A REPORT FOR THE MORAGA-ORINDA FIRE DISTRICT

COMMUNITY STANDARDS OF COVERAGE

Presented to the Board of Directors
March 15, 2006

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Acknowledgments

The Moraga-Orinda Fire District would like to thank the Commission of Fire Accreditation International and Deccan International for the data and information that was directly copied and/or utilized for the preparation of this document.

The management and administrative staff of the District put in a significant amount of time and effort into this document, bringing contributions in their specialized areas of expertise. They include all of the battalion chiefs, Bryan Collins, Pete Nowicki, Marty O'Connell and Bob Cox. The District's EMS Nurse, Nancy Daniel, Fire Marshal Tonya Hoover, and our information services technician, Bob Williams all made significant contributions. Our administrative manager, Pat Soler and administrative secretary, Christine Pokorney assisted in the proof reading, formatting and printing of this document. A special thanks goes to Director Peter S. Wilson for his willingness and patience in sitting through the many computer-modeled operational scenarios that were required during the process.

It is with great pleasure that I present this document to the Board of Directors of the Moraga-Orinda Fire District.

Sincerely,

James J. Johnston, Fire Chief
Moraga-Orinda Fire District

Introduction

The purpose of this Standards of Coverage document is to create written procedures that will determine the distribution and concentration of fixed and mobile resources and staffing for the Moraga-Orinda Fire Protection District.

This process includes setting response goals with respect to deployment requirements to mitigate the impact of fire, rescue and medical emergencies. Community expectations are an important and relevant factor to the process.

A systems approach to deployment will be utilized for the MOFD compared to a one-size-fits-all perspective formula. Through a comprehensive systems approach the MOFD Board of Directors will be able to match local needs (risks and expectations) with the costs of various levels of service. Through this process the Board of Directors essentially "purchases" the fire and EMS protection (insurance) the community needs and can afford now and into the future.

The Moraga-Orinda Fire District covers a broad geographic and population base consisting primarily of urban/suburban, semi-rural and rural service areas. Matching the distribution and arrival of resources to obtain maximum effectiveness to control a fire, mitigate a medical emergency, or effectuate a rescue is a significant challenge to the District. If resources arrive too late or are under staffed, the emergency will continue to escalate resulting in a losing battle and negative outcome. Arriving within a short period of time with adequate resources to do the job is imperative to the success of an emergency delivery system.

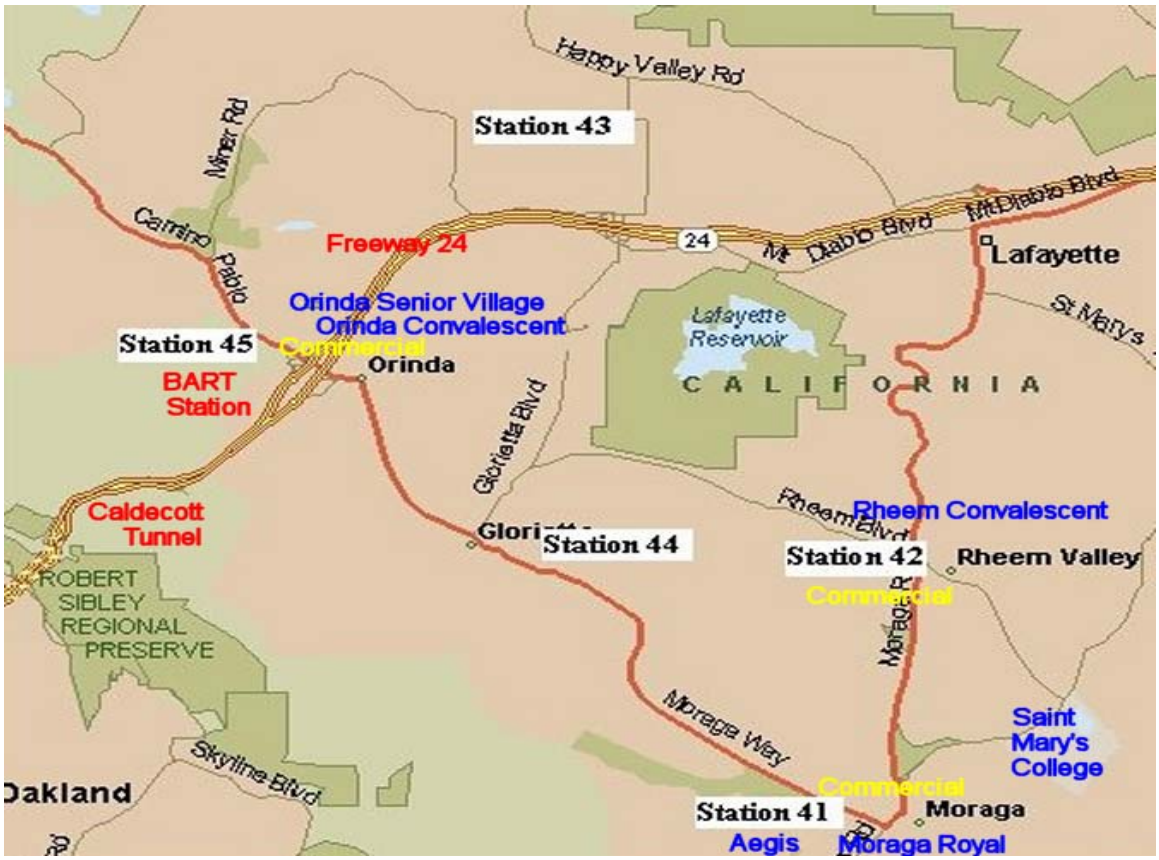
It is recognized within the fire service profession that an emergency service evaluation must take into account both the frequency and severity of the most common types of incidents. Emergency medical responses are the most frequent type of emergencies within the District and require immediate engine-based paramedic response and an advanced life support ambulance transport. Rescue emergencies such as multiple car collisions require speedy arrival of multiple crews to control the scene, perform rescue operations and provide medical care. Structure fires, especially involving high life safety occupancies such as college dormitories, senior living facilities, and apartment units, require the timely arrival of numerous fire companies for several reasons. More resources are required to rescue people, contain the fire from escalating into a larger conflagration and limiting property damage, as well as for providing for fire fighter safety.

Because the MOFD is expected to respond to these wide ranges of complex emergency needs, it is necessary that there is a method for identifying risks and expected outcomes. Based upon that risk assessment and anticipated workload, a standard of response is developed for fire fighting, rescue and EMS functions. Policy decisions must be made regarding the distribution and concentration of resources in relation to the potential demand placed upon them by the risk level in the community. The purpose of standards of coverage process is to utilize empirical evidence and rational discussion in order for the Board of Directors of the Moraga-Orinda Fire District to make an informed policy decision.

Risk Assessment Analyses

Description of the District

The Moraga-Orinda Fire District encompasses an area of approximately 63.5 square miles. Within that area approximately 90% of the Orinda Zone is designated as Very High Fire Hazard Severity Zone (VHFHSZ) by the California Department of Forestry and Fire Protection while significant areas within and around the Town of Moraga, the Community of Canyon and unincorporated Contra Costa County are considered wildland fire threat zones. Along with these recognized wildland fire hazard areas, the District has identified specific target hazard areas and occupancies within the Fire District boundaries. These areas and occupancies were selected based on the potential fire hazard level, risk potential and the number of occupants that may require assistance during an emergency. Examples of District target hazards include Saint Mary's College (Town of Moraga), the Bay Area Rapid Transportation (BART) station (City of Orinda), Orinda Senior Village (City of Orinda), Rheem Convalescent (Town of Moraga), Moraga Royal Assisted Living (Town of Moraga), and Aegis Assisted Living (Town of Moraga).



MOFD Target Hazard Map

The District is comprised of many occupancy classifications that are of concern for emergency responders. In the City of Orinda, Highway 24 bisects the commercial area.

A portion of the commercial zone lies east of Camino Pablo and north of Highway 24 while the rest of the commercial zone is located to the south of Highway 24 and east of Camino Pablo. The Bay Area Rapid Transportation (BART) station and freeway access ramps are located within the commercial zone of the City of Orinda.

The rest of the City of Orinda is a majority of single family residences. Many of these residential areas have narrow, steep and winding roadways with an interface of heavy vegetation and structures. All areas to the north of Highway 24 are part of the Very High Fire Hazard Severity Zone. The far north end of the Fire District contains a large recreational area that includes boating access to a major reservoir.

To the south of the commercial zone of Orinda continues the residential single family structures with a few smaller commercial buildings scattered to the south of Brookwood and Moraga Way. The Very High Fire Hazard Severity Zone continue south until just south of Hall Drive. The City of Orinda limits continue to Ivy Drive with flatter terrain, wider roadways and a concentration of single family structures.

The south end of the Fire District includes the Town of Moraga and the Bollinger Canyon area. The southwest area of the Town of Moraga has a concentration of single family structures, large open and undeveloped space and heavy vegetated wildland. The Town of Moraga's central light commercial area includes the area of Rheem Valley Road at Moraga Road and the east and west side of Moraga Way from School street to Moraga Road. Concentrated areas of single family dwellings are scattered throughout the Town of Moraga with the majority of multi-unit residential structures located on Donald Drive, Ascot Drive, Ascot Court, Camino Peral and Alta Mesa.

To the southeast of Moraga is Saint Mary's College. This private college includes a large building for sports gatherings, a three story science building, a historical chapel, a student union and fourteen residential student living buildings (dormitories). The college makes up approximately 2.5 percent of the total call volume for the Fire District. Continuing south of Saint Mary's College are large areas of undeveloped open space with single family dwellings, undeveloped roadways and limited or no water supply.

The Community of Canyon is located to the southwest (unincorporated Contra Costa County) of the Moraga-Orinda Fire District. This community is situated within a heavy vegetated area with very limited access. Many roadways are extremely under-developed and there is no public water supply available for fire hydrants. The Community of Canyon is home to a post office and a school building.

Building Occupancy Risk Analysis

Important factors to address when evaluating fire loss consequences include the potential for death, serious injury, property damage, business interruption, and environmental catastrophes. To address such concerns, the Fire District collected information on each "value at risk" (occupancy and address) and that information was used in a risk evaluation program. This program provided a "scoring" for each entered value at risk.

The Moraga-Orinda Fire District chose to use the Emergency Reporting Vision system as the tool to analyze and categorize risks present in the service.

The Vision system allows the user to select the appropriate regulatory building code necessary to analyze and categorize risk factors for occupancies. The Moraga-Orinda Fire District used the Uniform Building Code, the model code used to regulate building construction in the Fire District.

The Uniform Building Code divides occupancies into 11 "occupancy classifications" and they are:

Group A – Assembly
Group B – Business
Group C – Camps
Group E – Educational
Group F – Factory and Industrial
Group H – Hazardous
Group I – Institutional
Group M – Mercantile
Group R – Residential
Group S – Storage
Group U – Utility

Data collected included the number of employees, average exposure separation, number of floors, property value, occupancy load, occupancy access, occupant mobility, warning alarm systems, fire protection systems, exits, construction type, regulatory oversight, human activity, frequency of fires occurring in the type of occupancy, capacity to control a fire in the structure, hazard index, fire load and available water supply from the closest fire hydrant or hydrants to the structure. Each piece of data collected is given a value and scored by the program.

The program does not take into account exterior fire hazards or the impact of such exposure to wildland fire potential that includes slope, aspect, fuel type (vegetation), and the fuel condition (live verses dead fuel ratios); all which are important to wildland fire behavior and spread.

This program generated the Occupancy Vulnerability Profile Assessment (OVAP) score for all occupancies collected within the District's response area. OVAP scores provide risk levels for low (0 – 14), moderate (15 – 39), significant (40 – 59) and maximum (scores of 60+). Data was collected on 13,651 properties throughout the Moraga-Orinda Fire District. A sampling that included 4,586 properties has been assigned OVAP scores out of those properties.

