Strategic Plan and Standard of Cover
Dixon Fire Department

DIXON, CALIFORNIA

matrix consulting group

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1 Introduction and Executive Summary

The Matrix Consulting Group was retained by the City of Dixon to develop a long-range strategic plan for the Fire Department. The following report presents the long-range strategic recommendations for the Department.

1. Project Introduction

The purpose of this project was to develop a long-range Strategic Plan, including a Standard of Cover and Community Risk Analysis for the City and Fire Protection District. Fire protection services should be periodically reviewed to ensure appropriate availability of resources, operation readiness, and management practices are in place. This assessment is intended to provide an analysis of the fire protection system and identify areas the department can become more effective and efficient in the response to calls for service for fire and emergency medical needs.

2. Methodology Used in the Study

To understand and evaluate fire protection issues facing Dixon, the project team undertook an assessment of Department's operations. The principal approaches utilized by the project team in this study included, but were not limited to, the following:

- **Internal Interviews** – members of the project team individually interviewed numerous executives, management, and supervisory staff of the City of Dixon and key members of the Fire Department. Group sessions were conducted with the rank and file to gather input from their perspective.

- **Data Collection** – the project team collected a wide variety of external and internal data documenting the structure, operations and organization, including:

  – Department staffing and scheduling
  – Documentation reflecting operations management
  – Numerous output data reflecting services provided
  – Various other performance information

  This data was summarized in a 'descriptive profile' of the Department, which was reviewed by Dixon Fire Department staff to ensure we had a factual foundation for the study. This approach ensured that the project team had an appropriate understanding of the Department.

Data was collected over the past several months and presented in interim deliverables.

Throughout this process, the project team reviewed facts, findings, and conclusions through these interim deliverables with the Fire Department.

3. Summary of Recommendations

Throughout this report the project team provides evaluation and analysis of the staffing, organization, and services provided by the Dixon Fire Department and, where appropriate, makes suggestions for improvements. The table below provides a summary list of all the recommendations, appearing in sequential order, in this report.

RECOMMENDATIONs

DEPLOYMENT	
Key Findings	Key Recommendations
Call receipt is the first point of contact for any emergency. Accurate data collection and the time to process the call is essential.	Work with the Solano County Dispatch Center to improve their call processing time for emergency calls for service. Work with the Solano County Dispatch Center to improve the accuracy of the computer aided dispatch data. Establish call processing time benchmark performance objectives of 64 seconds for emergency calls for service 90% of the time.
One measurable component of a fire protection system is the response time to emergency calls for service. Benchmark performance is nationally accepted best practice and baseline are those times acceptable to the community. Establishing performance objectives not only allows the fire department to know how they are performing but also allows the public to be informed.	Establish turnout time benchmark performance objectives of 60 seconds for EMS responses and 80 seconds for fire and special operations responses 90% of the time. Establish travel time baseline performance objectives for the first arriving unit of 5 minutes 12 seconds and baseline performance objectives of 10 minutes 24 seconds for a first alarm assignment 90% of the time for emergency calls in the City of Dixon. Establish travel time baseline performance objectives for the first arriving unit of 13 minutes and baseline performance objectives of 18 minutes 12 seconds for a first alarm assignment 90% of the time for emergency calls in the Dixon Fire Protection District. Develop a mechanism to monitor and report the calls processing, turnout time, and travel time performance against the established benchmarks and baselines at least annually.

The staffing of fire apparatus is an ongoing national discussion that includes firefighter safety issues as well as the efficient performance of fireground activities.	Increase the minimum manning of fire suppression units from two personnel to three personnel phasing in two positions per year over the next three years at a cost of $204,424 per year over the next three years. Continue to support the reserve firefighter program.
The housing market appears to be strengthening and with that comes new construction. The new development in the southwest section of the City is projected to increase the housing stock in the City by 1,100 new homes.	As growth continues and funding becomes available construct a second station in the area of Pitt School Road and West A Street to improve travel time to the south and west areas of the City and District. Staff this station with an existing engine company. Cost is estimated at $6 to $7 million.

ESSENTIAL FUNCTIONS

Key Findings	Key Recommendations
Fire prevention activities function in many different areas of the department and community. Inspections, public education, and plan reviews are the more typical functions. It is not uncommon for this function to also work with others to plan the response to emergency incidents. It is essential the fire department be involved in any planning for new developments to ensure the department capabilities are not exceeded and the response to calls for service can be planned accordingly.	The Fire Department should become more involved with the planning and review of new developments to ensure appropriate access for apparatus, water supplies, or other impacts on the delivery of fire and emergency medical services are addressed. Monitor the engine company inspection program to ensure inspections are being completed in a timely manner. Annually review the types of preventable incidents impacting emergency services and develop pro-active public education programs to address these preventable emergencies.
There is an opportunity to increase the use of the training facilities and to bring outside training opportunities to the City for little cost or even to increase any revenues available from these activities. There is also an opportunity to enhance the fire prevention function with this position.	Create an administrative Captain position to deliver training sessions to the Department, coordinate the use of facilities for external vendors and training programs, and to assist the fire prevention function with inspections and plan reviews.
The second engine company is without a dedicated supervisor and relies on a senior firefighter to make any decisions. This puts the City at risk with an engine company that does not have appropriate supervision.	Create a supervisory position for the second engine company to provide appropriate supervision of personnel and decision-making processes.

It has been identified that many of the current employees can retire in the next five to eight years. Adopting a formal succession plan and a mentoring program will aid in ensuring the organization will continue to provide a strong performance through any transition period.	Develop a formal succession plan for the Fire Department to facilitate the education, training and exposure to functions of the department to the younger personnel. Develop a mentoring program for newly promoted staff to provide support and aid in gaining knowledge of the expectations of the Department.
Communications is a key component for the Fire Department not only for the dispatching and alerting of resources but also fire ground safety. The data from these events is used to determine the need for essential services and needs to be accurate as well. Moving to the Vacaville Communications System may improve the fireground communications as they are also a significant automatic aid partner.	Establish a connection with the communications center and the records management system to incorporate the call data directly from the computer aided dispatch system. Install mobile data terminals in the apparatus to improve the capturing of response data, improve the accessibility of preplan data, and take advantage of the Automatic Vehicle Locator (AVL) technology. The Fire Department should consider contracting with Vacaville for dispatching and communications or to improve the existing communications system with cost being a primary factor.
Apparatus replacement has been an issue in the forefront of many fire service organizations. Planning for the replacement is essential and having a mechanism to use aids in that decision-making process.	The Fire Department should consider revising its apparatus replacement program to establish benchmarks for the replacement and consider other factors such as wear and tear and reliability.

2 Organization and Area Overview

This chapter provides an overview of the Fire Department organization, governance, and general characteristics of Dixon.

1. Area Characteristics

Dixon is in the northern section of Solano County along Interstate 80 just north of Vacaville and south of Davis. Originally the City was named “Dicksonville” after Thomas Dickson who donated 10 acres of land for the railroad depot. A shipping label mistakenly addressed to “Dixon” that has been used since. The City was incorporated in 1878 and has a total area of about 7 square miles with an estimated population of 20,202 residents.

The City is governed by a Council-Manager form of government. There are five members of the City Council including the Mayor. The City Manager is appointed by the council and is generally responsible for the daily operations of the City. The Fire Department was originally organized in 1871 and operates within the city organization.

2. Climate

Dixon generally has a mild climate with temperatures averaging 60 degrees and rainfall averages of 26 inches. From May through November the area may have periods of Diablo winds. These winds will bring higher temperatures and low humidity into the area.

3. Topography

The City and surrounding area are in the Sacramento Valley area of Solano County at an elevation of 62 feet. The area is relatively flat with rolling hills. The western side of Solano County is the foothills of the coastal range including Vaca Mountains and Montezuma Hills. The area in the northeast section of the County, including Dixon, is described as prime farmland within Solano County.

4. Dixon Fire Protection District

Originally formed in 1926, the Dixon Fire Protection District contracts with the City of Dixon to provide fire suppression and response services to the District. The District encompasses about 312 square miles located in the northeast corner of Solano County and surrounds the City of Dixon. Services to be provided by the Dixon Fire Department to the District include administration, fire protection, emergency medical service, rescue

service, review of building plans, fire code enforcement inspections, investigation of fires, and limited inspections of the rural water systems.

5. Demographic Profile

Dixon Demographics			
American FactFinder Data	**2000**	**2010**	**2016**
Estimated Dixon Population	16,103	18,351	19,144
Median Age	31.5	33.3	34.0
Children Under Age 5	8.7%	7.2%	6.4%
Children Ages 5 to 19 years	26.1%	24.9%	25.7%
Persons Age 20 to 59 years	54.9%	54.7%	51.5%
Persons Age 60 and Over	10.2%	13.2%	16.5%
Families in Poverty	5.2%	6.9%	10.7%
Civilian Labor Force Unemployed	3.2%	6.6%	6.0%
Median Household Income	$54,472	$67,742	$72,383
Employment Sectors:			
Education, Health Care, Soc. Svc.	19.0%	17.7%	22.3%
Retail Trade	13.7%	12.3%	11.9%
Professional, Scientific, Mgmt.	8.7%	8.2%	10.3%
Finance, Insurance, Real Estate	6.4%	6.4%	5.3%
Entertainment, Recreation, Food	6.8%	9.0%	6.7%
Construction	9.0%	10.1%	8.3%
Manufacturing	11.4%	8.7%	9.1%
Transportation, Warehousing, Util.	5.7%	5.7%	4.6%
Public Administration	8.3%	8.6%	8.5%
Other Services	2.9%	3.0%	5.9%
Wholesale	3.0%	6.1%	1.3%
Information	2.2%	2.2%	1.1%

The population of Dixon has increased about 18.9% since 2000 adding an estimated 3,041 residents. The number of persons under the age of 60 has decreased slightly but the number of persons over 60 has increased at a higher pace.

The table below illustrates other general demographic information for the Dixon area.

Dixon Characteristics			
Sperling's Best Places	**Dixon**	**California**	**U.S. Average**
Unemployment rate	5.9%	5.7%	5.2%
High School Education	82.0%	81.5%	86.3%
High School with Some College	8.5%	7.8%	21.2%
Bachelors/Undergraduate Degree	20.9%	31.0%	37.2%
Masters, Professional, Doctorate Degree	2.0%	3.8%	11.0%

6. Financial Resources

The Fire Department is financially supported by the City of Dixon through a variety of revenue sources that includes property tax and sales tax. Other sources of revenue for the Department include grants, training fees, and permit fees. As well, some of the revenue sources are offset by an expense for the same program such as training fees. The contract with the Dixon Fire Protection District is also a revenue source for the Department. The table below illustrates the revenues for the past three years and includes the 2019 budget. These revenues are specific to the Dixon Fire Department with a balance needed for operations coming from the general fund of the City.

Dixon Fire Department				
Line Item	FY 2015 - 2016 Actual	FY 2016 - 2017 Actual	FY 2017 - 2018 Actual	FY 2018 - 2019 Budget
Revenues				
Fire Contract Service Fee	$661,331	$640,207	$717,913	$675,324
Fire Dept Fees	$66,104	$78,225	$105,870	$73,357
Fire Dept Fees-Training	$0	$0	$1,050	$0
Fire Dept. Fees - Fire Academy	$18,105	$31,942	$28,704	$18,000
Fire Dept Fees-Hosted Training	$0	$22,655	$7,595	$20,000
Fire Dept Permits	$8,342	$8,925	$9,831	$8,865
Fireworks stand fees	$1,250	$850	$1,325	$1,000
Fire Extrication Fees	$635	$25	$50	$0
EMS First Responder Fee	$0	$0	$0	$41,000
Emergency Cost Recovery Prog	$0	$59,765	$0	$0
Emergency Cost Recovery - CalFire	$396,805	$353,745	$294,798	$212,973
EMS Fire Project	$119,378	$119,378	$89,534	$119,378
Grant - Homeland Security/FEMA	$1,578	$0	$0	$0
Grant - FEMA SAFER Volunteer	$14,861	$6,250	$0	$0
Grant - FEMA SAFER Career	$288,473	$113,498	$0	$0
Total Revenues	$1,576,862	$1,435,465	$1,256,670	$1,169,897

The following table illustrates the operating expenditures and capital investments for the Fire Department.

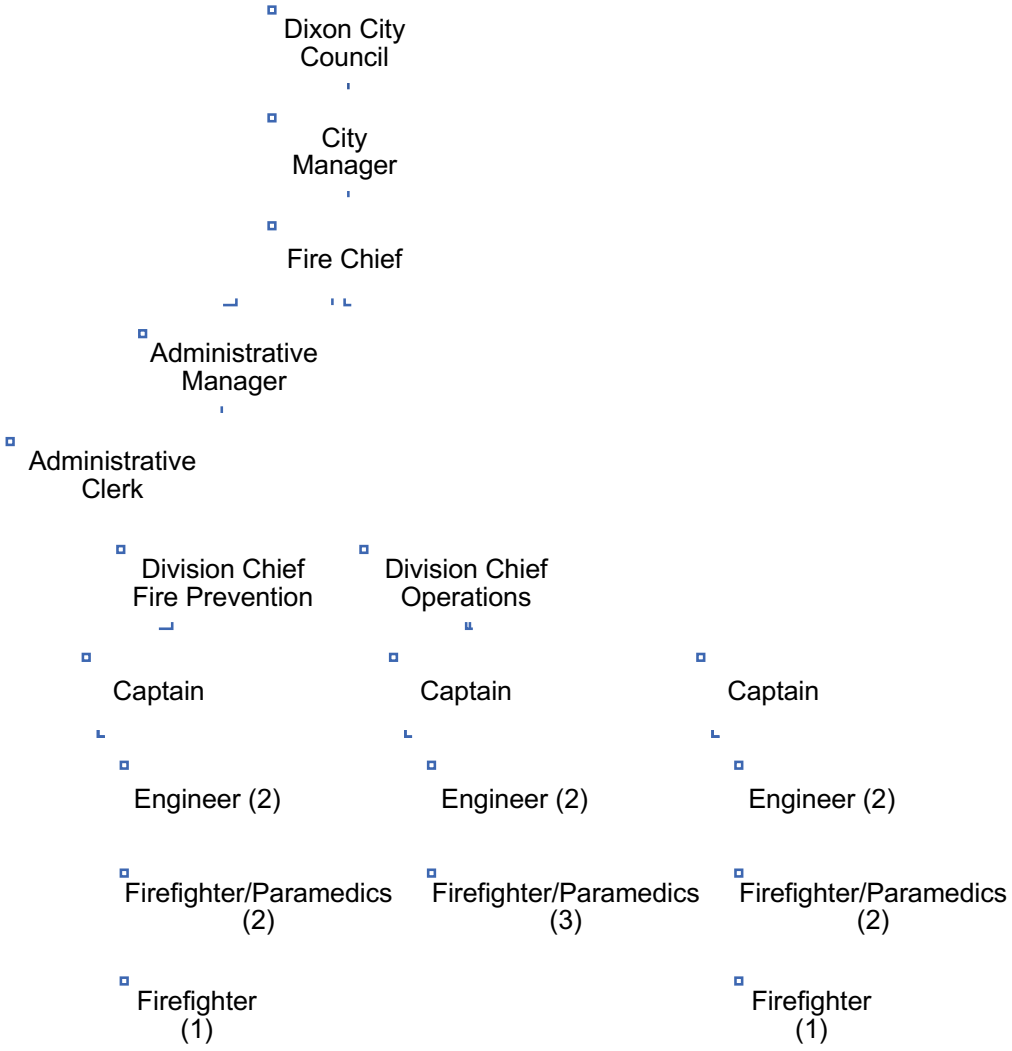
Dixon Fire Department				
Line Item	FY 15 - 16 Actual	FY 16 - 17 Actual	FY 17 - 18 Actual	FY 18 - 19 Budget
Expenditures				
Salaries and Wages	$2,579,785	$2,605,048	$2,722,490	$2,625,478
Benefits	$956,076	$963,309	$1,107,795	$1,133,260
Total Salaries and Benefits	$3,535,861	$3,568,357	$3,830,285	$3,758,738
Communications	$73,916	$79,651	$91,141	$82,840
EMS Supplies	$25,339	$26,316	$29,688	$28,700
Equipment Maintenance	$16,053	$10,887	$25,331	$23,005
Lease Purchase	$45,960	$34,495	$25,584	$30,600
Training	$21,746	$28,344	$24,163	$47,180
Utilities	$5,491	$15,428	$21,667	$17,100
Fuel	$24,522	$23,501	$30,169	$27,780
Vehicle Maintenance	$32,105	$53,544	$59,848	$45,500
General Operations	$143,339	$140,694	$230,274	$324,865
Total Operations	$388,471	$412,860	$537,865	$627,570
Capital Investments	$19,350	$156,666	$55,969	$87,000
Total Expenditures	$3,943,682	$4,137,883	$4,424,119	$4,473,308

3 Fire Rescue Services

This chapter provides an overview of the fire protection system including organization of the department, resources available to the department, and services provided by the department.

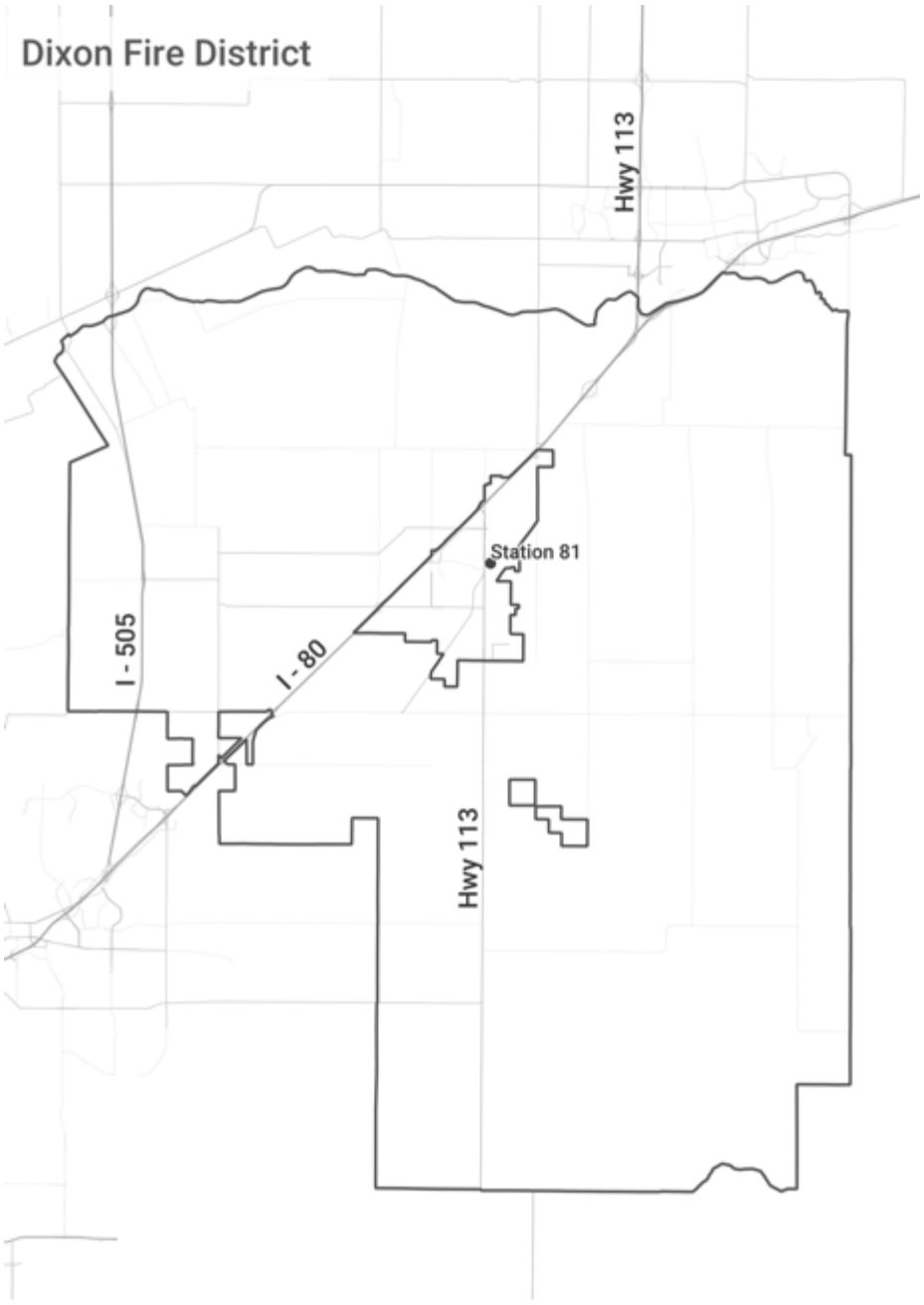
1. Organization of the Fire Department

Dixon Fire Department was originally organized in 1871 to cover the City of Dixon. Areas outside the City Limits were left to handle fires on their own as it was impractical to move firefighting equipment into the rural areas. In the early 1920's a relationship between the City of Dixon and the Dixon Fire Protection District began to develop and has continued since that time. Today the Dixon Fire Department provides fire suppression and emergency medical response to the City and District from a single station in the City.



2. Physical Resources

Service to the City of Dixon and the surrounding area is provided from a single station. The following map illustrates the location of the fire station



Dixon Fire Department operates on a three (3)-shift platoon system, working 48 hours on and 96 hours off. This results in a 56-hour average workweek for shift personnel. Six personnel are assigned to each shift with a minimum daily staffing of five personnel. The table below outline the apparatus and staffing for the station.

Dixon Fire Department Station 81 **Facility Location:** 205 Ford Way					
Description of Use	Serves as the single Fire Station for the City of Dixon and the Dixon Fire Protection District. Houses Fire Administration and Operations of the Department				
Year Constructed	1998				
Apparatus Space	Three drive-through bays				
Assigned Apparatus	Unit ID	Year	Description	Type	Minimum Staffing
	600	2000	Pierce	Type 1 Engine Reserve	
	602	2008	Pierce	Type 1 Engine	2
	603	2009	Ford F550	Type 5 Brush	
	604	2012	Chevrolet Suburban	Command	
	605	2017	Ford Expedition	Command	
	607	2011	Utility Trailer		
	608	2001	Pierce	Rescue	
	609	2012	Enclosed Utility Trailer		
	610	2002	Pierce	Aerial Ladder	
	611	2013	Pierce	Type 1 Engine	3
	612	2016	Pierce/International	Type 3 Engine	
	613	2016	Ford F550	Stake Side Utility	
	614	2016	Polaris Ranger	Utility	
	615	2005	Pierce/Navistar	Water Tender	
	616	2018	Ford F-250 4x4	Command	
	619	2011	Ford F250	Utility	
	620	2000	Pierce/Navistar	Water Tender	

3. Automatic and Mutual Aid

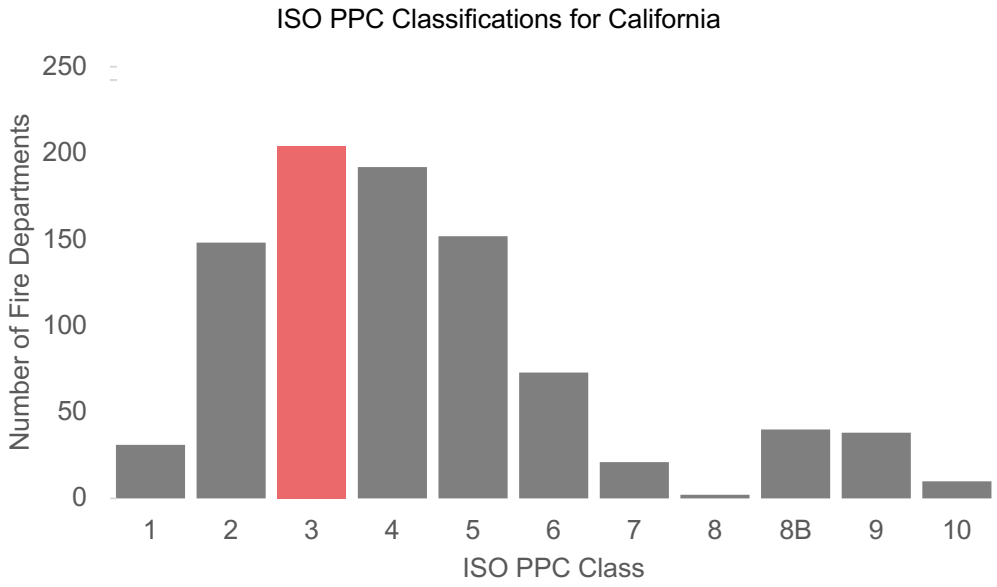
Dixon participates in a mutual aid and automatic aid system in both Solano and Yolo Counties. Automatic Aid is through an agreement with Vacaville Fire Department, the City of Davis West Sacramento, and Woodland. Additionally, there is an automatic aid agreement with the University of California at Davis Fire Department. Vacaville Fire Department provides an Engine Company and 3 personnel from the Eubanks Court station as a part of their automatic response into the City of Dixon and the Dixon Fire Protection District.

4. Insurance Services Office

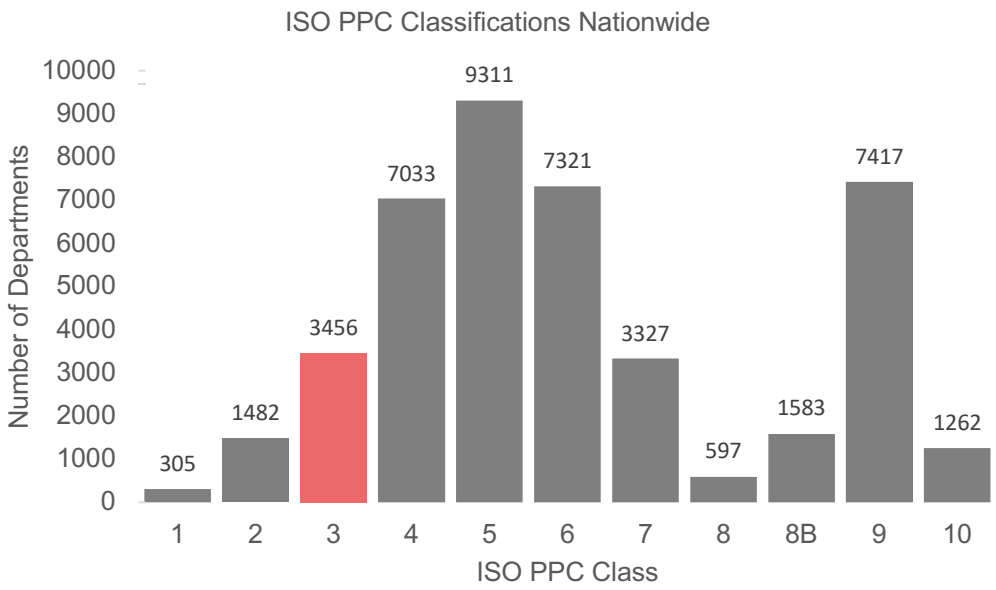
The Insurance Services Office (ISO) surveys communities across the country to assign a public protection classification (PPC) grade. This grade is used as a tool to establish property insurance rates for an area. While this survey should not be used as a standalone plan for providing fire suppression services it does have some useful information for the fire protection system in general.

