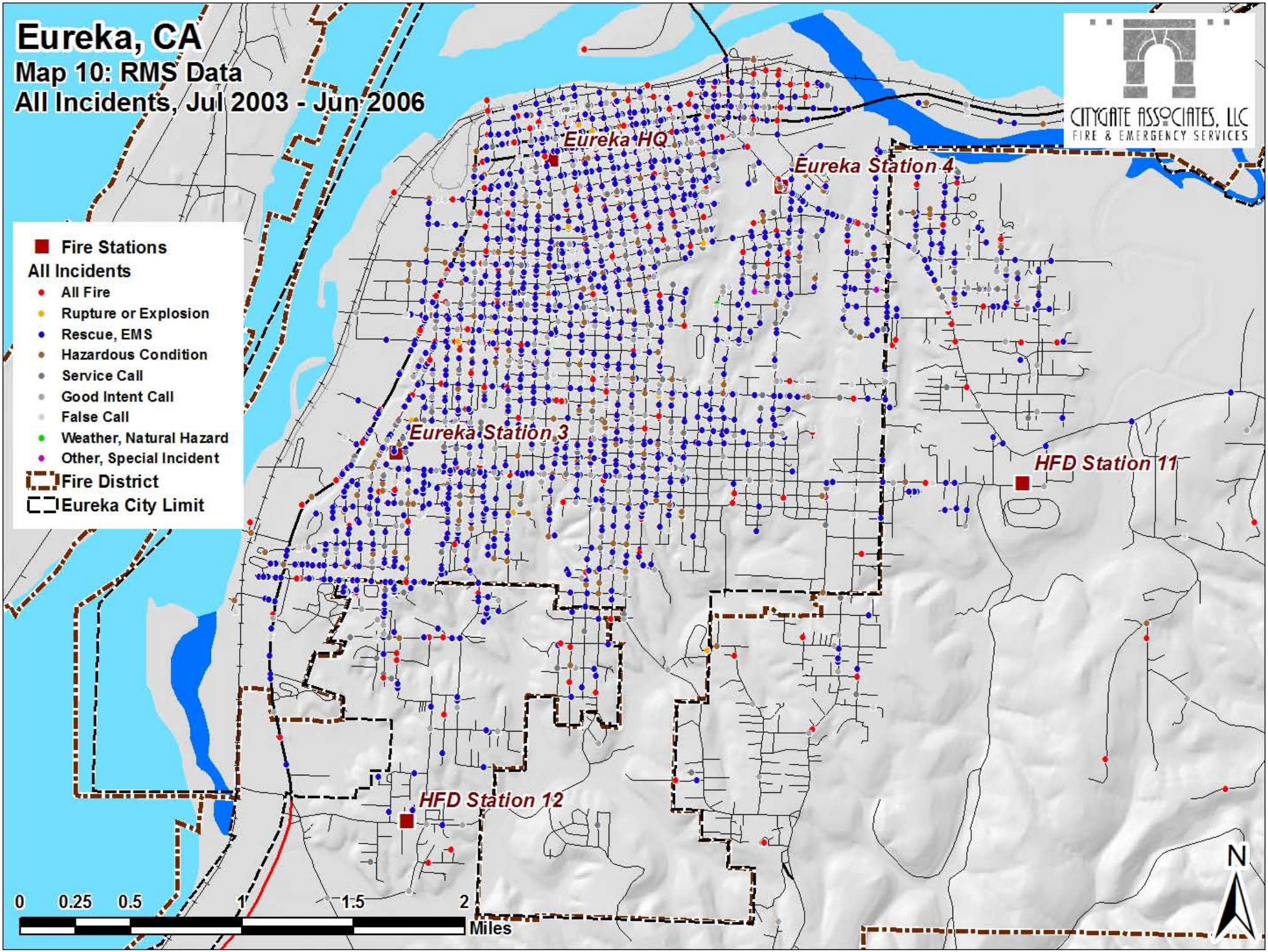

Eureka, CA
Map 6a: Fire Stations
8 Minute Travel
Effective Firefighting Force
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Battalion Chief
Trucks
Engines
Fire Stations
Effective Firefighting Force
No Personnel
8 Personnel
9, 10 Personnel
11, 12 Personnel
13, 14 Personnel
14, 16 Personnel
Over 16 Personnel
Eureka City Limit
Fire District
BC 1
Eureka HQ
E 1
T 1
5 Personnel
Eureka Station 4
E 4
3 Personnel
Eureka Station 3
E 3
3 Personnel
BC 11
HFD Station 11
E 11
4 Personnel
HFD Station 12
E 12
3 Personnel
0
0.25
0.5
1
1.5
2
Miles
N

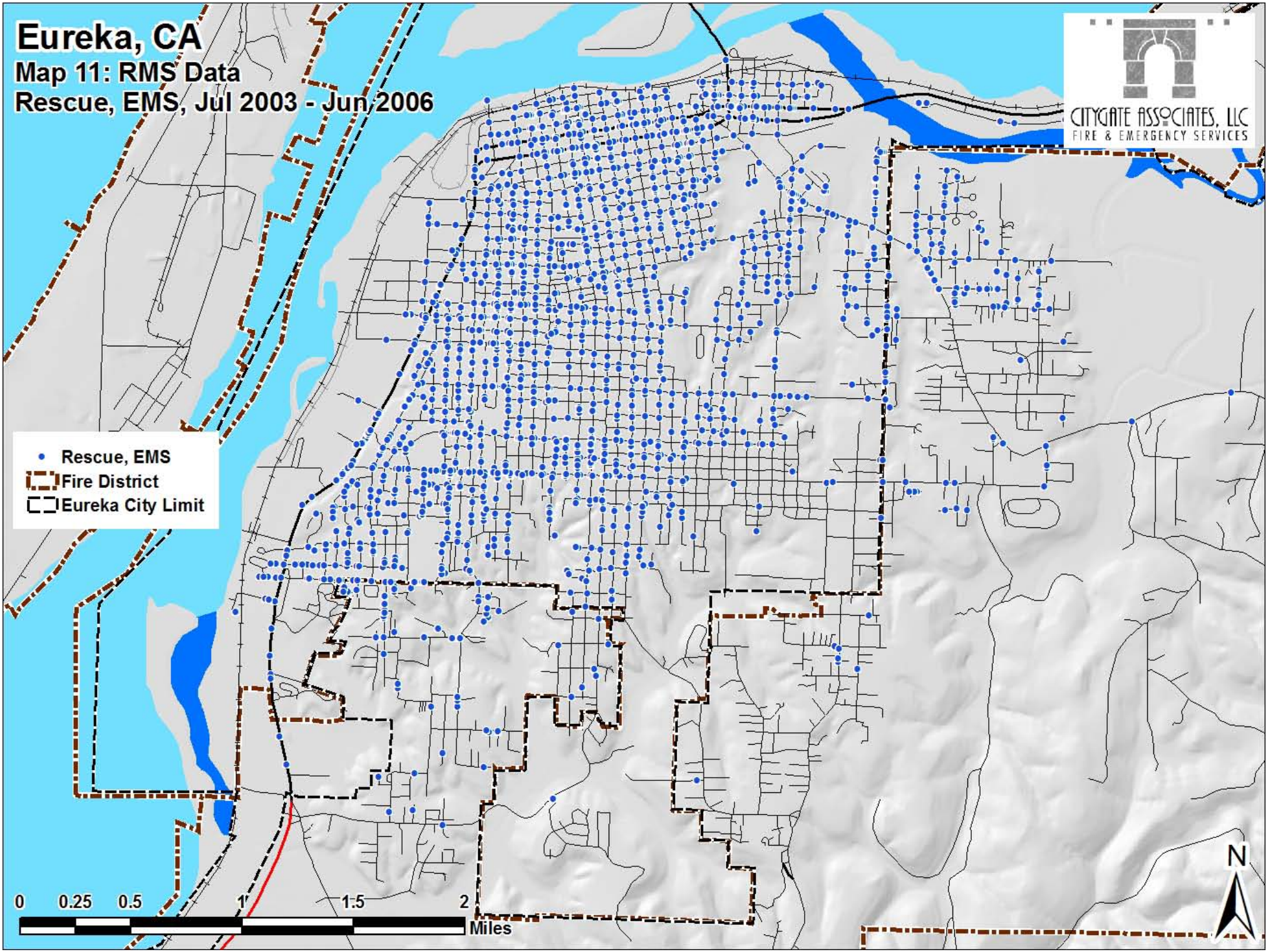

Eureka, CA
Map 6b: Fire Stations
8 Minute Travel
Effective Firefighting Force
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Battalion Chief
Trucks
Engines
Fire Stations
Effective Firefighting Force
No Personnel
8 Personnel
9, 10 Personnel
11, 12 Personnel
13, 14 Personnel
14, 16 Personnel
Over 16 Personnel
Eureka City Limit
Fire District
BC 1
Eureka HQ
E 1
T 1
E 4
Eureka Station 4
Eureka Station 3
E 3
BC 11
HFD Station 11
E 11
HFD Station 12
E 12
0 0.5 1 2 3 4
Miles
N

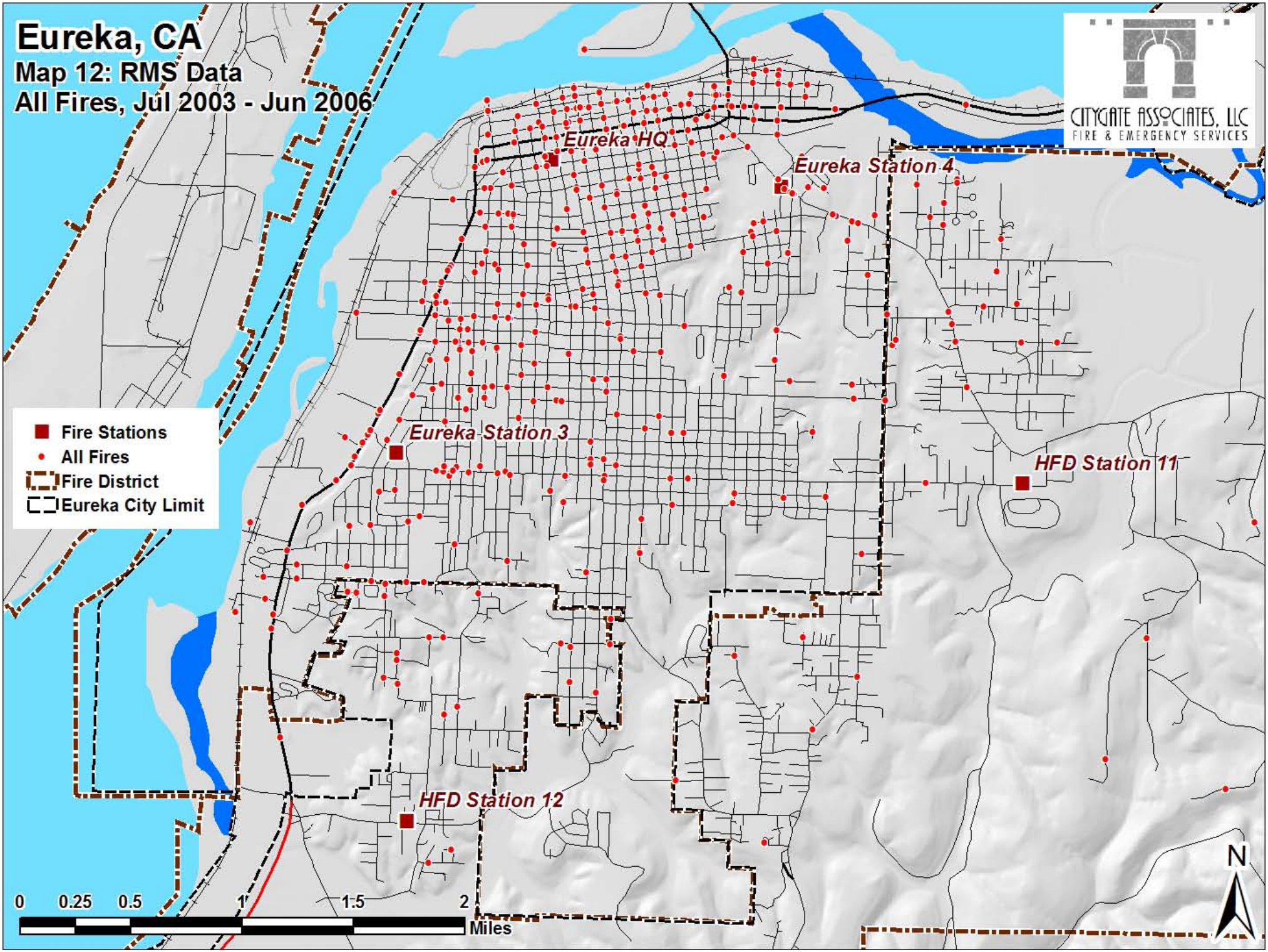

Eureka, CA
Map 7: Fire Stations
8 Minute Travel, Trucks
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Eureka HQ
T1
Eureka Station 4
Eureka Station 3
HFD Station 11
HFD Station 12
Trucks
Fire Stations
Truck 8 Minute Travel Area
Eureka City Limit
Fire District
0 0.5 1 2 3 4
Miles
N

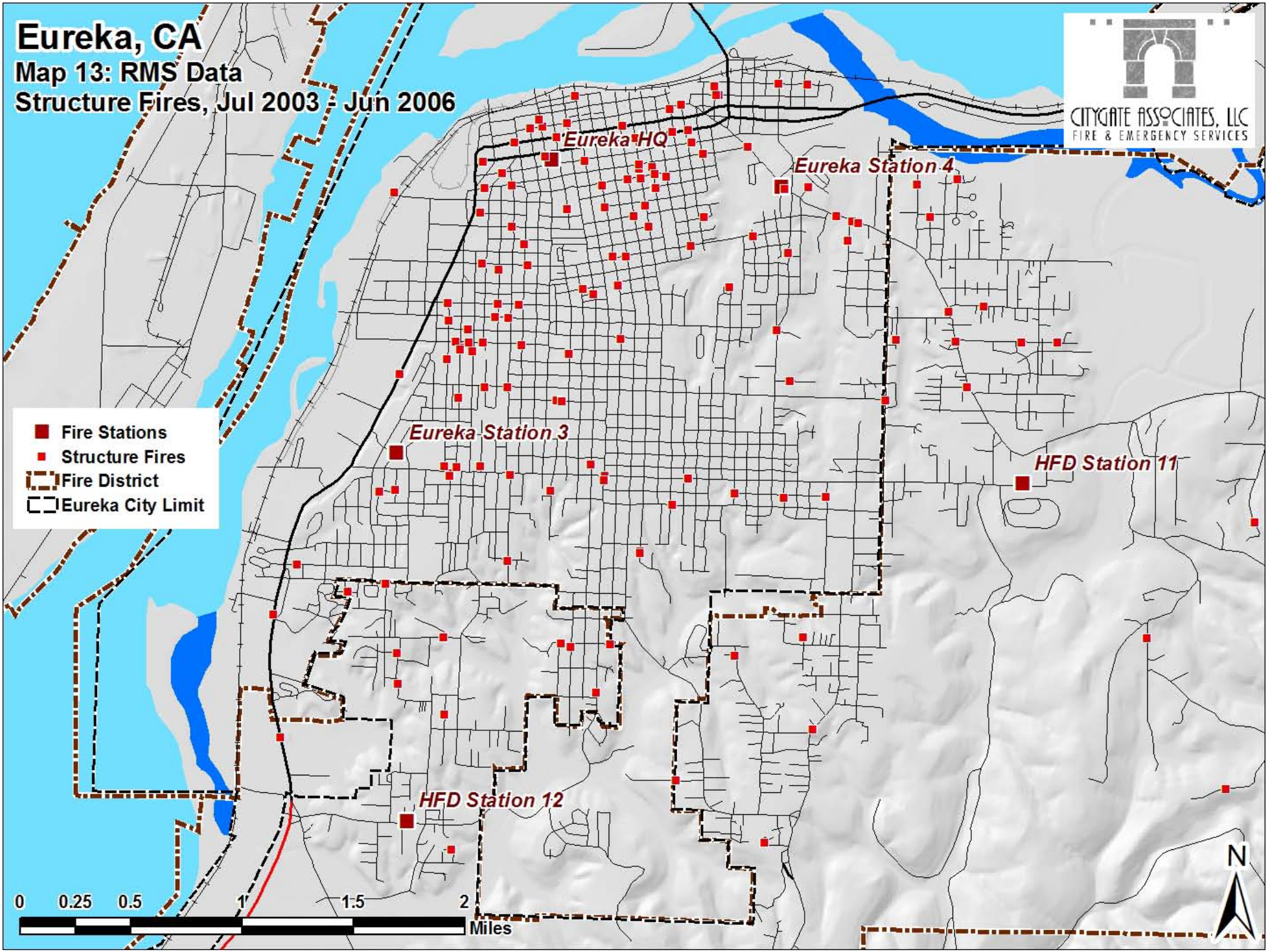

Eureka, CA
Map 8: Fire Stations
8 Minute Travel, Battalion Chiefs
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Battalion Chief
Fire Stations
BC 8 Minute Travel Network
BC 8 Minute Travel Area
Eureka City Limit
Fire District
BC 1
Eureka HQ
Eureka Station 4
Eureka Station 3
BC 11
HFD Station 11
HFD Station 12
0 0.5 1 2 3 4
Miles
N

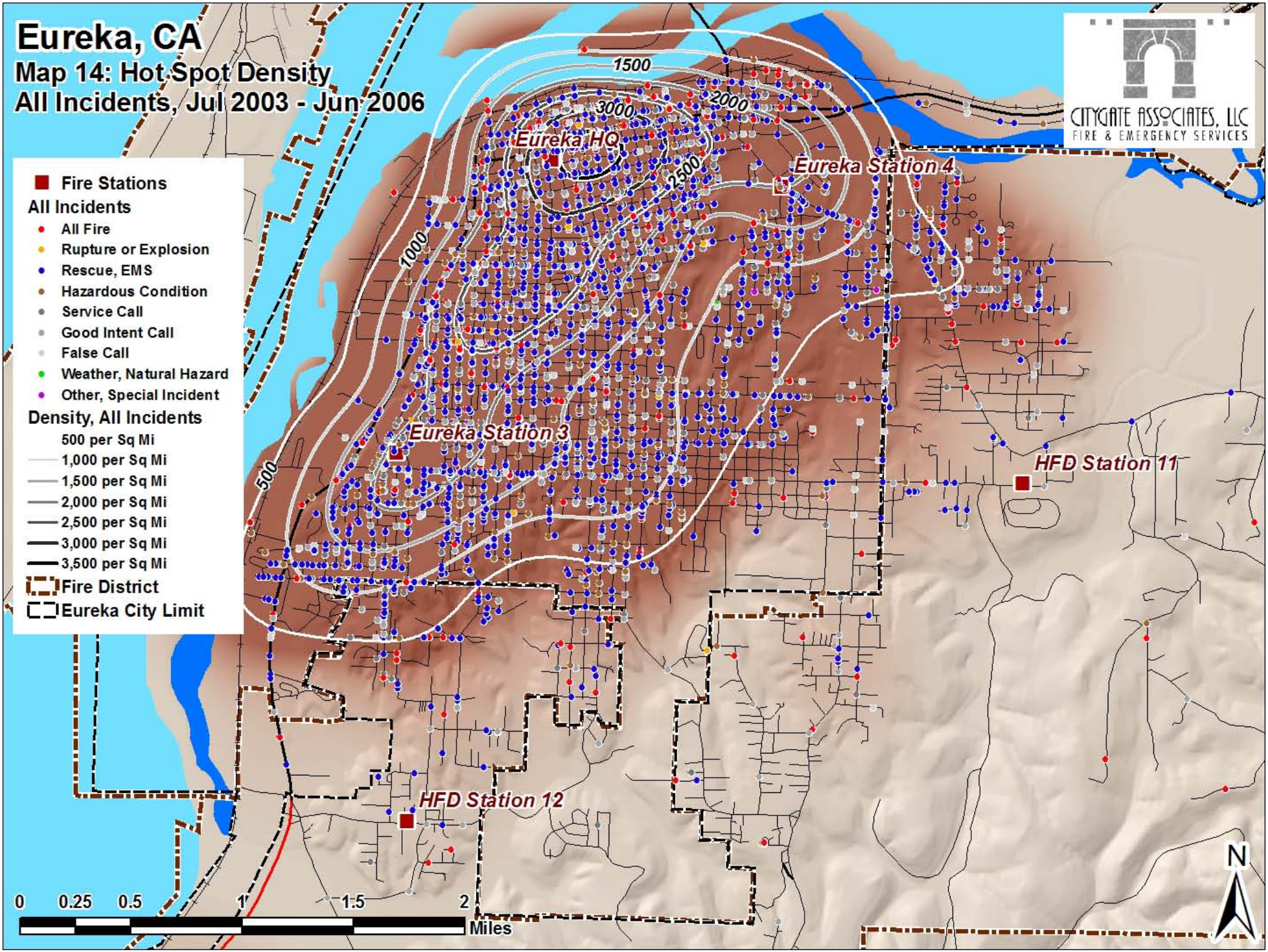

Eureka, CA
Map 9: Fire Stations
8 Minute Travel
Engine Concentration Density
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Battalion Chief
Trucks
Engines
Fire Stations
Eureka City Limit
Fire District
Engine Conc. Density
No Engines
1 Engine
2 Engines
3 Engines
4 Engines
5 Engines
BC 1
Eureka HQ
E 1
T 1
Eureka Station 4
E 4
Eureka Station 3
E 3
BC 11
HFD Station 11
E 11
HFD Station 12
E 12
0
0.25
0.5
1
1.5
2
Miles
N

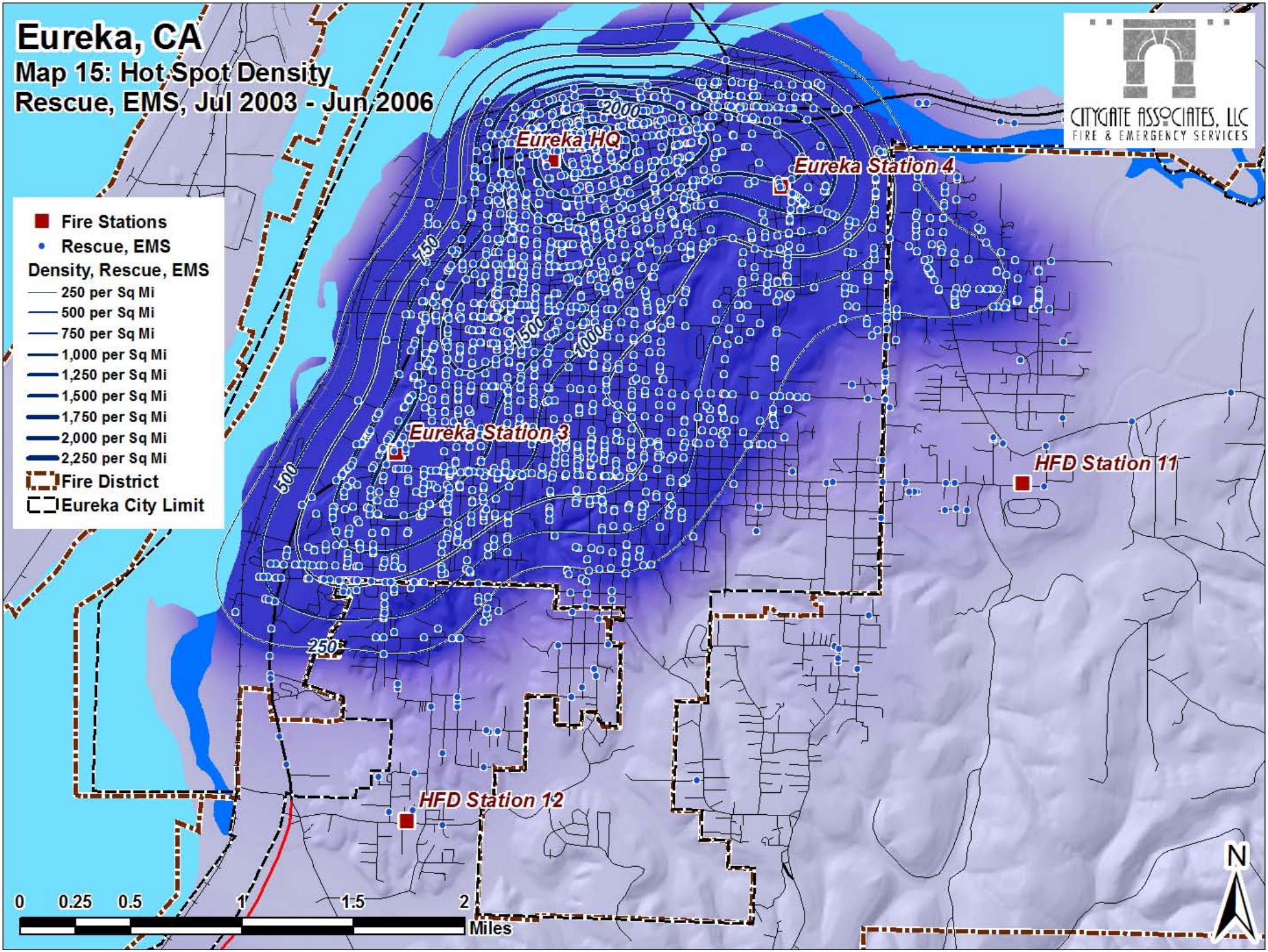

Eureka, CA
Map 10: RMS Data
All Incidents, Jul 2003 - Jun 2006
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Fire Stations
All Incidents
All Fire
Rupture or Explosion
Rescue, EMS
Hazardous Condition
Service Call
Good Intent Call
False Call
Weather, Natural Hazard
Other, Special Incident
Fire District
Eureka City Limit
Eureka HQ
Eureka Station 4
Eureka Station 3
HFD Station 11
HFD Station 12
0 0.25 0.5 1 1.5 2
Miles
N