The properties that have completed OVAP scores include all non single family residential occupancies, multi residential occupancies and approximately 30% of all single family dwellings. Of the 4,586 properties that were sampled:

74 properties were classified as low risk,
4,511 properties were classified as moderate risk and
1 property was classified with a significant risk level.

The average Occupancy Vulnerability Profile Assessment score was 16.72 for the sampled properties.

From the sampling data, the number of occupancies in the Fire District includes:

10	H-occupancies	85	B-occupancies
8	S-occupancies	5	R2.1-occupancies
19	E-occupancies	273	R1-occupancies
35	A-occupancies	4,131	R3-occupancies
2	I-occupancies		
18	M-occupancies		

The largest volume of R-1 occupancies (apartments, hotels and congregate residences) and R-2.1 (residentially-based, licensed facilities) are located in the Town of Moraga, while the other occupancy classifications are relatively evenly distributed throughout the District (except for the concentration of B-occupancies at Saint Mary's College).

Urban-wildland Interface Risks

The wildland-interface area is defined as the geographical area where structures and development meet wildland or hazardous vegetation. It is "where combustible homes meet combustible vegetation".

The community of Orinda has not been immune to the devastation of wildland-interface fires. On September 1, 1988, six homes were severely damaged, three homes were completely destroyed within 30 minutes as a fire ravaged up a hillside devouring everything in its path.

The Moraga-Orinda Fire District is located adjacent to and immediately east of the communities of Berkeley and Oakland and is susceptible to the same type of fire that occurred there. Over 90% of the City of Orinda has been designated by the State of California as a Very High Fire Hazard Severity Zone (VHFHSZ). The Town of Moraga has been designated as a Moderate Level of fire risk. (The District is in the process of conducting a re-evaluation of its threat zone areas.)

The disastrous Oakland Hills Fire occurred in 1991. This fire left 25 people dead, and destroyed more than 3,400 dwellings in Oakland and 63 homes in Berkeley. Dry Diablo winds that produced gusts up to 60 miles per hour, combined with vegetation that was parched from 5 years of drought set the stage for that catastrophic day. Temperatures were in the 90's, humidity was below 20%, and the wind was from the north east producing hot and dry conditions.

The East Bay hills, the venue for the Oakland Hills Fire, are a prime example of the modification of the fuel environment that occurs to accommodate human activities. Hundreds of years ago, fields of oak trees occupied most of the terrain. These indigenous

trees were harvested as the population in the area grew and prospered in the late 1800's. In place of the oak trees, local farmers planted thousands of eucalyptus trees because the trees were thought to be fast growing, hardwood, perfect for use as railroad ties and furniture. This turned out not to be the case and as a result, the trees invaded and are now prevalent along the hillsides. Another anticipated use of the eucalyptus trees was to utilize them as wind breaks. Instead, the wind blew the seeds and further spread their growth.

As people populated the hills they brought with them an assortment of vegetation, species such as junipers, cedars, and Monterey pine, all highly flammable. Chaparral and grasses are common to the area and are highly flammable. Chaparral is commonly made up of chamise, toyon, greasewood, manzanita, pine and oak. They flourish in areas that receive little or no rainfall, or no rain for the majority of the year. All, except the grasses are high in resin content, can ignite readily and produce airborne embers. The eucalyptus and Monterey pines also have low hanging limbs that provide a laddering effect that allows lower lying fuels that have ignited to readily "climb the ladder" and ignite the crown of the tree. A significant number of these flammable fuels directly abut homes in the area setting the stage for a wildland-interface fire.

The Importance of Time in Assessing Emergency Response Capabilities

Timely emergency response is critical with respect to fires, rescues and medical (especially cardiac arrest) outcomes. Emergency events occur at all hours, all days and under all conditions. The fire service's response to these unpredictable conditions has been to develop a methodology for being prepared to respond in a timely manner when they occur. The operative word is timely and the corresponding consequence of predicting outcome and measuring performance.

When evaluating fire station location, types of apparatus and staffing levels for structure fires, the flashover point, the significant threat to life and property, is the event that the service level is intended to prevent from occurring. The timeframe for flashover to occur is generally six to ten minutes.

From an emergency medical perspective, the six-minute time frame is used as a means of service level measurement, as brain damage is very likely in cardiac arrest patients after six minutes without oxygen flow to the brain.

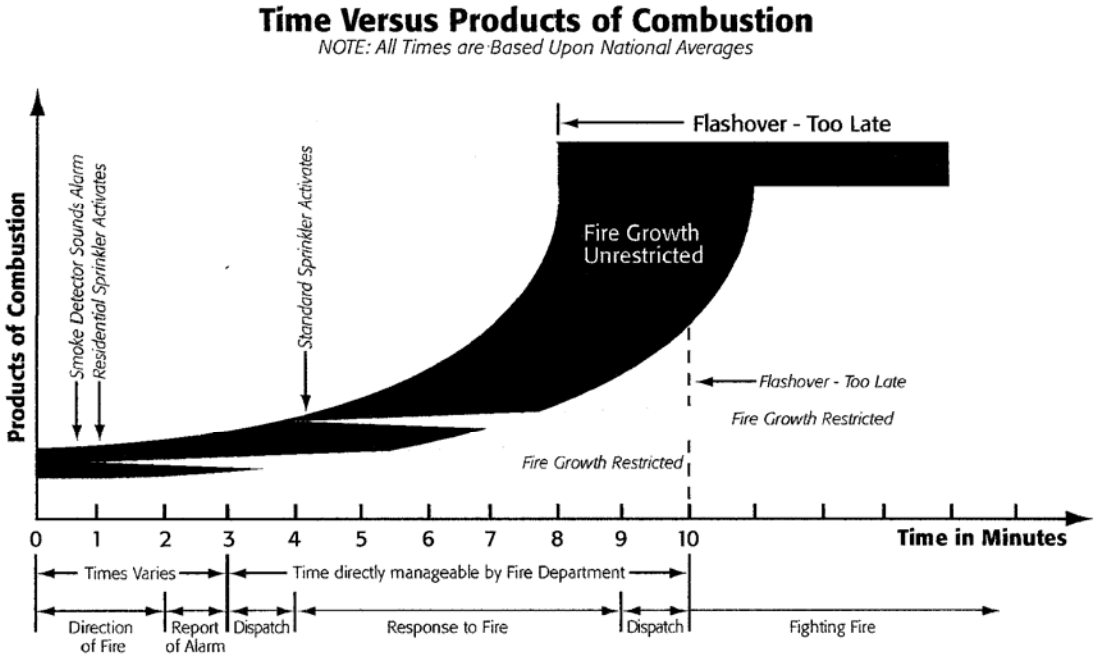
Rescue response for traumatic injuries references the "Golden Hour" during which time the patient must arrive to nearest emergency room facility to have the greatest opportunity for survival. The "Golden Hour" includes the time from the event and includes not only the response time of fire fighters to the event, but also disentanglement, stabilization and transportation to the hospital facility.

The significance of flashover

In addressing the issue of impact on response it is important to understand why a fire district must be able to deliver resources within a determined time frame. Fires progress in a geometric fashion whereby an added increase in time of response results in fire damage growing in factors of multiplication. This is due to the fact that as a fire builds up it can go through different stages of development. This buildup can be plotted on a timeline, the results of which are not linear, but logarithmic.

The stage of fire buildup that is of critical concern with respect to service delivery is flashover. Flashover occurs when the fire gases and products of combustion that have accumulated during the first phases of burning simultaneously ignite. The flashover will generally spread the fire through out the structure and make the likelihood of saving life and property very doubtful. This is due to flashover's sudden change from tenable atmosphere with good visibility and moderate heat to an atmosphere where death can occur within seconds. The time that it takes to reach flashover is generally six to ten minutes. The stages leading up to flashover will vary depending on the fuel, nearby combustibles and the surrounding air (availability of oxygen).

The following graph depicts the various fire stages utilizing the time-temperature curve.



The flashover stage of a fire marks a big turning point in fire conditions that escalate the challenge to a fire district's resources. First, no living thing in the room of origin will survive, so the chance of saving lives drops dramatically. Second, flashover creates a quantum jump in the rate of combustion, and a significantly greater amount of water is needed to reduce the burning material below its ignition temperature. A fire that has reached flashover means it is too late to save anyone in the room of origin, and a lot more staffing is required to handle the larger hose streams needed to extinguish the fire. A post-flashover fire burns hotter and moves faster, compounding the search and rescue problems in the remainder of the structure at the same time that more firefighters are needed for the attack.

The significance of Flashover

Pre-Flashover: ……...	**Post-Flashover:**
Limited to one room…….	May spread beyond one room
Requires smaller attack lines……	Requires more and larger attack lines
Search and rescue is easier……...	Compounds search and rescue
Initial assignment can handle……	Requires additional companies

As indicated above in the time-temperature curve graph, the stage of a fire affects staffing and equipment needs. The ability to correlate staffing and equipment needs with fires

according to their stage of growth is an essential basis of consideration for a response coverage study.

The geography, suburban/rural character, and street access configuration of the Moraga-Orinda Fire District create significant challenges to this endeavor. Even if the MOFD were to heavily staff and increase its station and equipment resources, it would be unrealistic to expect the fire district to reach all fires before flashover. It is also unreasonable to expect every fire to be at flashover when a fire engine arrives under current staffing levels. Given that some fires will reach flashover before the fire district can respond-either because the materials involved are very volatile, because the fire accelerated with flammable liquids, or because the fire went unreported-it is unreasonable to expect the fire district can save every life or stop all significant property loss.

Nonetheless, a response coverage study will allow policy makers to make reasonable and objective decisions that maximize the potential for saving life and property with the limited resources that are available.

Medical Responses

The Moraga-Orinda Fire District serves a population of approximately 42,000. Of that number, 18% are over the age of 65, compared to 10.6% for the State of California. The District responds to over 1,000 medical calls per year that require transportation to the hospital utilizing one of the District's two rescue ambulances. Of the medical calls that the District personnel respond to, over 30% require advanced life support compared to approximately 15 to 20% for other Bay Area fire agencies.

Of those calls requiring advanced life support within the District, over 65% of the calls are on behalf of residents over the age of 65.

Statistics Support Rapid Prehospital Care

Sudden cardiac arrest claims about 460,000 lives each year. The most common cause of sudden cardiac arrest is ventricular fibrillation – when the heart's electrical impulses become irregular and the heart is unable to pump oxygen-rich blood through the body. If left untreated, death occurs within minutes. Although the public health initiative for Public Access Defibrillation (PAD), placing "smart" defibrillators (AEDs) in the community for use by trained laypersons is gaining momentum, the numbers of public access AEDs are few, and survival is often still dependent on early activation of the 911 system and early arrival of EMS personnel.

Seventy-five percent of the people who die suddenly of heart disease, often without previous symptoms, are outside of a hospital setting. National statistics show that fewer than 5% of those who experience cardiac arrest outside of a hospital will survive. The chance of survival decreases by 10% for every minute that passes, so in order to be effective, defibrillation should be delivered within 3-5 minutes of collapse. After 6 minutes brain death is likely to occur and survivability is unlikely. Early access to 911

and **prompt arrival of emergency healthcare services are critical determinants of positive outcome for victims of cardiac arrest**. The Moraga-Orinda Fire District's first responder defibrillation program has been in place since 1994. There are approximately 10-20 lives saved each year throughout Contra Costa County as a result of EMS arriving and delivering a life-saving shock within a critical response time.

Rapid EMS Response Improves Quality of Life

Even when the victim has bystander CPR and early defibrillation before EMS arrives, the need for assessment and advanced prehospital care while being transported to the nearest medical facility is crucial to stabilize the patient's condition. For those patients who survive a heart attack, delay in treatment can mean increased damage to the heart muscle and poorer outcomes. The benefits of rapid identification and treatment of heart attacks are clear. Early treatment of heart attack patients reduces heart muscle damage, improves heart muscle function, and lowers the heart attack death rate.