In May 2016, the ISO performed a survey for Dixon Fire Department. The survey reviews communications, water supply, and the fire department. The results of this survey graded the Dixon Fire Department as a Class 3/3y on a scale of 1 – 10 with 1 being the best.

To put the public protection classification (PPC) for Dixon into perspective, the following charts illustrate the current PPC classifications in California and Nationwide.



The highlighted bar illustrates where Dixon fits in the State of California. There are 31 Class 1 departments and of the 911 departments shown, Dixon is in the top 42% of the state.



Nationally, Dixon is in the top 12.2% of the 43,094 departments nationally that have been assessed by the Insurance Services Office.

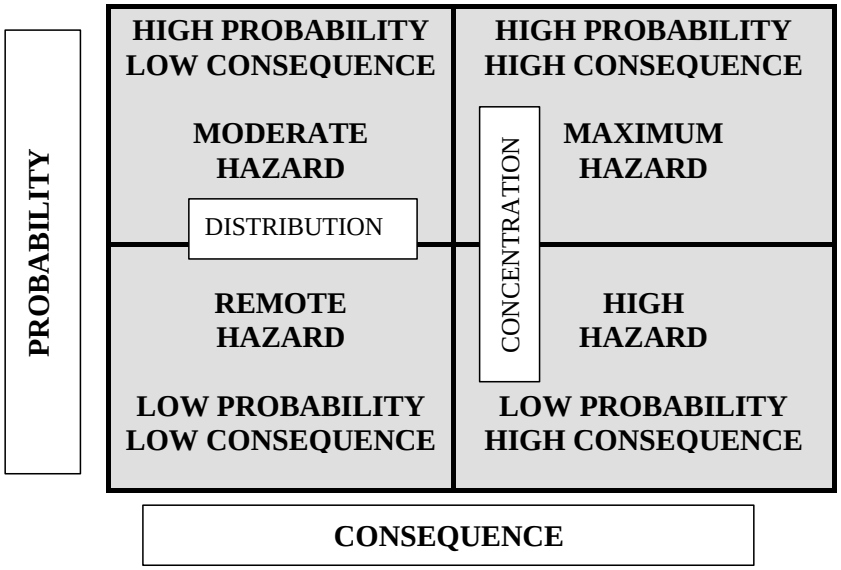
4 Community Risk Assessment

Risk is defined as the possibility of loss or injury or other unwelcome adverse circumstance or event. As a community we try to reduce the effects of the unwanted events through mitigation efforts prior to an emergency and using services such as police departments, public works and fire rescue.

1. RISK FACTORS AND CATEGORIES

Determining the fire and non-fire risks in a community provides the foundation to develop resource deployment strategies to reduce the effects of the unwanted events or circumstances. There are three primary components used in the risk assessment.

- Identification – what are the hazards faced by the community.
- Probability – the likelihood that an unwanted event will occur within a given period of time. Events that occur daily is highly probable while those that occur annually are less likely.
- Consequence – the measure of disparate outcome that can be defined by loss of life, loss of property and loss of historic values.
- Occupancy Risk – an assessment of the built upon area and the types of structures in the area, their occupancies, and any special risks that may be present.



The graph above illustrates the correlation between the probability of occurrence and consequences of that occurrence. The result of this graph then allows for the identification of the hazard class. The four hazard classes are defined as follows:

(1) Maximum Risk

An area classified as maximum risk should be of substantial size and contain properties presenting a high risk of life loss, loss of economic value to the community, or large loss damage to property if destroyed. Such areas would ordinarily be the highest fire flow areas and have a high probability of events. The structures within them may lack built in fire protection features and may contain occupants not capable of self-preservation. Maximum risk areas include the following:

- Major shopping and business centers, large department stores, shopping malls, multi-story hotels, and office properties.
- Concentrations of high risk industrial and commercial properties including hazardous materials facilities.
- Concentrations of theaters, cinemas, clubs, dance halls, bars and other areas with potential for large life loss.
- Occupancies with occupants that may require assistance such as non-ambulatory or restrained persons (i.e., nursing homes and hospitals).
- Any occupancy over 10,000 square feet without built-in fire protection.
- Emergency medical, rescue, special operations incidents requiring multiple alarms.

Maximum risks frequently impact a fire agency's needs for multiple alarm capability and an adequate assessment of its ability to concentrate resources. Failure to identify these risks often results in the inability to effectively control these incidents.

(2) High Risk

A high-risk area is defined as one that contains properties or hazards presenting a substantial risk of life loss, a severe financial impact on the community, or unusual potential damage to property if there is a fire and has a low probability of events. Examples of such areas include the following:

- Strip shopping centers and business centers not exceeding two stories,

- Concentrated areas of revenue generating properties or high job loss to the community if business is lost.
- Infrastructure facilities such as schools, city, state, and federal facilities.
- Properties deemed to be of historical value to the community.
- Any building with life safety and fire load beyond the reach of pre-connected hose lines (200 feet).
- Concentrated areas of single- or two-story multi-family dwellings.
- Any occupancy over 10,000 square feet with built-in fire protection not classified as a maximum risk.
- Emergency medical, rescue, special operations incidents requiring a first alarm.

(3) Moderate/Typical Risk

An area is classified as a moderate fire risk when it contains built up areas of average size and the risk of life loss or damage to property if there is a fire in a single occupancy is usually limited to the occupants. In certain areas such as small apartment complexes, the risk of death or injury may be relatively high. Concentrations of property may vary, but generally will be of limited extent. Probability of fire events are high along with frequent, routine non-fire risks resulting in a service demand other than fire. Examples of moderate risk areas include the following:

- Developments of generally detached single family housing.
- Apartments with pre-connected hose line access (200 feet).
- Industrial or commercial buildings under 5,000 square feet without built in fire protection.
- Emergency medical, rescue, special operations incidents requiring three units or less.

These risks are often the greatest factor in the distribution of fire stations to ensure fair and equitable access to initial attack capability.

(4) Remote Isolated Rural Risks

Areas may be classified as remote rural risks if they are isolated from any centers of population and contain few buildings. There is a low probability of events and low consequences. Examples include the following:

- Rural land with minimal occupied structures.
- Recreational areas.

2. Natural Hazard Assessment

In March 2012, Solano County published a Local Multi-Hazard Mitigation Plan and in January 2017, an updated Emergency Operations Plan. Both documents provide excellent information regarding risks within the County including Dixon.

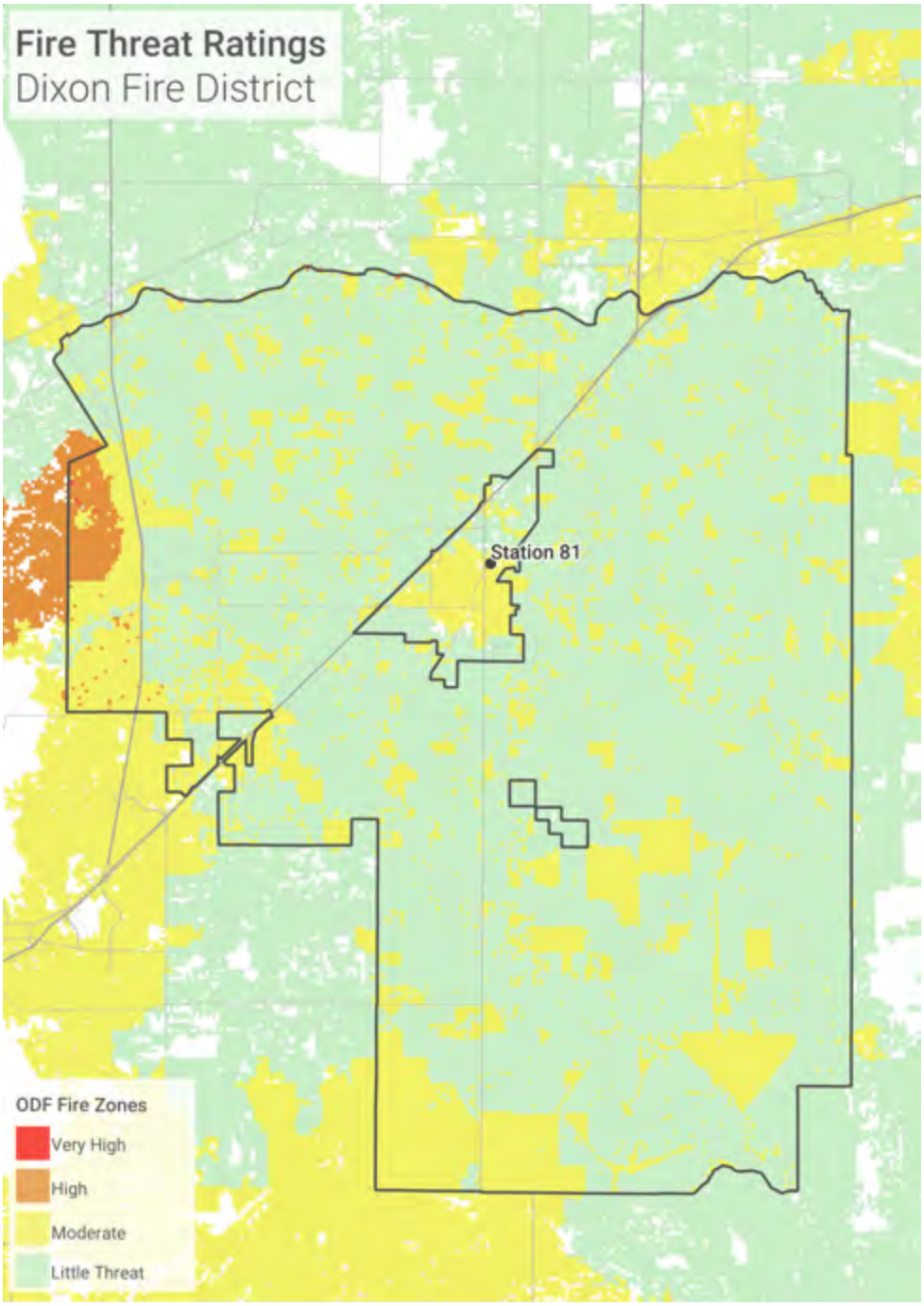
The table below outlines the ten highest threats to the area based on the Solano County Local Multi-Hazard Mitigation Plan prepared by the Solano County Office of Emergency Services and Department of Resource Management.

Solano County Hazard Prioritization				
Hazard Type	Localized Events	Spatial Extent	Probability of Future Occurrence	Mean Ranking
Wildfire	87	Significant	Highly Likely	1
Flooding	20	Significant	Occasional	2
Earthquake/Seismic Shaking	12	Significant	Occasional	3
Severe Weather and Storms		Extensive	Highly Likely	4
Landslides	52	Limited	Occasional	5
Drought		Extensive	Likely	6
Dam Failure		Significant	Occasional	7
Expansive Soils (Shrink-Swell)		Extensive	Highly Likely	8
Sea Level Rise/Climate Change		Significant	Likely	9
Tsunami		Limited	Unlikely	10

The three highest ranked risks are wildfires, flooding, and earthquake/seismic shaking.

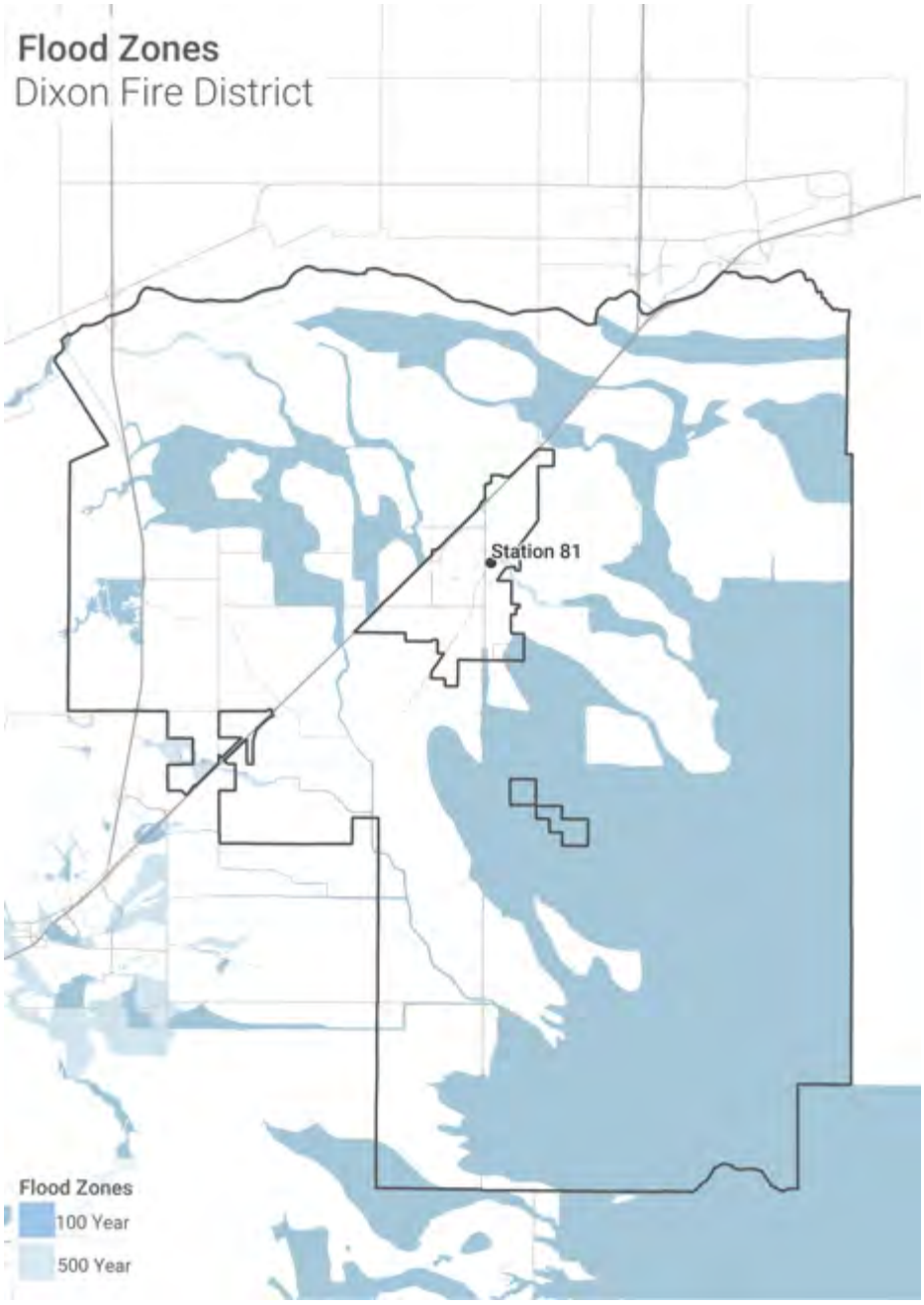
(1) Wildland Urban Interface

The wildfire threat to the Dixon area is predominately grass lands and farm crops. Due to the topography of the area the Dixon area does have any direct connection with the mountains and forested areas that are typically associated with a wildland-urban interface. The map below displays the wildfire threat, in the far western section of the District, near the mountain area, the threat increases.



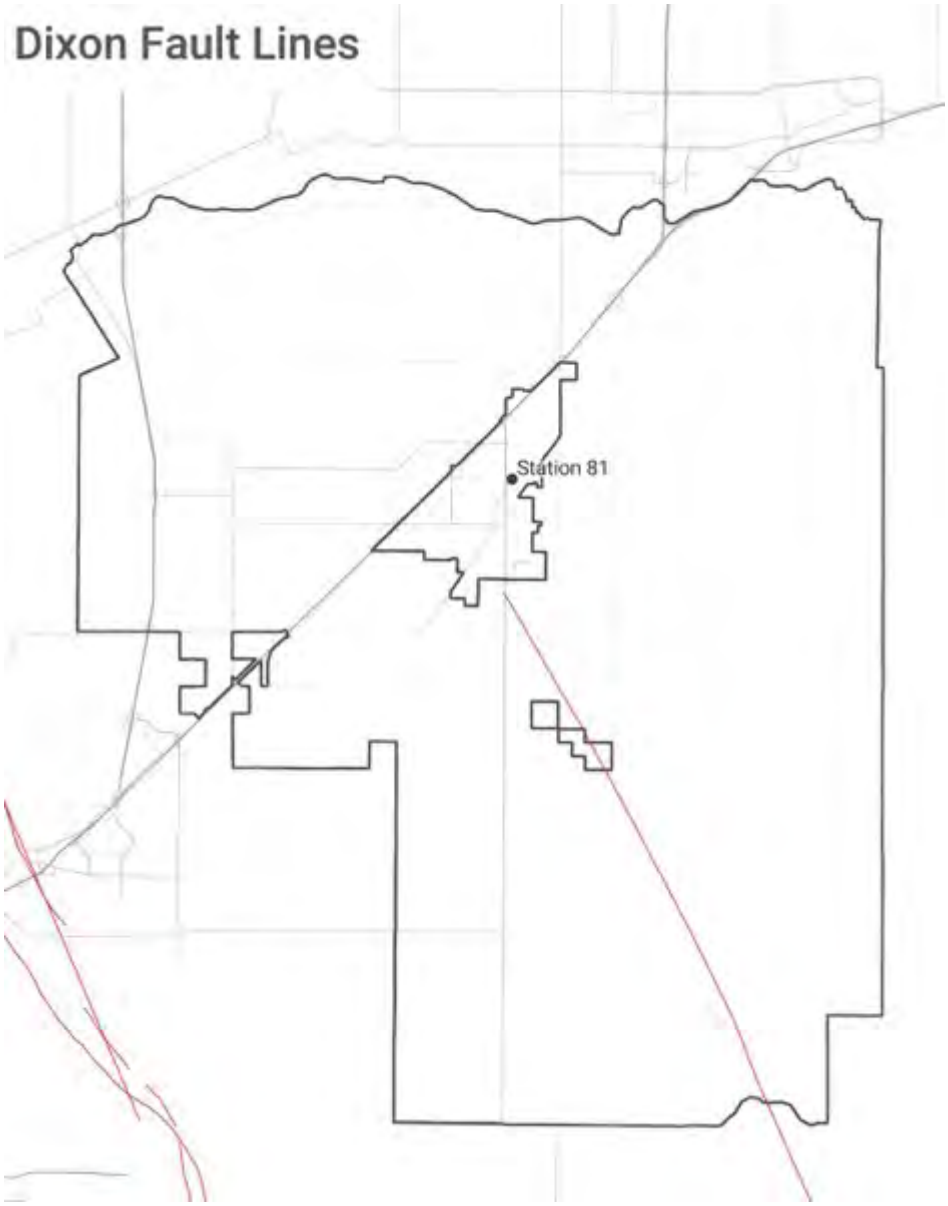
(2) Flood Zones

There are very limited flood zones in the City of Dixon, but there are several in the Dixon Fire Protection District. Shown in the map below are the 100-year and 500-year floodplain. Based on calculations from FEMA, the probability of flooding in the 100-year floodplain is 1% over the course of one year for the area shown. For the 500-year floodplain the annual chance of flooding is a 0.2% chance.



(3) Earthquakes

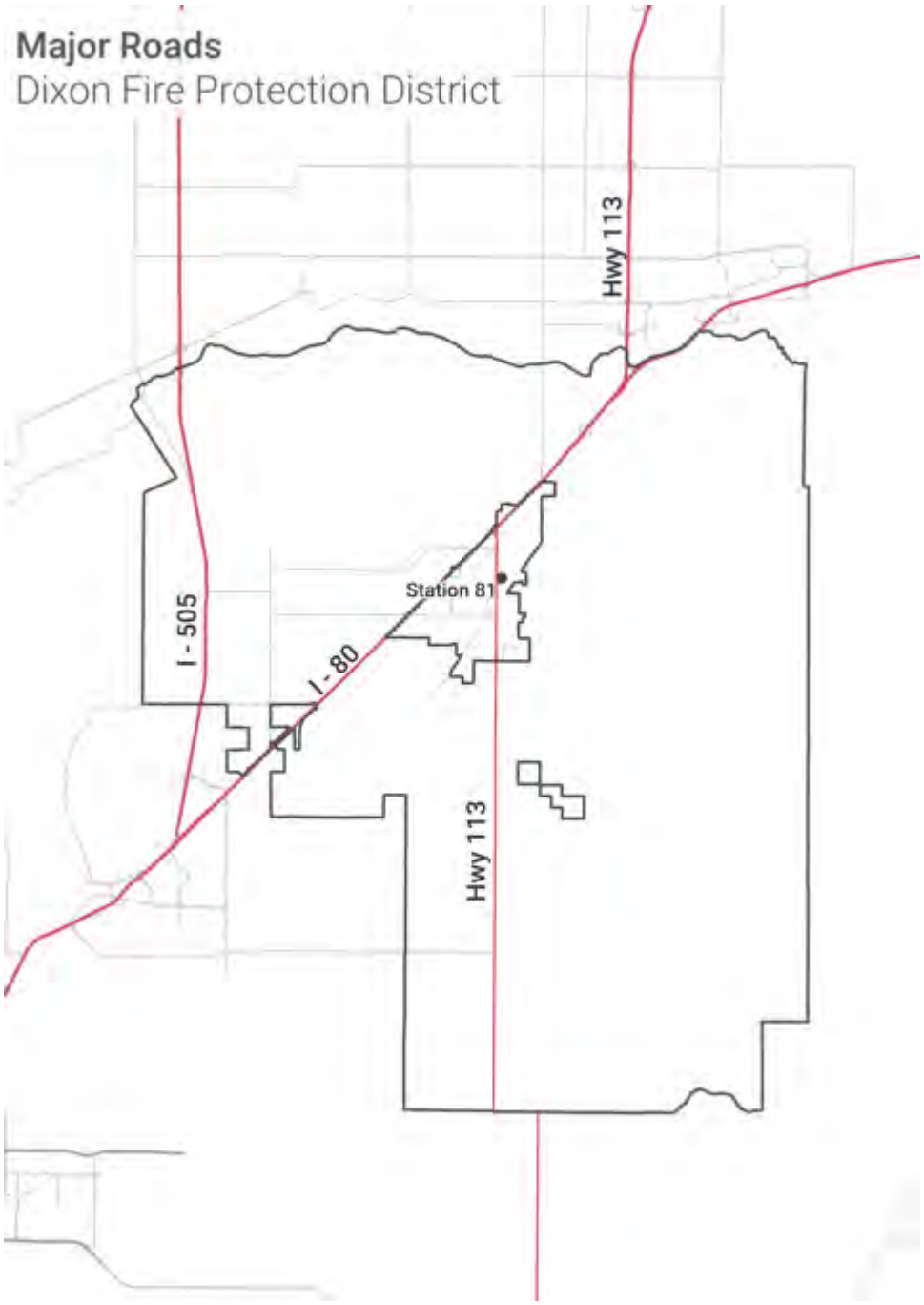
Dixon is situated just to the east of the Midland Fault Zone. This fault zone is relatively quiet as the last major earthquake occurred in 1892 causing damage in Vacaville, Dixon, and Winters. Although there have been numerous small earthquakes attributed to the Midland Fault Zone. These events can cause a variety of direct and indirect issues for the Fire Department including structural collapse, structure fires and damaged roadways. Additional issues include emergency medical responses and hazardous materials releases. The map below illustrates the location of the fault lines in the Dixon area.



3. Transportation

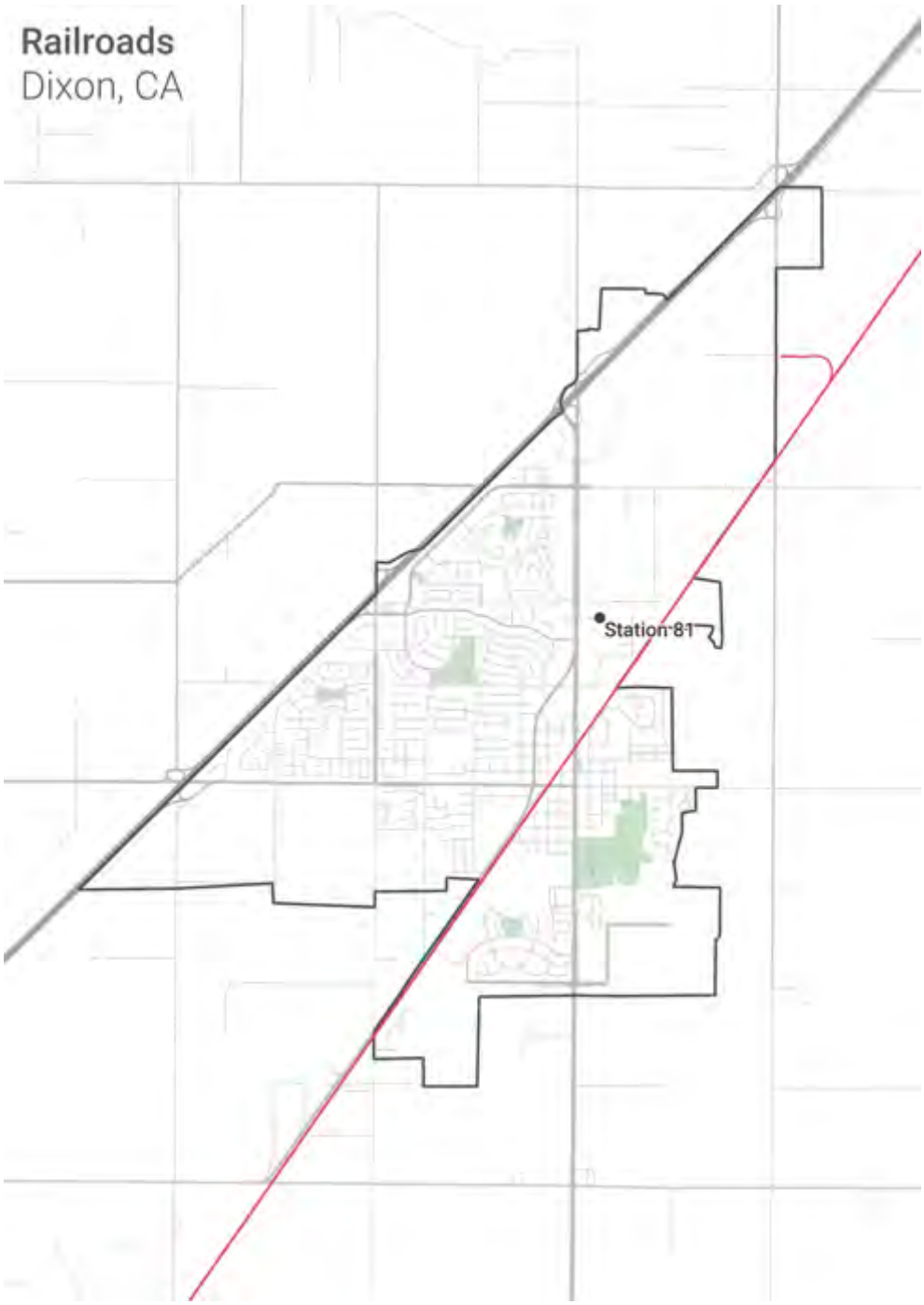
(1) Roadway Network

The roadway network in the Dixon area includes Interstate 80, Interstate 505, and Highway 113. The map below illustrates these highways in the District.