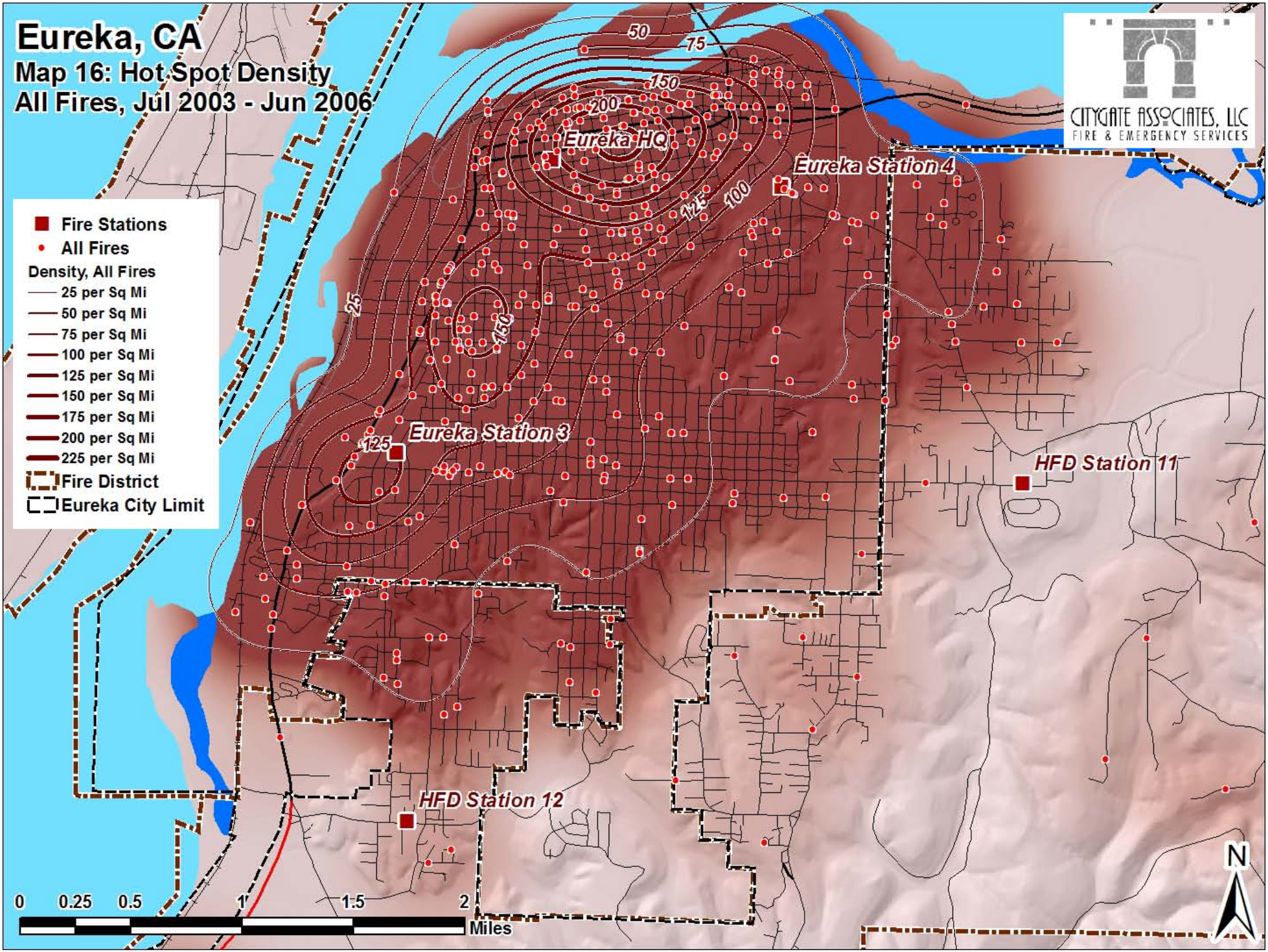

Eureka, CA
Map 11: RMS Data
Rescue, EMS, Jul 2003 - Jun 2006
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Rescue, EMS
Fire District
Eureka City Limit
0
0.25
0.5
1
1.5
2
Miles
N

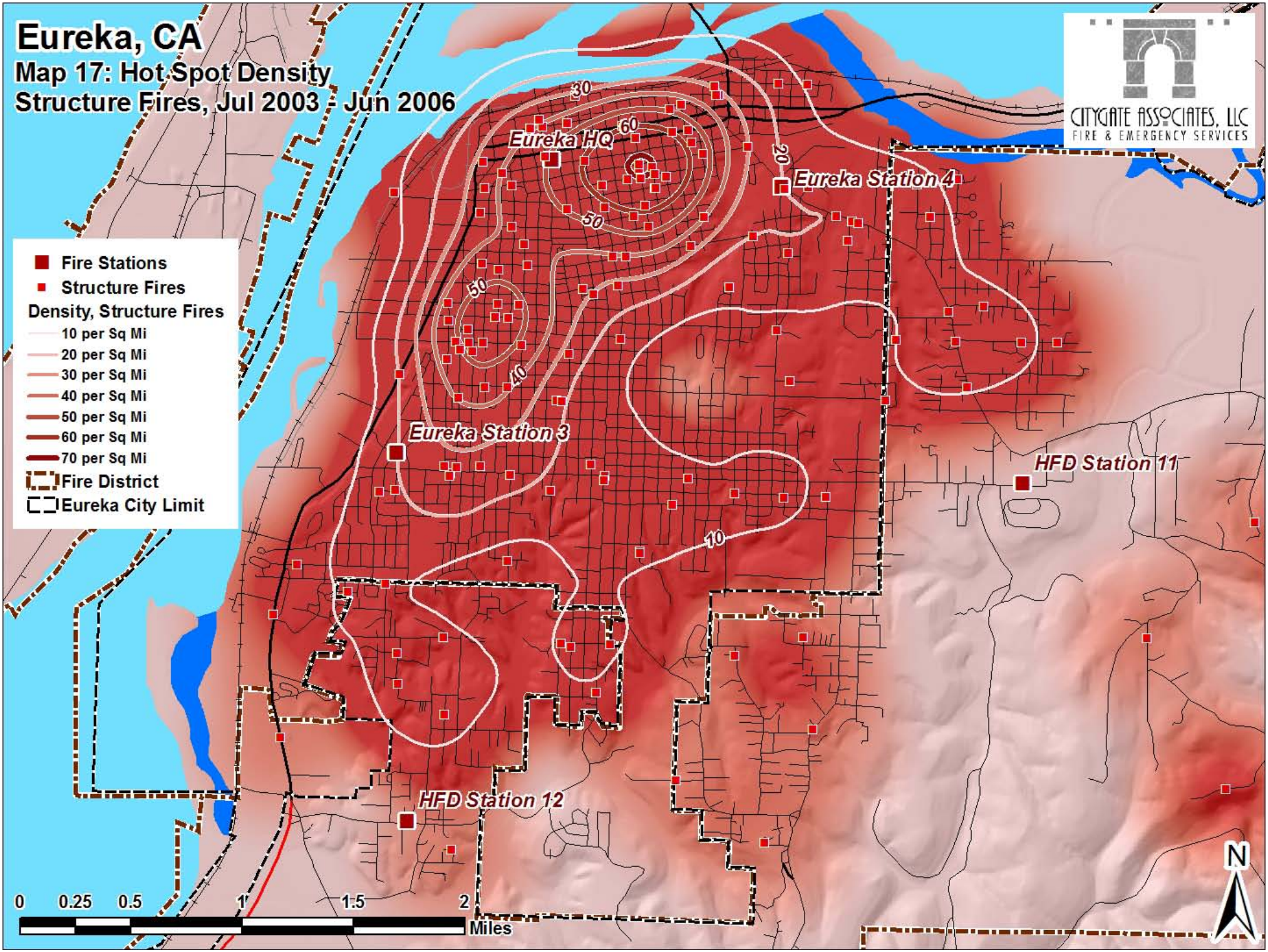

Eureka, CA
Map 12: RMS Data
All Fires, Jul 2003 - Jun 2006
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Eureka HQ
Eureka Station 4
Eureka Station 3
HFD Station 11
HFD Station 12
Fire Stations
All Fires
Fire District
Eureka City Limit
0
0.25
0.5
1
1.5
2
Miles
N


Eureka, CA
Map 13: RMS Data
Structure Fires, Jul 2003 - Jun 2006
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Eureka HQ
Eureka Station 4
Eureka Station 3
HFD Station 11
HFD Station 12
Fire Stations
Structure Fires
Fire District
Eureka City Limit
0
0.25
0.5
1
1.5
2
Miles
N


Eureka, CA
Map 14: Hot Spot Density
All Incidents, Jul 2003 - Jun 2006
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Fire Stations
All Incidents
All Fire
Rupture or Explosion
Rescue, EMS
Hazardous Condition
Service Call
Good Intent Call
False Call
Weather, Natural Hazard
Other, Special Incident
Density, All Incidents
500 per Sq Mi
1,000 per Sq Mi
1,500 per Sq Mi
2,000 per Sq Mi
2,500 per Sq Mi
3,000 per Sq Mi
3,500 per Sq Mi
Fire District
Eureka City Limit
500
1000
1500
2000
2500
3000
Eureka HQ
Eureka Station 4
Eureka Station 3
HFD Station 11
HFD Station 12
0
0.25
0.5
1
1.5
2
Miles
N


Eureka, CA
Map 15: Hot Spot Density
Rescue, EMS, Jul 2003 - Jun 2006
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Fire Stations
Rescue, EMS
Density, Rescue, EMS
250 per Sq Mi
500 per Sq Mi
750 per Sq Mi
1,000 per Sq Mi
1,250 per Sq Mi
1,500 per Sq Mi
1,750 per Sq Mi
2,000 per Sq Mi
2,250 per Sq Mi
Fire District
Eureka City Limit
Eureka HQ
Eureka Station 4
Eureka Station 3
HFD Station 11
HFD Station 12
2000
1750
1500
1000
750
500
250
0
0.25
0.5
1
1.5
2
Miles
N


Eureka, CA
Map 16: Hot Spot Density
All Fires, Jul 2003 - Jun 2006
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Fire Stations
All Fires
Density, All Fires
25 per Sq Mi
50 per Sq Mi
75 per Sq Mi
100 per Sq Mi
125 per Sq Mi
150 per Sq Mi
175 per Sq Mi
200 per Sq Mi
225 per Sq Mi
Fire District
Eureka City Limit
Eureka HQ
Eureka Station 4
Eureka Station 3
HFD Station 11
HFD Station 12
50
75
150
200
125
100
25
150
125
N
0
0.25
0.5
1
1.5
2
Miles


Eureka, CA
Map 17: Hot Spot Density
Structure Fires, Jul 2003 - Jun 2006
CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES
Fire Stations
Structure Fires
Density, Structure Fires
10 per Sq Mi
20 per Sq Mi
30 per Sq Mi
40 per Sq Mi
50 per Sq Mi
60 per Sq Mi
70 per Sq Mi
Fire District
Eureka City Limit
Eureka HQ
Eureka Station 4
Eureka Station 3
HFD Station 11
HFD Station 12
30
60
20
50
50
40
10
0
0.25
0.5
1
1.5
2
Miles
N

CITYGATE ASSOCIATES, LLC
FOLSOM (SACRAMENTO), CA MANAGEMENT CONSULTANTS

STANDARDS OF RESPONSE COVER STUDY FOR THE CITY OF EUREKA FIRE DEPARTMENT

Final Report

VOLUME 3 OF 3 – STATS APPENDIX

February 9, 2007

2250 East Bidwell St., Ste #100 Folsom, CA 95630
(916) 458-5100 Fax: (916) 983-2090

CITYGATE ASSOCIATES, LLC
FIRE & EMERGENCY SERVICES

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VOLUME 3 – STATISTICS APPENDIX

APPENDIX 1

EUREKA FIRE DEPARTMENT STATISTICS

EUREKA FIRE DEPARTMENT STATISTICS

Dataset Identification

The Eureka Fire Department (EFD) has furnished NFIRS 5 data for 12,050 incidents dated from 10/01/2002 through 6/30/2006. Supplemental CAD data was also submitted. The CAD data covered a 36-month period from 7/1/2003 – 6/30/2006. Since a 3-year period is ideal for analysis the set of NFIRS 5 incident records was reduced to the same dates provided in the supplemental CAD data. This reduced the incidents submitted by Eureka to 9,638 for the 3-year period.

The Humboldt Fire District (HFD) furnished 5,171 incidents from NFIRS 5 data for the period of 1/1/2003 – 6/30/2006. This dataset was reduced to the same 3-year date range. This trimmed the HFD incident count to 4,477. CAD data was not submitted since HFD utilizes different company inventories in their CAD and RMS systems.

Once date formats were converted Eureka raw CAD data was successfully merged into their NFIRS 5 data. This merge provides information about apparatus turnout and travel times not available from NFIRS 5 data alone. Because of the lack of CAD data these same measurements are not available for HFPD.

Data Quality

Eureka has a substantial history of using the current NFIRS 5 incident-reporting standard. Raw CAD data was available to augment NFIRS 5 response data.

Dataset strengths include the following:

- Use of NFIRS 5 Incidents and Apparatus modules
- Use of seconds in all time fields
- Consistent use of narratives by company officers in Incidents.

Dataset weaknesses include the following:

- Missing apparatus timestamps in CAD data
- Use of optional census tract would provide additional analysis opportunities.

Data Processing

Three years of NFIRS 5 data was imported from NFIRS 5 state transaction files for both Eureka and Humboldt. Eureka data was supplemented with raw CAD data.

For analysis purposes the 3-years are defined as follows:

Year 1 (7/1/2003 – 6/30/2004)

Year 2 (7/1/2004 – 6/30/2005)

Year 3 (7/1/2005 – 6/30/2006)

This breakdown will be used to analyze operational trends.

Demand for Service

Over the 36-month data period the Eureka Fire Department responded to an average of 8.80 incidents per day. Of those 5.43 incidents per day are for EMS. There are 4.08 fire incidents per week. For the 36-month time period 6.60% of incident responses were to fire, 61.75% to EMS and 31.65% to other types of incidents.

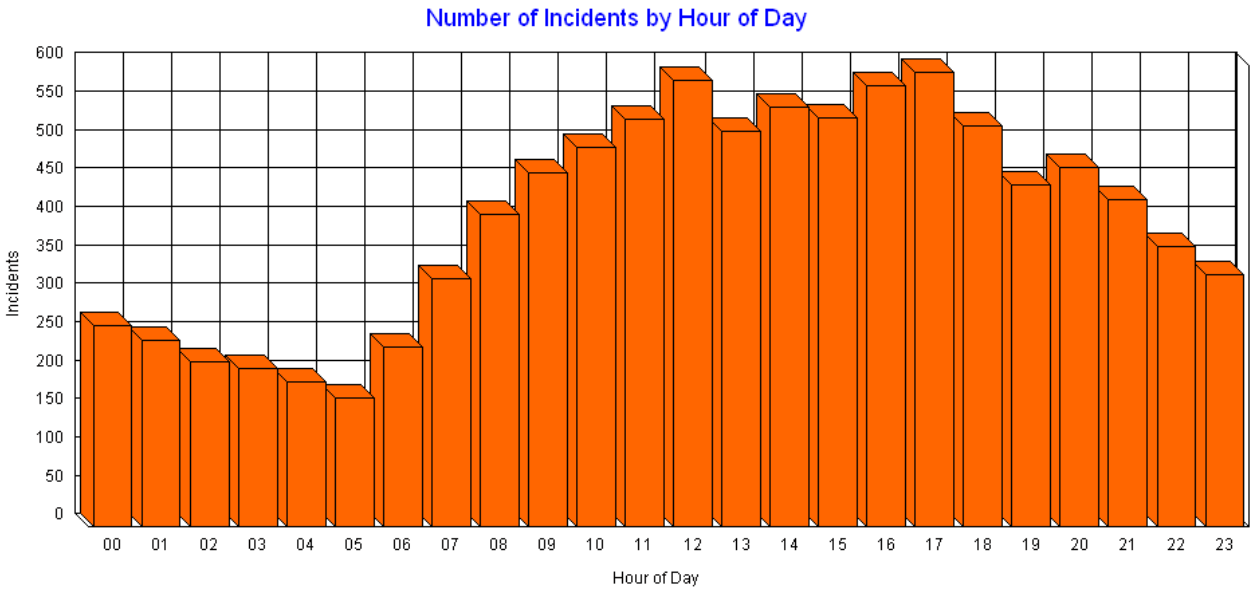
The years of available data breaks down as follows:

	Year 1	Year 2	Year 3
Incidents	3,316	3,107	3,215
Fire & EMS	2,258	2,174	2,157
Fire	256	212	169
Structure Fire	78	53	58
EMS	2,002	1,962	1,988

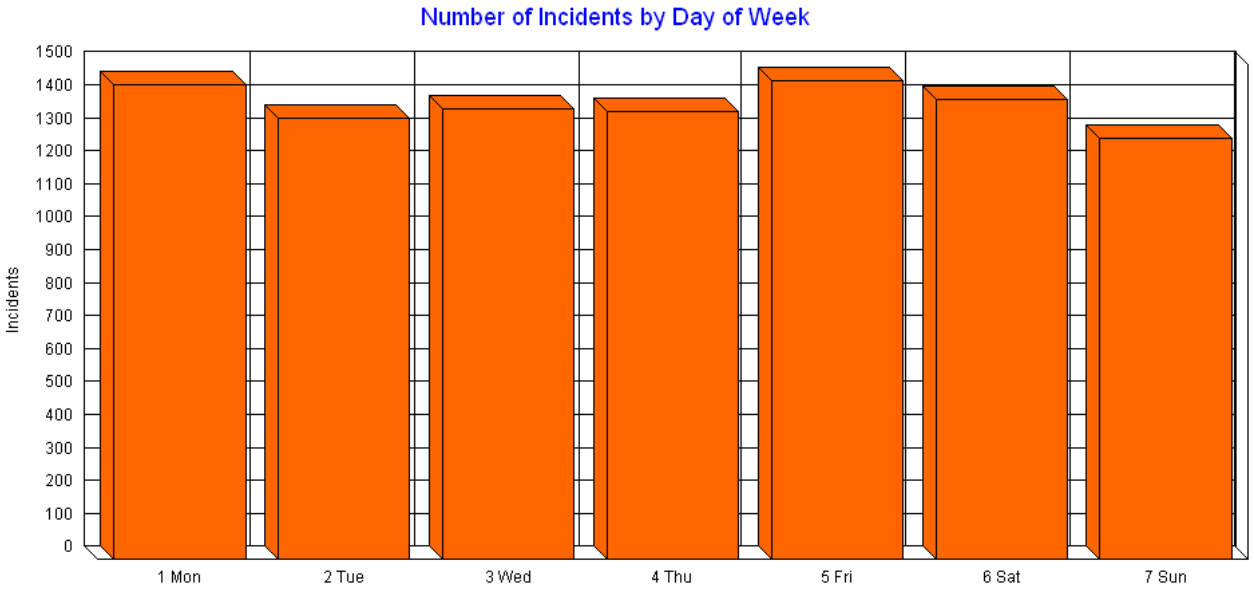
This trend analysis shows no steady increase in incidents. Decreases are noted Fire & EMS incidents as well as Fire incidents.

Chronological Distributions

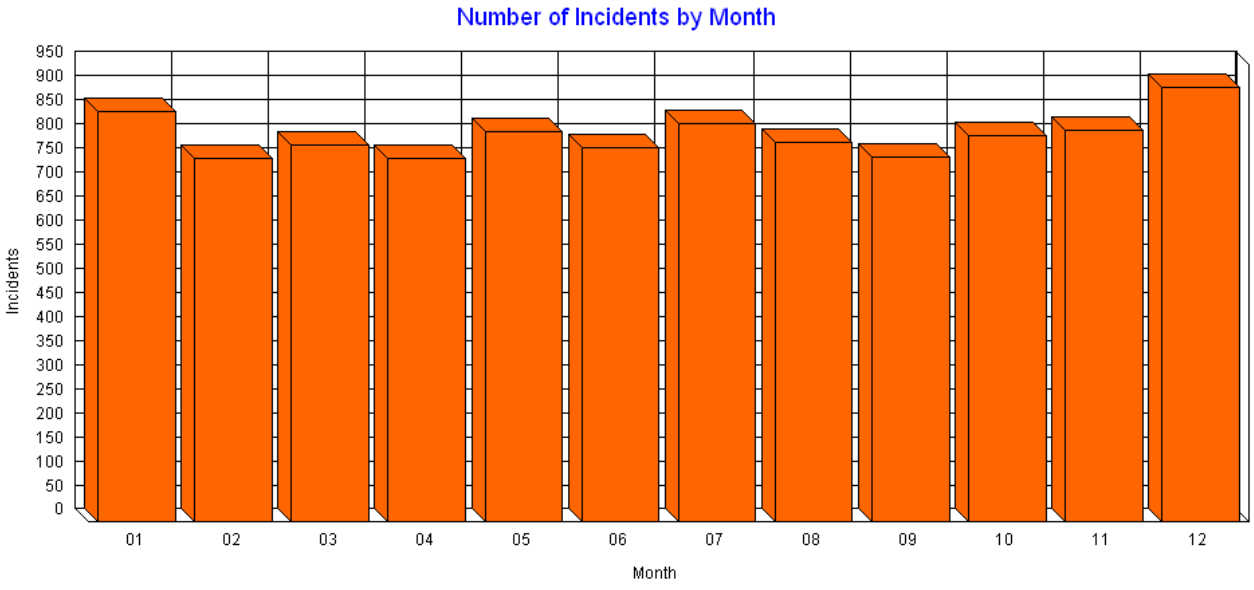
The following graph illustrates the number of incidents by hour of the day, day of week and month of year for the three-years of available data. Notice a minimal number of incidents in the early morning. After 5:00am the number of incidents grow through the late morning remaining fairly consistent through an evening drop-off. This response graph is a fairly typical representation of fire department activity.



The number of incidents tends to remain relatively constant by day of week with a slight increase in incident activity on Friday and Monday. This trend is illustrated in the following graph.



The following graph illustrates the monthly number of incidents. While monthly totals remain fairly consistent there is a slight spike of activity in December and January.



Below is a list of the top incident types for the 36-month period. Incident types with fewer than 20 responses were eliminated from the list.

Incident Type	Count
321 EMS call, excluding vehicle accident with injury	4,945
311 Medical assist, assist EMS crew	642
611 Dispatched & canceled en route	526
700 False alarm or false call, other	405
600 Good intent call, other	306
510 Person in distress, other	253
322 Vehicle accident with injuries	252
554 Assist invalid	231
111 Building fire	181
444 Power line down	124
561 Unauthorized burning	108
551 Assist police or other governmental agency	107
131 Passenger vehicle fire	87
531 Smoke or odor removal	82
500 Service Call, other	72
323 Motor vehicle/pedestrian accident (MV Ped)	68
400 Hazardous condition, other	60
661 EMS call, party transported by non-fire agency	57
142 Brush, or brush and grass mixture fire	54
151 Outside rubbish, trash or waste fire	46
631 Authorized controlled burning	46
412 Gas leak (natural gas or LPG)	45
413 Oil or other combustible liquid spill	45
651 Smoke scare, odor of smoke	43
154 Dumpster or other outside trash receptacle fire	37
440 Electrical wiring/equipment problem, other	36
511 Lock-out	31
411 Gasoline or other flammable liquid spill	30
100 Fire, other	29
671 Hazmat release investigation w/ no hazmat	29
522 Water or steam leak	27
140 Natural vegetation fire, other	26
445 Arcing, shorted electrical equipment	25
652 Steam, vapor, fog or dust thought to be smoke	25
143 Grass fire	24
352 Extrication of victim(s) from vehicle	22
113 Cooking fire, confined to container	21
150 Outside rubbish fire, other	21
160 Special outside fire, other	21
114 Chimney or flue fire, confined to chimney or flue	20

Here is a chart showing the top types of property receiving service from the Eureka Fire Department during the 36-month data period. Property types with fewer than 20 responses were eliminated from the list.

Property Type	Count
419 1 or 2 family dwelling	3,161
429 Multifamily dwellings	1,346
963 Street or road in commercial area	614
962 Residential street, road or residential driveway	550
439 Boarding/rooming house, residential hotels	301
965 Vehicle parking area	285
449 Hotel/motel, commercial	248
900 Outside or special property, other	207
960 Street, other	179
519 Food and beverage sales, grocery store	165
961 Highway or divided highway	149
459 Residential board and care	145
400 Residential, other	126
500 Mercantile, business, other	106
599 Business office	97
311 24-hour care Nursing homes, 4 or more persons	90
931 Open land or field	77
571 Service station, gas station	71
322 Alcohol or substance abuse recovery center	68
UUU Undetermined	68
460 Dormitory type residence, other	59
161 Restaurant or cafeteria	58
580 General retail, other	55
361 Jail, prison (not juvenile)	52
581 Department or discount store	46
160 Eating, drinking places	45
579 Motor vehicle or boat sales, services, repair	44
215 High school/junior high school/middle school	41
936 Vacant lot	40
569 Professional supplies, services	38
331 Hospital - medical or psychiatric	35
511 Convenience store	35
323 Asylum, mental institution	31
NNN None	25
300 Health care, detention, & correction, other	24
213 Elementary school, including kindergarten	23
549 Specialty shop	22
700 Manufacturing, processing	22
951 Railroad right of way	21

Simultaneous Incident Activity

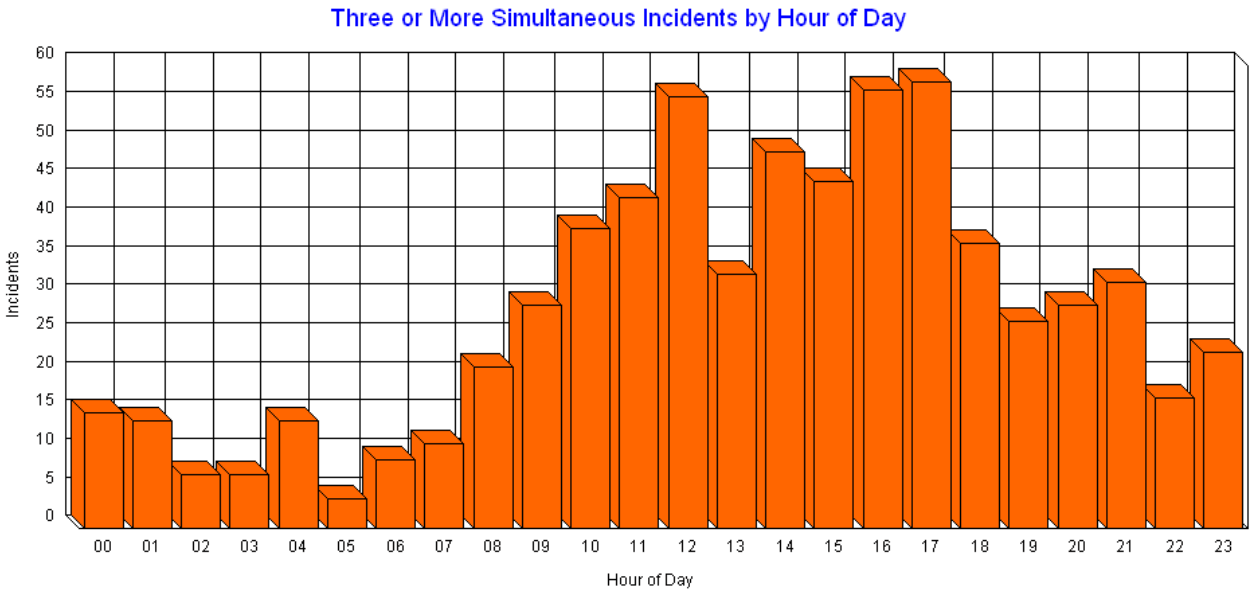
Obviously, incidents occurring at the same time tax fire department resources more than those occurring when there is no other fire department response activity. Since Eureka and Humboldt work closely together the following simultaneous measurements include both fire departments within the 3-year dataset.