Clot-dissolving (thrombolytic) agents used during the acute phase of a heart attack can open the affected coronary artery and reestablish blood flow. Patients who receive the treatment in the first and second hours after the onset of heart attack symptoms experience significant reductions in disability and death when compared to patients who are treated in the third to sixth hours. Other acute interventions for heart attack patients like angioplasty, coronary stenting, and coronary artery bypass surgery require early treatment in order to spare at-risk heart tissue. Optimal outcome requires rapid response, assessment and transport to definitive care by prehospital providers. Rapid EMS response may offset some of the common delay in recognition of a medical emergency by the patient or bystanders.

Stroke Care is Time Dependent Too

As with heart attacks, deaths from stroke can be reduced or delayed by using the most effective therapies in a timely manner. Neurological impairment as a result of ischemic stroke can be limited or reversed with the use of clot-dissolving drugs in appropriately selected patients if administered within 3 hours from onset of symptoms. Mechanical clot retrieval is a new procedure which can be used for some patients. As with ischemic heart disease, the sooner circulation is restored to the injured tissue, the better the patient's functional outcome.

Providing rapid assessment and supportive care to the victim of stroke can avert complications. Interventions are instituted enroute to an appropriate medical facility. These patients benefit from early access to oxygen therapy, I.V. fluids to maintain adequate circulating volume to the brain, blood glucose monitoring, cardiac and oxygen saturation monitoring. The receiving hospital is given advanced notice of the patient's arrival so necessary definitive diagnostic testing can be expedited.

Rescue Response - The "Golden Hour"

In emergency response to critical trauma, the "golden hour" refers to the first sixty minutes after an injury occurs. The clock starts ticking on the moment of impact and continues counting down through notification of the police; dispatch of the Fire rescue crews; transport of the victim to a hospital with life-supporting interventions en route; summons of the appropriate surgical and support staff; and performance of necessary life-saving surgery. The victim's chances of survival are greatest if he or she can be in the operating room within the Golden Hour. This concept of providing vital care during the first hour after a severe injury today serves as the benchmark for trauma care worldwide.

Origins

The concept of the "golden hour" comes from U.S. military wartime experience, particularly in the Vietnam War. In cases of severe trauma, especially internal bleeding, nothing can replace surgery. In addition, medical complications such as shock and secondary brain or spinal cord injury may occur if the patient is not managed appropriately and expeditiously.

Hospital Selection

The late Dr. R. Adams Cowley is credited with promoting this concept first as a military surgeon and later as head of the University of Maryland Shock Trauma Center, the first of its kind in the U.S. (http://www.arlingtoncemetery.net/racowley.html) and (http://www.umm.edu/shocktrauma/history.html) Gradually the "Golden Hour" theory emerged based on the importance of **speed as well as skill** in definitive care. This requires rapid assessment of patient condition by qualified prehospital technicians at the scene so the sickest patients can be triaged to the facilities most capable of treating the patient.

It is therefore necessary that trained and qualified basic and advanced prehospital care providers **arrive at the patient's side as quickly as possible** to assess and transport victims to specialists in the local Trauma Center. Because some injuries can cause a trauma victim to decompensate extremely rapidly, the lag time between injury and definitive treatment should ideally be kept to a bare minimum; over time, this lag time was further clarified to a now-standard time frame of no more than 60 minutes, after which time the survival rate for traumatic patients tends to fall off dramatically.

As Dr. Cowley explained in an interview; "There is a golden hour between life and death. If you are critically injured you have less than 60 minutes to survive. You might not die right then; it may be three days or two weeks later – but something has happened in your body that is irreparable."

The Golden Hour can be summarized by the 3R rule (http://www.ohsu.edu/surgery/UGS/FACULTY/DDTcv.shtml) of Dr. Donald Trunkey, an academic trauma surgeon. It involves:

- Getting the right patient
- To the right place
- At the right time

Measuring Response Time

Cascade of Events-The Response Time Continuum

Response time elements are a cascade of events. This cascade is similar to that used by the medical community to describe the events leading up to the initiation, mitigation, and the ultimate outcome of a cardiac arrest. It is imperative to keep in mind certain intervals described can be directly influenced by the fire service (reflex interval and travel interval), while others can be influenced indirectly (through public education, engineering initiatives, and standards). The following is a description of the cascade of events that are associated with an emergency. Some of these events can be quantified in terms of hard data while others are difficult if not impossible determine; yet all of them impact the outcome of the emergency.

Event Initiation: this is the point at which certain factors occur that may ultimately result in an activation of the emergency response system. These precipitating factors can occur seconds, minutes, hours, or even days until it reaches a critical point at which time a decision is made to seek assistance (point of awareness). Examples of this are the patient who ignores chest pain for days or a homeowner who dismisses the unusual smell of smoke coming from an electrical outlet. *It is rarely possible to quantify the point at which event initiation occurs.*

- **Emergency Event Awareness:** this is the point at which a person or technological device (i.e., smoke detector, infrared heat detector, etc.) becomes aware that conditions exist requiring an activation of the emergency response system. *This point of awareness is also difficult if not impossible to quantify.*

- **Alarm Transmission Interval:** this is the time period during which awareness is made that an emergency exists and an effort is made to contact the alarm point. This can be almost instantaneous such as when an automatic transmission signal from a monitored alarm notifies the dispatch center or the time it takes to get to the nearest telephone to make the call; or waiting for the proper connections when dialing 911 with a cell phone. *Again, it is difficult to determine the time interval during which this process occurs with any degree of reliability.*

- **Notification and Call Processing Interval:** time on this interval commences when the alarm is received by the public safety answering point (PSAP) and ends when the dispatcher activates the fire station and/or fire company alerting devices. For the MOFD both a station ring down and radio broadcast occur. *This is hard data that is collected via the computer aided dispatch (CAD) system and is the starting point of what is commonly referred to as the measurable "Response Time"*

- **Dispatch and Turnout Time:** this is the time between the activation of the fire station and/or fire company alerting device and the time when the responding crew notifies the dispatch center via responding button on the mobile computer terminal or by voice utilizing the radio. During this time period, crews cease other activities,

don appropriate protective clothing, determine the location of the call, and board and start the fire apparatus. It is expected that the responding signal will be given when personnel are aboard the apparatus and the apparatus is beginning to roll toward the call. *This hard data is also collected automatically via the CAD system.*

- **En Route Time or Travel Time:** this time period begins when the fire company has notified the dispatch center that they are responding and ends upon arrival on scene and notification (again via radio or mobile computer terminal notification). *This marks the end of the measurable "Response Time" hard data collection.*

- **Initiation of Action:** this is the point at which operations to mitigate the event begin. This may include size-up, resource deployment, etc.

- **Termination of Incident:** this is the point at which unit(s) has completed the assignment and is available to respond to another request for service.

The response time data that is collected to measure fire district performance includes the ***alarm processing time, plus turnout time plus travel time***. Unfortunately, some people do not realize that without detection, awareness, alarm and notification, the emergency system is essentially deaf, blind, and silent.

To a great degree, in public discussion about how well a fire district can perform, there is a tendency to believe that when a fire starts we will be there four minutes later. This type of measure is an indicator of the customer's perception of performance of the emergency service system. It reflects a misconception regarding those factors that the fire service has direct control of and ignores those elements that are critical but require extensive public education, code enactment and enforcement. To the degree that this report will be focusing on reducing the point of time from dispatch to arrival; equally, it should be emphasized that an effective fire protection program should also focus on reducing the point of time between ignition and detection.

Statistics That Relate to Time

For many years fire agencies have been using a statistical term that is based on one of the three types of central tendency. The three types are mean, median and mode. For nearly 50 years, fire agencies have been talking about their average response time. The Moraga-Orinda Fire District utilizes average response times in its reporting and evaluation. This is an inadequate statistical reference. A few isolated abnormal response times will skew the average, giving an inaccurate picture of the agency's overall response time. When the International Association of Fire Chief's (IAFC) Task Force on Accreditation researched this subject, it discovered that averaging was not a true reflection of performance. It is suggested that fractile goals are more relevant in defining an expected response goal for fire and EMS response times instead of using averages. The Standards of Coverage analysis that follows will utilize a fractile relationship in evaluating current coverage, impact of proposed developments, and establishing long-term goals to improve service capabilities.

Description of the Evaluation Process

Deccan International, Inc. was founded in 1995 and is located in San Diego, California. They are a software company focused on developing and applying practical, data based tools and analysis for enabling emergency medical, rescue and fire fighting operations to become more efficient.

Deccan utilizes two powerful response time analysis tools called CAD (Computer Aided Dispatch) Analyst and ADAM (Apparatus Deployment Analysis Module). These tools use communication center data not only to analyze current performance, but also enable the user to perform "what if" analysis on the impact of new developments, adding, repositioning, and/or eliminating, fire stations, apparatus and staffing levels.

CAD Analyst and ADAM were utilized to evaluate the service of the Moraga-Orinda Fire District under the following scenarios:

1. What is the current level of service provided to the community with respect to station location and response time?
2. What is the recommended best use of the District's current resources? In other words, where should the District place its apparatus, personnel and equipment to get the best overall response times?
3. The District has identified 5 potential developments that could impact emergency services to the existing community. They are:
    a. Gateway (Orinda) – 245 single family dwellings, mostly families with children
    b. Pine Grove (Orinda) – 36 single family dwellings (30 family with children units and 6 senior citizen families); and, 44 town homes
    c. Orinda Oaks (Orinda) – 12 single family dwellings, mostly families with children
    d. Palos Colorados (Moraga) – 123 single family dwellings with demographics similar to that currently in Moraga
    e. Rancho Laguna (Moraga) – 35 single family dwellings with demographics similar to that currently in Moraga
4. What are the impacts of those developments on current District services? (The baseline for measuring those impacts is the "best use" of resources.)
5. What is required with respect to stations, apparatus, personnel and equipment to remedy the impact of those developments? (Again, comparing the impact to the measured, "best use" of resources?
6. Finally, what are the recommended goals to implement that result in cost-effective improved emergency services to the community?

The Moraga-Orinda Fire District responded to approximately 2,476 incidents last year across 36 square miles of the total 63 square miles of the District. Focusing on emergency incidents, four types of incidents were chosen to measure its service levels. Structure fires, wildland fires, and rescue emergencies were chosen because, while they occur at low frequency, the potential for high impact to loss of life and property are great.

Medical emergencies were selected because they are by far, the most frequent type of emergency call. The incident types and volumes for the preceding year are listed below:

Structure Fires	34
Wildland Fires	10
Rescues	132
Medical	1,018 (consisting of all potential advanced life support calls)

For each of the above incident types, the MOFD chose to focus on specific criteria, which are listed below along with their time targets in urban and rural portions of the District. All of the criteria are measured from the time of dispatch of the call to when the units arrived on scene.