(2) Railways

The rail line through the Dixon area is operated by Union Pacific Railroad that moves freight along its lines. Amtrak also uses the rail line to provide passenger service between Sacramento and San Jose.



4. Physical Hazards

Physical hazards are facilities in the built upon area that may present a unique challenge for the Fire Department. These facilities are also referred to as target hazards. The Federal Emergency Management Agency (FEMA) defines target hazards as those facilities either in the public or private sector that provide essential products and services to the public, are otherwise necessary to preserve the welfare and quality of life in the community, or fulfill important public safety, emergency response, and/or disaster recovery functions.

In addition to the target hazards, there are underground transmission lines that run through the area. These lines carry gas and liquid products to various locations throughout the region. Other types of underground transmission lines include those used for the delivery of natural gas to homes and businesses. All these lines are subject to rupture due to an earthquake or through a mechanical means such as a contractor accidently digging up a line.

The following list of structures was developed to assist in the identification of target hazards in Dixon. Included in the table are the number of facilities identified in the response area.

Physical Target Hazards	
Type of Hazard	Number of Facilities
Education and Daycare Facilities	16
Flammable and Combustible Liquid Facilities	13
High Explosion Facilities	1
High Fire and Physical Hazard Facilities	11
High Health Hazard Facilities	13
High Occupancy Facilities	60
Hospital and Nursing Home Facilities	13
Residential Care Facilities	11

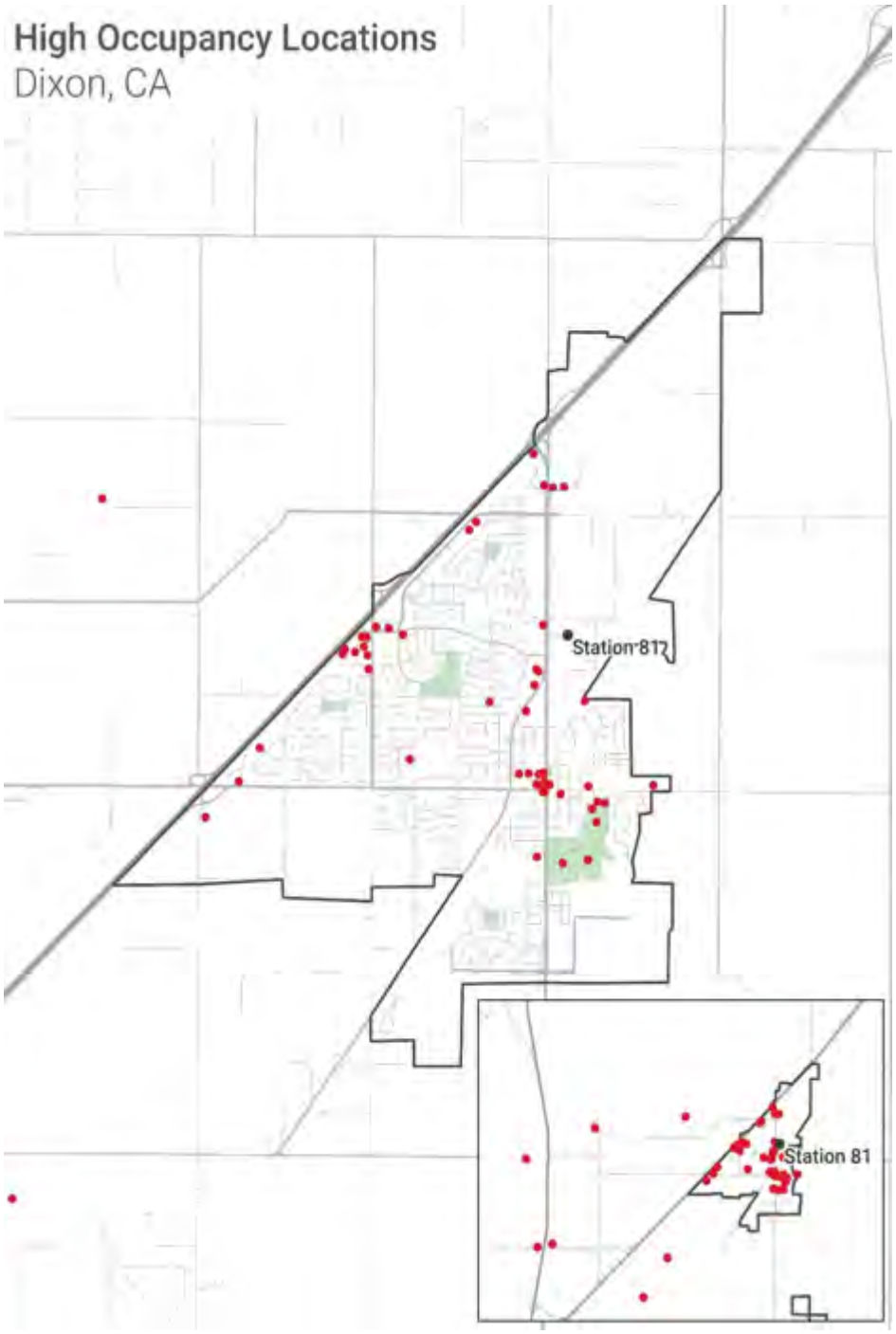
(1) High Occupancy Facilities

These facilities include place of public assembly, churches, and other facilities where large crowds will gather. They provide a risk of mass casualty incidents, as well as fires and potential terrorist incidents. The table below illustrates these types of facilities in the response area.

High Occupancy Facilities	
Anytime Fitness Center	1900 North Lincoln Street
Asian Garden	1145 Pitt School Road
Bud's Bar and Grill	100 South First Street
Burger King	1350 Stratford Avenue
Buster's Deli	700 Industrial Way
Buzzy B's Catering	231 North First Street
Calvary Chapel of Dixon	140 North First Street
Carl's Jr	125 Gateway Drive
Cattlemen's	250 Dorset Drive
Church of Christ	1115 Stratford Avenue
City Hall	600 East A Street
Cornerstone Baptist Church	185 West Cherry Street
Crossfit ASAP	1405 Market Lane
Dawson's	105 North First Street
Denny's	1250 Stratford Avenue
Dixon Aquatic Center	450 East Mayes Street
Dixon Community Church	955 East A Street
Dixon Dance	1910 North Lincoln Street
Dixon May Fair	655 South First Street
Dixon Senior Center	201 South Fifth Street
Dixon United Methodist Church	209 North Jefferson Street
DQ Equestrian Club	5183 Bryant Lane
Linde Lane Tea Room	140 North Jackson Street
Dreamland Farms	8127 Meridian Road
El Verduzco	1005 North Adams Street
Family Christian Center	700 North Adams Street
Fitness Evolution	1025 North Adams Street
Grace Fellowship Church	535 West H Street
Green River Tap Room	4513 Putah Creek Road
Habit Burger	1425 Ary Lane
Hall Memorial Park	450 East Mayes Street
Hall Memorial Park Skate Rink	Hall Park Drive
Huerta Arena	7736 Locke Road
Independent Order of the Odd Fellows	111 West A Street
Jack in the Box	150 Dorset Drive

High Occupancy Facilities	
Judy's Wild Wrangler Saloon	4823 Midway Road
L.D.S. Church	305 North Lincoln Street
La Cocina Restaurant	105 East Dorset Drive
Living Hope Church	410 Gateway Court
Mary's Pizza Shack	1460 Ary Lane
Mason Hall	159 North First Street
McDonald's	1410 Ary Lane
Midway RV Park	4933 Midway Road
Miracle Christian Worship Center	470 East H Street
Moose Lodge	180 West B Street
Noelting Horse Stables	6954 Lewis Road
Olde Veteran's Memorial Hall	231 North First Street
Pizza Guys	1455 Ary Lane
Punjabi Dhaba Restaurant	7800 Batavia Road
Round Table Pizza	825 North Adams Street
Seventh Day Adventist Church	4740 Allendale Road
St. Peter Church	105 South Second Street
Taco Bell	1420 Ary Lane
The Living Hope Church	159 North First Street
Veterans Memorial Hall	1305 North First Street
Wendy's	125 East Dorset Drive

The map below provides a geographical view of the high occupancy facilities within the response area.

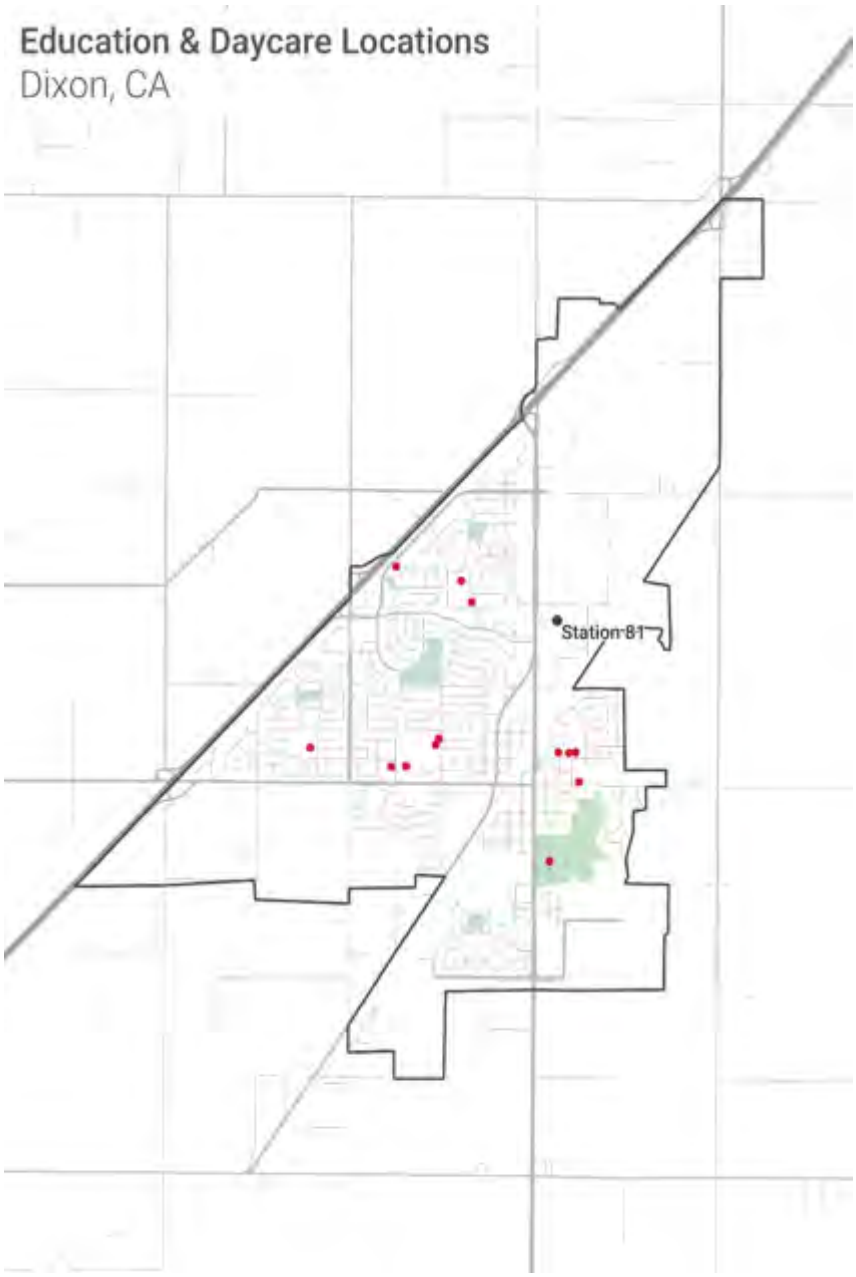


(2) Educational and Daycare Facilities

As with High Occupancy facilities, schools also provide a risk of mass casualty incidents and potential terrorist incidents. These facilities typically have large meeting areas for sports and assembly halls. Day care facilities are generally smaller than schools but house children that are much younger in age including infants. These facilities present a life risk due to the younger age of the occupants and the need to assist with evacuation and rescue. The table below illustrates these types of facilities in the response area.

Educational and Daycare Facilities	
Anderson CDC	415 East C Street
Anderson Elementary School	415 East C Street
Bert and Ernies Pre-School	255 North Lincoln Street
CA Jacobs Middle School	200 North Lincoln Street
Dixon High School	555 College Way
Dixon Montessori Charter School	355 North Almond Street
Early Learning Center	355 North Almond Street
Gretchen Higgins Elementary School	1525 Pembroke Way
Higgins CDC	1465 Pembroke Way
Old High School/Future Middle School	455 East A Street
Maine Prairie High School	305 East C Street
Neighborhood Christian School	655 South First Street
Phoenix Schools, Inc.	1520 North Lincoln Street
Silveyville CDC	355 North Almond Street
Silveyville Primary School	355 North Almond Street
Tremont Elementary School	355 Pheasant Run Drive

The map below provides a geographical view of the educational and daycare facilities within the response area.

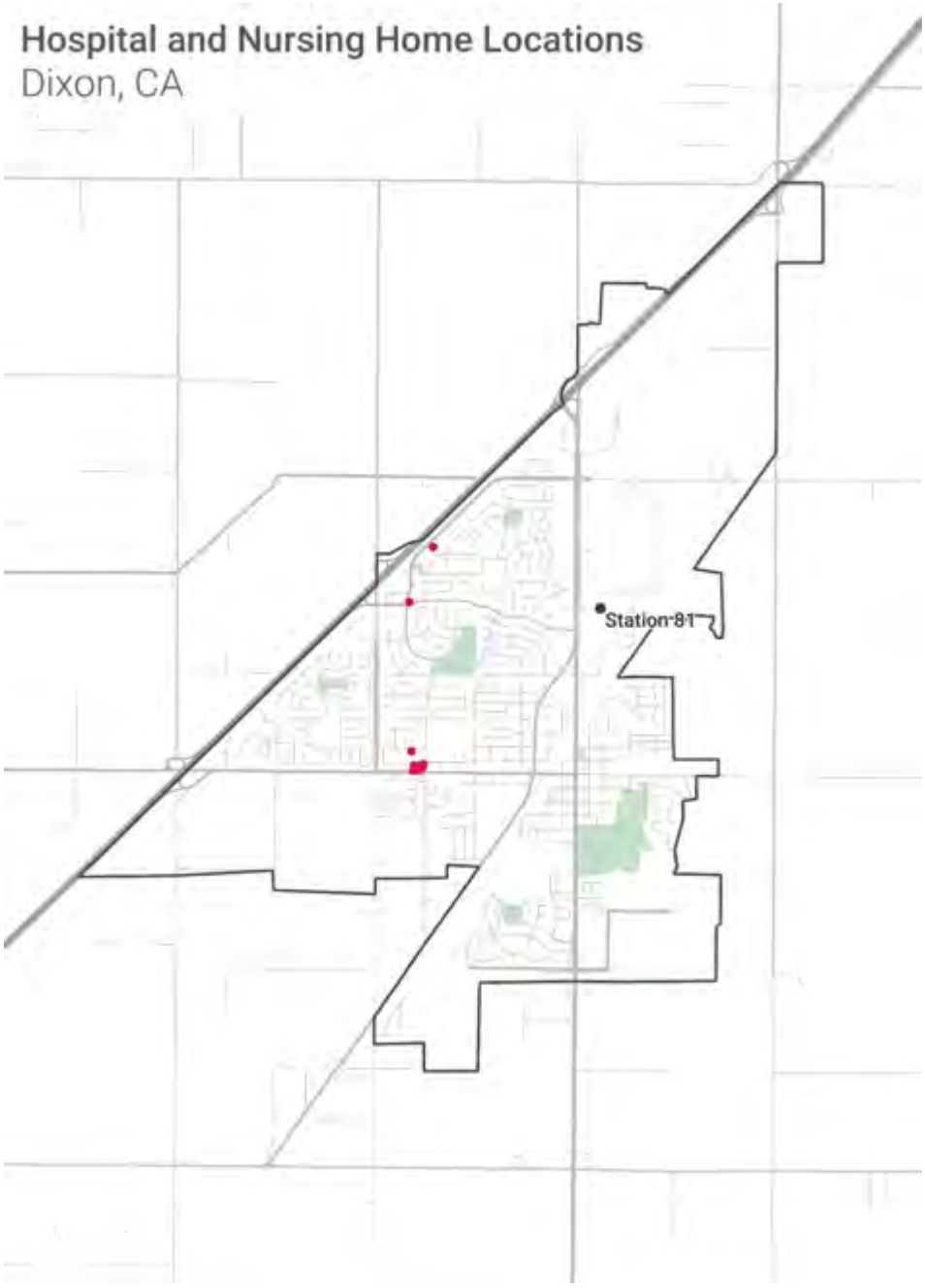


(3) Institutional Facilities

Institutional facilities include hospitals, medical office or facilities, nursing homes, assisted living facilities and extended care facilities. While most of these facilities have built-in fire protection systems such as fire sprinklers, the residents of these facilities may not be mobile or will at the very least need other assistance in the event of an emergency. The table below illustrates these types of facilities in the response area.

Institutional Facilities	
David A. Wilkins, DMD	255 North Lincoln Street
Davita Dialysis	1640 North Lincoln Street
Dixon Dialysis	125 North Lincoln Street
James Sanderson, DDS	1155 Rehrmann Drive
John G. Rosten, OD	125 North Lincoln Street
John R. Saunderson, DMD	255 North Lincoln Street
NCS Rehabilitation Service	450 Porter Street
Sutter West Medical Group	125 North Lincoln Street
Ted M. Ramirez, DDS	255 North Lincoln Street
Todd Comm, DDS	1300 North Lincoln Street
Dr. Wiley	140 North Jackson Street

The map below provides a geographical view of the institutional facilities within the response area.

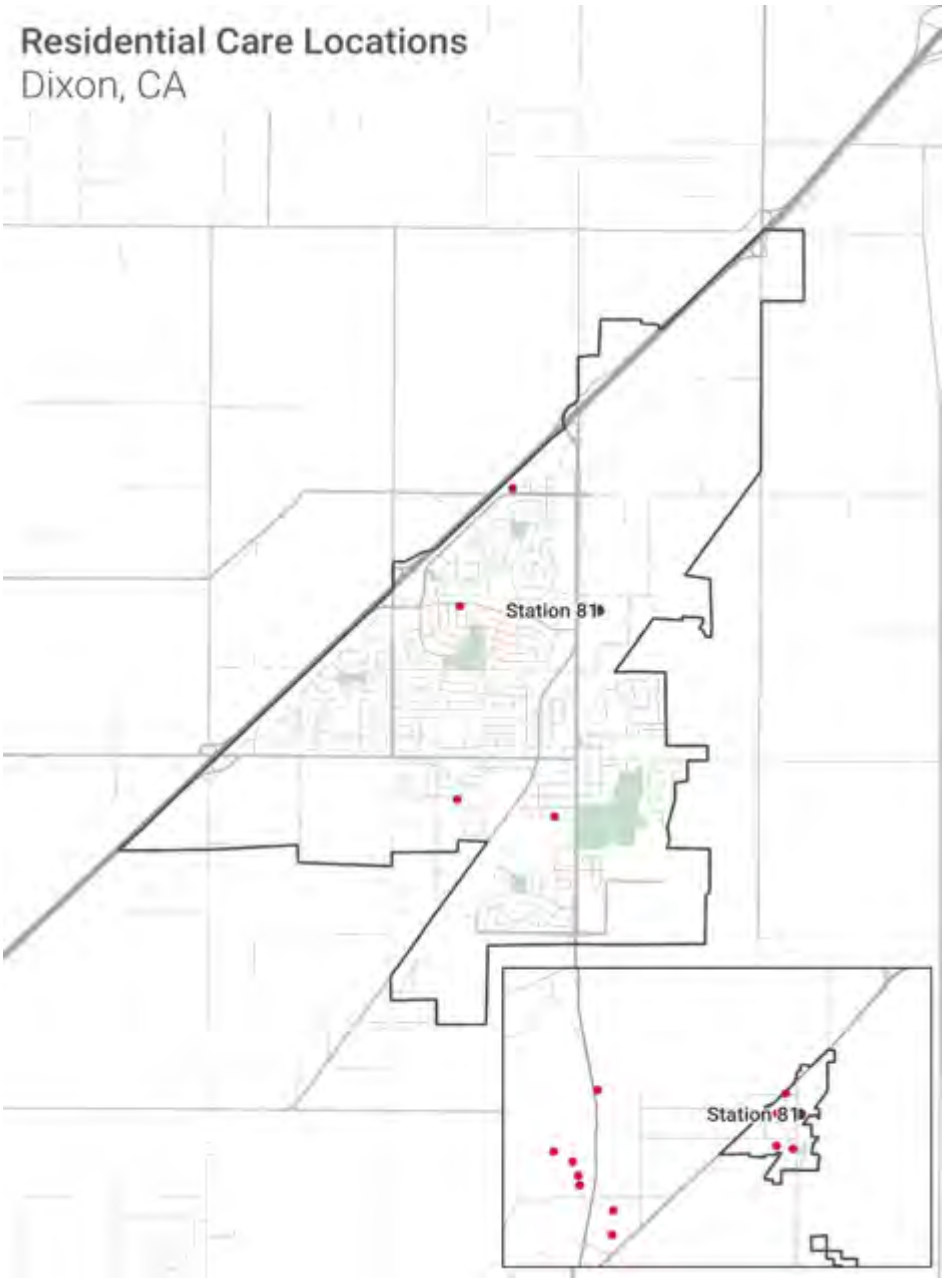


(4) Residential Care Facilities

These facilities present a unique challenge to the Fire Department. Residential care facilities typically have 6 to 10 residents in varying stages of care such as non-ambulatory or ambulatory with assistance. Fire suppression operations are different than those employed at other structures due to the occupants and the type of structure being used. The table below illustrates these types of facilities in the response area.

Residential Care Facilities	
A Place of Grace	7428 Paddon Road
American Alcohol Treatment	7516 Paddon Road
Brown Care Home	955 Hillview Drive
Crossroads Living Center	1250 Woodman Way
Grace Safe Place	670 Ferguson Court
Griffin Care Home	4692 Udell Road
Mark's Growing Center, Inc.	6996 Leisure Town Road
Solano Life House	575 South Jefferson Street
Teal Residence	4524 Shawn Lane
Tubbs Home	8270 Tubbs Road
Young Residence	5035 Victor Lane

The map below provides a geographical view of the residential care facilities within the response area.

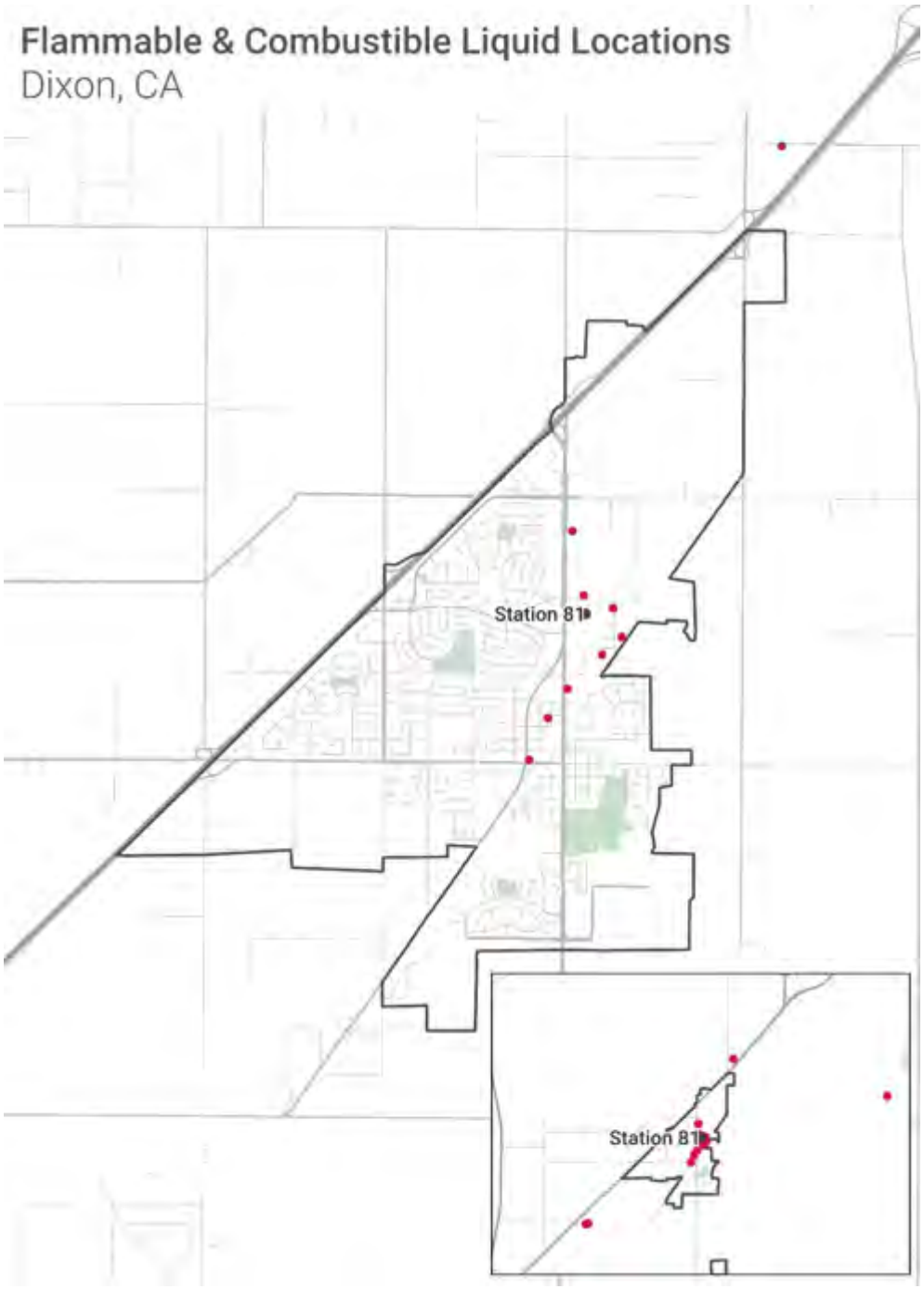


(5) Flammable and Combustible Liquid Facilities

These types of facilities present a challenge to the Fire Department as they may require foam or other types of extinguishing agents to suppress the fire. The table below illustrates these types of facilities in the response area.