Examining incident data for the 36-month period shows 25.11% of incidents occurred when Eureka or Humboldt were already engaged in other response activity. Despite combining data from two fire departments, this number illustrates a fairly low level of simultaneous activity.

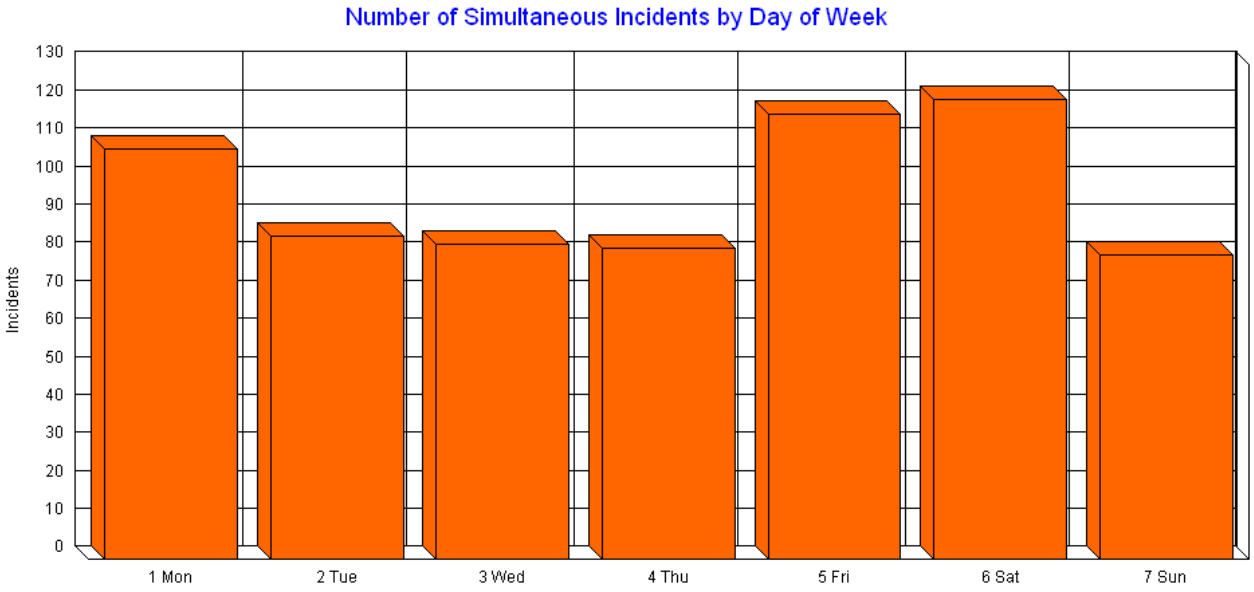
Here is the breakdown by number of incidents:

At least 2 Incidents occurring at the same time	25.11%
At least 3 Incidents occurring at the same time	4.78%
At least 4 Incidents occurring at the same time	.88%

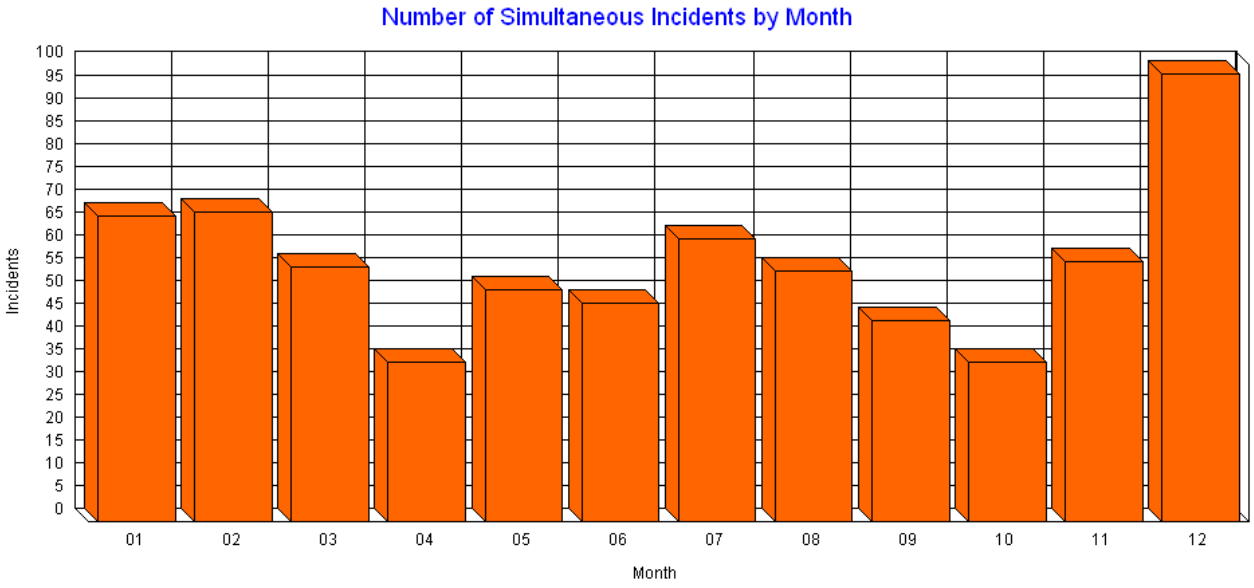
The graph below illustrates the hourly distribution of 3 or more (4.78%) simultaneous incidents. This graph roughly follows the distribution frequency of incidents in general. This means the percentage of simultaneous incidents remains relatively constant during a 24-hour day.



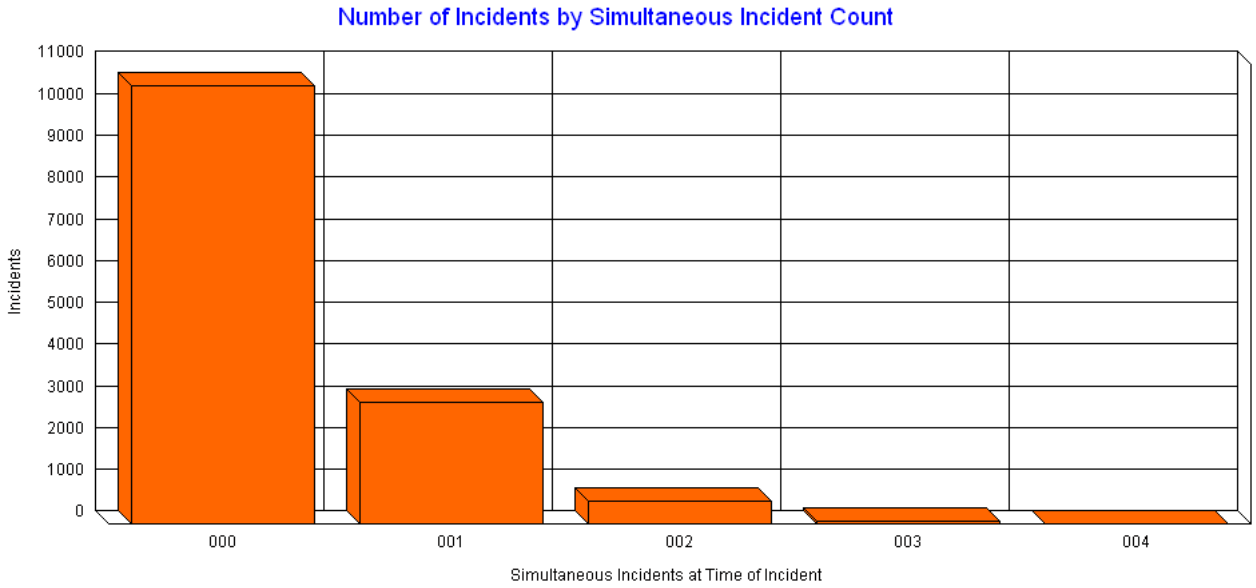
The occurrence of simultaneous incidents is greatest on Saturday and Friday with minimum simultaneous activity on Sunday. This is roughly in line with overall activity levels.



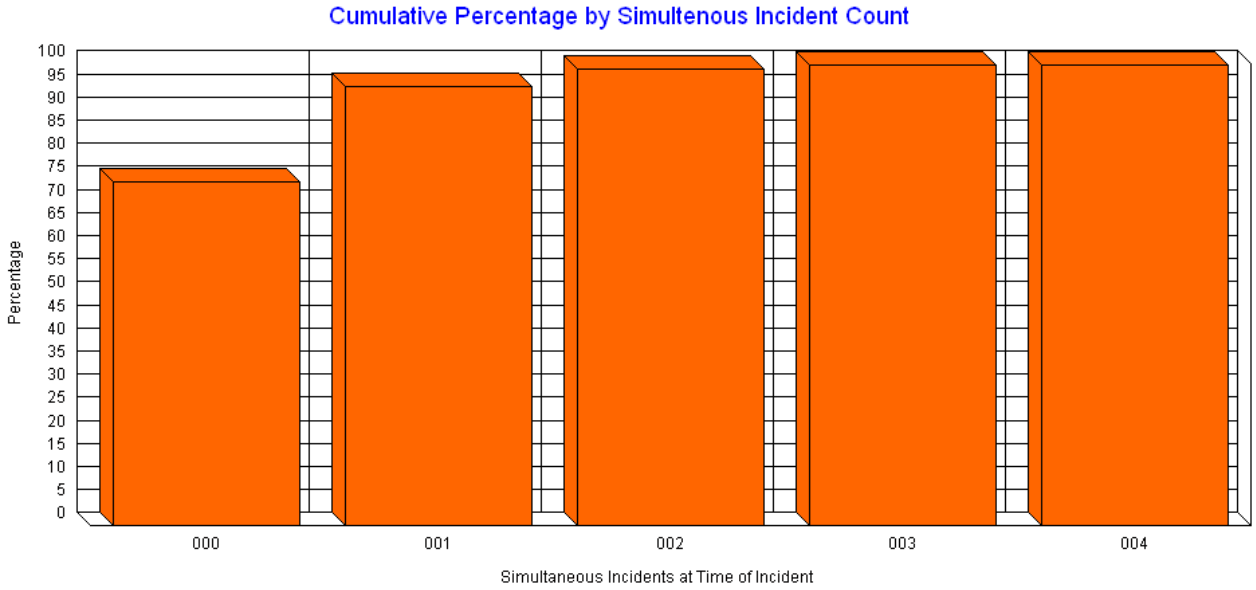
Simultaneous activity increases greatly in the month of December. It is at its minimum in April and October.



Let us shift gears to measure how simultaneous incidents affect performance. The following chart illustrates the number of incidents by simultaneous count. The vast majority of incidents occur when no other incidents are underway (000). The count of simultaneous incidents decreases rapidly as the number of simultaneous incidents increases.

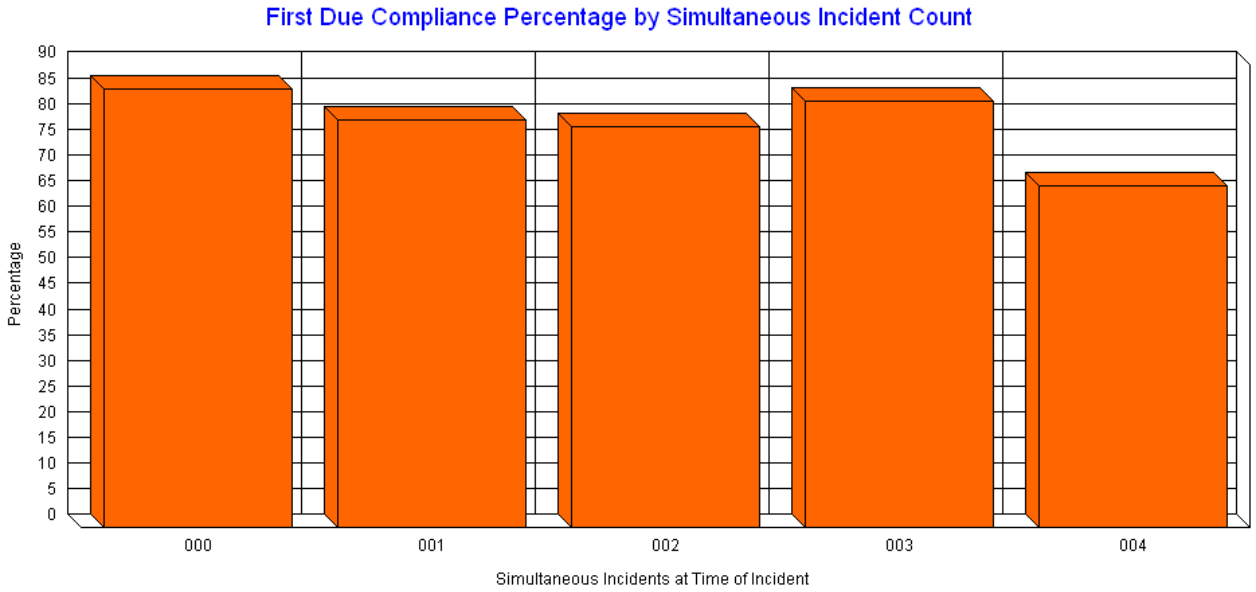


This next graph is a cumulative percentage graph. It illustrates how over 95% of all incidents occur when there are zero or one other incident underway.



Now let us see how simultaneous incidents affect the percentage of compliance with a 7-minute total reflex time (first apparatus to reach the scene). Notice, in general, response time

compliance drops with each additional simultaneous incident. Here the chart with three or four simultaneous incidents the graph becomes more volatile given the small number of incidents.



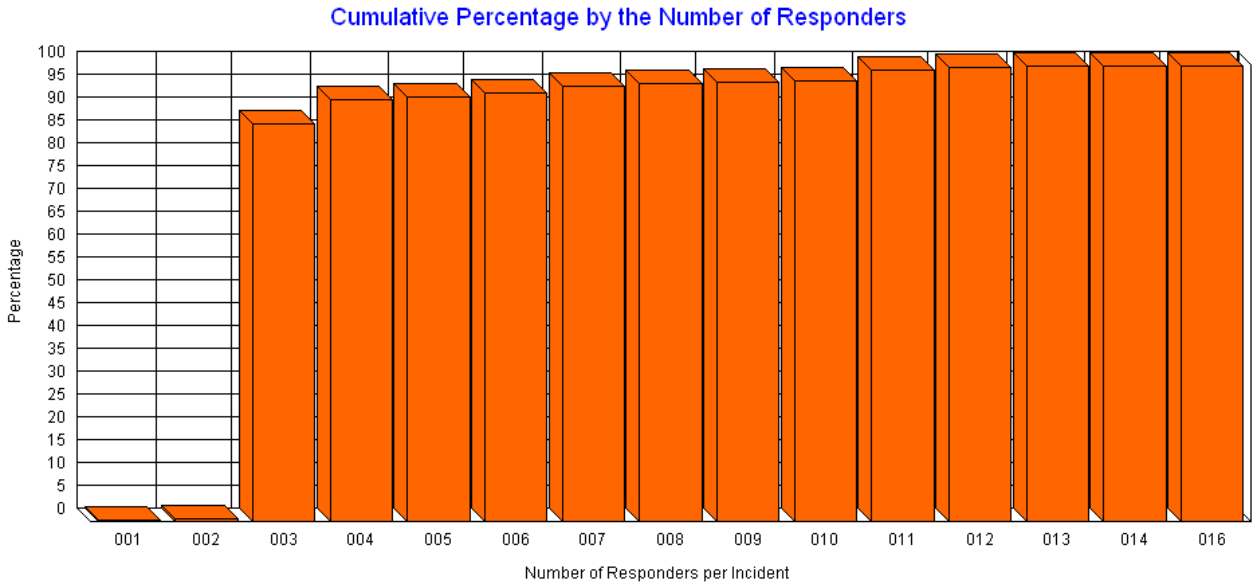
One factor increasing simultaneous incident activity is the duration of incidents. The longer an incident takes to resolve the more likely simultaneous incidents are to occur.

This numeric chart illustrates the top incident types in the 3-year dataset. Notice the average duration (in minutes) for EMS incident types is roughly similar to other incident types. Since EMS incidents are by far the most numerous type longer durations can drive simultaneous incident percentages higher. Eureka's relatively low incidence of simultaneous incidents is linked to lower duration times EMS incidents.

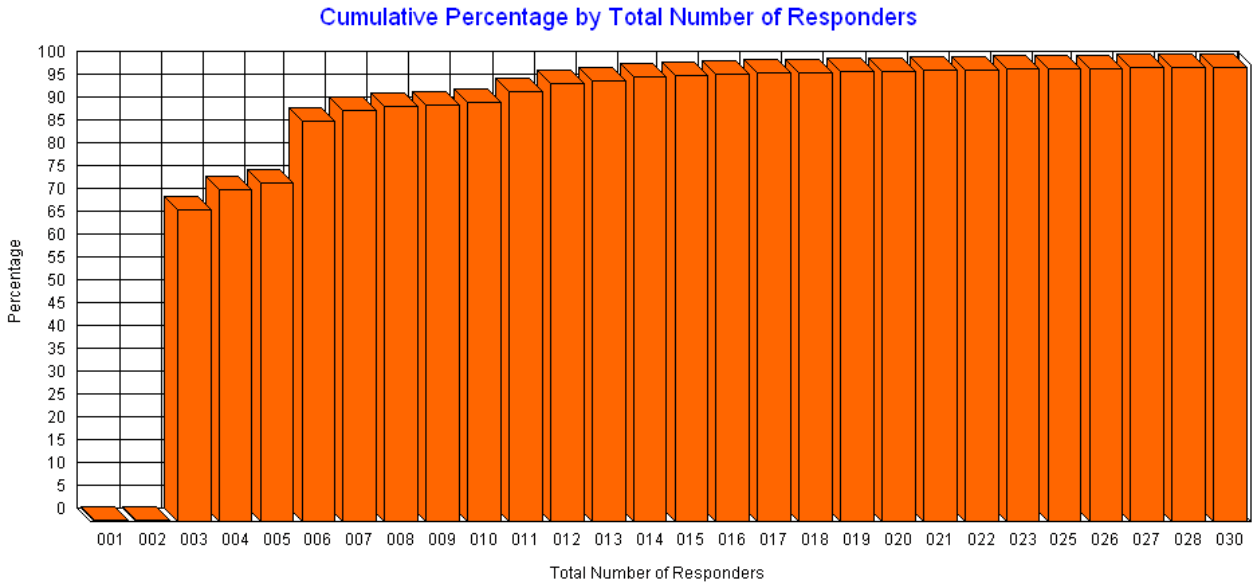
Description	Count	Average
321 EMS call, excluding vehicle accident with injury	7,019	22.05
311 Medical assist, assist EMS crew	1,153	21.80
611 Dispatched & canceled en route	903	15.34
700 False alarm or false call, other	503	25.47
600 Good intent call, other	417	23.50
111 Building fire	347	84.65
554 Assist invalid	341	20.00
322 Vehicle accident with injuries	331	31.64
510 Person in distress, other	314	23.49
561 Unauthorized burning	190	21.27

Let us see how simultaneous incidents affect staffing requirements. While the forgoing analysis has been for both Eureka and Humboldt, the following staff analysis is for Eureka only.

The following graph illustrates the number of incidents by the number of responders. Notice 95% of incidents can be handled with 7 or fewer on-duty responders.



Now let us shift so rather than measuring responder requirements by the incident we measure total responders required when incident overlap (simultaneous incidents) are considered.



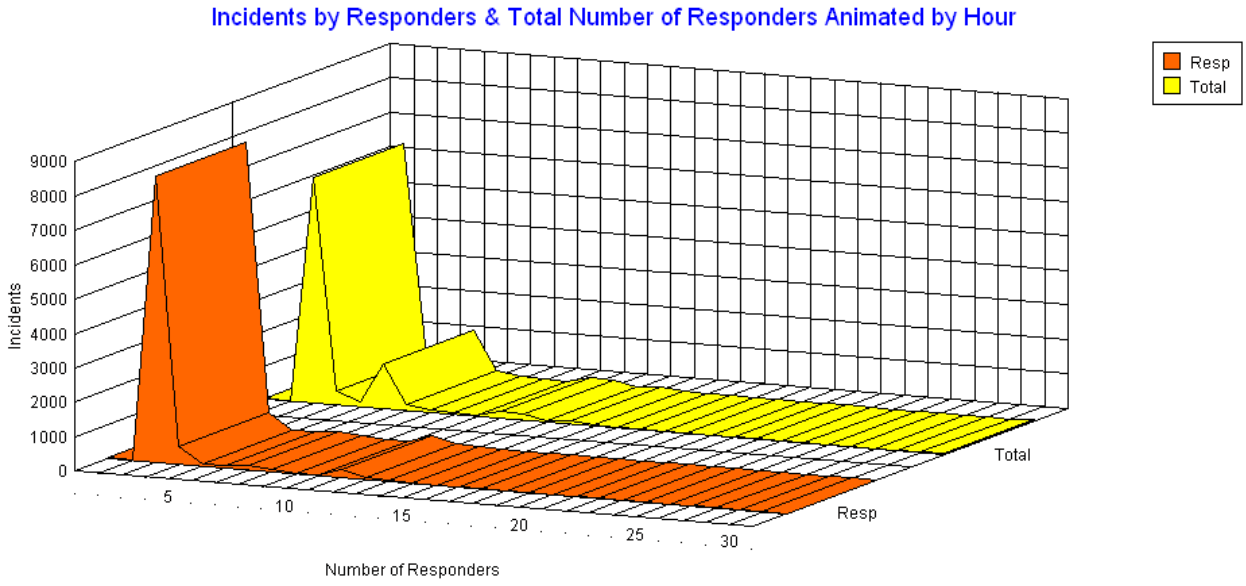
Here we see rather than 7-responders, the frequency of simultaneous incidents pushes the total number of responders required to cover 95% of incidents to between 11 and 12 responders. This is a relatively small increase and is directly traceable to lower EMS duration times.

These two charts can be combined. The area graph below compares the number of responders per incident to the total number of responders required for per incident. The orange area rises

based on the number of incidents handled by the number of responders on the X-Axis. Notice most incidents require substantially less than 10 responders. The yellow area rises based on the **total** number of responders required as each incident occurs.

To understand the graph let us use a simple example of two EMS incidents using three personnel each. On the orange graph there would be a sharp spike at the number 3 indicating two incidents requiring three personnel each. On the yellow graph there would be lower spikes at 3 and at 6 indicating the first incident was handled with 3 total responders, but when the second EMS incident overlapped the first requiring a total number of 6 responders.

While both the orange and yellow areas of the graphs cover exactly the same amount of area, the yellow graph shifts higher numbers of incidents to the right to indicate the increase in staffing demands caused by simultaneous incident activity.



Notice how low simultaneous incident activity causes the yellow "Total" area to roughly resemble the "Responders" area. A rise in the yellow graph at 6 responders indicates the presence of two 3-responder incidents. The affect of simultaneous activity is pretty low in the Eureka Fire Department. This dramatically holds down staffing requirements.

Interdepartmental Aid

During 3-years of available data aid types breakdown as follows:

Eureka	Count
1 Received	5
2 Automatic Aid Received	408
3 Given	22
4 Automatic Aid Given	317
5 Other Aid Given	19
N None	8,867

Humboldt	Count
1 Received	0
2 Automatic Aid Received	182
3 Given	16
4 Automatic Aid Given	901
5 Other Aid Given	14
N None	3,364

Data suggests the Eureka Fire Department, over the past 3-years, was slightly more likely to receive aid than give it. When interdepartmental aid is totaled it was received 53.56% of the time and given 46.44% of the time.

83.64% of the Humboldt Fire District's aid is given, 16.36% is received.