	Time target	
	Urban	Rural
Structure Fires		
First Engine	6:00	10:30
Effective Fire Force	13:00	17:30
Wildland Fires		
First Engine	6:00	10:30
Effective Fire Force	13:00	17:30
Rescues		
First Unit	6:00	10:30
First Engine and Transport	10:00	13:00
Medicals		
First Unit	6:00	10:30
First Transport	10:00	13:00

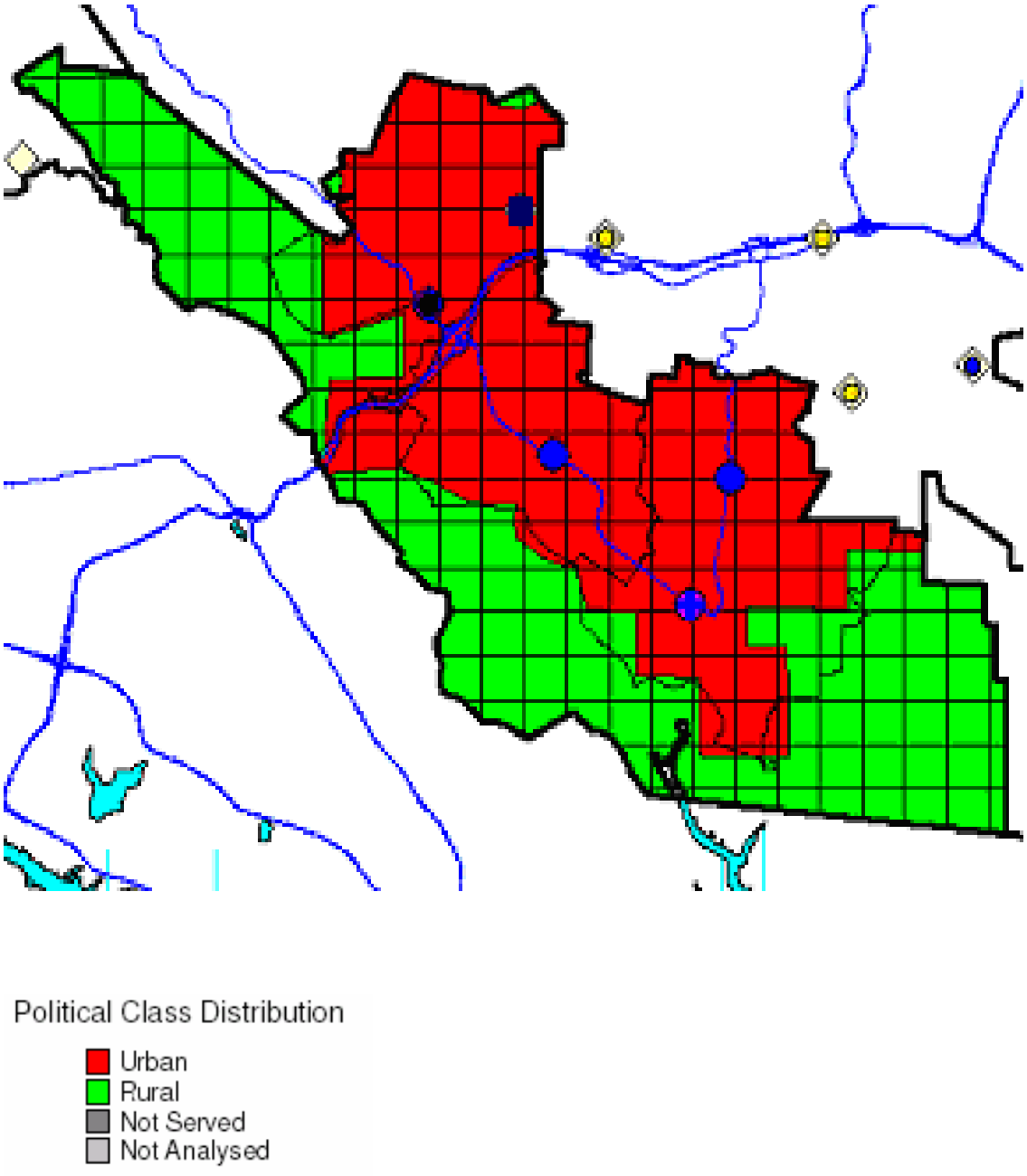
The 6 minute timeframe was chosen because of its correlation to flashover rates for structure fires and it is a time after which survivability is unlikely for cardiac arrest. There is no benchmark for wildland fires, but for consistency the 6 minute rate was established. It is standard practice to add 4 and one-half minutes to urban area response to determine rural area response.

The 6 minute benchmark selected as a reference for measuring MOFD response takes into consideration only those factors that the MOFD has direct control, namely, turn-out time and response time. Therefore, a limitation of utilizing this benchmark is that the other factors relating to the cascade of events on the timeline continuum will affect the eventual outcome of the emergency event.

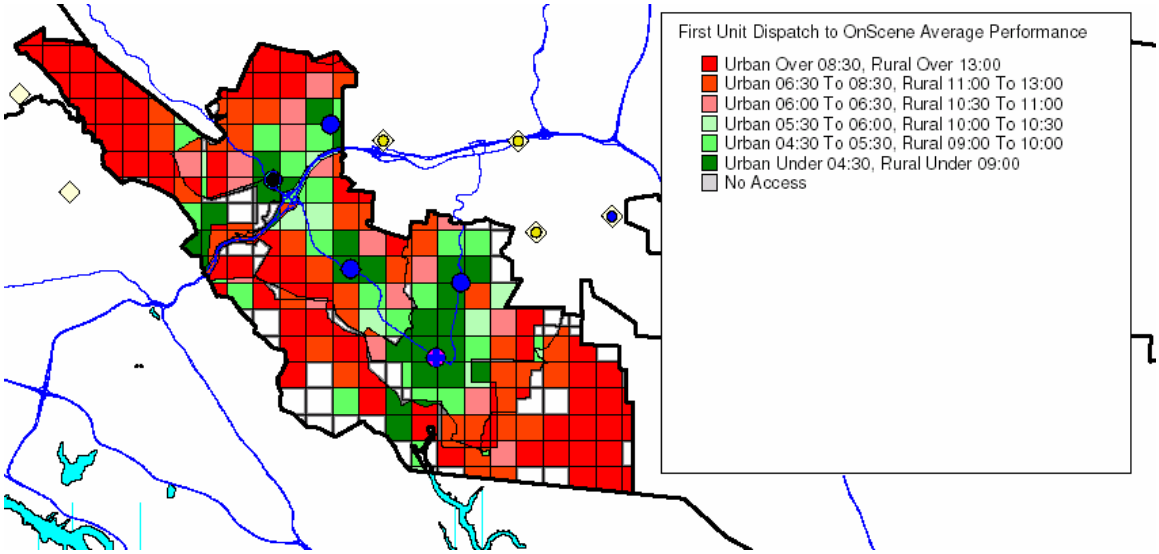
The 10 minute/13 minute timeframe for transports was selected because it was the prior Contra Costa County standard for ambulance response. While the County has modified that standard, increasing the time to 12 minutes, we chose to maintain it at the original levels.

Geographic areas were determined utilizing City of Orinda and Town of Moraga jurisdiction boundaries for urban and unincorporated areas for rural. The following is a map depicting the urban and rural response areas of the District.

Urban and Rural Boundary Areas of the MOFD



The Current Performance of the Moraga-Orinda Fire District



First Unit on Scene for All Incident Types

<u>First Unit on Scene, Performance by Specific Incident Types</u>

Medical Emergencies:

Less than 6 minutes urban/10:30 rural:	77% of the time	Average: 4:57

Rescue Emergencies:

Less than 6 minutes urban/10:30 rural:	57% of the time	Average: 6:06

Structure Fires:

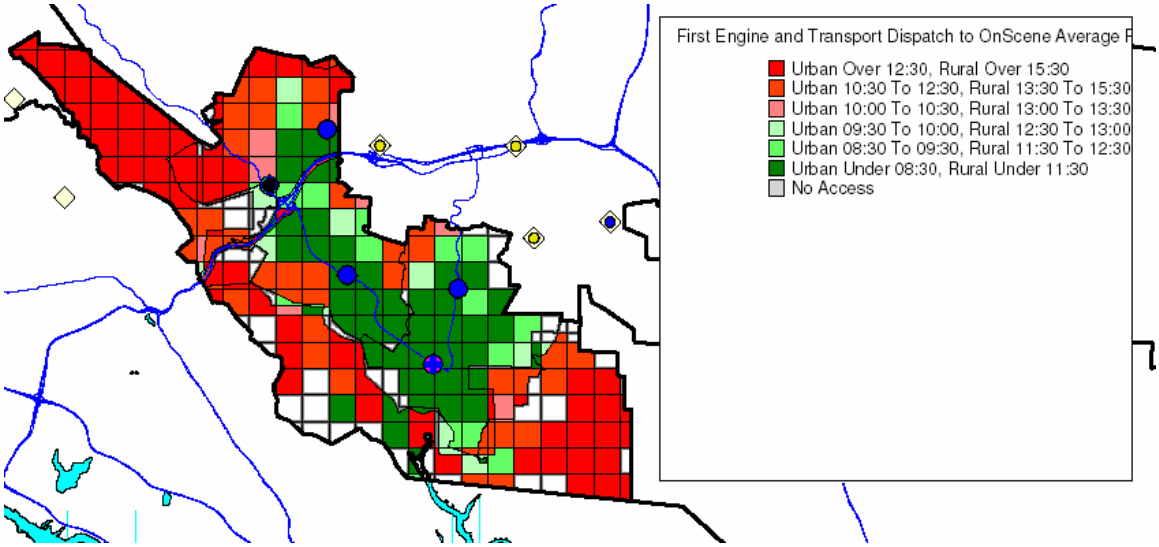
Less than 6 minutes urban/10:30 rural	43% of the time	Average: 6:40

Urban-Wildland Interface Fires:

Less than 6 minutes urban/10:30 rural	45% of the time	Average: 7:59

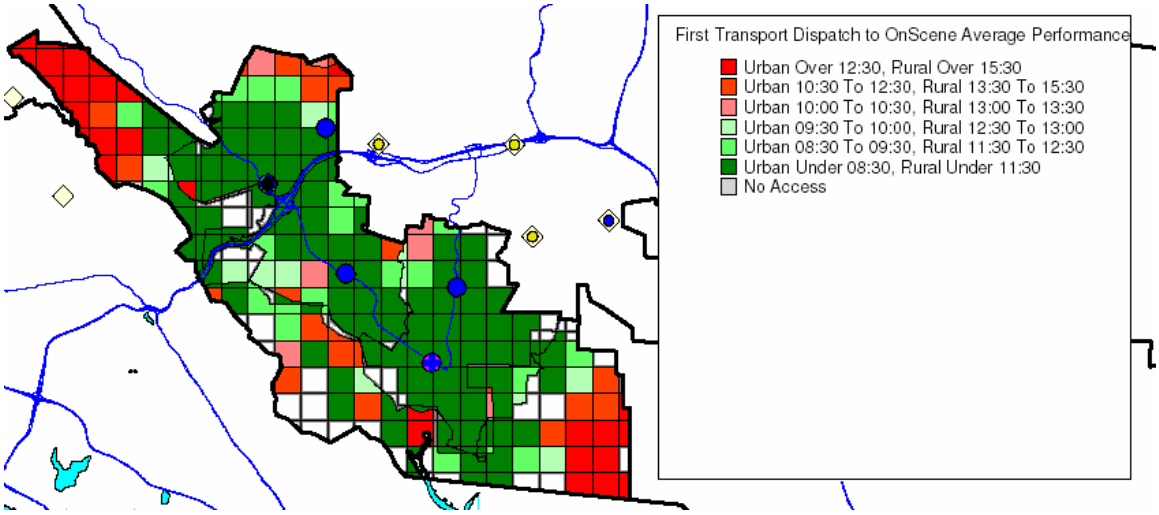
Turn-out Time:

Medical less than 1:30	29% of the time	Average: 1:58
Rescue less than 1:30	12% of the time	Average: 2:19
Structure fire less than 1:30	9% of the time	Average: 2:23
Urban-wildland interface fire less than 1:30	0% of the time	Average: 3:07