Flammable and Combustible Liquid Facilities	
Advanced Environmental, Inc.	7300 Chevron Way
Azko Nobel Inks	1100 Business Park Drive
Chavez Auto Body	1301 Business Park Drive
D/K Dixon	7300 Chevron Way
Fremouw Environmental Services	6940 Tremont Road
Moonshine Custom Paint	439 North Jackson Street
Ramos Oil	1900 North First Street
Rams Auto Body	305 Industrial Way
Superior Auto Body	640 North First Street
Triangle Digital	1000 Business Park Drive
TYH K-9	8248 Wild Rose Lane
World Oil Environmental Services	7300 Chevron Way

The map below provides a geographical view of the flammable and combustible liquid facilities within the response area.

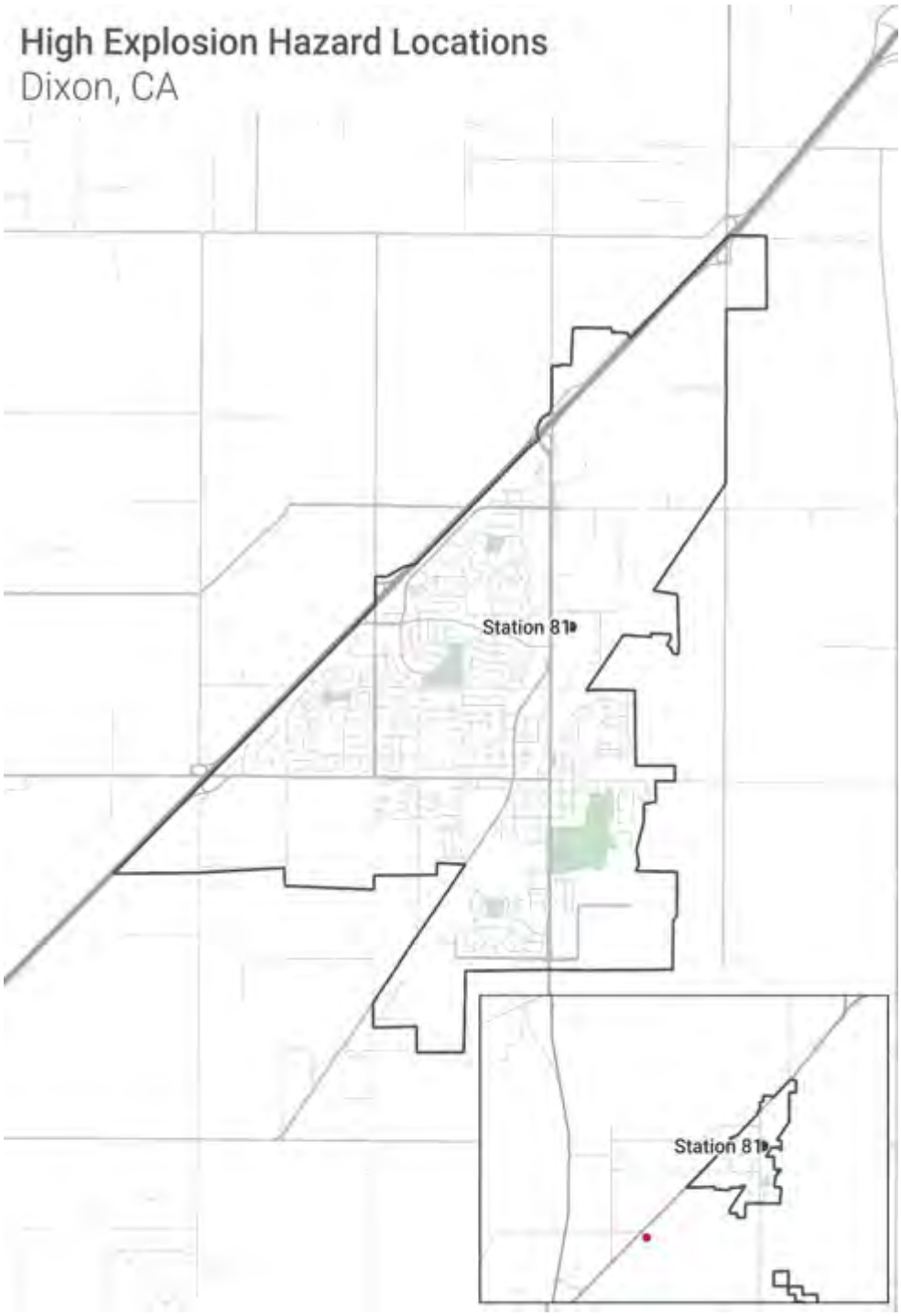


(6) High Explosion Facilities

This facility presents a hazard not only to the facility itself but could impact surrounding area buildings and roadways. The table below illustrates this type of facility in the response area.

High Explosion Facilities	
Utteback Propane Storage Facility	7284 Lewis Road

The map below provides a geographical view of the high explosion facilities within the response area.

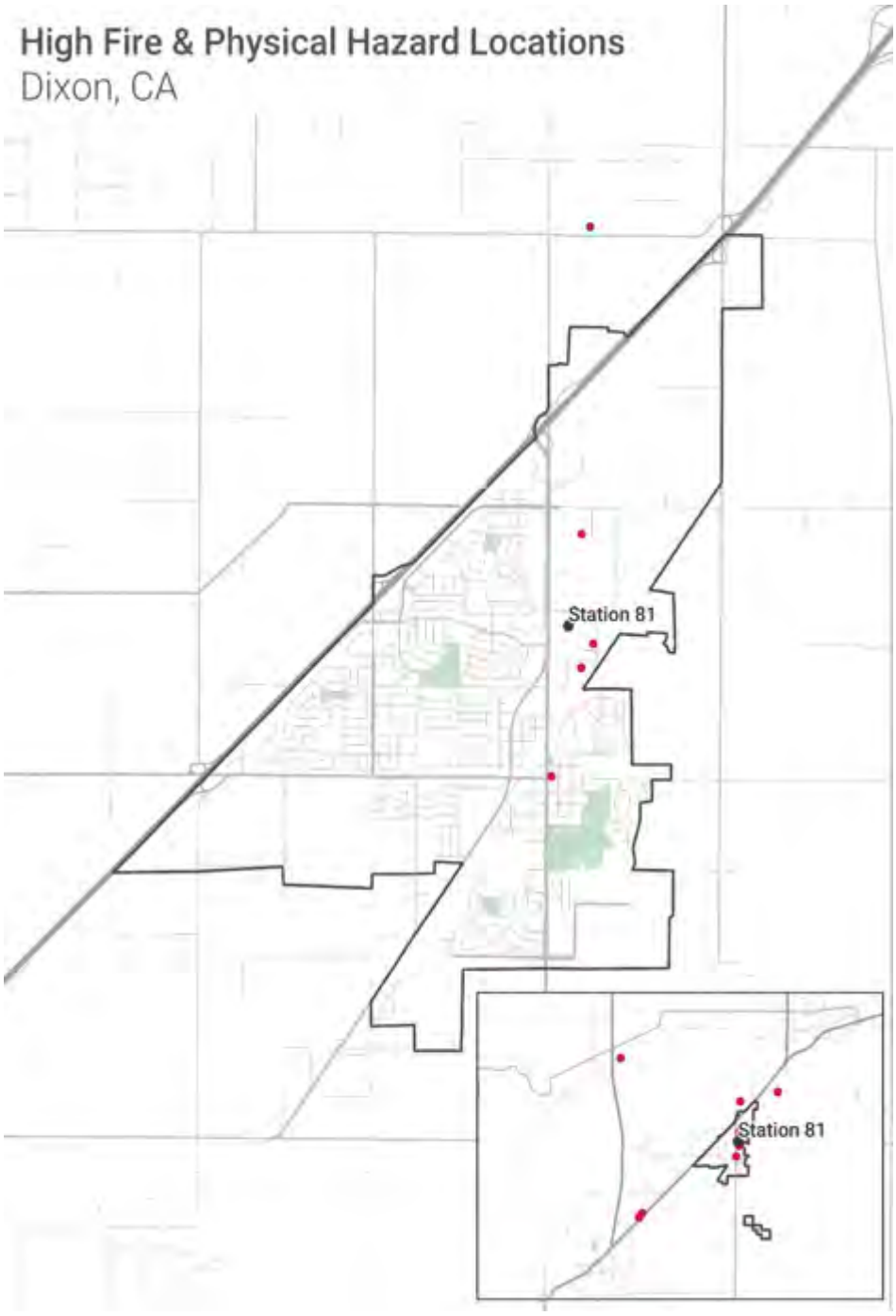


(7) High Fire and Physical Hazards

Large buildings and occupancies that contain flammable materials that may require additional resources to mitigate. The table below illustrates these types of facilities in the response area.

High Fire / High Physical Facilities	
Allied Propane Tank Installation	6663 Sievers Road
Gymboree	2299 Kids Way
L&M Auto Body	5151 Quinn Road
PG&E Sub-Station	5221 Quinn Road
RM Specialties, Inc.	1000 Business Park Drive
Slawson Exploration	9264 Boyce Road
The Printing Shop	125 East A Street
Tremont Supply, Inc.	7235 Tremont Road
Western Insulfoam	1155 Business Park Drive

The map below provides a geographical view of the high fire and high physical facilities within the response area.

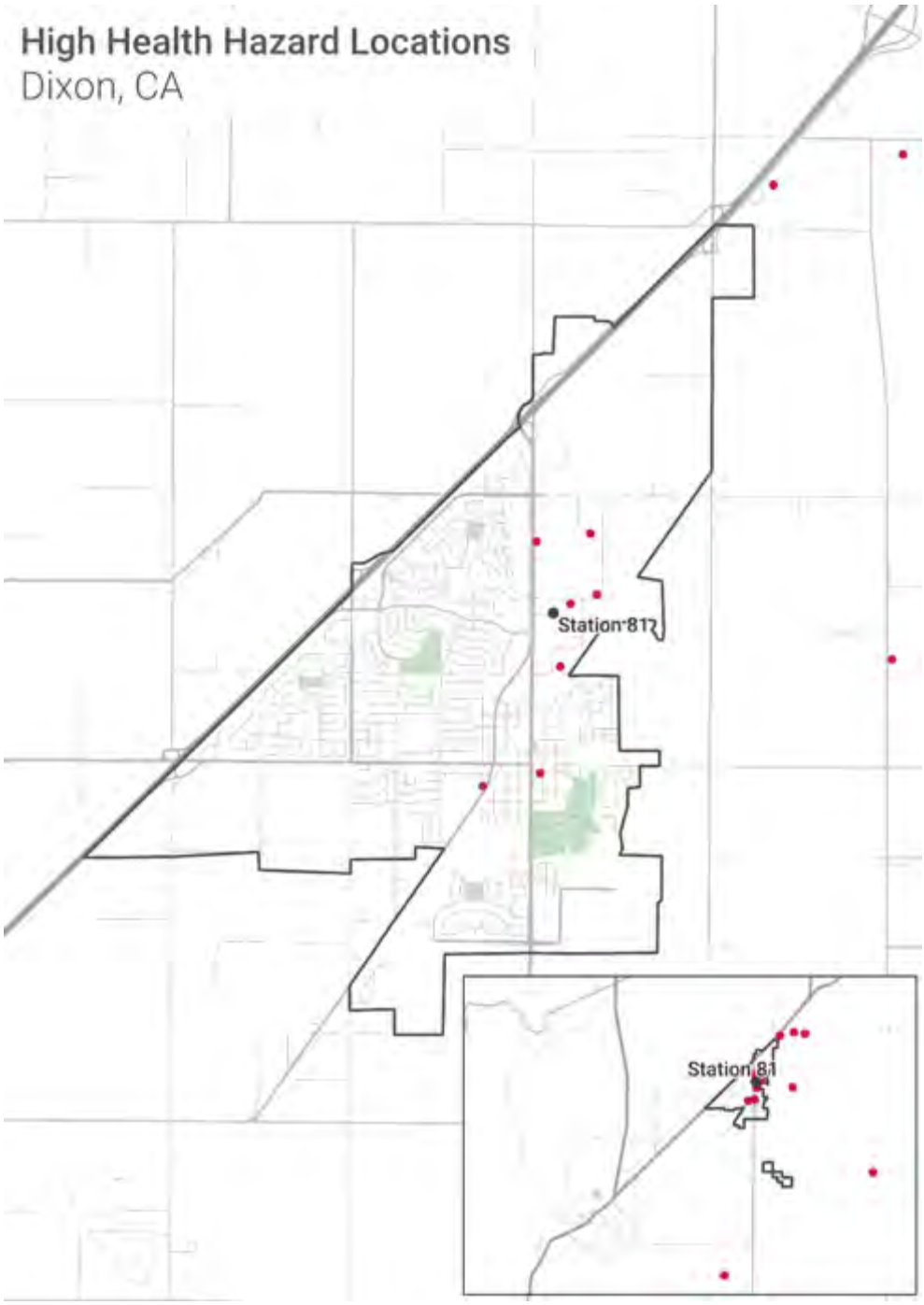


(8) High Health Hazards

Facilities in this group could pose a hazard to the public as well as to any fire service personnel. These types of facilities likely contain a hazardous material that could not only create a fire hazard but also a health risk. The table below illustrates these types of facilities in the response area.

High Health Hazards	
Axenia Biologix, LLC.	800 Business Park Drive
Genentech Research Building	2727 Fitzgerald Way
Hemostat	515 Industrial Way
J&J Welding and Fabrication	6648 Liberty Island Road
Mike Lowrie Trucking	7134 Tremont Road
Mike Lowrie Trucking	8714 Sparling Lane
Mistler Shop	7290 Tremont Road
Pacific Bell Telephone	160 South Second Street
Park Avenue Turf Shop	7145 Hackman Road
Superior Auto Body	640 North First Street
Vacaville Sanitary Maintenance Building	6226 Hay Road
Valley Livestock	280 Porter Street
Vintage One Auto Body	340 Industrial Way
Wilbur-Ellis Company	1850 North First Street

The map below provides a geographical view of the high health facilities within the response area.

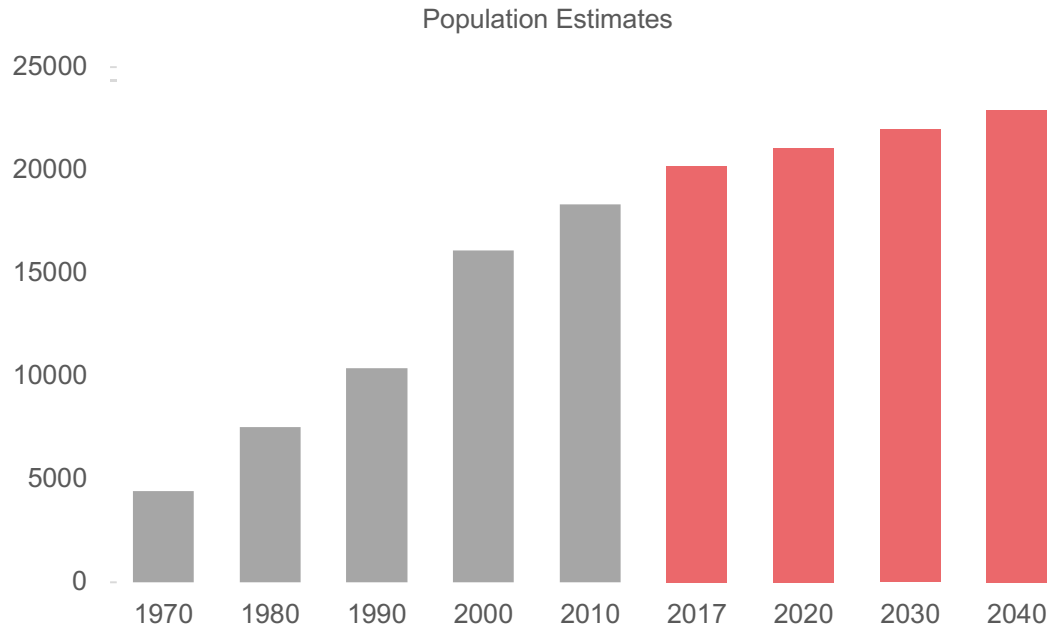


(9) Downtown District

This district represents the older section of the City. It contains some of the oldest buildings in the City and represents the core of the City. Bordered by the railroad tracks to the northwest, Mayes Street to the south, and Second Street along the east this area can present a unique challenge to the Fire Department. The buildings are typically built with common walls and basements, some have apartments or offices above the business, and have limited access.

5. Community Growth and Development

In February 2015, the Dixon Housing Element was produced as a part of the overall General Plan for the City. This document provides information for potential growth in the City through 2023. The Association of Bay Area Governments (ABAG) is cited in this document and projects Dixon will grow by 13 percent between 2010 and 2040 or an average of 4.3% every ten years. According to this group of the seven cities in Solano County, Dixon is anticipated to the have the smallest level of growth. The table below illustrates the population growth from 1970 through 2040. For the years beginning with 2017 the population are estimates based on the anticipated growth indicated above.

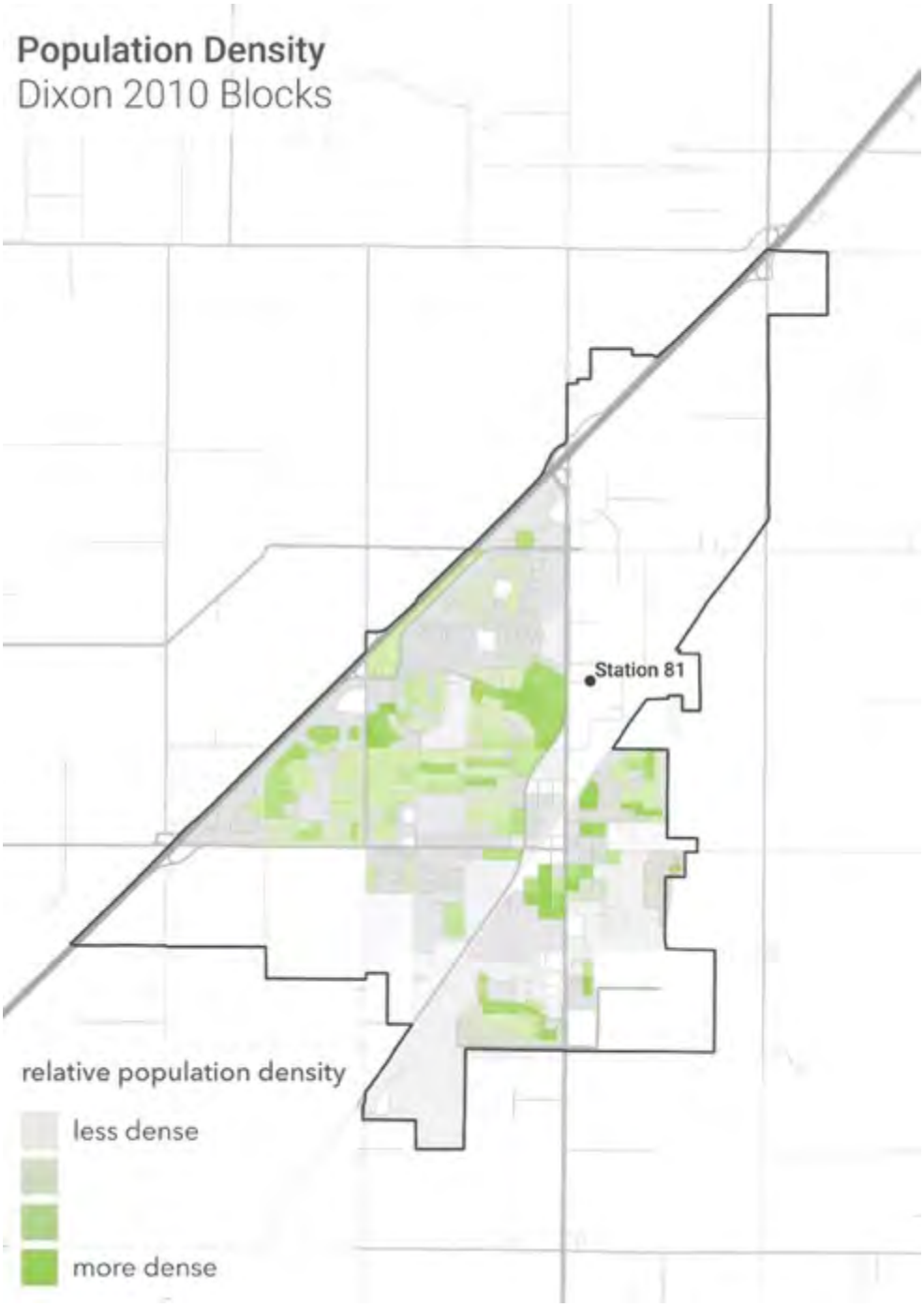


In October 2014, the Local Agency Formation Commission (LAFCo) prepared a Municipal Review of Dixon that included potential growth areas. Five areas totaling 803 acres were identified as probable annexations to the City, four of these areas in and around I-80. Within the City there is an area in the southwest section between Pitt School Road and I-80, approximately 590 acres, that has been the target for development. Recently, the development has reached its final stages of approval for approximately 1,100 single family homes. Development within the City is regulated by Measure B that limits the number of new dwelling units in a given year to 3% or less of the total housing units existing on December 31 of the previous year. The 2017 US Census estimate for housing units in the City is 6,204 which would allow 186 new units to be built in a year.

Further, areas in and outside the City were identified as prime agricultural lands and are likely to remain as agricultural properties. It is due to the prime agricultural lands the Dixon

Fire Protection District will not likely experience any significant growth in terms of housing, population, or business development.

The map below provides a view of population density by census tract.



The residential areas are more the west of First Street and south of H Street with the area to the east of First Street being more commercial in nature.

6. Historical Workload

The Fire Department responds to emergency and non-emergency calls for service. The following tables illustrate the activities of the Division grouped by the type of call or detail.

Calls for Service by Type

	2015	2016	2017	2018	Total	Pct.
Structure Fires	17	11	30	17	75	0.8%
Vehicle Fires	30	18	20	24	92	1.0%
Vegetation Fires	86	103	67	91	347	3.9%
All Other Fires	23	21	29	30	103	1.1%
Overpressure Rupture, Explosion, Overheat (No Fire)	0	1	3	1	5	0.1%
Motor Vehicle Accidents	209	207	208	185	809	9.0%
Extrications from Vehicles	0	3	3	1	7	0.1%
Rescues	2	5	2	2	11	0.1%
EMS-BLS Calls	744	765	881	1,085	3475	38.7%
EMS-ALS Calls	313	288	395	286	1282	14.3%
All Other Rescue & EMS	7	13	5	8	33	0.4%
Hazardous Condition (No Fire)	36	46	66	55	203	2.3%
Service Call	152	186	247	259	844	9.4%
Good Intent Call	243	335	370	380	1328	14.8%
False Alarm & False Call	79	74	83	97	333	3.7%
Severe Weather/Natural Disaster	0	0	0	0	0	0.0%
Special Incident Type	0	0	1	0	1	0.0%
CAL EMA Assignments	8	7	3	2	20	0.2%
Total Calls	**1,949**	**2,083**	**2,413**	**2,523**	**8,968**	
Mutual Aid Provided	58	75	71	82	286	
Automatic Aid Provided	44	36	54	49	183	
Mutual Aid Received	88	133	132	180	533	
Automatic Aid Received	30	29	36	31	126	

As shown above, medical calls account for most of calls for service at 52.6% of the call volume. As illustrated, there has been a 29.5% increase in call volume since 2015 for an average increase of 10% per year.

The following table displays the total number of calls for service handled by the Fire Department by each hour and day of the week for the past three years. Both emergency and non-emergency calls were included to provide an overall view of the fire protection system.

Calls for Service by Hour and Weekday

Hour	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
12 am	22	17	19	22	28	16	28	152
1 am	30	21	14	31	17	18	30	161
2 am	24	21	18	15	18	21	32	149
3 am	28	20	13	14	17	14	19	125
4 am	15	16	16	18	20	14	25	124
5 am	20	21	26	32	19	28	23	169
6 am	28	29	37	32	27	32	18	203
7 am	25	47	45	43	44	45	30	279
8 am	39	49	50	46	52	58	41	335
9 am	43	46	58	60	45	51	35	338
10 am	45	61	74	58	60	53	53	404
11 am	47	61	58	51	66	71	54	408
12 pm	65	68	51	53	65	64	64	430
1 pm	53	70	72	43	76	73	52	439
2 pm	62	65	62	55	62	56	61	423
3 pm	57	74	55	88	53	71	67	465
4 pm	60	55	55	77	52	76	60	435
5 pm	78	60	50	71	51	72	49	431
6 pm	64	41	43	56	53	60	53	370
7 pm	57	51	34	45	48	53	53	341
8 pm	43	47	33	34	47	39	45	288
9 pm	43	36	37	41	41	38	55	291
10 pm	37	37	31	46	29	40	35	255
11 pm	32	22	21	27	32	34	36	204
Total	1,017	1,035	972	1,058	1,022	1,097	1,018	7,219

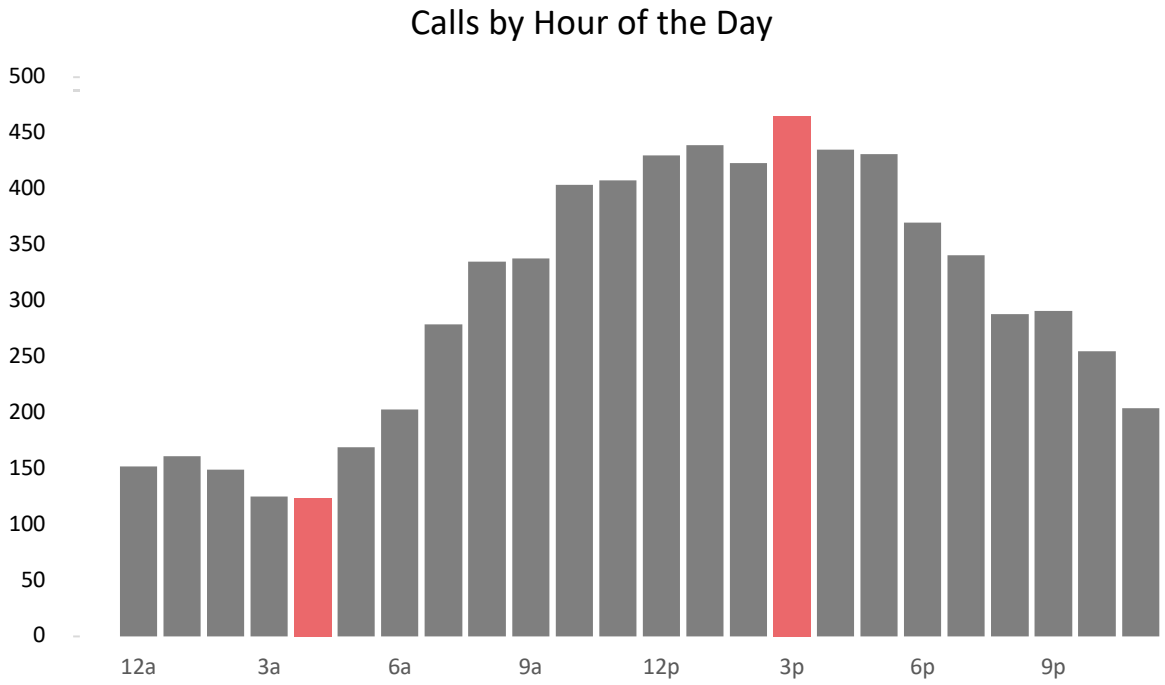
The calls for service varied by time of day and day of the week. The call volume is heaviest from mid- morning to late afternoon with Friday being the busiest day of the week. The busiest time of the day is the 3 pm hour with the slowest hour being 4 am.