Here is a summary of Aid Activity by fire department:

Department Aid Report for Eureka Fire Department

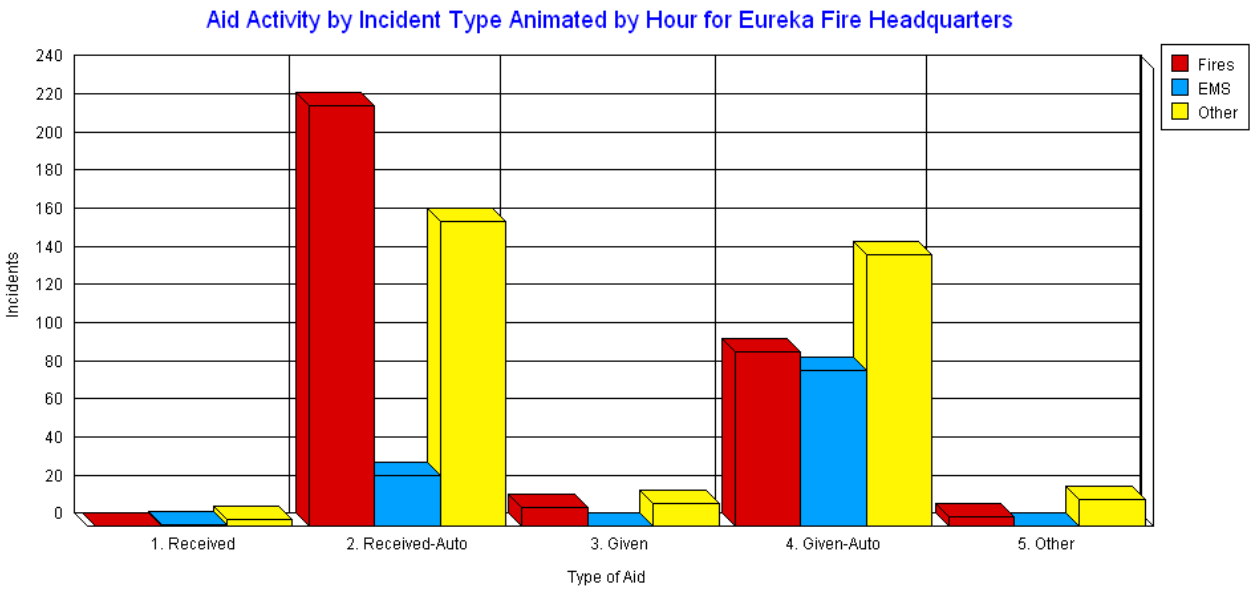
Total Incidents: 9,638

Incident	Count	Percentage
Incidents Involving Aid:	771	8.00%
Aid Incidents for Fires:	328	42.54%
Aid Incidents for EMS:	110	14.27%
Aid Incidents for Others:	333	43.19%
Incidents Involving Aid Received:	413	53.56%
Incidents Involving Requested Aid Received:	5	.65%
Incidents Involving Automatic Aid Received:	408	52.92%
Incidents Involving Aid Given:	358	46.44%
Incidents Involving Requested Aid Given:	22	2.85%
Incidents Involving Automatic Aid Given:	317	41.12%
Incidents Involving Other Types of Aid Given:	19	2.46%

Department Aid Report for Humboldt Fire District

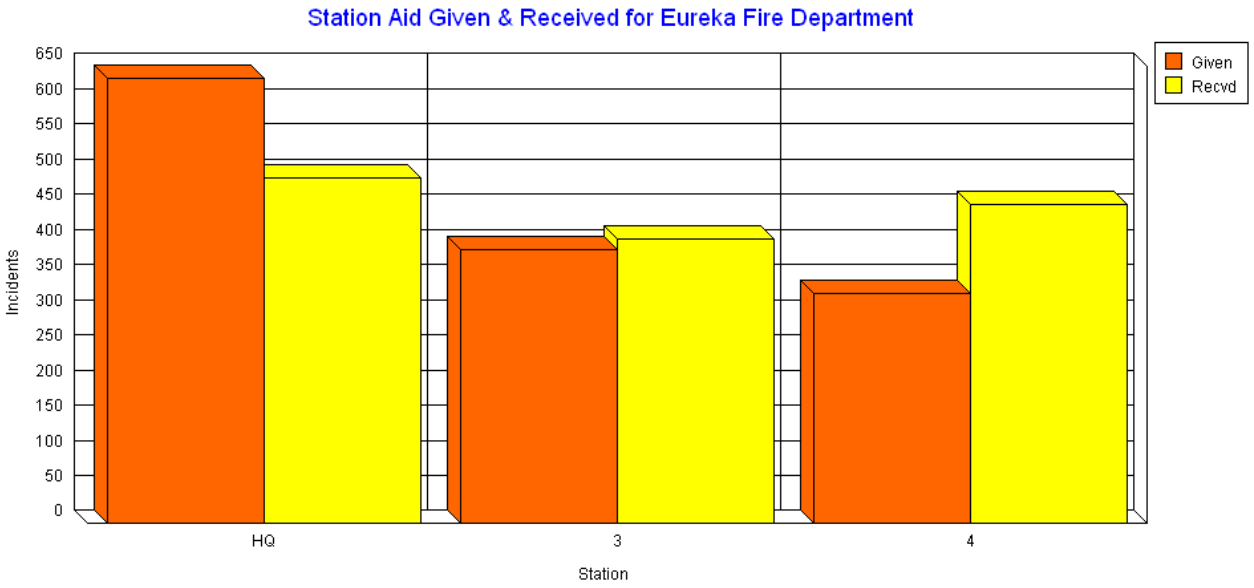
Total Incidents: 4,477

Incident	Count	Percentage
Incidents Involving Aid:	1,113	24.86%
Aid Incidents for Fires:	273	24.53%
Aid Incidents for EMS:	384	34.50%
Aid Incidents for Others:	456	40.97%
Incidents Involving Aid Received:	182	16.36%
Incidents Involving Requested Aid Received:		.00%
Incidents Involving Automatic Aid Received:	182	16.35%
Incidents Involving Aid Given:	931	83.64%
Incidents Involving Requested Aid Given:	16	1.44%
Incidents Involving Automatic Aid Given:	901	80.95%
Incidents Involving Other Types of Aid Given:	14	1.26%



Aid Given and Received Between Eureka Stations

The graph below illustrates aid distribution between fire stations in Eureka for the 3-year data period. If the orange and yellow bars associated with each fire station were of equal height, each of the fire stations would be sending apparatus into other districts and having apparatus responding into their district at an even rate. Unequal orange and yellow bars illustrate a lack of response "balance". Here we see a very even distribution of workload with the higher aid given in HQ due to it housing the ladder company.



Geographic Distributions

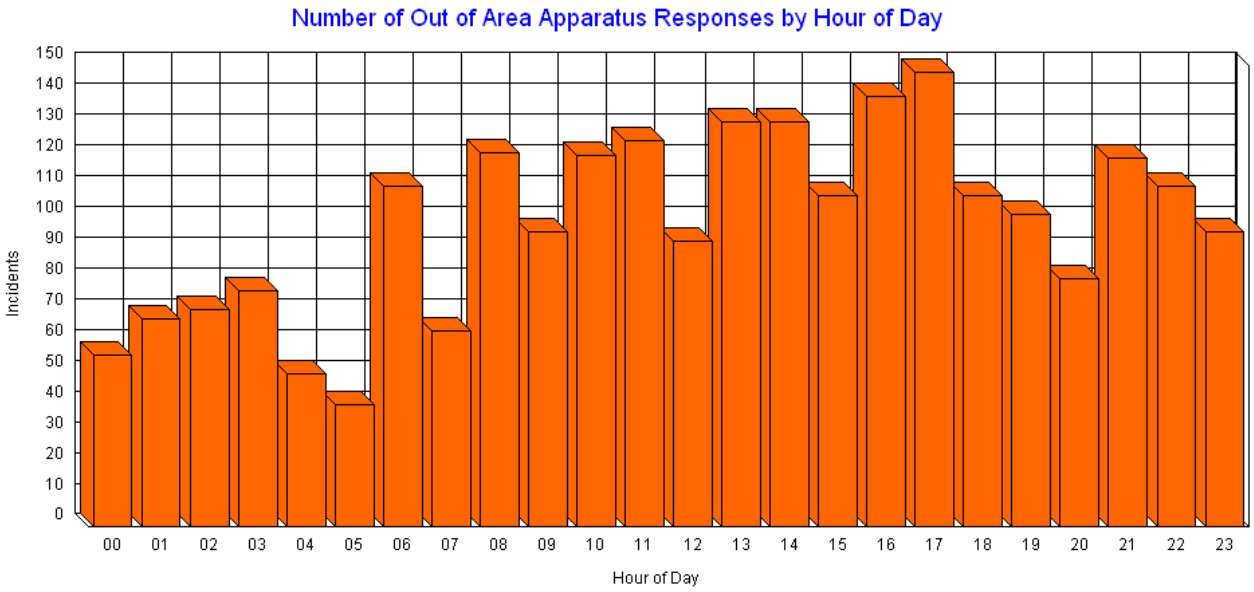
Here is the distribution of incidents by station for 2004-2005. The busiest stations are listed first.

3-Year Totals

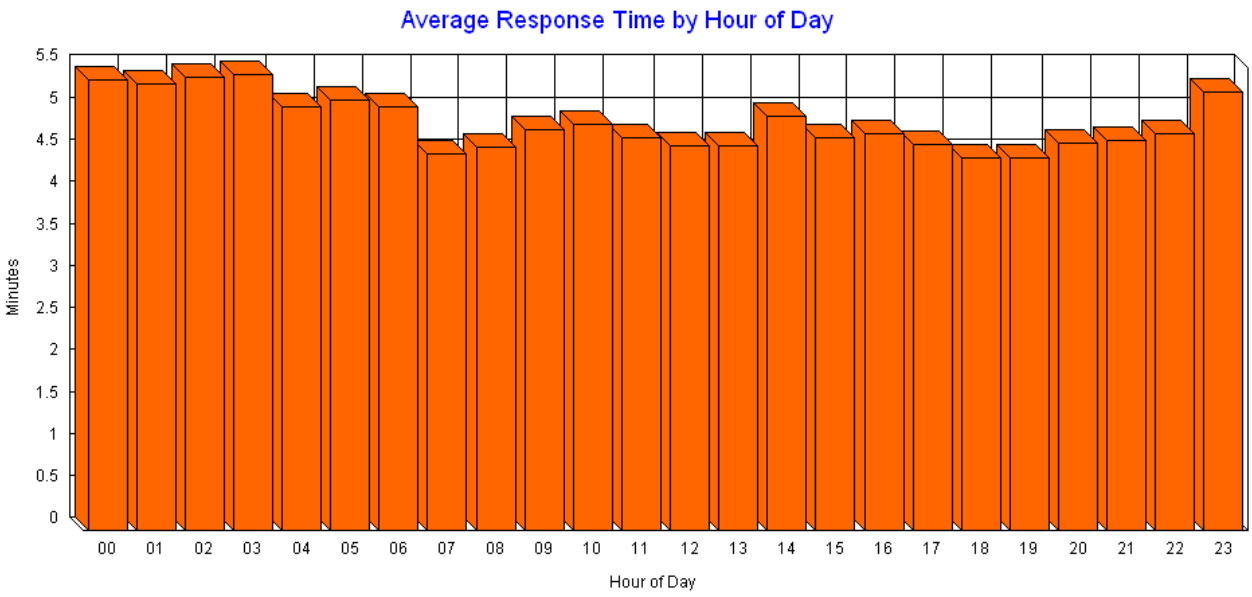
Sta.	Resp.	% Fire	% EMS	% Other	Per Day	Median Response Time
HQ	3,622	7.15%	59.17%	33.68%	3.30	4.42
3	3,361	5.95%	63.64%	30.41%	3.07	4.58
4	2,650	6.72%	62.98%	30.30%	2.42	4.37

Notice each station area enjoys a good median first unit arrival time. This indicates a fairly equal distribution of fire resources within the community.

We can test to see if simultaneous activity is correlated with responses outside of assigned station area. Like simultaneous responses, a substantial number of out of station area responses can tax fire department resources. Out of station area responses by hour of the day have a patterns similar to incident activity graphs. The same is true by day of week and by month. This indicates out of station activity is most closely correlated with overall incident activity.

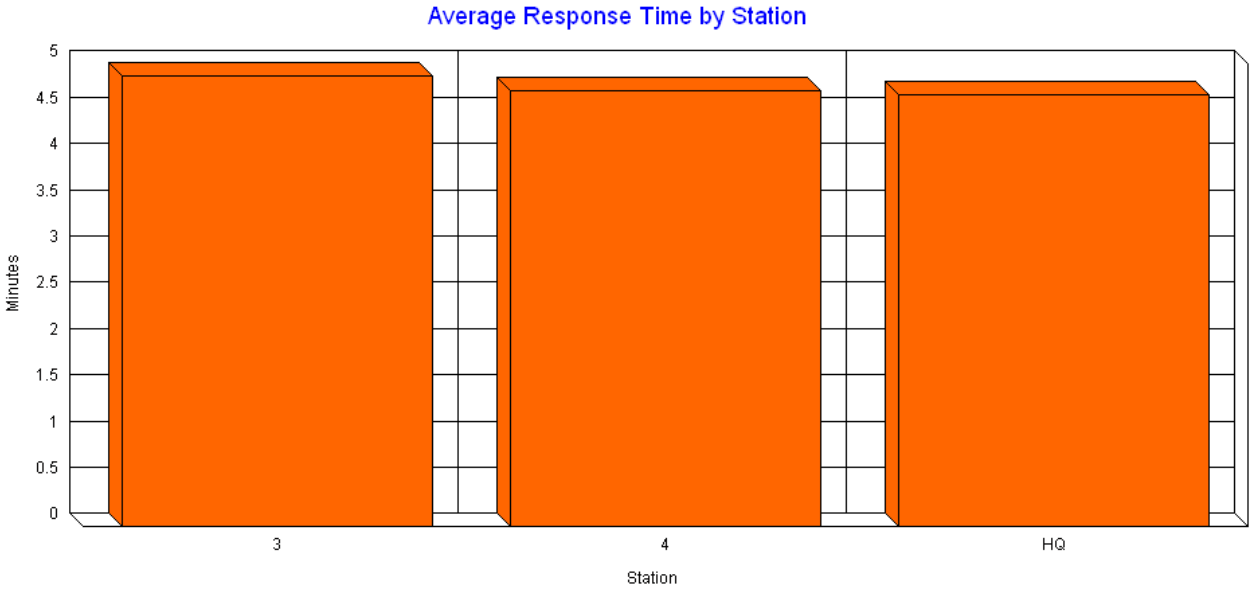


Another measurement of a fire department response system under stress is an increase in response times. Here is the breakdown of average response times by hour of the day. Only responses with a response time greater than zero and less then 12 minutes were included in this calculation.

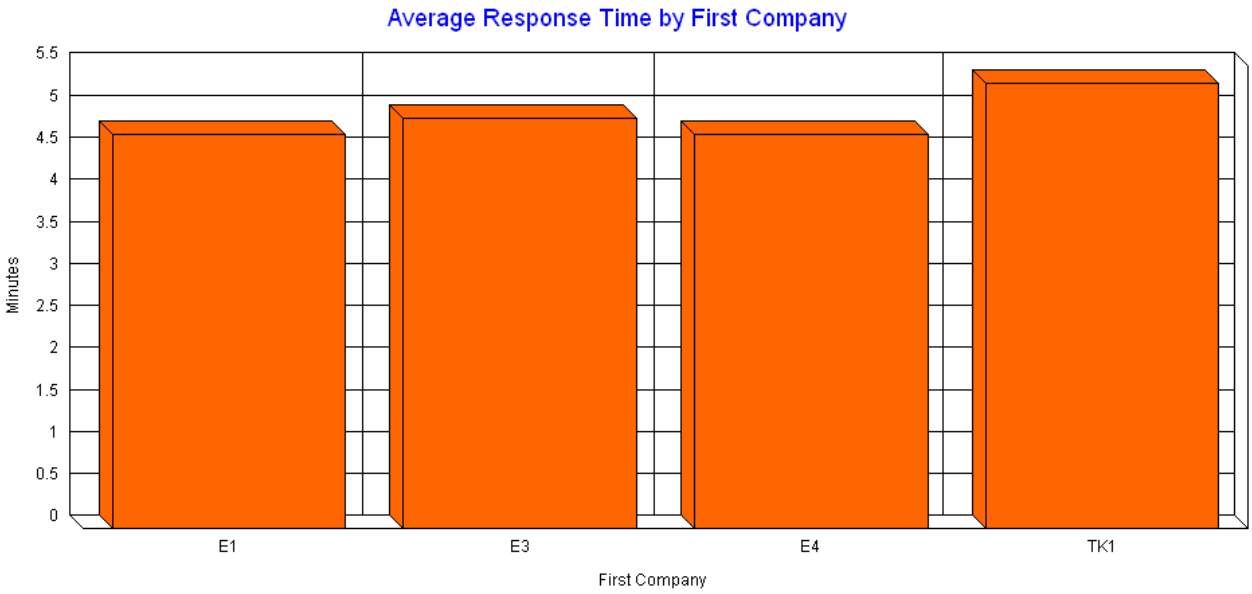


Notice Eureka does not experience longer average response times during high-traffic or commuting hours. Longer response times are more closely correlated with early morning hours during times of minimal response activity.

Here is a breakdown of average response time by station area. Again, response times appear fairly fast and consistent from station to station.



Here is a breakdown of average response time by first arriving company. The average is under 5-minutes for primary engines and under 5.5 minutes for the truck. Remember, these average response times are calculated for the first apparatus to reach the scene.



Response to Demands for Service

This section will focus on the most recent year of response activity, **Year 3** from 7/1/2005 to 6/30/2006.

While many fire departments track average response time it is not highly regarded as a performance measurement. One of the most commonly used criteria to measure response effectiveness is fractile analysis of response time.

A fractile analysis splits responses into time segments and provides a count and percentage for each progressive time segment.

Below is a fractile analysis of incidents in **Year 3**. This fractile is broken down into 15-second segments and progressively covers response times greater than 0 and less than 20 minutes. <u>This measures the elapsed time from CAD call received until the first apparatus arrives on the scene.</u>

There are 3,111 Incident records being analyzed.

1st Apparatus On Scene <= 00:00:00 .0% (0)
1st Apparatus On Scene <= 00:00:15 .2% (7)
1st Apparatus On Scene <= 00:00:30 .3% (8)
1st Apparatus On Scene <= 00:00:45 .3% (10)
1st Apparatus On Scene <= 00:01:00 .5% (16)
1st Apparatus On Scene <= 00:01:15 .6% (20)
1st Apparatus On Scene <= 00:01:30 .8% (26)
1st Apparatus On Scene <= 00:01:45 1.2% (36)
1st Apparatus On Scene <= 00:02:00 1.8% (57)
1st Apparatus On Scene <= 00:02:15 3.2% (101)

1st Apparatus On Scene <= 00:02:30 5.1% (160)
1st Apparatus On Scene <= 00:02:45 7.6% (236)
1st Apparatus On Scene <= 00:03:00 11.3% (352)
1st Apparatus On Scene <= 00:03:15 15.9% (496)
1st Apparatus On Scene <= 00:03:30 21.9% (682)
1st Apparatus On Scene <= 00:03:45 28.7% (894)
1st Apparatus On Scene <= 00:04:00 34.8% (1,083)
1st Apparatus On Scene <= 00:04:15 41.5% (1,290)
1st Apparatus On Scene <= 00:04:30 47.5% (1,478)
1st Apparatus On Scene <= 00:04:45 53.5% (1,665)
1st Apparatus On Scene <= 00:05:00 59.2% (1,842)
1st Apparatus On Scene <= 00:05:15 64.0% (1,991)
1st Apparatus On Scene <= 00:05:30 68.3% (2,124)
1st Apparatus On Scene <= 00:05:45 72.0% (2,241)
1st Apparatus On Scene <= 00:06:00 74.6% (2,320)
1st Apparatus On Scene <= 00:06:15 77.3% (2,406)
1st Apparatus On Scene <= 00:06:30 79.7% (2,478)
1st Apparatus On Scene <= 00:06:45 81.9% (2,547)
1st Apparatus On Scene <= 00:07:00 83.6% (2,600)
1st Apparatus On Scene <= 00:07:15 85.1% (2,646)
1st Apparatus On Scene <= 00:07:30 86.5% (2,690)
1st Apparatus On Scene <= 00:07:45 87.5% (2,722)
1st Apparatus On Scene <= 00:08:00 88.8% (2,762)
1st Apparatus On Scene <= 00:08:15 89.7% (2,792)
1st Apparatus On Scene <= 00:08:30 90.8% (2,824)
1st Apparatus On Scene <= 00:08:45 91.8% (2,855)
1st Apparatus On Scene <= 00:09:00 92.5% (2,879)
1st Apparatus On Scene <= 00:09:15 93.2% (2,898)
1st Apparatus On Scene <= 00:09:30 93.6% (2,912)
1st Apparatus On Scene <= 00:09:45 94.1% (2,929)
1st Apparatus On Scene <= 00:10:00 94.5% (2,941)
1st Apparatus On Scene <= 00:10:15 95.0% (2,955)
1st Apparatus On Scene <= 00:10:30 95.4% (2,969)
1st Apparatus On Scene <= 00:10:45 95.8% (2,981)
1st Apparatus On Scene <= 00:11:00 96.2% (2,992)
1st Apparatus On Scene <= 00:11:15 96.3% (2,996)
1st Apparatus On Scene <= 00:11:30 96.5% (3,002)
1st Apparatus On Scene <= 00:11:45 96.6% (3,006)
1st Apparatus On Scene <= 00:12:00 96.8% (3,010)
1st Apparatus On Scene <= 00:12:15 96.9% (3,014)
1st Apparatus On Scene <= 00:12:30 97.2% (3,023)
1st Apparatus On Scene <= 00:12:45 97.3% (3,028)
1st Apparatus On Scene <= 00:13:00 97.5% (3,034)
1st Apparatus On Scene <= 00:13:15 97.6% (3,036)
1st Apparatus On Scene <= 00:13:30 97.7% (3,040)
1st Apparatus On Scene <= 00:13:45 97.9% (3,045)

1st Apparatus On Scene <= 00:14:00 98.0% (3,048)
1st Apparatus On Scene <= 00:14:15 98.1% (3,051)
1st Apparatus On Scene <= 00:14:30 98.1% (3,052)
1st Apparatus On Scene <= 00:14:45 98.3% (3,059)
1st Apparatus On Scene <= 00:15:00 98.5% (3,063)
1st Apparatus On Scene <= 00:15:15 98.6% (3,066)
1st Apparatus On Scene <= 00:15:30 98.6% (3,068)
1st Apparatus On Scene <= 00:15:45 98.6% (3,069)
1st Apparatus On Scene <= 00:16:00 98.7% (3,071)
1st Apparatus On Scene <= 00:16:15 98.7% (3,072)
1st Apparatus On Scene <= 00:16:30 98.8% (3,075)
1st Apparatus On Scene <= 00:16:45 98.9% (3,077)
1st Apparatus On Scene <= 00:17:00 99.0% (3,081)
1st Apparatus On Scene <= 00:17:15 99.2% (3,086)
1st Apparatus On Scene <= 00:17:30 99.3% (3,088)
1st Apparatus On Scene <= 00:17:45 99.4% (3,092)
1st Apparatus On Scene <= 00:18:00 99.5% (3,095)
1st Apparatus On Scene <= 00:18:15 99.5% (3,097)
1st Apparatus On Scene <= 00:18:30 99.6% (3,100)
1st Apparatus On Scene <= 00:18:45 99.8% (3,104)
1st Apparatus On Scene <= 00:19:00 99.8% (3,106)
1st Apparatus On Scene <= 00:19:15 99.9% (3,107)
1st Apparatus On Scene <= 00:19:30 99.9% (3,109)
1st Apparatus On Scene <= 00:19:45 99.9% (3,109)
1st Apparatus On Scene <= 00:20:00 100.0% (3,111)

Median 1st Apparatus On Scene 00:04:37 (4.62 minutes)
Average 1st Apparatus On Scene 00:05:15 (5.25 minutes)

If incidents are reduced to **fire & EMS incidents**, the following fractile results. Notice Eureka's response effectiveness increases dramatically when responding to fire and EMS incidents, more likely to fall into the category of emergency responses. For all incidents the 90% first apparatus arrival is not reached until 08:15 (8 minutes, 15 seconds). However, when responding to fire and EMS incidents the 90% threshold is reached in just 06:30.

There are 2,111 Incident records being analyzed.

1st Apparatus On Scene <= 00:00:00 .0% (0)
1st Apparatus On Scene <= 00:00:15 .2% (4)
1st Apparatus On Scene <= 00:00:30 .2% (5)
1st Apparatus On Scene <= 00:00:45 .3% (6)
1st Apparatus On Scene <= 00:01:00 .5% (11)
1st Apparatus On Scene <= 00:01:15 .7% (14)
1st Apparatus On Scene <= 00:01:30 .9% (18)
1st Apparatus On Scene <= 00:01:45 1.3% (27)
1st Apparatus On Scene <= 00:02:00 2.1% (45)
1st Apparatus On Scene <= 00:02:15 3.9% (82)
1st Apparatus On Scene <= 00:02:30 6.3% (133)

1st Apparatus On Scene <= 00:02:45 9.4% (198)
1st Apparatus On Scene <= 00:03:00 14.1% (298)
1st Apparatus On Scene <= 00:03:15 19.9% (421)
1st Apparatus On Scene <= 00:03:30 27.8% (586)
1st Apparatus On Scene <= 00:03:45 36.3% (766)
1st Apparatus On Scene <= 00:04:00 43.8% (924)
1st Apparatus On Scene <= 00:04:15 51.9% (1,096)
1st Apparatus On Scene <= 00:04:30 58.8% (1,241)
1st Apparatus On Scene <= 00:04:45 65.4% (1,381)
1st Apparatus On Scene <= 00:05:00 71.5% (1,510)
1st Apparatus On Scene <= 00:05:15 76.6% (1,617)
1st Apparatus On Scene <= 00:05:30 80.9% (1,707)
1st Apparatus On Scene <= 00:05:45 84.2% (1,778)
1st Apparatus On Scene <= 00:06:00 86.3% (1,822)
1st Apparatus On Scene <= 00:06:15 87.9% (1,856)
1st Apparatus On Scene <= 00:06:30 89.7% (1,894)
1st Apparatus On Scene <= 00:06:45 90.9% (1,919)
1st Apparatus On Scene <= 00:07:00 91.9% (1,939)
1st Apparatus On Scene <= 00:07:15 92.5% (1,953)
1st Apparatus On Scene <= 00:07:30 93.1% (1,966)
1st Apparatus On Scene <= 00:07:45 93.7% (1,979)
1st Apparatus On Scene <= 00:08:00 94.4% (1,992)
1st Apparatus On Scene <= 00:08:15 94.9% (2,003)
1st Apparatus On Scene <= 00:08:30 95.6% (2,018)
1st Apparatus On Scene <= 00:08:45 96.1% (2,028)
1st Apparatus On Scene <= 00:09:00 96.4% (2,034)
1st Apparatus On Scene <= 00:09:15 96.6% (2,039)
1st Apparatus On Scene <= 00:09:30 96.8% (2,044)
1st Apparatus On Scene <= 00:09:45 97.2% (2,052)
1st Apparatus On Scene <= 00:10:00 97.5% (2,058)
1st Apparatus On Scene <= 00:10:15 97.7% (2,062)
1st Apparatus On Scene <= 00:10:30 98.0% (2,068)
1st Apparatus On Scene <= 00:10:45 98.2% (2,073)
1st Apparatus On Scene <= 00:11:00 98.4% (2,077)
1st Apparatus On Scene <= 00:11:15 98.4% (2,078)
1st Apparatus On Scene <= 00:11:30 98.5% (2,080)
1st Apparatus On Scene <= 00:11:45 98.5% (2,080)
1st Apparatus On Scene <= 00:12:00 98.5% (2,080)
1st Apparatus On Scene <= 00:12:15 98.5% (2,080)
1st Apparatus On Scene <= 00:12:30 98.6% (2,081)
1st Apparatus On Scene <= 00:12:45 98.6% (2,082)
1st Apparatus On Scene <= 00:13:00 98.8% (2,085)
1st Apparatus On Scene <= 00:13:15 98.8% (2,085)
1st Apparatus On Scene <= 00:13:30 98.8% (2,086)
1st Apparatus On Scene <= 00:13:45 98.9% (2,087)
1st Apparatus On Scene <= 00:14:00 98.9% (2,088)

1st Apparatus On Scene <= 00:14:15 99.0% (2,090)
1st Apparatus On Scene <= 00:14:30 99.0% (2,090)
1st Apparatus On Scene <= 00:14:45 99.1% (2,092)
1st Apparatus On Scene <= 00:15:00 99.1% (2,093)
1st Apparatus On Scene <= 00:15:15 99.1% (2,093)
1st Apparatus On Scene <= 00:15:30 99.2% (2,094)
1st Apparatus On Scene <= 00:15:45 99.2% (2,095)
1st Apparatus On Scene <= 00:16:00 99.3% (2,097)
1st Apparatus On Scene <= 00:16:15 99.3% (2,097)
1st Apparatus On Scene <= 00:16:30 99.4% (2,098)
1st Apparatus On Scene <= 00:16:45 99.4% (2,098)
1st Apparatus On Scene <= 00:17:00 99.4% (2,099)
1st Apparatus On Scene <= 00:17:15 99.4% (2,099)
1st Apparatus On Scene <= 00:17:30 99.5% (2,100)
1st Apparatus On Scene <= 00:17:45 99.5% (2,101)
1st Apparatus On Scene <= 00:18:00 99.6% (2,103)
1st Apparatus On Scene <= 00:18:15 99.6% (2,103)
1st Apparatus On Scene <= 00:18:30 99.8% (2,106)
1st Apparatus On Scene <= 00:18:45 99.9% (2,109)
1st Apparatus On Scene <= 00:19:00 100.0% (2,110)

Median 1st Apparatus On Scene 00:04:12 (4.2 minutes)
Average 1st Apparatus On Scene 00:04:36 (4.60 minutes)

Here is a breakdown when incidents are narrowed down to **structure fires**.