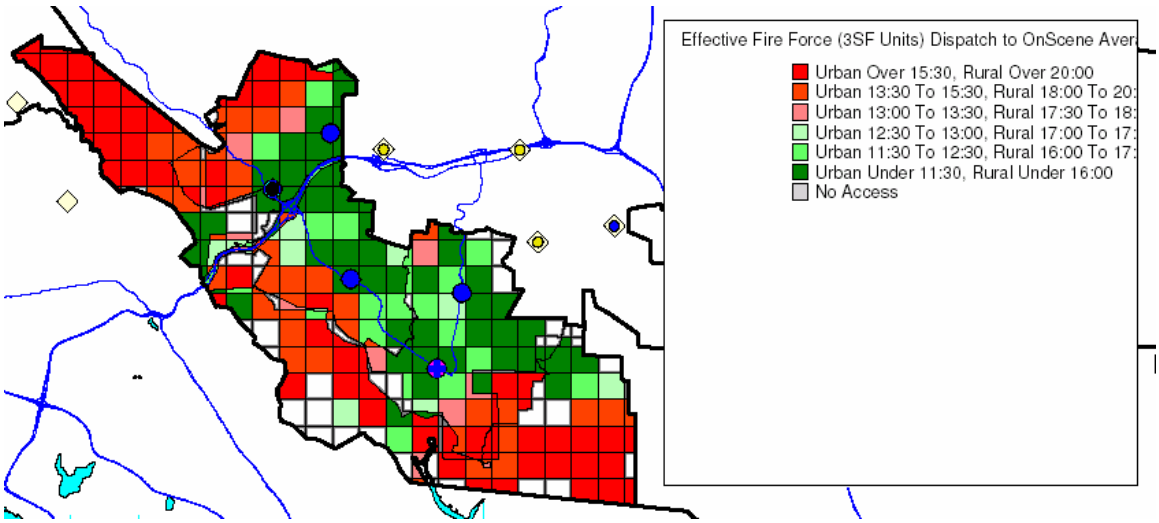
Rescue Response, First Engine and Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 54% of the time Average: 9:52



First Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 96% of the time Average: 5:37



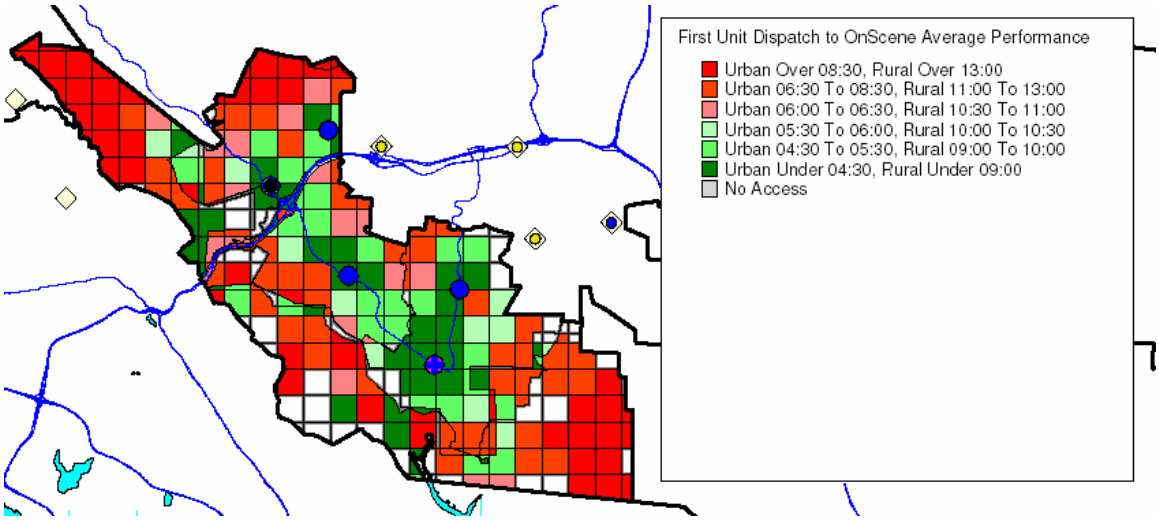
Effective Fire Force, Minimum of 3 Structure Fire Fighting Units

Structure fires less than 13:00 urban/17:30 rural 77% of the time Average:12:15

U-W interface fire less than 13:00 urban/17:30 rural 77% of the time Average:12:34

The "Best Use" of Current Resources

Dedicated Ambulance at Station 45, Cross-Staffed Ambulances at Station 41 and 44



First Unit on Scene for All Incident Types

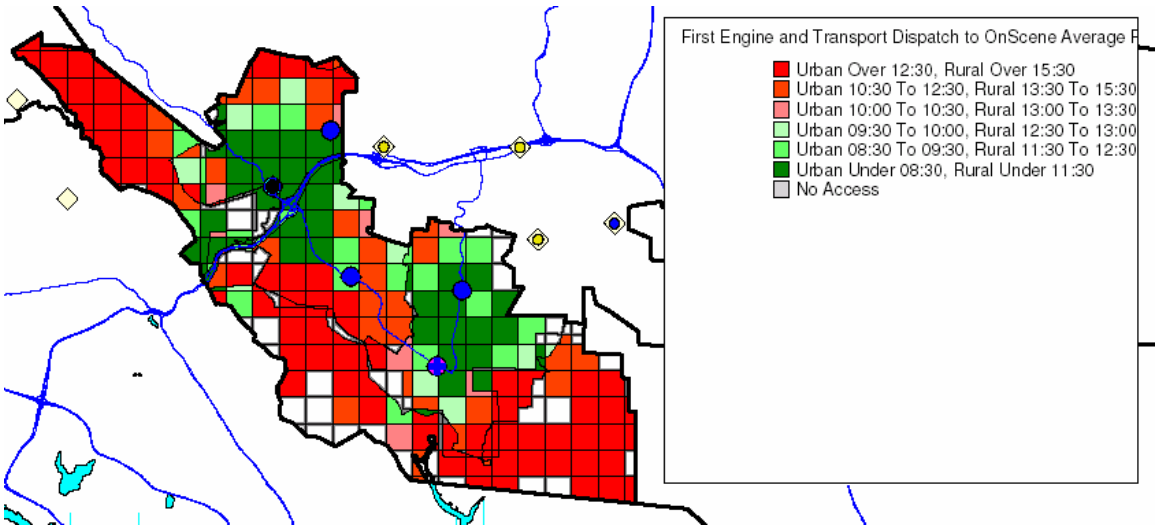
<u>First Unit on Scene, Performance by Specific Incident Types</u>

Medical Emergencies:
Less than 6 minutes urban/10:30 rural: 78% of the time Average: 4:50
This modification would result in an increase of 1% compared to current performance.

Rescue Emergencies:
Less than 6 minutes urban/10:30 rural: 59% of the time Average: 6:04
This modification would result in an increase of 2% compared to current performance.

Structure Fires:
Less than 6 minutes urban/10:30 rural 43% of the time Average: 6:40
No increase in performance would result from this modification.

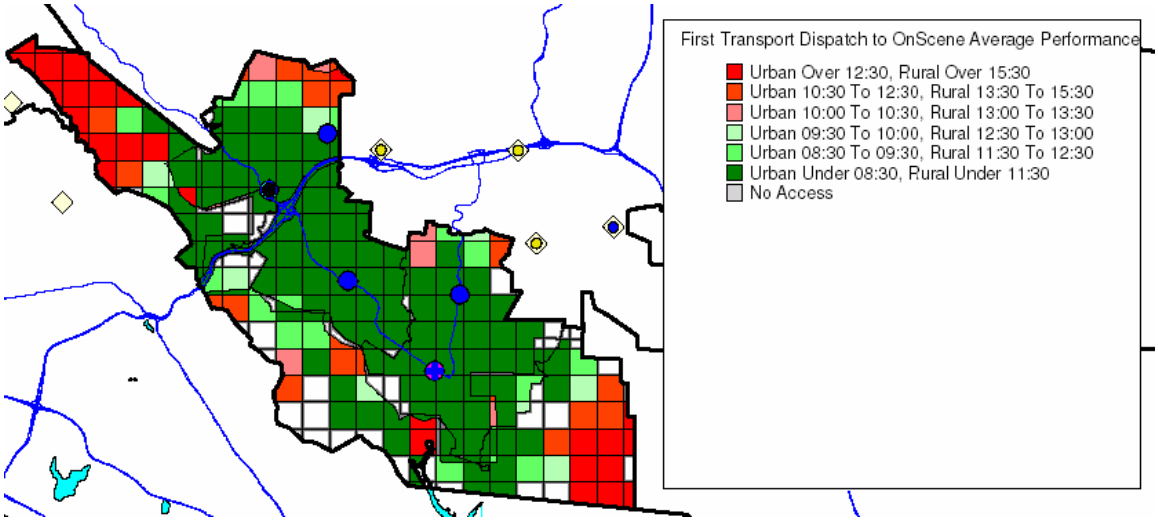
Urban-Wildland Interface Fires:
Less than 6 minutes urban/10:30 rural 45% of the time Average: 7:59
No increase in performance would result from this modification.



Rescue Response, First Engine and Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 85% of the time Average: 8:14

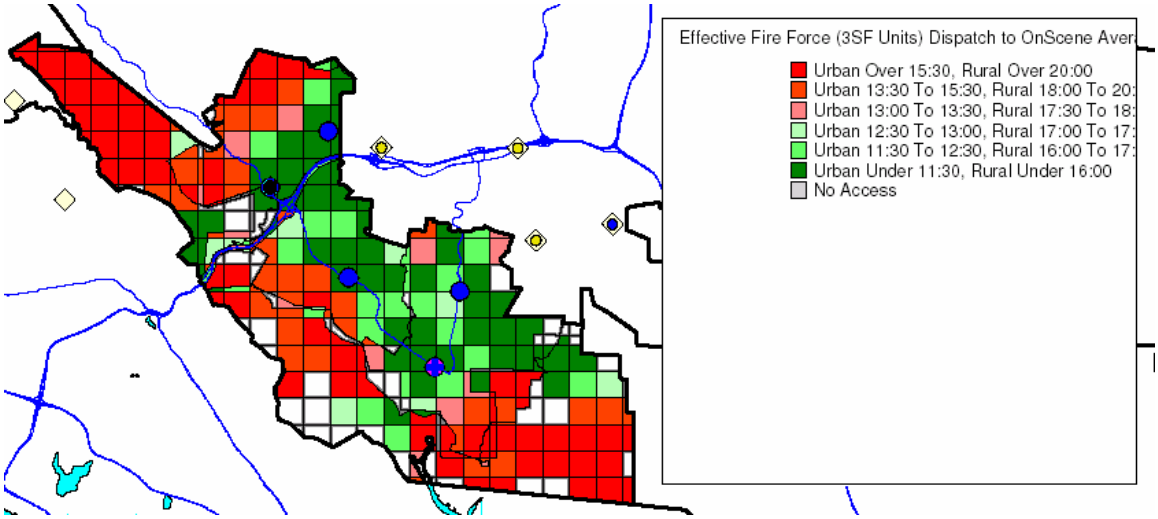
This modification would result in an increase of 31% compared to current performance.



First Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 97% of the time Average: 5:19

This modification would result in an increase of 1% compared to current performance.

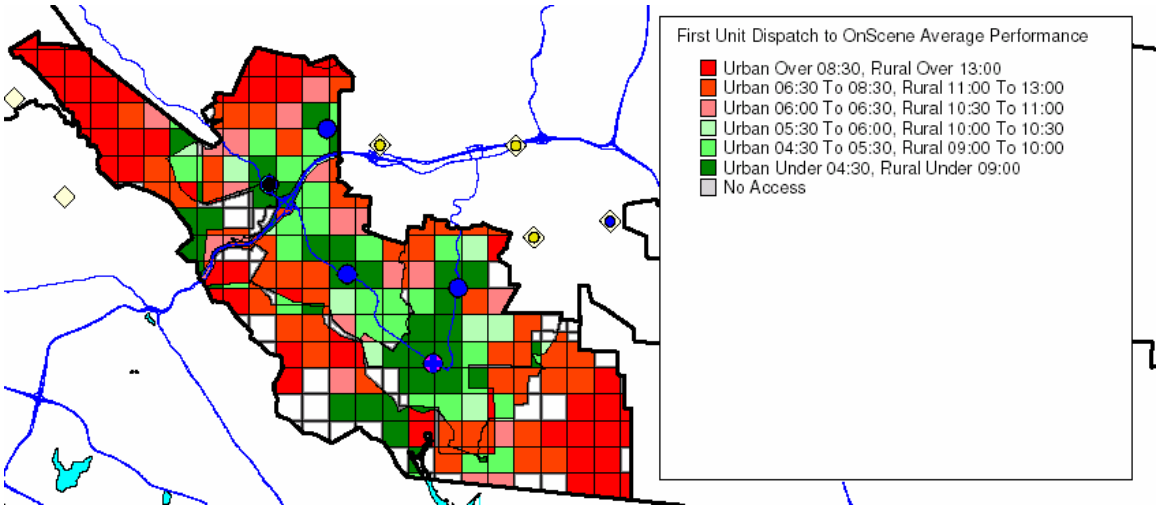


Effective Fire Force, Minimum of 3 Structure Fire Fighting Units

Structure fires less than 13:00 urban/17:30 rural	77% of the time	Average:12:15
U-W interface fire less than 13:00 urban/17:30 rural	77% of the time	Average:12:34

No increase in performance would result from this modification.