The same information was updated using 2018 calls for service data. The following table illustrates call demand by time of day and day of week for 2018:

Calls for Service by Hour and Weekday - 2018								
Hour	**Sun**	**Mon**	**Tue**	**Wed**	**Thu**	**Fri**	**Sat**	**Total**
12 am	12	17	5	8	9	8	13	72
1 am	12	11	12	7	3	13	13	71
2 am	13	13	3	8	13	10	14	74
3 am	5	4	3	7	8	9	6	42
4 am	10	10	8	7	4	7	7	53
5 am	13	14	15	10	18	6	12	88
6 am	7	17	11	12	18	17	12	94
7 am	11	19	18	12	21	14	7	102
8 am	16	29	19	22	27	21	14	148
9 am	14	15	26	28	21	20	13	137
10 am	26	24	25	27	14	23	26	165
11 am	19	22	30	28	22	19	26	166
12 pm	21	22	19	16	26	22	34	160
1 pm	27	25	15	30	24	27	26	174
2 pm	20	29	24	20	19	20	21	153
3 pm	20	26	27	24	24	22	24	167
4 pm	22	78	21	15	21	28	29	214
5 pm	24	21	20	36	19	21	21	162
6 pm	22	11	15	20	13	15	30	126
7 pm	17	19	20	17	19	15	26	133
8 pm	15	11	13	23	15	20	15	112
9 pm	13	14	13	24	15	30	20	129
10 pm	14	14	15	14	17	19	18	111
11 pm	12	9	9	15	6	10	15	76
Total	385	474	386	430	396	416	442	2,929

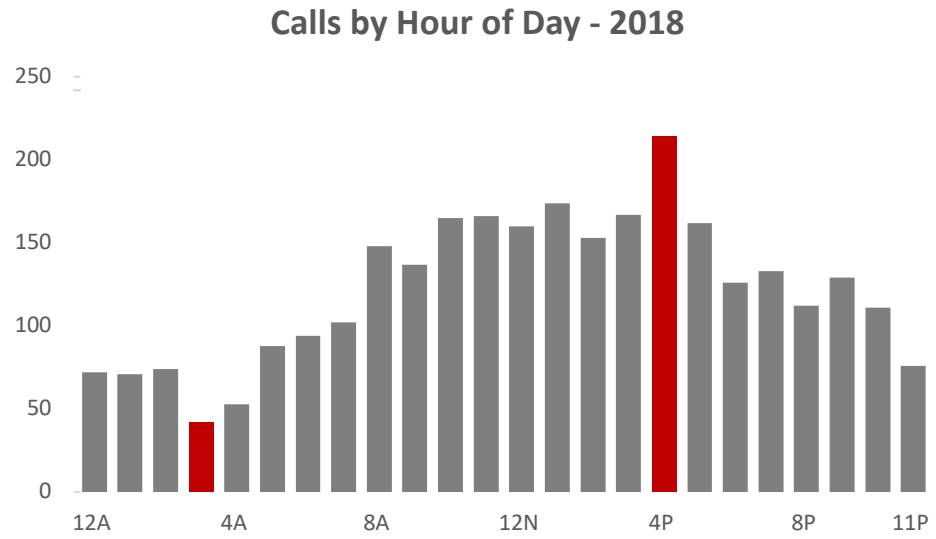
The calls for service varied by time of day and day of the week. The call volume is heaviest from mid- morning to late afternoon with Monday being the busiest day of the week. The busiest time of the day is the 4 pm hour with the slowest hour being 3 am.

The following chart further illustrates the calls for service by hour of the day.



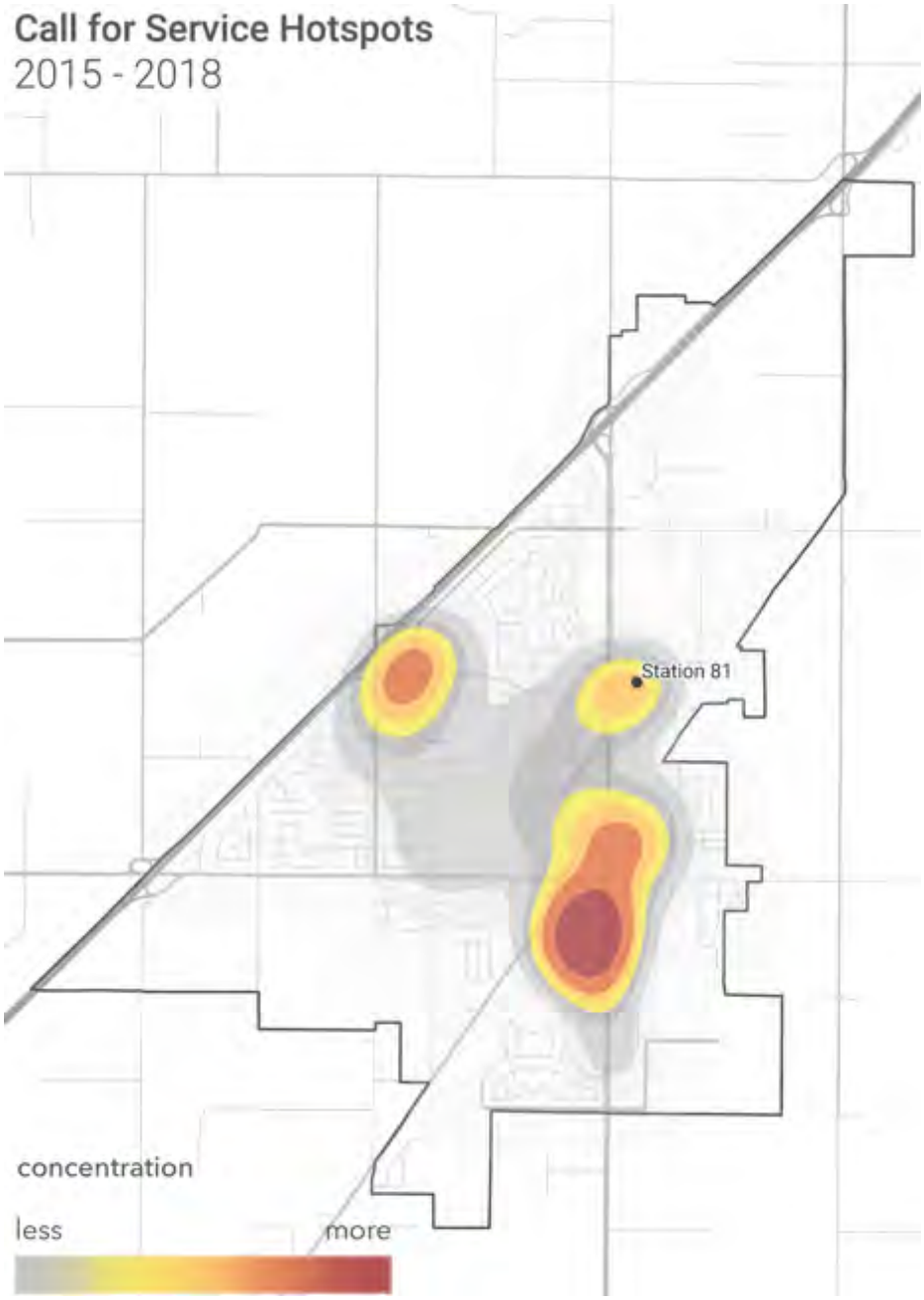
As illustrated above, calls increase sharply at the 7 am hour peaking at the 3 pm hour and remain steady throughout the day. The calls begin to decline at the 6 pm hour with 4 am being the slowest hour of the day.

The following table was added to illustrate any changes in the call demand by hour of day in 2018:

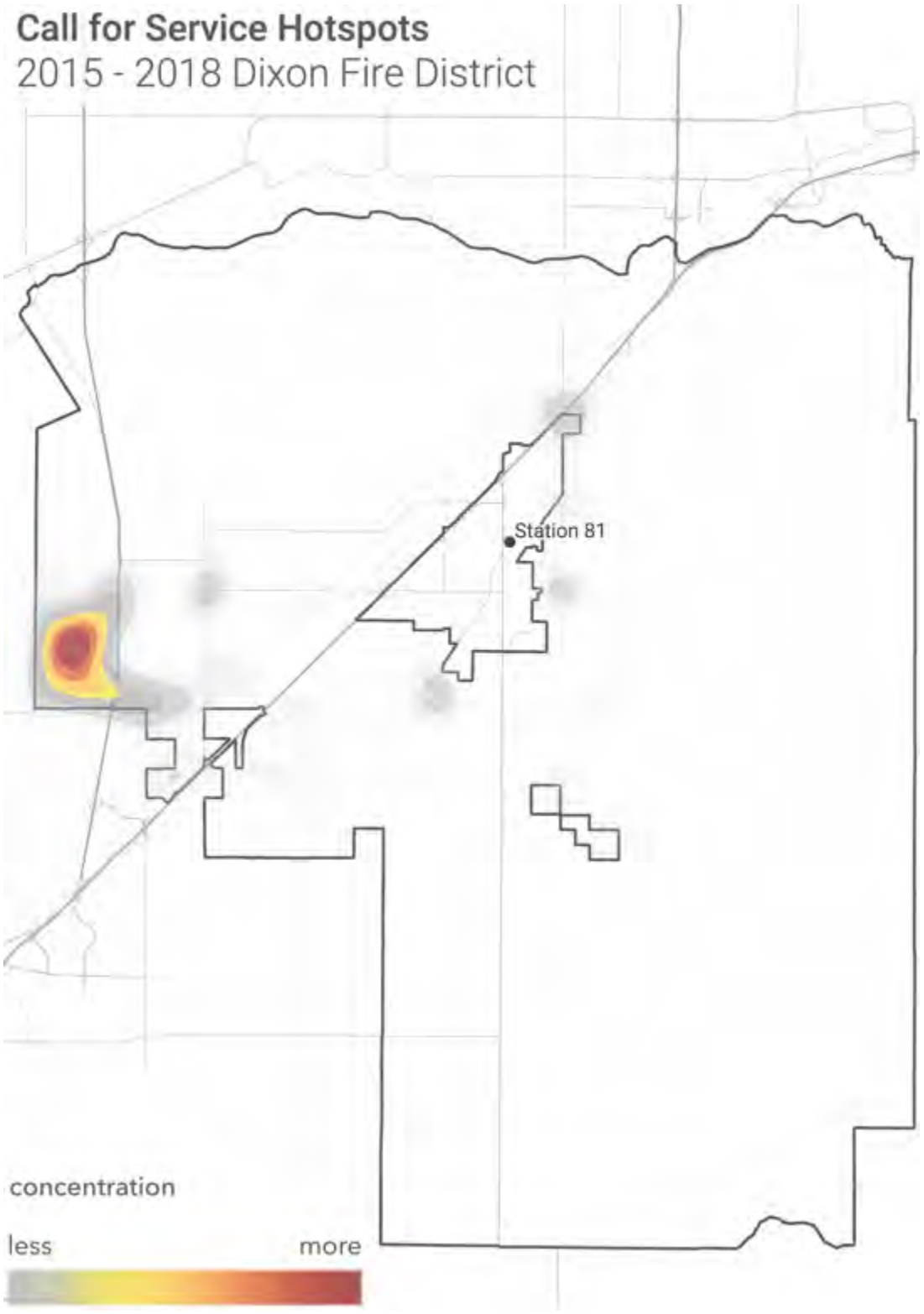


As illustrated above, calls increase sharply at the 8 am hour peaking at the 4 pm hour and remain steady throughout the day. The calls begin to decline at the 6 pm hour with 3 am being the slowest hour of the day.

The map below illustrates the calls using GIS technology to outline where many of the calls are occurring. As illustrated, the highest volume of calls is in the central section of the City. Calls outside the City in the District were very light and did not plot very well on the map, therefore the map concentrates on the City.



Overall the calls for service are heaviest in the City which results in the calls in the District not to be shown very well. The map below illustrates the calls for service for the District only.



7. Water Supply System

The City of Dixon and California Water Service supplies potable water to the City. The City relies on groundwater as its sole supply of water and is produced from five (5) groundwater wells that produce about 12.2 million gallons of water per day. The distribution system uses four storage tanks, three booster pump stations, and a piping system of about 40 miles of pipeline ranging from 4 to 14-inch diameter pipes. The City system provides services to areas outside the downtown and center sections of the City.

The California Water Service (CWS) Dixon District was formed in 1927 with the purchase of the water system from Pacific Gas and Electric Company. In 2003 CWS began operating the water system owned by the Rural North Vacaville Water District. This system provides service to the downtown and center sections of the City delivering about one million gallons of water using nine wells, two storage tanks, and 32 miles of pipeline.

5 Fire Protection System Dynamics

In making decisions about a fire protection system, it is important for the leadership of Dixon to understand the science behind the location of resources, the deployment strategies of those resources, and the other parts necessary to form an effective fire protection system.

For many years the Insurance Services Office (ISO) set a standard through their efforts with the Public Protection Classification system. This system is designed to limit the exposure of insurers to large losses and catastrophic events. There are now three major sources of information to which responders, local policymakers, and the public can refer when determining the most appropriate response objectives for their community:

- The Insurance Services Office (ISO) provides basic information regarding distances between fire stations. However, this "objective" does little to recognize the unique nature of every community's road network, population, calls for service, call density, etc.

- The National Fire Protection Association (NFPA) promulgated a document entitled: "NFPA 1710: Objective for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments." This document (NFPA 1710) was published in 2001 and generated a great deal of dialogue and debate – which is still ongoing.

- The Commission on Fire Accreditation International (CFAI) in its "Objectives of Coverage" manual places the responsibility for identifying "appropriate" response objectives on the locality. These objectives should be developed following a comprehensive exercise in which the risks and hazards in the community are compared to the likelihood of their occurrence.

Nationally, a great deal of effort and research has been put into developing performance objectives for the delivery of fire and emergency medical services. This effort is critical for local governments making decisions about deployment and location of emergency

resources. The objectives promoted for Fire/Rescue and EMS providers have their basis derived from research that has been conducted in these two critical issues:

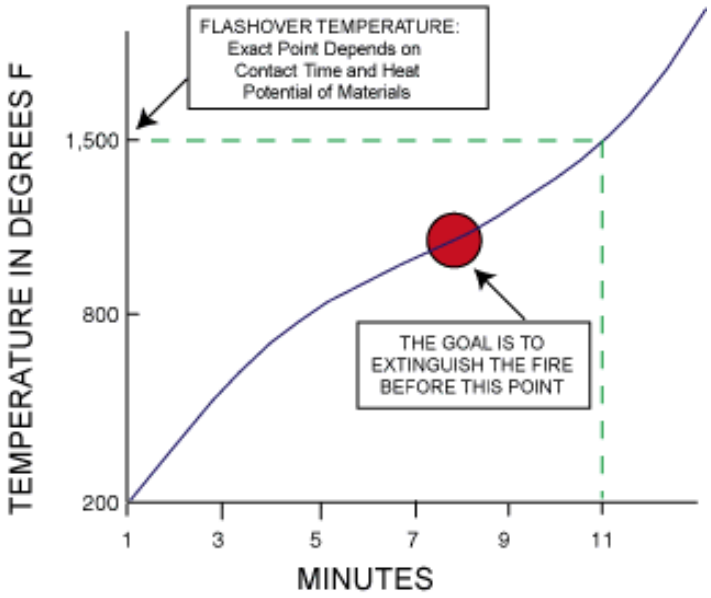
- What is the key point in a fire's "life" for gaining control of the blaze while minimizing the impact on the structure of origin and on those structures around it?

- What is the impact of the passage of time on survivability for victims of cardiac arrest?

1. Fire Protection Services

The chart that follows, shows a typical "flashover" curve for interior structure fires. The point in time represented by the occurrence of "flashover" is critical because it defines when all of the contents of a room become involved in the fire. This is also the point at which a fire typically shifts from "room and contents" to a "structure" fire – involving a wider area of the building and posing a potential risk to the structures surrounding the original location of the fire.

Generalized Flashover Curve



Note that this illustration depicts a fire from the moment of inception – not from the moment that a fire is detected or reported. This demonstrates the importance of early detection and fast reporting as well as rapid dispatch of responding units. This also shows the critical need for a rapid (and sufficiently staffed) initial response – by quickly initiating

the attack on a fire, "flashover" can be averted. The points below describe the major changes that occur at a fire when "flashover" occurs:

- It is the end of time for effective search and rescue in a room involved in the fire. It means the likely death of any person trapped in the room – either civilian or firefighter.

- After this point in a fire is reached, portable extinguishers can no longer have a successful impact on controlling the blaze. Only larger hand-lines will have enough water supply to affect a fire after this point.

- The fire has reached the end of the "growth" phase and has entered the fully developed phase. During this phase, every combustible object is subject to the full impact of the fire.

- This also signals the changeover from "contents" to "structure" fire. This is also the beginning of collapse danger for the structure. Structural collapse begins to become a major risk at this point and reaches the highest point during the decay stage of the fire (after the fire has been extinguished).

It should be noted that not every fire will reach flashover – and that not every fire will "wait" for the 8-minute mark to reach flashover. A quickly responding fire crew can do things to prevent or delay the occurrence of flashover. These options include:

- Use of a master stream device, using a handline through a window, or other "fast attack" methodology.

- Venting the room to allow hot gases to escape before they can cause the ignition of other materials in the room.

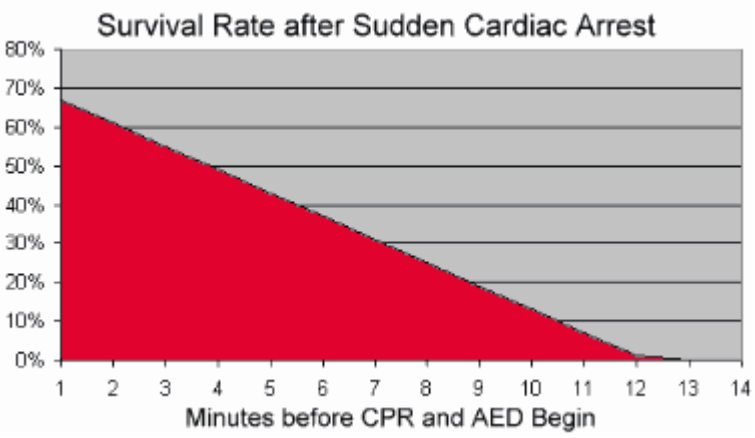
- Not venting a room – under some circumstances this will actually stifle a fire and prevent flashover from occurring.

Each of these techniques requires the rapid response of appropriately trained fire suppression resources that can safely initiate these actions. In the absence of automatic fire suppression systems, access to interior fires can again be limited by a safety requirement related to staffing levels. OSHA and related industry standards require the presence of at least 2-firefighters on the exterior of a building before entry can be made to a structure in which the environment has been contaminated by a fire. In the absence of a threat to life demanding immediate rescue, interior fire suppression operations are

limited to the extent a fire service delivery system can staff, to assuring a minimum of 4-people actively involved in firefighting operations.

2. Emergency Medical Services

The second issue to consider is the delivery of emergency medical services. One of the primary factors in the design of emergency medical systems is the ability to deliver basic CPR and defibrillation to victims of cardiac arrest. The graph below, demonstrates the survivability of cardiac patients as related to time from onset:



This graph illustrates that the chances of survival of cardiac arrest diminish approximately 10% for each minute that passes before the initiation of CPR and/or defibrillation. These dynamics are the result of extensive studies of the survivability of patients suffering from cardiac arrest. While the demand for services in EMS is wide ranging, the survival rates for full-arrests are often utilized as benchmarks for response time standards as they are more readily evaluated because of the ease in defining patient outcomes (a patient either survives or does not). This research results in the recommended objective of provision of basic life support within 4-minutes of notification and the provision of advanced life support within 8 minutes of notification. Considering the response time continuum, the response time goal for emergency services is to provide BLS within 6 minutes of the onset of the incident (including detection, dispatch and travel time) and ALS within 10 minutes. This is often used as the foundation for a two-tier system where fire resources function as first responders with additional (ALS) assistance provided by responding ambulance units and personnel.

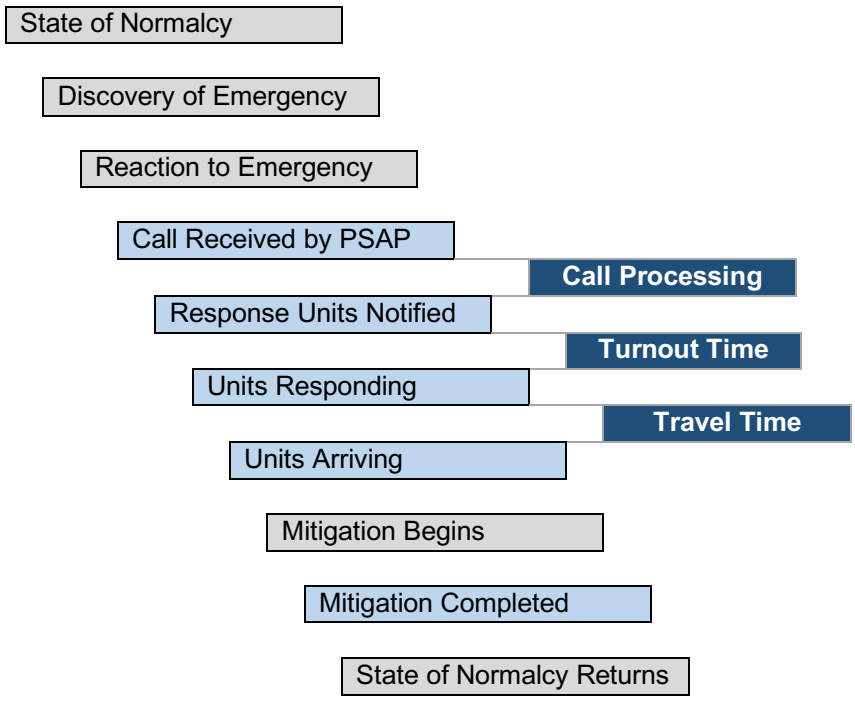
Additionally, recent research is beginning to show the impact and efficacy of rapid deployment of automatic defibrillators to cardiac arrests. This research – conducted in King County (WA), Houston (TX) and as part of the OPALS study in Ontario, Canada – shows that the AED can be the largest single contributor to the successful outcome of a

cardiac arrest – particularly when accompanied by early delivery of CPR. It is also important to note that these medical research efforts have been focused on a small fraction of the emergency responses handled by typical EMS systems – non-cardiac events make up the large majority of EMS and total system responses and this research does not attempt to address the need for such rapid (and expensive) intervention on these events.

3. Response Time Goals and Objectives

Response time to an emergency or call for assistance has been broken down into measurable and non-measurable segments. The response time continuum begins when the state of normalcy changes to a recognizable emergency. The following chart outlines the cascade of events that occurs once an emergency starts or is recognized. Those highlighted points represent hard data or that which is quantitative versus soft data or that which is subjective and unknown.

Response Time Continuum



The highlighted points in the chart above represent three segments that can be used for evaluation; call processing, turnout time, and travel time. Each of these components represent a different point in the response time continuum and through their measurement and evaluation areas for improvement can be identified. Below are the definitions for the three components:

- Call Processing is the defined as beginning when the call taker answers the call and ends with the dispatching of appropriate emergency services.

- Turnout Time is defined as beginning when the emergency service receives the call and is on the apparatus responding (wheels rolling) to the call.

- Travel Time is defined as beginning when the apparatus and personnel begin the response (wheels rolling) and ends once on location of the emergency (wheels stopped).

The National Fire Protections Association (NFPA), Center for Publics Safety Excellence (CPSE), and the Insurance Services Office (ISO) offered reference points for communities to follow relative to fire service responses, however, only NFPA 1710 offers any specificity. It is important to note that the performance objectives (in terms of response times) provided in the NFPA 1710 document are derived from the basic research previously described. These include the following (all are taken from section 4.1.2.1 of NFPA 1710):

- One minute four seconds (64 seconds) for the processing of an incoming emergency phone call, including the completion of the dispatching of fire response units.

- "One minute twenty seconds (80 seconds) for turnout time for fire related incidents." This is also called reflex time, reaction time, "out-the-chute" time, etc. This is the time that elapses between dispatch and when the units are actively responding.

- "One minute (60 seconds) for turnout time for emergency medical incidents." This is also called reflex time, reaction time, "out-the-chute" time, etc. This is the time that elapses between dispatch and when the units are actively responding.

- "Four minutes (240 seconds) or less for the arrival of the first arriving engine company at a fire suppression incident and / or 8 minutes (480 seconds) or less for the deployment of a full first-alarm assignment at a fire suppression incident."

- "Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher-level capability at an emergency medical incident."

- "Eight minutes (480 seconds) or less for the arrival of an advanced life support unit at an emergency medical incident, where this service is provided by the fire department."

- In section 4.1.2.4, NFPA 1710 goes on to state: "The fire department shall establish a performance objective of not less than 90 percent for the achievement of each response time objective specified in 4.1.2.1"

It is important to note the "and / or" found in the initial response objective statement. This indicates that a system would meet the intent of the standard if it can reasonably plan to deliver either the single unit, 4-minute travel time standard, the first alarm, 8-minute travel time standard, or both. It should also be noted that it is implied that the total time allotted is additive with each successive event. For example, a system which arrived on-scene in 6-minutes or less 90% of the time (from time of dispatch) would be in compliance – even if the turnout time was longer than a minute (though that should clearly be improved).

It is also critical to note that these time objectives apply to emergency calls for service – there is nothing in NFPA 1710 (nor in any other objective) that suggests that communities cannot establish a differential response to calls for service determined to be non-emergency in nature.

Previously the Center for Public Safety Excellence had defined benchmark and baseline response times for each of the three components. They have since determined they are not a standard making organization and decided to leave the establishment of response time standards to others. However, their body of work is significant and has been used by numerous communities across the country and is included here.

The Center for Public Safety Excellence (CPSE) uses a population and density component to determine what the performance of the fire department should be to meet best practices and does not require a set number of personnel per piece of apparatus, but rather that an effective response force can be delivered to an emergency scene in a timely manner. The table below defines the population demographics as it relates to the delivery of emergency services.