There are 55 Incident records being analyzed.

1st Apparatus On Scene <= 00:00:00 .0% (0)
1st Apparatus On Scene <= 00:00:15 .0% (0)
1st Apparatus On Scene <= 00:00:30 .0% (0)
1st Apparatus On Scene <= 00:00:45 .0% (0)
1st Apparatus On Scene <= 00:01:00 1.8% (1)
1st Apparatus On Scene <= 00:01:15 1.8% (1)
1st Apparatus On Scene <= 00:01:30 3.6% (2)
1st Apparatus On Scene <= 00:01:45 3.6% (2)
1st Apparatus On Scene <= 00:02:00 3.6% (2)
1st Apparatus On Scene <= 00:02:15 5.5% (3)
1st Apparatus On Scene <= 00:02:30 5.5% (3)
1st Apparatus On Scene <= 00:02:45 7.3% (4)
1st Apparatus On Scene <= 00:03:00 14.5% (8)
1st Apparatus On Scene <= 00:03:15 16.4% (9)
1st Apparatus On Scene <= 00:03:30 18.2% (10)
1st Apparatus On Scene <= 00:03:45 27.3% (15)
1st Apparatus On Scene <= 00:04:00 36.4% (20)
1st Apparatus On Scene <= 00:04:15 47.3% (26)
1st Apparatus On Scene <= 00:04:30 50.9% (28)

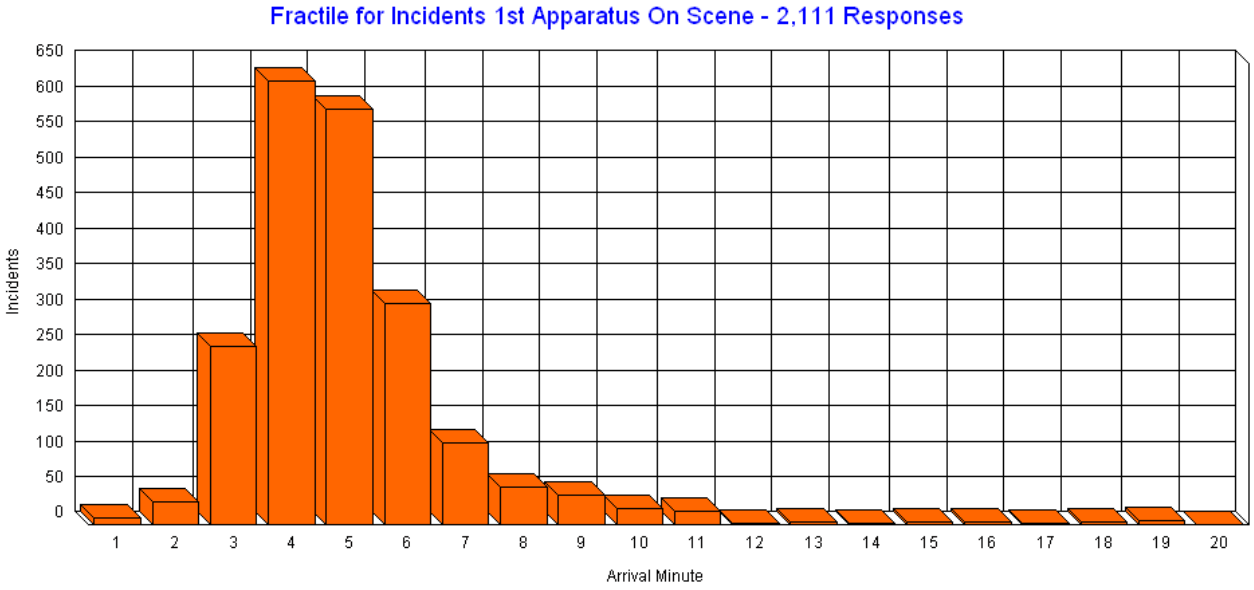
1st Apparatus On Scene <= 00:04:45 54.5% (30)
1st Apparatus On Scene <= 00:05:00 61.8% (34)
1st Apparatus On Scene <= 00:05:15 69.1% (38)
1st Apparatus On Scene <= 00:05:30 74.5% (41)
1st Apparatus On Scene <= 00:05:45 81.8% (45)
1st Apparatus On Scene <= 00:06:00 83.6% (46)
1st Apparatus On Scene <= 00:06:15 83.6% (46)
1st Apparatus On Scene <= 00:06:30 83.6% (46)
1st Apparatus On Scene <= 00:06:45 85.5% (47)
1st Apparatus On Scene <= 00:07:00 87.3% (48)
1st Apparatus On Scene <= 00:07:15 87.3% (48)
1st Apparatus On Scene <= 00:07:30 87.3% (48)
1st Apparatus On Scene <= 00:07:45 87.3% (48)
1st Apparatus On Scene <= 00:08:00 87.3% (48)
1st Apparatus On Scene <= 00:08:15 87.3% (48)
1st Apparatus On Scene <= 00:08:30 87.3% (48)
1st Apparatus On Scene <= 00:08:45 87.3% (48)
1st Apparatus On Scene <= 00:09:00 87.3% (48)
1st Apparatus On Scene <= 00:09:15 87.3% (48)
1st Apparatus On Scene <= 00:09:30 89.1% (49)
1st Apparatus On Scene <= 00:09:45 89.1% (49)
1st Apparatus On Scene <= 00:10:00 90.9% (50)
1st Apparatus On Scene <= 00:10:15 90.9% (50)
1st Apparatus On Scene <= 00:10:30 90.9% (50)
1st Apparatus On Scene <= 00:10:45 90.9% (50)
1st Apparatus On Scene <= 00:11:00 90.9% (50)
1st Apparatus On Scene <= 00:11:15 90.9% (50)
1st Apparatus On Scene <= 00:11:30 90.9% (50)
1st Apparatus On Scene <= 00:11:45 90.9% (50)
1st Apparatus On Scene <= 00:12:00 90.9% (50)
1st Apparatus On Scene <= 00:12:15 90.9% (50)
1st Apparatus On Scene <= 00:12:30 90.9% (50)
1st Apparatus On Scene <= 00:12:45 90.9% (50)
1st Apparatus On Scene <= 00:13:00 92.7% (51)
1st Apparatus On Scene <= 00:13:15 92.7% (51)
1st Apparatus On Scene <= 00:13:30 92.7% (51)
1st Apparatus On Scene <= 00:13:45 94.5% (52)
1st Apparatus On Scene <= 00:14:00 94.5% (52)
1st Apparatus On Scene <= 00:14:15 94.5% (52)
1st Apparatus On Scene <= 00:14:30 94.5% (52)
1st Apparatus On Scene <= 00:14:45 94.5% (52)
1st Apparatus On Scene <= 00:15:00 94.5% (52)
1st Apparatus On Scene <= 00:15:15 94.5% (52)
1st Apparatus On Scene <= 00:15:30 94.5% (52)
1st Apparatus On Scene <= 00:15:45 94.5% (52)
1st Apparatus On Scene <= 00:16:00 94.5% (52)

1st Apparatus On Scene <= 00:16:15 94.5% (52)
1st Apparatus On Scene <= 00:16:30 94.5% (52)
1st Apparatus On Scene <= 00:16:45 94.5% (52)
1st Apparatus On Scene <= 00:17:00 94.5% (52)
1st Apparatus On Scene <= 00:17:15 94.5% (52)
1st Apparatus On Scene <= 00:17:30 94.5% (52)
1st Apparatus On Scene <= 00:17:45 96.4% (53)
1st Apparatus On Scene <= 00:18:00 98.2% (54)
1st Apparatus On Scene <= 00:18:15 98.2% (54)
1st Apparatus On Scene <= 00:18:30 98.2% (54)
1st Apparatus On Scene <= 00:18:45 100.0% (55)

Median 1st Apparatus On Scene 00:04:27 (4.45 minutes)
Average 1st Apparatus On Scene 00:05:33 (5.54 minutes)

While most fire and EMS responses are handled with a single local apparatus, structure fires draw resources from more distant locations. The slower response time figures may be due to a disproportionate number of responses to neighboring fire jurisdictions.

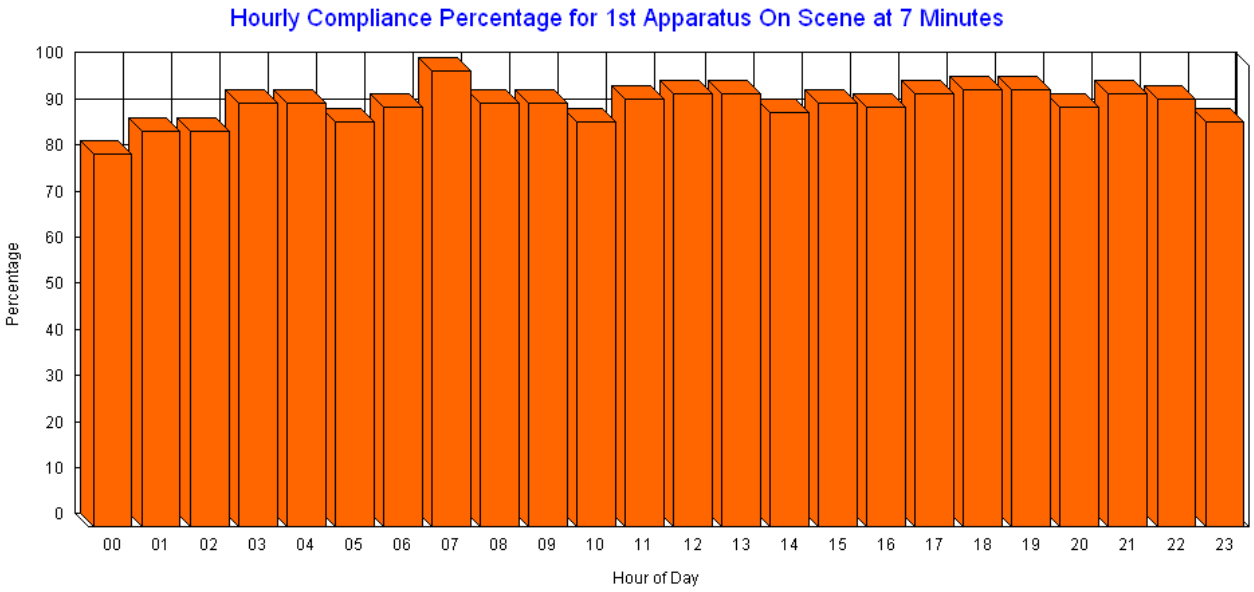
Fractile response times can also be viewed graphically. Here is a graph illustrating the number of incidents by response time minute for **fire and EMS incidents**. Incidents with a zero response time were eliminated from the graph.



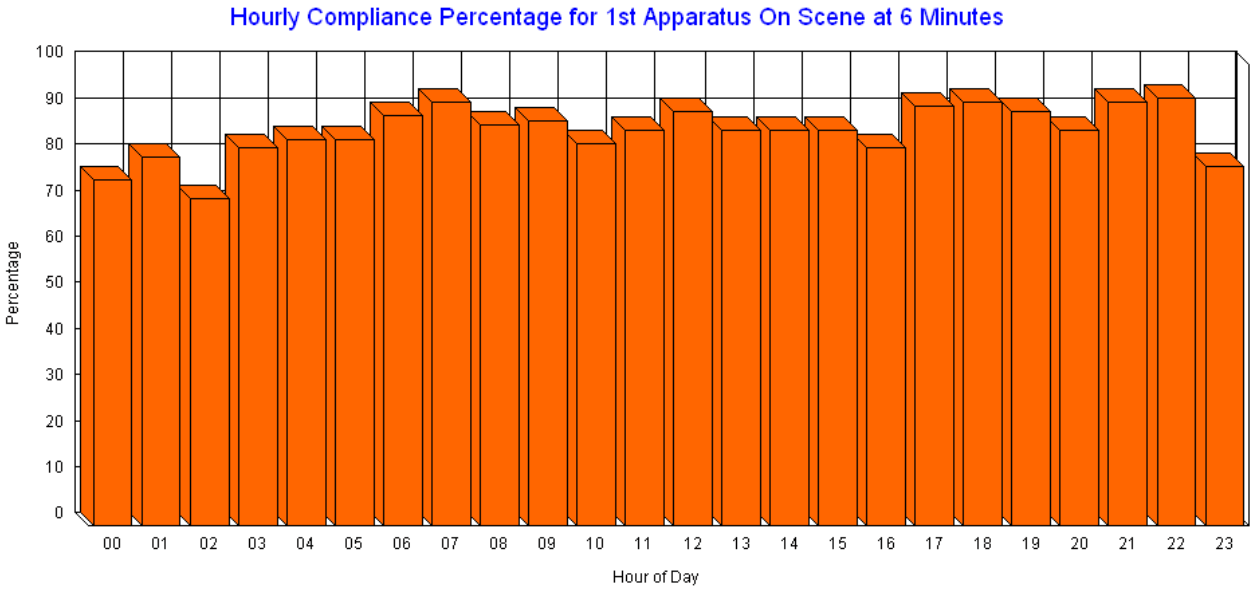
Notice the minute with the most first arriving apparatus is minute 4. This is unusually good performance. It shows a large number of responses are located close to fire stations. There are, however, responses that require longer travel to more distant locations.

We can look at this same set of response statistics in a different way. The concept here is called "Compliance". Compliance measures the percentage of time a response time goal (in this case of 7 or 6 minutes) is met.

Here is a graph illustrating the percentage of compliance (0 – 100%) with a 7-minute response time standard (beginning with CAD call receipt) by hour of the day. Notice incidents that occur early in the morning are just slightly less likely to meet a 7-minute response time objective.



Here is the same graph this time testing compliance with a standard of 6-minutes.

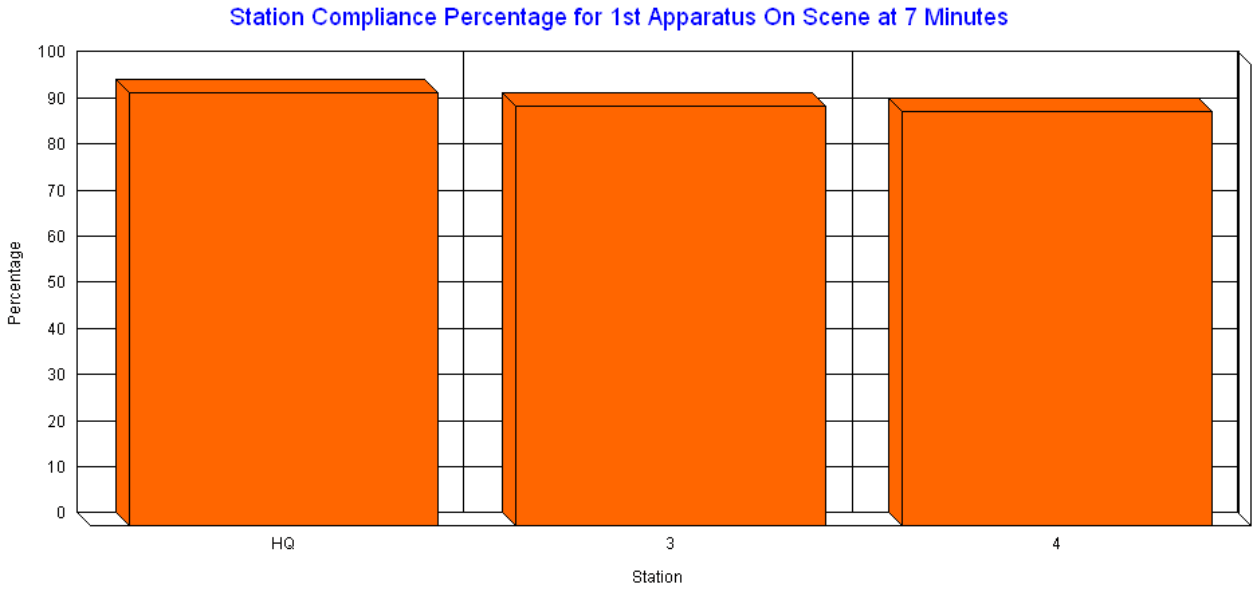


Notice while the compliance percentage is just a little less at 6-minutes, this is nevertheless a strong showing for first company arrival.

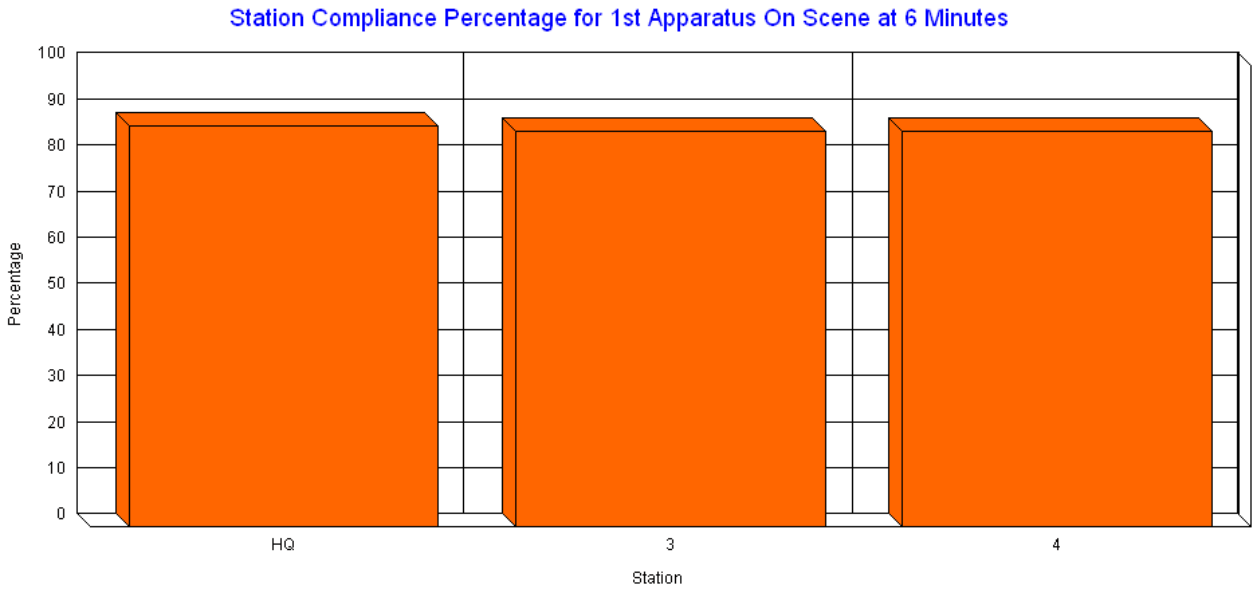
Station Response

This graph compares the overall 7 and 6-minute response time compliance percentages for the first apparatus to arrive on the scene by station in **Year 3**.

Notice at 7-minutes all stations are in first company compliance over 90% of the time. The HQ station shows the best performance solidly over 90%.



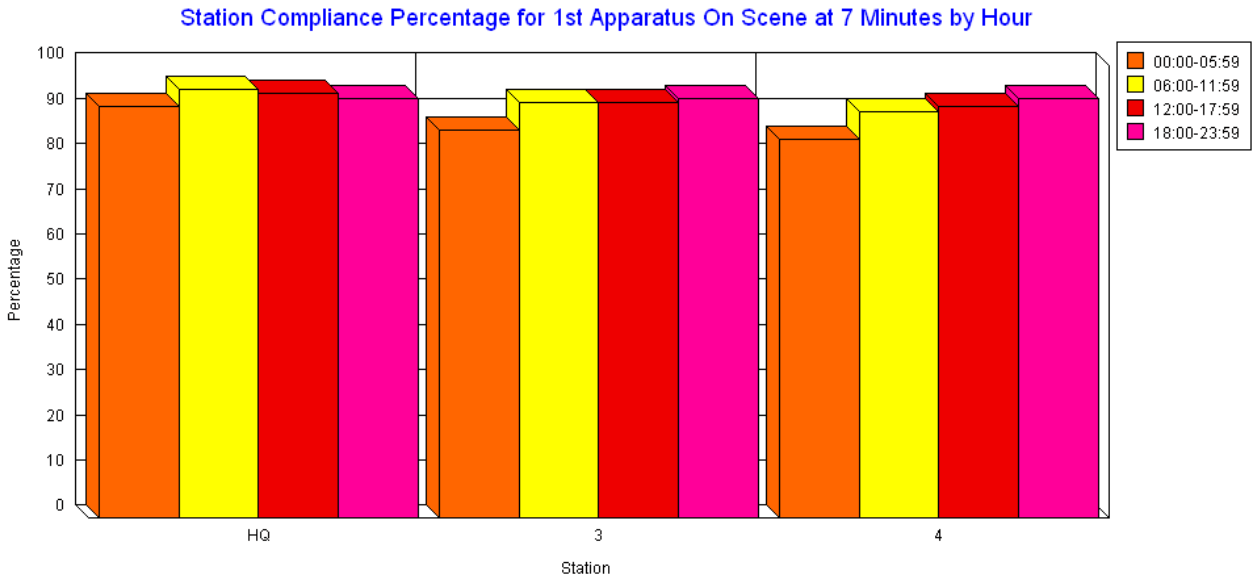
Here is a breakdown of Station response time compliance at 6-minutes from CAD call receipt.



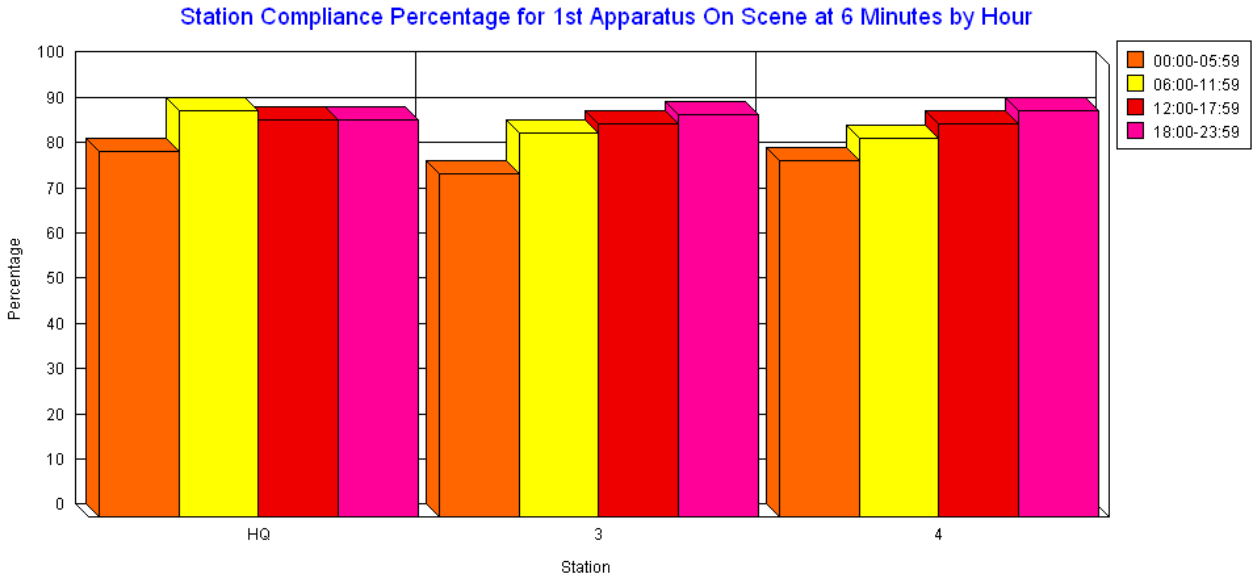
All three stations show good and consistent performance at this demanding 6-minute goal.

If we breakdown the compliance percentage by hour of the day we see only slightly lower compliance percentage in the early morning hours.

Here is a graph illustrating compliance with a goal of 7-minutes from CAD call receipt to arrival of the first apparatus on the scene.

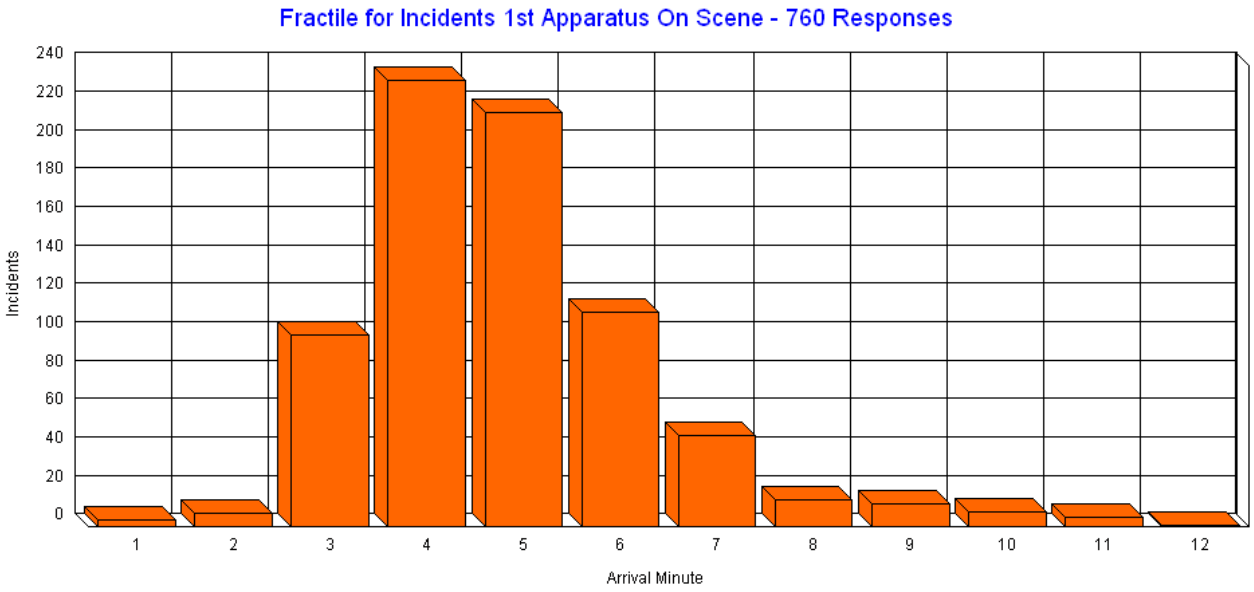


Here is the same graph using a 6-minute standard.