Impact of New Developments on Service Levels



First Unit on Scene for All Incident Types

<u>First Unit on Scene, Performance by Specific Incident Types</u>

Medical Emergencies:

Less than 6 minutes urban/10:30 rural: 76% of the time Average: 4:54

This impact would result in a decrease in service level of 2% compared to best use of current resources.

Rescue Emergencies:

Less than 6 minutes urban/10:30 rural: 57% of the time Average: 6:06

This impact would result in a decrease in service level of 2% compared to best use of current resources.

Structure Fires:

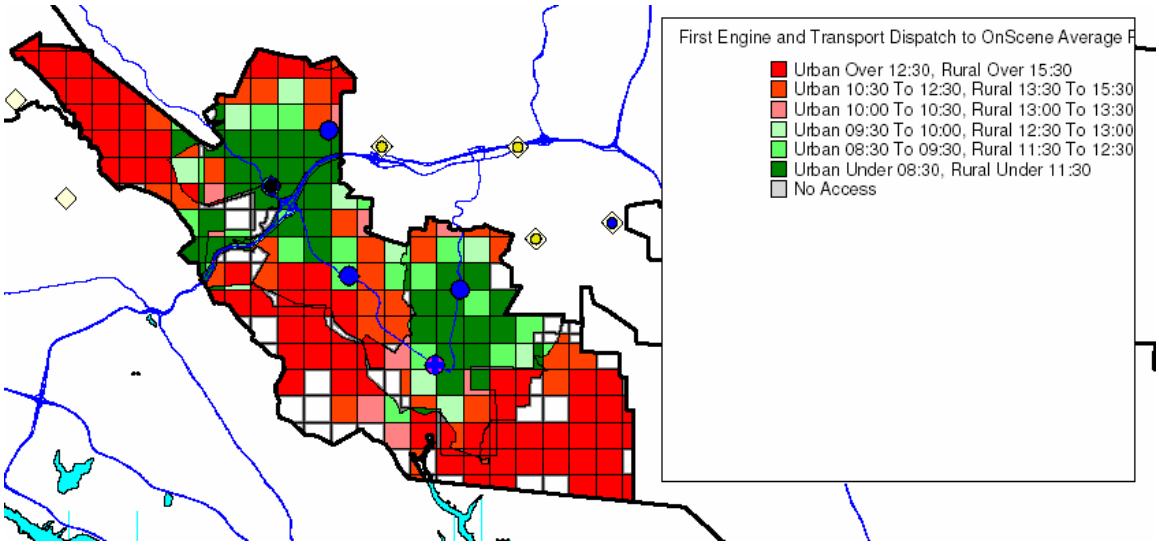
Less than 6 minutes urban/10:30 rural 40% of the time Average: 6:41

This impact would result in a decrease in service level of 3% compared to best use of current resources.

Urban-Wildland Interface Fires:

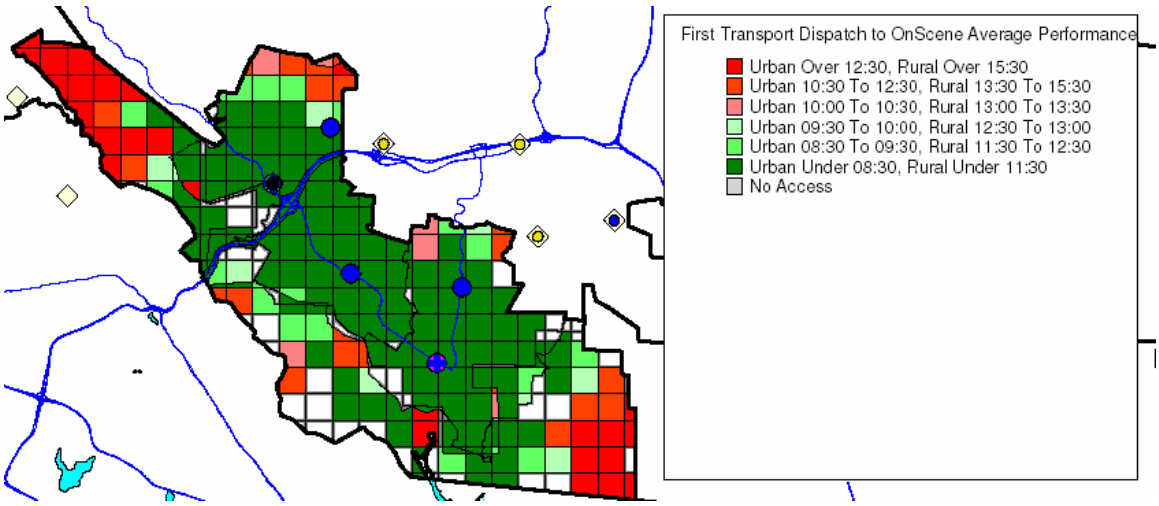
Less than 6 minutes urban/10:30 rural 45% of the time Average: 7:59

There is no measurable impact to wildland response.



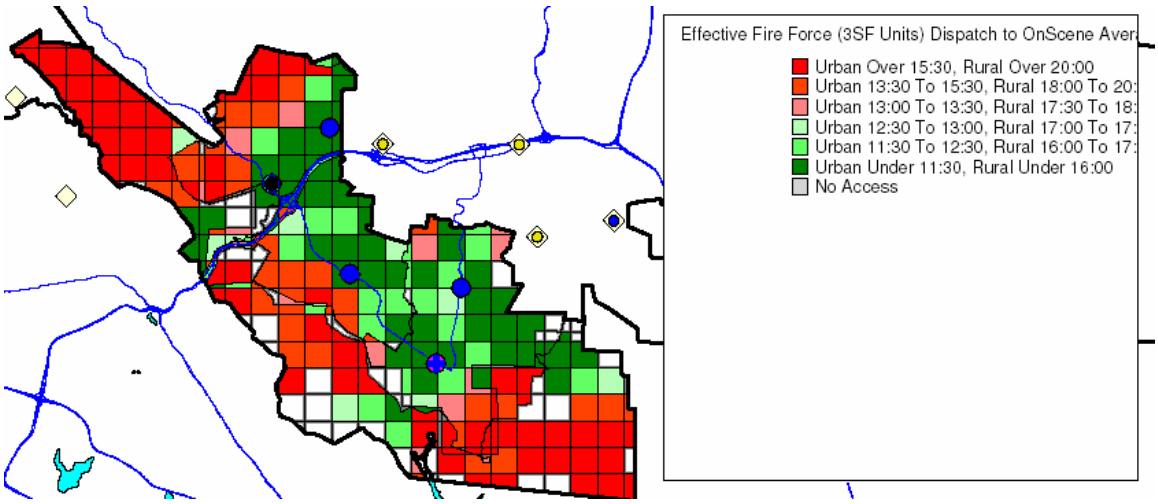
Rescue Response, First Engine and Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 82% of the time Average:8:20
This impact would result in a decrease in service level of 3% compared to best use of current resources.



First Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 96% of the time Average: 5:25
This impact would result in a decrease in service level of 1% compared to best use of current resources.

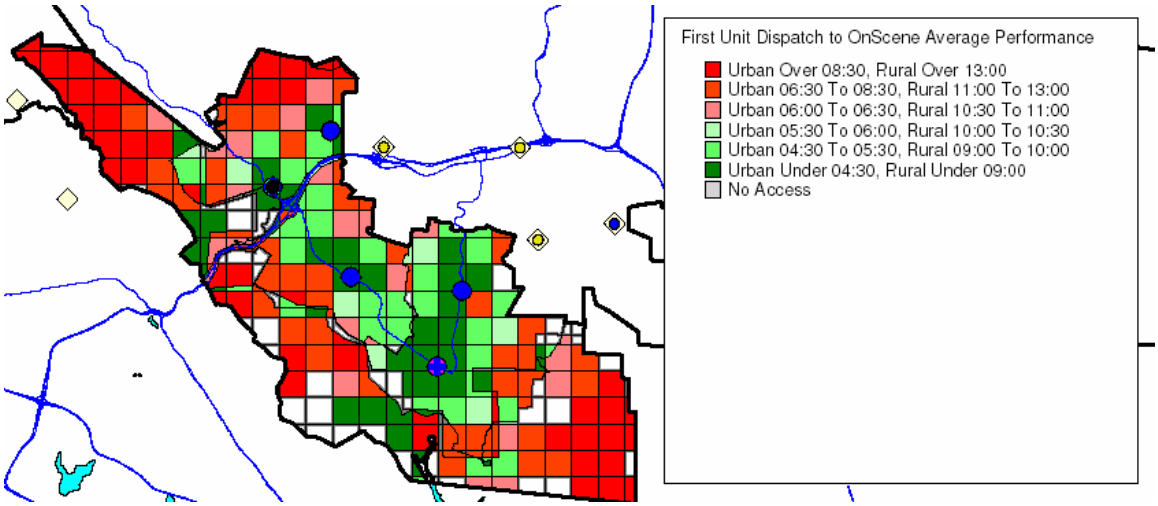


Effective Fire Force, Minimum of 3 Structure Fire Fighting Units

Less than 13 minutes urban/17:30 rural 80% of the time Average:12:07
There would be an overall increase in response time performance due to the proximity of development infill, specifically, the Pine Grove Development.

Staffing Modifications to Remedy Impact of Developments

Dedicated Rescue Ambulances at Fire Station's 41 and 45
Cross-Staffed Rescue Ambulances at Fire Station's 42 and 44
Increase Daily Minimum Staffing From 17 to 19



First Unit on Scene for All Incident Types

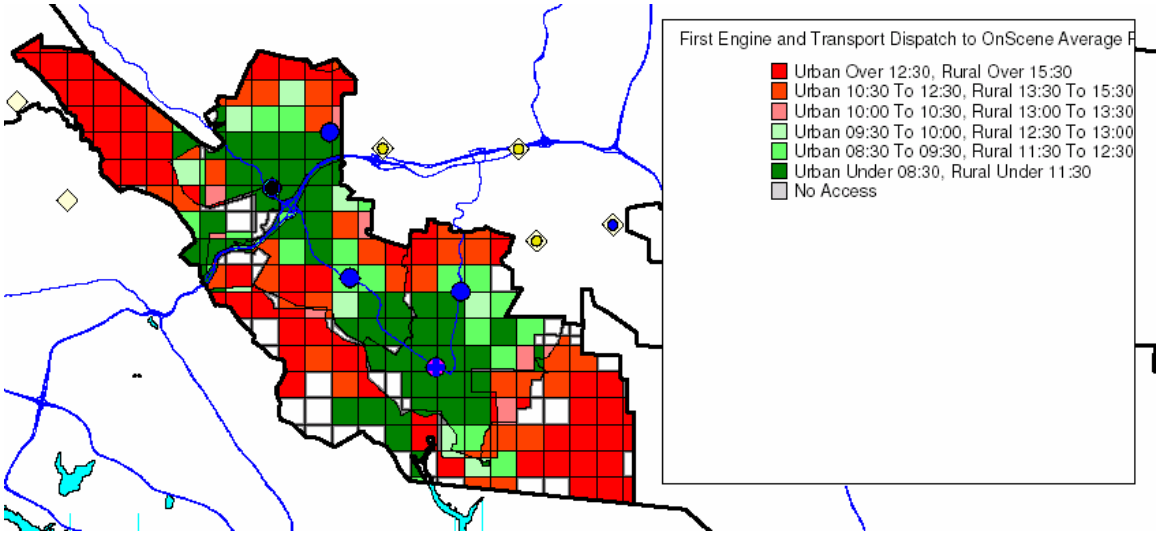
<u>First Unit on Scene, Performance by Specific Incident Types</u>

Medical Emergencies:
Less than 6 minutes urban/10:30 rural: 79% of the time Average: 4:48
This remediation would offset the impact of the developments and would result in an increase in service level of 1% compared to best use of current resources.