Demographic Risk Categories	
Risk Category	**Definition**
Urban	An area with a population density greater than 1,000 people per square mile.
Suburban Area	An area with a population density of 500 - 1,000 people per square mile.
Rural Area	An area with a population density of less than 500 people per square mile.

The expression of response time has changed. In years past the measurement was expressed as an average of time. This essentially represents how the system or

department is performing 50% of the time and is not a true reflection of how a department is performing. With the research that has been performed in developing performance standards and practices the use of fractal time has become the best practice in the measurement and presentation of response time components. Fractal response time measures how often (as a percent of calls) a department can perform within each response time component. The NFPA and CPSE use the 90th percentile as the standard to meet for benchmark and baseline criteria.

The definitions for the criteria of each service area are defined in the table below. CPSE also gives a community a range of acceptable performance standards from "Baseline", minimally accepted performance to "Benchmark", fully compliant with best practices. CPSE had previously set the following performance standards for urban, suburban and rural areas:

Service Area / Population Density Response Travel Time Standards				
Urban: Population density of over 1,000 per square mile				
	1st Unit	**2nd Unit**	**1st Alarm Balance**	**Performance**
Benchmark	4 minutes	8 minutes	8 minutes	90%
Baseline	5 minutes/12 seconds	10 minutes 24 seconds	10 minutes/24 seconds	90%
Suburban: Population density between 500 and 1,000 per square mile				
Benchmark	5 minutes	8 minutes	10 minutes	90%
Baseline	6 minutes/30 seconds	10 minutes/24 seconds	13 minutes	90%
Rural: Population density of less than 500 per square mile				
Benchmark	10 minutes	14 minutes	14 minutes	90%
Baseline	13 minutes	18 minutes/12 seconds	18 minutes/12 seconds	90%

4. Effective Response Force

There are several tasks, which must occur simultaneously to adequately combat different types of fires. The absence of adequate personnel to perform these tasks requires each task to be prioritized and completed in chronological order. These fire ground tasks include command, scene safety, search and rescue, water supply, fire attack, pump operations, ventilation, back up, and rapid intervention.

An initial full alarm assignment should be able to provide personnel to accomplish the following tasks:

- Establish incident command outside of the hazard area. This will allow coordination and direction of the incoming emergency response personnel and apparatus. A minimum of one person should be dedicated to this task.

- Establish an uninterrupted water supply of at least 400 gallons per minute for 30 minutes. Once established the supply line can be maintained by the pump operator to ensure uninterrupted water supply. A minimum of one person is assigned to this task that can then assume support role.

- Establish an effective water flow rate of 300 gallons per minute. This will be supplied to a minimum of two hand lines each operating at a minimum flow of 100 gallons per minute. Each hand line must have two individuals assigned with one serving as the attack line and the other as a back-up line.

- Provision of one support person to handle the hydrant hookup, utility control, forcible entry, and assist in deploying fire hose lines.

- Establish a search and rescue team. Each team will consist of a minimum of two.

- Establish a ventilation team. Each team will consist of a minimum of two personnel.

- Establish an initial rapid intervention team (RIT). Each RIT team shall consist of a minimum of two properly trained and equipped personnel.

Critical tasking will vary depending on the size and nature of the incident. The Center for Public Safety Excellence (CPSE) provides a suggestive list of tasks that need to be completed at a fire situation based on the risk. A similar list is provided within the NFPA 1710 document. The CPSE analysis, from the 8th edition, is summarized in the table below showing the minimum required personnel to mitigate the initial emergency response requirements by occupancy risk:

Critical Tasks for the Effective and Efficient Control of Structural Fires				
Critical Task	**Maximum Risk**	**High Risk**	**Moderate Risk**	**Low Risk**
Attack Line	4	4	4	2
Search and Rescue	4	2	2	0
Ventilation	4	2	2	0
Backup Line	2	2	2	2
Rapid Intervention	2	2	0	0
Pump Operator	1	1	1	1
Water Supply	1*	1*	1*	1*
Support (Utilities)	1*	1*	1*	1*
Command	1	1	1	1
Safety Officer	1	1	1	1
Salvage/Overhaul	2	0	0**	0
Command Aid	1	1	0	0
Operations Chief	1	1	0	0
Logistics	1	0	0	0
Planning	1	0	0	0
Staging Officer	1	1	0	0
Rehabilitation	1	1	0	0
Division Supervisors	2	1	0	0
High-rise Evacuation	10	0	0	0
Stairwell Support	10	0	0	0
Total Personnel	**50-51**	**21-22**	**14-15**	**8-9**

*Tasks can be performed by the same individual **Task can be performed by the attack crew

It is interesting to note that the four-person companies discussed in some areas of NFPA 1710 are not maintained in the description of primary tasks to be accomplished on the fire ground – recognition that the requirements of the response in the field are dynamic and do not fit neatly into size and shape of any particular response configuration. These objectives apply to the initial and follow-up response for reported structure fires. The document does not suggest that this response be mounted for all incidents.

A task analysis for emergency medical calls analyzes three different types of calls or patient conditions. These three types of calls usually require the most effort on the part of the response team. Other calls or patient types can generally be handled with two or three personnel. Many times, especially in trauma calls, there are multiple patients. The table below outlines the tasks for handling these critical patients and the number of responders it may require for a successful outcome.

Critical Tasks for Effective Patient Care			
Critical Task	**Cardiac Arrest**	**Stroke**	**Multi-System Trauma**
Patient Assessment	2 per patient	2 per patient	2 per patient
Airway Management/Intubation	2 per patient	2 per patient	2 per patient
Cardiac Defibrillation	1	N/A	N/A
CPR	1	N/A	N/A
EKG Monitoring	1	1	1
IV/Pharmacology	1	1	1
Splint/Bandage/Immobilization	N/A	N/A	1
Patient Lifting/Packaging	2 – 4	2 – 4	2 – 4
Medical Information Collection	1	1	1

It is incumbent upon the fire department to have a response plan in place to ensure enough personnel are on scene to accomplish the stated critical tasks in a timely fashion. Structure fires are very labor-intensive incidents with any number of factors, such as weather, making the task that much more difficult.

Adding to the critical tasks and staffing issues is the OSHA requirement of two in – two out in 1910.134(g)(4). This regulation states that if entry into an Immediately Dangerous to Life and Health (IDLH) atmosphere is necessary, two firefighters must enter together and remain in contact with each other. In addition, there must be two firefighters located outside the IDLH atmosphere for potential rescue if needed. This is a mandatory requirement.

The concept of an effective response force carries through for other responses by the fire department. The tables below outline the critical tasks for an effective response force for those responses.

Critical Tasks for Hazardous Materials		
Critical Task	**High Risk**	**Low Risk**
Command/Safety	2	1
Liaison	1	1
Decontamination	4	4
Research Support	2	1
Team Leader, Entry Team, Backup Team	6	6
Total Personnel	**15**	**13**

Critical Tasks for Initial Wildland Urban Interface Fires		
Critical Task	**No Hydrants**	**w/Hydrants**
Command/Safety	1	1
Pump Operations	1	1
Attack Line	2	2
Structure Protection	3	2
Water Supply	1	0
Tender Operator	2	0
Exposure Lines	2	0
Total Personnel	**12**	**6**

Critical Tasks for Motor Vehicle Accident		
Critical Task	**No Entrapment**	**With Entrapment**
Scene Management/Documentation	1	
Patient Care/ Extrication	2	
Command/ Safety		1
Scene Management		1
Patient Care		2
Extrication		3
Pump Operator/Suppression Line		2
Vehicle Stabilization		2
Total Personnel	**3**	**11**

Critical Tasks for Technical Rescue Incidents				
Critical Task	**Swift Water**	**High/Low Angle**	**Confined Space**	**Trench**
Command/Safety	1	1	2	2
Rescue Team	3	2	2	2
Backup Team	2	2	2	2
Patient Care	2	2	2	3
Rope Tender	2	0	0	0
Upstream Spotter	2	0	0	0
Downstream Safety	2	0	0	0
Rigger	0	1	1	0
Attendant	0	1	1	0
Ground Support	0	4	4	0
Edge Person	0	1	0	0
Shoring	0	0	0	5
Total Personnel	**14**	**14**	**14**	**14**

6 Evaluation of Deployment and Performance

This chapter compares and evaluates the deployment and performance of the Fire Department as it relates to the performance objectives outlined and described in the previous chapter.

1. Response Time

Computer Aided Dispatch (CAD) data for 2015, 2016, and 2017 was examined and evaluated. The data is not without issues such as coding problems, transcription errors, and equipment failures. The project team uses the following mechanism to address these issues.

Only qualified data is used to calculate response time and any related components. To be considered the data must meet the following criteria:

- The incident must have been unique
- The incident must have involved at least one fire department unit being dispatched to the call.
- Calls that are missing data are not used in the computations for call processing, turnout time, travel time, or call duration.
- Any call with usually long times or times sorted incorrectly (arrived before dispatch time) were removed.
- Non-emergency responses are removed, only emergency responses are included.

After filtering the data using the methodology outlined above, the remaining incidents represent the response time for calls for service handled by the Fire Department.

2. Call Processing

The Solano County Sheriff's Office provides dispatch services and is the public safety answering point (PSAP) for the Dixon Fire Department. This dispatch system also provides dispatch services for four law enforcement agencies and seven fire departments/districts. Additionally, they handle after-hours calls for several other county services such as animal control, coroner, roads, and public works. Minimum staffing is two dispatchers on-duty with the potential for three on-duty depending on scheduling issues.

NFPA 1221 Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems establishes the call processing benchmarks as outlined in the chart below.

NFPA 1221 Time Requirements		
Component	**Target**	**Performance**
Calls Answered	Within 15 seconds	95%
	Within 40 seconds	99%
Call Processing	Within 64 seconds	90%
	Within 106 seconds	95%
Call Processing for: * EMD * Language Translation * TTY/TDD Device Services	Within 90 seconds	90%
* Hazardous Materials * Technical Rescue * Text Message * Unable to Determine Location	Within 120 seconds	99%

Additionally, NFPA 1710: Objective for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments in section 4.1.2.1 provides a benchmark call processing time: One minute four seconds (64 seconds) for the processing of an incoming emergency phone call, including the completion of the dispatching of fire response units.

The table below illustrates the performance of the dispatch center for Dixon Fire Department.

Call Processing							
System Performance							
	Benchmark	**2016**		**2017**		**2018**	
		Performance	**Variance**	**Performance**	**Variance**	**Performance**	**Variance**
All Calls	1:04 / 90%	2:58	1:54	2:58	1:54	2:31	1:27
	Avg.:	2:01		1:59		1:30	

The times are shown in two formats, the average and the 90th fractal time. The average response time is an average of the call processing time for the calls evaluated. The benchmark time shown is a measurement using a 90% fractal time and represents the goal or industry best practice. For example, the call processing time benchmark is 64 seconds at 90% of the time and in 2017 the call processing time was 2:58 90% of the time. The column marked as variance represents the difference between the benchmark and the actual performance. For example, in 2017 the dispatch center was 1 minute and 54 seconds over the benchmark of 1 minute and 4 seconds. The same information was updated to illustrate the call processing performance for 2018. The following table illustrates the call processing performance in 2018.

3. Turnout Time

Turnout time is a measurable time segment that begins when the emergency service receives the call and is on the apparatus responding (wheels rolling) to the call. NFPA 1710: Objective for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments in section 4.1.2.1.1 provides the following performance objectives for turnout time:

- "One minute twenty seconds (80 seconds) for turnout time for fire and special operations."
- "One minute (60 seconds) for turnout time for emergency medical services."

The table below illustrates the performance of the Dixon Fire Department for turnout time.

Turnout Time							
System Performance							
	Benchmark	2016		2017		2018	
		Performance	Variance	Performance	Variance	Performance	Variance
EMS Calls	1:00 / 90%	2:28	1:28	2:20	1:20	2:45	1:45
	Avg.:	1:32		1:31		1:44	
Fire Related Calls	1:20 / 90%	2:39	1:19	2:54	1:34	2:58	1:38
	Avg.:	1:43		1:52		2:29	

The times are shown in two formats, the average and the 90th fractal time. The average response time is an average of the turnout time for the calls evaluated. The benchmark time shown is a measurement using a 90% fractal time and represents the goal or industry best practice. For example, the turnout time benchmark is 60 seconds at 90% of the time for emergency medical calls and the Dixon Fire Department has a turnout time of 2:20 90% of the time in 2017. The column marked as variance represents the difference between the benchmark and the actual performance. For example, in 2017 the department was 1 minute and 20 seconds over the benchmark of 1 minute.

There have been numerous national discussions about the measurement of turnout time as it relates to the benchmark times shown above. These discussions have centered around the ability of the personnel to safely disengage from non-emergency tasks and move to an emergency response. Adding to the discussion is the design of a fire station and the ease of accessing the apparatus and the time of day. While the discussion continues about this measurement, the table below illustrates the turnout time as a baseline using the same principles as the baseline travel time or 70% of the benchmark time. For example, the benchmark time of 60 seconds for medical calls will have a

baseline time of 78 seconds.

Turnout Time							
System Performance							
	Baseline	2016		2017		2018	
		Performance	Variance	Performance	Variance	Performance	Variance
EMS Calls	1:18 / 90%	2:28	1:10	2:20	1:02	2:45	1:27
	Avg.:	1:32		1:31		1:44	
Fire Related Calls	1:44 / 90%	2:39	0:55	2:54	1:10	2:58	1:14
	Avg.:	1:43		1:52		2:29	

The times are shown in two formats, the average and the 90th fractal time. The average response time is an average of the turnout time for the calls evaluated. The baseline time shown is a measurement using a 90% fractal time. For example, the turnout time baseline is 1 minute 18 seconds at 90% of the time for emergency medical calls and the Dixon Fire Department has a turnout time of 2:20 90% of the time in 2017. The column marked as variance represents the difference between the baseline and the actual performance. For example, in 2017 the department was 1 minute and 2 seconds over the baseline of 1 minute 18 seconds.

4. Distribution of Resources

Distribution is the measure of getting initial resources to an emergency to begin mitigation efforts. This is measured in a variety of ways including percentage of square miles, percentage of road miles and travel time. The Insurance Services Office (ISO) has used road miles for many years. With the advent of GIS technology and improved computer aided dispatch (CAD) systems, the use of actual travel time is another more accurate measure for the distribution of resources.

Travel time is a measurable time segment that begins when the apparatus and personnel begin the response (wheels rolling) and ends once on location of the emergency (wheels stopped). NFPA 1710: Objective for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments in section 4.1.2.1 provides the following performance objectives for travel time of the first arriving unit for an urban setting:

- “Four minutes (240 seconds) or less for the arrival of the first arriving engine company at a fire suppression incident.”

- “Four minutes (240 seconds) or less for the arrival of a unit with first responder or higher-level capability at an emergency medical incident.”

The performance measures shown above are benchmark travel times. These times represent the industry best practices. The baseline performance measure is generally defined as the travel time the fire department is currently achieving and is acceptable to the community. For Dixon, the baseline was established using 70% of the benchmark travel time or 5 minutes and 12 seconds for an urban setting.

The table below illustrates the travel time for initial arriving unit of the Dixon Fire Department.

Travel Time							
System Performance for City of Dixon							
	Objective	2015		2016		2017	
		Performance	Variance	Performance	Variance	Performance	Variance
Benchmark	4:00 / 90%	5:25	1:25	5:12	1:12	5:28	1:28
Baseline	5:12 / 90%		0:13		0:00		0:15
	Avg.:	3:27		3:27		3:22	

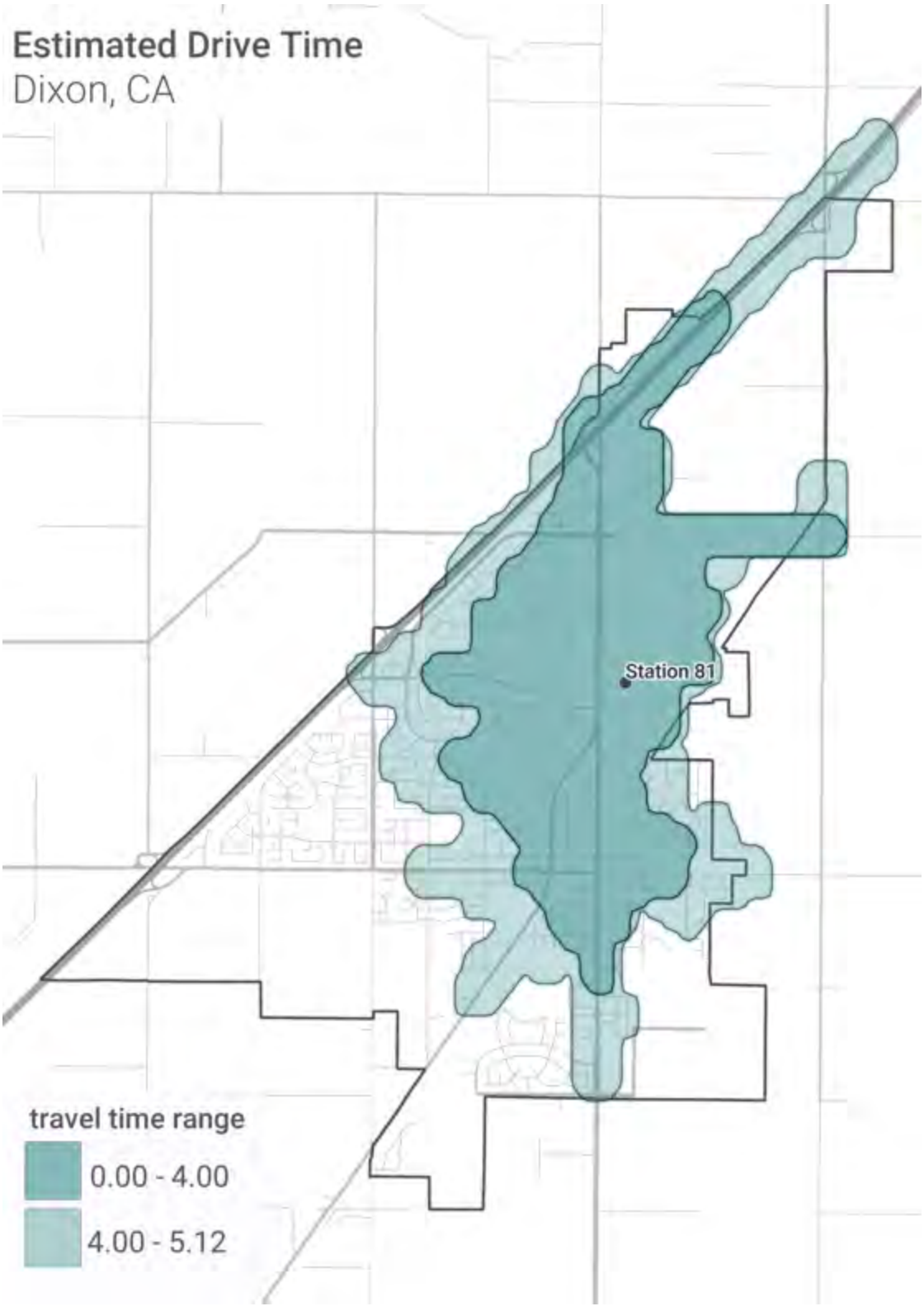
The times are shown in two formats, the average and the 90th fractal time. The average response time is an average of the travel time for the calls evaluated. The benchmark time shown is a measurement using a 90% fractal time and represents the goal or industry best practice. For example, the travel time benchmark is 4 minutes at 90% of the time for calls for service and the Dixon Fire Department has a travel time of 5:28 90% of the time in 2018. The column marked as variance represents the difference between the benchmark and the actual performance. For example, in 2018 the department was 1 minute and 28 seconds over the benchmark of 4 minute. Using the same data for 2018 the department was 15 seconds above the baseline travel time of 5 minutes 12 seconds.

The Dixon Fire Department provides services to the Dixon Fire Protection District outside the City Limits of Dixon. This area is a rural area and has different travel time benchmarks and baselines. The Center for Public Safety Excellence (CPSE) has defined the travel time benchmark as 10 minutes for the first arriving unit and a baseline travel time of 13 minutes. The table below illustrates the travel time for initial arriving unit of the Dixon Fire Department for Fire District calls.

Travel Time							
System Performance for Dixon Fire Protection District							
	Objective	**2016**		**2017**		**2018**	
		Performance	**Variance**	**Performance**	**Variance**	**Performance**	**Variance**
Benchmark	10:00	14:37	4:37	14:21	4:21	14:25	4:25
Baseline	13:00		1:37		1:21		1:25
	Avg.:	9:27		9:45		10:44	

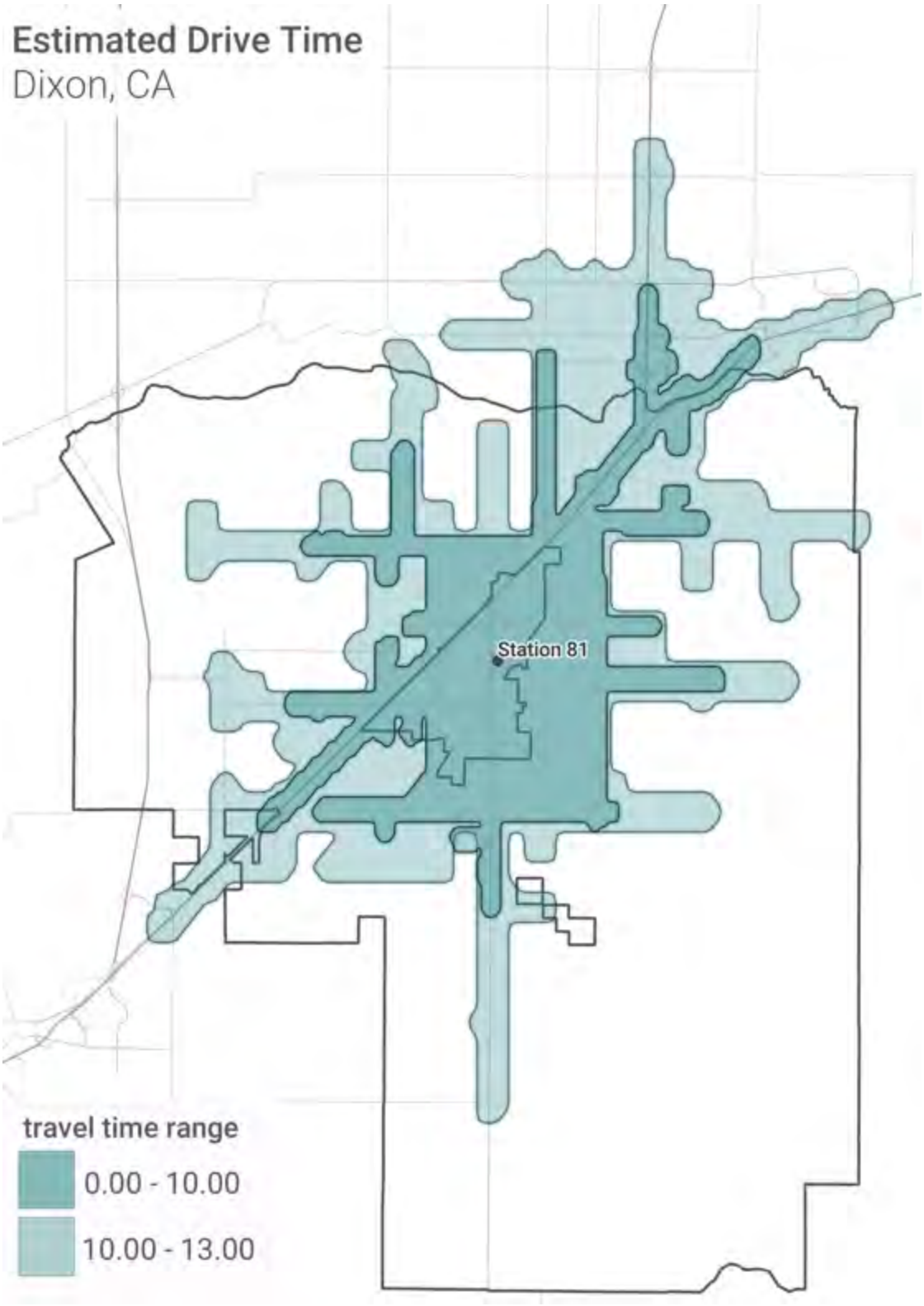
The times are shown in two formats, the average and the 90th fractal time. The average response time is an average of the travel time for the calls evaluated. The benchmark time shown is a measurement using a 90% fractal time and represents the goal or industry best practice. For example, the travel time benchmark is 10 minutes at 90% of the time for calls for service and the Dixon Fire Department has a travel time of 14:25 90% of the time in 2018. The column marked as variance represents the difference between the benchmark and the actual performance. For example, in 2018 the department was 4 minutes and 25 seconds over the benchmark of 10 minutes. Using the same data for 2018 the department was 1 minute and 25 seconds over the baseline travel time of 13 minutes.

The map below provides a spatial view of the travel time for the urban demographic using the current fire station location.



Based on this map the southern and western sections of the City is outside the baseline travel time of 5 minutes 12 seconds. A review of the actual performance for the past three years indicates the travel time is within the benchmark and baseline performance objectives. However, the call density is occurring in the central section of the City. As the City continues to grow and the call density moves the travel time will likely become extended.

The map below provides a spatial view of the travel time for the rural demographic using the current fire station location.



The areas in the Fire District area that are within the performance objectives are those areas immediately surrounding the City and to areas that have good roadway networks.

5. Concentration

Concentration is generally described as the ability of the fire department to get the appropriate number of personnel and resources to the scene of an emergency to effectively mitigate the incident. There are two parts to this component which is an effective response force and the amount of time to get the resources in place.

(1) First Alarm Assignment Travel Time

The first part to the concentration model is the travel time for the remainder of the first alarm assignment. The concentration of resources is necessary to ensure the effective response force arrives in a timely manner. Much like the distribution of resources, the concentration is dependent on the population density. It is not reasonable or financially possible for a rural area to have the same concentration of resources that is in an urban setting.

Travel time is a measurable time segment that begins when the apparatus and personnel begin the response (wheels rolling) and ends once on location of the emergency (wheels stopped). NFPA 1710: Objective for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments in section 4.1.2.1.1 provides the following performance objectives for travel time of the first arriving unit:

- "Eight minutes (480 seconds) or less for the deployment of a full first-alarm assignment at a fire suppression incident."

The performance measures shown above are benchmark travel times. These times represent the industry best practices. The baseline performance measure is generally defined as the travel time the fire department is currently achieving and is acceptable to the community. Dixon does not have a baseline travel time set for the full first-alarm assignment. CPSE has previously established a baseline travel time of 10 minutes and 24 seconds for the full first alarm assignment for urban areas and 18 minutes and 12 seconds for rural areas. For purposes of evaluation these travel times will be used.