Here are the fractile response time breakdowns by Eureka fire station in **Year 3**. Only **fire and EMS** incidents with response times greater than zero and less than 12 are represented. This set of graphs illustrates fast response time performance in each of Eureka's three station areas.

Station HQ

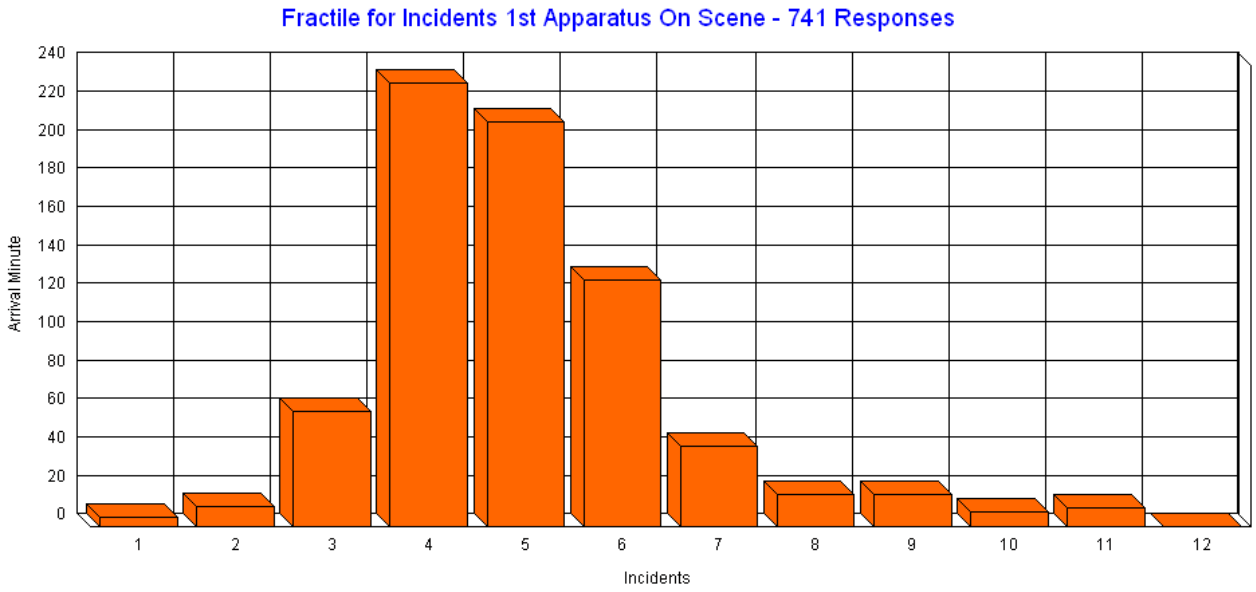


There are 760 Incident records being analyzed.

1st Apparatus On Scene <= 00:00:00 .0% (0)
1st Apparatus On Scene <= 00:01:00 .5% (4)
1st Apparatus On Scene <= 00:02:00 1.4% (11)
1st Apparatus On Scene <= 00:03:00 14.6% (111)
1st Apparatus On Scene <= 00:04:00 45.3% (344)
1st Apparatus On Scene <= 00:05:00 73.7% (560)
1st Apparatus On Scene <= 00:06:00 88.4% (672)
1st Apparatus On Scene <= 00:07:00 94.7% (720)
1st Apparatus On Scene <= 00:08:00 96.6% (734)
1st Apparatus On Scene <= 00:09:00 98.2% (746)
1st Apparatus On Scene <= 00:10:00 99.2% (754)
1st Apparatus On Scene <= 00:11:00 99.9% (759)
1st Apparatus On Scene <= 00:12:00 100.0% (760)

Median 1st Apparatus On Scene 00:04:08 (4.13 minutes)
Average 1st Apparatus On Scene 00:04:22 (4.36 minutes)

Station #3

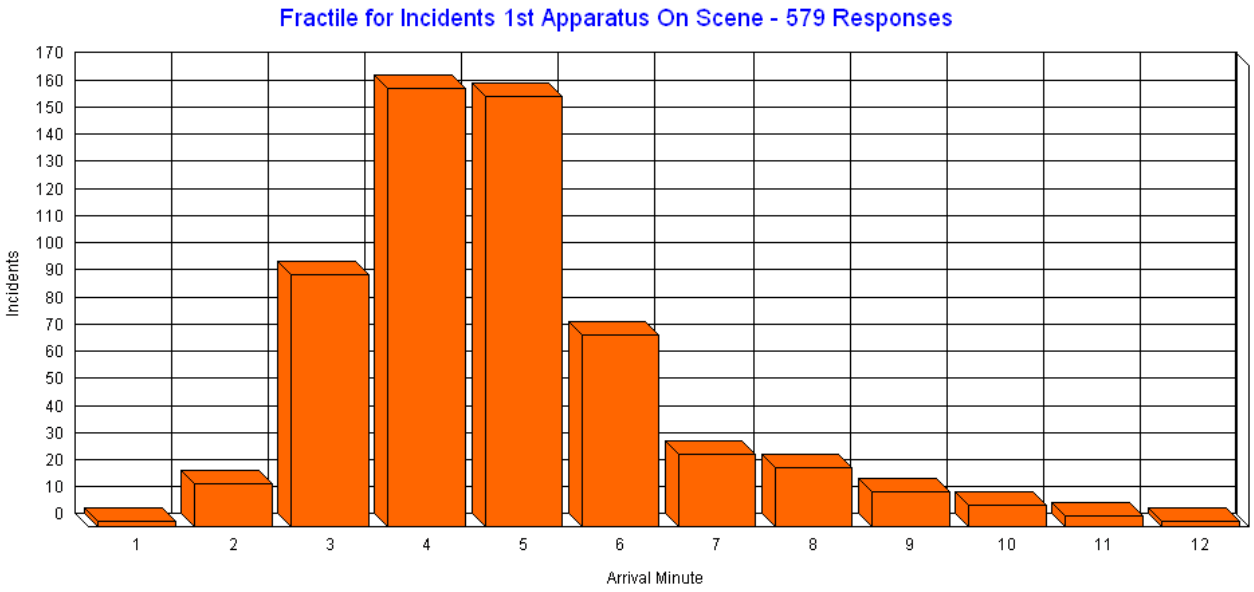


There are 741 Incident records being analyzed.

1st Apparatus On Scene <= 00:00:00 .0% (0)
1st Apparatus On Scene <= 00:01:00 .7% (5)
1st Apparatus On Scene <= 00:02:00 2.2% (16)
1st Apparatus On Scene <= 00:03:00 10.3% (76)
1st Apparatus On Scene <= 00:04:00 41.4% (307)
1st Apparatus On Scene <= 00:05:00 69.9% (518)
1st Apparatus On Scene <= 00:06:00 87.3% (647)
1st Apparatus On Scene <= 00:07:00 93.0% (689)
1st Apparatus On Scene <= 00:08:00 95.3% (706)
1st Apparatus On Scene <= 00:09:00 97.6% (723)
1st Apparatus On Scene <= 00:10:00 98.7% (731)
1st Apparatus On Scene <= 00:11:00 100.0% (741)
1st Apparatus On Scene <= 00:12:00 100.0% (741)

Median 1st Apparatus On Scene 00:04:16 (4.27 minutes)
Average 1st Apparatus On Scene 00:04:33 (4.55 minutes)

Station #4



There are 579 Incident records being analyzed.

1st Apparatus On Scene <= 00:00:00 .0% (0)
1st Apparatus On Scene <= 00:01:00 .3% (2)
1st Apparatus On Scene <= 00:02:00 3.1% (18)
1st Apparatus On Scene <= 00:03:00 19.2% (111)
1st Apparatus On Scene <= 00:04:00 47.2% (273)
1st Apparatus On Scene <= 00:05:00 74.6% (432)
1st Apparatus On Scene <= 00:06:00 86.9% (503)
1st Apparatus On Scene <= 00:07:00 91.5% (530)
1st Apparatus On Scene <= 00:08:00 95.3% (552)
1st Apparatus On Scene <= 00:09:00 97.6% (565)
1st Apparatus On Scene <= 00:10:00 99.0% (573)
1st Apparatus On Scene <= 00:11:00 99.7% (577)
1st Apparatus On Scene <= 00:12:00 100.0% (579)

Median 1st Apparatus On Scene 00:04:08 (4.13 minutes)
Average 1st Apparatus On Scene 00:04:23 (4.37 minutes)

Engine / Station Area Response Matrix

This matrix illustrates the responses of Eureka engine companies in **Year 3**. As expected engine companies make more responses within their assigned station area than any other station area.

	HQ	3	4	Total
E1	1,135	43	70	**1,248**
E3	87	1,121	47	**1,255**
E4	73	22	886	**981**
Total	**1,295**	**1,186**	**1,003**	**3,484**

This chart illustrates a fairly even distribution and sharing of engine company resources.

Total Reflex Time Analysis

Response time has different meanings in different fire departments. Here we will evaluate all response time components by breaking-down "Total Reflex Time" or the amount of time that passes from citizen request until the arrival of a fire department company on the scene of the reported emergency.

The following data was taken from Eureka CAD data. CAD data was merged into NFIRS 5 transaction data inside NFIRS 5 Alive.

Total Reflex Time can be broken-down into the following component parts:

- Call-handling time – time of call until time of dispatch. Only incident records showing a call-handling time greater than 0 seconds and less than 3-minutes were used in this analysis.
- Turnout time – time of dispatch until time unit is responding. Only incident records showing a Turnout time greater than 0 seconds and less than 4-minutes were used in this analysis.
- Travel time – time unit is responding until time the unit arrives on the scene. Only CAD records showing a Travel time greater than 0 seconds and less than 10-minutes were used in this analysis.

Call Handling Time

Call Handling Time (Call Processing Time) for all fires and EMS responses in **Year 3** can be broken-down as follows:

There are 1,968 Incident records being analyzed.

Call Processing <= 00:00:00 .0% (0)
Call Processing <= 00:00:15 2.5% (49)
Call Processing <= 00:00:30 10.5% (206)
Call Processing <= 00:00:45 25.2% (496)
Call Processing <= 00:01:00 43.1% (848)

Call Processing <= 00:01:15 60.7% (1,195)
Call Processing <= 00:01:30 74.0% (1,456)
Call Processing <= 00:01:45 83.4% (1,641)
Call Processing <= 00:02:00 89.5% (1,762)
Call Processing <= 00:02:15 93.6% (1,842)
Call Processing <= 00:02:30 96.6% (1,901)
Call Processing <= 00:02:45 98.8% (1,945)
Call Processing <= 00:03:00 100.0% (1,968)

Median Call Processing 00:01:06 (1.1 minutes)
Average Call Processing 00:01:11 (1.18 minutes)

Call Processing performance appears to be well below the 90% at 1-minute standard recognized as a national call processing goal. This is unexpected given fast overall first company response statistics.

Call Processing should be timed and monitored manually to see what events trigger timestamps. This will provide better insight into performance and opportunities for performance enhancement.

Turnout Time

Here is a breakdown of turnout time for Incidents in **Year 3**.

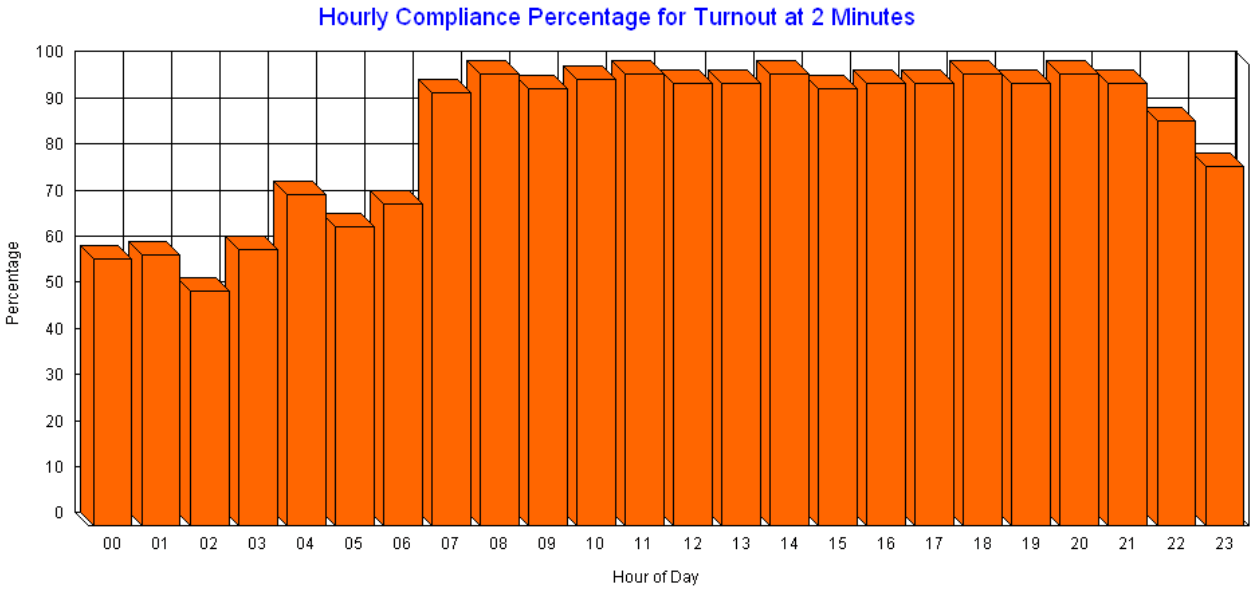
There are 2,021 Incident records being analyzed.

Turnout <= 00:00:00 .0% (0)
Turnout <= 00:00:15 7.4% (149)
Turnout <= 00:00:30 16.3% (330)
Turnout <= 00:00:45 27.6% (557)
Turnout <= 00:01:00 42.4% (856)
Turnout <= 00:01:15 58.4% (1,180)
Turnout <= 00:01:30 73.1% (1,478)
Turnout <= 00:01:45 82.6% (1,669)
Turnout <= 00:02:00 89.6% (1,811)
Turnout <= 00:02:15 93.9% (1,897)
Turnout <= 00:02:30 96.9% (1,959)
Turnout <= 00:02:45 98.6% (1,993)
Turnout <= 00:03:00 99.2% (2,005)
Turnout <= 00:03:15 99.6% (2,013)
Turnout <= 00:03:30 99.8% (2,017)
Turnout <= 00:03:45 100.0% (2,020)

Median Turnout 00:01:08 (1.13 minutes)
Average Turnout 00:01:10 (1.16 minutes)

Theoretically, a nationally accepted turnout time goal is one minute or less. However, a more practical and achievable goal is 2-minutes.

Here is a compliance percentage graph illustrating a 2-minute goal for apparatus turnout in **Year 3**. This graph breaks down performance by hour of day. Notice the data tends to indicate opportunities to improve turnout time in the early morning hours. However, Eureka does achieve an overall compliance percentage of nearly 90% at 2-minutes. This is considered good performance.



These numbers are simply numbers. Actual experience may require apparatus to sign-on long after their vehicles are rolling. Further investigation will be required before any conclusion is drawn.

Travel Time

Here is a breakdown of travel time performance for all Eureka incidents in **Year 3**.

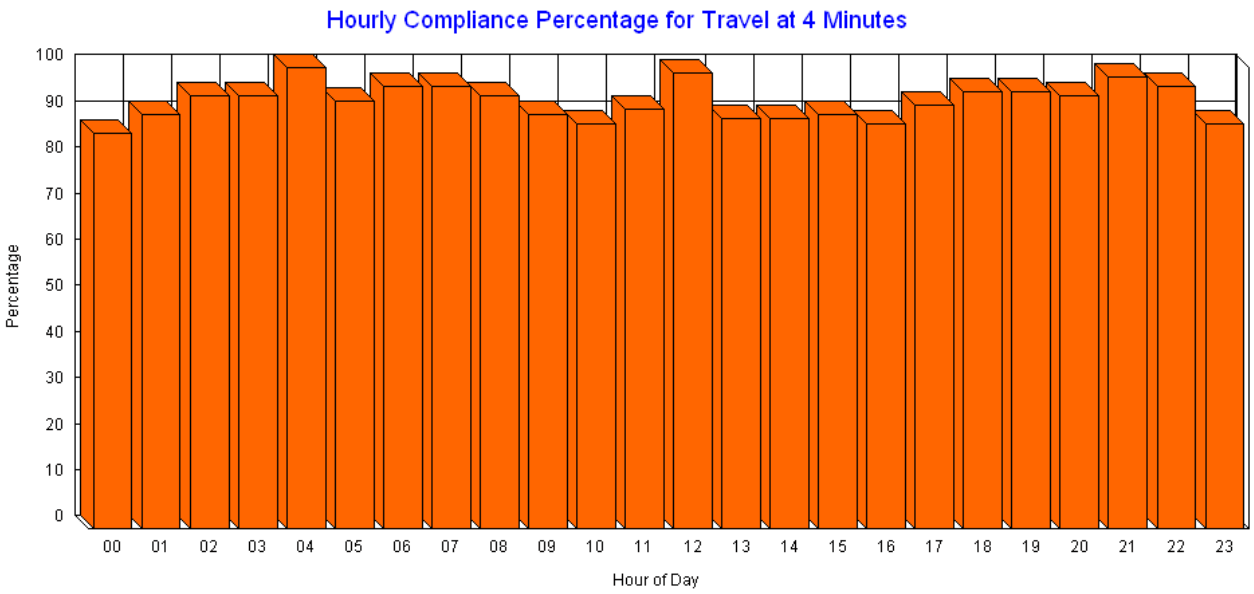
There are 2,052 Incident records being analyzed.

Travel <= 00:00:00 .0% (0)
Travel <= 00:00:15 2.7% (56)
Travel <= 00:00:30 6.6% (135)
Travel <= 00:00:45 11.5% (237)
Travel <= 00:01:00 19.7% (404)
Travel <= 00:01:15 28.4% (583)
Travel <= 00:01:30 39.6% (812)
Travel <= 00:01:45 49.8% (1,022)
Travel <= 00:02:00 60.2% (1,236)
Travel <= 00:02:15 68.5% (1,406)
Travel <= 00:02:30 75.8% (1,556)
Travel <= 00:02:45 80.5% (1,652)
Travel <= 00:03:00 84.7% (1,739)
Travel <= 00:03:15 87.3% (1,792)
Travel <= 00:03:30 89.9% (1,845)

Travel <= 00:03:45 91.2% (1,872)
Travel <= 00:04:00 92.5% (1,898)
Travel <= 00:04:15 93.7% (1,923)
Travel <= 00:04:30 94.6% (1,942)
Travel <= 00:04:45 95.4% (1,957)
Travel <= 00:05:00 96.2% (1,973)
Travel <= 00:05:15 96.7% (1,984)
Travel <= 00:05:30 97.2% (1,995)
Travel <= 00:05:45 97.7% (2,005)
Travel <= 00:06:00 97.9% (2,009)
Travel <= 00:06:15 98.3% (2,017)
Travel <= 00:06:30 98.5% (2,021)
Travel <= 00:06:45 98.7% (2,025)
Travel <= 00:07:00 98.9% (2,030)
Travel <= 00:07:15 99.2% (2,036)
Travel <= 00:07:30 99.4% (2,040)
Travel <= 00:07:45 99.6% (2,043)
Travel <= 00:08:00 99.6% (2,044)
Travel <= 00:08:15 99.7% (2,046)
Travel <= 00:08:30 99.8% (2,048)
Travel <= 00:08:45 99.8% (2,048)
Travel <= 00:09:00 99.9% (2,050)
Travel <= 00:09:15 99.9% (2,050)
Travel <= 00:09:30 99.9% (2,050)
Travel <= 00:09:45 100.0% (2,051)
Travel <= 00:10:00 100.0% (2,052)

Median Travel 00:01:46 (1.77 minutes)
Average Travel 00:02:01 (2 minutes)

Travel times in Eureka are impressive. This indicates the vast majority of incidents occur in areas near fire stations. The small number of simultaneous incident activity also contributes to these impressive statistics.



Travel time compliance appears to be slightly depressed during the workday. This could be a function of traffic in core areas. Regardless, variations in travel time by hour are very subtle.

Deployment Compliance

Deployment Compliance is a type of compliance report that measures the percentage of time a preset goal is realized. Again, the percentage range can range from 0% to 100%. For example, a goal could be set to measure compliance with having at least one company on the scene of an emergency within six or seven minutes of CAD notification and having a first alarm assignment on the scene within 11 minutes.

Here is how a 7 minute goal for first company arrival breaks-down:

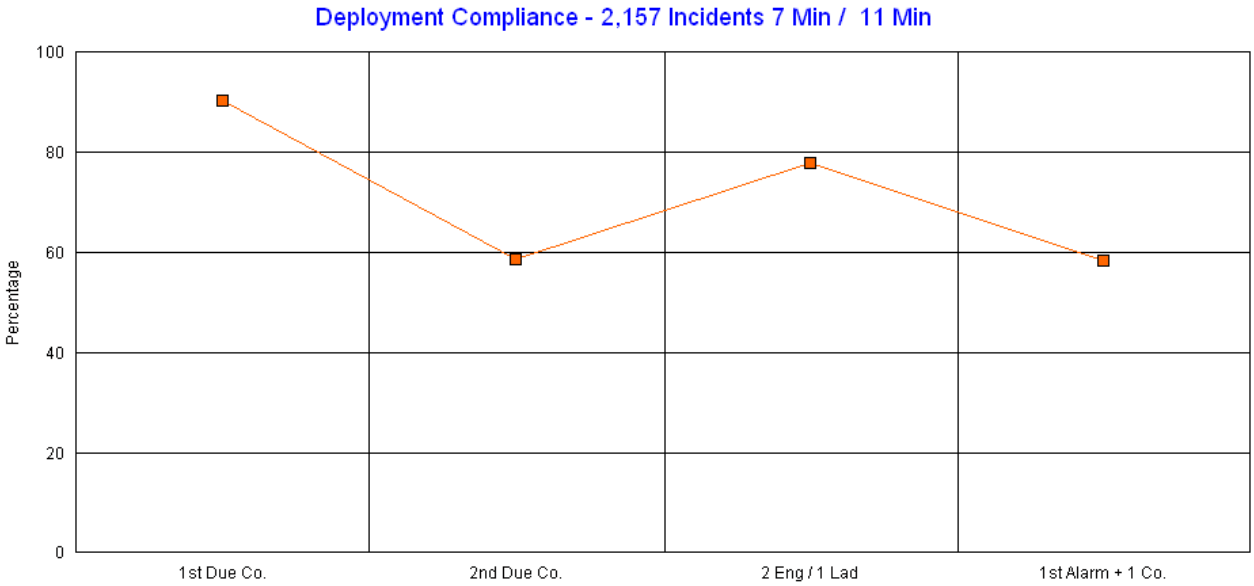
Call Processing Time	1 min
Turnout Time	2 min
Travel Time	4 min
Total First Unit Arrival	**7 min**

The following Deployment Compliance graphs were constructed from NFIRS 5 Incident data for Eureka in **Year 3**. Since NFIRS 5 records mark the time of alarm as the time the CAD center was first notified, the following graphs will measure response time compliance from CAD notification until apparatus arrive on the scene. Eureka's standard first alarm response has been set to two engines and 1 ladder for purposes of this measurement.

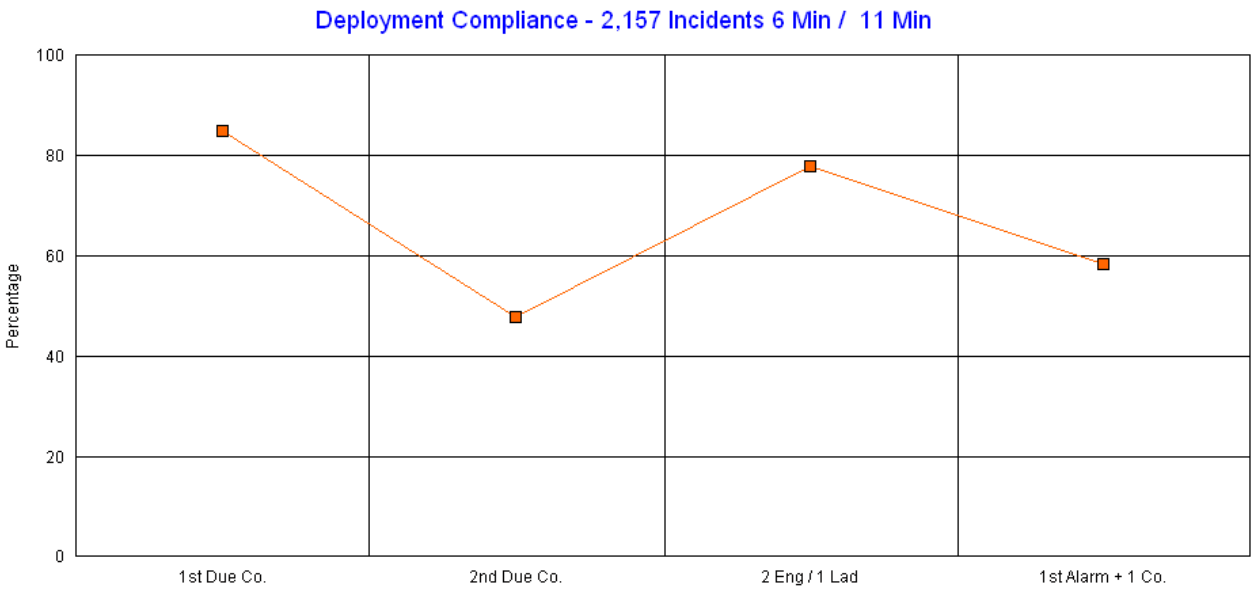
The following graphs plot compliance for the 1st Due Company (first plot) as well as a 2 Engine / 1 Ladder 1st Alarm assignment (third plot). The second and fourth plots illustrate compliance level for additional resources, the second company at 6 and 7 minutes and an augmented 1st Alarm Assignment at 11 minutes. An augmented first alarm assignment is simply 2 engines and

1 ladder plus one additional ladder or engine. These graphs include engines responding from Humboldt Fire District for automatic aid.