Rescue Emergencies:
Less than 6 minutes urban/10:30 rural: 58% of the time Average: 6:05
This remediation would not quite offset the impact of the developments and would result in a decrease in service level of 1% compared to best use of current resources.

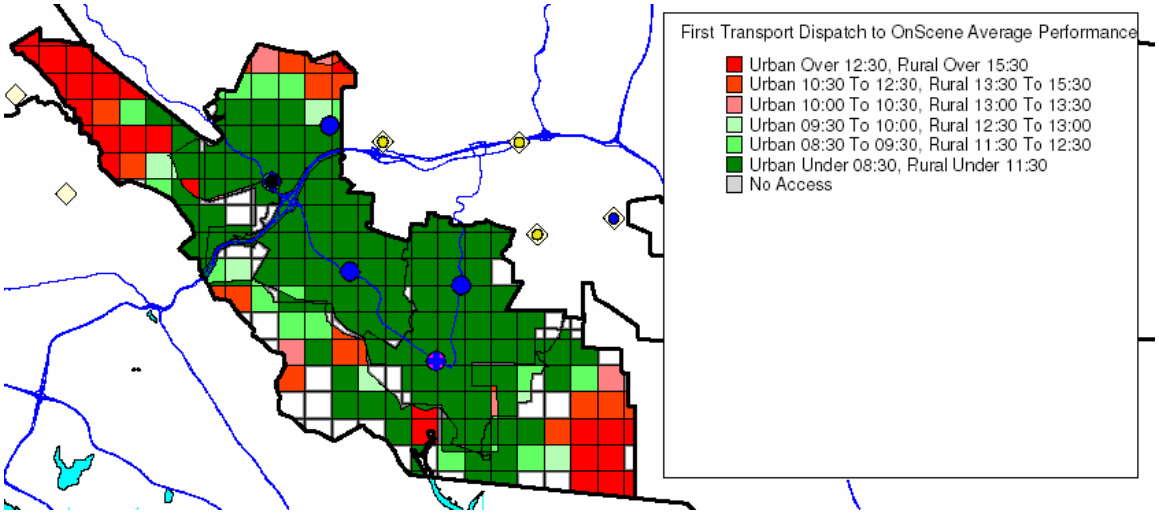
Structure Fires:
Less than 6 minutes urban/10:30 rural 44% of the time Average: 6:31
This remediation would offset the impact of the developments and would result in an increase in service level of 1% compared to best use of current resources.

Urban-Wildland Interface Fires:
Less than 6 minutes urban/10:30 rural 45% of the time Average: 7:59
There was no impact to offset for first unit on scene to wildland fires.



Rescue Response, First Engine and Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 85% of the time Average:7:45
This remediation would offset the impact of the developments.

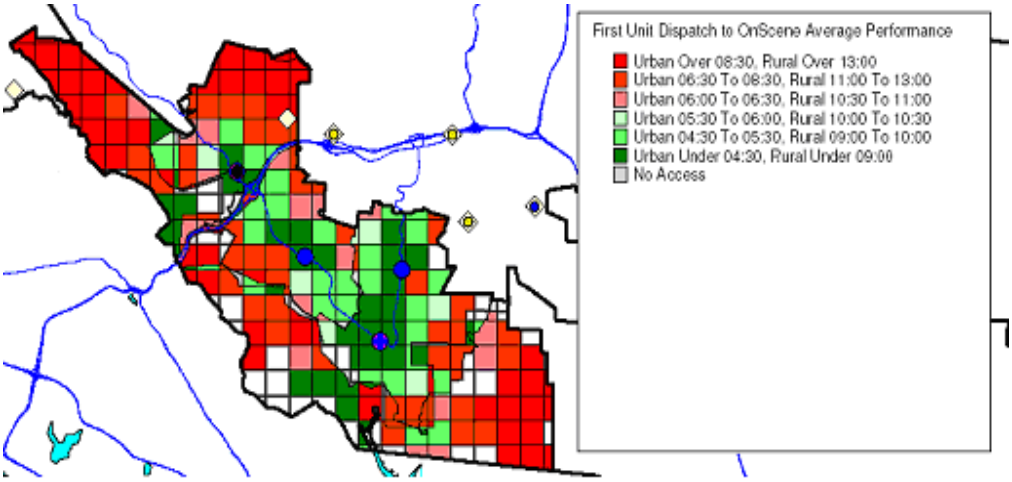


First Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 98% of the time Average: 4:56
This remediation would offset the impact of the developments and would result in an increase in service level of 1% compared to best use of current resources.

There was no impact to measure for effective fire fighting force due to developments.

Impact of Eliminating Fire Station 43 and Replacing the Response with Combined Fire Station 43/16



First Unit on Scene for All Incident Types

<u>First Unit on Scene, Performance by Specific Incident Types</u>

Medical Emergencies:
Less than 6 minutes urban/10:30 rural: 76% of the time Average: 4:56
This impact would result in a decrease in service level of 3% compared to remediation to the impact of developments.

Rescue Emergencies:
Less than 6 minutes urban/10:30 rural: 57% of the time Average: 6:10
This impact would result in a decrease in service level of 1% compared to remediation to the impact of developments.

Structure Fires:
Less than 6 minutes urban/10:30 rural 40% of the time Average: 6:41
This impact would result in a decrease in service level of 4% compared to remediation to the impact of developments.

Urban-Wildland Interface Fires:
Less than 6 minutes urban/10:30 rural 40% of the time Average: 8:21
This impact would result in a decrease in service level of 5% compared to remediation to the impact of developments.

Rescue Response, First Engine and Rescue Ambulance on Scene:
Less than 10 minutes urban/13:00 rural 85% of the time Average:7:47
The elimination of Fire Station 43 would not alter this category significantly because, while the engine response would increase, the rescue ambulance response would still remain the same.

Effective Fire Fighting Force:
The elimination of Fire Station 43 would result in a decrease in service level of 5% for both structural and wildland response.

Recommended Performance Objectives to Implement

1. Add a dedicated Rescue Ambulance at Fire Station 45 by July 2009.

a. Implement Transition Plan: Hire 2 additional paramedic-fire fighters per shift for a total of 6 by July 2007. Run a dedicated ambulance at Station 45 as staffing permits. In 2005 the Board of Directors authorized the fire chief to hire 1 additional fire fighter per shift in anticipation of retirements. A side benefit of this decision was that on some days there were a sufficient number of personnel to place a dedicated ambulance in service at Fire Station 45. The cost for these personnel has been added to the District's long-range financial plan. Significant savings in overtime costs were also realized by this modification.

   If the District were to hire 1 more additional fire fighter (paramedic) per shift in addition what has currently been done, it is projected that the district would have sufficient personnel to have a dedicated ambulance in service approximately 50% of the time. Savings from overtime would help to offset the additional cost. (See attachment A for the financial impact of this and other listed objectives)

b. Increase minimum daily staffing from the current 17 personnel per shift to 19 personnel per shift on July 1, 2009, one year after commencement of additional property tax collection from planned housing developments. (This timeline may be modified if other funding such as developer provided financing occurs.)

c. Comments: Due to the low frequency of fire related events in the District, modifying daily minimum staffing does not significantly improve service statistically. A high level of potential loss does however remain and adding the dedicated ambulance at Fire Station 45 reduces that potential loss from an incident command-operations standpoint. Last summer a fire occurred in the Sleepy Hollow neighborhood of the District. The on-scene incident commander had to wait longer than he would have liked for the full arrival of his effective fire fighting force. This occurred because Medic 45 (currently and adaptive response ambulance) was transporting a patient to the hospital. As a result, Engine 45 was not available to respond to the fire. With a dedicated ambulance at Fire Station 45 the patient would have received the same excellent customer service, and there would have been an available engine to respond to the fire that had occurred simultaneously. While this comment lacks statistical backing, from a professional opinion, adding a dedicated ambulance would improve fire fighting capabilities to the District, especially the north end.

In addition, a dedicated ambulance at Station 45 allows the station Captain increased flexibility in carrying out monthly training responsibilities. This staffing model would provide for coverage in the 45 response zone while simultaneous training activities are taking place.

2. **Add cross-staffed ambulances at Fire Station's 44 by July 2010 and 42 by July 2011.**

    a. This objective requires the purchase of 2 additional rescue ambulances. A cross-staffed ambulance could be placed in service to coincide with the implementation of the 19-person staffing recommended to occur in 2009. The limitation of doing so would be that there would be no District ambulances in reserve should one go out of service for repairs or maintenance. The timelines herein recommended allow for the purchase of 2 ambulances within the financial constraints of the District.

    b. b. (This timeline may be modified if other funding such as developer provided financing occurs.)

3. **Add an adaptive truck response at Fire Station 45 by July 2013**

    a. Purchase a Fire Truck (quint type) during the 2012/2013 fiscal year.

    b. Prepare for placing the truck in service during the 2012/2013 fiscal year with such issues as computer aided dispatch modifications and training.

    c. (This timeline may be modified if other funding such as developer provided financing occurs.)

4. **Improve turn-out times by 30 seconds for all emergencies by July 2007**

    a. Form an oversight sub-committee comprising of the Fire Chief, Operations Chief, Training Chief, Captain, Engineer, and Fire fighter.

    b. Evaluate the physical layout of each fire station, look for advantages as well as constraints. Develop time and motion standards that utilize each member of the crew to optimize turn-out time.

    c. Develop and implement a comprehensive training program.

    d. Evaluate and refine this operation as required.

    e. Report findings to the Board of Directors

f. Comments: To those unfamiliar with fire operations one would very likely question why it would take more time than simply turning on the power to the fire apparatus and driving to the emergency call. 30 years ago that assumption would have been the likely response scenario. When an emergency call was received the fire fighter simply dropped what they were doing, jumped onto the fire engine and went to the call.

   Fire fighters responded on the rear end of the tailboard and would put on their turn-out coats while holding onto a bar in the back as the apparatus drove down the street. Turn-out pants were not used during the day and therefore were not a factor that took time to deal with. Needless to say, fire fighter safety was compromised in the process.

   Over the years simply getting ready for an emergency call has become a complex process. Fire fighters must not only wear full protective equipment before boarding the apparatus, they have different turn-out equipment depending upon whether the call is for a structure fire or a wildland fire. They respond in fully enclosed cabs and must be completely fastened in seat belt and shoulder harness restraints before the apparatus moves. These safety measures take time.