(2) Effective Response Force

As noted previously, there are several tasks which must occur simultaneously to

effectively control and extinguish a fire. The size of the response force is dependent on the size, occupancy, and type of structure. The absence of adequate personnel to perform these tasks requires each task to be prioritized and completed in a chronological order instead of simultaneously. These fire ground tasks include command, scene safety, search and rescue, water supply, fire attack, pump operations, ventilation, back up, and rapid intervention. The table below illustrates the simultaneous tasks to be completed for a moderate risk fire and the assignments for the Dixon Fire Department with the current available resources. A moderate risk fire is considered to be a 1,500 to 2,000 square feet single family home and typically a one room involved fire.

Critical Task Assignments		
Critical Task	**Needed Personnel**	**Assignment**
Attack Line	2	2 (E81)
Backup Line	2	2 (E281)
Rapid Intervention Team	2	2 (Automatic Aid)
Search and Rescue	2	
Ventilation	2	
Pump Operator	1	1* (E81)
Water Supply	1	1* (E81)
Support (Utilities)	1	1 (Automatic Aid)
Command	1	1 (B81 - Duty Chief)
Safety Officer	1	
Total Personnel	**15**	**9**

*Task can be performed by the same individual

The assignments in the table above are for illustrative purposes, actual assignments will differ depending on the situation. However, based on the current resources there are currently insufficient personnel responding to a structure fire to perform the critical tasks simultaneously. Completing the assignments in a chronological order may allow the fire to increase in intensity causing more damage, resulting the need for additional resources, and increasing the risk of injury to the responding personnel.

(3) Evaluation of the Concentration of Resources

Computer Aided Dispatch (CAD) data for 2015, 2016, and 2017 was examined and evaluated for the table below. To be considered for inclusion the following conditions were required to be met:

- The incident must have building fire as the incident type.
- All the units dispatched must have an enroute time and an arrival time recorded. It was assumed if the unit did not arrive on scene that it was cancelled.

To be considered as meeting the concentration both the travel time and a minimum of 14 personnel had to arrive on location. The staffing of the Dixon Fire Department provides for a minimum of five (5) personnel per shift and a Duty Chief. Vacaville Fire Department provides automatic aid to Dixon with one Engine Company and three (3) personnel. Based on this staffing model, nine (9) personnel would be assigned to the first alarm assignment and does not meet the fourteen (14) personnel minimum established by the critical task analysis for a moderate risk structure fire.

The table below illustrates the structure fire calls in the City in terms of the distribution of resources. For concentration, the calls examined did not meet the personnel requirement.

Dixon City		Distribution			Concentration	
Date	Number of Incidents	Benchmark 4:00	Baseline 5:12		Benchmark 8:00	Baseline 10:24
2015	12	58.30%	66.70%		0.00%	0.00%
2016	13	61.50%	100.00%		0.00%	0.00%
2017	16	75.00%	75.00%		0.00%	0.00%
2018	11	63.64%	81.82%		0.00%	0.00%

In 2018 63.6% of the calls met the benchmark travel time and 81.8% met the baseline travel time for the first arriving unit.

The table below illustrates the structure fire calls in the Fire District in terms of distribution of resources. For concentration, the calls examined did not meet the personnel requirement.

Dixon District		Distribution			Concentration	
Date	Number of Incidents	Benchmark 10:00	Baseline 13:00		Benchmark 14:00	Baseline 18:12
2015	6	100.00%	100.00%		0.00%	0.00%
2016	3	100.00%	100.00%		0.00%	0.00%
2017	8	87.50%	100.00%		0.00%	0.00%
2018	5	40.00%	80.00%		0.00%	0.00%

In 2018 40% of the structure fire calls met the benchmark travel time and 80% met the baseline travel time for the first arriving unit.

6. Concurrent Calls and Reliability

The concept of distribution and concentration of resources can be influenced by other contributing factors including unit hour utilization and concurrent calls for service. Unit hour utilization is calculated by taking the total hours the unit is committed to an incident divided by the total available hours. Expressed as a percentage, it identifies the amount of time the unit is committed but more importantly the amount of time the unit is available. Within the framework of the 90th percentile performance standards the amount of available time can have an impact in meeting that standard. If utilization rates are too high the units are often unavailable for immediate response.

The table below illustrates the unit hour utilization for the past three years.

Unit Hour Utilization									
Unit	2016			2017			2018		
	Duration	Pct. of Time	Avg.	Duration	Pct. of Time	Avg.	Duration	Pct. of Time	Avg.
Engine 81	466:45:40	5.33%	32:11	531:38:31	6.07%	32:02	409:21:45	4.67%	25:37
Engine 281	416:05:14	4.75%	22:59	491:16:12	5.61%	23:14	519:05:42	5.93%	21:37

The units shown are not overutilized as the highest utilization rate over the 3 year period is 6.07% with the average time per call in the range of twenty-one to thirty-two minutes. The table below illustrates the number of concurrent calls for the past three years.

Concurrent Calls for Service						
Calls	**2015**	**2016**	**2017**	**2018**	**Total**	**%**
1	1,315	1,190	1,592	1,743	5,840	63.78%
2	363	502	568	735	2,168	23.68%
3	122	217	117	306	762	8.32%
4	79	71	19	104	273	2.98%
5	12	12	7	25	56	0.61%
6+	13	11	17	16	57	0.62%
Total	**1,904**	**2,003**	**2,320**	**2,929**	**9,156**	**100%**

Call concurrence is becoming an issue for the Department as the number of instances of multiple calls is increasing. In 2015 there were 589 instances of multiple calls occurring while that increased to 1,186 instances in 2018, approximately a 116% increase. As shown 64% of the time calls occur as a single incident with 24% of the time two incidents occurring at the same time. This means all scheduled apparatus are on emergency scenes simultaneously. Additionally, it is indicator for the increased use of mutual aid resources as Dixon resources are not available.

7 Strategic Deployment Initiatives

During the deployment analysis several opportunities for improvement were identified. This chapter provides recommendations based on the deployment of resources to calls for service in the service area.

1. Performance Objectives

Service levels for a fire protection system are usually measured using response time to calls for service. As noted previously this is due to the effects unfriendly fires can have on property and to the delivery of emergency medical services. Gaps in the service levels are generally identified using performance objectives and these objectives should be monitored on a regular basis.

Call processing, turnout time, and travel time are those response time components a fire protection system is measured. The call processing component is not in the direct control of the Fire Department however, the Department should work with the dispatch center to improve this component. The data from the dispatch center had issues as well. Of the calls reviewed in 2017, 94% had an enroute time recorded and 82% had an on-scene time recorded. There are a variety of reasons for this discrepancy including the data did not export properly from the CAD to the spreadsheet the project team received, or the dispatcher did not record the time due to other calls and issues occurring at the same time. There should be a mechanism in place to identify these issues and work to correct the problem. The table below includes the call processing performance for the past three years.

Call Processing							
System Performance							
	Benchmark	2016		2017		2018	
		Performance	Variance	Performance	Variance	Performance	Variance
All Calls	1:04 / 90%	2:58	1:54	2:58	1:54	2:31	1:27
	Avg.:	2:01		1:59		1:30	

As illustrated above, the communications center is not meeting industry standards for performance related to processing emergency calls for service. The Fire Department should work continually with the dispatch center to improve performance.

Recommendations:

Work with the Solano County Dispatch Center to improve their call processing time for emergency calls for service.

Work with the Solano County Dispatch Center to improve the accuracy of the computer aided dispatch data.

Establish call processing time benchmark performance objectives of 64 seconds for emergency calls for service 90% of the time.

Turnout time has been defined as that time from which units are notified (dispatched) until the units are responding. Creating a system to review and monitor this performance objective will not only provide direction to the personnel but also allow for any discrepancies to be addressed with the dispatch center. The table below includes the turnout time performance for the past three years.

Turnout Time							
System Performance							
	Baseline	2016		2017		2018	
		Performance	Variance	Performance	Variance	Performance	Variance
EMS Calls	1:18 / 90%	2:28	1:10	2:20	1:02	2:45	1:27
	Avg.:	1:32		1:31		1:44	
Fire Related Calls	1:44 / 90%	2:39	0:55	2:54	1:10	2:58	1:14
	Avg.:	1:43		1:52		2:29	

As illustrated above, while turnout times have improved over the past three years, the Fire Department is not meeting either benchmark or baseline performance standards for turnout times and should work to improve their performance.

Recommendations:

Establish turnout time benchmark performance objectives of 60 seconds for EMS responses and 80 seconds for fire and special operations responses 90% of the time.

Travel time has been defined as that time from which units are responding until the time those units arrive on the scene of call for service. In this service area there are two population demographics to consider. Within the City Limits of Dixon, the population density is approximately 2,886 people per square mile making this an urban demographic. About 80% of the Dixon Fire Protection District is farmland with small pockets of residential housing in the southern sections. The District is considered to be a rural

demographic. With the differences in population densities, these areas have different travel time performance objectives. The tables below illustrate the travel time for both communities for the past three years.

Travel Time System Performance for City of Dixon							
	Objective	2015		2016		2017	
		Performance	Variance	Performance	Variance	Performance	Variance
Benchmark	4:00 / 90%	5:25	1:25	5:12	1:12	5:28	1:28
Baseline	5:12 / 90%		0:13		0:00		0:15
	Avg.:	3:27		3:27		3:22	

Travel Time System Performance for Dixon Fire Protection District							
	Objective	2016		2017		2018	
		Performance	Variance	Performance	Variance	Performance	Variance
Benchmark	10:00	14:37	4:37	14:21	4:21	14:25	4:25
Baseline	13:00		1:37		1:21		1:25
	Avg.:	9:27		9:45		10:44	

As illustrated above, performance related to travel times is slightly above baseline standards, which indicates the current travel time performance is acceptable for the initial arrival of apparatus at emergency calls. The Department should continually monitor this performance to ensure they are able to maintain this performance.

Recommendations:

Establish travel time baseline performance objectives for the first arriving unit of 5 minutes 12 seconds and baseline performance objectives of 10 minutes 24 seconds for a first alarm assignment 90% of the time in the City of Dixon.

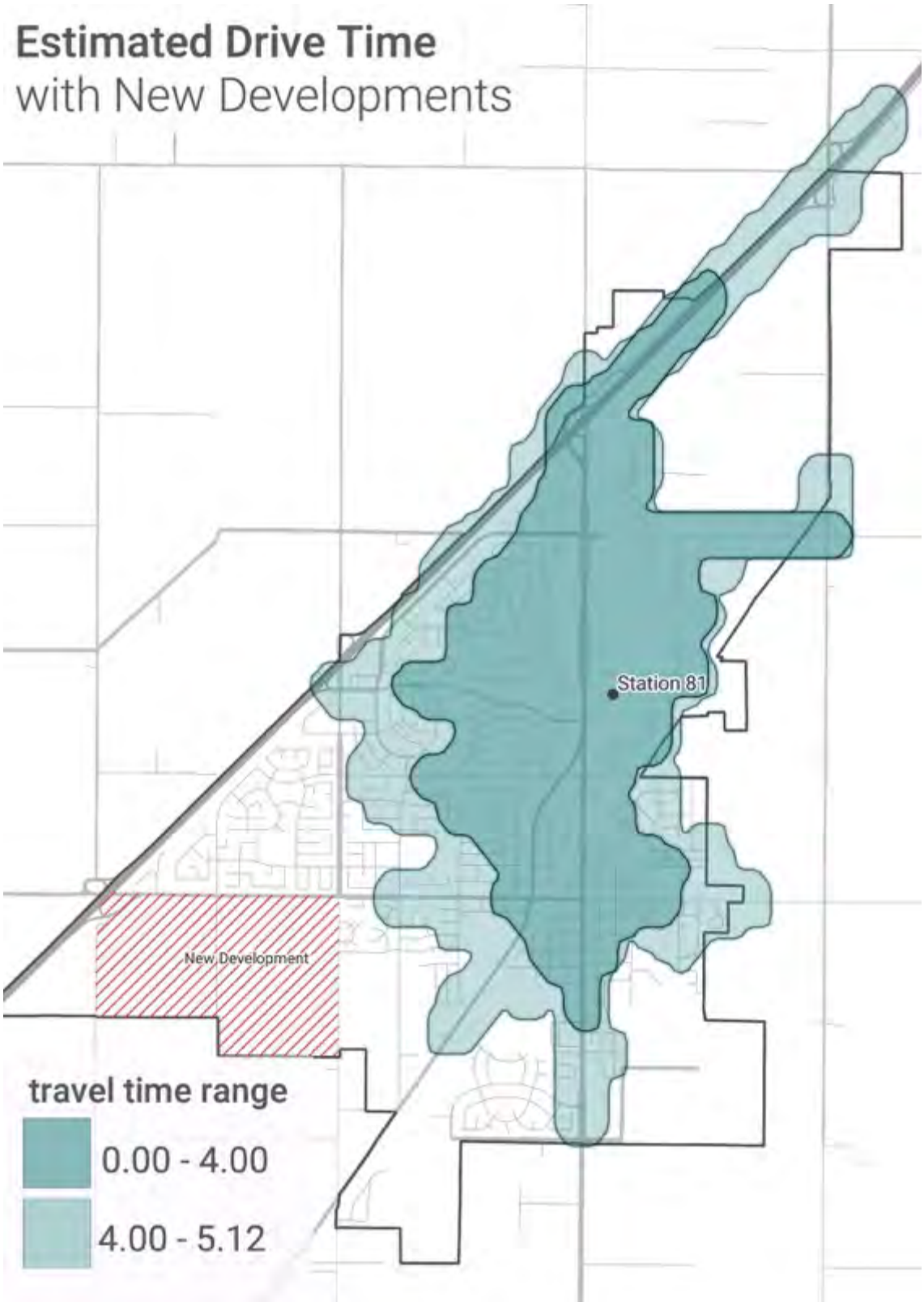
Establish travel time baseline performance objectives for the first arriving unit of 13 minutes and baseline performance objectives of 18 minutes 12 seconds for a first alarm assignment 90% of the time in the Dixon Fire Protection District.

Develop a mechanism to monitor and report the calls processing, turnout time, and travel time performance against the established benchmarks and baselines at least annually.

2. Expansion of the Fire Protection System

The deployment analysis in the previous sections have identified the concentration of resources for the fire protection system is not adequate for the services provided.

Both engine companies respond from the same station located in the north central part of the City. This creates areas in the City that are outside the travel time benchmark and baseline performance objectives. Currently the call density allows the system to perform well overall, but as development continues in the southern and western portions of the City and call volume increases in these areas this reliability will decline. The map below illustrates the travel time performance objectives.

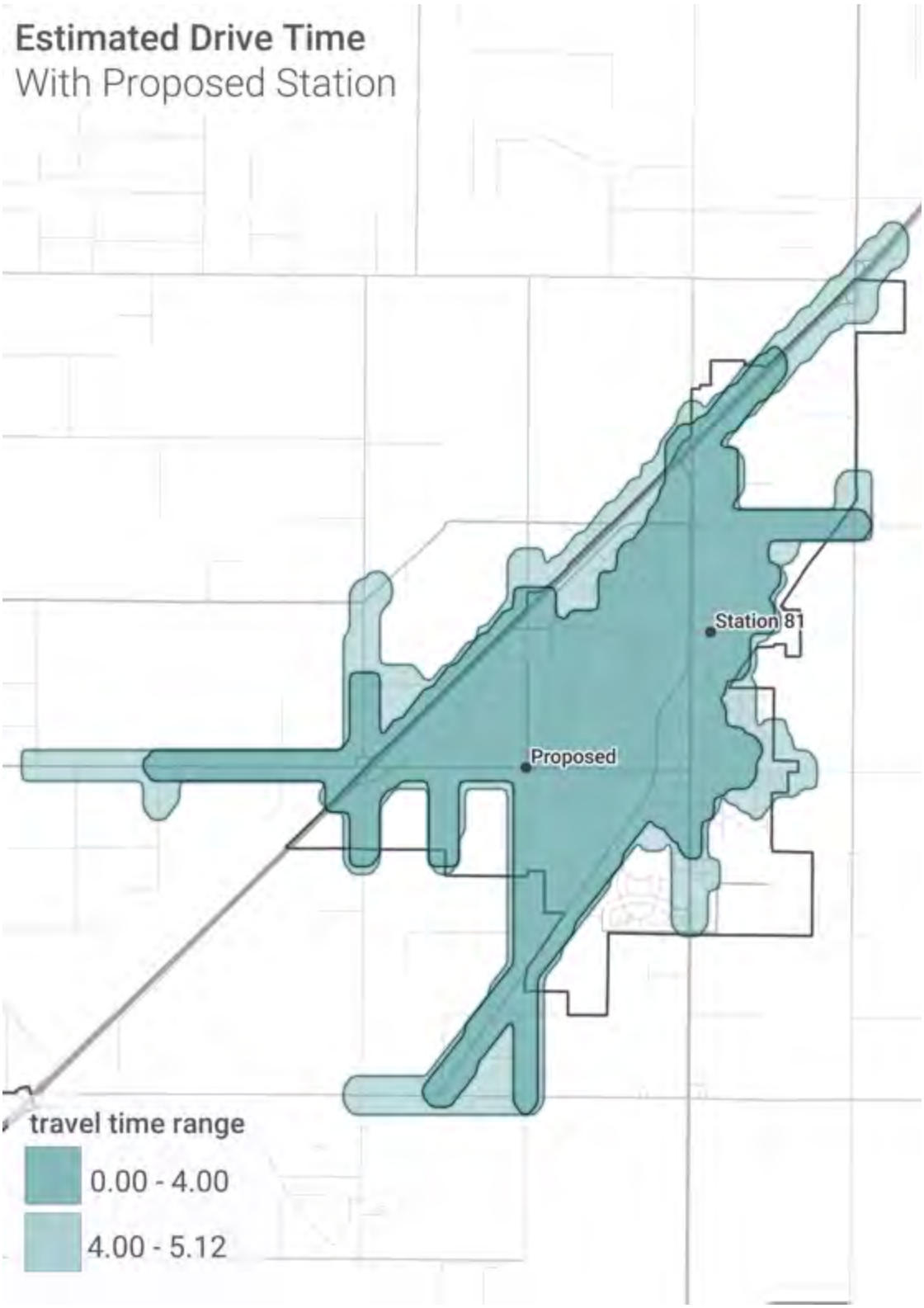


Within the City there are undeveloped areas that are now being developed, specifically in the southwest end of the City primarily with residential properties. This new development

area is shown on the map above to further illustrate the travel time issues that will likely occur once the southwest development is completed. According to City officials any interest in development outside the City is in small areas surrounding the City within their sphere of influence. The fertile agricultural land surrounding the City is another factor in any plans to expand the City Limits.

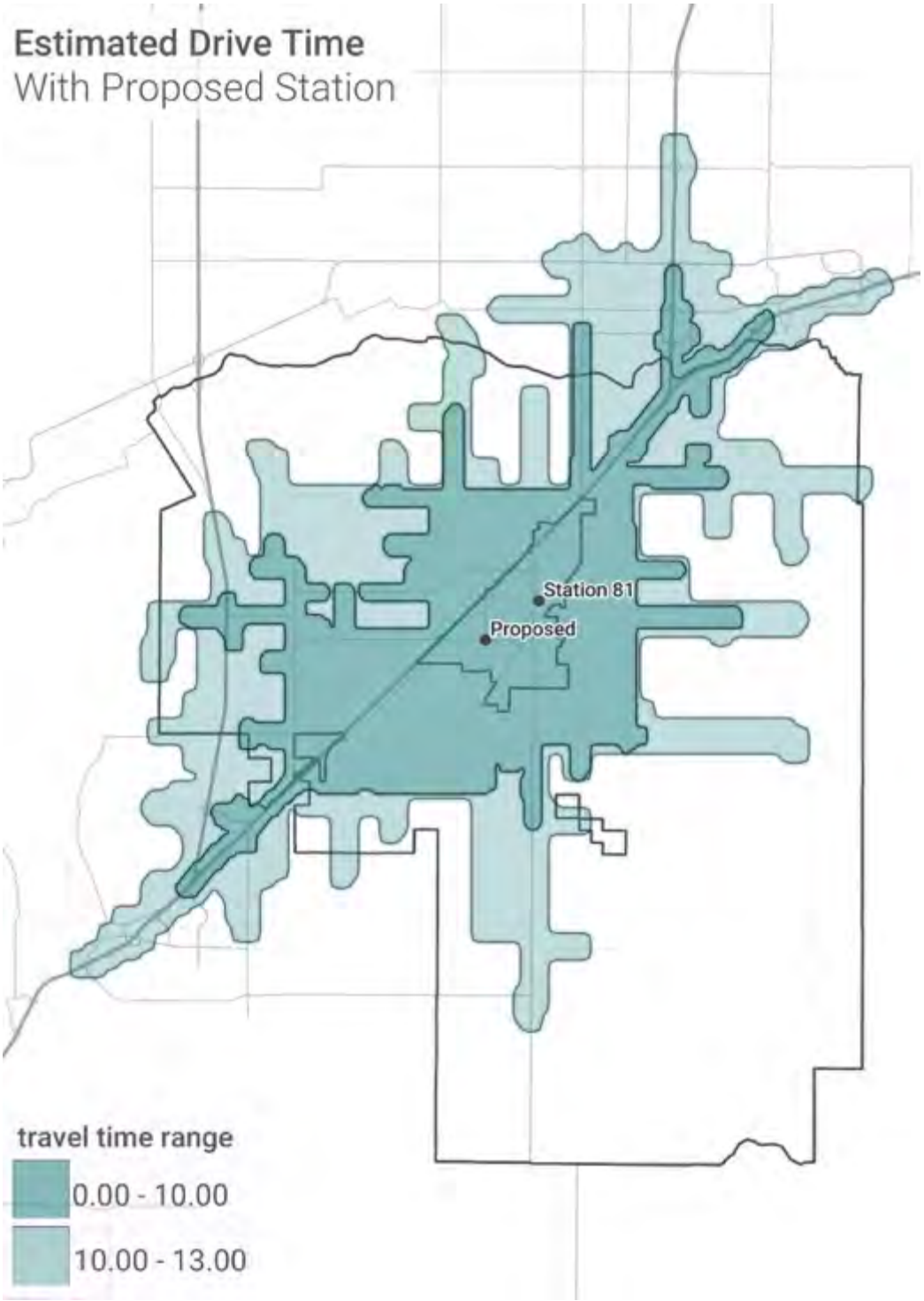
Calls for service are concentrated in the central core area of the City with pockets in the north sections. With the development of residential properties in the south, the calls for service will likely increase in the south as well. For the District, the calls for service are concentrated in the Allendale area on the west side of the District.

A second station located in the area of Pitt School Road and West A Street would improve the response time to these areas. This location also provides for the quick access to the I-80 corridor as this location is within a mile of an interchange. The map below illustrates the travel time for this station location.

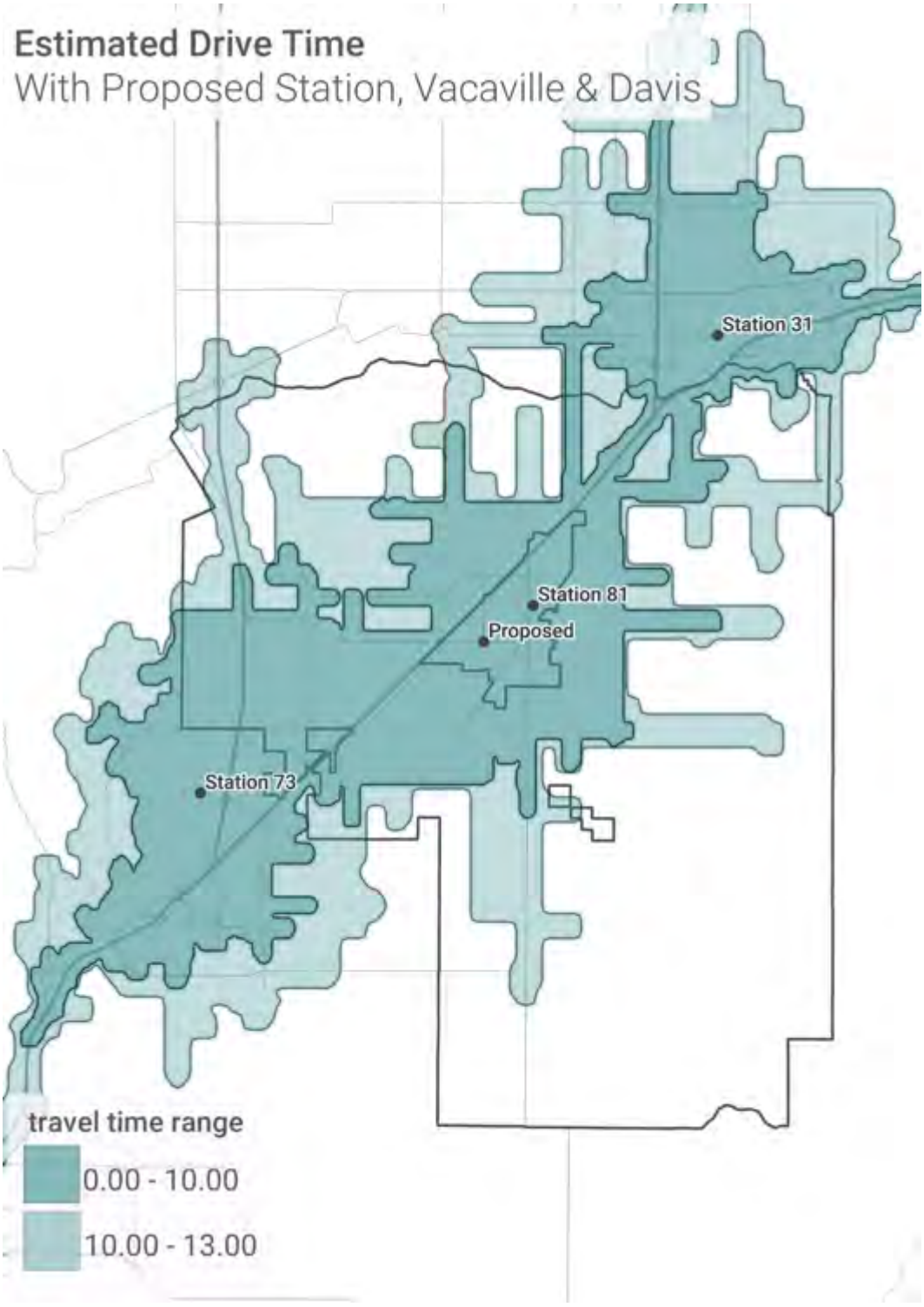


The proposed station extends the travel time performance objectives further south and west.

Travel time in the District is also improved especially in the southern and western sections. The heavier call volume for the District is in the Allendale area in the west. The map below illustrates the travel time for this station location using the travel time benchmark and baseline for the rural demographic.



To put the fire protection system into perspective, the following map illustrates the travel time using the proposed new station and including the automatic aid partners. The travel time used was the rural demographic of a 10-minute benchmark and 13-minute baseline travel time.



As illustrated, the City of Dixon is well covered in terms of travel time and the District improves especially in those areas of the heavier call volumes.