Note: The following charts may not exactly match the response time text above. This is because 1st Due is calculated only for incidents where both a first due and second due company responded. Also, this chart only measures engine and ladder companies that recorded an On Scene time in NFIRS 5 records.



Here we see a "fast" response with over 90% of incidents having the first apparatus arrive on scene within the 7-minute compliance goal. However, the first company will have to handle the situation for a while since the arrival of the second company within 7-minutes only occurs 60% of the time. Here we see the speed of the response is quite satisfactory, but the "weight" of the response (multiple apparatus, quickly) is much lighter.

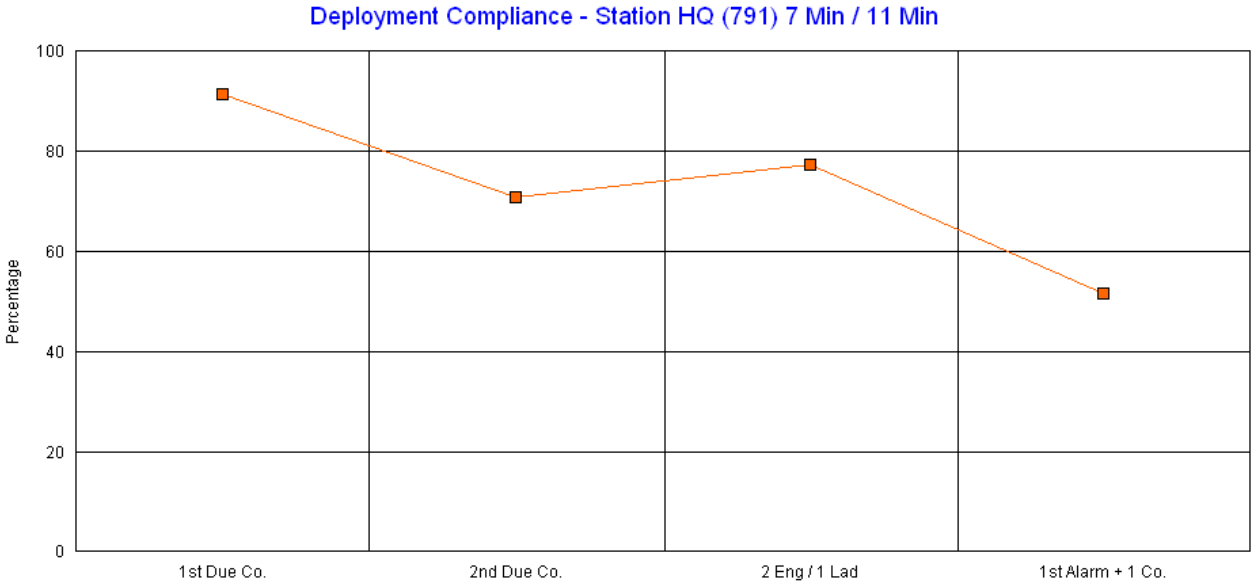


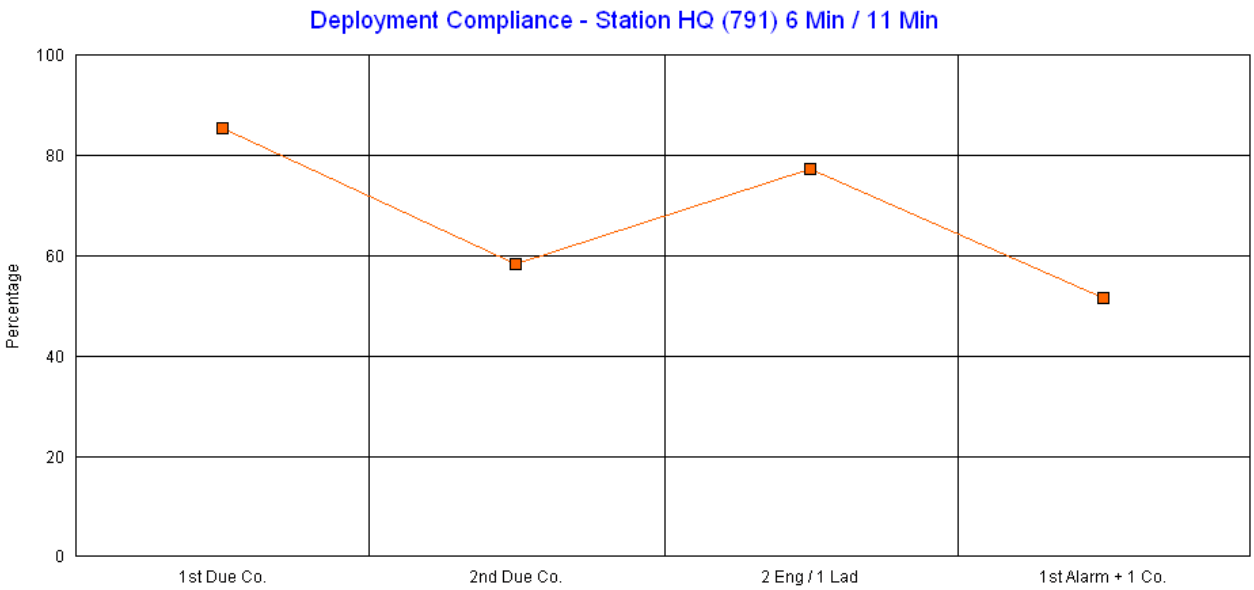
Notice the first due company response is well over 80% at 6-minutes. This is solid performance for the arrival of the first company. Again however, the second due companies arrive within the 6 minute criteria just about 50% of the time.

Having a 2 / 1 first alarm assignment arrive within 11 minutes occurs just under 80% of the time, while an augmented first alarm response (response of one additional engine or ladder) occurs within 11 minutes just under 60% of the time.

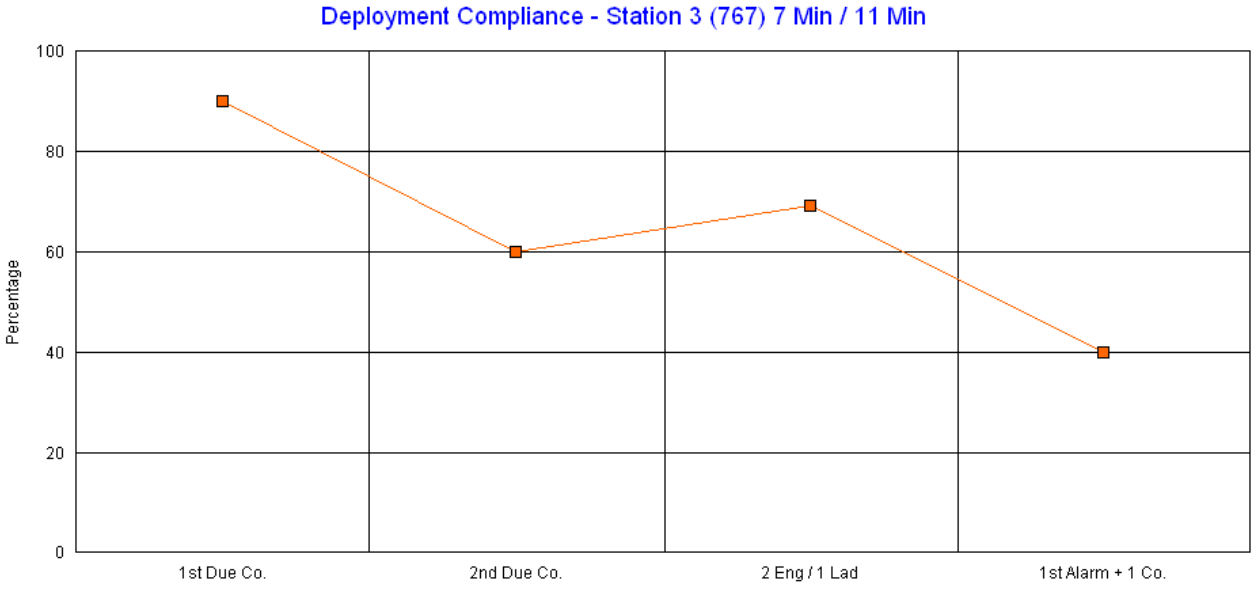
Here is a breakdown by Station Area. These charts can be more volatile and less accurate in the "2 Eng / 1 Lad" and "First Alarm + 1 Co." columns because of a very limited number of incidents meeting these two criteria within a given station area.

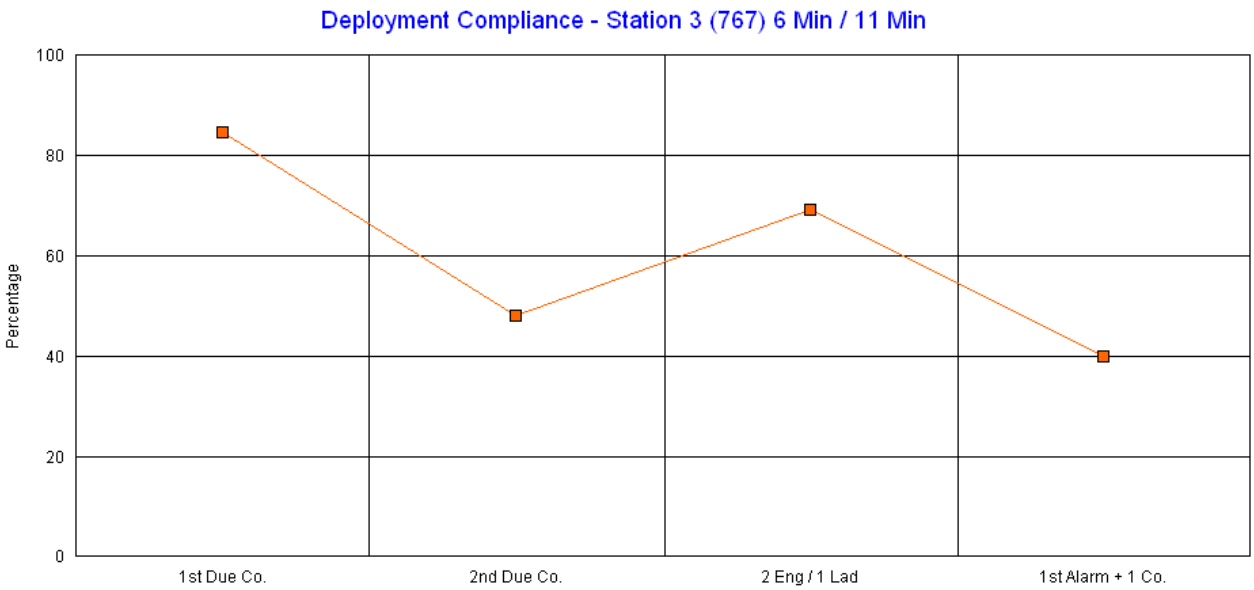
Station HQ Area



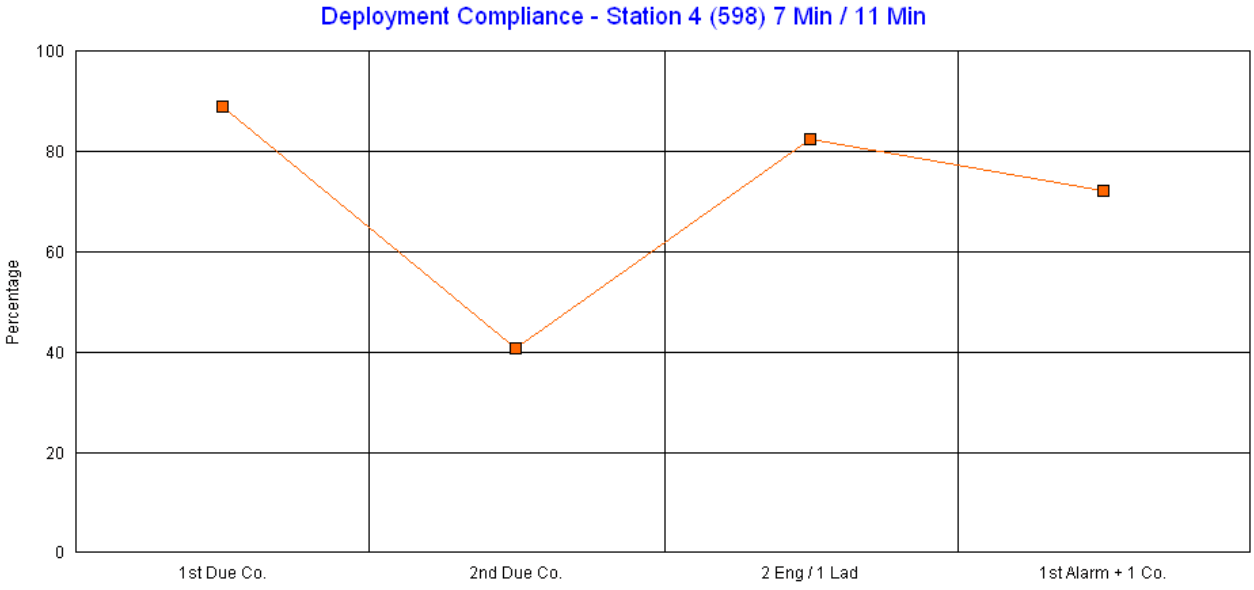


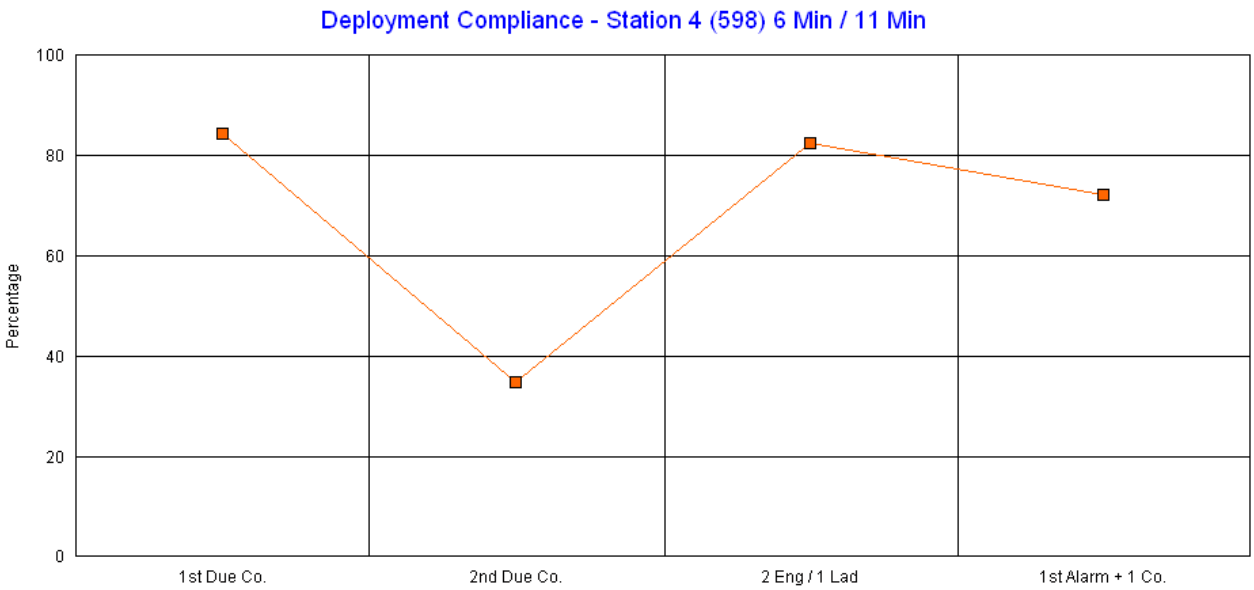
Station 3 Area





Station #4 Area





Response Reliability Graphs

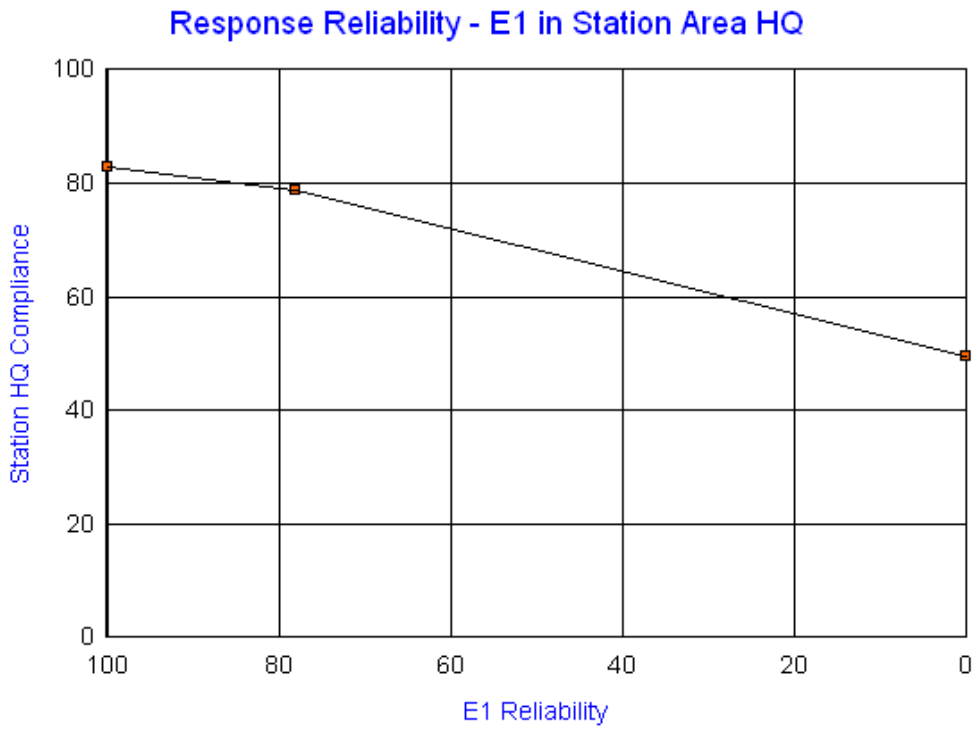
"Response Reliability" is a Standard of Cover measurement displayed in a line graph. The graph describes the effect a single engine company has on the response compliance percentage within its own response area.

The graph measures the percentage of compliance with the fire department's stated goals in three key areas:

- The percentage of compliance when the subject engine responds
- The percentage of compliance for all engine responses within the response district
- The percentage of compliance when the subject engine is not able to respond.

This type of graph can be used to measure "concentration" which can be defined as the ability to provide adequate numbers of engine companies to a station's response area in a short amount of time. Concentration measures the "weight" of the response.

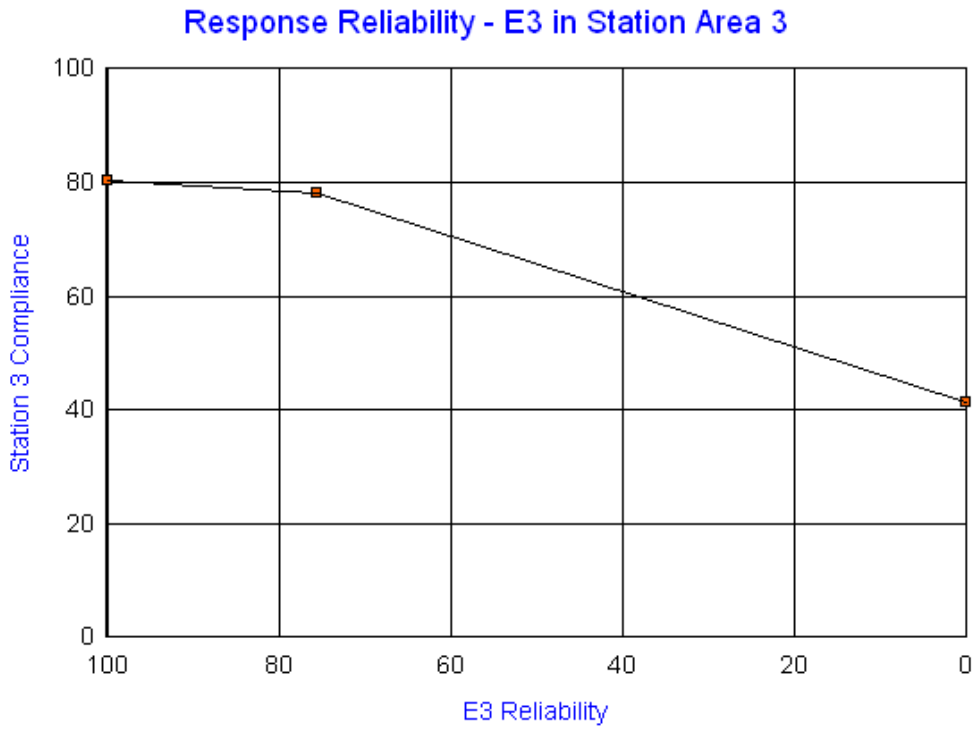
Here is the Response Reliability graph for Engine 1 responding in the HQ station area:



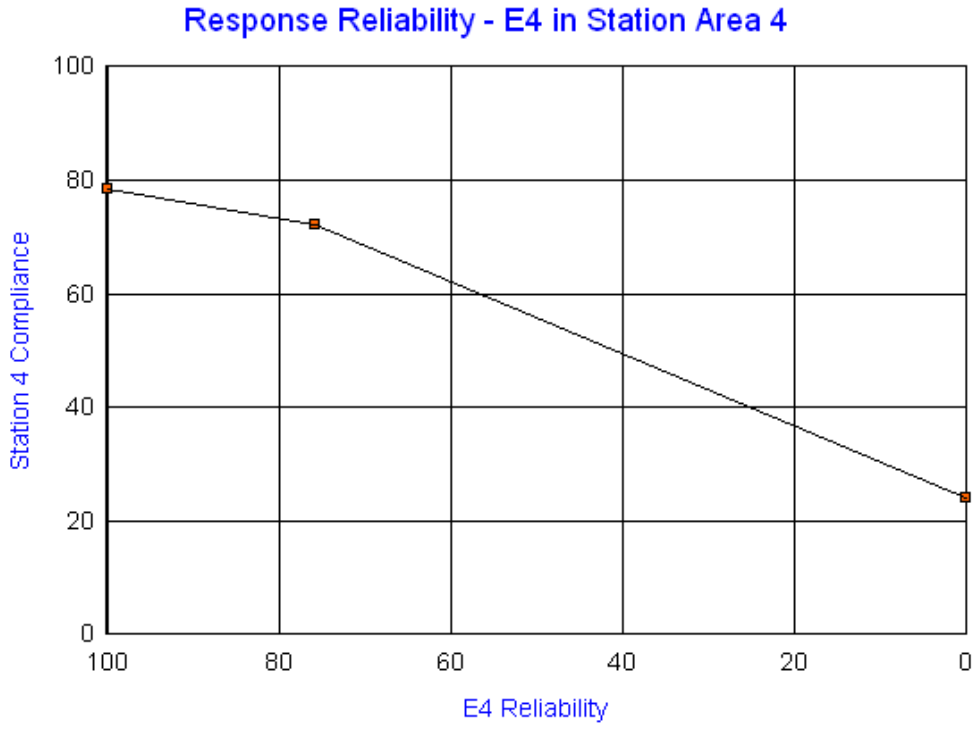
Ideally, the first line should run straight across the graph indicating a solid matrix of available engine companies. The matrix provides quick augmentation and backup. The short space between the first two plots indicates Engine 1 has high reliability, meaning it is available to cover its own response area quite frequently. However, when it is not available, other engine companies only fill-in at 7-minutes only about 50% of the time.

Let us look at Station 3 and Station 4:

Station 3 has similar availability for Engine 3. However, if Engine 3 is not available the compliance for a 7-minute response time drops to 40%.



The trend continues with Engine 4. Here, Engine 4 is just a bit less "reliable". But a big drop in compliance occurs if Engine 4 is not available to respond within its district. Here reliability can drop down to near 20%.



APPENDIX 2

HUMBOLDT FIRE DISTRICT STATISTICS

HUMBOLDT FIRE DISTRICT STATISTICS - SUPPLEMENTAL

This supplemental report is based on an initial data assessment performed by NFIRS 5 Alive. It is intended to identify extremely broad trends and areas in need of additional study.

Dataset Identification

The Humboldt Fire District furnished 5,171 incidents from NFIRS 5 data for the period of 1/1/2003 – 6/30/2006. This dataset was reduced to the same 3-year date range. This trimmed the HFD incident count to 4,477. CAD data was not submitted since HFD utilizes different company inventories in their CAD and RMS systems.

Major Call Types

The years of available data breaks down as follows:

	Year 1	Year 2	Year 3
Incidents	1,534	1,439	1,504
Fire & EMS	1,033	1,024	1,069
Fire	151	124	139
Structure Fire	70	42	61
EMS	882	900	930

This trend analysis shows no steady increase in any call type category except EMS incidents.

Below is a list of the top incident types for the 36-month period. Incident types with fewer than 20 responses were eliminated from the list.

Incident Type	Count
321 EMS call, excluding vehicle accident with injury	2,074
311 Medical assist, assist EMS crew	511
611 Dispatched & canceled en route	377
111 Building fire	166
600 Good intent call, other	111
554 Assist invalid	110
700 False alarm or false call, other	98
561 Unauthorized burning	82
322 Vehicle accident with injuries	79
500 Service Call, other	68
510 Person in distress, other	61
631 Authorized controlled burning	59
100 Fire, other	49
743 Smoke detector activation, no fire - unintentional	44
733 Smoke detector activation due to malfunction	40
131 Passenger vehicle fire	38
444 Power line down	36

114	Chimney or flue fire, confined to chimney or flue	31
352	Extrication of victim(s) from vehicle	23
142	Brush, or brush and grass mixture fire	21

Response to Demands for Service

This section will focus on the most recent year of response activity, **Year 3** from 7/1/2005 to 6/30/2006.

One of the most commonly used criteria to measure response effectiveness is fractile analysis of response time. A fractile analysis splits responses into time segments and provides a count and percentage for each progressive time segment.

Below is a fractile analysis of incidents in **Year 3**. Incidents with a response time of zero or a response time greater than 20 minutes were eliminated from this analysis. This fractile is broken down into 15-second segments and progressively covers response times greater than 0 and less than 20 minutes.

There are 1,461 Incident records being analyzed.