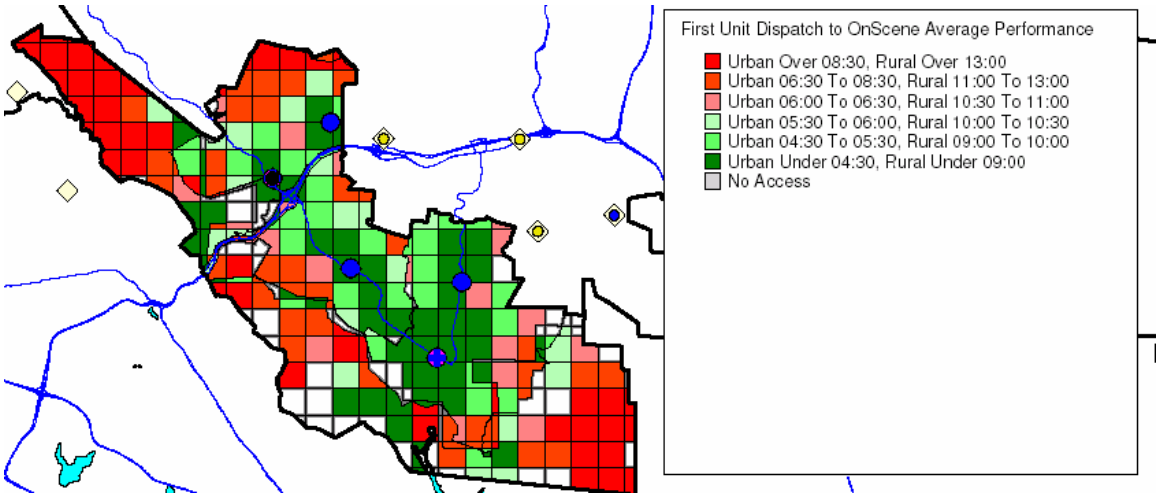
   The question is; are there areas that MOFD fire fighters can more efficiently operate when preparing to respond to an emergency call that will shave off the turn-out time. An analogy would be the track runner who is looking to evaluate every component of his or her running in a race to look for improvement because time is obviously a critical factor.

   This analogy is a positive way to approach the issue of turn-out time. Are their things that we can do to shave off turn-out time while at the same time ensuring fire fighter safety in the process?

With the implementation of these recommendations the Moraga-Orinda Fire District will be able to improve its' service level to the entire community while remaining cost-effective and accountable to the citizens that it serves.

Impact of Recommended Performance Objectives

Dedicated Rescue Ambulances at Fire Station's 41 and 45
Cross-Staffed Rescue Ambulances at Fire Station's 42 and 44
Adaptive Truck Response at Fire Station 45
Reducing Turn-out Time for All Emergencies



First Unit on Scene for All Incident Types

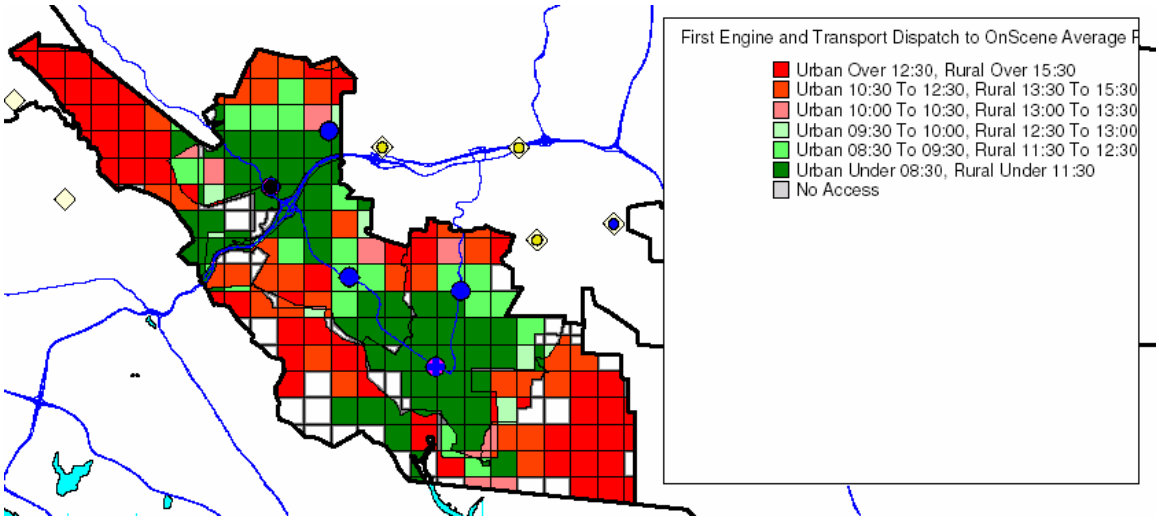
<u>First Unit on Scene, Performance by Specific Incident Types</u>

Medical Emergencies:
Less than 6 minutes urban/10:30 rural: 85% of the time Average: 4:18
This modification would result in an increase of 8% compared to current performance.

Rescue Emergencies:
Less than 6 minutes urban/10:30 rural: 64% of the time Average: 5:35
This modification would result in an increase of 7% compared to current performance.

Structure Fires:
Less than 6 minutes urban/10:30 rural 56% of the time Average: 5:51
This modification would result in an increase of 13% compared to current performance.

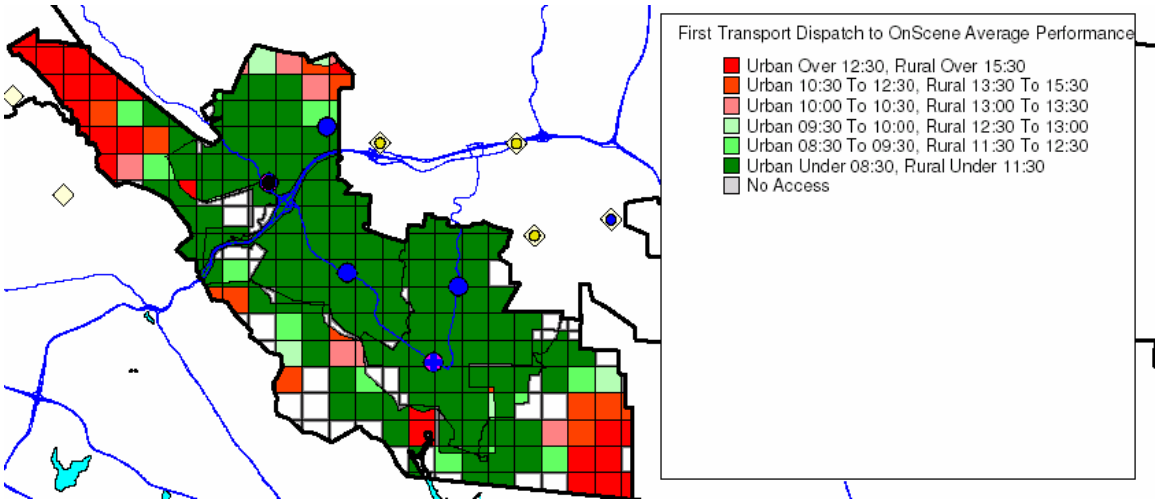
Urban-Wildland Interface Fires:
Less than 6 minutes urban/10:30 rural 48% of the time Average: 7:44
This modification would result in an increase of 3% compared to current performance.



Rescue Response, First Engine and Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 86% of the time Average: 7:15

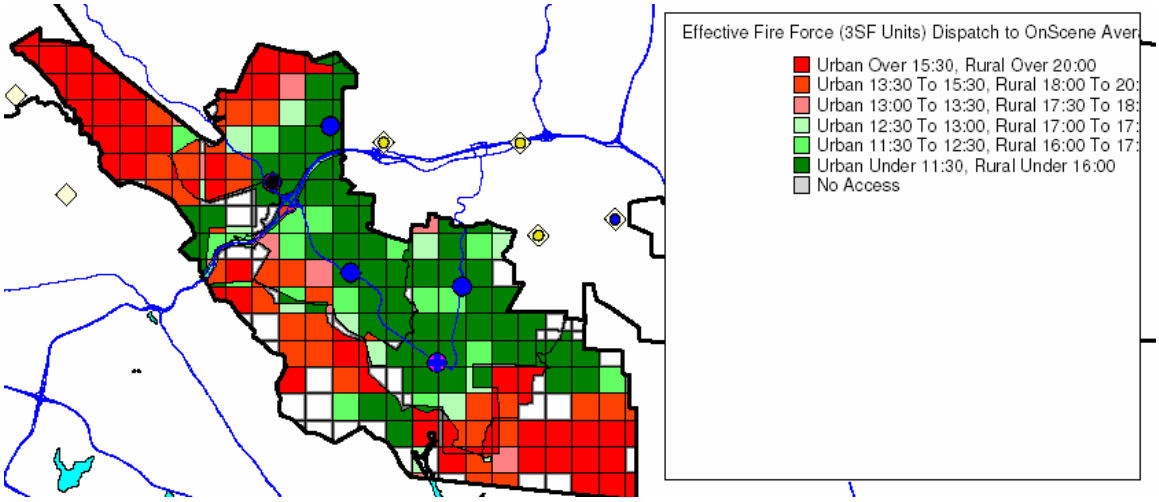
This modification would result in an increase of 32% compared to current performance.



First Rescue Ambulance on Scene

Less than 10 minutes urban/13:00 rural 99% of the time Average: 4:26

This modification would result in an increase of 3% compared to current performance.



Effective Fire Force, Minimum of 3 Structure Fire Fighting Units

Structure fires less than 13:00 urban/17:30 rural 86% of the time Average:11:34
U-W interface fire less than 13:00 urban/17:30 rural 79% of the time Average:12:04
This modification would result in an increase of 9% for structure fires and 2% for wildland fires compared to current performance.

	Current Deployment	"Best Use" Deployment	Development Impact	Remediation Measures	Recommended Standards of Coverage
Medical First Unit	77%< 6/10:30 Average=4:57	78%< 6/10:30 Average=4:50	76%< 6/10:30 Average=4:54	79%< 6/10:30 Average=4:48	85%< 6/10:30 Average=4:18
Rescue First Unit	57%<6/10:30 Average=6:06	59%<6/10:30 Average=6:04	57%<6/10:30 Average=6:07	58%<6/10:30 Average=6:05	64%<6/10:30 Average=5:35
Structure Fire First Unit	43%<6/10:30 Average=6:40	43%<6/10:30 Average=6:40	40%<6/10:30 Average=6:41	44%<6/10:30 Average=6:31	56%<6/10:30 Average=5:51
Wildland Fire First Unit	45%<6/10:30 Average=7:59	45%<6/10:30 Average=7:59	45%<6/10:30 Average=7:59	45%<6/10:30 Average=7:59	48%<6/10:30 Average=7:44
Rescue Response	54%<10/13:00 Average=9:52	85%<10/13:00 Average=8:14	82%<10/13:00 Average=8:20	85%<10/13:00 Average=7:45	86%<10/13:00 Average=7:15
First Ambulance	96%<10/13:00 Average=5:37	97%<10/13:00 Average=5:19	96%<10/13:00 Average=5:25	98%<10/13:00 Average=4:56	99%<10/13:00 Average=4:26
Effective Fire Force Structure	77%<13/17:30 Average=12:15	77%<13/17:30 Average=12:15	80%<13/17:30 Average=12:07	80%<13/17:30 Average=12:07	86%<13/17:30 Average=11:34
Effective Fire Force Wildland	77%<13/17:30 Average=12:34	77%<13/17:30 Average=12:34	77%<13/17:30 Average=12:34	77%<13/17:30 Average=12:34	79%<13/17:30 Average=12:04

Table 1 Comparative Deployments for Standards of Coverage

ATTACHMENT “A”

CURRENT LONG-RANGE FINANCIAL PLAN, and

RECOMMENDED STANDARDS OF COVERAGE IMPLEMENTATION PLAN

Attachment A-1 Current Long-Range Financial Plan

Attachment A-1 Current Long-Range Financial Plan

Attachment A-1 Current Long-Range Financial Plan

Attachment A-1 Current Long-Range Financial Plan

Attachment A-2 Recommended Standards of Coverage Implementation Plan

Attachment A-2 Recommended Standards of Coverage Implementation Plan

Attachment A-2 Recommended Standards of Coverage Implementation Plan

Attachment A-2 Recommended Standards of Coverage Implementation Plan