Current staffing for the Fire Department is a minimum of five (5) personnel per shift. This places three (3) personnel on one engine company and two (2) on the other engine company. The critical tasks, as outlined by the NFPA and CFAI, for a structure fire identify a minimum of 14 personnel on the first alarm assignment to mitigate the emergency in an efficient and effective manner. The fire protection system cannot meet this requirement in its current configuration. Automatic aid is available from Vacaville that provides an additional three (3) personnel bringing the total available for a first alarm assignment to eight (8) personnel which is still below the identified critical tasks. The table below illustrates the current staffing for calls for service.

Alarm Assignments and Staffing

Type of Call	Dixon Engine	Dixon Engine	Dixon Duty Chief	Vacaville Engine	Medic	Staffing Provided	Staffing Needed
Structure Fire	3	2	1	3		9	14
Auto Accident - No Entrapment	2 - 3					2/3	3
Auto Accident - with Entrapment	3	2	1			6	11
Medical Call - Critical Patient	2 - 3				2	4 - 5	9 - 11
Medical Call - Non-Critical Patient	2 - 3				2	4 - 5	2 - 5
Wildland - Non-Hydrant	3	2	1			6	12
Wildland - with Hydrants	3	2	1			6	6

The staffing needed is based on the critical tasks described in a previous section and is from the NFPA and CFAI best practices. For the medical calls, the staffing is based on those critical incidents involving cardiac arrest, strokes, and major trauma calls. Other medical calls such as difficulty breathing, or chest pains would not necessarily need that many personnel. The staffing shown for the Dixon apparatus considers the engine company that is staffed with three (3) personnel. It is possible the engine company that responds may only have two (2) personnel depending on any simultaneous events or other situations.

The staffing of fire stations, apparatus, and firefighter safety have been the subject of national discussions for quite some time. The National Fire Protection Association, the Center for Public Safety Excellence and the National Institute of Standards and Technology among others have all weighed in on these topics.

In April 2010 The National Institute of Standards and Technology (NIST)[1] completed studies on the effectiveness and efficiencies of various crew sizes. Their work included numerous laboratory tests and actual field tests. For the field tests the study used a response of three engine companies, a truck company and a command officer with an aide. They measured and timed twenty-two fire ground tasks using different crew sizes. The crews arrived at the scene in a staggered fashion much like what is common in communities across the Country. The results of their sixty full-scale tests show that four-person crews were on average seven minutes faster than to two-person crews at accomplishing the fire ground tasks. Further, the four-person crews completed their tasks 5.1 minutes faster than three-person crews. The field tests and tasks were performed using a typical one to two family dwelling. The study concluded that adding a fifth person to the crews did not significantly impact the time on this type of occupancy. None of the tests performed used a one-person crew.

Another component of the above noted study was performed by Skidmore College[2] on the physiological effects of crew size. The average peak heart rates for firefighters on the 1st Engine were above 80% of age-predicted maximums when only 2 firefighters were deployed. In fact, the driver had an average peak heart rate nearly 90% of age-predicted maximums when there were only 2 firefighters on the engine[2]. The insufficient number of personnel on the apparatus or at the scene increases the potential for firefighter injury not the mention the need for additional resources to control the fire and the potential for additional damage to the property.

The reserve firefighter program was established following a goal in the 2007 Strategic Plan. This program has provided some success to the Fire Department but not without some issues. Reserve firefighters have come from the training classes held at the Fire Department through the Solano Community College and has provided a good resource for the reserve program. Once the college program is completed there is a practical section that must be competed which is typically done through reserve programs or internships. The Fire Department indicates it costs about $7,000 per reservist to get them to being proficient at the position. This cost includes turnout gear, uniforms, and additional time spent completing the practical section of their training. Without any full-time positions available in Dixon, they look elsewhere to obtain employment creating an ever-changing group of reservists. However, using the reserve program has assisted the department with staffing of stations and apparatus.

[1] Robertson, Bill. Report on Residential Fireground Field Experiments. National Institute of Standards and Technology. April 2010.

[2] Smith, Denise, Ph. D and Benedict, Ron. Effect of Deployment of Resources on Cardiovascular Strain of Firefighters. April 2010.

With the improved staffing levels, both engine companies would be able to respond and perform initial duties required on an emergency scene until additional units were able to arrive to provide assistance. Therefore, initially one of the engines should be transferred from the existing station and used to staff the second station. The issue of call concurrence and unit utilization should be monitored to determine when an additional unit may be required to staff the current station to ensure response reliability is maintained in the City. Like the current apparatus any additional engine companies should have a minimum staffing of three (3) personnel per shift. This ultimately would bring daily staffing to 12 personnel scheduled with minimum staffing of nine (9) personnel daily, which still does not provide the 14 personnel needed for an initial response to a working structure fire. This underscores the importance of maintaining the current automatic aid partners to ensure a full first alarm response. The table below provides a comparison summary of the personnel needed to perform the critical tasks, the existing staffing, and the proposed staffing model for the various incident types. It also includes the staffing for the automatic aid partners for those calls the automatic aid would normally respond.

Dixon Staffing Model					
Incident Type	Required Personnel	Existing Min Staffing	Proposed Min Staffing	Auto Aid Staffing	Total w/New staffing and Auto Aid
Structural Fires (Moderate Risk)	14	5	9	3	12
Medical Emergencies (cardiac arrest, stroke, trauma)	8	5	9		9
Hazardous Materials (high risk)	15	5	9		9
Hazardous Materials (low risk)	13	5	9		9
Wildland Urban Interface (with hydrants)	6	5	9	3	12
Wildland Urban Interface (no hydrants)	12	5	9	3	12
Technical Rescue Incidents	14	5	9		9

The most significant improvement, in terms of response capabilities, is for structure fire responses, wildland urban interface, and medical emergencies. An additional benefit to the increased staffing is to afford the department the ability to deploy resources to State Strike Team requests. The assistance by hire program used by CAL FIRE in their response to wildfires does provide pay for staff and fees for the use of equipment. These fees will increase the revenues generated by the Fire Department but should not be relied upon as a sustainable revenue source.

To add one position to a shift will require 1.35 full time equivalents (FTE's) as shown in the table below. To ensure a minimum staff of 3 personnel on each apparatus, 4 personnel will need to be scheduled per apparatus on each shift.

48/96 Schedule	
Single Position	
122	Shifts for one Firefighter
12	Sick Days
12	Holidays/Kelly Days
7.5	Vacation days
90.5	Shifts Available to work
1.35	People to cover 122 shifts
Single Shift	
2	Number of Apparatus
3	Minimum Manning per Apparatus
8	Number Assigned per Shift for Engine Companies
Department	
2	Number of Apparatus to Cover
3	Minimum Manning per Apparatus
24	People to cover - 24 / 7 / 365

Based on the calculations above, each shift will require (8) personnel to provide a six (6) person minimum staffing. Currently there are six (6) personnel assigned to each shift requiring an additional two (2) personnel per shift to maintain the minimum staffing of six (6) personnel per shift. When an additional unit is required this number will increase to 12 personnel per shift for a total staffing of 36 personnel to staff the emergency apparatus.

Increasing the staffing of the shifts could be implemented in a phased in approach. The first phase is to increase the staffing for the second engine company from two (2) personnel to three (3) personnel. Based on the schedule above, a total of six (6) new personnel would be needed to provide the minimum staffing.

Each phase increases the personnel for the Fire Department by 2 personnel per year for three (3) years until the new minimum staffing of three (3) personnel per apparatus can be achieved. Implementing the staffing in this manner increases the scheduled staffing to four per apparatus at the end of the third year. It also provides a mechanism to acclimate these personnel to the Dixon Fire Department in advance of the second station being built.

The final phase (phase 4) would occur when the need for an additional apparatus is realized. This would require the hiring of twelve (12) personnel to fully staff the third apparatus.

The table below illustrates the cost (based on 2018 costs) to implement the four-year approach to increased staffing. The cost for these positions is based on the pay scale for a Firefighter/Paramedic. Each of these new positions should be paramedic level to improve the response to medical emergencies.

Cost to Increase Minimum Staffing of Fire Suppression Units						
Firefighter/ Paramedic	Salary	Benefits	Turnout Gear / Uniforms	Total Cost	Number of Personnel	Total First Year Cost
Phase One	$63,967	$28,145	$10,000	$102,112	2	$204,224
Phase Two	$63,967	$28,145	$10,000	$102,112	2	$204,224
Phase Three	$63,967	$28,145	$10,000	$102,112	2	$204,224
Phase Four	$63,967	$28,145	$10,000	$102,112	12	$1,225,344
Total Cost	$63,967	$28,145	$10,000	$102,112	18	$1,838,016

As illustrated above the increase of two personnel per year will cost the City $204,224 in additional salary, benefit, and equipment cost each year over the next three years. The total impact of adding these positions is $612.612 per year once all positions are filled, as uniforms and equipment are part of the startup costs. At the point an additional apparatus is required the staffing costs of that apparatus are $1.225 million annually.

Based on costs from neighboring communities recent experience, it is estimated that a 6,700 square foot 2 bay station will cost approximately $6 to $7 million depending on site development and building materials chosen.

Recommendations:

Increase the minimum manning of fire suppression units from two personnel to three personnel phasing in two positions per year over the next three years at a cost of $204,424 per year over the next three years.

As growth continues and funding becomes available construct a second station in the area of Pitt School Road and West A Street to improve travel time to the south and west areas of the City and District. Staff this station with an existing engine company. Cost is estimated at $6 to $7 million.

Continue to support the reserve firefighter program.

8 Essential Function Initiatives

The primary purpose of the Dixon Fire Department is to respond to and mitigate fire and medical emergencies in the City and Fire District. To support these responses, there are a variety of other functions and responsibilities assigned to the Fire Department such as fire prevention and training. Historically the fire service has been tasked only with fire suppression however, in the past few decades there have been changes that now entails a fire protection system to provide service to the community.

In 2007, the Dixon Fire Department developed a strategic plan that addressed several initiatives and issues. This plan provided a guide for improvements to the fire protection system. During the course of this study opportunities for improvement were also identified. This chapter is intended to build upon the previous goals to further improve the services of the Fire Department and the fire protection system.

1. Fire Prevention and Loss Control

Fire prevention and loss control is the first defense against unwanted fires. The goal of any fire prevention program is to prevent the fire from occurring, prevent the loss of life, reduce the severity of a fire if one does occur, and if a fire does occur to enable the fire suppression forces to perform their tasks easier. These goals are accomplished through building inspections, public education activities, and the planning before a building is built.

Plans for new developments and buildings need to be reviewed by the Fire Department not only to ensure code compliance but also to ensure access and water supplies are adequate. As well, there are fire protection systems and other specialized systems that require closer scrutiny and inspections. In the instance of new developments, the fire department should be included in the review of any new development. This will ensure the department can address any concerns or impacts on the service delivery of fire and emergency medical services.

Engine company inspections are used by numerous fire departments across the country to ensure this function of the fire service is completed. This allows the engine companies an opportunity to visit the buildings and structures in their respective response areas and become familiar with the building prior to an emergency. This system is not without its limitations. Some of the buildings are quite large and may have specialized fire suppression systems or other building systems that require inspection. These types of facilities should be inspected by a fire safety specialist to ensure the systems are functioning properly.

The DFD has an inspection program in place through an engine company inspection program. This program has recently been reinstituted after a seven-year hiatus. With this program, the engine companies will also become familiar with the businesses in the jurisdiction. It will require close monitoring to ensure that all businesses are in fact inspected and any follow up inspections required are completed.

Complex plan reviews and inspections are typically beyond the capabilities of engine company personnel and require an individual that is well versed in the fire prevention code, building code, and other standards that apply to a specific situation. The Dixon Fire Department should employ a specialist to conduct these duties.

Fire safety education programs are delivered by request from a group or school. Once the request is made the engine company on-duty will deliver the program. With this type of scheduling the education program is more reactive than proactive. It is a best practice for fire departments to annually review the types of incidents in their jurisdiction and develop education plans to minimize these risks and reduce the incidence of emergency response to preventable emergencies.

Recommendations:

The Fire Department should become more involved with the planning and review of new developments to ensure appropriate access for apparatus, water supplies, or other impacts on the delivery of fire and emergency medical services are addressed.

Monitor the engine company inspection program to ensure the inspections are being completed in a timely manner.

Annually review the types of preventable incidents impacting emergency services and develop pro-active public education programs to address these preventable emergencies.

2. Training and Education

The training program is managed by a Division Chief and is delegated to the individual shifts to conduct training. The schedule for internal training sessions is to complete two hours of training on every shift. Sessions are a mixture of hands-on, classroom, or through Target Solutions, which is a web-based program.

The Solano Community College District provides training and education for individuals to become firefighters. Through an agreement with the City of Dixon, the college utilizes the training facilities of the DFD to deliver these programs. There is a monetary component to the agreement that provides a revenue source for the department. Students from this academy have become reserve firefighters with the DFD.

There are other opportunities to more fully utilize the training facility and increase training opportunities for personnel. The DFD is an approved rescue system training site through CAL FIRE and is permitted to host certain rescue classes. The classroom area is of sufficient size and has appropriate equipment to host classroom sessions. Opportunities to host training sessions from outside vendors or rescue classes from the State would allow for DFD personnel to participate in a local setting instead of traveling to other areas to obtain specialty training. In some instances, outside vendors will provide two or three slots free to the host agency in lieu of paying tuition in exchange for the use of the facility. In other instances, there would be fees or other stipends that may be paid to the host department for the use of the facilities. In either scenario, the Fire Department benefits from hosting the training. However, there needs to be an individual to coordinate with the vendor and to ensure the facility is ready for the coursework.

In addition to the training programs, this Division Chief is also responsible for fire suppression operations, fire investigations, emergency medicals service operations, development of policies and procedures, and acts as the liaison with the dispatch center. Given these duties, this Division Chief does not have the time to appropriately manage the training program, coordinate with the Community College, or to coordinate any outside training opportunities. While this would not require a full-time position, consideration should be given to hiring a part-time training officer position to coordinate these tasks.

Recommendation:

Create an administrative Captain position to deliver training sessions to the Department, coordinate the use of facilities for external vendors and training programs, and to assist the fire prevention function with inspections and plan reviews.

3. Organizational Structure

(1) Command and Control

Currently a shift operates two engine companies with minimum staffing of three (3) personnel on one unit and two (2) personnel on the other. The unit with three personnel

includes a Captain while the other unit does not have an assigned officer. The issue is for those single company calls, once the first engine company is assigned to a call there is no officer or supervisor for the second engine company. The second unit relies on the most senior firefighter to make decisions about the response and actions at the next emergency call. For any calls that would require more than one company, during the off-duty hours there would be a Chief Officer that would also respond.

Best-practices in organizational structure are: 1) designed to facilitate consistent management and supervision; 2) enhance communication; 3) improve coordination of work efforts; and 4) consistently identify who is accountable/responsible in the chain-of-command. Appropriate organizational structuring encourages a suitable number of supervisory full-time staff to provide effective organizational oversight, perform key managerial and critical administrative functions, and help mitigate overall risk to the community. The risk includes personnel operating without appropriate supervision and possibly inexperienced personnel.

Recommendation:

Create a supervisory position for the second engine company to provide appropriate supervision of personnel and decision-making processes.

(2) Organization Continuity

Succession planning is a necessary function in every organization no matter the size. It is a process whereby the organization develops employees to fill key roles within the organization. This ensures there is an employee prepared to fill that key role if and when it opens. However, the tendency in most organizations is to plan informally or verbally for succession. Promotion of the most tenured people in the organization to positions that control the organization may not be the best use of this resource.

During the interviews and review of data, the project team learned there are 12 of the 20 personnel or 60% of the department that could retire in the next seven years. To facilitate the continuity of the organization and provide a level of succession planning, the project team recommends a formal succession plan be developed to include education, training, and exposure to the various functions of the department. This plan could also provide a basis and background for any upcoming promotions.

A mentoring program would also provide additional support to the continuity and succession plan. These programs provide an opportunity for the more tenured officer to pass on their expertise and encourages the development of leadership competencies.

Promotions are always difficult but none more so than promoting from a firefighter to an officer. As an officer and a front-line supervisor, the individual is now the one giving orders and not following them making this transition more difficult. A mentoring program for these promotions is essential to ensure the new officer gets started in the right way.

Recommendations:

Develop a formal succession plan for the Fire Department to facilitate the education, training and exposure to functions of the department to the younger personnel.

Develop a mentoring program for newly promoted staff to provide support and understand the expectations of the Department.

4. Communications

Currently the Fire Department is dispatched by the Solano County Sheriff's Office along with the City of Rio Vista, seven fire districts, and other law enforcement agencies. Within the dispatch center there is a minimum of two (2) dispatchers on-duty for fire and police agencies with one working on the fire dispatch and one working on the law enforcement dispatch. All dispatchers are cross trained to handle fire and police calls. The communications center has automatic vehicle locator (AVL) technology available and can support additional users. Additionally, there is an interface available with the records management system for the fire departments. The communications center has a goal to separate the fire dispatch from the law enforcement although funding may be an issue. In addition, the center has plans to implement emergency medical dispatching (EMD) which will provide additional information to responding agencies and may reduce the number of calls based on that information.

Operationally the DFD is on a VHF frequency that is not reliable in terms of coverage throughout the City and District. This creates "dead spots" in the radio system and the area served by the Dixon Fire Department. The fire department does not utilize the AVL technology or the use of mobile data terminals. Changing from the County Communications System to the Vacaville Communications System could provide better reliability in terms of coverage throughout the City and District.

There is another radio available for use on an 800 mhz system but it is designated for the mutual aid system. Vacaville is an automatic aid partner with Dixon and is dispatched by their own dispatch center on a different radio system. Anytime Vacaville resources are needed, the Solano County dispatch center must call Vacaville to request the resource.

Vacaville will switch to the Dixon radio frequency as an incoming resource, likewise the Dixon apparatus will switch to the Vacaville radio frequency as an incoming resource to Vacaville.

Changing from Solano County Dispatch Services to Vacaville is a potential solution to the radio communications dilemma for the Fire Department. The Fire Department is currently experiencing "dead spots" in their communications system in different areas of the City and District. Additionally, Vacaville is an essential automatic aid partner in the response to calls for service. Once these calls are initiated, the response agency must change to a different radio frequency for communications. Changing to the Vacaville communications system for dispatch services and communications could enhance the reliability of radio communications and would ease the communications process during calls for service. The cost to make this change is dependent on the cost for radio communications equipment and the cost for Vacaville to provide the dispatch service. According to the financial resources, the Fire Department paid over $91,000 for communications in FY18. Another alternative is to make improvements to the current radio system to eliminate the "dead spots" in the response area. The cost for these improvements would need further examination as to equipment and placement of equipment such as antennas, repeaters, or microwave technology.

Recommendation:

Establish a connection with the communications center and the records management system to incorporate the call data directly from the computer aided dispatch system.

Install mobile data terminals in the apparatus to improve the capturing of response data, improve the accessibility of preplan data, and take advantage of the Automatic Vehicle Locator (AVL) technology.

The Fire Department should consider contracting with Vacaville for dispatching and communications or to improve the existing communications system with cost being a primary factor.

5. Apparatus and Equipment

One of the more difficult tasks facing a community is the replacement of fire apparatus due in large part to available funding, the timing of when to replace and the cost associated with replacing the apparatus. As the apparatus ages, it becomes more difficult to maintain, less parts are available for replacement and the pumps begin to fail their annual testing. Like the distribution and concentration of resources, a one size fits all

approach does not work well with apparatus. Some vehicles and apparatus do not last as long as others. This could be due to higher call volumes, extreme wear and tear and varied preventive maintenance measures.

The Fire Department has a program to replace apparatus and support vehicles. The table below outlines the current guidelines used to replace apparatus using mileage and age as the primary factors.

Apparatus Replacement Schedule		
Vehicle Type	Mileage	Age
Engine	100,000	20
Ladder	100,000	20
Wildland Engine	80,000	15
Water Tender	100,000	15
Squads	80,000	15
Command/Staff/Support	80,000	7

The program does not consider maintenance issues, overall condition, or reliability of the apparatus.

An effective apparatus replacement program will have benchmarks established to drive the replacement schedule. These benchmarks should establish a replacement guideline to categorize the various units and their target replacement date, definitions for the determination of the condition of the vehicle and other criteria to be used in the evaluation of the vehicle. Using the table above will establish the expected life for purposes of depreciation and the funds that will to be available for the eventual replacement.

The table below illustrates the year for replacement of apparatus based strictly on age in accordance with the expected life cycle from above.

Dixon Fire Department Apparatus Replacement					
Unit ID	Year	Description	Type	Replacement Year	2018 Mileage
600	2000	Pierce	Reserve	2020	198,255
602	2008	Pierce	Type 1 Engine	2028	103,374
603	2009	Ford F550	Type 5 Brush	2024	27,368
604	2012	Chevrolet Suburban	Command	2019	86,213
605	2017	Ford Expedition	Command	2024	22,503
608	2001	Pierce	Rescue	2016	7,289
610	2002	Pierce	Aerial Ladder	2022	12,345
611	2013	Pierce	Type 1 Engine	2033	78,469
612	2016	Pierce/International	Type 3 Engine	2031	15,295
613	2016	Ford F550	Stake Side Utility	2023	2,366
615	2005	Pierce/Navistar	Water Tender	2019	20,627

616	2018	Ford F-250 4x4	Command	2025	3,413
619	2011	Ford F250	Utility	2018	64,883
620	2000	Pierce/Navistar	Water Tender	2014	22,978

The following replacement guideline uses a point system to determine when a unit should be replaced. It utilizes a variety of factors such as mileage, reliability, and maintenance costs to score the apparatus. The table below identifies those factors and the recommended point system to use.

Replacement Guidelines

Factor	Points
Age	One point for each year of chronological age.
Mileage / Engine Hours	One point for each 10,000 miles or 1,000 engine hours.
Type of Service	Points are based on severity of service 5 points - Engine Company 3 Points - Aerial Ladders / Specialty Units 1 Point - Administrative Vehicles
Reliability	Points are based on the frequency a vehicle is in the garage for repair 5 points - Two or more times per month (average) 3 Points - Two times every three months (average) 1 point - Once every three months (average)
M & R Costs	Maintenance and repair costs on the total life of the vehicle, excluding accident damage. 5 points – M & R costs equal to or greater than original purchase price 4 points – M & R costs 75% to equal to the original purchase price. 3 points – M & R costs 50% to 75% of the original purchase price 2 points – M & R cost 20% to 50% of the original purchase price. 1 point – M & R costs 20% or less than original purchase price.
Condition	Consideration given to body condition, rust, interior condition, accident history, anticipated repairs, etc. 5 points - Poor Condition 4 points - Fair Condition 3 points - Good Condition 2 points - Very Good Condition 1 point - Excellent Condition

This system uses the major components typically considered in evaluating vehicles and then puts a numeric value to the vehicle. It can be adjusted to fit the local perspective. For example, if the maintenance costs are a more important factor then adjusting the percentage to the original cost will provide a higher weight to that category.

The table below outlines the total score and the expected outcome of that score.

Replacement Guideline Scoring

Point Range	Condition
Fewer than 18 points	Condition I - Excellent
18 to 22 points	Condition II - Good
23 to 27 points	Condition III - Qualifies for Replacement
28 points and above	Condition IV - Needs Immediate Consideration

Another component to this type of system is the collaboration between the Fire Department and those involved in the maintenance of the fleet. All involved should discuss the results of the survey to determine the needs of the apparatus in terms of mechanical issues. It is possible there is a unit or units that will need major repairs that would influence the decision to replace the apparatus.

The most important function of fire apparatus is the safe movement of personnel and equipment to and from an emergency scene and the investment in fire apparatus is a significant endeavor for any community. Changes in the standards by which they are built and the performance standards by which they are tested continue to evolve and has resulted in rapidly increasing costs for fire apparatus. A typical engine will cost in the range of $500,000 to $600,000 depending on the manufacturer, configuration of the truck and other needs of the Fire Department. In addition, the aerial ladders will cost in the range of $900,000 to $1.3 million again depending on the same variables. Many communities will borrow the funds to purchase the apparatus while others will have set aside funds based on the depreciation of the current apparatus and planned replacement schedule.

Recommendation:

The Fire Department should consider revising its apparatus replacement program to establish benchmarks for the replacement and consider other factors such as wear and tear and reliability.

A Internal Stakeholder Contributions

Meeting with employees and other internal stakeholders provides an opportunity for those individuals to candidly identify positive and less than desirable attributes of an organization. The results contained herein are those opinions and perceptions of these employees. Analysis of strengths, weaknesses, opportunities, and threats (SWOT) allow for a full range of thoughts and contributions to the planning process.

1. Strengths

Identifying strengths within an organization provides a point to build the future. It is important to ensure those strengths meet or match the services provided by the fire department to the community. Comments from the staff were very strong as to the teamwork and dedication of the personnel in the department. Another identified strength is the low turnover. However, there are 12 of the 20 personnel or 60% of the department that could retire in the next seven years. This retirement rate could influence the low turnover rate currently experienced by the department. The table below outlines the strengths identified by the internal stakeholders.

Strengths of Dixon Fire Department	
Low Turnover Rate	Dedicated Personnel
High Service Levels	Good Equipment
Reserve Program	

2. Weaknesses

Weaknesses are those issues that may inhibit progress of improvements or areas that are not functioning. The lack of staffing is the biggest concern expressed by the staff. They feel the level of service is inhibited, safety of the crews, and the potential for injury to the crew is exacerbated with the lack of personnel. The lack of career development concerns is related to the turnover rate. At this point the turnover rate is very low and there is little movement in terms of upward mobility. The table below displays the weaknesses as noted by the internal stakeholders.

Weaknesses of Dixon Fire Department	
Lack of Staffing	Lack of Career Development
Dispatch Services	Need for 2nd Station

3. Opportunities

Opportunities are best described as points that will enhance the strengths of the fire department or to lessen the effects of any identified weaknesses. They may also be points to review for new programs and services that will enhance the fire department. Regionalizing the training and facilitating classes for outside agencies was viewed as a positive opportunity for the department. The thought process from the group included generating revenue for the classes and providing additional training opportunities for the department. The table below identifies the opportunities the internal stakeholders found to be important.

Opportunities for the Dixon Fire Department	
Regional Training Facilitation	Public Education
Development of a CERT Team	Updating Policies and Procedures
Improvements to Fire Investigations	

4. Threats

Threats can take many forms, they may be obstacles for improving services, they may be external to the organization, or they could be out of the control of the organization. There were two issues that caused considerable discussion in the groups; the lack of mobility and the lack of succession planning. Concerns were expressed about the number of staff members that are eligible for retirement in a very short period of time and the loss of institution knowledge of the department. The mobility issue is directed at the lack of promotional opportunities. The table below illustrates the threats from the internal stakeholders.

Threats to the Dixon Fire Department	
Lack of Succession Planning	Lack of Personnel Mobility
Funding for New Programs	Increasing call workload