1st Apparatus On Scene <= 00:00:00 .0% (0)
1st Apparatus On Scene <= 00:00:15 .5% (7)
1st Apparatus On Scene <= 00:00:30 .8% (11)
1st Apparatus On Scene <= 00:00:45 1.7% (25)
1st Apparatus On Scene <= 00:01:00 3.4% (50)
1st Apparatus On Scene <= 00:01:15 4.7% (68)
1st Apparatus On Scene <= 00:01:30 5.8% (85)
1st Apparatus On Scene <= 00:01:45 7.8% (114)
1st Apparatus On Scene <= 00:02:00 11.0% (161)
1st Apparatus On Scene <= 00:02:15 13.8% (202)
1st Apparatus On Scene <= 00:02:30 16.6% (242)
1st Apparatus On Scene <= 00:02:45 19.2% (280)
1st Apparatus On Scene <= 00:03:00 25.7% (376)
1st Apparatus On Scene <= 00:03:15 30.3% (443)
1st Apparatus On Scene <= 00:03:30 34.2% (499)
1st Apparatus On Scene <= 00:03:45 37.9% (554)
1st Apparatus On Scene <= 00:04:00 44.8% (654)
1st Apparatus On Scene <= 00:04:15 48.9% (714)
1st Apparatus On Scene <= 00:04:30 52.5% (767)
1st Apparatus On Scene <= 00:04:45 56.1% (820)
1st Apparatus On Scene <= 00:05:00 61.7% (901)
1st Apparatus On Scene <= 00:05:15 65.5% (957)
1st Apparatus On Scene <= 00:05:30 68.2% (997)
1st Apparatus On Scene <= 00:05:45 70.6% (1,031)
1st Apparatus On Scene <= 00:06:00 75.3% (1,100)
1st Apparatus On Scene <= 00:06:15 77.3% (1,130)
1st Apparatus On Scene <= 00:06:30 78.7% (1,150)
1st Apparatus On Scene <= 00:06:45 80.2% (1,171)
1st Apparatus On Scene <= 00:07:00 82.8% (1,209)
1st Apparatus On Scene <= 00:07:15 84.4% (1,233)

1st Apparatus On Scene <= 00:07:30 85.7% (1,252)
1st Apparatus On Scene <= 00:07:45 86.7% (1,267)
1st Apparatus On Scene <= 00:08:00 88.5% (1,293)
1st Apparatus On Scene <= 00:08:15 89.7% (1,310)
1st Apparatus On Scene <= 00:08:30 90.5% (1,322)
1st Apparatus On Scene <= 00:08:45 91.5% (1,337)
1st Apparatus On Scene <= 00:09:00 92.7% (1,354)
1st Apparatus On Scene <= 00:09:15 93.1% (1,360)
1st Apparatus On Scene <= 00:09:30 93.9% (1,372)
1st Apparatus On Scene <= 00:09:45 94.4% (1,379)
1st Apparatus On Scene <= 00:10:00 95.3% (1,392)
1st Apparatus On Scene <= 00:10:15 95.7% (1,398)
1st Apparatus On Scene <= 00:10:30 96.0% (1,403)
1st Apparatus On Scene <= 00:10:45 96.2% (1,405)
1st Apparatus On Scene <= 00:11:00 96.5% (1,410)
1st Apparatus On Scene <= 00:11:15 96.5% (1,410)
1st Apparatus On Scene <= 00:11:30 96.8% (1,414)
1st Apparatus On Scene <= 00:11:45 96.9% (1,415)
1st Apparatus On Scene <= 00:12:00 97.0% (1,417)
1st Apparatus On Scene <= 00:12:15 97.3% (1,421)
1st Apparatus On Scene <= 00:12:30 97.3% (1,421)
1st Apparatus On Scene <= 00:12:45 97.5% (1,424)
1st Apparatus On Scene <= 00:13:00 98.2% (1,434)
1st Apparatus On Scene <= 00:13:15 98.4% (1,437)
1st Apparatus On Scene <= 00:13:30 98.4% (1,438)
1st Apparatus On Scene <= 00:13:45 98.4% (1,438)
1st Apparatus On Scene <= 00:14:00 98.7% (1,442)
1st Apparatus On Scene <= 00:14:15 98.7% (1,442)
1st Apparatus On Scene <= 00:14:30 98.8% (1,444)
1st Apparatus On Scene <= 00:14:45 98.9% (1,445)
1st Apparatus On Scene <= 00:15:00 99.2% (1,450)
1st Apparatus On Scene <= 00:15:15 99.2% (1,450)
1st Apparatus On Scene <= 00:15:30 99.3% (1,451)
1st Apparatus On Scene <= 00:15:45 99.4% (1,452)
1st Apparatus On Scene <= 00:16:00 99.5% (1,453)
1st Apparatus On Scene <= 00:16:15 99.5% (1,453)
1st Apparatus On Scene <= 00:16:30 99.5% (1,453)
1st Apparatus On Scene <= 00:16:45 99.5% (1,454)
1st Apparatus On Scene <= 00:17:00 99.7% (1,456)
1st Apparatus On Scene <= 00:17:15 99.7% (1,456)
1st Apparatus On Scene <= 00:17:30 99.7% (1,456)
1st Apparatus On Scene <= 00:17:45 99.7% (1,456)
1st Apparatus On Scene <= 00:18:00 99.7% (1,456)
1st Apparatus On Scene <= 00:18:15 99.7% (1,456)
1st Apparatus On Scene <= 00:18:30 99.7% (1,457)
1st Apparatus On Scene <= 00:18:45 99.7% (1,457)

1st Apparatus On Scene <= 00:19:00 99.7% (1,457)
1st Apparatus On Scene <= 00:19:15 99.7% (1,457)
1st Apparatus On Scene <= 00:19:30 99.9% (1,459)
1st Apparatus On Scene <= 00:19:45 99.9% (1,460)
1st Apparatus On Scene <= 00:20:00 100.0% (1,461)

Median 1st Apparatus On Scene 00:04:20 (4.33 minutes)
Average 1st Apparatus On Scene 00:04:53 (4.88 minutes)

If incidents are reduced to **fire and EMS incidents**, the following fractile results. Notice HFD's response effectiveness increases when responding to fire and EMS incidents, more likely to fall into the category of emergency responses. For all incidents the 90% first apparatus arrival is not reached until 08:15 (8 minutes, 15 seconds). However, when responding to fire and EMS incidents the 90% threshold is reached in 07:30.

There are 1,052 Incident records being analyzed.

1st Apparatus On Scene <= 00:00:00 .0% (0)
1st Apparatus On Scene <= 00:00:15 .5% (5)
1st Apparatus On Scene <= 00:00:30 .7% (7)
1st Apparatus On Scene <= 00:00:45 1.1% (12)
1st Apparatus On Scene <= 00:01:00 2.4% (25)
1st Apparatus On Scene <= 00:01:15 3.4% (36)
1st Apparatus On Scene <= 00:01:30 4.7% (49)
1st Apparatus On Scene <= 00:01:45 7.0% (74)
1st Apparatus On Scene <= 00:02:00 10.6% (111)
1st Apparatus On Scene <= 00:02:15 14.0% (147)
1st Apparatus On Scene <= 00:02:30 17.5% (184)
1st Apparatus On Scene <= 00:02:45 20.4% (215)
1st Apparatus On Scene <= 00:03:00 27.3% (287)
1st Apparatus On Scene <= 00:03:15 32.9% (346)
1st Apparatus On Scene <= 00:03:30 37.5% (395)
1st Apparatus On Scene <= 00:03:45 41.4% (436)
1st Apparatus On Scene <= 00:04:00 49.1% (517)
1st Apparatus On Scene <= 00:04:15 53.3% (561)
1st Apparatus On Scene <= 00:04:30 56.9% (599)
1st Apparatus On Scene <= 00:04:45 60.5% (636)
1st Apparatus On Scene <= 00:05:00 66.4% (699)
1st Apparatus On Scene <= 00:05:15 70.3% (740)
1st Apparatus On Scene <= 00:05:30 73.1% (769)
1st Apparatus On Scene <= 00:05:45 75.4% (793)
1st Apparatus On Scene <= 00:06:00 80.2% (844)
1st Apparatus On Scene <= 00:06:15 82.4% (867)
1st Apparatus On Scene <= 00:06:30 83.9% (883)
1st Apparatus On Scene <= 00:06:45 85.1% (895)
1st Apparatus On Scene <= 00:07:00 87.5% (921)

1st Apparatus On Scene <= 00:07:15 89.2% (938)
1st Apparatus On Scene <= 00:07:30 90.3% (950)
1st Apparatus On Scene <= 00:07:45 91.1% (958)
1st Apparatus On Scene <= 00:08:00 92.7% (975)
1st Apparatus On Scene <= 00:08:15 93.5% (984)
1st Apparatus On Scene <= 00:08:30 94.3% (992)
1st Apparatus On Scene <= 00:08:45 94.9% (998)
1st Apparatus On Scene <= 00:09:00 95.4% (1,004)
1st Apparatus On Scene <= 00:09:15 95.8% (1,008)
1st Apparatus On Scene <= 00:09:30 96.4% (1,014)
1st Apparatus On Scene <= 00:09:45 96.9% (1,019)
1st Apparatus On Scene <= 00:10:00 97.5% (1,026)
1st Apparatus On Scene <= 00:10:15 97.8% (1,029)
1st Apparatus On Scene <= 00:10:30 98.0% (1,031)
1st Apparatus On Scene <= 00:10:45 98.1% (1,032)
1st Apparatus On Scene <= 00:11:00 98.4% (1,035)
1st Apparatus On Scene <= 00:11:15 98.4% (1,035)
1st Apparatus On Scene <= 00:11:30 98.4% (1,035)
1st Apparatus On Scene <= 00:11:45 98.4% (1,035)
1st Apparatus On Scene <= 00:12:00 98.5% (1,036)
1st Apparatus On Scene <= 00:12:15 98.5% (1,036)
1st Apparatus On Scene <= 00:12:30 98.5% (1,036)
1st Apparatus On Scene <= 00:12:45 98.8% (1,039)
1st Apparatus On Scene <= 00:13:00 99.1% (1,043)
1st Apparatus On Scene <= 00:13:15 99.1% (1,043)
1st Apparatus On Scene <= 00:13:30 99.2% (1,044)
1st Apparatus On Scene <= 00:13:45 99.2% (1,044)
1st Apparatus On Scene <= 00:14:00 99.3% (1,045)
1st Apparatus On Scene <= 00:14:15 99.3% (1,045)
1st Apparatus On Scene <= 00:14:30 99.4% (1,046)
1st Apparatus On Scene <= 00:14:45 99.4% (1,046)
1st Apparatus On Scene <= 00:15:00 99.5% (1,047)
1st Apparatus On Scene <= 00:15:15 99.5% (1,047)
1st Apparatus On Scene <= 00:15:30 99.5% (1,047)
1st Apparatus On Scene <= 00:15:45 99.6% (1,048)
1st Apparatus On Scene <= 00:16:00 99.7% (1,049)
1st Apparatus On Scene <= 00:16:15 99.7% (1,049)
1st Apparatus On Scene <= 00:16:30 99.7% (1,049)
1st Apparatus On Scene <= 00:16:45 99.7% (1,049)
1st Apparatus On Scene <= 00:17:00 99.7% (1,049)
1st Apparatus On Scene <= 00:17:15 99.7% (1,049)
1st Apparatus On Scene <= 00:17:30 99.7% (1,049)
1st Apparatus On Scene <= 00:17:45 99.7% (1,049)
1st Apparatus On Scene <= 00:18:00 99.7% (1,049)
1st Apparatus On Scene <= 00:18:15 99.7% (1,049)
1st Apparatus On Scene <= 00:18:30 99.7% (1,049)

1st Apparatus On Scene <= 00:18:45 99.7% (1,049)
1st Apparatus On Scene <= 00:19:00 99.7% (1,049)
1st Apparatus On Scene <= 00:19:15 99.7% (1,049)
1st Apparatus On Scene <= 00:19:30 99.9% (1,051)
1st Apparatus On Scene <= 00:19:45 100.0% (1,052)
1st Apparatus On Scene <= 00:20:00 100.0% (1,052)

Median 1st Apparatus On Scene 00:04:02 (4.03 minutes)
Average 1st Apparatus On Scene 00:04:32 (4.53 minutes)

Here is a breakdown when incidents are narrowed down to **structure fires**.

There are 59 Incident records being analyzed.

1st Apparatus On Scene <= 00:00:00 .0% (0)
1st Apparatus On Scene <= 00:00:15 .0% (0)
1st Apparatus On Scene <= 00:00:30 .0% (0)
1st Apparatus On Scene <= 00:00:45 .0% (0)
1st Apparatus On Scene <= 00:01:00 .0% (0)
1st Apparatus On Scene <= 00:01:15 .0% (0)
1st Apparatus On Scene <= 00:01:30 1.7% (1)
1st Apparatus On Scene <= 00:01:45 3.4% (2)
1st Apparatus On Scene <= 00:02:00 6.8% (4)
1st Apparatus On Scene <= 00:02:15 8.5% (5)
1st Apparatus On Scene <= 00:02:30 8.5% (5)
1st Apparatus On Scene <= 00:02:45 10.2% (6)
1st Apparatus On Scene <= 00:03:00 11.9% (7)
1st Apparatus On Scene <= 00:03:15 13.6% (8)
1st Apparatus On Scene <= 00:03:30 16.9% (10)
1st Apparatus On Scene <= 00:03:45 18.6% (11)
1st Apparatus On Scene <= 00:04:00 32.2% (19)
1st Apparatus On Scene <= 00:04:15 33.9% (20)
1st Apparatus On Scene <= 00:04:30 33.9% (20)
1st Apparatus On Scene <= 00:04:45 33.9% (20)
1st Apparatus On Scene <= 00:05:00 40.7% (24)
1st Apparatus On Scene <= 00:05:15 47.5% (28)
1st Apparatus On Scene <= 00:05:30 49.2% (29)
1st Apparatus On Scene <= 00:05:45 50.8% (30)
1st Apparatus On Scene <= 00:06:00 61.0% (36)
1st Apparatus On Scene <= 00:06:15 64.4% (38)
1st Apparatus On Scene <= 00:06:30 66.1% (39)
1st Apparatus On Scene <= 00:06:45 71.2% (42)
1st Apparatus On Scene <= 00:07:00 79.7% (47)
1st Apparatus On Scene <= 00:07:15 79.7% (47)
1st Apparatus On Scene <= 00:07:30 81.4% (48)
1st Apparatus On Scene <= 00:07:45 84.7% (50)

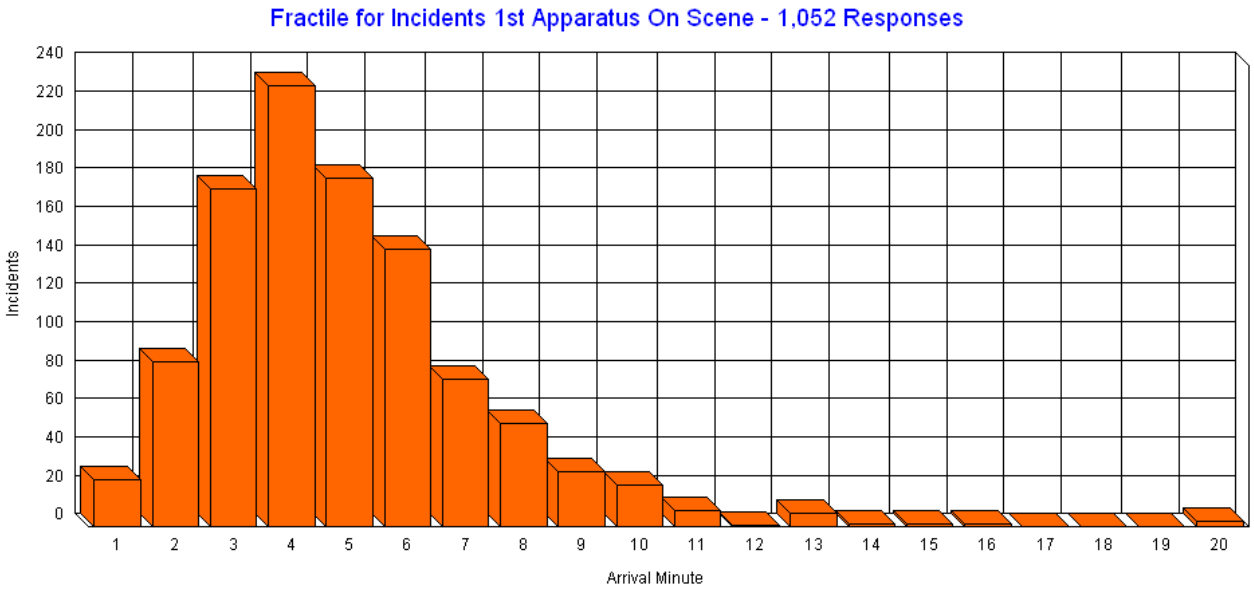
1st Apparatus On Scene <= 00:08:00 88.1% (52)
1st Apparatus On Scene <= 00:08:15 88.1% (52)
1st Apparatus On Scene <= 00:08:30 89.8% (53)
1st Apparatus On Scene <= 00:08:45 91.5% (54)
1st Apparatus On Scene <= 00:09:00 91.5% (54)
1st Apparatus On Scene <= 00:09:15 91.5% (54)
1st Apparatus On Scene <= 00:09:30 93.2% (55)
1st Apparatus On Scene <= 00:09:45 94.9% (56)
1st Apparatus On Scene <= 00:10:00 94.9% (56)
1st Apparatus On Scene <= 00:10:15 96.6% (57)
1st Apparatus On Scene <= 00:10:30 96.6% (57)
1st Apparatus On Scene <= 00:10:45 98.3% (58)
1st Apparatus On Scene <= 00:11:00 98.3% (58)
1st Apparatus On Scene <= 00:11:15 98.3% (58)
1st Apparatus On Scene <= 00:11:30 98.3% (58)
1st Apparatus On Scene <= 00:11:45 98.3% (58)
1st Apparatus On Scene <= 00:12:00 98.3% (58)
1st Apparatus On Scene <= 00:12:15 98.3% (58)
1st Apparatus On Scene <= 00:12:30 98.3% (58)
1st Apparatus On Scene <= 00:12:45 98.3% (58)
1st Apparatus On Scene <= 00:13:00 98.3% (58)
1st Apparatus On Scene <= 00:13:15 98.3% (58)
1st Apparatus On Scene <= 00:13:30 98.3% (58)
1st Apparatus On Scene <= 00:13:45 98.3% (58)
1st Apparatus On Scene <= 00:14:00 98.3% (58)
1st Apparatus On Scene <= 00:14:15 98.3% (58)
1st Apparatus On Scene <= 00:14:30 98.3% (58)
1st Apparatus On Scene <= 00:14:45 98.3% (58)
1st Apparatus On Scene <= 00:15:00 98.3% (58)
1st Apparatus On Scene <= 00:15:15 98.3% (58)
1st Apparatus On Scene <= 00:15:30 98.3% (58)
1st Apparatus On Scene <= 00:15:45 98.3% (58)
1st Apparatus On Scene <= 00:16:00 98.3% (58)
1st Apparatus On Scene <= 00:16:15 98.3% (58)
1st Apparatus On Scene <= 00:16:30 98.3% (58)
1st Apparatus On Scene <= 00:16:45 98.3% (58)
1st Apparatus On Scene <= 00:17:00 98.3% (58)
1st Apparatus On Scene <= 00:17:15 98.3% (58)
1st Apparatus On Scene <= 00:17:30 98.3% (58)
1st Apparatus On Scene <= 00:17:45 98.3% (58)
1st Apparatus On Scene <= 00:18:00 98.3% (58)
1st Apparatus On Scene <= 00:18:15 98.3% (58)
1st Apparatus On Scene <= 00:18:30 98.3% (58)
1st Apparatus On Scene <= 00:18:45 98.3% (58)
1st Apparatus On Scene <= 00:19:00 98.3% (58)
1st Apparatus On Scene <= 00:19:15 98.3% (58)

1st Apparatus On Scene <= 00:19:30 100.0% (59)
1st Apparatus On Scene <= 00:19:45 100.0% (59)
1st Apparatus On Scene <= 00:20:00 100.0% (59)

Median 1st Apparatus On Scene 00:05:21 (5.35 minutes)
Average 1st Apparatus On Scene 00:05:44 (5.72 minutes)

While most fire and EMS responses are handled with a single local apparatus, structure fires draw resources from more distant locations. The slower response time figures may be due to a disproportionate number of responses to neighboring fire jurisdictions.

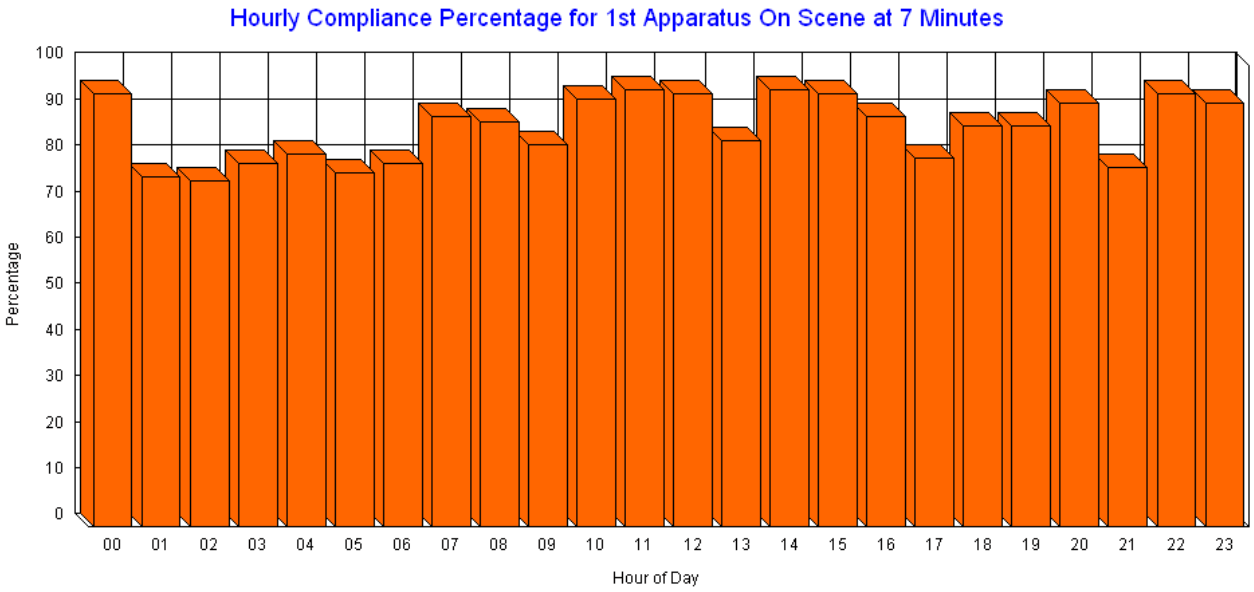
Fractile response times can also be viewed graphically. Here is a graph illustrating the number of incidents by response time minute for **fire and EMS incidents**. Incidents with a zero response time were eliminated from the graph.



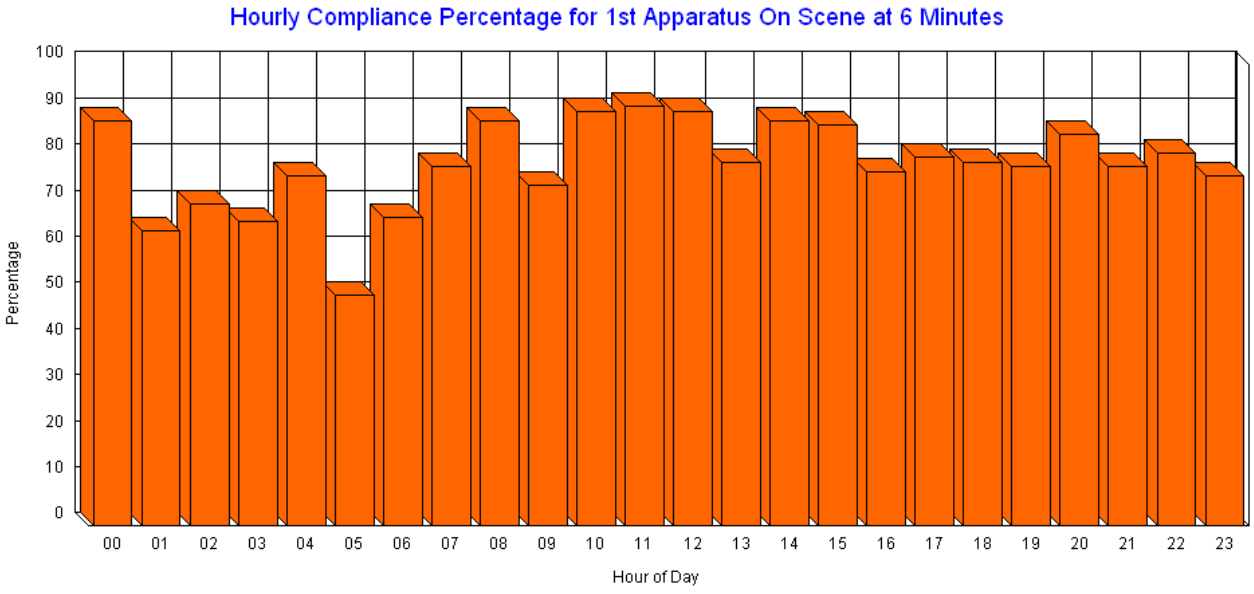
Notice the minute with the most first arriving apparatus is minute 4. This is unusually good performance. It shows a large number of responses are located close to fire stations. There are, however, responses that require longer travel to more distant locations.

We can look at this same set of response statistics in a different way. The concept here is called "Compliance". Compliance measures the percentage of time a response time goal (in this case of 7 or 6 minutes) is met.

Here is a graph illustrating the percentage of compliance (0 – 100%) with a 7-minute response time standard (beginning with CAD call receipt) by hour of the day. Notice incidents that occur early in the morning are just slightly less likely to meet a 7-minute response time objective.



Here is the same graph this time testing compliance with a standard of 6-minutes.



Notice while the compliance percentage is just a little less at 6-minutes, this is nevertheless a strong showing for first company arrival.

Departmental Aid

Here is the department aid report summary for HFD. These stats were drawn from the 3-year dataset:

Total Incidents: 4,477

Incidents Involving Aid: 1,113	Percentage: 24.86%
Aid Incidents for Fires: 273	Percentage: 24.53%
Aid Incidents for EMS: 384	Percentage: 34.50%
Aid Incidents for Others: 456	Percentage: 40.97%
Incidents Involving Aid Received: 182	Percentage: 16.35%.
Incidents Involving Requested Aid Received:	Percentage: .00%
Incidents Involving Automatic Aid Received: 182	Percentage: 16.35%
Incidents Involving Aid Given: 931	Percentage: 83.65%.
Incidents Involving Requested Aid Given: 16	Percentage: 1.44%
Incidents Involving Automatic Aid Given: 901	Percentage: 80.95%
Incidents Involving Other Types of Aid Given: 14	Percentage: 1.26%

Here is aid activity illustrated in graphic form: