LAWRENCE-DOUGLAS COUNTY FIRE MEDICAL

Community Risk Assessment & Standards of Cover

2017

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Lawrence-Douglas County Fire Medical

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December 2017

The following report serves as the Lawrence-Douglas County Fire Medical Standard of Cover plan. The Commission on Fire Accreditation International (CFAI) defines the process, known as "deployment analysis," as written procedure, which determines the distribution and concentration of fixed and mobile resources of an organization. This plan is a living document, which assesses the department as the community and the department evolves. We will continue to assess the needs of the community and the department, so that we can make necessary changes.

The Community Risk Assessment Standards of Cover, the department's Strategic Plan, and the self-assessment tell the overall story of how our department meets the prescribed standards of our profession. Our Community Resource Standards of Coverage is a result of the combined efforts and input from numerous members of our department and is a reflection of all member ranks; including members of the IAFF Local 1596 and our civilian employees.

Our Department continues to meet the increased demands placed on us each day. To be responsive requires an in-depth agency evaluation of our performance. This evaluation and plan routinely results in optimism of current performance and reflects the challenge that we have for improvement. In both outcomes, we have a commitment to provide continuous improvement. We do so in a professional manner and are dedicated to the mission of the Lawrence-Douglas County Fire Medical Department. We will continue to provide highly trained professional personnel that will deliver services that are the best. We will continue to pursue the goals of the community and the goals we have set for ourselves.

We will continue to make Lawrence and Douglas County a better place to live, work, and play. We hope that this document will provide the reader with an understanding of how we intend to look to the future to be the best we can possibly be. We will continue to set short-term and long-term professional goals. We look forward to interacting with our community and the continued support we receive from them. I would like to personally thank the community and City Administration for its continued support of the Lawrence-Douglas County Fire Medical Department.

Sincerely,

Mark F. Bradford
Chief

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Executive Summary

This Community Risk Assessment Standards of Cover document is a comprehensive study of the community's hazards and threats to determine the optimal delivery system to mitigate those risks. The document defines the policies and procedures for distribution and concentration of fixed and mobile emergency response resources. The department establishes response time standards for timely deployment of resources necessary to respond to emergency calls for service in the community. Based on the community risk assessment, the Standards of Cover offers a number of recommendations and future goals to maintain and improve the department's response cover, thereby maintaining and improving the safety of the community.

Lawrence, Kansas is a diverse and multifaceted city, with a population of approximately 93,917 people. Located in northeast Kansas, Lawrence is just 30 minutes west of Kansas City. The city has many recreational amenities such as parks, golf courses, aquatic centers, Lawrence Sports Pavilion, and bike/walk trails. The historic Downtown is one of the most vibrant downtown shopping, dining and entertainment districts in the Midwest. Lawrence is also home to two universities: the University of Kansas (KU) and Haskell Indian Nations University. The University of Kansas and Lawrence Public Schools are the largest employers in Douglas County.

The Lawrence Fire Department was first organized in 1859 as "Republic Engine Company No. 1." On December 16, 1996, the City of Lawrence entered into an inter-local agreement with Douglas County to merge the existing Lawrence Fire Department and the Douglas County Ambulance Service into one combined agency named the Lawrence-Douglas County Fire and Medical (LDCFM) department. LDCFM provides all hazards services to the City of Lawrence and Grant Township. The City of Lawrence encompasses 34.8 square miles. Additionally, the department provides emergency medical services to all residents within 475 square miles of Douglas County.

Historically, Lawrence started using a standards of cover document to guide its operations in 2007. As a part of the accreditation model, the department works to determine acceptable levels of service based on the National Fire Protection Association (NFPA) standards, EMS criteria, and other related factors of response.

The primary source of funding for the department comes from the city's general fund. The 2018 budget for the fire medical department consists of 12% of the general fund budget at $21,356,600. The city's share of the total operating budget is 74.36%, for the provision of fire and rescue services in the city. Douglas County's share of the total operating budget is 25.64%, for the provision of emergency medical services in Douglas County. All costs associated with coroner scene investigation (CSI) and hazardous materials services are the responsibility of the county. Per the 1996 Interlocal Agreement with Douglas County, the city collects revenue from fees for service for the emergency medical services and deposit fees to the county on a quarterly basis.

A staff of 149 committed men and women deliver comprehensive emergency response, public education and protection services. LDCFM operations is made up of three (3) shifts. Each shift

consists of one (1) shift commander, five (5) captains, eight (8) lieutenants and twenty-nine (29) firefighters who work a rotating 24-hour schedule. Emergency staff and equipment are dispersed throughout the city of Lawrence in five fire stations as well as two ambulance stations located in the City of Baldwin (Station 11) and the City of Eudora (Station 12). Each of the five stations in Lawrence are comprised of one primary fire apparatus with a minimum staffing of one officer, one engineer and two firefighters. Each of the five stations in Lawrence also houses one medic unit that is staffed with one officer and one firefighter/paramedic. Station 5 houses an additional rescue unit with one officer, one engineer and one firefighter. The medic unit at Station 11 and 12 is staffed with one officer and one firefighter/paramedic. Minimum staffing for each shift is 38 personnel, maximum scheduled staffing is 43.

The LDCFM department is led by Fire Chief Mark Bradford and is directly supported by seven division chiefs and by two civilian, administrative personnel. The Operations Division is made up of three division chiefs who are responsible for the emergency and administrative activities of all members assigned to his/her shift. The Administrative Division is managed by the Division Chief of Administration and supported by one civilian, administrative personnel. The Administrative Division is responsible for facilities, fleet management, accounting and finance operations. The Prevention Division is managed by the Division Chief of Prevention and supported by a captain and lieutenant. The primary goal of the Prevention Division is to reduce the incidence and severity of preventable injuries and fire loss through public education, code inspections, plan reviews, and investigations. The Emergency Medical Services Division is managed by the Division Chief of EMS and supported by three civilian, medical claims positions. The EMS Division is responsible for EMS quality control, risk management, special events, the employee wellness program, EMS billing and serves as the liaison to the Medical Director. The Training Division is managed by the Division Chief of Training and supported by a captain and lieutenant. The goal of the Training Division is to provide competency-based training for department members and county EMS first responders, and to facilitate public awareness. The Douglas County Emergency Communications Center (DGECC) serves as the sole dispatch center for fire and EMS in Douglas County. DGECC is located within the Judicial and Law Enforcement Center.

For the purpose of analyzing risk and service levels, the department has divided Douglas County into 14 response areas. There are five planning zones within the City of Lawrence and nine planning zones in the county. Based on population, all planning zones in the City of Lawrence, City of Eudora and Baldwin City are classified as urban. All other planning areas in the County are classified as rural. A detailed profile of each response area is outlined in Section D.

A comprehensive study of the community's hazards and event threats was completed by the department to determine risk of an incident (Section G). The department utilizes two models to assess the nature and magnitude of all hazards and risks in the community through a three-axis methodology and location-based model. The first model analyzes types of risk by program classification (fire, emergency medical services, technical rescue, and hazardous materials). The

department utilizes a three-axis methodology for assessing risk by considering: the probability the event occurs, consequences to the community for each event, and agency impact. The second risk analysis tool identifies specific locations of risk based on defined criteria. The department developed a risk assessment program called RAPTOR – Risk Analysis Profile & Target Occupancies and Risk. RAPTOR uses data collected from fire and life-safety inspections to identify locations of low, moderate, high, and maximum risk.

A critical task analysis was performed for each category and classification of risk to determine the first-due and effective response force capabilities. Critical tasks are those tasks that must be conducted in a timely manner by personnel at a scene. The department has utilized its risk assessment, experience, knowledge, and call history to determine the effective minimum response force should be for the identified incident types.

Today, the department responds to almost 12,000 calls for service from seven stations in Douglas County. From 2012 to 2016, the number of total calls for service has increased over 15%. Almost 80% of the total calls are emergency medical response incidents.

The Standards of Cover (SOC) for the department has been derived from and influenced by two specific concepts: distribution of emergency resources and the concentration of those resources throughout the community. Distribution of station and resource locations is needed to ensure rapid first due response deployment in order to mitigate emergencies. Concentration addresses the spacing of multiple resources arranged close enough together so that an initial effective response force (ERF) can be assembled on scene targeting total response time goals. Using GIS, the department is able provide a geographic representation of the four and eight minute travel time from fixed station locations. While coverage for a majority of the city falls within these projected benchmark travel times, analysis shows actual travel times is longer than the estimated times.

The department reviews factors in Section H related to system performance and provides a historical perspective. Emergency response performance for all risk categories and classes was calculated for a five-year period from January 1, 2012 to December 31, 2016. Total response time is a compilation of the elements beginning with alarm handling time, turnout time, and travel time.

The Standards of Cover document provides information on the reliability of benchmark travel response time of a qualifying unit by planning zone within the City of Lawrence. Travel time response quality is affected by several factors including resource availability, weather, road conditions, and traffic.

Findings from the emergency response time analysis indicate gaps with travel time and total response time performance of the first due unit for moderate and high risk incidents types. The performance in the five-year period for alarm handling across all risk categories and classifications did not meet the benchmark performance and *NFPA 1710: Standard for the Organization and*

Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.

The department has identified time-specific recommendations, based on the information available at the time of this publication, to address performance gaps and assist in the effectiveness of deployment and coverage. These objectives were identified to address challenges ranging from administrative support to assist with statistical analysis, technology enhancements, and operational expansion to embrace the dynamic changes to the community and county.

Immediate Recommendations (within 18 months):

1. Investigate solutions for improvements in performance monitoring processes on emergency response data to include both computer software and internal system controls.
2. Develop and facilitate training on data entry to ensure the quality of information remains at a high level for performance and outcome measurements.
3. Work collaboratively with Douglas County Emergency Communications to establish time-based performance objectives for alarm answering and alarm processing. The objectives should be formally established in a written agreement with Douglas County Emergency Communications.
4. Add a second operations chief officer to manage county-wide emergency resources. This position should be included in daily minimum staffing and would be a total increase of three Assistant Shift Commanders/Battalion Chiefs.
    a. Currently, daily minimum staffing includes one operations chief. The operations chief is responsible for fire, medical, hazardous material, and technical rescue resource management in the City of Lawrence. The operations chief is also responsible for resource management with medical and hazardous materials incidents in all of Douglas County. The operations chief provides resource management for the entire Douglas County area, 475 square miles. When high-risk events occur, such as a working structure fire within Lawrence, a hazardous materials event, or a cardiac arrest in the county, the chief officer is committed to the incident as the incident commander performing all associated command staff tasks until they can be delegated. On these incidents, the operations chief manages, supervises and delegates activities while simultaneously monitoring system wide resource availability. One operations chief can no longer effectively manage incident command responsibilities and county-wide emergency resources.
5. The department should analyze and recommend alternative solutions for staffing ambulances for medical transfers outside of Douglas County. Currently, medical transfers are performed by emergency ambulances dedicated to the standards of cover within Douglas County. During the period of a transfer, an ambulance is taken from the area of coverage resulting in an elongated incident commit time decreasing the reliability of quality coverage to the County.

6. Continue to communicate through management channels the need to increase operational staffing on the rescue unit to be consistent with other fire apparatus. This request has been proposed each year since 2006. Currently, the rescue unit is not compliant with the OSHA "2-in 2-out" rule for emergency rescue operations with firefighters engaged in interior structural firefighting. Operational objectives cannot be maintained city-wide in an efficient, effective and safe manner with three-member staffing.
7. The Prevention Division's needs continue to grow with the community. With the current staffing, the division can no longer meet the time-sensitive demands of the developing community. The division should add an additional inspector to address the needs of the program. The expansion request would be for (1) FTE within the Prevention Division.
8. In 2017, an administrative support position was eliminated as part of a workforce reduction. The impact of the position elimination was significant to the administrative operations of the department. Currently, there are two positions for six organizational divisions and 149 FTEs. The expansion request would be for (1) administrative support FTE. Operations staff and Division Chiefs have been utilized to perform administrative duties, which has increased cost and displaced resources associated with the standards of cover.

Short-term Recommendations (within 36 months):

1. Due to the rapid growth in the northwestern portion of the city, the department should secure a funding source for fire station #6 and other resources to provide reliable, effective response coverage, consistent with other areas of the city.
2. The department should closely analyze the resiliency of fire apparatus within high demand areas of the city. In addition, the department should communicate needs to retain resource reliability in those areas. These resources would also assist with the arrival of the effective response force on higher risk incidents within the city.

Long-term Recommendations (with the next five years):

1. Construct station (station #6) in service to provide reliable coverage to an area of rapid growth in the northwestern portion of the city.

Due to planned growth in the southern and southeastern portion of the city, the department should secure a funding source for fire station #7 and other resources to be able to provide reliable and effective response coverage, consistent with other areas of the city.

A. Description of Community Served

Introduction

In December 1996, the International Association of Fire Chiefs and the International City Managers Association formally created a trust known as the Commission on Fire Accreditation International. This trust is supervised by the Center for Public Safety Excellence (CPSE). Today, the CPSE oversees the Commission on Fire Accreditation International (CFAI).

The focus of CFAI is to develop a comprehensive system to assist local government in risk management evaluation to establish performance goals and to link long-term strategic planning to the development of a standard of cover document. As part of the process, it is paramount that agencies qualify for its customers through community expectation assessment, self- assessment, risk analysis, establishing response goals and developing a system of measurement of performance; its mission, vision and expected delivery of service.

The Center for Public Safety Excellence (CPSE) defines the standards of cover for a fire department as being those "adopted written policies and procedures that determine the distribution, concentration and reliability of fixed and mobile response forces for fire, emergency medical services, hazardous materials and other forces of technical response." There have been many attempts to create a standard for the response of firefighters and paramedics without gaining national or even international consensus. Several industry standards have been adopted, namely National Fire Protection Association standard 1710, attempting to create a standard for staffing of fire and medical response apparatus in a community. While many communities have adopted in theory the staffing and response mandates of NFPA 1710, few have the ability to completely comply.

The City of Lawrence initiated the self-assessment process for achieving International Accreditation in 2004. Lawrence-Douglas County Fire Medical (LDCFM) is committed to achieving accredited status to further demonstrate the department's ability to provide superior service. As such, the department is committed to remaining accredited and submitting all required documentation on an annual basis. Three components must be submitted to be considered for initial accredited status. These include a strategic plan, a community risk assessment-standards of cover (CRA-SOC) document, and a self-assessment.

This accreditation effort has been a collaborative and collective process whereby members of the organization with expert knowledge contributed substantially to its written content. These are the same members that contribute daily to the needs of the organization and the constituents served.

LDCFM first achieved accreditation in 2008 and again in 2013. The department continues to maintain a high level of commitment to the service to Douglas County and the City of Lawrence.

Historically, Lawrence had not used a standards of cover document or official statement to guide its operations until 2007. Instead, it has operated under a variety of documents, including a merger plan, operational guidelines, policies and procedures, emergency medical services protocols and verbal

requirements from command staff. As a part of the accreditation model, the department worked to determine acceptable levels of service based on the NFPA fire curve models, EMS criteria, and other related factors of response.

Community and Department Legal Basis

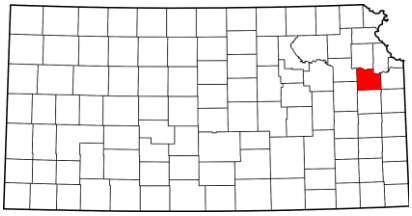
The City of Lawrence was chartered in 1854 and currently is governed by a Commission-Manager form of government in which five Commissioners is elected at large who select a mayor annually.

In 1866 the City Commission passed Ordinance Number 19 stating the Head Center Hose Company will provide for prevention and extinguishment of fires.

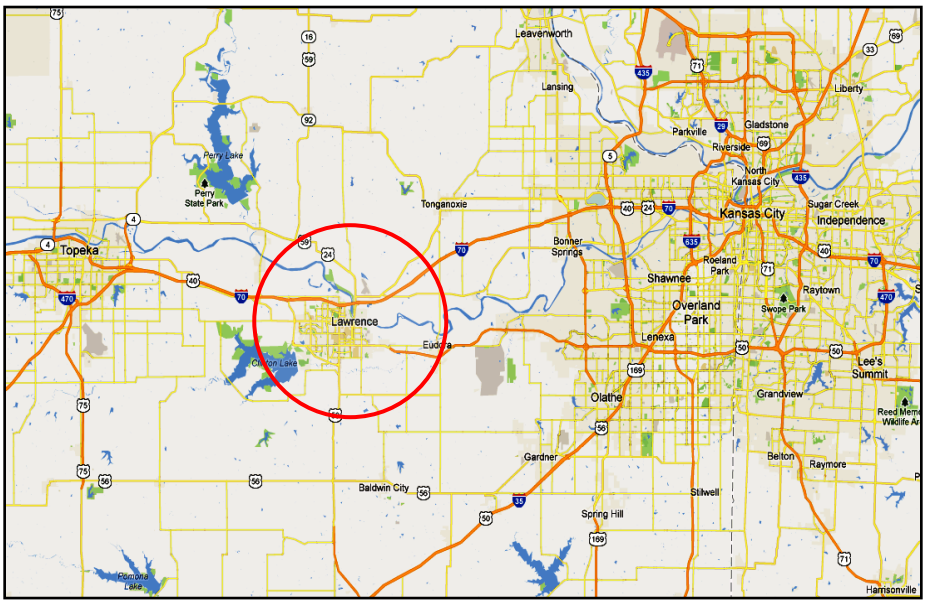
On December 16, 1996, the City of Lawrence entered into an inter-local agreement with Douglas County to merge the existing Lawrence Fire Department and the Douglas County Ambulance Service into one combined agency. This combined agency was named the Lawrence-Douglas County Fire and Medical department. Pursuant to this agreement, the City of Lawrence adopted Chapter VIII, Article I, section 8-101 of the municipal code that legally establishes within the City of Lawrence the "Lawrence-Douglas County Fire and Medical Department."

The city manager is appointed by the Commission, who in turn employs department heads. The city manager has the ultimate approval of all employees and acts as the chief executive officer of the city. The city manager is responsible for carrying out Commission policies through a professionally trained and experienced staff.

History of the Community



Lawrence is a diverse and multifaceted city, with a population of approximately 93,917 people, which ranks as the 6th largest. Lawrence provides many of the amenities of a large metropolitan area, while still maintaining a strong sense of community. Lawrence is the County seat for Douglas County Kansas. Located in northeast Kansas, Lawrence is just 30 minutes west of Kansas City, and 20 minutes east of the state capital, Topeka. Lawrence offers a rich and fascinating history, a wide range of exciting cultural experiences, nationally recognized educational institutions, and some of the most unique and enjoyable shopping opportunities in the Midwest.



Lawrence possesses all the aspects of a friendly, active and culturally diverse community. With the perfect combination of small-town hospitality and big-city attractions, Lawrence lays claim to its share of national recognition and historical significance.

Lawrence was founded in 1854 by the New England Emigrant Aid Society in an effort to keep the territory free from slavery. It is said that Lawrence is one of the few cities in the U.S. founded strictly for political reasons. On August 21, 1863 Lawrence was attacked by pro-slavery guerillas led by William Quantrill. Approximately 180 men and boys were killed in a town with a population of 3,000 people, along with the destruction of downtown by fire. From this event, the City Seal of a Phoenix rising from fire destroyed buildings and motto "From Ashes to Immortality" was created. The areas on the eastern side of Kansas and western side of Missouri where these pre-civil war clashes over slavery occurred have been designated as part of Freedom's Frontier National Heritage Area.

Lawrence boasts one of the most vibrant downtown shopping, dining and entertainment districts in the Midwest. Massachusetts Street, referred to as “Mass” by residents, has been noted as one of the most beautiful main streets in America.

Lawrence provides many recreational opportunities for the community such as Eagle Bend golf course, outdoor and indoor aquatic centers, Lawrence Sports Pavilion, and bike/walk trails throughout the city. Lawrence Parks and Recreation operates and maintains: 64 parks and open spaces, three recreation centers, one sports pavilion, two community centers and four swimming facilities. The city is home to one public golf course, Eagle Bend, and two private golf courses, Lawrence Country Club and Jayhawk Golf Club.

Lawrence VenturePark was opened in 2015 as a new business park. VenturePark is located on more than 200 acres and is adjacent to the existing East Hills Business Park.

In 2018 the City of Lawrence will bring online a second $74 million Wastewater Treatment Plant located on the southeast edge of the city. It is expected with the completion to see new growth to the south and east of the City of Lawrence with the ability to provide wastewater service where it had not been possible before.

Lawrence is also home to two universities: the University of Kansas (KU) and Haskell Indian Nations University. Approximately 28,000 students attend KU, which is ranked as one of the nations' most beautiful campuses. Haskell Indian Nations University is the nation's only inter-tribal university for Native Americans, representing more than 150 tribes from across the country.

Dr. James Naismith, inventor of basketball and KU's only basketball coach with a losing record, is buried in Lawrence where he lived and coached most of his adult life. The DeBruce Center was constructed onto historic Allen Fieldhouse to house the original rules of basketball as developed by Dr. Naismith. The KU Jayhawk basketball program is among the best in the country.

The city is located between both the Oregon and the Santa Fe Trails, which run through Lawrence and Douglas County, KS. Lawrence streets are named after the states, in the order in which they came into the Union, beginning with Delaware. Massachusetts Street was designated the "main" street because Lawrence's founders were from Massachusetts.

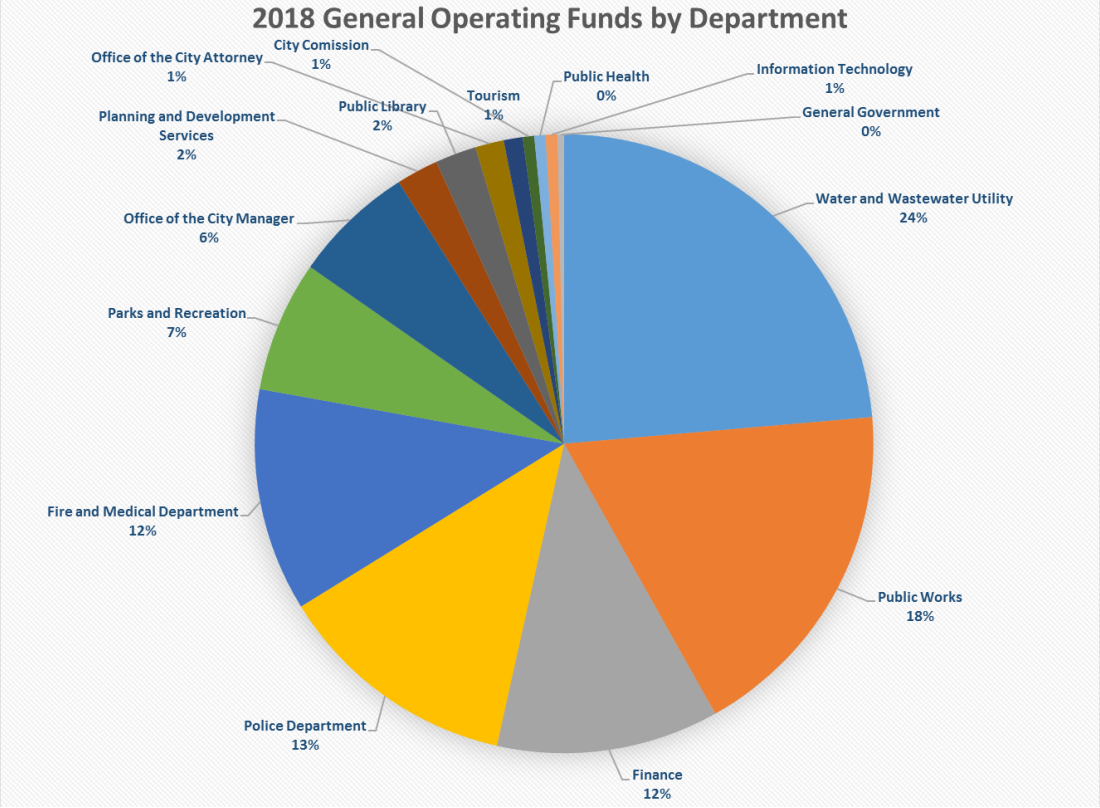
Lawrence is the boyhood home of writer and poet Langston Hughes whose novel "Not Without Laughter" is said to be based on his life in Lawrence. It is also home to beat-writer and artist William S. Burroughs.

Community Financial Basis

The department is funded by the city's general fund, which is shared by ten city departments. The largest portion of the city's general fund is supported by sales tax, followed by property tax and franchise fees. The 2018 budget for the fire medical department makes up 12% of the general fund budget at $21,356,600. The overall budget for the City of Lawrence in 2018 was $196,847,000.

Douglas County's share of the total operating budget is 25.64%, for the provision of emergency medical services in Douglas County. The county's portion is reimbursed to the city on a quarterly basis. The city's share of the total operating budget is 74.36%, for the provision of fire and rescue services in the city. All cost associated with coroner scene investigation (CSI) services are the responsibility of the county.

Figure 1 2018 City of Lawrence General Operating Funds, by Department



The City Commission sets budget priorities and adopts the city budget. The City of Lawrence staffs and provides accounting and financial resources to the entire organization. The Finance Department and City Manager's Office, in cooperation with the city executive team, is responsible for the preparation and the management of the budget as well as financial forecasting based on actual

income and predicted trends. The city's general fund is developed based on revenue from sales and property taxes collected. The fire chief, along with select staff, assist in developing the annual budget based on an examination of existing service levels, new programs, staffing requirements, and past fiscal year trends.

Sales tax, property taxes and fund balance forward make up the largest portion of general fund revenues. Almost half of the resources supporting the general fund come from various sales/use taxes:

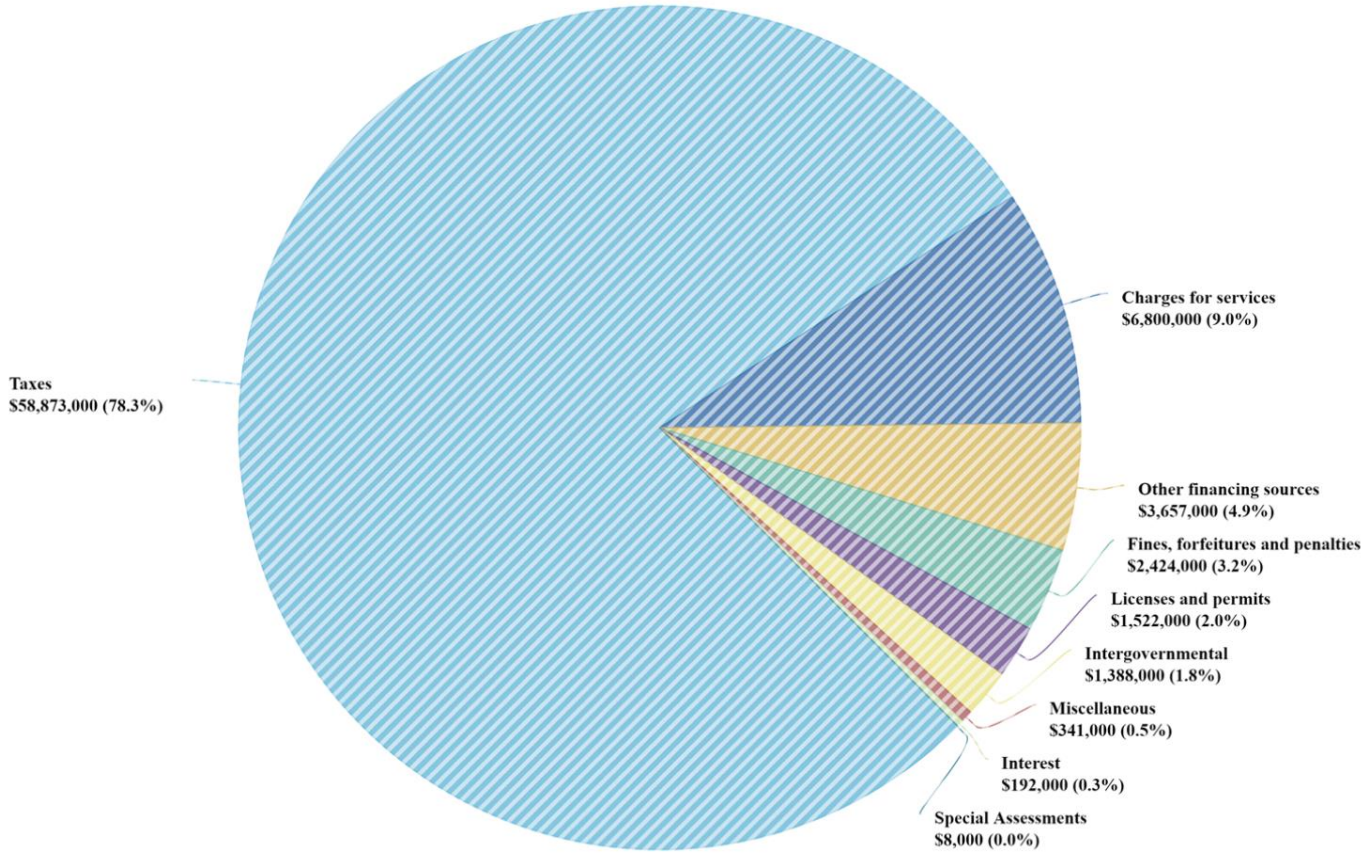
1% City
0.3% Infrastructure
0.2% Transit
0.05 Transit Expanded
1% County-wide

The 2018 budget estimated total revenue from EMS fees is $ 2,400,000. Per the 1996 Interlocal Agreement with Douglas County, the city collects revenue from fees for service for the emergency medical services and deposit fees to the county on a quarterly basis. Charges for special event standbys are, collected by the city and deposited to the county. The county funds three full-time medical claims positions in the fire medical department.

Capital improvements of facilities, suppression apparatus, rescue apparatus, and large equipment over $100,000 and with a five-year lifespan are part of the City Capital Improvement Plan. These projects are largely funded by general obligation debt from the City of Lawrence. The county is responsible for 100% of the cost of the preplacement or addition of all vehicular and other capital equipment that is used primarily for medical purposes. The infrastructure sales tax provides the department $500,000, annually, to support an ongoing preplacement plan for fire apparatus. Expiration of the infrastructure sales tax will take place in the year 2019, unless reapproved through ballot election.

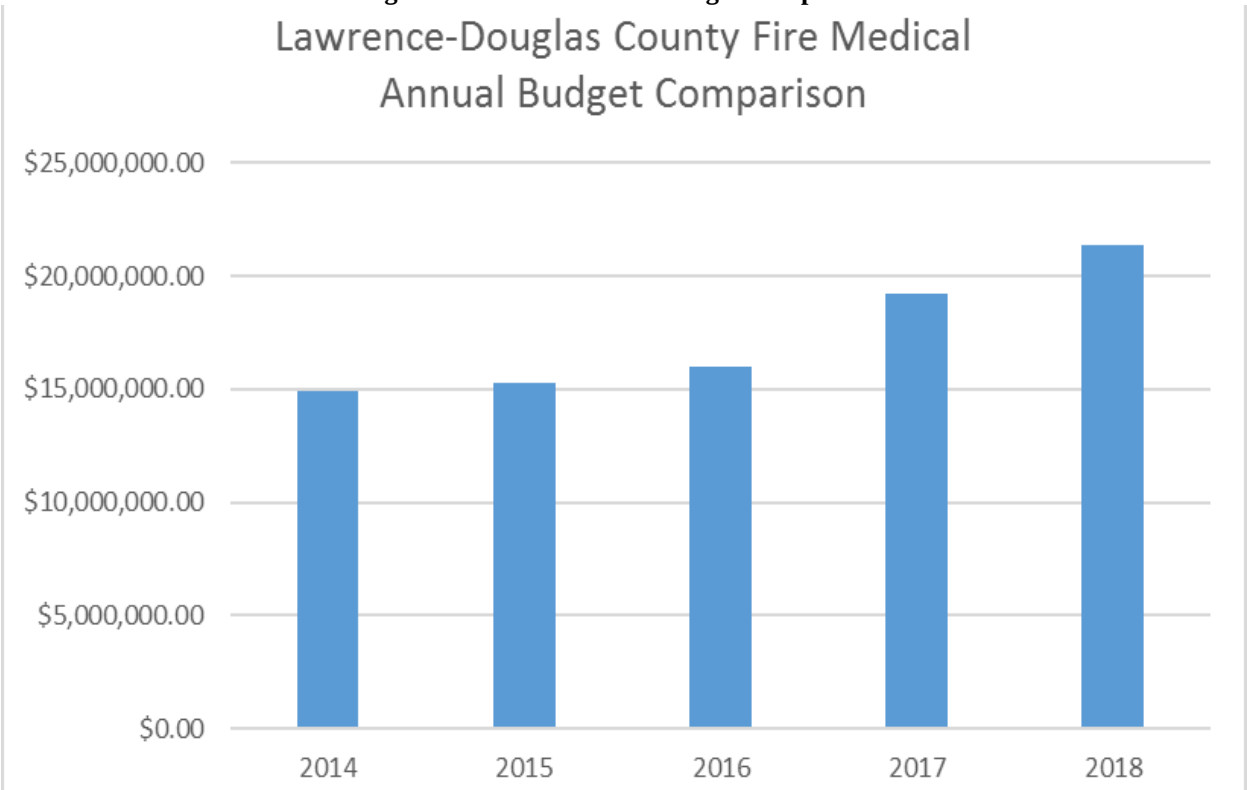
General Operating Fund Resources

Figure 2 LDCFM General Operating Fund Resources



Historically, the department's total operating budget has increased over the last five years from 14.8 million to 21.9 million due to increased costs of personnel, maintenance, and equipment. In the last five years the annual budget for the department has increased by 38% from 2014 to 2018.

Figure 3 LDCFM Annual Budget Comparison



The department's executive staff and city budget staff monitors and evaluates the organization's budget throughout the year to ensure the maintenance for fiscal responsibility. The Finance Department monitors and provides updates throughout the year on revenue projections, and fiscal adjustments are made as necessary. The City Manager's Office implemented a new transparency reporting platform, OpenGov, as part of the 2018 General fund development process. OpenGov will allow citizens direct online access to financial reporting.

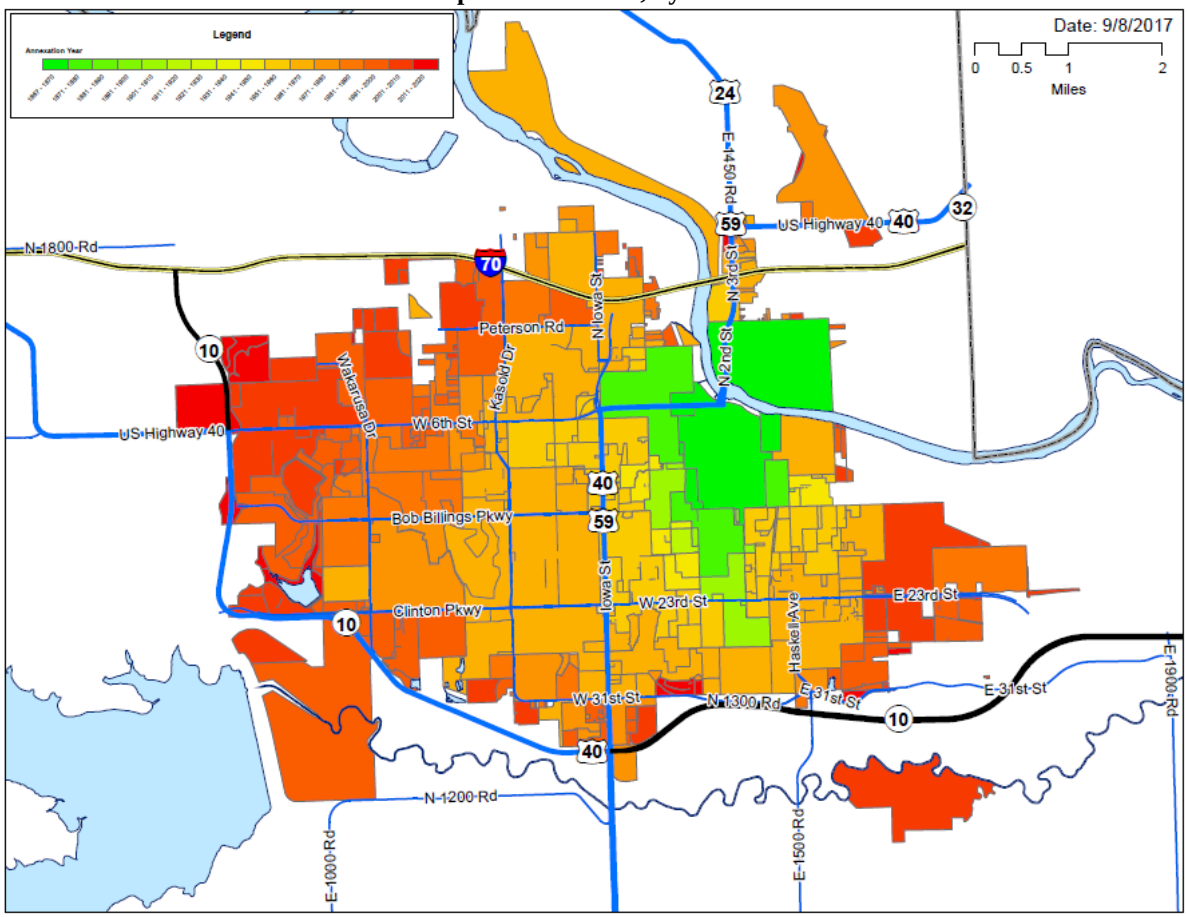
The city receives an annual Certificate of Achievement for Excellence in Financial Reporting from the Government Finance Officers Association (GFOA) for the Comprehensive Annual Financial Report.

Area Description

Community Boundaries

The city has grown significantly since its original Charter in 1854. Growth of the city has been concentrated on the West and Southeast. The historical view of growth illustrates a great land expansion starting in the 1960's. The expansion lasted well into the mid to late 2000's and has dropped off considerably, in part due to the downturn of national economy. The following map depicts annexations by decade.

Map 1 Annexations, by Decade



Community Planning Areas/Zones

Lawrence is home to two University campuses, the University of Kansas and Haskell Indian Nations University. The City of Lawrence does not have regulatory authority over planning and development on either campus.

The State of Kansas has jurisdiction over all University of Kansas property. The Office of Design and Construction Management at the University oversees all planning, zoning, design and construction. The Office conducts fire code reviews and inspections for buildings three stories or lower under commissioned authority of the Office of the State Fire Marshall through the University Fire Marshal Authority. Inspections for buildings four stories or greater are conducted by the Office of the State Fire Marshall.

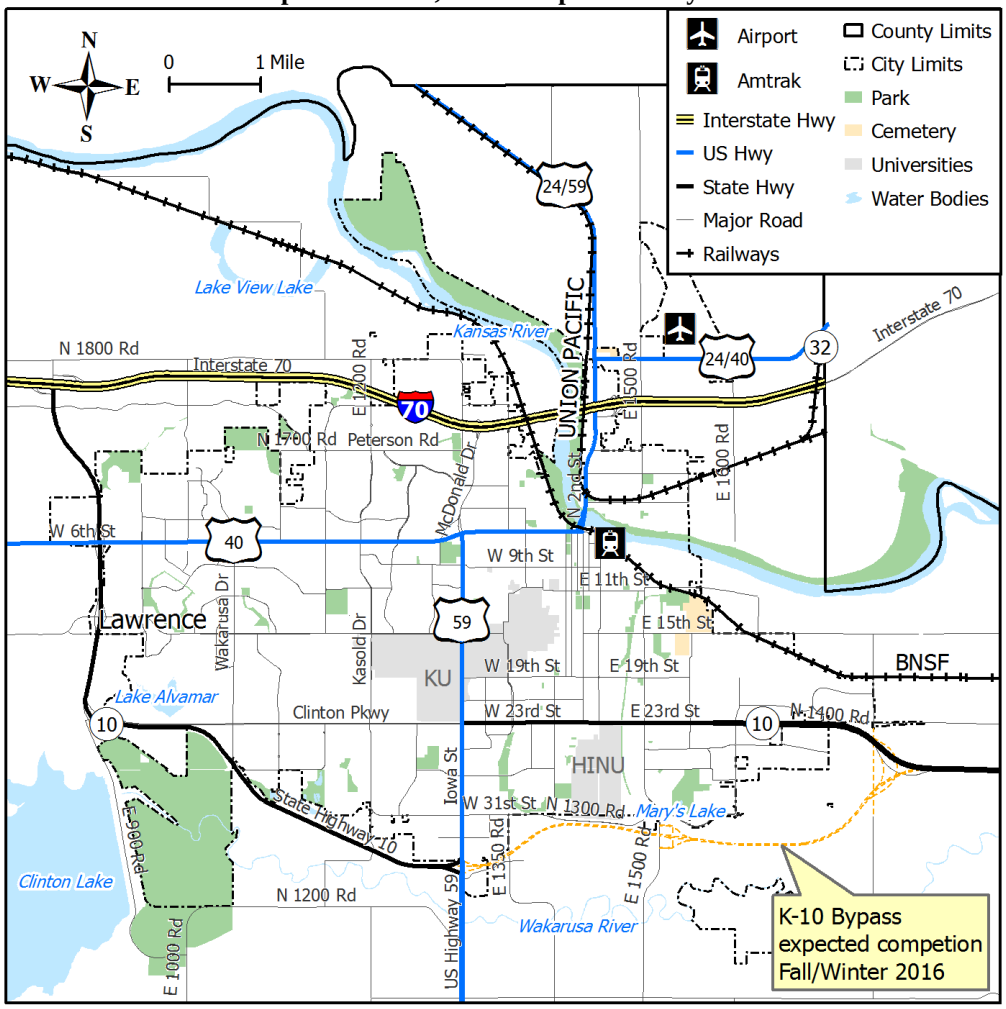
Haskell is a federally operated tribal university funded by the United States Department of Interior. Multiple federal offices are involved in overseeing Haskell and have jurisdiction over planning, development and construction. The University maintains fire protection systems on campus.

Community Transportation Systems

The far eastern side of the city, which includes the East Hills Business Park and Venture Park, are easily accessed from the Kansas State Highway 10(K-10) bypass. K-10 bifurcates at the eastern edge of Lawrence. K-10 is a four-lane limited access highway, which runs west from Interstate 435 in Johnson County, south around the City of Lawrence connecting with US Highway 59 and further west connects to Interstate 70 west of the City of Lawrence. Kansas Highway 10 provides a divided four-lane exit on the east side of Lawrence that becomes East 23rd Street. Currently at the transition of K-10 and East 23rd Street exit is O'Connell Road. O'Connell Road has become a primary residential artery extending south from K-10 to the city limits and provides access to the east side of Prairie Park neighborhood and the Douglas County Jail. Until the K-10 bypass was completed in 2016, East 23rd Street was previously designated as the truck route and all hazardous materials traveled on East and West 23rd Street. Since the completion of the K-10 bypass, the hazardous material shipments have been reduced through the city by routing it to the southern edge of the city.

K-10 bypass ends north of I-70 at US Highway 40. With the completion of the K-10 bypass, access to US Highway 24, US Highway 40, US Highway 59 and Interstate 70. The US highway routes provide two lane services from the Kansas City and Topeka metropolitan areas to points in the eastern quarter and northeast quadrant of Kansas. Interstate 70 is a multi-lane highway that carries a significant amount of interstate traffic through the heart of Kansas. These routes are the primary routes for transportation and distribution of substantial quantities of consumer goods and hazardous material.

Map 2 Lawrence, KS Transportation Systems



Access to North Lawrence on the north side of the Kansas River is gained by the Kansas River Bridge or remotely by Interstate 70. Access is normally not a problem, but contingency plans for access and suppression capability have been developed in the event access cannot be accomplished.

The Union Pacific and Burlington Northern Santa Fe (BNSF) Railroads transect the city. The Union Pacific travels through North Lawrence approximately 40 to 50 times a day with no passenger service and the BNSF with less than 10 including Amtrak twice daily through central and east Lawrence.

The Lawrence Municipal Airport (LWC) is located approximately three miles north of Downtown Lawrence on East US Hwy 24/40 and is a general aviation facility. The City of Lawrence has owned and operated the airport at its current location since its dedication in October 1929. An uncontrolled airfield, LWC averages more than 100 daily flight operations of single-engine, twin-engine and business jets. With the assistance of a 5,700 feet runway and Class I Instrument Landing System LWC provides an all-weather airport for business and recreational planes.

Community Critical Infrastructure

The department has identified important public infrastructure that supports emergency response. Infrastructure are essential resources that play a role in determining the department's ability to "reaching, controlling and terminating an emergency incident."

Lawrence Energy Center (Westar Energy - Electricity)

- 530-megawatt coal plant located in Lawrence, Kansas
- First commissioned in 1938
- Third largest plant in the state of Kansas
- Fueled by low-sulfur coal

Black Hills Energy (Natural Gas)

- Provides natural gas service in Lawrence

Street Maintenance

Lawrence has 841.5 lane-miles of streets that are maintained by the Street Maintenance Division. The Street Maintenance Division is responsible for:

- routine maintenance of the city's streets, alleys, curbs, and gutters
- street sweeping
- ice and snow control on public streets
- maintenance of Kansas River and Mud Creek levee
- maintenance of some infrastructure at the Lawrence Municipal Airport
- operational crew for the storm water utility

Central Maintenance Garage

The Central Maintenance Garage operates as an internal service fund to provide fuel, management, and repair services for the city's fleet of vehicles and equipment. The maintenance facility is located at 11th and Haskell. Fuel stations are located at 11th and Haskell and the "West 40" property near 18th and Wakarusa. The Central Maintenance Garage provides essential fleet management services for all city departments. This division provides technical assistance in the development of vehicle and equipment specifications, evaluates fleet efficiency, and assists with the disposal of surplus equipment.

Storm Water Engineering

The Storm Water Engineering Division was created in 1996 to manage the storm water utility and to implement other recommendations of the *Stormwater Management Master Plan*. Storm water utility fees are charged to all landowners based on impervious surfaces on each property. The resulting revenue supports system reconstruction projects, system maintenance, development review and pollution prevention measures.

Solid Waste

Comprehensive solid waste management services are provided in the context of a growing university community (University of Kansas and Haskell Indian Nations University), resulting in a highly transient population. The 2014 estimated population of the City of Lawrence was 92,763. The collection and disposal of garbage became a municipal service in 1946. The city continues to provide exclusive trash service for residential and commercial customers, as well as curbside single-stream recycling and yard waste collection for residential customers. Additionally, cardboard and office paper recycling collection is offered to commercial customers and there are 11 city-operated recycling drop-off locations for newspaper, cardboard, mixed paper, and / or glass.

The Solid Waste Division hosts several public events throughout the year, including: Lawrence's Earth Day Celebration, Compost & Woodchip Sales, and Electronic Recycling events. Additionally, the division operates facilities that are open to Lawrence and Douglas County residents for Compost & Brush Drop-Off and Household Hazardous Waste.

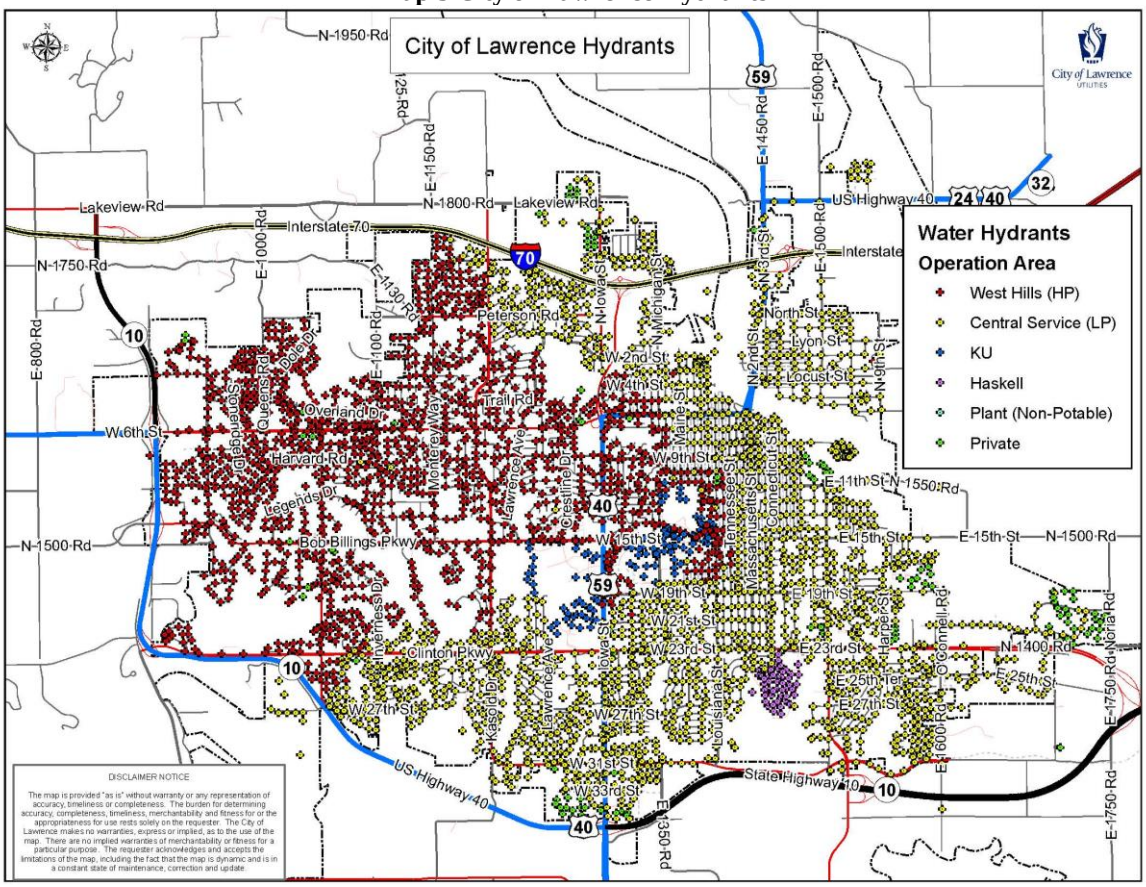
The Solid Waste Division utilizes an enterprise fund account for its operations. The city's solid waste services are financed and operated in a manner similar to private business enterprises. The intent of

the governing body is that the costs of providing services (collection, disposal, recycling, and technical assistance) to the general public is financed or recovered primarily through user charges.

Water Distribution Division

The Water Distribution Division is responsible for the installation, maintenance, inspection and repair of the water pipelines that deliver drinking water from the water treatment plants to the taps. The system consists of pipes ranging in size from the large 24" transmission lines to small ¾" service lines. Five rural water districts and Baldwin City also receive water from the city's distribution system. The Utilities Department is constantly striving to ensure that clean, safe water is available for both consumption and for fire protection needs. The distribution system is continually being upgraded and updated. Each year, sections of pipe that have been identified, for a variety of reasons, as needing replacement are either replaced by distribution personnel or outside contractors.

Map 3 City of Lawrence Hydrants



The City of Lawrence Utilities Department manages the testing and maintenance of all public hydrants in the city. Private hydrants, those located at Haskell Indian Nations University and University of Kansas campuses are not maintained by the City of Lawrence Utilities Department.

The City of Lawrence provides fire protection to Grant Township through a fire protection agreement. There is a plan in place for water shuttle supply using water tenders due to the lack of a hydrant system for firefighting purposes.

Water Treatment Division

The Water Treatment Division is responsible for all water treatment activities, in-house engineering and management of water treatment projects and water rights procurement management. The division works in cooperation with the Distribution and Quality Control Divisions to ensure a safe, reliable and aesthetically pleasing water supply to the citizens of Lawrence and surrounding communities. The Water Treatment Division operates two treatment facilities, the Kaw River Water Treatment Plant and the Clinton Reservoir Water Treatment Plant.

The Kaw River Water Treatment Plant was completed in 1917 and an addition to this plant was completed in 1958. The capacity of this plant stands at 16.5 million gallons per day (MGD). This plant draws its water from the Kansas River and six alluvial wells on the River banks.

The Clinton Reservoir Water Treatment Plant has a capacity of 15 million gallons per day and was put into service on March 1, 1980. A recently completed expansion increased the capacity from 10 million gallons per day to 15 million gallons per day. The Clinton Reservoir serves as the source of raw water to this plant.

Wastewater Collection Division

The Wastewater Collection Division is responsible for maintaining the sanitary sewer collection system that collects and delivers wastewater to the Wastewater Treatment Plant for treatment. The collection system infrastructure includes 400 miles of gravity and forced sewer mains, 15,000 manholes and 38 lift stations. The sewer lines are constructed of vitrified clay pipe and PVC truss pipe. The pipes range in size from 8 inches to 48 inches in diameter.

Wastewater Treatment Division

The City of Lawrence Wastewater Treatment Plant, located at 1400 East 8th Street, has the capacity to treat approximately 12.5 million gallons per day, with peak flows of 25 million gallons per day through the normal process and an additional 40 million gallons through the excess flow system during extreme rain events. City staff are responsible for the plant's efficient operation and maintenance.

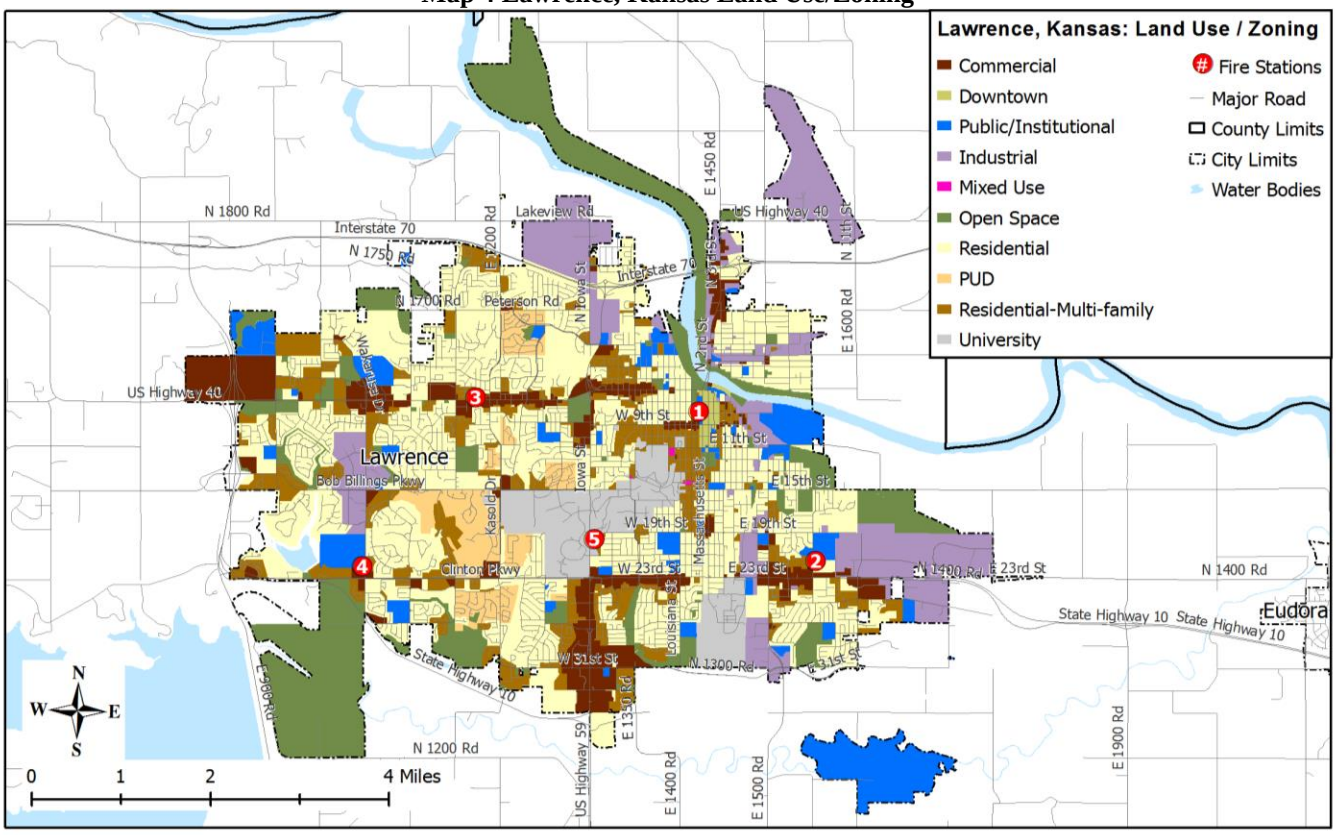
The City of Lawrence is also currently constructing a second wastewater treatment plant to accommodate future growth. The Wakarusa River Wastewater Treatment Plant, located at 2300 West 41st Street, provides a second wastewater treatment plant and enhanced operational flexibility, with pump station functionality to divert flows between treatment plants as needed to meet changing operational needs. The project provides for future community growth, meets the regulatory requirements for wet weather treatment and nutrient removal, and increases system reliability and resiliency in transporting and treating wastewater without negatively impacting the community or the environment.

Sources: City of Lawrence Website

Community Land Use and Zoning

The following map shows the land use and zoning types as the city has developed and expanded. The newly developing areas of the community are continuing with commercial development along main thoroughfares with fill in of residential and multi-family residential around the commercial development. The industrial areas of the community are currently located along the outskirts of the community near the highways that are needed to transport the manufactured products. The community has a nice compliment of green space and parks throughout the city for citizens and visitors to enjoy.

Map 4 Lawrence, Kansas Land Use/Zoning



Lawrence has adopted a document entitled *Horizon 2020* as their comprehensive land use plan. A comprehensive plan expresses a community's desires about the future image of the community. It provides the foundation and framework for making physical development and policy decisions. Prior to Horizon 2020, Douglas County had *The Guide Plan* and the City of Lawrence had *Plan 95* to use as guides in comprehensive planning. The planning process for *Horizon 2020* was initiated in 1992. After years of public involvement, *Horizon 2020* was adopted in 1998 to serve as the comprehensive plan for the City of Lawrence and unincorporated areas of Douglas County and has continuously been amended to address changing trends and beliefs about development in the community.

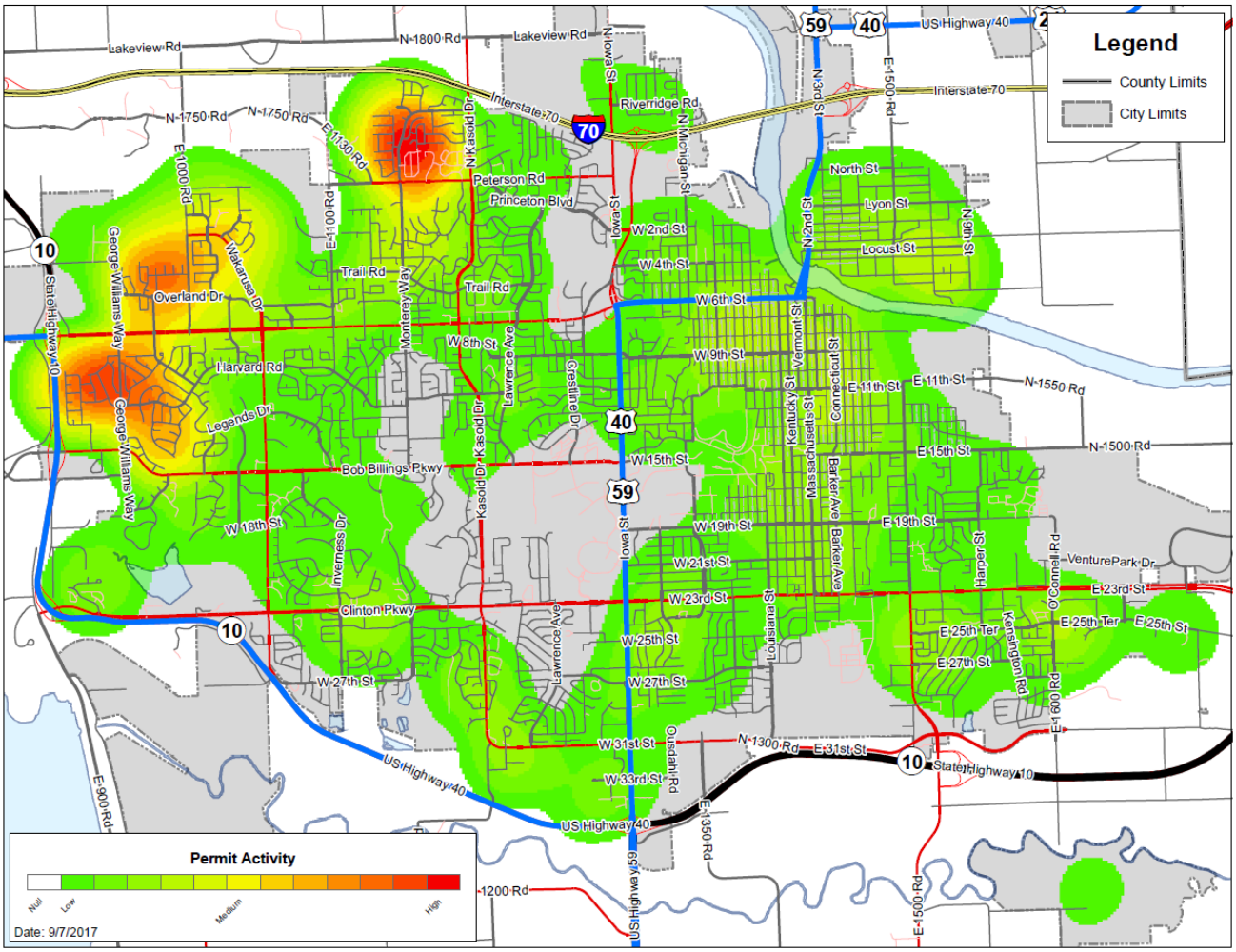
The comprehensive plan is a policy guide that describes in text and displays in graphics the community's vision for directing future land development. A plan includes several components:

- It is a policy plan, stating the community's desires for directing land use decisions through the identified goals and polices.
- It provides a physical plan component by mapping generalized land uses and describing in policies the relationships between different land uses.
- It is long-range, considering Lawrence and Douglas County's expected growth in the future. Future land use maps graphically display potential development of the community.

- It is comprehensive, considering issues such as demographic, economic and transportation factors that have shaped and will continue to influence land development in Lawrence and the unincorporated areas of Douglas County.

Source: City of Lawrence Website

Map 5 Permit Activity, City of Lawrence, 2012-2016



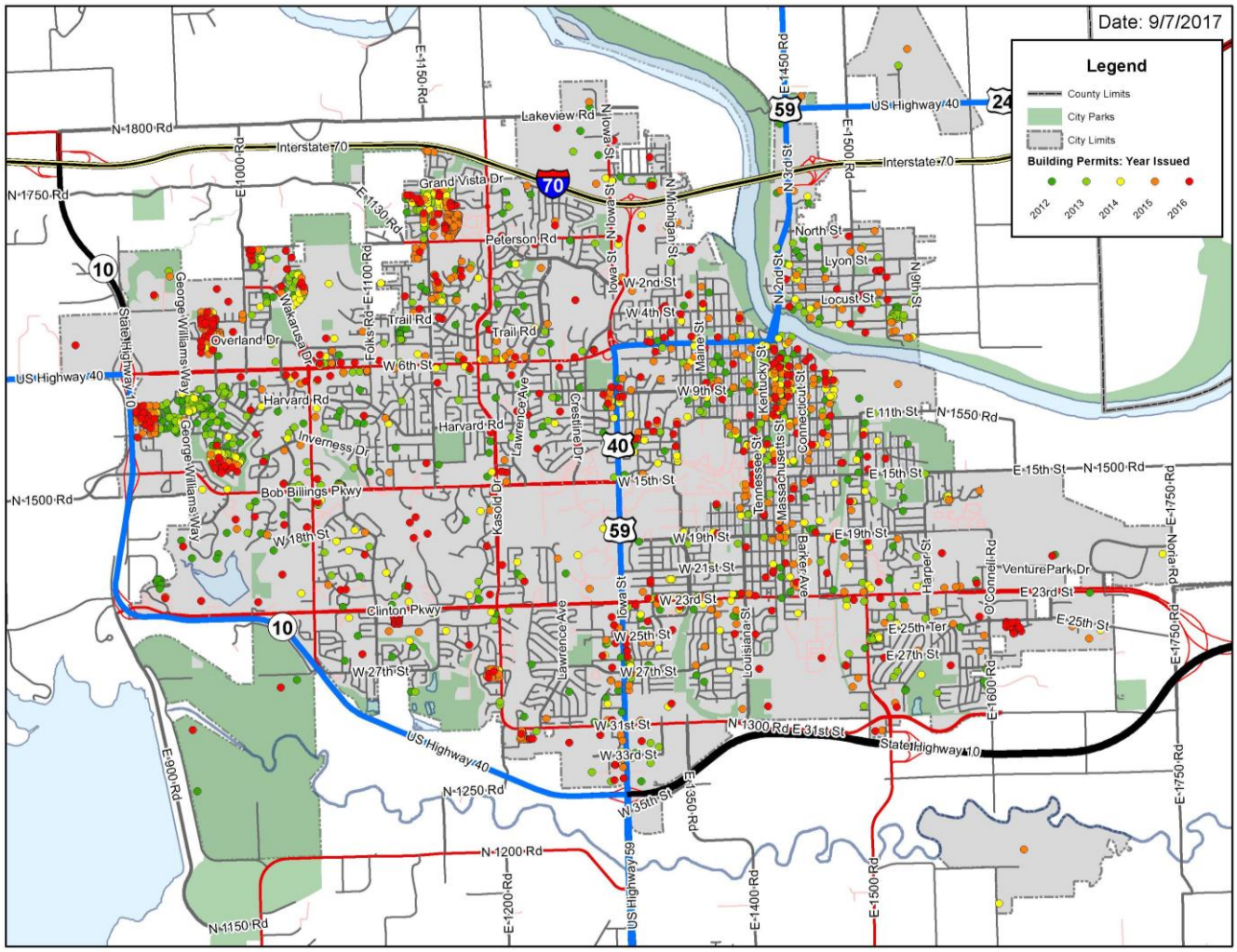
The trend in Lawrence's total number of permits issued annually had been steadily decreasing since 2000, reaching a decade-long low of 1,998 in 2009. The number of annual permits trended up from the low in 2009 to 2,377 in 2012, but dropped again in 2013 and 2014. In 2014, the number of permits issued dropped to 1,930, the lowest level since 2000. However, the total annual number of permits issued increased in both 2015 and 2016, to 2,320 and 2,577, respectively. The total of 2,577 permits issued in 2016 was an 11.1% increase over 2015 and a 15.2% increase over the rolling 5-year annual average of 2,237 (2012 through 2016).

In 2016, permits were issued for 1,205 new multifamily dwelling units in Lawrence, up 158.0% from the 467 new multifamily units permitted in 2015, and 153.9% greater than the 5-year annual average (2012-2106) of 474.6 new multifamily dwelling units. The 1,205 new multifamily dwelling units

permitted in 2016 was the highest number of new multifamily units ever permitted in a single year in Lawrence, and the highest number since 1996 (when permits for 972 new units were issued). Compared to peer university cities and Regional Kansas Jurisdictions, Lawrence rates highest on the number of new multi-family building permits and dwelling units. The map below shows the building permits by year.

*Information from City of Lawrence Planning and Development Services

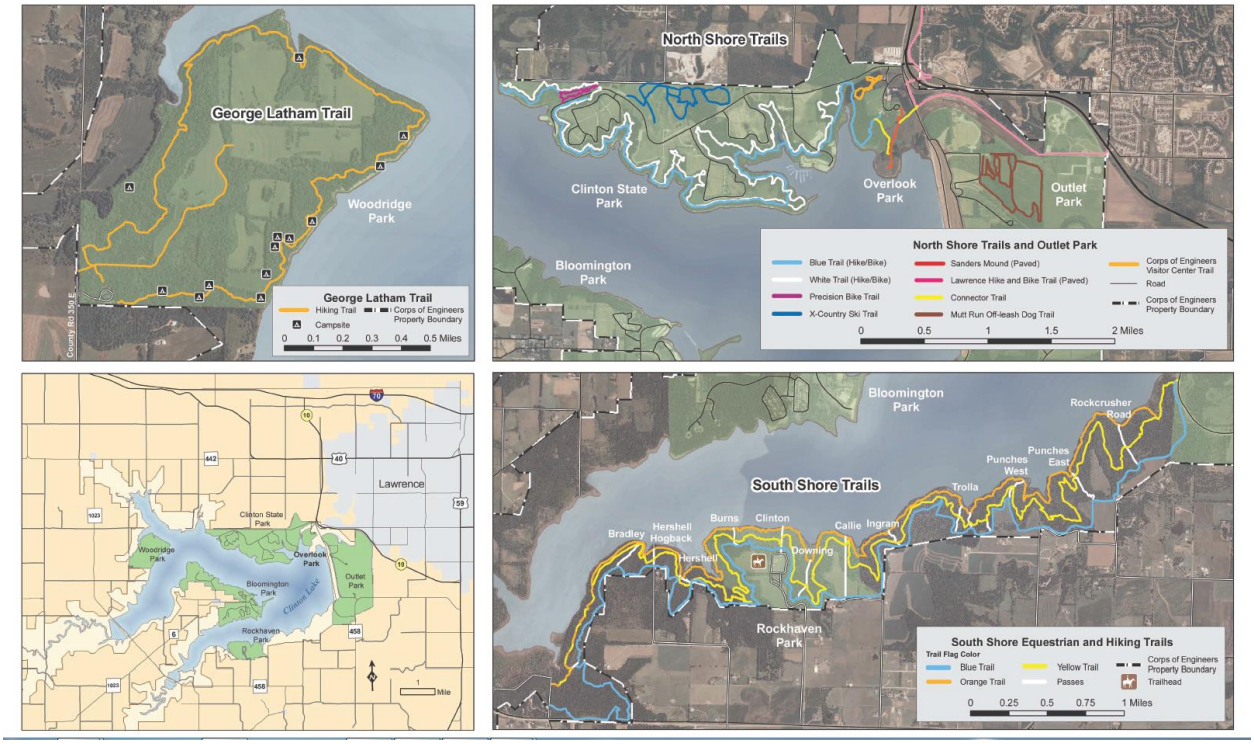
Map 6 Building Permits, City of Lawrence, 2012-2016



Community Topography

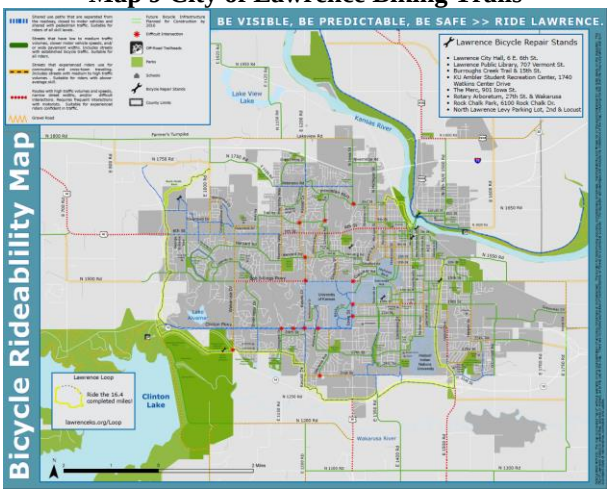
Lawrence is located in the northeast corner of Douglas County with a land mass of 34.8 square miles, water area of 0.70 square miles with an elevation of 866 ft. Douglas County has a land mass of 475 square miles with a water area of 19 square miles and elevation of 1164 ft. Lawrence is known for the hills and valleys of the area. Lawrence is bordered by the Kansas River on the north which separates North Lawrence from the rest of Lawrence to the south. On the southern border is the Wakarusa River which is fed by Clinton Lake. Lawrence has 3953 acres of parks, of which, 155 acres are undeveloped and 153 are preservation land. Lawrence has 84 miles of hiking and biking trails; Douglas County has 151 miles of trails.

Map 7 Clinton Lake Walking/Biking and Horse Riding Trails



Map 8 City of Lawrence Walking/Jogging Trails

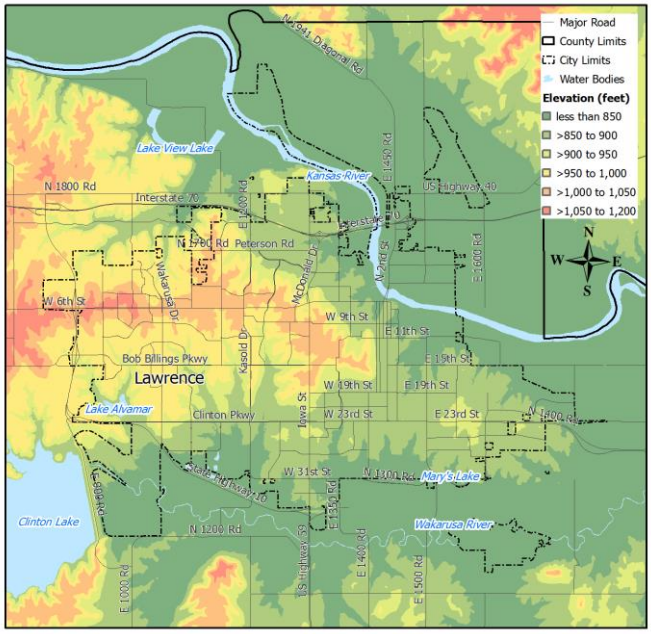
Map 9 City of Lawrence Biking Trails

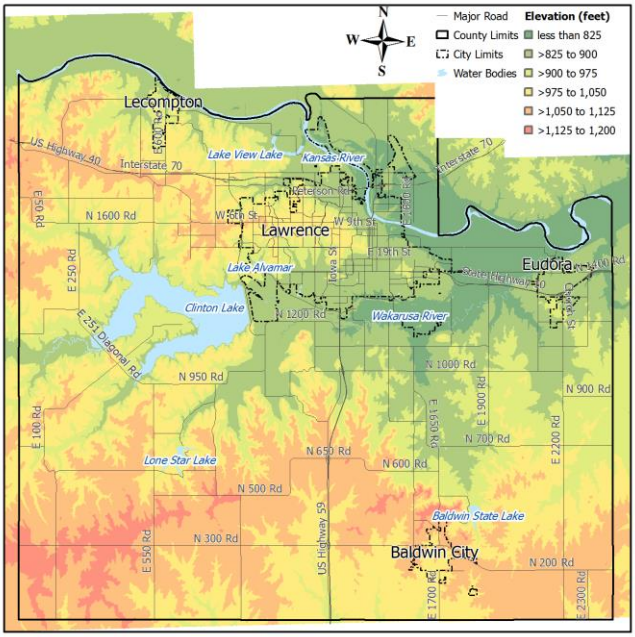


Clinton Lake was built by the Corps of Engineers as a result of the Flood Control Act of 1962 with construction beginning in 1972 and was completed in 1975. It is a large recreational lake with several bike trails, camping facilities and boating amenities. Lawrence is also complemented by several biking, walking and hiking trails throughout the city and along the Kansas River. Lawrence has several lakes in the area which include Clinton Lake, Douglas County Lake, Lone Star Lake, Mary's Lake and Potter's Lake which is located on Kansas University Campus.

Kansas University is located in the center of the city and sits 1,037 feet above sea level. This area is known as Mount Oread and is known as the "Hill" to people in Lawrence.

Map 10 Lawrence and Douglas County Topography





Community Geography

Mount Oread is the highest point in Lawrence at 1,020 feet. The city lies on the southern edge of the Dissected Till Plains, bordering the Osage Plains to the south. According the US Census Bureau, the city has a total area of 34.8 square miles.

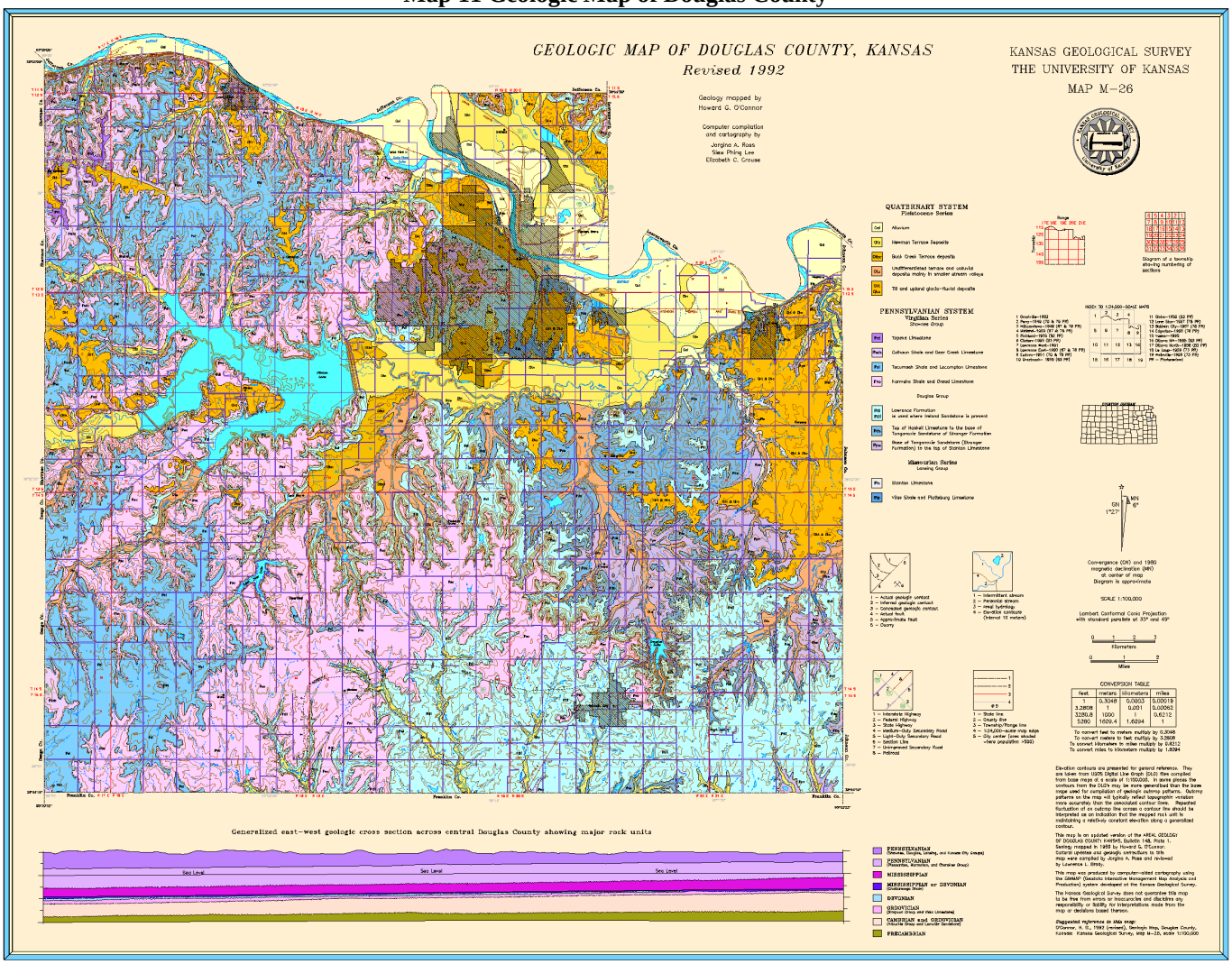
Lawrence is situated along the banks of the Kansas and Wakarusa Rivers. There are several major creeks that flow through Lawrence. Burroughs Creek is located in eastern Lawrence and Baldwin Creek in northwestern Lawrence that converge with the Kansas River. Yankee Tank Creek in southwest Lawrence and an unnamed creek that flows through central Lawrence converge with the Wakarusa River south of the city. Yankee Tank Creek is dammed to form Lake Alvamar, which was originally called Yankee Tank Lake. The Wakarusa River is dammed to form Clinton Lake. There are also the Haskell-Baker Wetlands that maintained by Haskell University and Baker University.

Community Geology

Douglas County lies in northeast Kansas with Lawrence located in northeast Douglas County. Northeastern Douglas County is part of the Glaciated Region with the remainder of the county part of the Osage Cuestas. The Osage Cuestas has created the gently dipping hills that has alternating hard and soft rock layers. This gives Douglas County gentle hills throughout the county.

The main rock deposits found in this area are sandstone, shale, and limestone. Sandstone is a common sedimentary rock in the area while shale is composed of hardened, compacted clay or silt. The shale deposits have been used for making bricks in eastern Kansas which is used in construction of area homes and businesses.

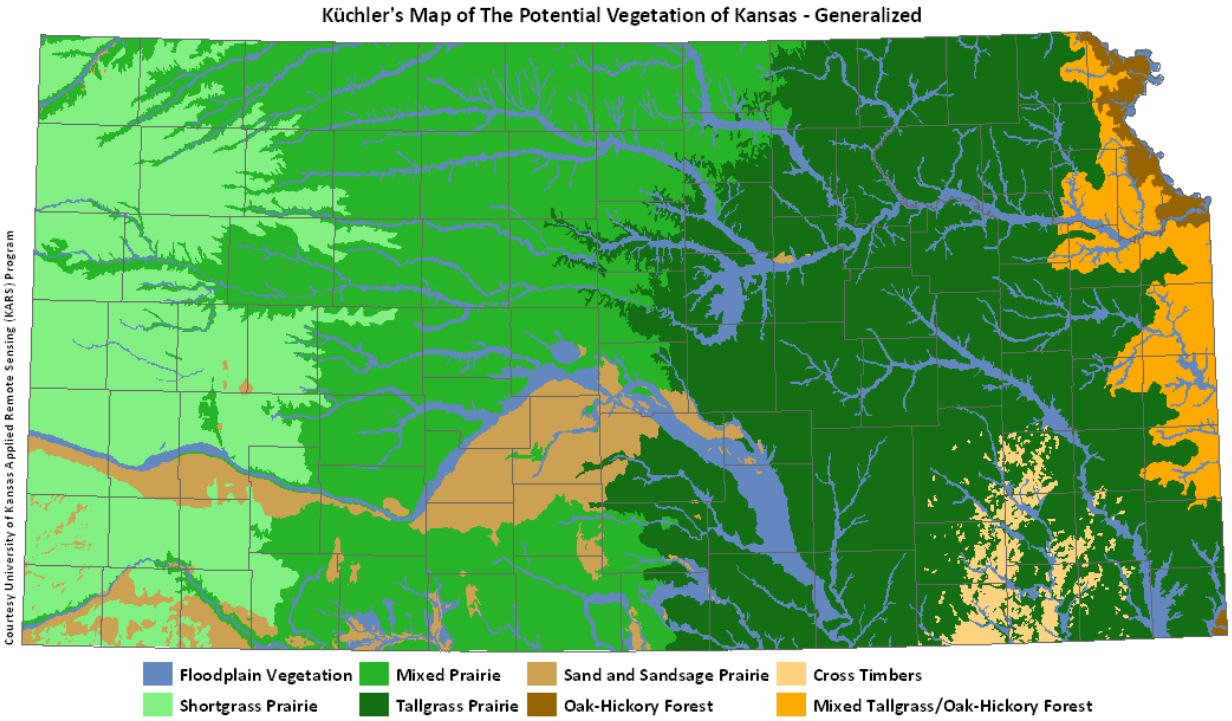
Map 11 Geologic Map of Douglas County



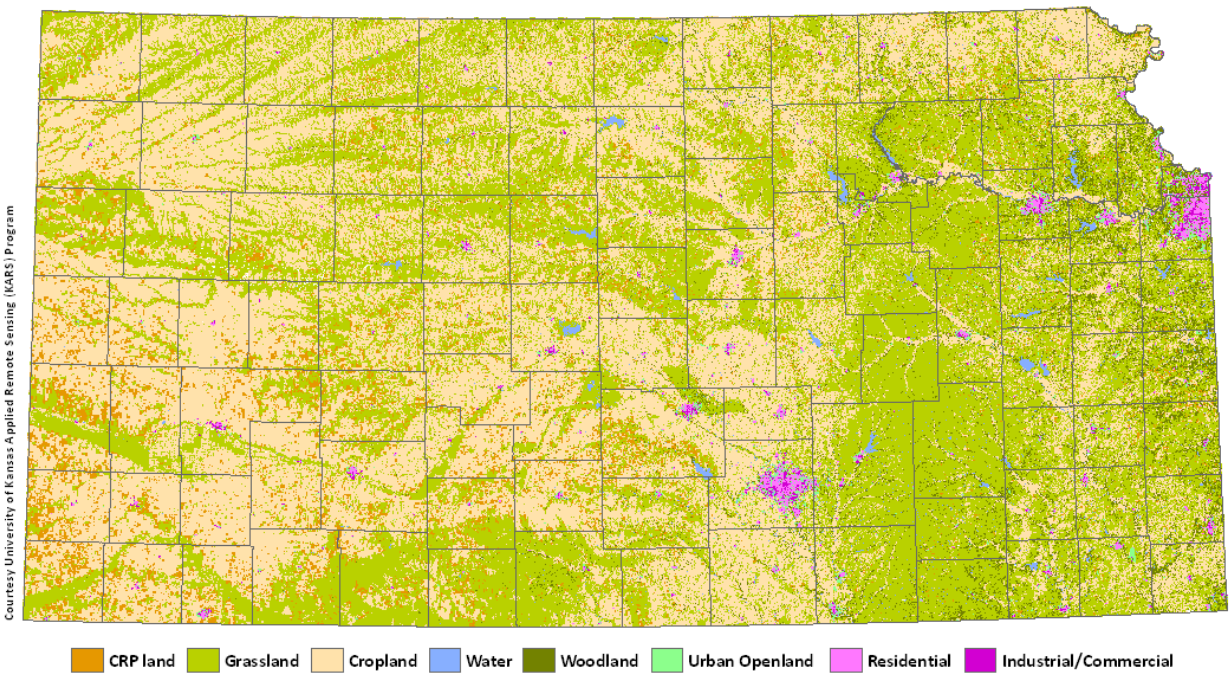
Community Physiography

Douglas County and the City of Lawrence sit within the Osage Cuestas region of Kansas. This area is made up of mostly undulating plains with some areas of woodland area and perennial streams and larger bodies of water. The city and county have two rivers, the Kansas River in the northern area of the county and the Wakarusa River that is located more centrally to the area. The ground is made up of silty and clayey residuum and colluvium, with alternating layers of Pennsylvanian sandstone, limestone and shale. The vegetation of the area is mostly made up of tallgrass prairie and a combination of upland forest that contain shagbark hickory, bitternut hickory, red oak, white oak, and black oak. The land use of Lawrence and Douglas County is made up of cropland, woodland, grassland and developed land. The City of Lawrence is the developed land within Douglas County with three other small cities Lecompton (West), Baldwin City (South) and Eudora (East) located within the county. In all these cities, the vegetation transitions from Tall prairie grass to developed area with no buffer between the transitions.

Map 12 Potential Vegetation of Kansas - Generalized



Map 13 Kansas Land Cover Patterns, 2005



Community Climate

As a Midwest city, Lawrence annually experiences four seasons. The city has a humid continental climate with hot summers and no dry season. The temperatures range from an average low of 42 degrees Fahrenheit in January to an average high of 70 degrees Fahrenheit in July. Lawrence's average temperature is nearly 56 degrees Fahrenheit with a high temperature of 108 degrees and low of 2 degrees. Lawrence has a south prevailing wind. The summer is typically hot and humid, and the winter is dry.

The Lawrence weather information was provided by Weather Underground and describes the typical weather at the Lawrence Municipal Airport (Lawrence, Kansas, United States) weather station over the course of an average year. It is based on the historical records from 2012 to 2017.

The length of the day varies significantly over the course of the year. The shortest day is December 21 with 9:26 hours of daylight; the longest day is June 20 with 14:55 hours of daylight. Over the entire year, the most common forms of precipitation are thunderstorms, light rain, moderate rain, and light snow.

Disaster Potential

Severe Thunderstorm **Risk - High**

The department has identified the risk of severe thunderstorms as high. Climate conditions that create the severe thunderstorms exist mostly in the spring and summer months. However, there remains a potential for storms year-round. In Kansas, severe thunderstorms frequently occur in the late afternoon or evening.

Severe thunderstorms consist of high winds, lightening, some localized flooding, and at times, hail. Fallen trees and localized flooding impact mobility in and around the city and have an impact for emergency responses. Downed power lines create an interruption in power supply, activation of alarms and an electrical hazard for response units.

Because the threat and risk of severe thunderstorms and lightning is persistent in Lawrence, homes and buildings could be damaged due to high winds and lightning strikes. Life loss should not be much of a factor in a severe thunderstorm. Mutual aid from neighboring communities could be activated, but may be limited due to similar responses within those communities.

The department has the ability to provide the emergency response services needed to mitigate the various effects of thunderstorms. Operational parameters exist for thunderstorms in order to enhance responses, maintain responder and citizen safety, and utilize resources in an efficient manner.

One operational parameter exists with the Douglas County Emergency Operations Plan covering thunderstorms and could be activated if needed. Historically, the department has been able to maintain emergency response to impacts as stated in this section.

Tornado/Microburst **Risk – High**

The department has identified the risk of tornadoes as high. The potential for impacts and effects from tornadoes and/or microburst exist within the City of Lawrence. As is the case with severe thunderstorms, the climate conditions which spawn such meteorological events are ideal during the spring and summer months.

These events historically have been random, but as a by-product of thunderstorms, the potential exists. With tornadoes and microburst come the potential for major property damage and mass casualty. The economic impact would be great, depending on the magnitude of the damage.

Any tornado moving through Lawrence would be devastating due to the density of population per square mile and the prevalence of homes built over slabs due to high water tables and rocky soil. The last tornado to seriously affect Lawrence occurred May 8, 2003 and touched down in southwest Lawrence. The tornado caused heavy damage to about 40 homes and six apartment buildings. One resident was reported injured and damage was estimated at $6.4 million.

In the early evening hours of June 19, 1981, a tornado devastated southwest Lawrence with the heaviest damage and a single fatality occurring near the intersection of West 31st and Iowa Streets. The west side of a K-mart store collapsed, killing a 30-year-old Lawrence man. Damage was estimated at approximately $20 million and 35 people were injured.

An April 12, 1911 tornado swept through the north end of the downtown area, killing a couple in their home.

Microbursts are very strong winds that quickly descend from the base of a severe thunderstorm and then spread out quickly upon impact with the ground. This straight line, damaging winds can cause extensive damage across a large area.

On March 12, 2006, a microburst struck Lawrence around 8 a.m. The microburst contained 70 to 90 mph straight line winds. The damage from the microburst in Lawrence included extensive damage to trees, power lines, and over $8.0 million of property loss.

A weak tornado touched down South-Central Douglas County on February 28, 2012. Several barns were damaged or destroyed, and numerous trees were uprooted.

Emergency warning sirens can alert citizens of any funnel cloud or tornado in the area or conditions that could create them. With proper warning, life loss can be kept to a minimum but estimating and preventing property damage would be difficult. Risk level for a tornado for loss of life and property would be high. Depending on the nature and scope of the incident, the Emergency Operations Plan would be implemented.

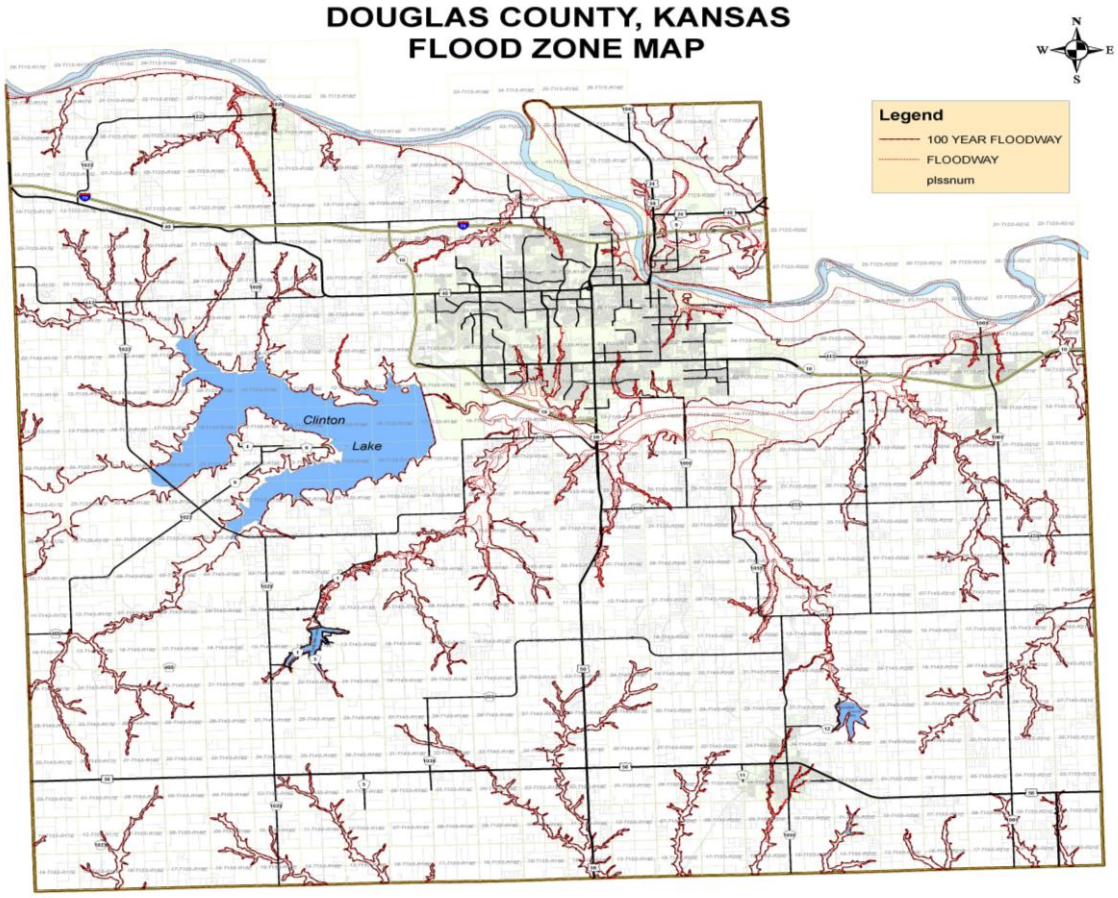
Flood/Flash Flood **Risk - Moderate**

The department has identified the risk of flooding and flash flooding as moderate during any part of the year. The Kansas River has a long history of flooding that has caused significant damage and economic losses.

Historically, the early 1900's ushered in a wet cycle; this persisted for nearly fifteen years. There were minor floods in 1901 and 1902, and then in 1903 came a significant flood. In 1903, the river channel was about one-half of its present width. At the conclusion of the flood, approximately one-third of North Lawrence was added to the channel of the Kaw River by the disastrous flood.

Floods of lesser proportions occurred in 1904, 1905, 1908, 1910, 1912, and 1915 with relatively minor property damage. This frequent reoccurrence was of sufficient significance and inconvenience to slow the development of North Lawrence.

Map 14 Douglas County Flood Zone



Lawrence had to cope with two floods in less than a month in 1951. On June 23, the Kaw level reached 25.6 feet at the Lawrence dam, the highest it had been since 1903. The Great Flood of 1951 was the costliest catastrophe of its kind in local area history and occurred on "Black Friday," July 13, 1951. Surprisingly, not one life was lost in Lawrence and the immediate area. Loss estimates here ranged from $4 million to $6 million. The peak Kansas (Kaw) River reading at the Bowersock Dam in Lawrence was three and one half feet above the crest of the fabled 1903 flood, which had been recorded at 27 feet. Flood stage at the dam was 18 feet, the same as today. With the Flood Control Act of 1954, a series of reservoirs; including Clinton, Milford, Perry and Tuttle; and a river levee system were constructed in northeast Kansas to reduce flooding and its affects.

The Kansas River, last flood outside the river levee occurred in June of 1993, causing the evacuation of several residents and causing millions in damage to north Lawrence.

As the city continues to grow new development has shifted the flow of water during heavy storms to areas previously not considered a problem.

Flash Flooding intersection of 23rd and Ousdahl June 2010

Drought/Heat Wave **Risk - Moderate**

The department has identified the risk of drought and or heat wave as moderate during summer months. The threat of drought is persistent in Lawrence. The City of Lawrence has taken significant measures to reduce the impact of drought. Department operations and capabilities may be jeopardized due to a lack of a water supply. Loss of life could very well be a factor with the number of older adults in Lawrence. EMS capabilities could be stretched to the limit by an abundance of dehydration calls. Fire calls could greatly increase due to dry conditions. Economically, the City of Lawrence could be affected by loss of vegetation (trees, shrubs, flowers, plants, grass). Lawn watering and car washing restrictions should be in effect and monitored. Cooling stations would be established throughout the City of Lawrence. Senior citizens and shut-ins would need to be checked on regular basis.

Winter Storms **Risk - High**

The department has identified the risk of winter storms and or heavy snowfall as high during winter months. Severe winter storms can cause widespread damage and disruption. Heavy snow often results in paralyzed transportation systems, automobile accidents and stranded vehicles. The hazards posed by winter storms may be catastrophic. Glazing from ice storms and heavy snow can affect power lines and other utilities. Intense wind, extreme cold and snow can have profound health effects, especially on the elderly.

Historical response data indicates that ice buildup can create problems. In January 2002, the city and Douglas County were part of the northeast Kansas federal disaster area after a January 30 storm knocked down tree limbs and power lines and left thousands of Lawrence residents without power for several days.

Structural collapses may occur due to heavy snowfall on roofs. Life safety would be minimal, but property damage could be high due to roof collapses and frozen water pipes.

In the advent of severe winter weather and snow conditions, the department's severe weather standard operating procedure would be put into effect. The plan increases staffing and modifies response to ensure the highest level of service is maintained when roads and access to homes and businesses are adversely affected.

Earthquake **`Risk - Low**

The department has identified the risk of a high impact earthquake as low. The risk from earthquakes in Kansas is relatively low according to a report, completed in 200, from the Federal Emergency Management Agency (FEMA). Kansas ranked 43 of 50 states in the amount of damage caused by earthquakes in an average year.

According to the U.S. Geological Survey the earthquake count for Kansas from 2010-2016 shows a positive trend. The count for 2010-2012 was zero, and then has rapidly increased to two in 2013, 42 in 2014 and then 60 in 2016. On September 3, 2016, a M5.6 earthquake struck near Pawnee, Oklahoma. Multiple states in the Midwest felt the quake and it was the largest reported in the state of Oklahoma.

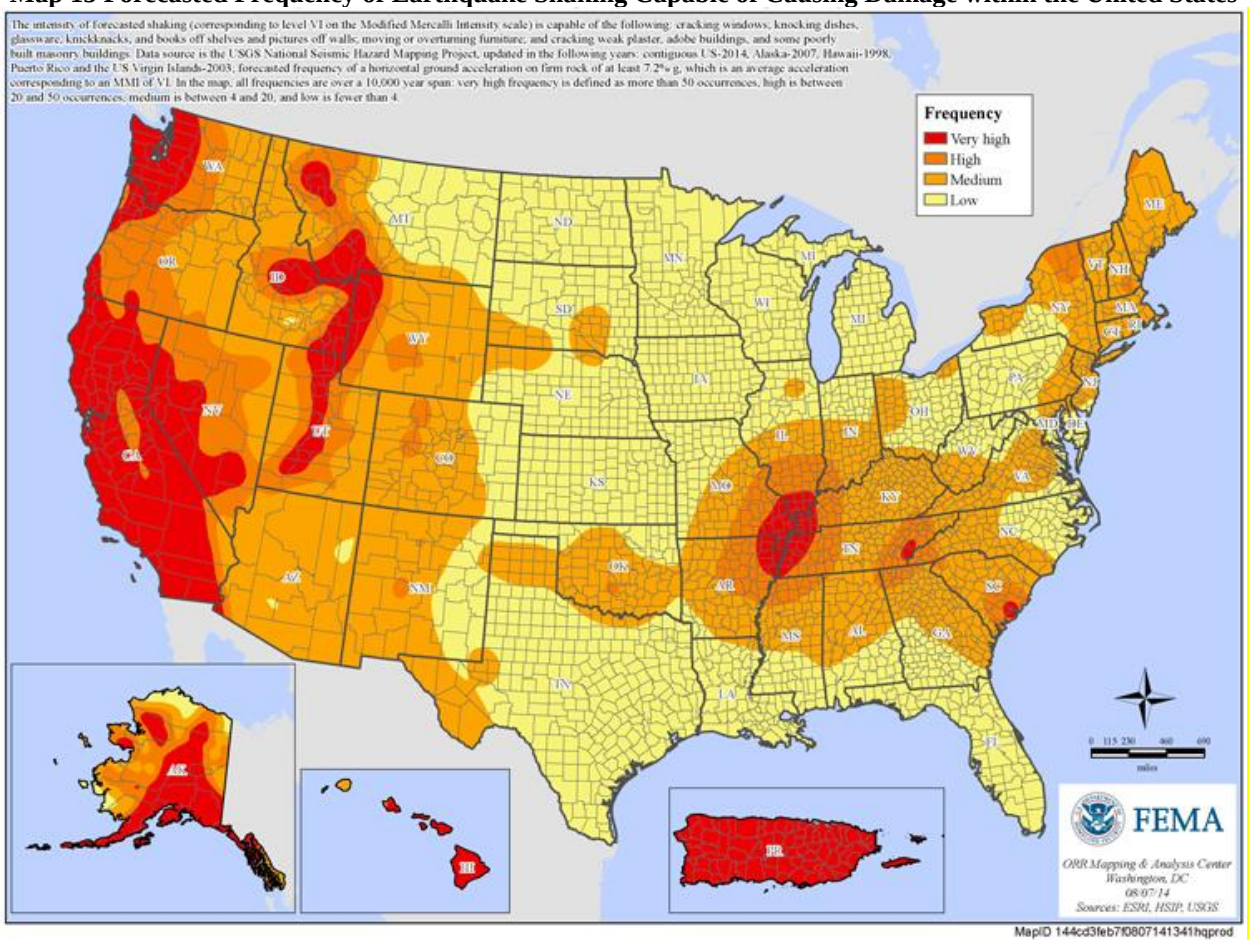
This region has had notable examples of earthquakes including the three very large New Madrid, Missouri, earthquakes that shook the eastern half of the United States in the winter of 1811-12. In terms of the amount of land shaken, these earthquakes were the largest in recorded U.S. history.

Kansas is not generally associated with earthquakes, but does sit on the Nemaha fault. The largest earthquake to strike Lawrence occurred April 24, 1867. This tremor was estimated to be 5.1 on the Richter Scale. It was centered near Wamego and affected an area estimated at 300,000 square miles, including much of Nebraska.

The potential for large devastating earthquakes has sparked a great deal of ongoing research concerning mitigation and hazard reduction of possible future earthquakes. Major structural damage to buildings, utilities and infrastructures may result. Injuries and casualties could be significant. Evacuation, housing, food and water would pose significant operational concerns. Clearly, the size of the quake would determine the life risk and property loss involved.

This map from FEMA shows the eastern United States. The range of colors indicate the seismic design categories, which show the likelihood of the area experiencing an earthquake shaking of various intensities.

Map 15 Forecasted Frequency of Earthquake Shaking Capable of Causing Damage within the United States



Water/Ice Rescue **Risk - Moderate**

The department has identified the hazard level for drowning and water rescue as moderate. The department provides water rescue primarily within the city but responds countywide to support the EMS mission and provide mutual aid. The department has identified itself as the best agency available to provide this service due to the overlapping needs of fire, rescue, EMS, response time, personnel staffing, certifications, and equipment deployment.

The department provides a trained team of ice rescue and swift water rescue personnel. These team members respond with rescue boats and related equipment to the many ponds, lakes and rivers within the department response area. The department has identified several small ponds, Clinton Lake, and a segment of the Kansas River as target risk within its response area.

Recovery services are provided by the Douglas County Sheriff Underwater Recovery Team with boat support provided by the department.

Community Population/Population Densities

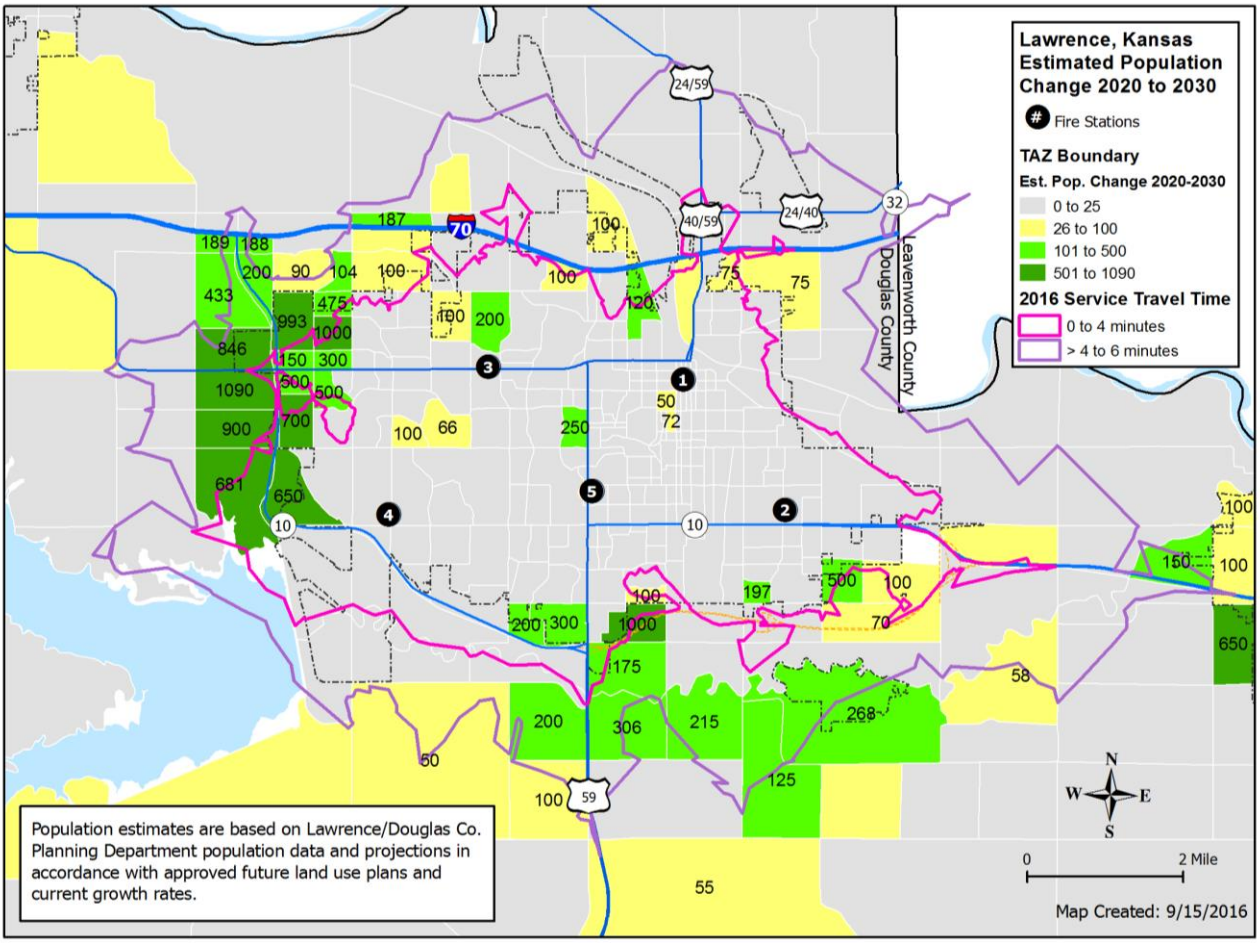
Since 1980, Lawrence's population has risen from 52,738 to approximately 93,917 (2015 census estimate) residents, a 78 percent increase. Douglas County's population during the same time has risen from 67,640 to 110,826, a 63 percent increase. During the last five years the number of calls per year for fire and EMS service has risen from 9,924 to 11,911 a 20 percent increase. This is an increase of five percent from the previous 10 years. Calls for service in 2017 are expected to exceed 12,339.

Table 1 Historical Population of Lawrence, KS

Census	Population	%±	Square Miles	Density
1930	13,726	-------	-------	-------
1940	14,390	4.8%	4.08	3,572
1950	23,351	62.3%	4.73	4,937
1960	32,858	40.7%	8.06	4,077
1970	45,698	39.1%	16.93	2,699
1980	52,738	15.4%	19.51	2,703
1990	65,608	24.4%	22.88	2,867
2000	80,098	22.1%	28.02	2,859
2010	87,643	9.4%	33.56	2,611
2015	93,917	6.7%	34.26	2,741

Population projections for Lawrence, Kansas indicate a majority of the growth for the period of 2020-2030 will be in the west and south regions of the city. The following map shows the growth relative to the location of existing fire stations. Additionally, the pink and purple lines represent four minute and six minutes travel times.

Map 16 Lawrence, KS Estimated Population Change 2020-2030



Community Demographic Features

Lawrence and Douglas County are located in northeastern Kansas, 40 miles west of downtown Kansas City, Missouri, and 28 miles east of downtown Topeka, Kansas. It enjoys direct access to Interstate 70, Kansas Highway 10, US Highway 59, US Highway 40 and is located a short distance from Interstate 435, Interstate 635, and Interstate 35. Lawrence also maintains a Municipal Airport and is 50 miles southeast of Kansas City International Airport.

Douglas County was organized in 1855 in honor of Stephen A. Douglas, a United States Senator from Illinois and candidate for the presidency in 1860. In 1854 Senator Douglas took a leading part in securing adoption of the "popular sovereignty" principle in the Act organizing the Kansas Territory. This principle allowed settlers of a territory to decide whether to be admitted as a free state or allow slavery.

Population (5th largest county in population of 105 Kansas counties)

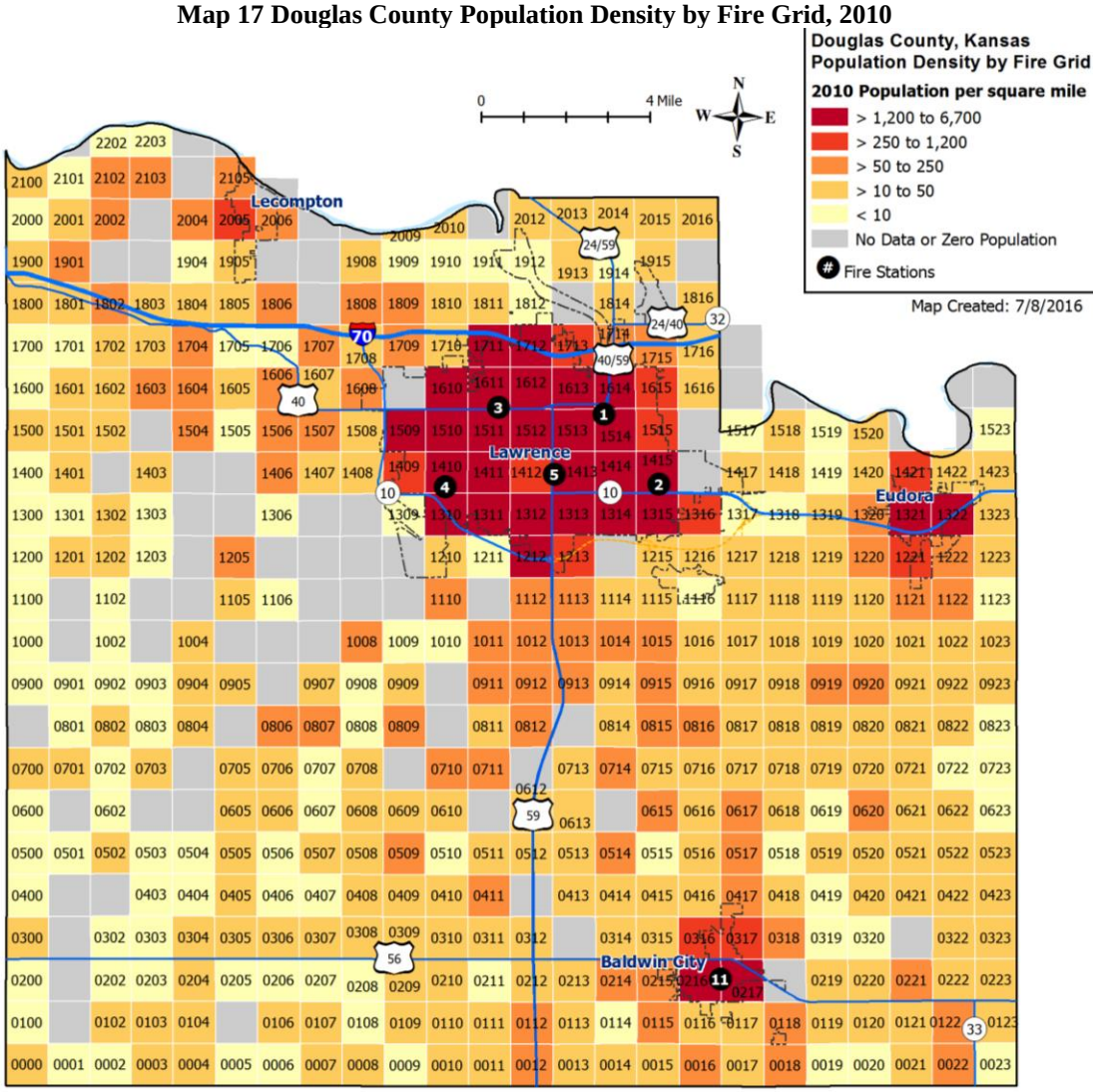
112,211	(2011)
99,962	(2000)
81,798	(1990)
25,096	(1900)

Area: 474.6 Square Miles

Population Density per Square Mile (includes all cites): 233.5

Population Density per Square Mile (unincorporated areas): 27.5

Map 17 Douglas County Population Density by Fire Grid, 2010



(Information from Lawrence Chamber of Commerce, 2010 U.S. Census, Kansas Dept. of Labor, and U.S. Dept. of Labor)

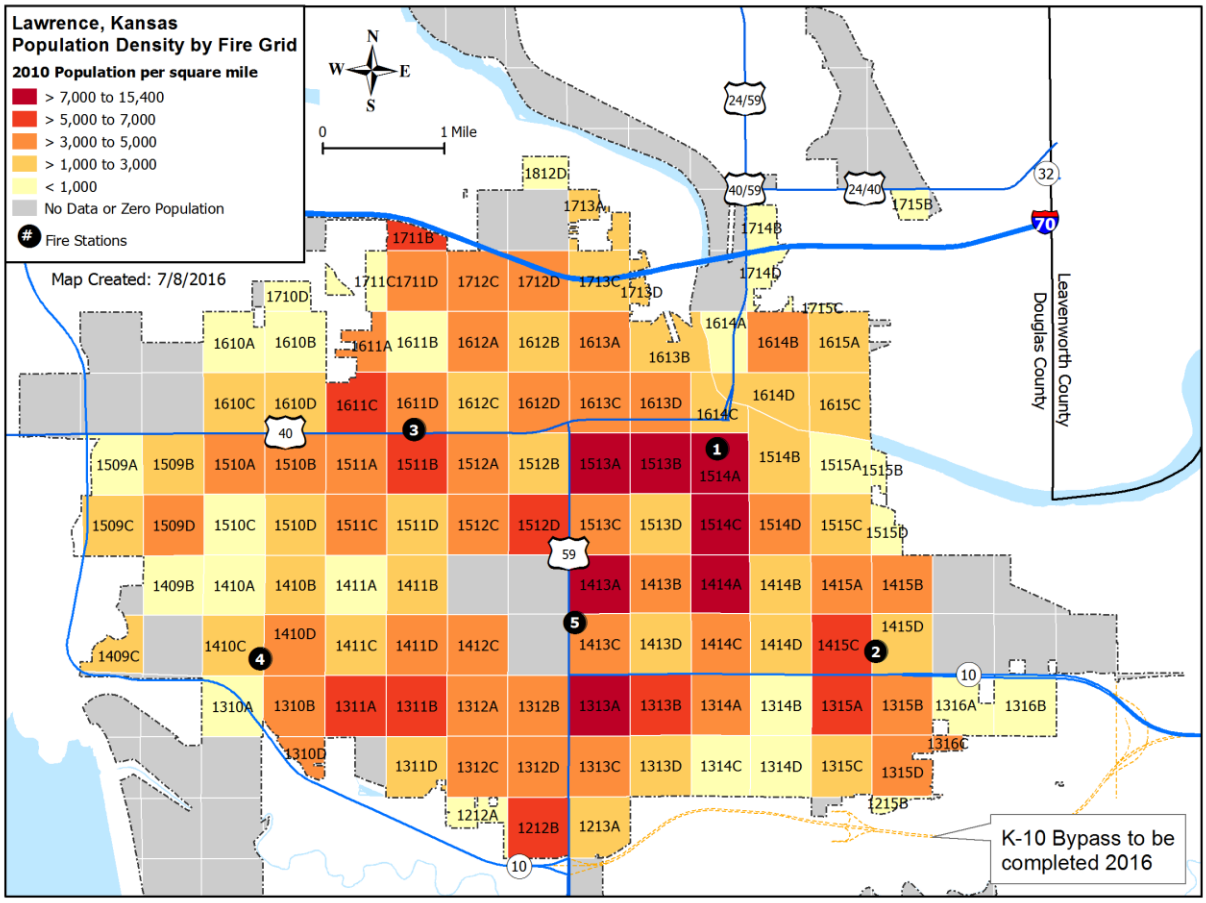
City of Lawrence Demographics

Population (6th Largest city in Kansas) 93,917 (2015 US Census estimate)

Area: 34.8 Square Miles

Population Density per Square Mile: 2,741

Map 18 Lawrence, KS Population Density by Fire Grid, 2010



Race

African American	4,095	4.67%
American Indian	2,700	3.08%
Asian	3,971	4.53%
Hispanic or Latino	5,006	5.71%
Other	1,346	1.54%
Two or more races	3,602	4.11%
White	71,872	82.01%

Gender		
Male	44,000	50.2%
Female	43,643	49.8%

Median Age

27 years

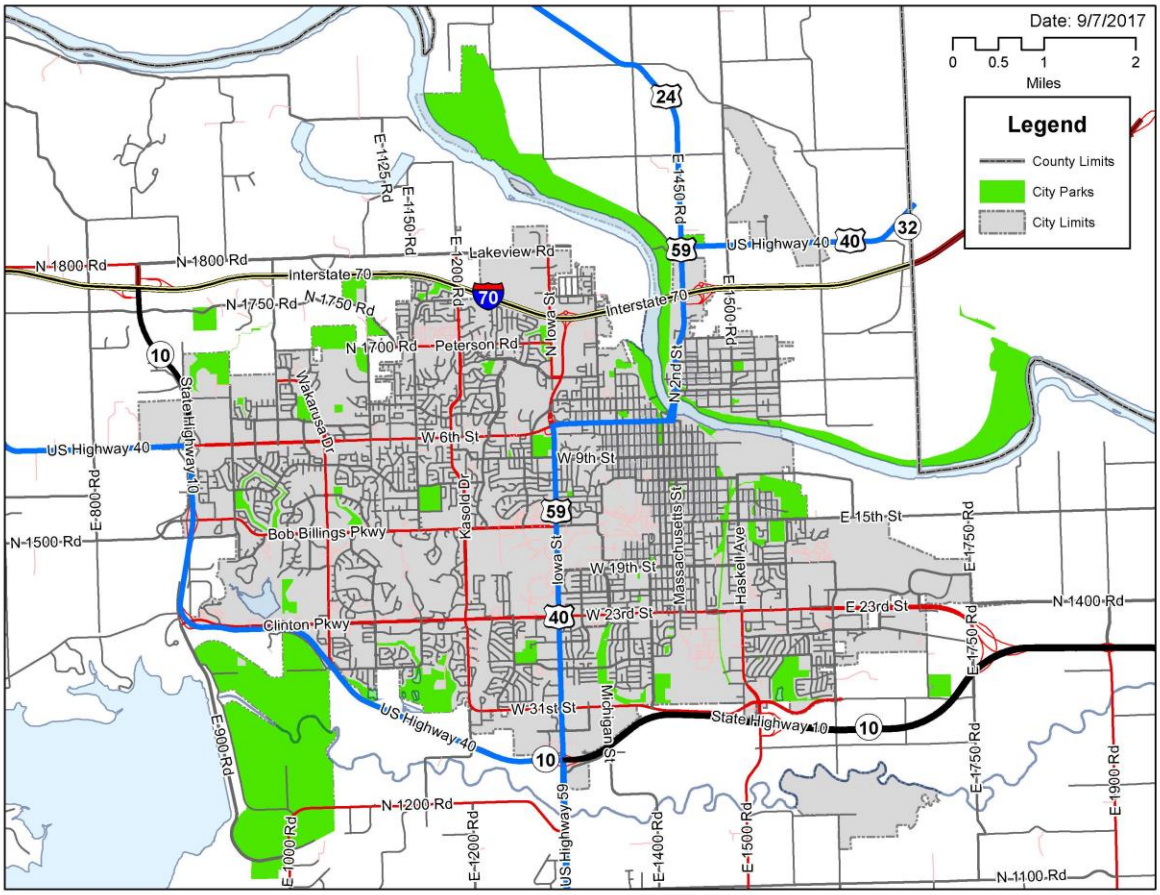
Population Distribution		
0-9 years	9,308	10.2%
10-19	11,488	12.6%
20-29	29,811	32.7%
30-39	11,090	12.2%
40-49	8,063	8.8%
50-59	8,704	9.5%
60-69	6,879	7.5%
70-79	3,611	4%
80+	2,328	2.6%

Housing	
Average Household Size	2.28
# Owner-Occupied housing units	16,826
# Renter-Occupied Housing Units	19,438
# Occupied Housing Units	38,776
# Vacant Housing Units	2,512

Educational Attainment (over age 25)	
9-12, No Diploma	5.1%
High Scholl Diploma	18 %
Some College	21.9%
Associates Degree	4.8%
Bachelor's Degree	26.9%
Graduate Degree	20.8%

Income	
Median Family Income	$70,117
Median Household income	$46,929
Personal Income per capita	$27,695
Household Income under $50K	20,280
Household Income $50K - $100K	9,968
Household Income $100K - $200K	4,823
Household Income Over $200K	1,193
Educational Institutions	
Public Elementary Schools	14
Public Middle Schools	4
Public High Schools	2
Private Schools	9
Colleges/Universities	
University of Kansas	28,401
Haskell Indian Nations University	799
Navigable Waterways	
Kansas River	
Wakarusa River	
Parks and Recreation	
Recreation Centers	4
Sports Pavilion	1
Parks	54
Park acreage	4,000
Public Pools	4
Public Tennis Courts	18
Sports Complexes	3
Trails (miles)	60
Golf Courses	3
Playgrounds	30

Map 19 City of Lawrence Parks



The City of Lawrence has a good distribution of city parks throughout the jurisdiction. The city continues to expand its boundaries and adds parks to the city to provide recreation to the community.

Public Utilities in the City of Lawrence

Electric Power - Westar Energy
Water/Sewer - City of Lawrence
Natural Gas – Black Hills Energy, Southern Star
Telephone – Midco, SWB
Cable Television/Internet – Midco, Wicked Broadband, ATT
Reclaimed Water - City of Lawrence
Storm Water Management - City of Lawrence
Solid Waste/Recycling - City of Lawrence

Hospitals

Lawrence Memorial Hospital (LMH) - is a 174 Bed facility with Level 4 Trauma designation (currently being considered for Level 3 Trauma Center designation), Level 2 Nursery designation and 27 bed Emergency Room. All emergency room beds can be used for general medical however three beds designated specifically for psychiatric patients and two rooms available for critical trauma or medical

emergencies. LMH provides adult diagnostic and interventional cardiac catheterization and adult and pediatric surgical rooms with post-surgical intensive care as well as general medical intervention and diagnostic services.

Watkins Health Clinic (KU) - provides medical services to KU Students and is capable of handling minor injuries, illnesses, prescription services and x-ray available.

Haskell Indian Health Center - provides minor medical care and evaluation to the Native American population in the area. As long as there are monies set aside by the Indian Health Service & Bureau of Indian Affairs, medical visits are free of charge to Native American members of a federally recognized Tribe.

Top 10 Largest Employers

University of Kansas	9,881	
Lawrence Public Schools	1,800	
City of Lawrence	1,455	
Lawrence Memorial Hospital		1,322
Berry Plastics	739	
Hallmark Cards, Inc.	525	
Baker University	496	
Amarr Garage Doors Manufacturing		461
Douglas County	435	
Boston Financial Data Services	394	

(Information from Lawrence Chamber of Commerce, 2010 U.S. Census, Kansas Dept. of Labor, and U.S. Dept. of Labor)

B. History of the Fire and Emergency Services Agency

Major Historical Milestones of the Department

Lawrence-Douglas County Fire Medical (LDCFM) is an organization that emerged in 1997 as a result of combining the Lawrence Fire Department and the Douglas County Ambulance Service.

The Lawrence Fire Department was first organized in 1859 as "Republic Engine Company No. 1." This volunteer fire company was formed after purchasing a steam engine and hose cart from St. Louis, MO in the winter of 1858. In 1862, this company was disbanded because of a lack of funds from the city due to the Civil War. In 1868, after constant persuasion for better fire protection from local businessmen, the city council created a volunteer fire department deemed the Head Center Hose Company. The initial firehouse, the "old engine room," was a barn at 11th and Vermont. In 1869 the Head Center Hose Company moved to the Market Building that became City Hall at 8th and Vermont. There has been a station in this location for over 140 years.

In 1915 the Head Center Hose Company became the Lawrence Fire Department, a fully paid department, thus ending the volunteer fire service era in Lawrence.

In the 1950's, the Lawrence Fire Department received an E & J resuscitator from the Sertoma Club of Lawrence and started running "resuscitator calls" in Lawrence when needed, the first venture into the world of Emergency Medical Service (EMS).

Gold Cross Ambulance Service (a private provider) provided medical service to Douglas County until 1974. In 1974, the Douglas County Ambulance Service (DCAS) was established as the first county provided ambulance service providing basic and advanced life support emergency medical care for citizens in Douglas County. DCAS operated two or three ambulances out of two stations providing ALS service for the entire county.

Today, LDCFM responds to almost 12,000 alarms annually out of seven response stations. The department provides all service missions to the City of Lawrence, University of Kansas, and Haskell Indian Nations University. Emergency Medical Services are provided to all cities, and unincorporated areas within Douglas County.

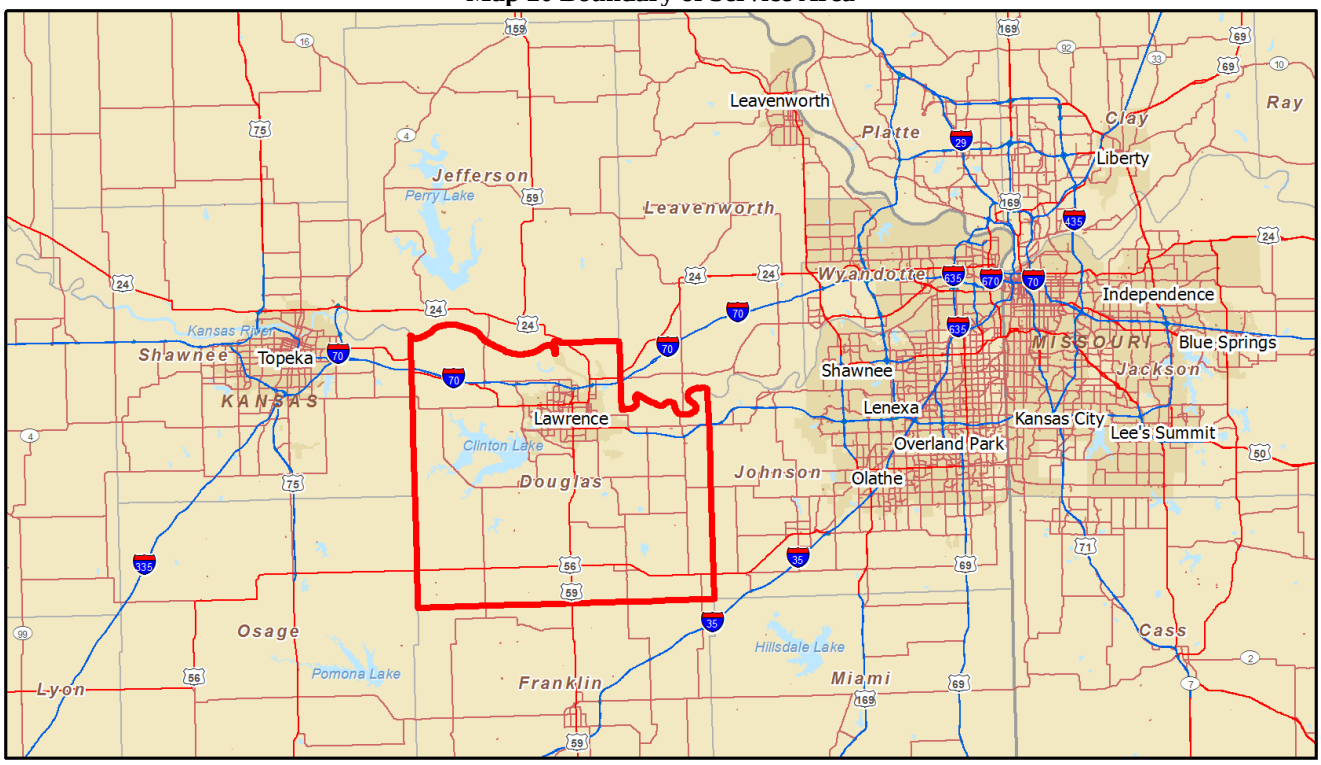
LDCFM first achieved accreditation through the Center for Public Safety Excellence (CPSE) in 2008. After going through an intensive evaluation, the department was re-accredited in 2013.

In 2016, the City of Lawrence attained a fire protection rating class from the Insurance Service Office of 1 (with 1 being the highest on a 10- point scale).

Current Legal Boundary of Service Area

LDCFM provides all services to the City of Lawrence, Grant Township, the University of Kansas, and Haskell Indian National University. The City of Lawrence encompasses 34.8 square miles. Additionally, the department provides emergency medical services to all residents within 475 square miles of Douglas County. This includes the cities of Eudora, Lecompton and Baldwin City.

Map 20 Boundary of Service Area



The department has the capability to request additional resources from the Kansas City Metro Area fire departments. These additional units are available upon request through the normal communications channel.

Current Organization, Divisions, Programs and Services

The LDCFM department is led by the fire chief and is directly supported by seven division chiefs. The fire chief performs a variety of technical, administrative and supervisory work in planning, organizing, directing and implementing fire prevention, suppression, and emergency medical services to prevent or minimize the loss of life and property. This is accomplished through direct supervision of:

- Accreditation
- Administrative Division
- Budget Management
- Emergency Medical Services Division
- Operations Division
- Payroll/ Personnel Services
- Performance Management
- Prevention Division
- Social Media/ Website Management
- Strategic Planning
- Training Division

The Training Division is managed by the Division Chief of Training and supported by a captain and lieutenant. The goal of the Training Division is to provide competency-based training for department members and county EMS first responders, and to facilitate public awareness. The Training Division is responsible for overseeing the following:

- Employee Development/ Training
- Employee Mentoring
- Community Education and Outreach
    - Greek Academy
    - High School Career Day
    - Public Education Programs
    - Public CPR
    - Safety and Hazard House
    - Wheeled Sports Program
    - Youth Firesetter Prevention and Intervention Program
- Douglas County 1st Responder Training
- EMS Preceptor Program
- Explorer Post
- Incident Safety
- Professional Standards
- Promotion Coordination
- Recruit Academy

The Emergency Medical Services Division is managed by the Division Chief of EMS and supported by three civilian, medical claims positions. The EMS Division is responsible for numerous functions of the department. The most prominent are:

- Community Relations

- Douglas County EMS 1st Responder Program
- EMD Program
- Employee Wellness Program
- EMS Quality Control
- HIPAA Notice of Privacy Practices
- Marketing
- Medical Billing
- Medical Facility Liaison
- Medical Director Liaison
- Public Information Officer
- Recruitment/ Hiring
- Risk Management
- Special Events

The Prevention Division is managed by the Division Chief of Prevention and supported by a captain and lieutenant. The primary goal of the Prevention Division is to reduce the incidence and severity of preventable injuries and fire loss through public education, code inspections, plan reviews, and investigations. The Prevention Division accomplishes these goals through various activities which include:

- Burn Permits and Requirements
- Code Enforcement
- Company Inspections
- Coroner Scene Investigations
- Douglas County Coroner Liaison
- Fire Investigation Bureau
- Home Fire Safety Inspection Program
- Inspections/ Plan Review
- KNOX-BOX Security Program
- Night Consultants
- Occupant Services
- Uniform Fire Code Board of Appeals

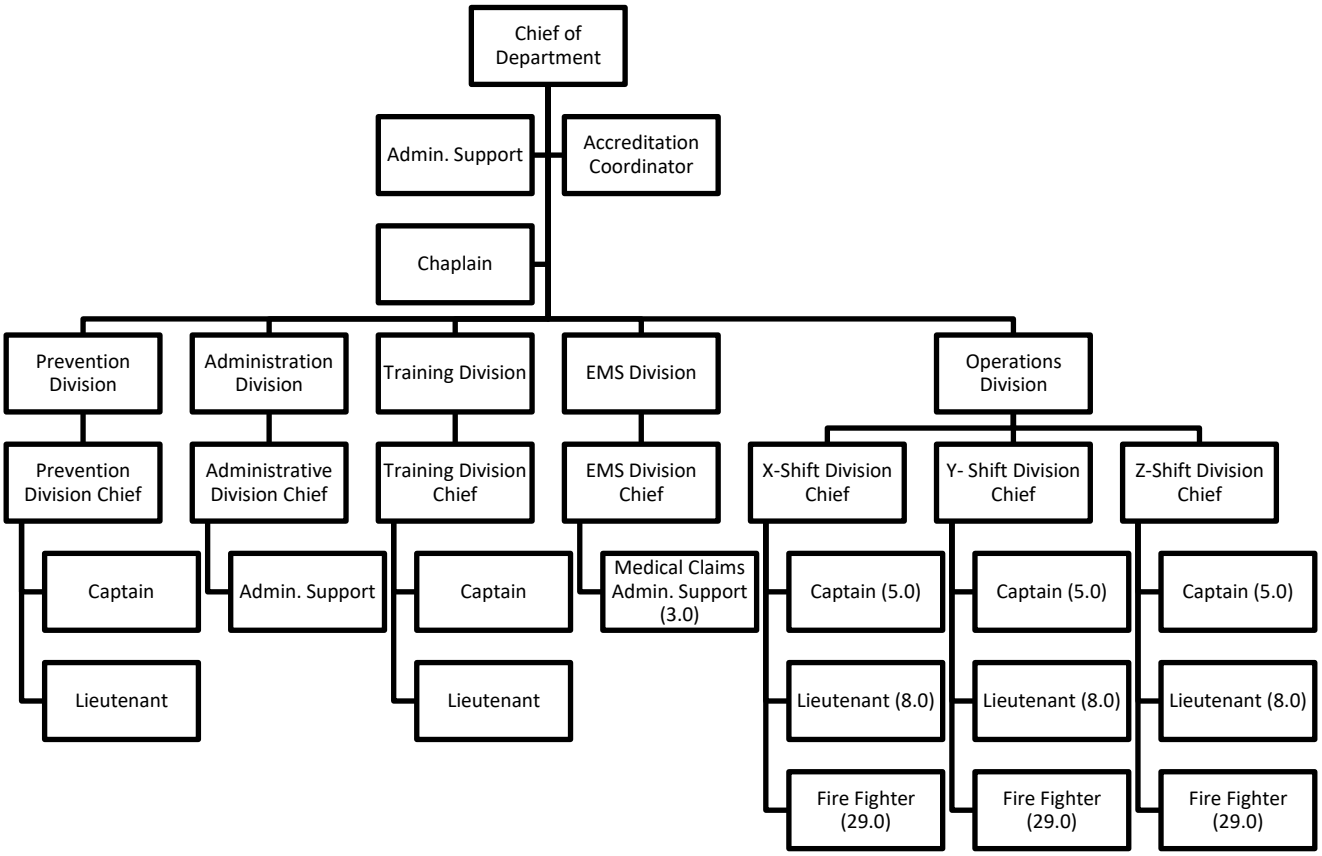
The Administrative Division is managed by the Division Chief of Administration and supported by one civilian, administrative personnel. The Administrative Division is responsible for:

- Accounting/ Finance Operations
- Emergency Communications
- Information Technology
- Facilities Management
- Fleet Management
- GIS/ Mapping
- Records Systems Management
- SCBA/ Air Equipment
- Standard Operating Procedures Management
- Uniforms and Equipment

The Operations Division is made up of three division chiefs who are responsible for the emergency and administrative activities of all members assigned to his/her shift. The Operations Division provides the following:

- Emergency Medical Services
- Fire Suppression
- Hazmat
- Prevention
- Technical Rescue Teams
    - Confined Space
    - Mass Casualty
    - Rope Rescue
    - Structural Collapse
    - Water/ Ice Rescue

Figure 4 Department Organizational Chart



Fire Stations, Training Facilities, Apparatus, Equipment and Staffing

The LDCFM is made up of three (3) shifts consisting of one (1) shift commander, five (5) captains, eight (8) lieutenants and twenty-nine (29) firefighters working a rotating 24-hour schedule.

Emergency staff and equipment are dispersed throughout the City of Lawrence in five fire stations as well as one station located in the city of Baldwin (Station 11), approximately 20 miles south and east of Lawrence. In February 2017, the department began staffing one station in the city of Eudora (Station 12) as well. Eudora is located about 6 miles due east of Lawrence. Each of the five stations in Lawrence are comprised of one primary fire apparatus with a minimum staffing of one officer, one engineer and two firefighters. Each of the five stations in Lawrence also house one medic unit that is staffed with one officer and one firefighter/paramedic. Station 5 houses an additional rescue unit with one officer, one engineer and one firefighter. The medic unit at Station 11 and 12 is staffed with one officer and one firefighter/paramedic. Minimum staffing for each shift is 38 personnel, maximum scheduled staffing is 43.

The department staffs the following stations with the listed apparatus and noted *minimum* staffing per unit:

Station 1- 746 Kentucky Street

Engine 1 (646)	2010 Pierce Velocity, 2000 GPM, 500 Gal. Water, 30 Gal. Foam, Compressed Air Foam System (CAFS)	4 Personnel Minimum
Medic 1 (686	2014 Ford F-550	2 Personnel Minimum
Medic 10 (681)	2010 American Emergency Vehicles (AEV) Chevrolet 4500	Secondary
Utility 1 (611)	2001 Ford F-250	Support
Gator 1 (698)	1998 John Deere	Support

Station 2- 2128 Harper Street

Quint2 (649)	2015 Pierce Velocity, 100' Aerial, 2000 GPM, 500 Gal. Water, 30 Gal. Foam, Pierce Ultimate Configuration (PUC)	4 Personnel Minimum
Medic 2 (667)	2015 Ford F-550	2 Personnel Minimum
Quint 20 (642)	2009 Pierce Velocity, 75' Aerial, 2000 GPM, 500 Gal. Water, 30 Gal. Foam, CAFS	Secondary
Medic 20 (690)	2007 AEV Freightliner	Secondary
Brush 2 (651)	2006 Ford F-350, 100 GPM, 200 Gal. Water, 12 Gal. Foam	Cross Staffed
Utility 2 (637)	2006 Ford F-350	Support
Gator 2 (697)	2004 John Deere	Support
MCI Trailer (6015)	2008 Pace	Support

Station 3- 3708 W 6th Street

Quint 3 (644)	2013 Pierce Velocity, 75' Aerial, 2000 GPM, 500 Gal. Water, 30 Gal. Foam, CAFS, PUC	4 Personnel Minimum
Medic 3 (668)	2015 Ford F-550	2 Personnel Minimum
Medic 30 (693)	2010 AEV Chevrolet 4500	Secondary
Utility 3 (653)	2013 Ford F-350	Support
Air Trailer (6022)	1998 Ballcrank	Support

Station 4- 2111 Wakarusa Drive

Engine 4 (648)	2012 Pierce Velocity, Hazmat, 1500 GPM, 500 Gal. Water, 30 Gal. Foam, CAFS, PUC	4 Personnel Minimum
Medic 4 (683)	2014 Ford F-550	2 Personnel Minimum
Quint 40 (641)	2006 Pierce Lance, 75' Aerial, 2000 GPM, 500 Gal. Water, 30 Gal. Foam	Secondary
Medic 40 (680)	2011 AEV Chevrolet 4500	Secondary
Brush 4 (652)	2006 Ford F-350, 100 GPM, 200 Gal. Water, 12 Gal. Foam	Cross Staffed
Utility 4 (659)	2007 Ford F-250	Support
HM Trailer (6014)	2004 Wells Cargo	Support
Engine 40 (650)	2017 Pierce Velocity, 2500 Gal. water, 40 Gal Class "A" foam, 300 Gal Class "B" foam	Cross staffed

Station 5- 1911 Stewart Avenue

Truck 5 (647)	2011 Pierce Velocity, 100' Aerial Platform, 2000 GPM, 300 Gal. Water, 30 Gal. Foam, CAFS	4 Personnel Minimum
Medic 5 (682)	2014 Ford F-550	2 Personnel Minimum
Rescue 5 (645)	2009 Pierce Velocity, 75 KW Generator, Light Tower, SCBA Fill	3 Personnel Minimum
SC 1 (676)	2013 Chevrolet Tahoe	1 Personnel Minimum
Quint 50 (643)	2009 Pierce Velocity, 75' Aerial, 2000 GPM, 500 Gal. Water, 30 Gal. Foam, CAFS	Secondary
Medic 50 (691)	2007 AEV Freightliner	Secondary
Utility 5 (658)	2007 Ford F-250	Support
TSF Trailer (6026)	2012 H&H Trailer	Support
Boat 1 (6001)	2005 Rescue One	Support
Boat 2 (6002)	2005 Rescue One	Support
Boat 3 (6003)	2005 Rescue One	Support
Boat 4 (6004)	2005 Mercury Inflatable	Support

Station 11- 212 Kibbee Street, Baldwin City, KS

Medic 11 (669)	2015 Ford F-550	2 Personnel Minimum

Station 12- 903 Main Street, Eudora, KS

Medic 12	2017 Ford F-550	2 Personnel Minimum

Training Center- 1941 Haskell Avenue

Safe House (6023)	1998 Scotty	Support

Investigation Center- 1839 Massachusetts Street

Investigation 1 (634)	2006 Pierce SSV GMC 4500, Mobile Command, Fire & Coroner Investigation	Support

C. Current Levels of Service with Delivery Programs

Fire Suppression

Lawrence Douglas County Fire Medical (LDCFM) provides a broad range of responses to structure fires involving single family dwellings, multi-family dwellings, high rise, commercial and industrial occupancies. Additionally, high hazard structures such as institutional facilities, schools, nursing homes, assisted living facilities and congregate housing. Other fire related responses involve mobile property such as passenger vehicles, road freight, rail freight, water craft, recreational vehicles, aircraft, dumpster or rubbish fires and heavy equipment fires. The department provides contractual services for Grant Township which is comprised of agricultural, residential and some commercial structures.

Rescue

The department provides technical rescue services within the city, supports the EMS mission in the county, and provides mutual aid as needed. The department provides firefighters trained in various aspects of technical rescue to respond to emergencies for confined space, extrication, trench rescue, structural collapse, high angle rope rescue, and water/ice rescue. The technical rescue team is based at Station 5. The department has identified major highways, water towers, utility services, new construction, remodeling of structures and water and sewer pipe maintenance as potential sites for technical rescue. The department continually performs ongoing evaluations to identify new potential technical rescue hazards or sites.

Technical rescue operations generally require specialized training and equipment. Providing sufficient resources to mitigate a protracted or complicated rescue would be difficult for the department. The department in many instances would need the support of regional technical rescue teams for complex and time demanding operations. The technical rescue component of the department is part of Kansas Task Force 2. Kansas Task Force 2 is a regional response team for the northeast region of Kansas, managed by the Kansas Department of Emergency Management (KDEM). The teams' main disciplines are confined space, extrication, trench rescue, structural collapse, high angle and rope rescue, water/ice rescue. The often complex and dangerous nature of a technical rescue requires that responders be both highly trained and rapidly deployable.

Emergency Medical Services

The department provides first responder medical care at the basic life support (BLS) and advanced life support (ALS) service levels. Calls for EMS continue to be the dominant emergency type within the city and county. Medical responses continue to account for approximately 79% of all annual emergency responses managed by the department. All members of the department are at a minimum certified Advanced Emergency Medical Technicians (AEMT's), while approximately 51 are state and/or nationally certified paramedics. The department provides advanced life support services utilizing paramedics countywide.

The department provides the best available service due to the overlapping needs of fire, rescue, EMS, member staffing, certifications, and equipment deployment. The department provides seven primary

and five secondary Advanced Life Support (ALS) ambulances. Each primary unit is staffed by one officer and one firefighter/paramedic. The department's five primary fire apparatus and rescue are full time ALS units. Primary fire apparatus carry a full complement of ALS equipment including cardiac AED's, advanced respiratory equipment, as well as cardiac medications and intravenous therapy supplies.

EMS includes first response, rescue, treatment, transportation and reporting for medical emergencies to approximately 9,418 calls per year out of the 11,800 within the City of Lawrence and Douglas County in 2016. Responses to these calls include but are not limited to cardiac and respiratory emergencies, difficulty breathing, childbirths, cardiac arrests, strokes and trauma. Medical supervision is provided on shift by a shift commander as well as medical direction provided by the department's medical director. For the majority of ALS level EMS calls the basic response is one medic unit staffed with a paramedic and AEMT.

Hazardous Materials

The department is staffed and equipped to respond to hazardous materials incidents county-wide. Hazmat operations are based out of Station 4. Engine 4, staffed with an officer, Engineer and two firefighters. Medic 4 is staffed with one officer and one paramedic/firefighter. Engine 4 is a dual-purpose unit that carries specialized hazardous materials response equipment as well as fire suppression capabilities. Station 4 also houses a hazmat trailer that responds in tandem to incidents that require more resources which enhances capabilities. The department currently maintains approximately 40 members trained to NFPA 472 competencies for hazardous materials technician. The remaining members are trained to the Hazardous Materials Operations level. Hazmat technicians are dispersed throughout the department to offer a higher level initial response to hazardous materials incidents.

The department is the primary agency within Douglas County to respond to hazardous material incidents and receives mutual aid from Johnson County approximately 35 miles to the east. The agency is responsible for both offensive and defensive operations however, the department does not collect or dispose of any hazardous materials.

Community Risk Reduction Program

The department is committed to reducing the incidence and severity of fire loss through public education, code inspection, plan reviews, and investigations. The city currently has adopted the 2015 International Fire Code and has amended it as contained in Chapter 8, Article 2 of the Code of the City of Lawrence. Additional programs that are employed are building plan reviews, multi-family residence fire inspections, and night-time public assembly inspections (night consultants).

Public Education

The Training Division oversees LDCFM's public education program. The Training Division chief is responsible for overall coordination of all aspects of LDCFM's education mission by increasing public awareness to the potential hazards they face and how they can combat them with proper knowledge and life safety awareness. Community education and outreach programs include: Greek Academy,

High School Career Day, Public CPR, Safety and Hazard House, Wheeled Sports Program, Youth Firesetter Prevention and Intervention Program. Teaching the various programs is handled by on- and off-duty personnel. Six public education specialists (two on each shift) provide for delivery of the program and work with the shift personnel to deliver the public education program.

Specialized Services

The department has been progressive over the years and continues to be progressive in its efforts to serve the citizens of Lawrence and Douglas County. Within the department are several incentive positions for members to expand their career choices. Incentive positions include fire investigator, coroner scene investigator (CSI), and tactical medic.

Fire Investigations

The Division Chief of Prevention is designated by the fire chief as the fire marshal for the City of Lawrence. A captain within the Prevention Division oversees the activities of the six certified fire investigators; two per shift. Fire investigators meet the State of Kansas' requirements to be certified as a fire investigator II.

The fire investigator position is an incentive position designed to determine the origin and cause of all fires within the City of Lawrence and Grant Township. The fire investigator collects evidence, prepares legal documents for case presentation in the court of law and maintains powers of arrest through the state of Kansas, Office of the Fire Marshal with a State of Kansas Fire Investigator II certification.

Coroners Scene Investigator

The Division Chief of Prevention is designated by the fire chief as the CSI program manager for Douglas County. A lieutenant within the Prevention Division oversees the activities of the six certified investigators; two per shift. Investigators meet the requirements of American Board of Medicolegal Death Investigators (ABMDI).

The CSI position is an incentive position designed to assist the coroner with information gathering at the scene that will aid in the final determination as to the cause and manner of death of individuals within Douglas County. Department standard operating procedures (SOPs) guide the performance of investigations. *Frontier Forensics, P.A.* receives evaluates and stores investigation documents.

Tactical Medic

A Division Chief of Operations is designated by the fire chief as the program manager for Tactical Medic program. The program manager oversees the activities of the six tactical medics, two per shift and is the department liaison for the Crisis Response Team within the Lawrence Police Department. The departments tactical medics meet the Tactical Medical Emergency Support (TEMS) requirements.

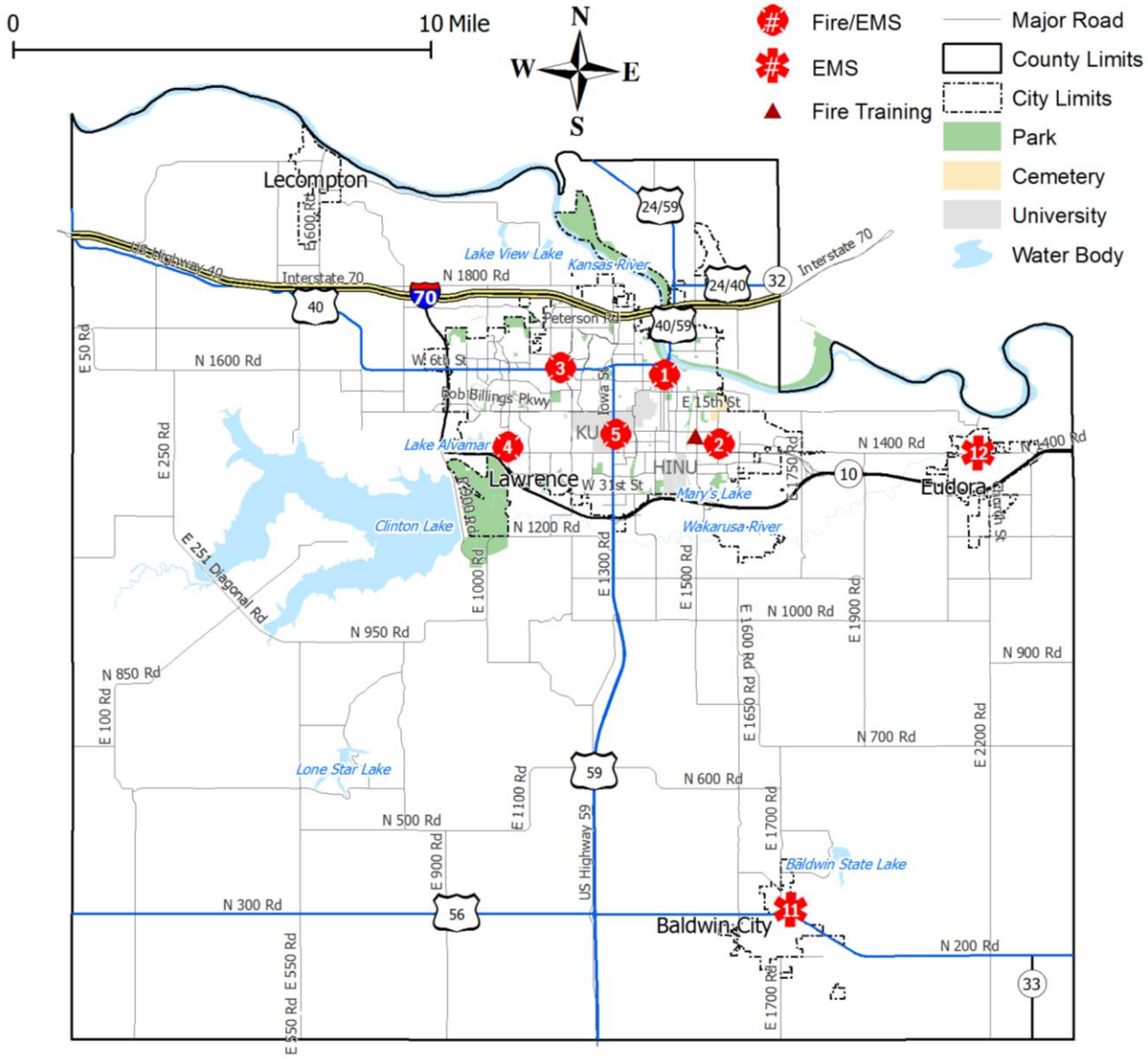
Tactical medic is an incentive position designed to assist the City of Lawrence Police Department and Douglas County Sheriff's Department by providing medical assistance at the scene of high risk warrant service, hostage situations and other law enforcement activities where the increased

potential of law enforcement officer injury is possible. The tactical medics are trained to the State of Kansas AEMT level or paramedic level with specialized training in treatment of traumatic/penetrating injures, wound care and airway management.

D. Current Deployment and Coverage Areas

Points of Service Delivery

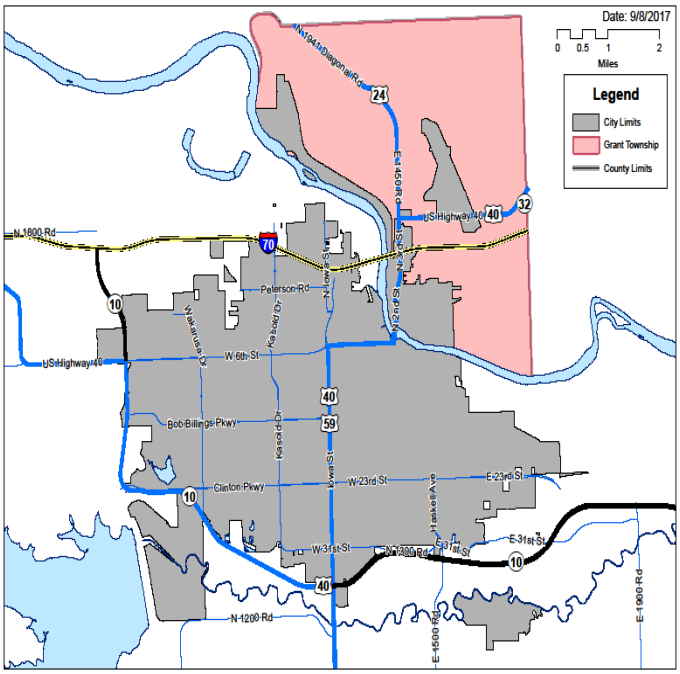
Map 21 Points of Delivery



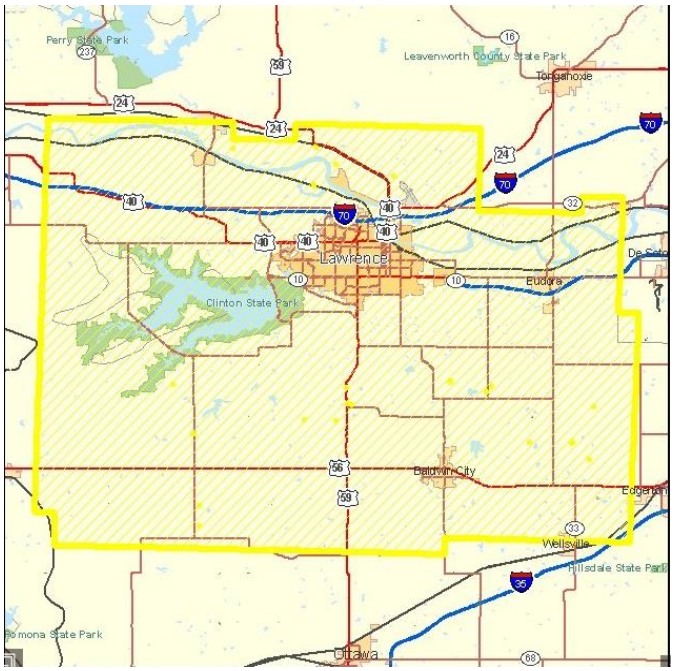
Response Areas

The department provides primary response within the City of Lawrence (gray area) for fire, EMS, hazardous materials, and technical rescue response. The department also provides primary response for Grant Township (Pink area) for fire suppression. The City of Lawrence is approximately 34.8 square miles with 841.5 lane miles of road. The department provides primary response within Douglas County for EMS and hazardous materials response covering approximately 475 square miles of land and approximately 521 lane miles of bituminous surfaced roads and 519.94 miles of gravel surfaced roads. Many areas of Douglas County, outside of the City of Lawrence are protected by other local emergency first responders for primary response.

Map 22 Demand Zones - City



Map 23 Demand Zones - County



E. Summary of Community Response History

Table 2 Number of Incidents by Year (2012-2016)

Incident Type	2012	2013	2014	2015	2016
Fire Response	1638	1597	1802	1827	1814
EMS Response	8024	8574	8887	9383	9513
Hazmat	308	341	327	332	350
Rescue	173	145	98	59	58
CSI	162	167	187	199	166
Other	34	24	74	45	25
Total Incidents	10339	10848	11375	11845	11926

*Dispatched call nature from Spillman®, Computer-Aided Dispatch Software.

Other programs					
Program	**2012**	**2013**	**2014**	**2015**	**2016**
Public Education Events	206	192	160	153	145
Fire Inspections	5221	3558	4326	5659	6314
Fire Investigations	84	60	58	66	61
Training hours	26,638	24,940	19,426	20,675	28,221

*Information provided from FIREHOUSE Software®, record management system.

F. Community Priorities, Expectations, and Performance Goals

Mission Statement

The department evaluated our mission statement and still believes that our current mission statement, "Committed to saving and protecting lives and property" encompasses what we value as a department.

Community Service Priorities

The public was asked to prioritize the programs delivered by the department during the external stakeholders meeting through a process of direct comparison. Below are the results of the process.

Table 3 Community Service Priorities

PROGRAMS	RANKING	SCORE
Emergency Medical Services	1	253
Fire Suppression	2	243
Technical Rescue	3	197
Tactical Medic	4	153
Domestic Preparedness Planning and Response	5	147
Hazards Material Mitigation	6	136
Community Risk Reduction	7	120
Fire Investigation, Cause and Origin	8	99
Public Fire and Life Safety Education	9	86
Coroner Scene Investigation	10	51

Community Service Expectations

To ensure that community needs were incorporated in the planning process of the fire department, a facilitated community-driven strategic planning process was initiated by the department. A community stakeholder meeting was held on July 11, 2016. The participants in the external stakeholder meeting provided a total of 48 expectations of the department and its members. The top ten expectations received are listed verbatim and in priority order below.

1. Rapid response to emergency fire and medical calls in all geographic areas of the community. Respond to medical emergency and fire calls within response times. Quick response times.
2. Highly and well-trained/certified personnel who are well practiced. Employ professional people current on their certifications. Expanding the knowledge needed to address situations as required.
3. Developing community educational opportunities to increase prevention and preparedness. Provide education presentations to area schools, businesses, and other city departments.
4. Preparedness for a heightened state of emergency. To be ready for disasters and other large community emergencies.
5. Up-to-date technology and equipment to provide efficient and effective outcomes.
6. Professional- I expect the FD staff to always be professional, communicate, and share their expertise. I expect the fire and medical personnel to be professional on and off the job.

7. To partner with organizations to ensure safety (KU in particular). Collaborative.
8. Communicative- in case of fire, I expect the FD to share information with staff on site about their immediate needs and findings, and requests to staff re: evacuation.
9. Stay current on best practices in the field. Ensuring that the practices, codes, and training exceed the industry's best practices.
10. Great stewardship of community resources.

Performance Goals

Based on the assessed risk, the department has a standard for the delivery services. These services are based on many factors and have served to develop what is considered as an acceptable level of risk.

The department has had a long-standing history of established response time goals. The previous performance level goals were published in the 2012 standards of cover document. These goals were originally derived more from an expectation and assumption rather than as a measurable fact. The effective service area of each fire station is the area that is accessible by fire units within four minutes driving time, taking into account street patterns, terrain, and traffic arrangement of fire stations as factors that impact response and station location. The following represents historical performance goals, based on the previous edition of the adopted standards of cover.

2012 Standards of Cover

The department's Structure Fire benchmark service level objectives are as follows:

For 90 percent of all low, moderate, and high risk structure fire responses, the total response time for the arrival of the first-due unit, with a minimum of 4 firefighters, shall be: 6 minutes and 30 seconds. The first arriving unit shall be capable of: establishing command; completing an initial size up; establishing water supply; and initiating fire attack and/or rescue. These operations shall be done utilizing safe operational procedures.

For 90 percent of all low, moderate, and high risk structure fire responses, the total response time for the arrival of the effective response force (ERF), with a minimum of 16 firefighters, shall be: 10 minutes and 30 seconds. The ERF shall be capable of: establishing command; providing an uninterrupted water supply; advancing an attack line and a backup line for fire control; complying with the requirements of two in-two out; completing forcible entry; searching and rescuing at-risk victims; evacuation; ventilating the structure; exposure protection; controlling utilities; and performing salvage and overhaul. These operations shall be done utilizing safe operational procedures.

The department's EMS benchmark service level objectives are as follows:

For 90 percent of all priority medical incidents, the total response time for the arrival of the first-due unit, with a minimum of 1 paramedic and 1 EMT-I, shall be: 6 minutes and 30 seconds in urban areas, 12 minutes and 30 seconds in rural areas, and 9 minutes and 30 seconds countywide. The first-due unit shall be capable of establishing command; assessing scene safety; conducting

initial patient assessment; obtaining vitals and patient's medical history; initiating basic life support with AED capability until the ALS transport unit arrives on the scene.

For 90 percent of all priority medical incidents, the total response time for the arrival of the ERF (ALS unit), with a minimum of 1 Paramedic and 2 EMT-I's, shall be 10 minutes and 30 seconds in urban areas, 14 minutes and 30 seconds in rural areas, and 12 minutes and 30 seconds countywide. The ERF shall be capable of: establishing command; assessing scene safety; conducting initial patient assessment; obtaining vitals and patient's medical history; providing intravenous (IV) access-medication administration and transport the patient.

The department's Hazardous Materials benchmark service level objectives are as follows:

For 90 percent of all hazardous materials response incidents, the total response time for the arrival of the first-due unit, with a minimum of 4 firefighters, shall be; 6 minutes and 30 seconds. The first-due unit shall be capable of: establishing command; sizing up; assessing the situation to determine the presence of a potential hazardous material; determining the need for additional resources; estimating the potential harm without intervention; and begin establishing a hot, warm and cold zone. These operations shall be done utilizing safe operational procedures.

For 90 percent of all hazardous materials response incidents, the total response time for the arrival of the effective response force (ERF), staffed with 16 firefighters shall be 10 minutes 30 seconds. The ERF shall be capable of providing the equipment, technical expertise, knowledge, skills and abilities to mitigate a hazardous materials incident. These operations shall be done utilizing safe operational procedures.

The department's Technical Rescue benchmark service level objectives are as follows:

For 90 percent of all technical rescue incidents, the total response time for the arrival of the first-due unit, with a minimum of 4 firefighters, shall be; 6 minutes and 30 seconds. The first-due unit shall be capable of: establishing command; sizing up to determine if a technical rescue response is required; requesting additional resources; controlling the hazard; and providing basic life support to any victim without endangering response personnel. These operations shall be done utilizing safe operational procedures.

For 90 percent of all technical rescue incidents, the total response time for the arrival of the effective response force (ERF), staffed with 16 firefighters shall be 10 minutes 30 seconds. The ERF shall be capable of; establishing patient contact; providing the equipment, technical expertise, knowledge, skills and abilities to mitigate a technical rescue incident; providing advanced life support and transport patient(s). These operations shall be done utilizing safe operational procedures.

The department's Technical Rescue benchmark service level objectives are as follows:

For 90 percent of all technical rescue incidents, the total response time for the arrival of the first-due unit, with a minimum of 4 firefighters, shall be; 6 minutes and 30 seconds. The first-due unit shall be capable of: establishing command; sizing up to determine if a technical rescue response is required; requesting additional resources; controlling the hazard; and providing basic life support to any victim without endangering response personnel. These operations shall be done utilizing safe operational procedures.

For 90 percent of all technical rescue incidents, the total response time for the arrival of the effective response force (ERF), staffed with 16 firefighters shall be 10 minutes 30 seconds. The ERF shall be capable of; establishing patient contact; providing the equipment, technical expertise, knowledge, skills and abilities to mitigate a technical rescue incident; providing advanced life support and transport patient(s). These operations shall be done utilizing safe operational procedures.

G. Community Risk Assessment and Risk Levels

Risk Assessment Model

A community risk assessment, according to the Center for Public Safety Excellence (CPSE), is the evaluation of the community's fire and non-fire hazards and threats, taking into account all pertinent facts that increase or decrease risk in order to define standards of cover (SOC). The CPSE defines risk as "the exposure or chance of injury or loss." When designing the appropriate community risk assessment model, the department understands there must be a combination of objective and subjective criteria in order to provide guidance in developing department programs. The program must produce results that are generally reflective of what the organization believes to be the true risk in the community. The department utilizes two models to assess risk in the community through a three-axis methodology and location-based model.

The first model analyzes types of risk by program classification (fire, emergency medical services, technical rescue, and hazardous materials). The department's previous SOC utilized a two-axis methodology for assessing risk by considering both probability the event occurs and consequences to the community for each event. After review of the two-axis model, the department decided a three-axis model that includes agency impact, would be more comprehensive in demonstrating the drawdown of the agency's resources for a given incident than the two-axis model.

The second tool identifies specific places of risks based on defined criteria. The department developed a risk assessment program called RAPTOR – Risk Analysis Profile & Target Occupancies and Risk. RAPTOR uses data collected from inspections to identify locations of low, moderate, high, and maximum risk.

The department has identified the following as the basic types of risk to plan for and analyze:

- Risk of having a call at a particular location (Fire, EMS, Technical Rescue, or Hazmat)
- Risk of having a specific type of call no specific location (past experience)
- Fire risk (needed fire flow)
- Risk of occupants not being able to escape fire
- Risk of building collapse under fire
- Risk of firefighters being injured or dying inside a building on fire
- Risk of economic impact to community
- Risk of negative impact on department due to an incident
- Risk of fire spread potential (conflagration or single exposure)
- Risk to firefighters in reaching occupants or fire (inside access = stairs or outside access = aerial)
- Risk of draining agency resources

The department has identified the following as some of the best risk reduction strategies:

- Fire protection systems and alerting system
- Internal education and practice to escape or stop risk

- Strong codes and inspections practices
- Firefighter training
- Risk-Benefit training
- Pre-planning and company familiarization

Risk Assessment Methodology

Three-axis Model (Probability/Consequence/Impact of Event Risk)

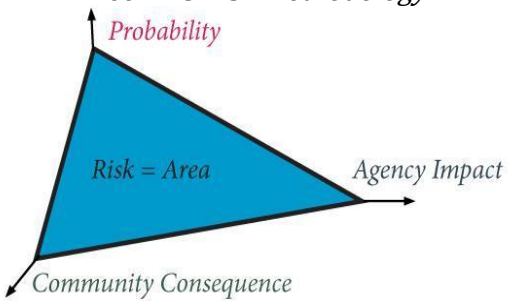
The three-axis methodology operates by assigning each response a score for the three risk areas: probability, community consequence, and agency impact. In the model, a score in each of the risk areas is expressed as a point on the axis. Each axis is scored on a scale of 2 to 10 (even numbers) where a two indicates a low risk and 10 is a high risk score. CFAI defines risk as "the program classification type and category degree of potential danger and/or peril of injury of loss." The three-axial methodology established a process of evaluating risk through a systematic approach that assesses the all-hazards risks in the service area.

Scores for the risk areas are plugged into Heron's formula to calculate the risk rating. Heron's formula computes the volume of a tetrahedron. Assigning a category of risk based on the degree (low, moderate, high, or maximum) helps define the relationship between community requirements and commitment or resources. The risk-based response polygon provides guidance on a rational strategy for company deployment.

Heron's formula modified for tetrahedrons

$$Risk = \sqrt{\frac{(pc)^2}{2} + \frac{(ci)^2}{2} + \frac{(ip)^2}{2}}$$

Three Axis Risk Methodology



Magnitude of the risk is determined by the greater the total area of mass, the greater the risk category level. For example, a tetrahedron with a greater mass will translate to a higher category of risk level than a tetrahedron with a smaller mass.

Y Axis: *Probability*

Assessing probability for an incident type is defined by CPSE as "measuring the likelihood an emergency situation will occur in a given period." The department calculated probability by determining the average annual incidents for each response over a five-year period from 2012- 2016. Based on historical call data, the more likely an incident type will occur the higher the risk score assigned to the incident type (2- low probability, 10-very high probability).

X Axis: *Community Consequence*

Community consequence is defined by CPSE as "the study of what is the impact magnitude or expected loss that will be experienced by the response area, community, and citizenry of the area." It is the significance of the actual loss to the community. Factors to consider are potential economic loss, property loss, historical importance and life loss/injury. Community consequence is scored on a scale of 2 to 10 (even numbers) with two indicating low community consequence and 10, indicating high community consequence.

Z Axis: *Agency Impact*

Agency impact is defined by CPSE as "the drain effect on the community's standard of deployment and coverage capacity when an emergency event occurs." Impact of an incident type is calculated by evaluating the amount of agency resources utilized for the emergency event based on the established critical tasks. The number of people needed to complete an effective response force (ERF) is what is used to calculate risk score. The more resources needed for a response then the less residual resources available in the system to respond to emergencies. Residual coverage effect refers to the reserve capacity for area protection, deployment and/or coverage. Agency impact is scored on a scale of 2 to 10 (even numbers) with two indicating low agency impact and 10, indicating high agency impact.

All emergency incident types were reviewed and discussed for each program classification. Utilizing the risk assessment criteria for calculating probability, community consequence, and agency impact, the values used for Heron's Formula for each incident type were determined by the members of the SOC team and executive team. The SOC team consists of individuals from all levels of the organization: the fire chief, division chief of EMS, division chief of training, division chief of prevention, operations division chief, two captains, five lieutenants, one acting officer and the accreditation manager. An officer from IAFF Local 1596 is included in the group as well. This group represents a diverse set of skills and years of fire service experience. Based on the established risk assessment methodology the members assign values of for each axis. The risk score, allowed the department members to place incident types into risk levels of low, moderate, high and maximum risk.

Risk Classification and Categories

Risk categorization by degree are generally defined as the following:

- Low- Risk requiring a minimal commitment of resources, generally a single unit response.
- Medium- Risk requiring an initial dispatch of multiple resources, generally a primary response.

- High- Risk requiring a full multi-unit response, generally a full response.
- Maximum- Risk requiring a substantial commitment of resources or posing potential for extreme loss.

Risk Assessment by Program Classification

Fire Suppression Services

The area included in the city limits of Lawrence, Kansas and Grant Township was assessed to evaluate the community's fire risks. Three primary components were utilized as part of the evaluation as described below.

Y Axis

Probability

Measuring the likelihood an emergency situation will occur in a given period. Probability is calculated by determining the average annual incidents over a five-year period, 2012-2016. Based off historical data, the more likely an incident type will occur the higher the risk score.

Table 4 Fire Suppression Probability Risk Scoring

Risk Score	2	4	6	8	10
Average Annual Incidents (2012-2016)	0 - 500	501 - 1000	1001 - 1500	1500 - 2000	>2000

X Axis

Community Consequence

The study of what is the impact magnitude or expected loss that will be experienced by the response area, community, and citizenry of the area. It is the significance of the actual loss to the community.

Community consequence for fire incidents is determined by potential economic loss and life loss/injury. Potential life loss or injury from fire is a greater risk if it is either in a place of employment or sleeping area/home. While a fire incident at a place of employment is a risk, usually people are alert and able to avoid serious injury. Businesses are more likely to be annually inspected and have fire protection systems installed. Residential areas pose a great potential for life loss/injury because they are sleeping areas, may be difficult to escape. According to the United State Fire Administration (USFA), from 2012 to 2014, civilian fire fatalities in residential buildings accounted for 84 percent of all fire fatalities. Additionally, USFA states that in the same time period, 87 percent of fire-related firefighter injuries reported to NFIRS were associated with structure fires. Three times as many firefighter injuries occurred in residential structures as in nonresidential structures.

Considerations when determining the Fire Consequence Scoring:

- Structure or non-structure fire
- Level of occupancy of the structure
- Land use and zoning
- Whether the structure or property is designed for habitation
- Exposures or extent of potential damage
- Level of patient care needed

- Extent of community impact: individual/ business/ community-wide
- Effects to critical infrastructure/asset damage
- High safety/health risk
- Restricted mobility and/or at-risk patients
- Discretionary or non-discretionary time
- Presents danger to firefighter or other public safety personnel
- Proximity to high risk populations
- Requires outside assistance or additional resources

Z Axis

Agency Impact

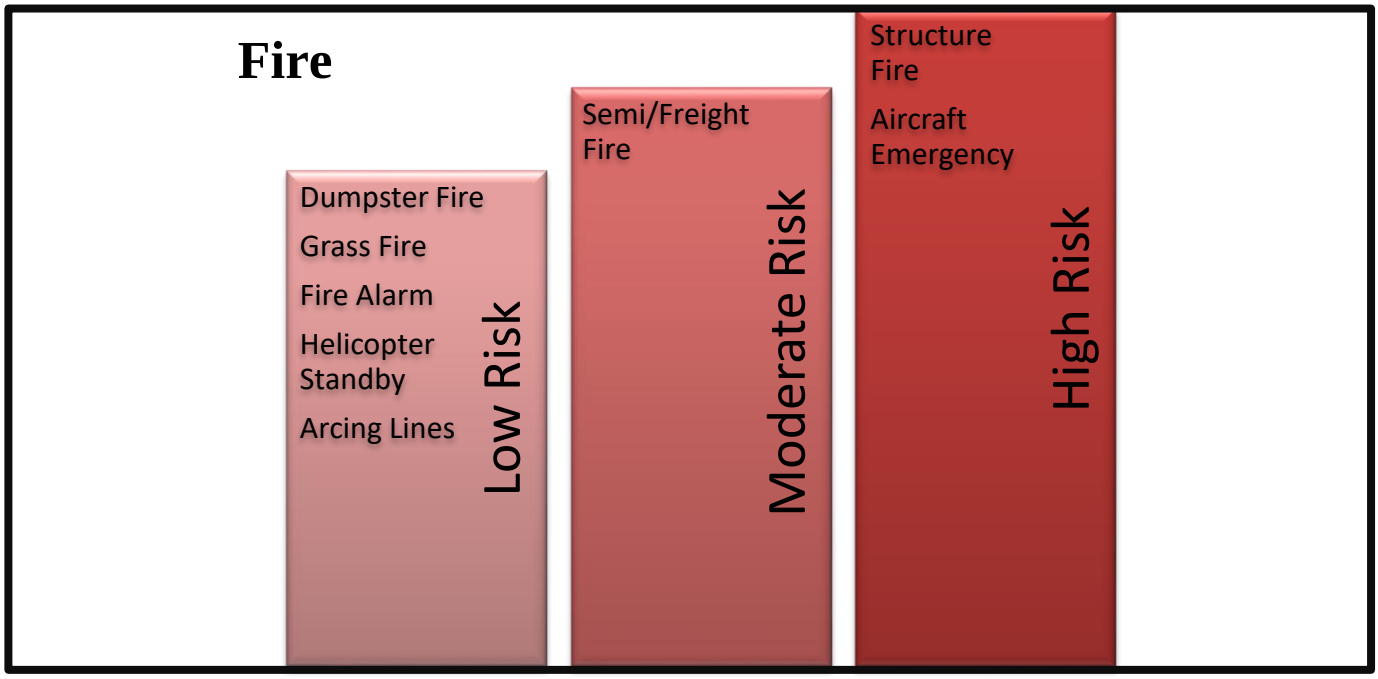
Impact measures the drain effect on the community's standard of deployment and coverage capacity when an emergency event occurs. The more resources needed for a response then the fewer residual resources available in the system to respond to emergencies. Agency resources are based on the critical tasks of the incident type. The number of people needed to complete an ERF is what is used to calculate risk score. The more resources needed for a response then the fewer residual resources available in the system to respond to emergencies.

Table 5 Fire Suppression Impact Risk Scoring

Risk Score	2	4	6	8	10
Number of people based on Response Matrix	1 -2 people	3 – 4 people	5- 11 people	12 – 18 people	>19 people

Table 6 Fire Suppression Incident Type Risk Score and Category

Incident Type	Probability	Consequence	Impact	Risk Score	Risk Category
Aircraft Emergency	2	6	8	36.77	High
Fire Alarm	4	2	4	13.86	Low
Car Fire, Pickup Fire, Helicopter Standby	2	2	4	8.48	Low
Dumpster Fire	2	2	4	8.49	Low
Grass Fire	2	2	4	8.49	Low
Semi/Freight Fire	2	4	6	19.79	Moderate
Structure Fire	2	6	8	36.77	High



The department is currently undergoing revision and update to the response matrix. Implementation of the new matrix will create three structure fire classifications: Level 1, Level 2, and Level 3.

Level 3 indicates an appliance fire, electrical outlet/fixture, contained fire i.e. a pizza box in the oven. Emergency Communications will dispatch one engine, one medic unit and a shift commander to mitigate the incident or investigate. Level 2 indicates a fire that has been reported out, stovetop fire, smoke only. Emergency Communications will dispatch two engines, one medic unit, one rescue unit and a shift commander. A working structure fire or where there is smoke, flames or victims inside will be dispatched as a Level 1 structure fire. Emergency Communications will dispatch three engines, two medic units, one rescue unit and a shift commander. By updating the response matrix, the department will be able to respond with the appropriate amount of resources needed to mitigate the risks based on the critical tasks.

Emergency Medical Services

The area of Douglas County, Kansas was assessed to evaluate the community's emergency medical services risks. Three primary components were utilized as part of the evaluation as described below.

Y Axis

Probability

Measuring the likelihood an emergency situation will occur in a given period. Probability is calculated by determining the average annual incidents over a five-year period, 2012-2016. Based off historical data, the more likely an incident type will occur the higher the risk score.

Table 7 EMS Probability Risk Scoring

Risk Score	2	4	6	8	10
Average Annual Incidents (2012-2016)	0 - 500	501- 1000	1001- 1500	1500- 2000	>2000

X Axis

Community Consequence

The study of what is the impact magnitude or expected loss that will be experienced by the response area, community, and citizenry of the area. It is the significance of the actual loss to the community. Community consequence for EMS incidents is determined by potential economic loss and life loss/injury.

Considerations when determining the EMS consequence scoring:

- Level of patient care needed
- Extent of community impact: individual/ business/ community-wide
- Emergent or non-emergent care
- Number of patients
- Restricted mobility patients
- Public safety threat
- Effects to critical infrastructure/asset damage
- High safety/health risk
- Discretionary or non-discretionary time
- Specialized training needed
- Presents danger to firefighter or other public safety personnel
- Limited access or isolated location

Z Axis

Agency Impact

Impact measures the drain effect on the community's standard of deployment and coverage capacity when an emergency event occurs. The more resources needed for a response then the fewer residual resources available in the system to respond to emergencies. Agency resources are based on the critical tasks of the incident type. The number of people needed to complete an ERF is what is used to calculate risk score.

Table 8 EMS Impact Risk Scoring

Risk Score	2	4	6	8	10
Number of people based on Response Matrix	1 -2 people	3 people	4- 11 people	12 – 18 people	>19 people

Table 9 EMS Incident Type Risk Scores and Risk Category

Incident Type	Probability	Consequence	Impact	Risk Score	Risk Category
Abdominal pain; breathing problems; overdose; seizure; diabetic, etc.	10	2	2	20.199	Moderate
Motor Vehicle Accident Level 1 (City)and Level 2 (County)	2	2	2	4.90	Moderate
Motor Vehicle Accident Level 3- County	2	4	4	13.86	High
Motor Vehicle Accident Level 4- County	2	6	6	28.14	Maximum
Medical Patient Transfers-Emergency	2	2	2	4.90	Moderate
Cardiac Arrest; shooting; stabbing; electrocution; diving accident	2	8	4	25.923	High
Lift Assist	2	2	2	4.90	Low

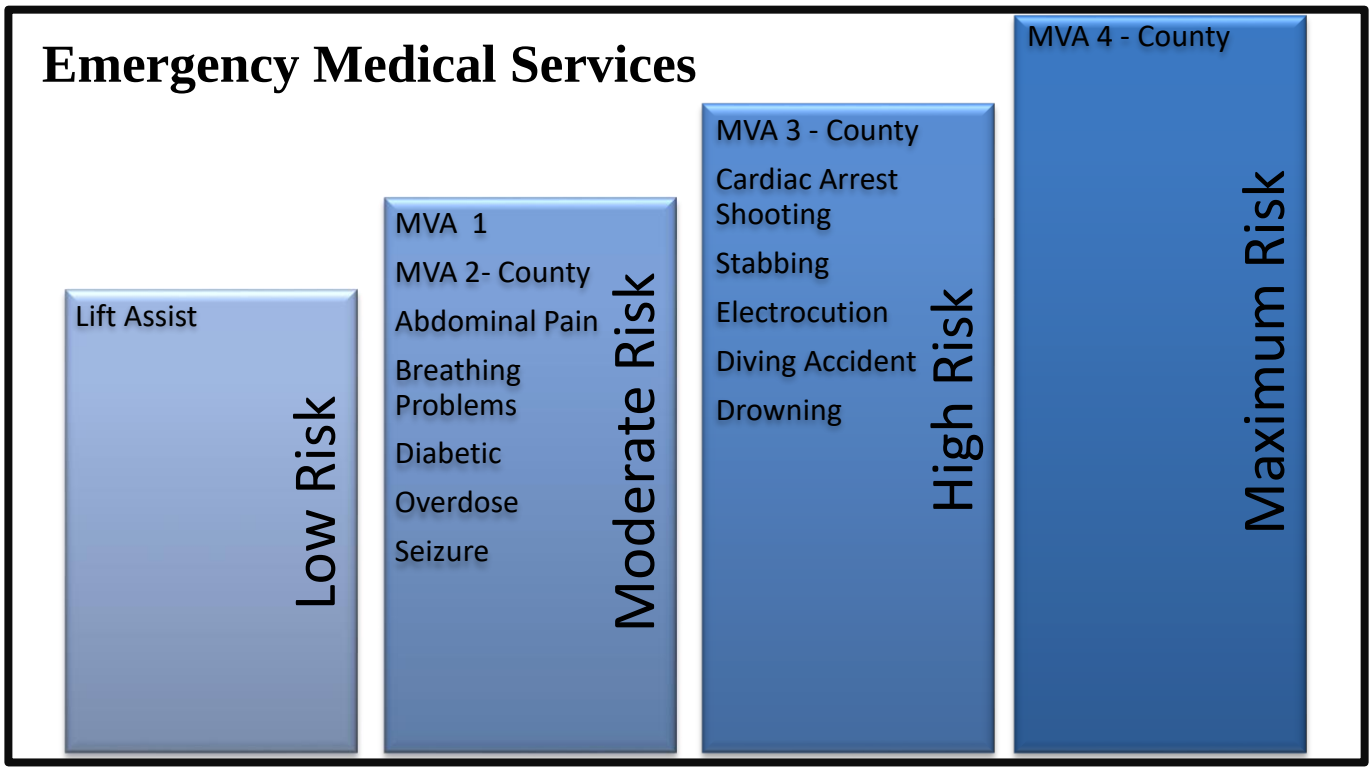
All emergency medical responses are ALS services because personnel are required to have a minimum of AEMT. Lift assists are considered a low risk because it does not require a transport unit.

The Medical Priority Dispatch (EMD) protocols with pre-arrival instructions ensure an adequate number of personnel and units respond to out-of-hospital incidents to provide the best and quickest possible care. The EMD systems quickly dispatches units by chief complaint, allowing the department to define priority medical incidents in the computer-aided dispatching software.

The department dispatches four levels of motor vehicle accidents. The difference between a city and county response, is the number of department members dispatched to the incident and the type of care provided. The primary response for a motor vehicle accident in the county is emergency medical care. If the call in the county requires extrication the department will assist the jurisdictional fire department with extrication for the purpose of providing emergency medical care. Below are the criteria used to determine the MVA Levels.

Table 10 MVA Levels / Criteria

Level 1	Vehicle accident with 1 or 2 patients with minor injuries, cuts, scrapes, bruises, neck or back pain to be evaluated for more serious injuries. This level is classified as an emergency medical call in the City and the County.
Level 2	Vehicle accident with 1 or 2 patients with serious injuries including but not limited to, facial injuries, long bone fractures, loss of consciousness, chest pain, shortness of breath, and underlying medical problems. Classified as Technical Rescue in the City and Emergency Medical Response in the County.
Level 3	Vehicle accident at highway speeds, rollover, ejection, multiple patients, multi-system trauma. Classified as Technical Rescue in the City and Emergency Medical Response in the County.
Level 4	Vehicle accident requiring extrication. Classified as Technical Rescue in the City and Emergency Medical Response in the County.



Hazardous Materials Services

The area of Douglas County, Kansas was assessed to evaluate the community's hazardous materials risks. Three primary components were utilized as part of the evaluation as described below.

LDCFM is the primary agency responsible for providing a coordinated response to major releases or spills of hazardous materials in Douglas County. Responses within the City of Lawrence deliver more personnel trained at a higher level than a response in the county. The department responds all risk levels in the City of Lawrence and only high risk events in the county.

Y Axis

Probability

Measuring the likelihood an emergency situation will occur in a given period. Probability is calculated by determining the average annual incidents over a five-year period, 2012-2016. Based off historical data, the more likely an incident type will occur the higher the risk score.

Table 11 HazMat Probability Scoring

Risk Score	2	4	6	8	10
Average Annual Incidents (2012-2016)	0 - 500	501- 1000	1001- 1500	1500- 2000	>2000

X Axis

Community Consequence

The study of what is the impact magnitude or expected loss that will be experienced by the response area, community, and citizenry of the area. The study of what is the impact magnitude or expected loss that will be experienced by the response area, community, and citizenry of the area. It is the significance of the actual loss to the community. Community consequence for hazardous materials incidents is determined by potential economic loss and life loss/injury.

Considerations when determining the hazmat consequence scoring:

- Level of patient care needed
- Extent of community impact: individual/ business/ community-wide
- Effects to critical infrastructure/asset damage
- High safety/health risk
- Discretionary or Non-Discretionary time
- Specialized training needed
- Environmental concerns
- Presents danger to firefighter or other public safety personnel
- Evacuation necessary
- Proximity to high risk populations
- Entry with advanced protection
- Requires outside assistance

Z Axis

Agency Impact

Impact measures the drain effect on the community's standard of deployment and coverage capacity when an emergency event occurs. The more resources needed for a response then the fewer residual

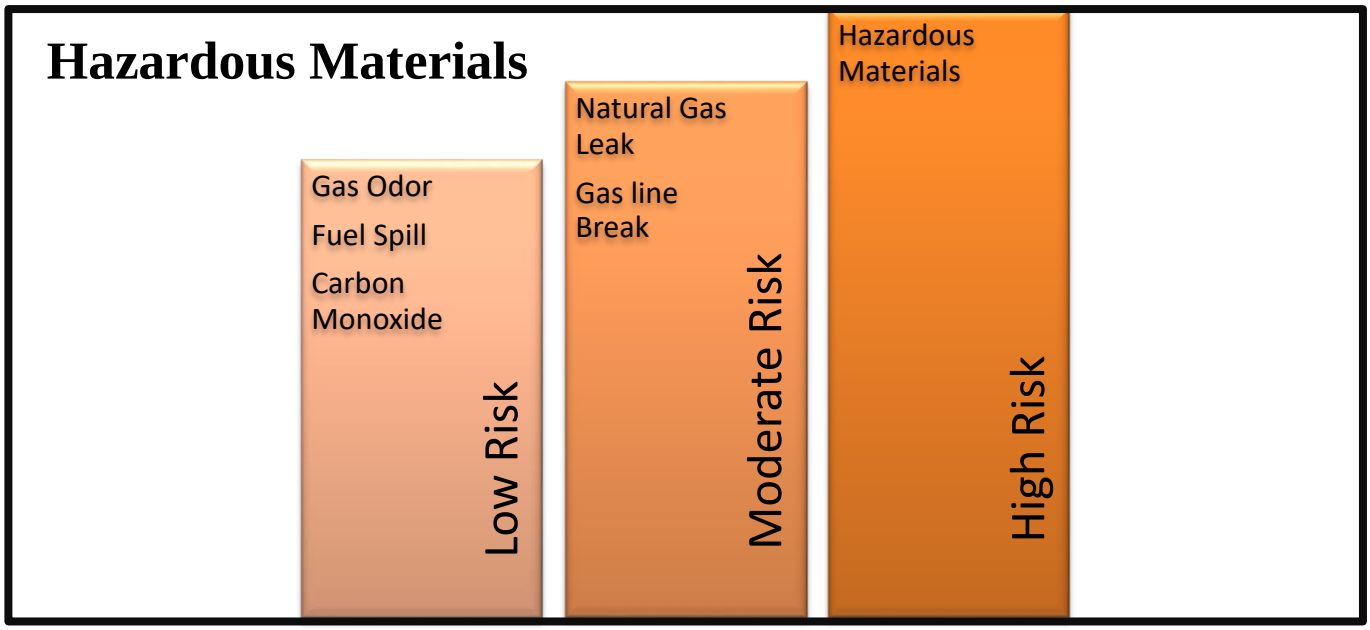
resources available in the system to respond to emergencies. Agency resources are based on the critical tasks of the incident type. The number of people needed to complete an ERF is what is used to calculate risk score. The more resources needed for a response then the fewer residual resources available in the system to respond to emergencies.

Table 12 HazMat Impact Scoring

Risk Score	2	4	6	8	10
Number of people based on Response Matrix	1 -2 people	3 – 4 people	5- 11 people	12 – 18 people	>19 people

Table 13 HazMat Incident Type Scores and Risk Category

Incident Type	Probability	Consequence	Impact	Risk Score	Risk Category
Odor of Gas	2	2	2	4.90	Low
Fuel Spill	2	4	2	8.49	Low
Natural Gas Leak	2	4	2	8.49	Moderate
Hazardous Materials Incident	2	6	8	36.77	High
Carbon Monoxide Incident	2	2	2	4.90	Low



Technical Rescue Services

The area included in the city limits of Lawrence, Kansas was assessed to evaluate the community's technical rescue risks. Three primary components were utilized as part of the evaluation as described below.

The department provides assistance to the Douglas County first responder agencies with technical rescue, including motor vehicle accidents, though the primary responsibility of the agency is emergency medical care.

Y Axis

Probability

Measuring the likelihood an emergency situation will occur in a given period. Probability is calculated by determining the average annual incidents over a five-year period, 2012-2016. Based off historical data, the more likely an incident type will occur the higher the risk score.

Table 14 Technical Rescue Probability Scoring

Risk Score	2	4	6	8	10
Average Annual Incidents (2012-2016)	0- 500	501- 1000	1001- 1500	1500- 2000	>2000

X Axis

Community Consequence

The study of what is the impact magnitude or expected loss that will be experienced by the response area, community, and citizenry of the area. The study of what is the impact magnitude or expected loss that will be experienced by the response area, community, and citizenry of the area. It is the significance of the actual loss to the community. Community consequence for technical rescue incidents is determined by potential life loss/injury.

- Specialized training required
- Maximum equipment or tools needed
- Evacuation needed
- Exposures or extent of potential damage
- Level of patient care needed
- Extent of community impact: individual/ business/ community-wide
- Effects to critical infrastructure/asset damage
- High safety/health risk
- Restricted mobility and/or at-risk patients
- Discretionary or non-discretionary time
- Presents danger to firefighter or other public safety personnel
- Proximity to high risk populations
- Requires outside assistance or additional resources

Z Axis

Agency Impact

Impact measures the drain effect on the community's standard of deployment and coverage capacity when an emergency event occurs. The more resources needed for a response then the fewer residual

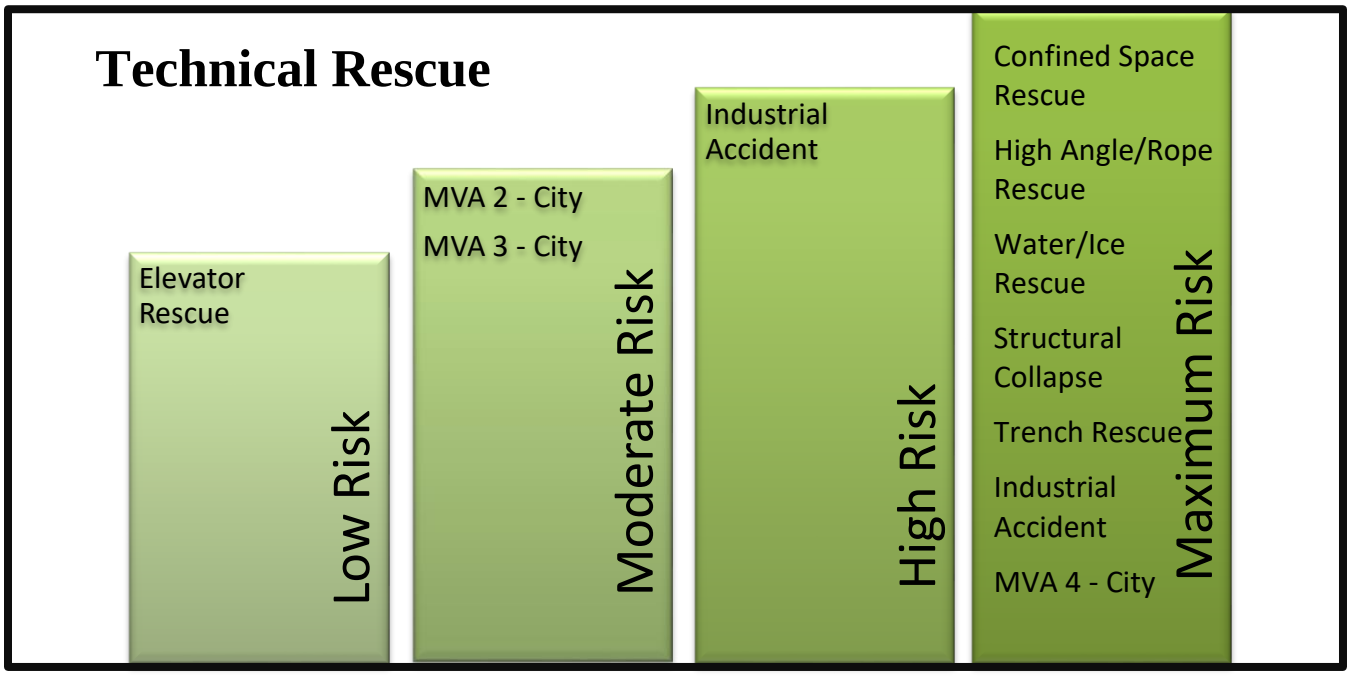
resources available in the system to respond to emergencies. Agency resources are based on the critical tasks of the incident type. The number of people needed to complete an ERF is what is used to calculate risk score. The more resources needed for a response then the fewer residual resources available in the system to respond to emergencies.

Table 15 Technical Rescue Impact Risk Scoring

Risk Score	2	4	6	8	10
Number of people based on Response Matrix	1 -2 people	3 – 4 people	5- 11 people	12 – 18 people	>19 people

Table 16 Technical Rescue Incident Type Scores and Risk Category

Incident Type	Probability	Consequence	Impact	Risk Score	Risk Category
Building Collapse	2	8	8	48	Maximum
Confined Space Rescue	2	8	8	48	Maximum
Elevator Rescue	2	2	2	4.90	Low
High Angle Rescue	2	8	8	48	Maximum
Motor Vehicle Accident Level 4 with Extrication- City	2	8	8	48	Maximum
Trench Rescue	2	8	8	48	Maximum
Water/Ice Rescue	2	8	8	48	Maximum
Machine/Industrial Accident	2	8	6	36.77	High



Risk Analysis Profile & Target Occupancies and Risk (RAPTOR)

The department has used a variety of risk assessment models since developing a CRA-SOC. The previous models, Risk Hazard and Value Evaluation (RHAVE™) and VISION™ software, were not sustainable because of lack of program support and did not reflect the risk as department leaders inherently identified.

The department uses Firehouse™ software as a records management system (RMS). The goal is to have one database for all department needs, and Firehouse™ has been identified as the core database. One disadvantage is there are limited capabilities in the current Firehouse software for a module that will output a score similar to the OVAP score generated by the VISION™ software. Until a risk assessment module can be administered by the software company, the department developed its own criteria into a report called "RAPTOR." The report outputs a risk score categorize occupancies into "low, moderate, high and maximum" risk. Occupancies identified in the high and maximum risk categories would be considered target occupancies. The RAPTOR community risk assessment provides occupancy data for urban areas.

Risk Analysis Profile

Every map reference in the city has a risk analysis profile completed by the risk manager (station officer) for that area reference, in collaboration with their crews, complete a single page sheet identifying risk for fire, EMS, technical rescue and hazardous materials and identifying the public education targets.

Target Occupancies

These are significant risk that would be identified community wide and would also show up in each risk analysis profile. Target is an indicator with a magnitude that can be realized at a specific time or location or date; an explicit and objectively measured output. The department defined ten criteria based on occupancy data, to be used in the RAPTOR report.

Appendix A lists the full criteria and scoring matrix for the RAPTOR program.

- Fixed Property Use
- Building Class
- Suppression System
- Structure Type
- Building Status
- Roof Type
- Construction
- Floors Above
- Floors Below
- Needed Fire Flow

The RAPTOR community risk assessment tool provides the department with a program that is dynamic because the program utilizes existing occupancy data. The department is able to establish its own criteria based on risk by defining the scoring formula for each criterion. The higher the RAPTOR score indicates a higher risk score. Suppression systems and other mechanism may decrease the likelihood that these events occur and would generate a lower score. One restriction to the program is that occupancy data is limited to urban areas of Douglas County. The database is growing as the department inspects more occupancies. In April 2014, the Lawrence City Commission voted to expand the city's Rental Registration Ordinance to all rental properties in Lawrence. This program has added more occupancy data on rental properties in Lawrence city-limits.

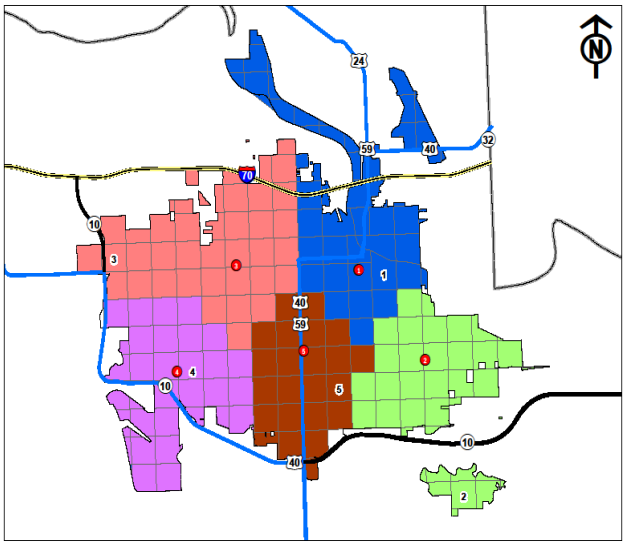
Planning Areas/Zones

Response Areas

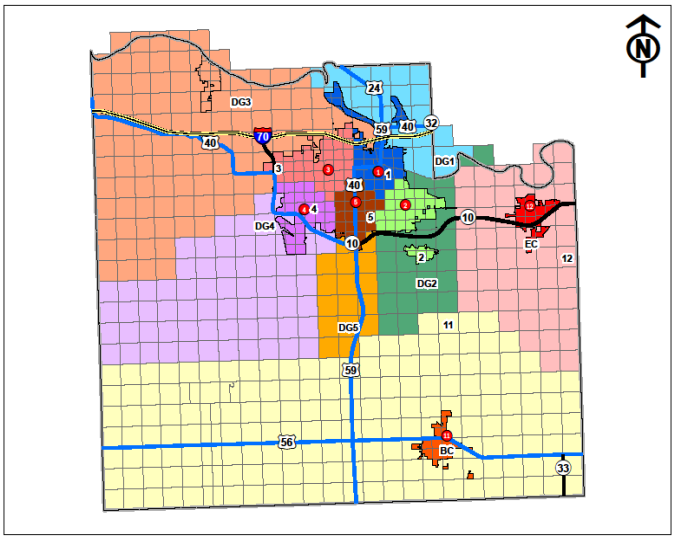
The department has identified 14 station response areas in which to analyze risk as well as service levels. There are five planning zones within the City of Lawrence and nine planning zones in the county. Each planning zone can be further divided in smaller zones referred to as map references. Map references in outlying planning zones are one square mile. Map references in the urban planning zones have been reduced to one quarter square mile.

The department began training dispatchers to use automatic vehicle locators (AVL) in 2015 in its computer aided dispatcher call (CAD). The CAD uses an AVL system to track the location of units using a global positioning system (GPS) receiver. In 2016, the Emergency Communications Center began dispatching the closest available units utilizing information from installed GARMIN GPS Systems. AVL allows the Emergency Dispatch Center to utilize the information from the GPS satellites to recommend units based on their current location. The GPS system allows the dispatcher to view live interactive maps with all the units and their status. Based on the new dispatching model, the identified planning zones function as station reporting districts rather than response areas.

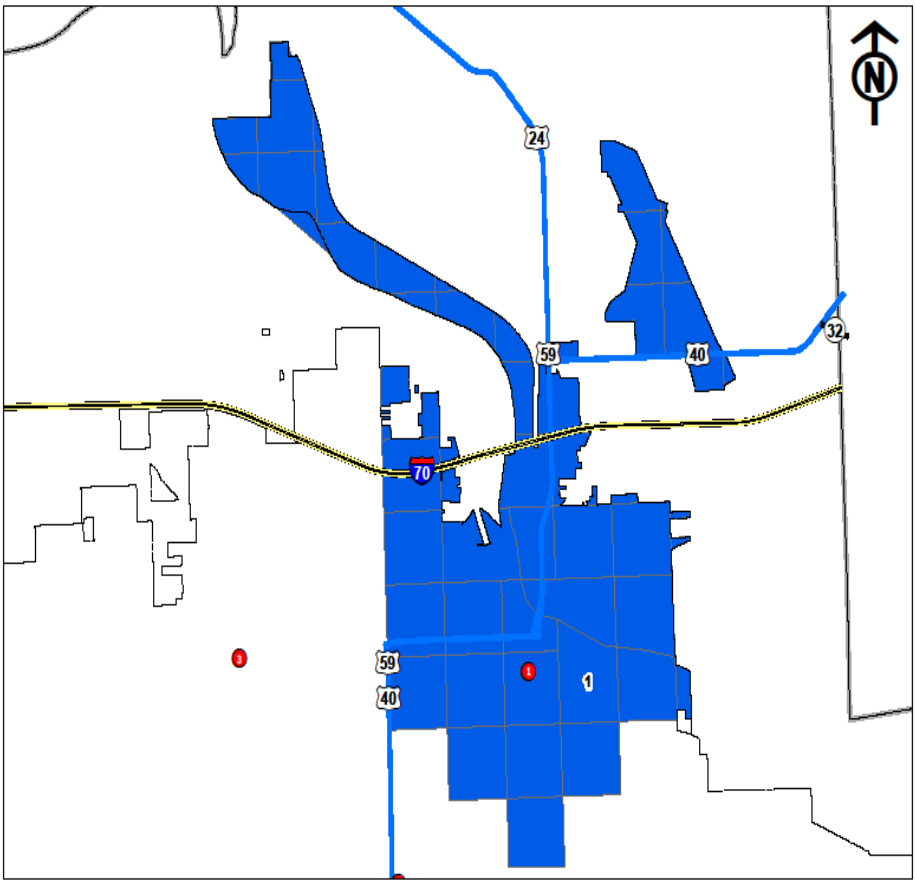
Map 24 City Demand Zones



Map 25 County Demand Zones



Map 26 Planning Zone 1

Planning Zone 1	
Map Reference(s): 1414-A 1513-A, B, D 1514-A, B, C, D 1515-A, B 1613-A, B, C, D 1614-A, B, C, D 1615-A, B, C, D 1713-A, B, C, D 1714-A, B, C, D 1715-B, C 1716-A 1813 B 1814-A, B, C, D 1815-A, B, C, D	

Profile

This area includes the neighborhoods of Oread, Old West Lawrence, East Lawrence, North Lawrence and Pinckney. The central business district (downtown) lie within this zone as does a portion of Kansas University. Downtown is considered the hub of daily activity in the community and transitions into a popular evening destination for entertainment and dining. Many of the commercial buildings are of vintage 19th Century ordinary construction and contain mixed occupancies with retail shops on the street level and residential apartments on the upper floors.

There is a mix of owner occupied homes as well as historic residential structures converted to apartments throughout this zone. The Oread, Old West, and Pinckney neighborhoods are predominantly comprised of larger, two story Victorian / Queen Anne homes built from the mid-1800's to early-1900's and reflect the early affluence of these areas. Utilizing balloon framing, these homes can pose a significant firefighting challenge due to their size, construction type, and limited accessibility. East Lawrence and North Lawrence is comprised largely of smaller one story and one and one half story framed homes indicative of the working class industrial roots of these neighborhoods. Balloon framing is prevalent and bungalow style architecture is predominant. North

Lawrence has struggled over the years to due to the many floods that occurred here, with the latest as recent as 1993, it is generally surrounded by farmland.

The downtown commercial district poses one of the greatest risks for this zone. The many commercial buildings have sporadic fire protection systems, share common walls, and as noted, have mixed occupancies making these buildings a challenge. Structural fires must be stopped or entire city blocks could be threatened with loss.

This district has had a recent boom in mixed-use multi-story buildings along New Hampshire Street and near campus located in the Oread neighborhood. The Oread Hotel is a seven story-story hotel, with commercial and below grade parking and entertainment use. The newest development in the Oread District is HERE Kansas, a seven-story mixed-use student housing projects with 237 apartments, parking garage and retail space.

This area is comprised mainly of residential streets. Massachusetts Street is the primary thoroughfare for this zone. In the downtown area, the street is two driving lanes wide with diagonal parking on both sides. This street is heavily congested at many times of the day and evening and the department typically travels streets to the east and west of Massachusetts to avoid this area.

The Lawrence Municipal Airport, opened in 1929, is located northeast of the core of Lawrence, in Grant Township. Like many suburban airports it is located near the city but is not fully encompassed by the city limits. The airport has a terminal and several hanger buildings for storage and maintenance of aircraft.

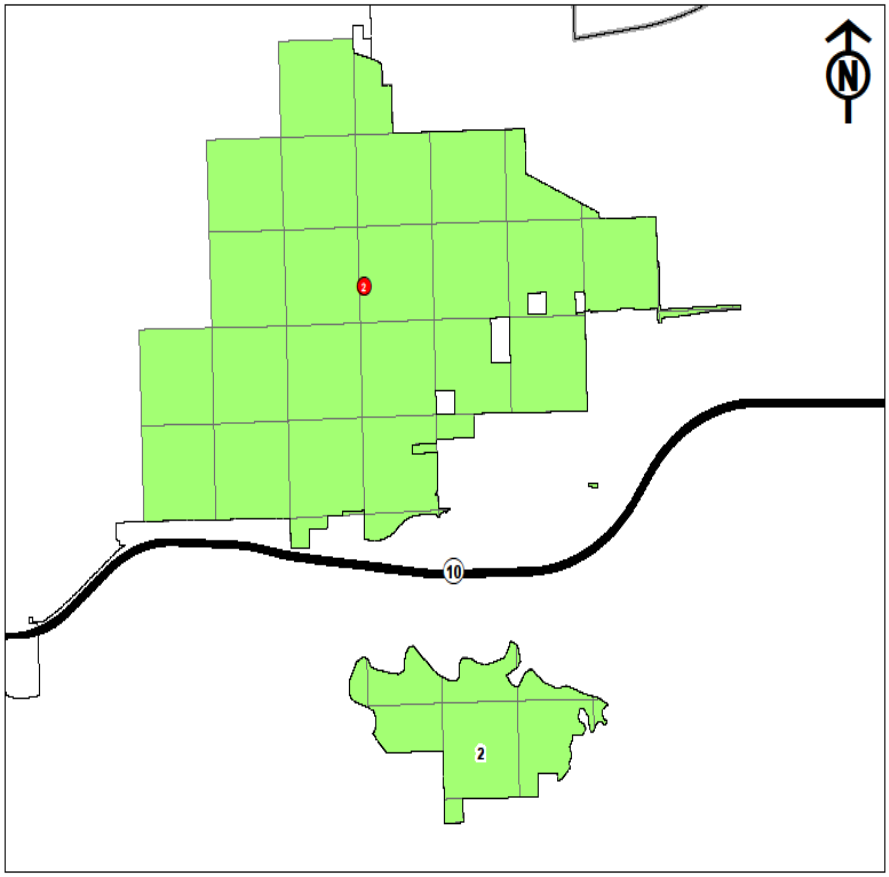
Two railroads transverse this zone; the Union Pacific (UP) located north of the Kansas River and the Burlington Northern Santa Fe (BNSF) located south of the Kansas River. Both railroads have main rail lines that generally travel east and west and both have spur tracks and rail switching yards. The BNSF track is also used by Amtrak on their Southwest Chief route which has a stop at East 7th and New Jersey streets in east Lawrence. Both railroads maintain numerous controlled and uncontrolled intersections throughout the City of Lawrence and Douglas County. There is significant rail traffic, especially on the UP track, with significant quantities of consumer goods, coal, and hazardous material being transported. Both railroads have high speed and low speed service through the city and county.

This area has quick access to US Highway 24, US Highway 40, US Highway 59 and Interstate 70. The US highway routes provide two lane services from the Kansas City and Topeka metropolitan areas to points in the eastern quarter and northeast quadrant of Kansas. Interstate 70 is a multi-lane highway that carries a significant amount of interstate traffic through the heart of Kansas. These routes are the primary routes for transportation and distribution of substantial quantities of consumer goods and hazardous material.

A notable risk within this zone is the Kansas River, also known as the Kaw River. The Kansas River flows west to east along the northeast boundary of the city and divides Lawrence proper from North Lawrence. The levee system associated with the river provides walking, biking and running surfaces

with numerous off-shoots for mountain biking and hiking. There are three city parks along the river that provide recreational access to the river. A key feature of the river is a low head dam located below the Kansas River Bridge at West 6th and Massachusetts Street. This dam provides flow to a new re-constructed private hydro-electric plant and is a popular fishing destination at times.

Map 27 Planning Zone 2

Planning Zone 2	
Map Reference(s): 1214 A, B, C, D 1215-A, B, D 1216- A, B, C, D 1217- A, B, C, D 1314-A, B, C, D 1315-A, B, C, D 1316-A, B, C, D 1317- A, B, C, D 1414-B, D 1415-A, B, C, D 1416-A, B, C, D 1417-C, D 1418- A, C 1515-C, D	

Profile

This area represents eastern and southeastern expansion and growth of the city beginning in the early 1960's to present. It is predominantly residential in nature with a mix of commercial, light industry, and Haskell Indian Nations University. This area includes the neighborhoods of Breezedale, Prairie Park, High Chaparral, East Hills and Park Hill. These neighborhoods are largely owner-occupied, platform framing over slab, residences. As the city continues to grow, vacant areas within these neighborhoods are being developed with wood-frame duplexes and medium to large apartment complexes. This area also contains larger mobile home parks. Commercial development within this area lines East 23rd Street, Haskell Avenue south from east 19th Street, and Delaware Street.

East Hills Business Park, established in 1987, is a city hosted, light industrial park located at the eastern edge of the city. Buildings within the park are large, tilt-up concrete over slab, structures. Two of these businesses located in the business park are in the top 10 for employment numbers for the city. South of the business park is the Douglas County Jail, a large correctional facility.

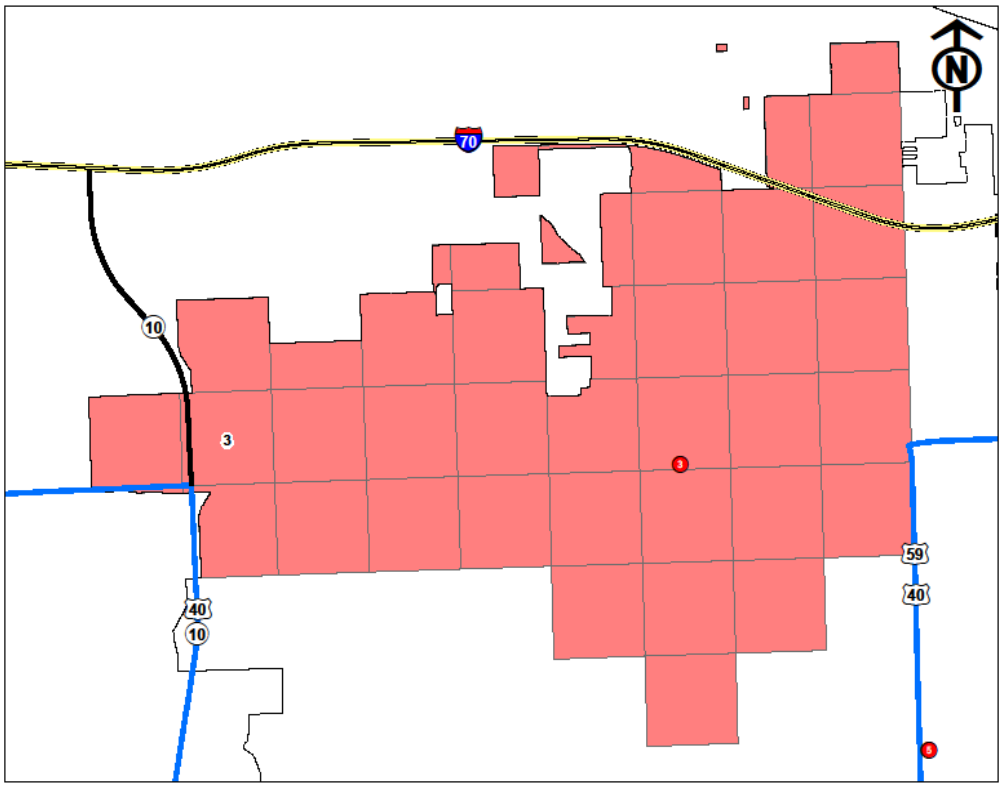
Haskell Indian Nations University (HINU) is a federally funded University offering free tuition to members of registered Native American tribes in the United States. Typical enrollment is approximately 1000, representing 150 tribes and all 50 states.

Also located in this zone are the Douglas County Fairgrounds and VenturePark, the former site of Farmland Industries. The fairgrounds, located north of East 23rd Street on Harper Street, is a popular destination throughout the year as a host of frequent canine and equine events; a large, annual swap meet in the spring; and a large County Fair in August. The fairgrounds also border VenturePark, the site of Farmland Industries. This now defunct facility was a large producer of fertilizer, predominantly ammonium nitrate. It is currently a new industrial and business park ready for development.

The far eastern side of the city, which includes the East Hills Business Park, lies within a regional development project known as the K-10 Corridor. This corridor lies along the route of Kansas Highway 10 (K-10), a four-lane limited access highway, which runs west from Interstate 435 in Johnson County to Lawrence. Kansas Highway 10 enters the city and becomes East 23rd Street. Because of the high speed associated with this highway, numerous accidents occur due to poor speed controls and highway urban interface. Located at the transition of K-10 and East 23rd street is O'Connell Road. O'Connell Road has become a primary residential artery extending south from K-10 to the city limits and provides access to the east side of Prairie Park neighborhood and the Douglas County Jail. The newly completed South Lawrence Traffic way provides a link from K-10 to US Highway 59, which will divert some drivers from using Lawrence city streets to connect the highways.

All occupancies within the East Hills Business Park meet protection requirements as established by city code. Of note are API Foils and Prosoco. Due to the use and or production of hazardous material by these companies, their respective structures utilize state-of-the-art containment and suppression systems including but not limited to high density sprinkler heads; vapor ventilation; external containment with foam system; and blast walls.

Map 28 Planning Zone 3

Planning Zone 3	
Map Reference(s): 1411-B 1508- A, B 1509-A, B 1510-A, B 1511-A, B, C, D 1512-A, B, C 1608- A, B, C, D 1609-A, B, C, D 1610-A, B, C, D 1611-A, B, C, D 1612-A, B, C, D 1708 A, B, C, D 1710-C, D 1711-A, B, C, D 1712-A, B, C, D 1812-C, D	

Profile

This area represents growth and expansion of the city to the northwest from the 1950's to present. Neighborhoods within this area include Perry Park, Quail Run, Sunset Hills, and portions of West Lawrence. Homes within this zone are predominantly larger, two story, platform wood frame over basement construction. Areas of the zone that border the Kansas University or are located in newer western areas have very large wood frame apartment complexes. This area also is home to the Lawrence Country Club with its private 18-hole golf course and the Alvamar Orchards public nine-hole golf course. Homes bordering these courses are generally larger and more expensive. West 6th Street, also known as US 40 Highway, is a primary east/west artery and is commercially developed its entire length. Additional commercial and office park development extends south of West 6th Street along Wakarusa Drive. Bauer Farm Development on West 6th Street is planned as a New Urbanism type of development with retail, apartments, senior living and urgent care facilities.

The northern boundary of this area contains a large industrial complex defined by the intersection of North Iowa Street and Lakeview Road. Structures within this area range from very large clear span

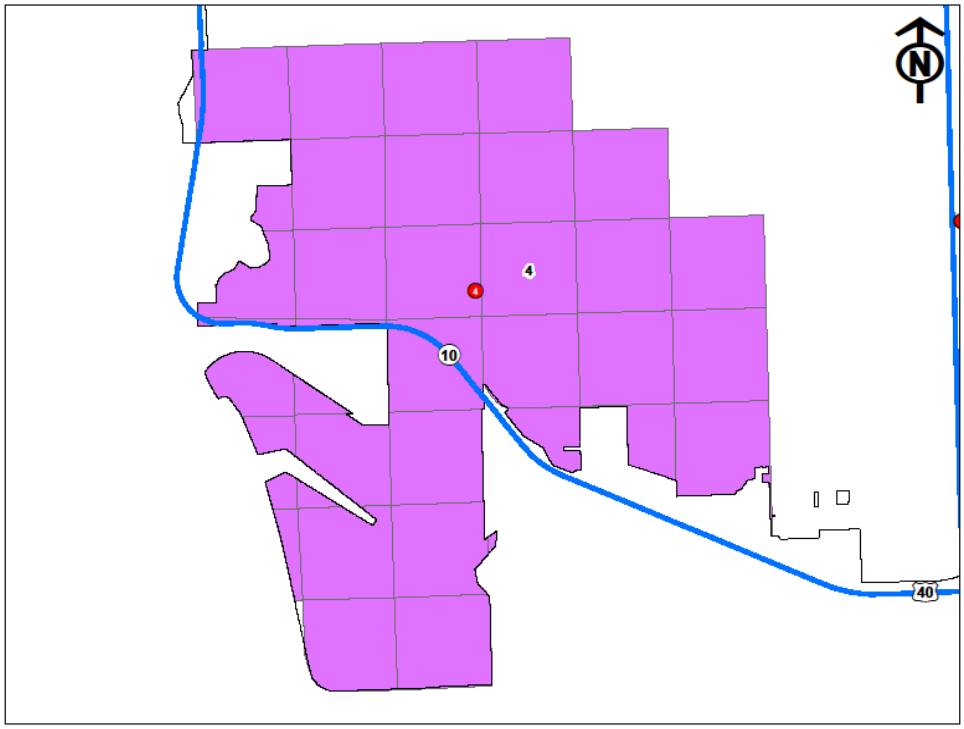
steel to tilt-up concrete. Occupancies include a K-Mart Distribution Center; Schlumberger oil well cable; Heinz Pet Food; and Berry Plastics, manufacturer of plastic dinner ware. These occupancies are covered by full fire protection systems. This area has wide two-lane roads and handles semi traffic in great volumes. A railroad spurs cuts through this area for delivery to the industrial complexes located on the south side of Lakeview Road.

The greatest area of growth for Lawrence is currently targeted for this area. A new 1000-unit apartment complex is planned along with developing commercial areas. In 2014, Rock Chalk Park opened featuring a new track stadium, softball complex, large recreation center called Sports Pavilion Lawrence.

The primary arteries that bisect the zone include West 6th Street (US Highway 40); Iowa Street and McDonald Drive, which provide access to Interstate 70 to the north and US Highway 59 to the south; Peterson Road; Kasold Drive; and Wakarusa Drive. Large trucks can access Interstate 70 from two directions, with access gates on McDonald Drive and at the intersection of US Highway 40 and Kansas Highway 10, thereby reducing the demand on the access routes. Congestion does become an issue along each of these arteries during peak morning and evening traffic periods in which there are substantial traffic in-flow/out-flow. Noon time traffic is moderate to heavy and is impacted by Free State High School.

The greatest risk lies in the northern industrial park with a concentration of occupancies that have significant fire loading. Access to this area and to the commercial structures along West 6th Street and along Wakarusa Drive is good and does not present notable problems. Additional risks present are the numerous assisted living and nursing home occupancies. These occupancies tend to be large multi-story wood frame structures with large numbers of elderly and or incapacitated residents. The occupancies also have higher EMS call volumes.

Map 29 Planning Zone 4

Planning Zone 4	
Map Reference(s): 1209-A, B, D 1210-A, B, C, D 1211- A, B, C, D 1308-A, B, C, D 1309-A, B, C, D 1310 -A, B, C, D 1311-A, B, C, D 1408-A, B, C, D 1409-A, B, C, D 1410-A, B, C, D 1411-A, C, D 1508-C, D 1509-C, D 1510-C, D	

Profile

This area is best described as residential in nature and represents west and southwest growth and expansion of the city. With the exception of a small area immediately west and adjacent to Kasold Drive, this area was constructed 1990 to the present. Large land segments have been dedicated to recreational pursuits. The Jayhawk Club maintains a 27-hole private golf course. Homes adjacent to the golf courses and located within the Alvamar and Lake Alvamar sub-divisions are large and expensive. There are large multifamily apartments complexes located on the northwestern and southern sides of this zone. Construction within this zone is predominantly platform wood frame over slab or basement. Wakarusa Drive hosts commercial development and a medium sized commercial park, Oread West Research, located at the intersection of Wakarusa Drive and Bob Billings Parkway.

The extreme southwest corner of this zone includes Corps of Engineers land that the city annexed for the purpose of recreation. It is comprised primarily of the Eagle Bend 18-hole golf course, YSI sports complex (baseball, football, kickball and soccer) and the Speicher baseball/softball complex. The city has constructed a wide concrete trail through this zone that provides access to the western recreational complexes and a scenic route for cycling, running, and walking. Clinton Lake lies adjacent

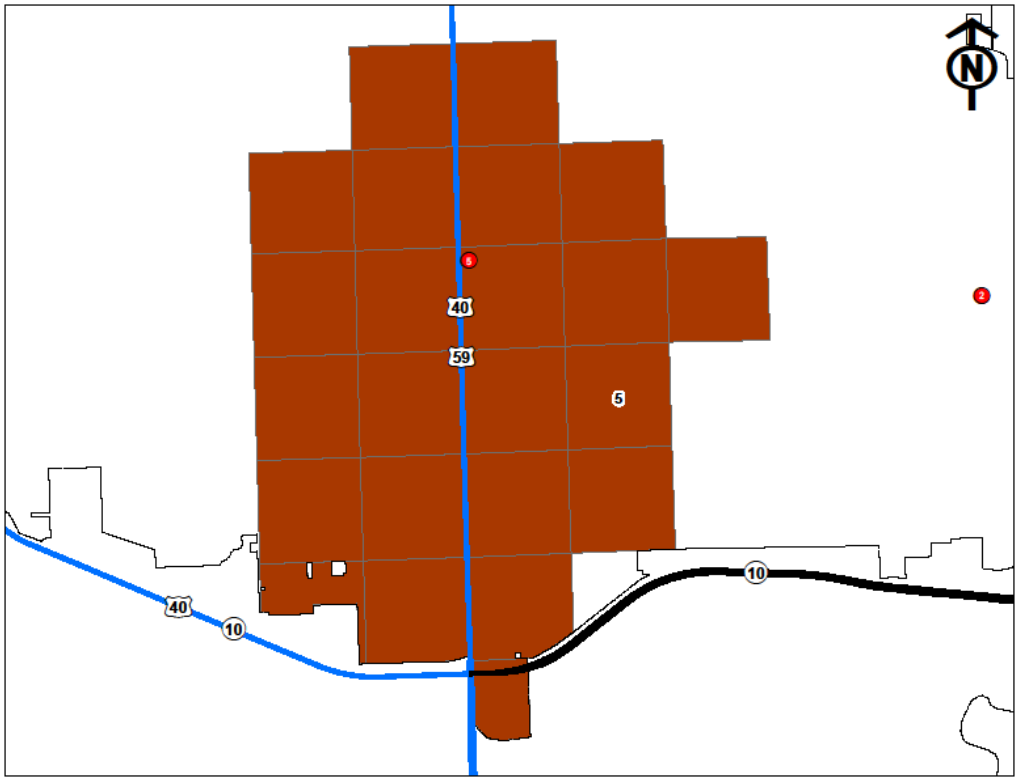
to the western boundary, providing excellent aquatic and watercraft recreation and hiking and cycling trails with easy access from the city.

The majority of roads in this area would be classified as residential. The current south and west borders of this zone is the south Lawrence traffic way, a four lane, limited access road. This traffic way is the western most leg of Kansas Highway 10 and is commonly referred to as the "bypass." Kasold Drive and Wakarusa Drive are the primary roads that shuttle residential traffic to Clinton Parkway and West 6th Street which in turn provide access to the bypass and Interstate 70. These roads may become moderately congested during peak traffic periods. Bob Billings Parkway is the primary feeder into the western most areas of the city.

This zone hosts a substantial number of very large apartment complexes. These complexes are typically three stories, platform wood framing over slab, with high life hazard and significant exposure problems. Access into several of the complexes is limited with narrow streets and tight radius turns producing access issues for large apparatus. In addition, this is in area of limited wildland/urban interface and some steep topography. Because of terrain and this zone's southwest location, radio communication can be an issue in some areas. Water rescue is also a risk. This zone is adjacent to Clinton Lake and contains Lake Alvamar. Topography has produced numerous deep valleys with significant run off and water flow that is directed to the lakes and the Wakarusa River. Many of these valleys and water ways lie adjacent to or pass through development and are easily accessed by residents.

The district has had a steady increase in senior housing developments projects to support the city as a retirement community. Additional risks present are the numerous assisted living and nursing home occupancies. These occupancies tend to be large multi-story wood frame structures with large numbers of elderly and or incapacitated residents. These occupancies and urgent care facilities have higher EMS call volumes.

Map 30 Planning Zone 5

Planning Zone 5	
Map Reference(s): 1212-A, B, D 1213-A, C 1312-A, B, C, D 1313-A, B, C, D 1412-A, B, C, D 1413-A, B, C, D 1414-C 1512-D 1513-C	

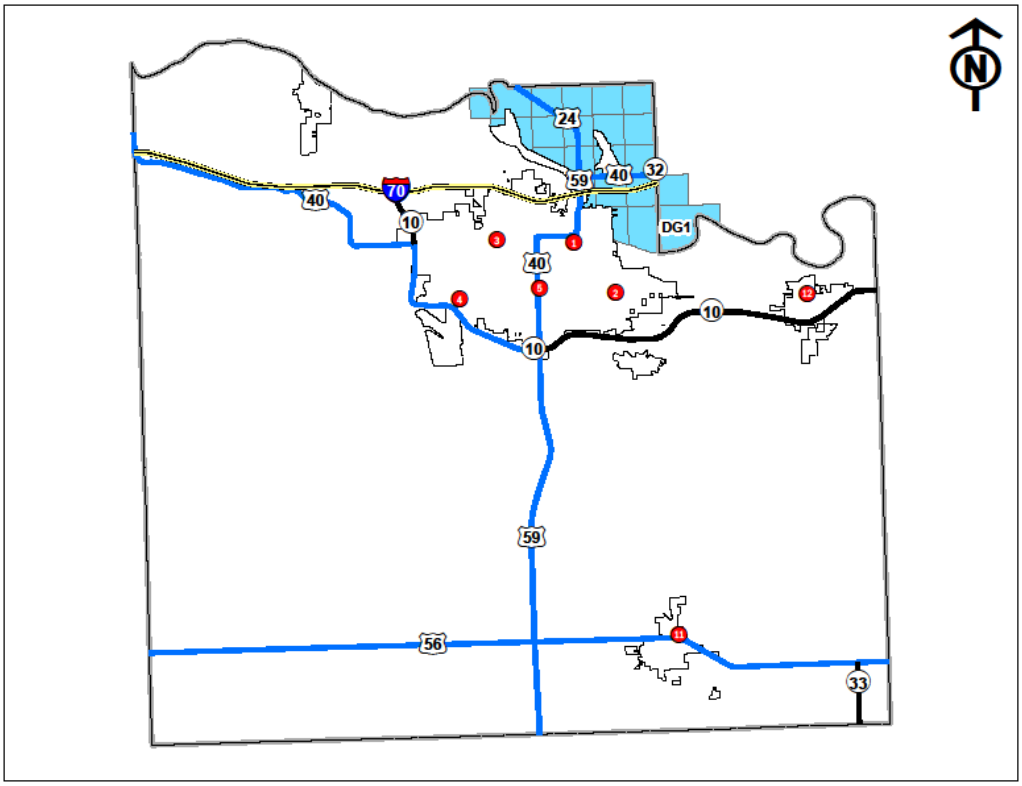
Profile

This area runs from the University of Kansas core to the south Iowa retail district. It has a higher population density representative of growth around the University of Kansas due to residential dorms located in this district. Areas south of Clinton Parkway represent newer growth and development from the mid-1970's to present while areas south of West 23rd Street represent 1960 to the present. All construction types are represented in this area from balloon and platform framed residential structures to non-combustible high/midrise structures. At the very heart of this zone is the University of Kansas with a student population of 28,000. South Iowa Street bisects this zone and contains significant commercial and retail development and rivals the downtown area as a shopping destination with retailers such as Menard's, Target, Wal-Mart, Kohl's, and Home Depot. There are also numerous restaurants, sports bars and a large multiplex theater. This zone hosts the largest number of apartment complexes and contains one of the largest mobile home communities in the city.

West 23rd Street and Iowa Street intersect in this zone. Both routes are four lanes wide and both are heavily developed with commercial and retail development. West 23rd Street is the west extension of East 23rd Street after Massachusetts Street and carries westbound traffic from Kansas Highway 10 into the core of the city. Iowa Street runs north to south and is the city leg of US Highway 59 through Lawrence. US Highway 59 was reconstructed to interstate standards and opened in October 2012 to be a major route out of south Lawrence connecting to I-35. Due to the convergence of K-10 and US 59

there is a significant amount of heavy truck traffic through this zone. In 2016, an extension of K-10, was completed to connect K-10 to US Highway 59, which will divert some drivers from using Lawrence city streets to connect the highways. In addition, population density, commercial and retail development, and the University Kansas, create extremely high volumes of traffic and congestion throughout this zone.

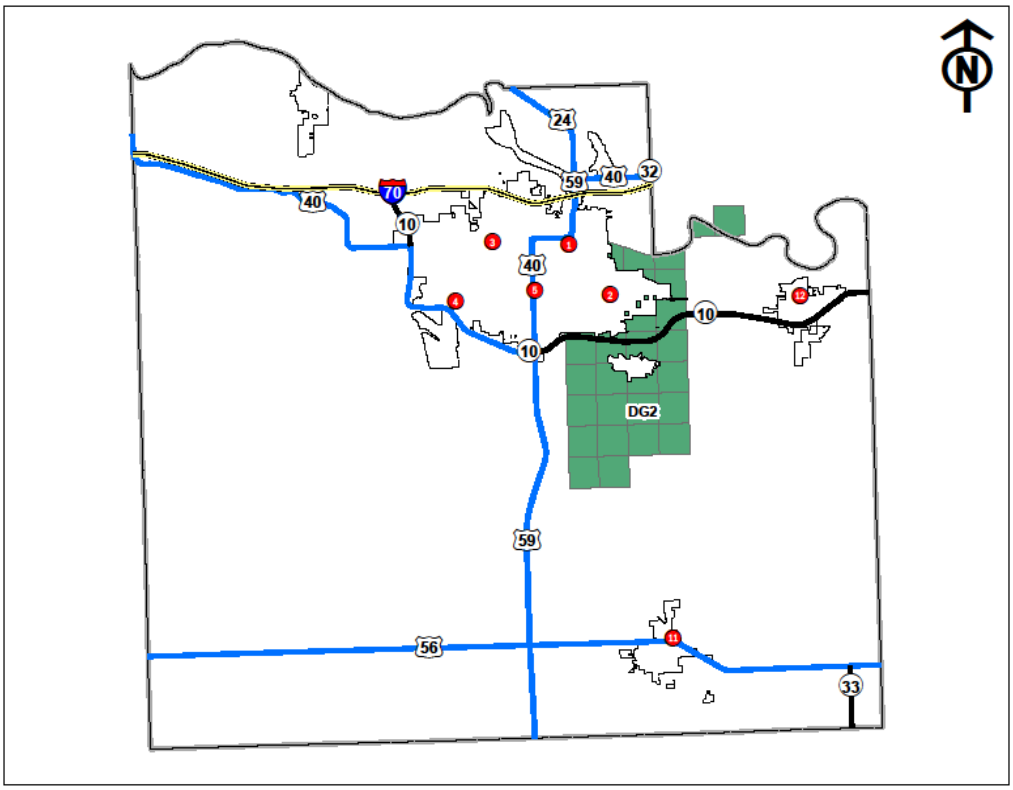
Map 31 Planning Zone DG1

Planning Zone DG1	
Map Reference(s): 1615 - 1616 1714 - 1716 1813 - 1816 1912 – 1916 2011 - 2016	

Profile

This zone is best described as rural in nature. This zone is north of the City of Lawrence and is commonly referred to as Grant Township. Roads in this area generally are located one mile apart and follow a common grid pattern. Principal Roads – Interstate 70, US Highway 24-40 and US Highway 24-59 as well as a few County roads, allow faster travel throughout the zone. The bulk of the roads are gravel with a few being identified as minimum maintenance and commonly identified as dirt roads and impassable except in the best conditions. Kansas River flows through this zone. This zone surrounds Lawrence municipal airport. Responses to and along Interstate 70 have extended travel times due to this highway being six lanes with restricted access and median barriers. Responding units frequently must respond to a service area several miles east of the county line, turn around and respond back to a scene located across the barriers.

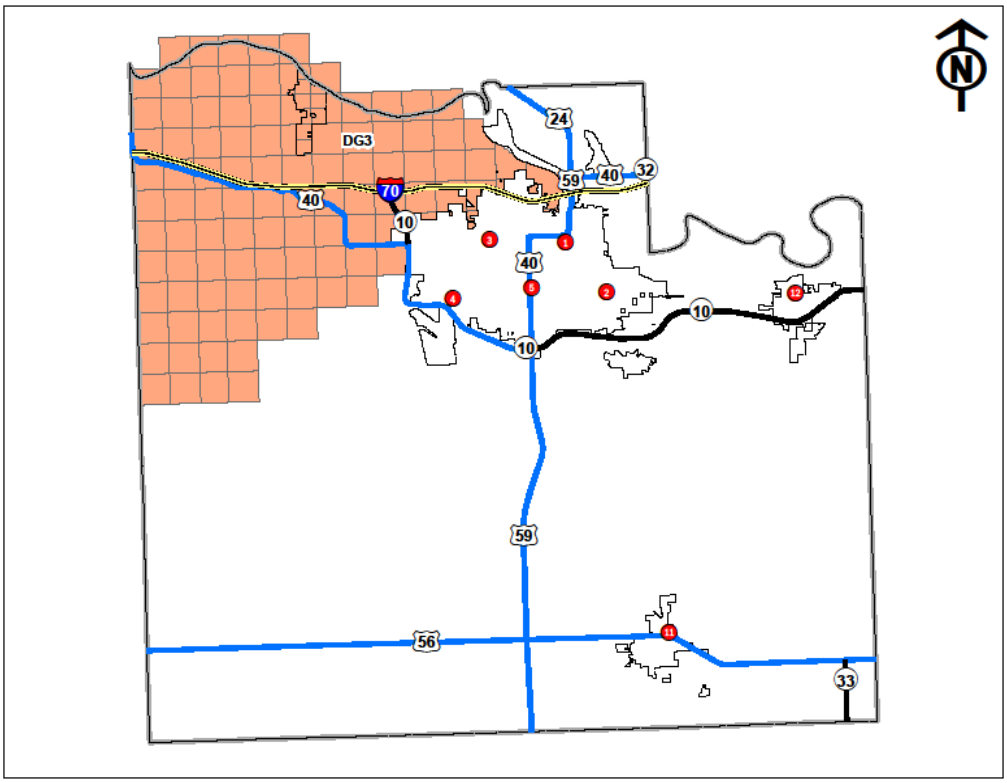
Map 32 Planning Zone DG2

Planning Zone DG2	
Map Reference(s): 0814 – 0815 0914 - 0923 1014 – 1023 1114 – 1123 1214 - 1223 1316 – 1323 1416 - 1423 1515 - 1523 1618 - 1619 1622 - 1623	

Profile

This zone is best described as rural in nature. This zone is east of Lawrence and surrounds the area outside of Eudora. Roads in this area generally are located one mile apart and follow a common grid pattern. Principal Roads – Interstate 70, Kansas Highway 10, County Road 438 (N1800), County Road 442 (N1600), County Road 1023 (E175/E250), County Road 1029 (E600), allows faster travel throughout the zone. The bulk of the roads are gravel with a few being identified as minimum maintenance and commonly identified as dirt roads and impassable except in the best conditions. The Kansas River is on the north border of this zone.

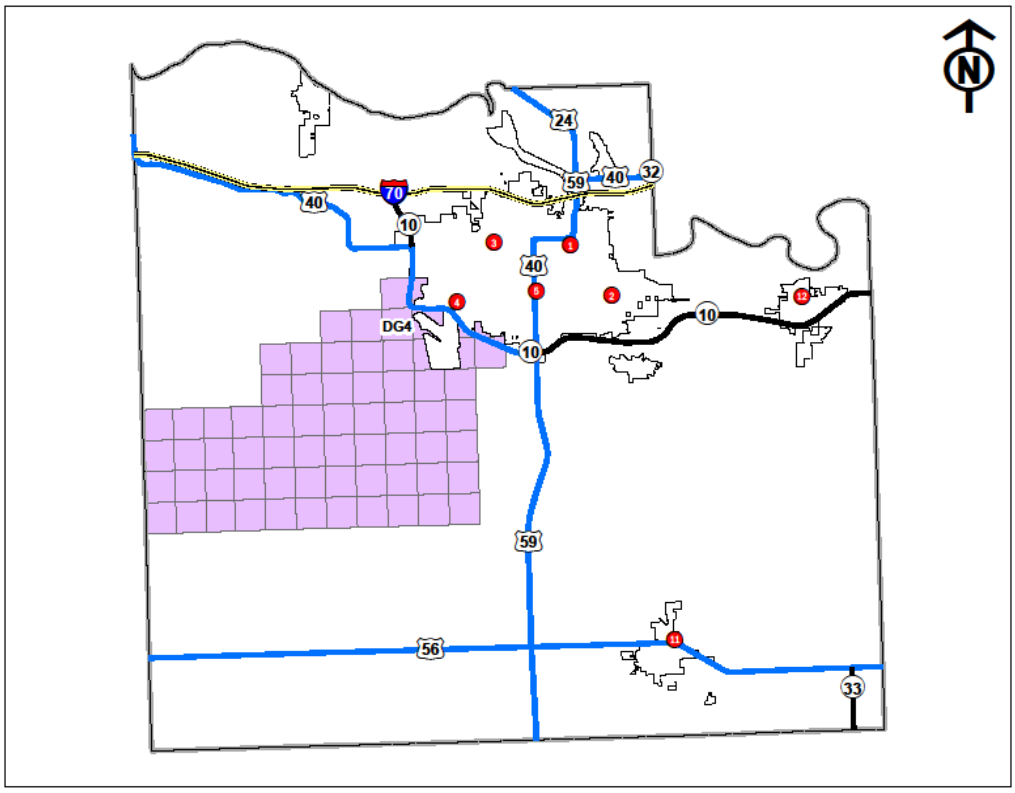
Map 33 Planning Zone DG3

Planning Zone DG3	
Map Reference(s): 1100 – 1103 1200 – 1203 1300 – 1305 1400 – 1407 1500 – 1509 1600 – 1611 1700 – 1711 1800 – 1812 1900 – 1911 2000 – 2010 2100 – 2106 2202 - 2205	

Profile

This zone is best described as rural in nature. This zone is west of the City of Lawrence and contains the city of Lecompton with a 2010 population of 625; the zone extends to the Shawnee County line. Roads in this area generally are located one mile apart and follow a common grid pattern. Kansas Highway 10 and US Highway 40, as well as a few county roads, allow faster travel throughout the zone. Interstate 70 travels through this zone however, its limited access provides no faster travel for areas within the county except on the Interstate proper. The bulk of the roads are gravel with a few being identified as minimum maintenance and commonly identified as dirt roads and impassable except in the best conditions. Responses to and along Interstate 70 have extended travel times due to this highway being six lanes with restricted access and median barriers. Responding units frequently must respond to a service area at the western county line, turn around and respond back to a scene located across the barriers. The Kansas River borders the northern edge of this zone. Clinton state park and lake is the southwest border of this zone.

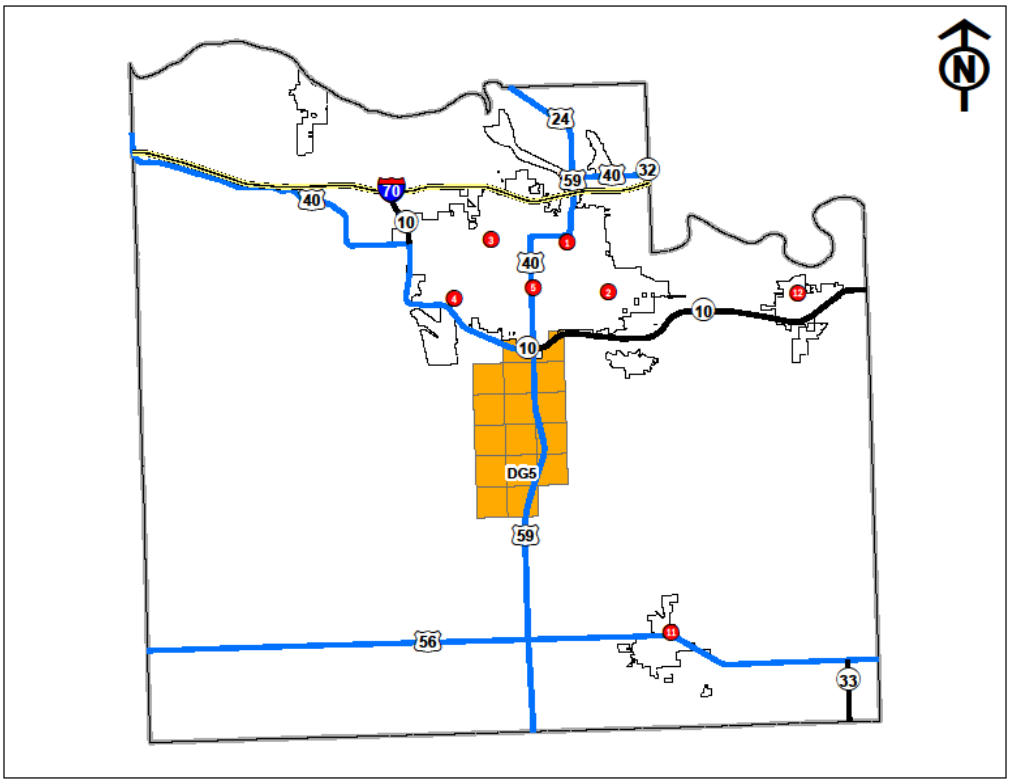
Map 34 Planning Zone DG4

Planning Zone DG4	
Map Reference(s): 0700 – 0710 0800 – 0810 0900 – 0910 1000 – 1010 1104 – 1110 1204 – 1211 1306 – 1311 1408 – 1410	

Profile

This zone is best described as rural in nature. This zone is west of the City of Lawrence and borders the southern part of Clinton Lake area and west to Shawnee county line. Roads in this area generally are located one mile apart and follow a common grid pattern. Kansas Highway 10, as well as a few county roads, allows faster travel throughout the zone. The bulk of the roads are gravel with a few being identified as minimum maintenance and commonly identified as dirt roads and impassable except in the best conditions. The majority of Clinton Lake is also located in this zone. The lake provides full recreation for the residents as well as travelers to the area.

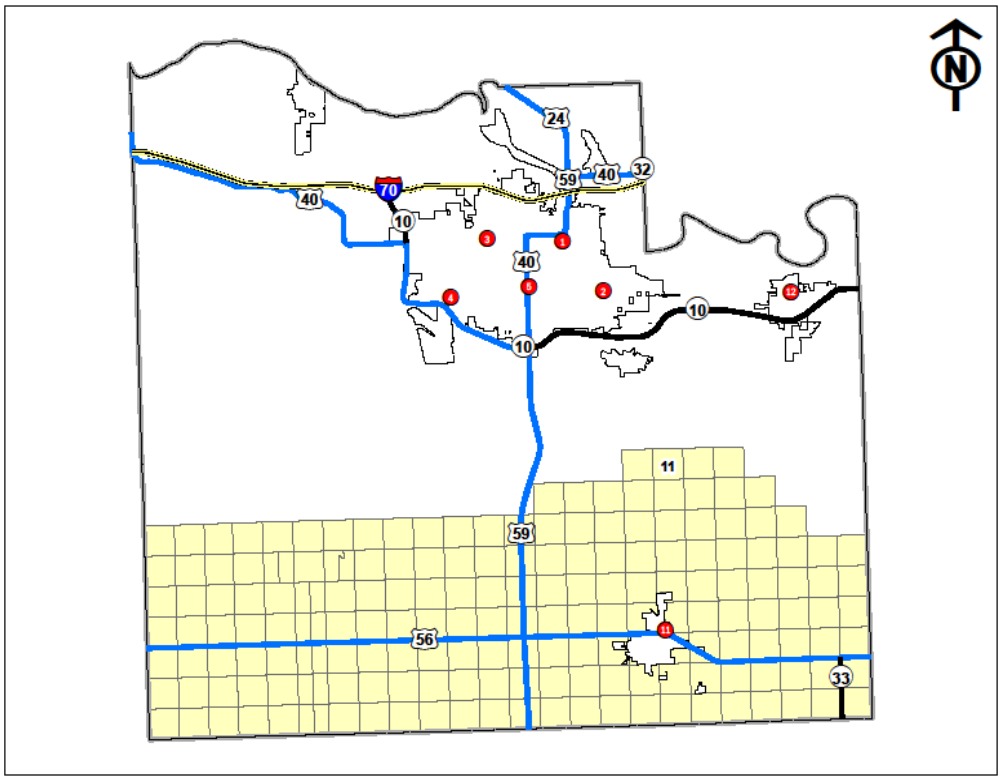
Map 35 Planning Zone DG5

Planning Zone DG5	
Map Reference(s): 0711 – 0712 0811 – 0813 0911 – 0913 1011 – 1013 1111 – 1113 1212 - 1213	

Profile

This zone is best described as rural in nature. This zone is directly south of Lawrence. Roads in this area generally are located one mile apart and follow a common grid pattern. US 59 Highway as well as a few County roads allow faster travel throughout the zone. US 59 is the primary entrance and exit for the south side of the City of Lawrence and thus heavily traveled. US Highway 59 is a major interstate route out of south Lawrence connecting to I-35. The bulk of county roads are gravel with a few being identified as minimum maintenance and commonly identified as dirt roads and impassable except in the best conditions.

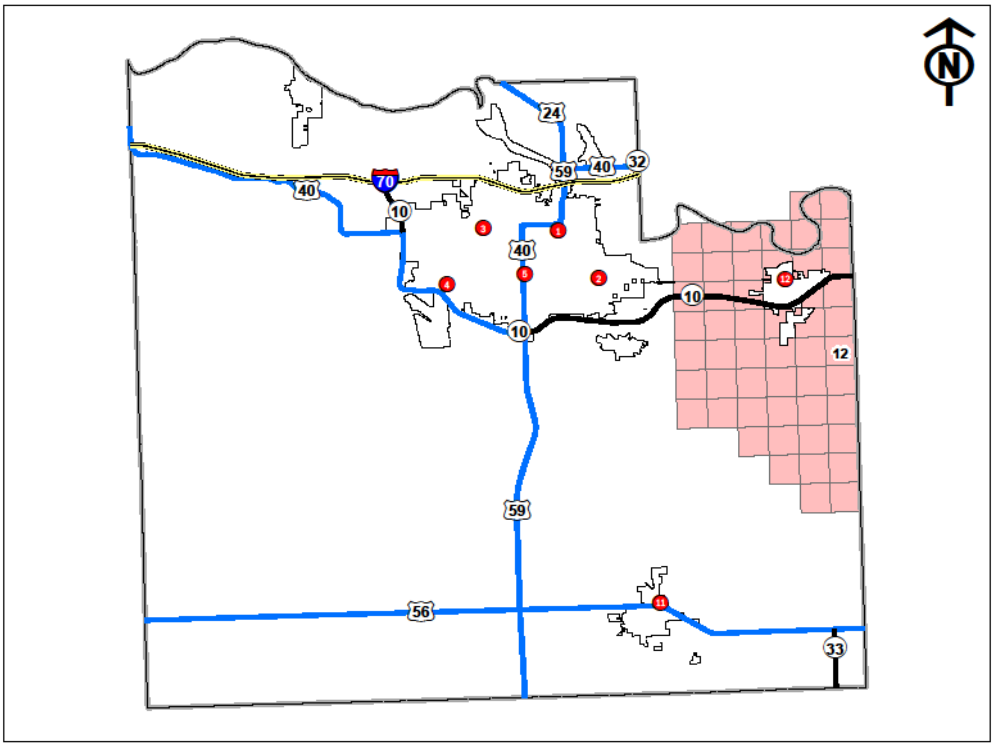
Map 36 Planning Zone 11

Planning Zone 11	
Map Reference(s): 0000 – 0023 0100 – 0123 0200 – 0223 0300 – 0323 0400 - 0423 0500 – 0523 0600 – 0623 0713 – 0723 0816 - 0823	

Profile

This zone is best described as rural in nature. This zone is in the southern most area of the county, bordered to the east by Johnson County, to the west by Osage, and to the south by Franklin. Roads in this area generally are located one mile apart and follow a common grid pattern. US Highway 56 and US Highway 59, as well as a few county roads, allow faster travel throughout the zone. The bulk of the roads are gravel, with a few being identified as minimum maintenance and commonly identified as dirt roads and impassable except in the best conditions. US 59 was recently re-built as a limited access highway to the east of existing US 59 and was opened to traffic in October 2012.

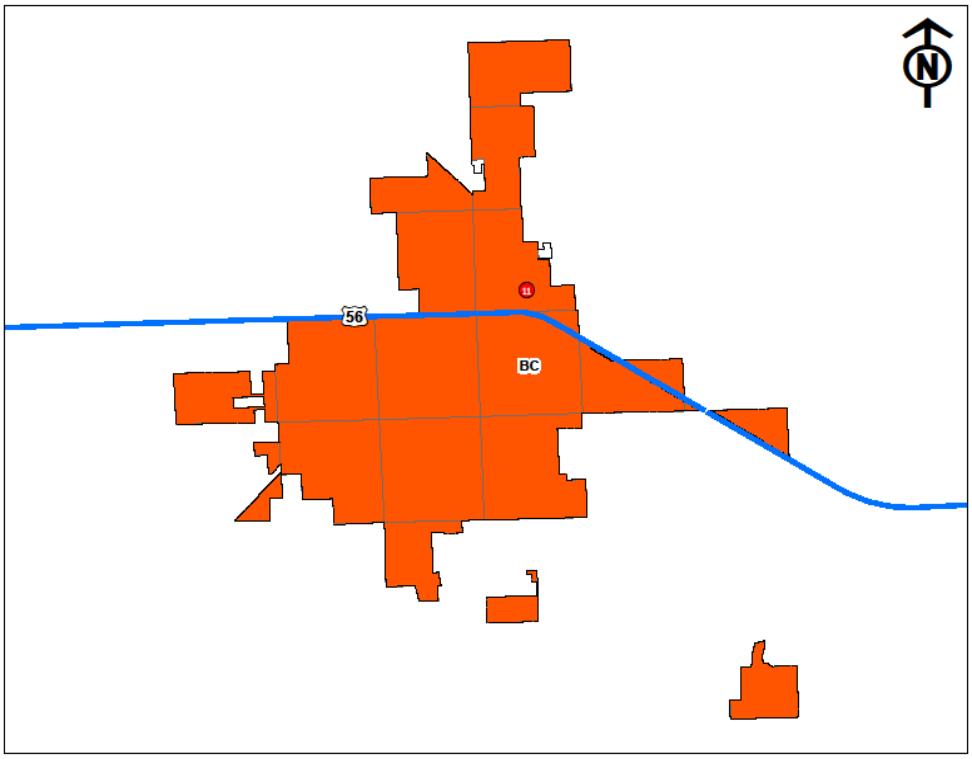
Map 37 Planning Zone 12

Planning Zone 12	
Map Reference(s): 0622-0623 0721-0723 0820-0823 0918-0923 1018-1023 1118-1123 1218-1223 1318-1323 1418-1423 1518-1523 1618-1619 1622-1623	

Profile

This area comprises the city of Eudora, located in eastern Douglas County, with a 2010 population of approximately 6,136. There is some industry located in the Intech Business Park on the east side of the city with access off the Old K-10 Highway. The city is primarily residential in nature with most being one and two-family dwellings. The city is location along the Kansas and Wakarusa Rivers. The city is steadily growing with the current growth area located north of US Highway 56. Roads in this zone are residential and generally pose no issues for emergency response. Principal Roads: Kansas Highway 10, County Road 2200.

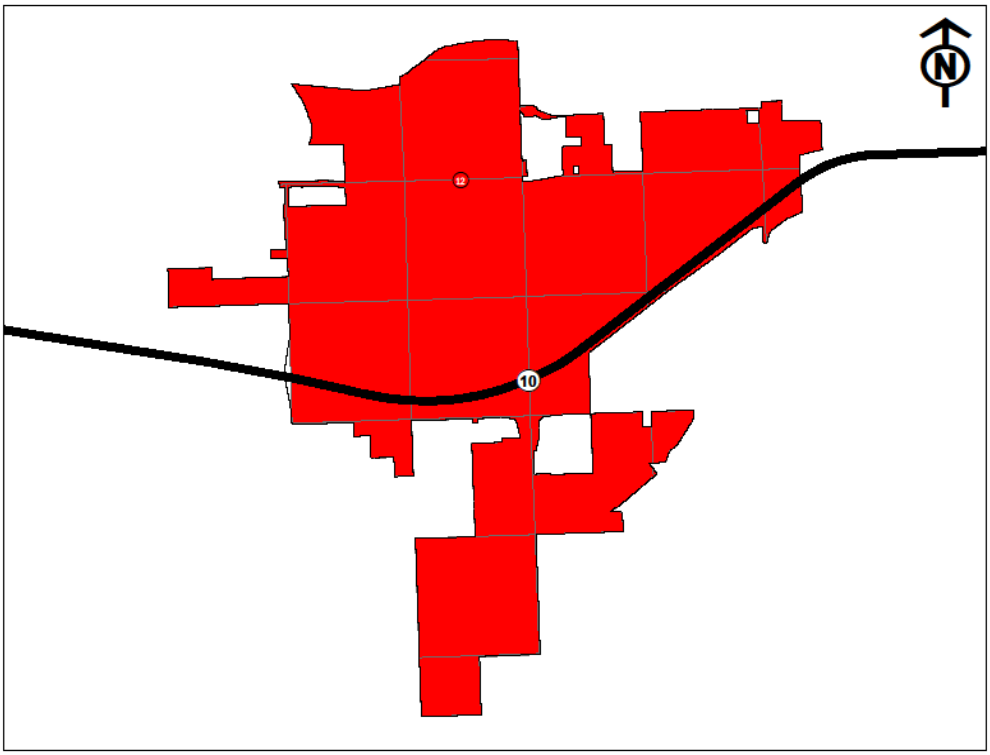
Map 38 Planning Zone BC

Planning Zone BC	
Map Reference(s): 0116-A, B 0117 – A, B 0118-C 0215-B, D 0216 –A, B, C, D 0217-A, B, C, D 0218-A, C 0316-B, D 0317-A, B, C, D 0417-C, D	

Profile

This area comprises the city of Baldwin, located in southern Douglas County, with a 2010 population of approximately 4,515. There is some industry scattered throughout the community with no central hub. US Highway 56 is the most heavily traveled road and generally divides Baldwin north and south; commercial properties continue to grow on both sides of this highway. The city is primarily residential in nature with most being one and two-family dwellings. Baldwin is home to Baker University, a private college with a student population of over 900. The city is steadily growing with the current growth area located north of US Highway 56. Roads in this zone are residential and generally pose no issues for emergency response. Principal Roads: US Highway 56, County Road 1055.

Map 39 Planning Zone EC

Planning Zone EC	
Map Reference(s): 1221-A, B, C, D 1222-A, B, C, D 1320-A, B, C, D 1321-A, B, C, D 1322-A, B, C, D 1421-A, B, C, D 1422 – A, C	

Profile

This area comprises the city of Eudora, located in eastern Douglas County with a 2010 population of approximately 6,136. There is some industry located primarily along Kansas Highway 10. There are two commercial areas. The central business district is comprised of business located along Main Street. Church Street, the main access point from Kansas Highway 10, also has a cluster of business located near the intersection of highway. The remainder of the city is residential in nature with most being one and two-family dwellings. The city is experiencing good growth and is primarily expanding on either side of the K-10 Corridor and is primarily expanding south of the highway. Roads in this zone are residential and generally pose no issues for emergency response. The Kansas River is at the north and Wakarusa river at the west edge of the city. Eudora Medicalodges is a professional therapy and skilled nursing facility. Additional risks present with high-risk populations in assisted living and nursing home occupancies.

Critical Task Analysis

To affect positive change in an incident, department personnel must be properly assigned, resources must be properly placed and equipped, and each individual must be assigned a critical task(s) to complete. Consequently, those individuals must arrive within a time frame which allows them a chance to use their skills to mitigate the incident at hand. This section will illustrate the critical tasks for each risk class and category.

Critical tasks are those tasks that must be conducted in a timely manner by personnel at the scene. The department has evaluated the critical tasks needed for a variety of incidents. When identifying critical tasks, the safety of department personnel is paramount. A command structure must also be in place to ensure that critical tasks are being met.

Fire Critical Tasks

Critical tasks must be conducted in a timely manner by firefighters at structure fires if firefighters are expected to control the fire. There are several other tasks that must be performed prior to termination of the scene such as salvage and overhaul. In creating standards of cover, an assessment must be conducted to determine the capabilities of the arriving companies and individual firefighters to achieve those tasks. The department has evaluated the critical tasks needed for a structural fire. When identifying critical tasks, firefighter safety must be emphasized. Whenever interior fire operations are to be accomplished, which require the use of protective clothing (including turnout gear, SCBA, and a minimum 1-3/4" hose line); additional personnel must be staged to perform rescue functions for interior firefighters. A command structure should also be in place. The following key critical tasks must be accomplished by the ERF for the department to meet its mission, goals, and objectives.

Table 17 Critical Tasks - Low Risk Fire

Common Critical Tasks for Low-Risk Fire	
Command/Safety/Attack Line	2
Apparatus Operator	1
Hose Line Support	1
Total Firefighters	**4**

Table 18 Critical Tasks - Moderate Risk Fire

Common Critical Tasks for Moderate-Risk Fire	
Attack Line	2
Backup Line	2
Search and Rescue	2
Water Supply	2
Apparatus Operator	1
Command/Safety	1
Total Firefighters	**10**

Table 19 Critical Tasks - High Risk Fire

Common Critical Tasks for High-Risk (Structure) Fire	
Task	**Firefighters**
Attack Line	2

Backup Line	2
Search and Rescue	2
Water Supply	1-2
Ventilation	2
RIT Team	4
Engineer	1
Command/Safety	1-2
Total	**16**

Emergency Medical Services Critical Tasks

The department responds to over 9000 EMS related calls a year. These calls include cardiac arrests, heart attacks, difficulty breathing, childbirths and strokes. For the majority of advanced life support (ALS) level EMS call the basic response is one medic unit staffed with a paramedic and AEMT.

Emergency communications dispatchers have the responsibility of screening calls utilizing the Emergency Medical Dispatch (EMD) system to establish the correct effective response and to provide pre-arrival instructions for callers. Upon arrival of the first officer on the scene, the initial response may be adjusted actual conditions/patient have been assessed. Standard operating procedures (SOP) are utilized to request adequate personnel for these types of calls needing additional resources.

A moderate acute medical emergency may be defined as an incident with a risk of serious outcome or potential life loss. A single acute coronary syndrome patient with difficulty breathing and shock like symptoms would necessitate the following task by responding personnel.

Table 20 Critical Tasks - EMS

Common Critical Tasks for an EMS Incident	
Paramedic Critical Task	**AEMT Critical Task**
Primary and secondary assessment	Oxygen set up and administration
Triage decision and direct all patient care	ECG application
ECG interpretation	IV line placement and monitoring
Medication administration	Vital signs and oxygen saturation monitoring
Bio-com communications with medical control	Radio communications with dispatch
Application of standing and physician orders	Patient and equipment packaging for transport
Report to medical staff on arrival	Vehicle operations to/from scene
Written report documentation	Vehicle readiness and restocking
	Assist with all EMT level care

Table 21 Critical Tasks - Low Risk EMS

Critical Tasks for Low-Risk EMS	
Task	**Firefighters**
ALS Patient Care	1
Command	1
Total	**2**

Table 22 Critical Tasks - Moderate Risk EMS

Critical Tasks for Moderate-Risk EMS	
Task	**Firefighters**
ALS Treatment/Transport	1
Command	1
Total	**2**

Table 23 Critical Tasks - High Risk EMS

Critical Tasks for High-Risk EMS	
Task	**Firefighters**
ALS Treatment / Transport	2
Command	1
Total	**3**

Table 24 Critical Tasks - Maximum Risk EMS

Critical Tasks for Maximum-Risk EMS	
Task	**Firefighters**
ALS Treatment / Transport	3
Command	1
Total	**4**

Technical Rescue - Critical Tasks

The often complex and dangerous nature of a technical rescue requires that responders both highly trained and rapidly deployable. The common tasks associated with mitigating a rope rescue, trench collapse, building collapse, water or ice rescue are identified to follow.

Table 25 Critical Tasks - Low Risk Rescue

Common Critical Tasks for Low-Risk Rescue	
Task	**Firefighters**
Rescue	1
Command	1
Total	**2**

Table 26 Critical Tasks - Moderate Risk Rescue

Critical Tasks for Moderate-Risk Rescue	
Task	**Firefighters**
ALS Patient Care/Transport	2
Extrication/Additional Patient Care Providers/ Hazard Mitigation	3
Command/ Safety	1
Total	**6**

Table 27 Critical Tasks - High Risk Rescue

Common Critical Tasks for High-Risk Rescue	
Task	**Firefighters**
Rescue Group (primary and secondary teams and Rescue Group Officer)	6
Medical	2
Rescue Safety	1
Command	1
Total	**10**

Table 28 Critical Tasks - Maximum Risk Rescue

Common Critical Tasks for a Maximum Risk Rescue	
Task	**Firefighters**
Rescue Group (primary and secondary teams)	6
Rigging	5
Medical	2
Rescue Safety (upstream and downstream)	2
Command/Safety	1
Total	**16**

Hazardous Materials Critical Tasks

The department currently maintains a hazardous materials unit and hazardous materials support trailer at station four. Approximately 40 personnel are trained to NFPA 472 competencies for hazardous material technician. The remainder of the department is trained to the operations level. Guidelines for response and critical tasks are set forth in the hazmat response SOP. A hazardous materials response would necessitate the following tasks by responding personnel.

Table 29 Critical Tasks - Low Risk HazMat

Critical Tasks for Low-Risk Hazardous Materials	
Task	**Firefighters**
Investigation/Monitoring	3
Command/ Safety	1
Total	**4**

Table 30 Critical Tasks - Moderate Risk HazMat

Critical Tasks for Moderate-Risk Hazardous Materials	
Task	**Firefighters**
Pump Operation	1
Fire Suppression Standby	2
Air monitoring	2
Command/Safety	1
Total	**6**

Table 31 Critical Tasks - High Risk HazMat

Common Critical Tasks for High-Risk Hazardous Materials	
Task	**Firefighters**
Haz-Mat Safety (1-HM)	1
Decontamination	4
Site Access Control	1
Technical Specialist (HM) (Research)	1
Safe Refuge	1
Medical monitoring	1
Entry Team (1 HM)	2
Entry Team Leader	1
Hazmat Group Supervisor	1
Back-up Team (1-HM), (RIT)	2
Command	1
Total	**16**

Incident scenes are unpredictable in many ways. While it is possible to state what critical tasks must be accomplished for each incident to be mitigated, it is not always possible to predict how many firefighters it will take to accomplish a specific task. On larger incidents, it is expected that chief officers not assigned to the initial response will arrive on scene to provide command support. This supports the on-duty response by adding personnel for command functions such as planning, logistics, and administrative positions.

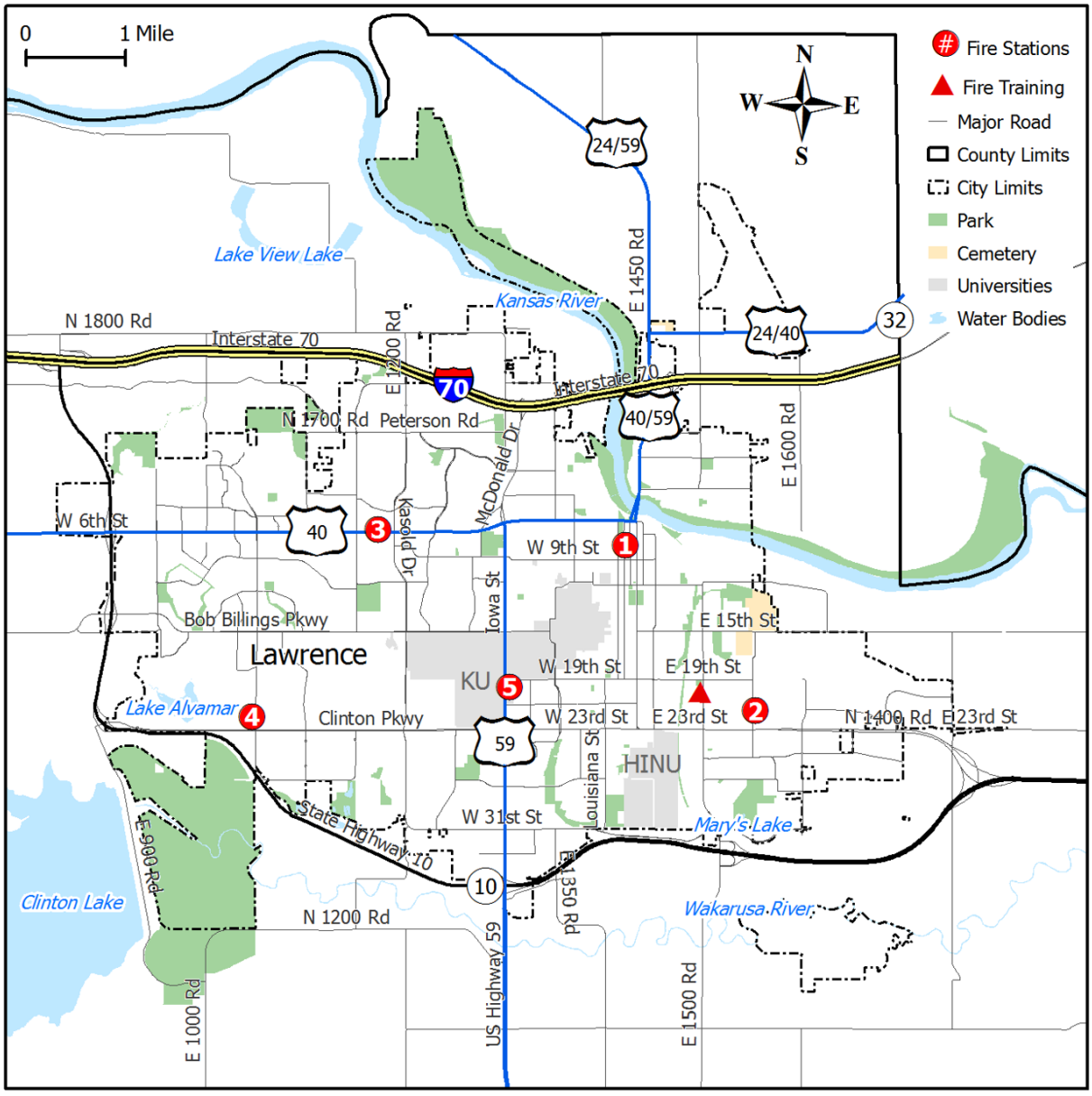
The department has utilized its risk assessment, experience, knowledge, and call history to determine what the effective minimum response force should be for the identified incident types. These numbers represent an accurate number of firefighters to develop an effective response force for each of the incident types. The need for more or less personnel may arise on any incident at any time. Incident conditions or complexity must dictate the response available for any given incident, even if that response is above what is outlined in this document.

H. Historical Perspective and Summary of System Performance

The Standards of Cover (SOC) for the department has been derived from and influenced by two specific concepts: distribution of emergency resources and the concentration of those resources throughout the community.

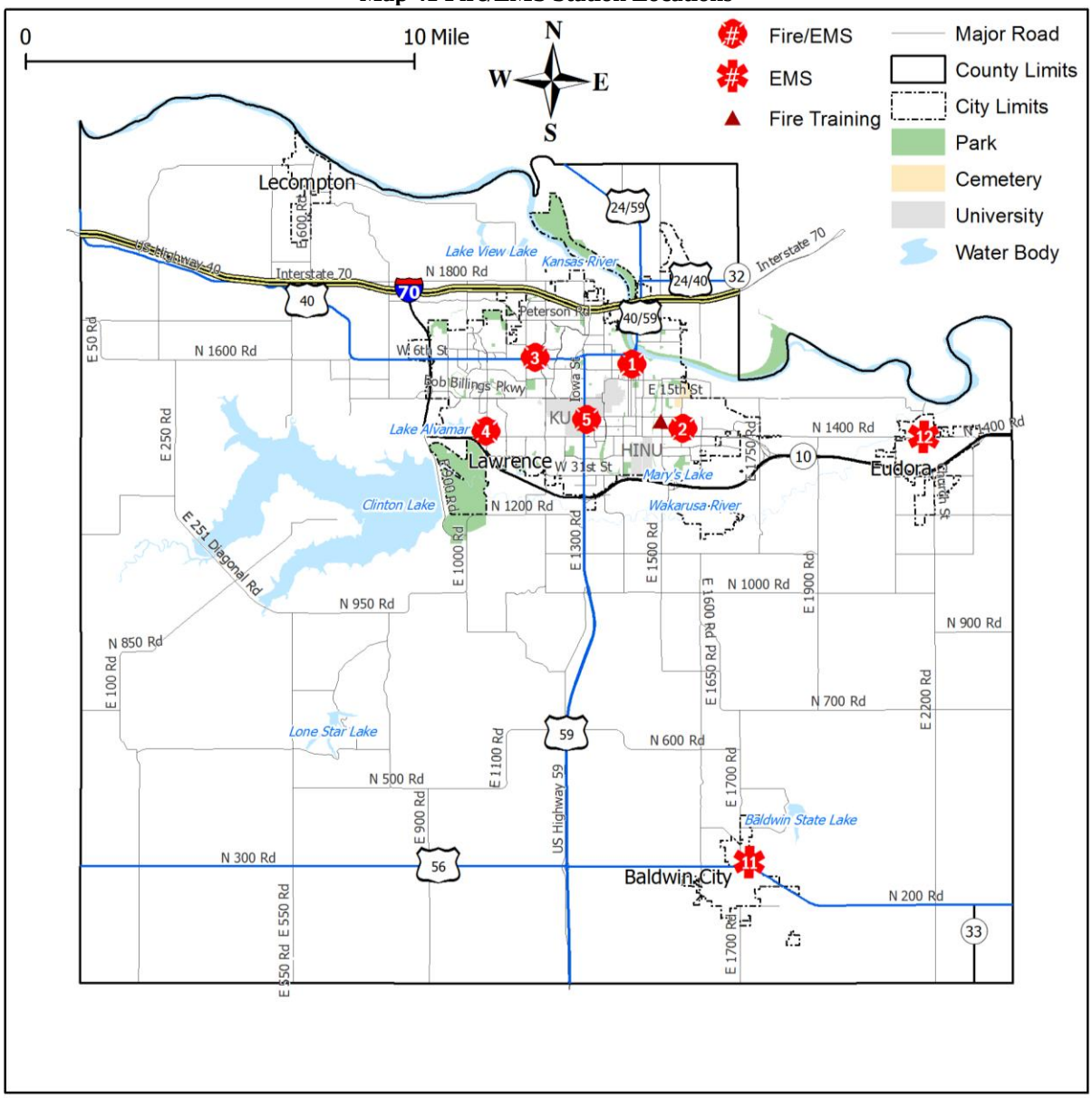
Lawrence-Douglas County Fire Medical (LDCFM) currently operates five stations in the City of Lawrence providing all hazards coverage of 34.8 square miles.

Map 40 Fire Station Locations



The area of Douglas County covers 475 square miles with two ambulance stations in the county. LDCFM provides emergency medical services and hazard materials response in the county.

Map 41 Fire/EMS Station Locations



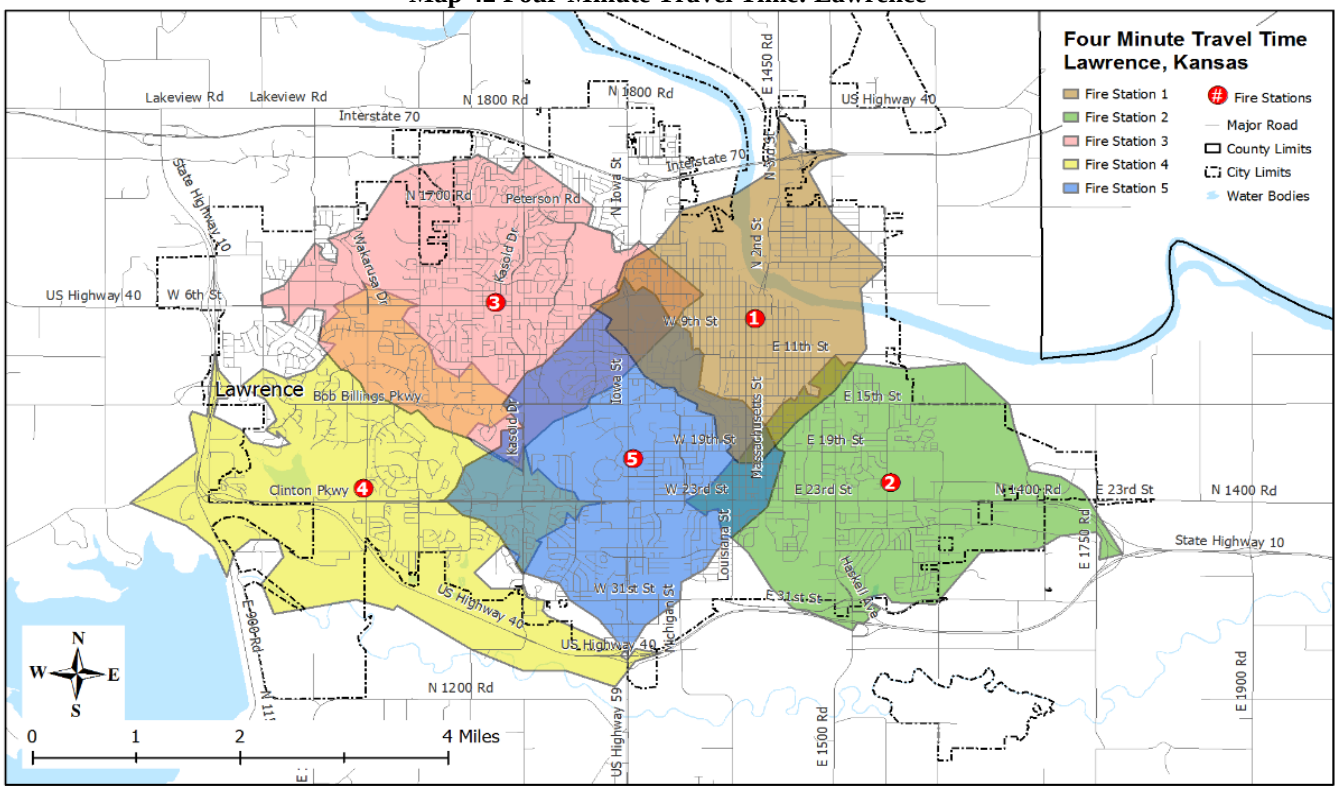
Distribution Factors

Distribution of response resources defines the specific geographical location for each resource. Resources change locations at any one point in time. These estimates are based upon what is considered first due or closest resources under normal response situations.

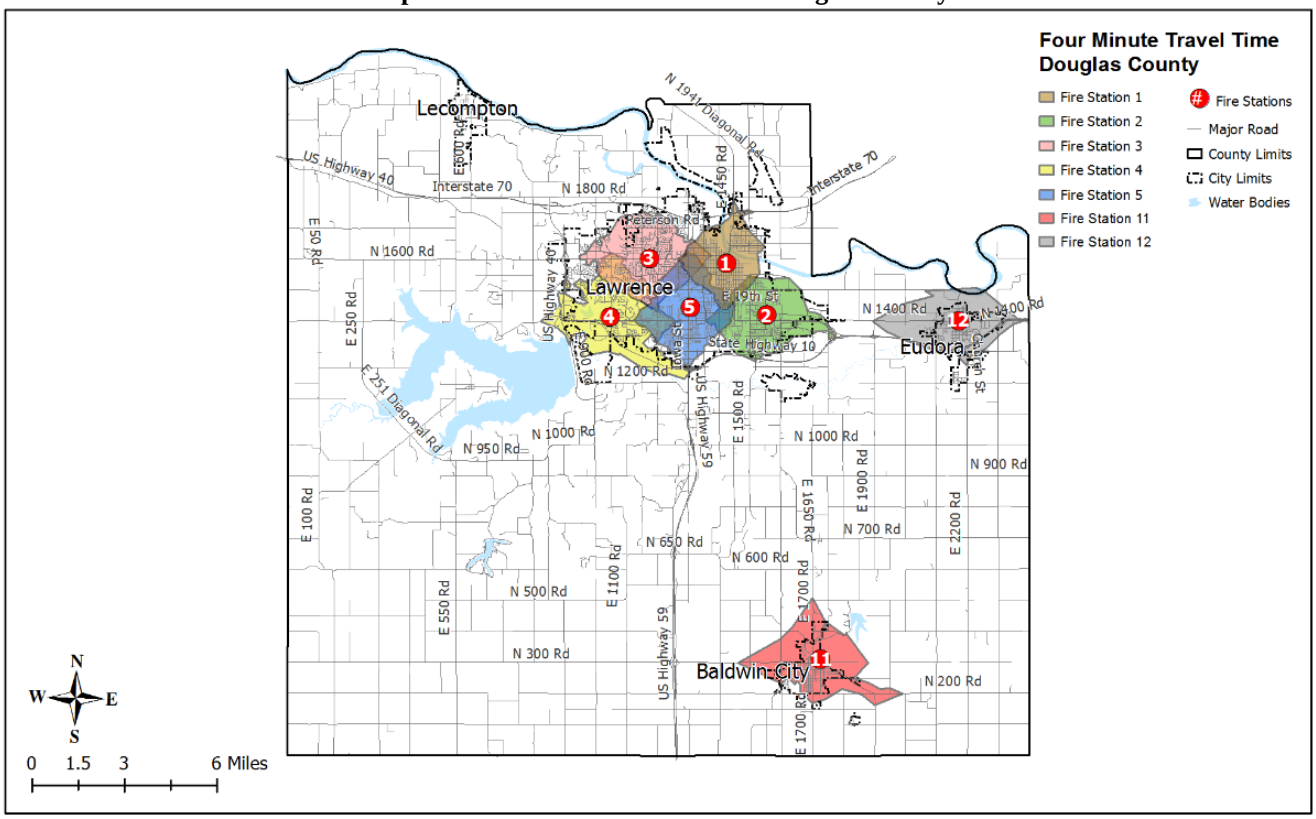
Fire station location is driven by a number of factors, the least of which is delivery of quality service. Stations are usually located where they are most tolerated by the residents and where the city owns or can obtain land inexpensively. Extraordinary requirements are needed for a department to locate a service facility exactly where it is needed. Rarely considered is that several blocks in either direction sometimes makes a serious change in regular response patterns and the ability to meet the SOC total response time objectives. In the case of Lawrence, the city currently operates five response facilities from which both fire and emergency medical services are dispatched.

Distribution of station and resource locations is needed to ensure rapid first due response deployment in order to mitigate emergencies. Distribution is measured by the percent of the jurisdiction that covered by the first due units. Currently, the department operates out of five stations in the City of Lawrence, each containing an engine/quint/truck company staffed with four personnel and a medic unit staffed with two personnel. The department also operates medic units out of Baldwin City and Eudora.

Map 42 Four-Minute Travel Time: Lawrence



Map 43 Four-Minute Travel Time: Douglas County



For each type of category and classification, distribution is based on whether a qualifying unit arrives on scene to make progress on mitigating the incident.

Table 32 Qualifying Units by Risk Category

Risk Category	Qualifying Unit
Fire	Engine, Quint, or Truck
Emergency Medical Services	Vehicle with an AED and Advanced Emergency Medical Technician
Hazardous Materials	Engine, Quint, or Truck
Technical Rescue	Engine, Quint, Truck or Rescue

Reliability Factors

Response reliability is defined as the frequency of resource response time performance within some geographical regions, or planning zones. Travel time response quality is affected by several factors including resource availability, weather, road conditions, and traffic. Theoretically, if all units were available and always in their stations, then the reliability of performance within a shaded area would be near one-hundred percent. Except, units are not always available. They are utilized for a myriad of tasks daily. These tasks include not only emergency calls, but also prevention activities such as fire inspections or public education events, administrative assignments, training activity, and vehicle maintenance and fueling. If the closest unit to an incident is unavailable, the next closest unit will be

assigned to the incident. Reliability is reduced when companies are unavailable for a multitude of reasons including:

- Out-of-station or district training
- Fueling apparatus
- Routine apparatus maintenance
- Emergency repair of apparatus
- On the scene of another emergency
- Covering another station

In 2016, the department began utilizing automatic vehicle location (AVL) in conjunction with the identification and deployment of department resources. It is the department's realization that this deployment enhancing technology has assisted in ensuring the closest resources are mobilized for the best outcome to the community. The department believes this technology has assisted in maintaining a consistent travel time measurement with an increasing number of demands for service.

The table below illustrates the reliability of benchmark travel response time (4 minutes/urban standard) of a fire apparatus on structure fires by planning zone within the City of Lawrence.

Table 33 Reliability of Structure Fire Benchmark Travel Times by Planning Zone

Structure Fires	Planning Zone 1	Planning Zone 2	Planning Zone 3	Planning Zone 4	Planning Zone 5	City-wide
Reliability 2012-2016	73% N=318	61% N=124	52% N=149	47% N=97	56% N=372	61% N=1060

The table below illustrates the reliability of benchmark travel response time (4 minutes/urban standard) of any unit to a high risk medical call by planning zone within the City of Lawrence. High risk medical calls include cardiac arrest, electrocution, drowning/diving accident, shootings, and stabbings.

Table 34 Reliability of High Risk Medical Urban Benchmark Travel Times by Planning Zone

High Risk Medical	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	City-wide
Reliability 2012-2016	79% n=170	85% n=81	77% n=140	75% n=55	72% n=145	77% n=591

Table 35 Reliability of High Risk Medical Urban Benchmark Travel Times in Eudora and Baldwin

High Risk Medical	Eudora*	Baldwin City
Reliability 2012-2016	13% n=38	74% n=27

*An expansion ambulance was stationed within Eudora in 2017.

The following table illustrates the reliability of benchmark travel response time (10 minutes/rural standard) of any unit to a high risk medical call by planning zone within the City of Lawrence. High risk medical calls include cardiac arrest, electrocution, drowning/diving accident, motor vehicle accident level 3 (county only), shootings, and stabbings.

Table 36 Reliability of High Risk Medical Rural Benchmark Travel Times by Planning Zone

Cardiac Arrest	County Zone 1	County Zone 2	County Zone 3	County Zone 4	County Zone 5	County Zone 11	County Zone 12	County Rural
Reliability 2012-2016	82% n=17	80% n=5	55% n=29	45% n=20	89% n=9	74% n=42	56% n=9	66% n=131

Concentration Factors

Concentration addresses the spacing of multiple resources arranged close enough together so that an initial effective response force (ERF) can be assembled on scene targeting total response time benchmark objectives. An initial ERF is that which will most likely stop the escalation of an emergency in a specific risk type. Such an initial response may stop the escalation of the emergency, even in maximum risk areas. However, an initial ERF is not necessarily the total number of units or personnel needed if the emergency escalated to the maximum potential. Additional "alarms" or units could be planned on from further away, including mutual aid.

The concentration of emergency response units in Lawrence is a reflection of the demand for service. Fire and emergency medical services are delivered from all five locations.

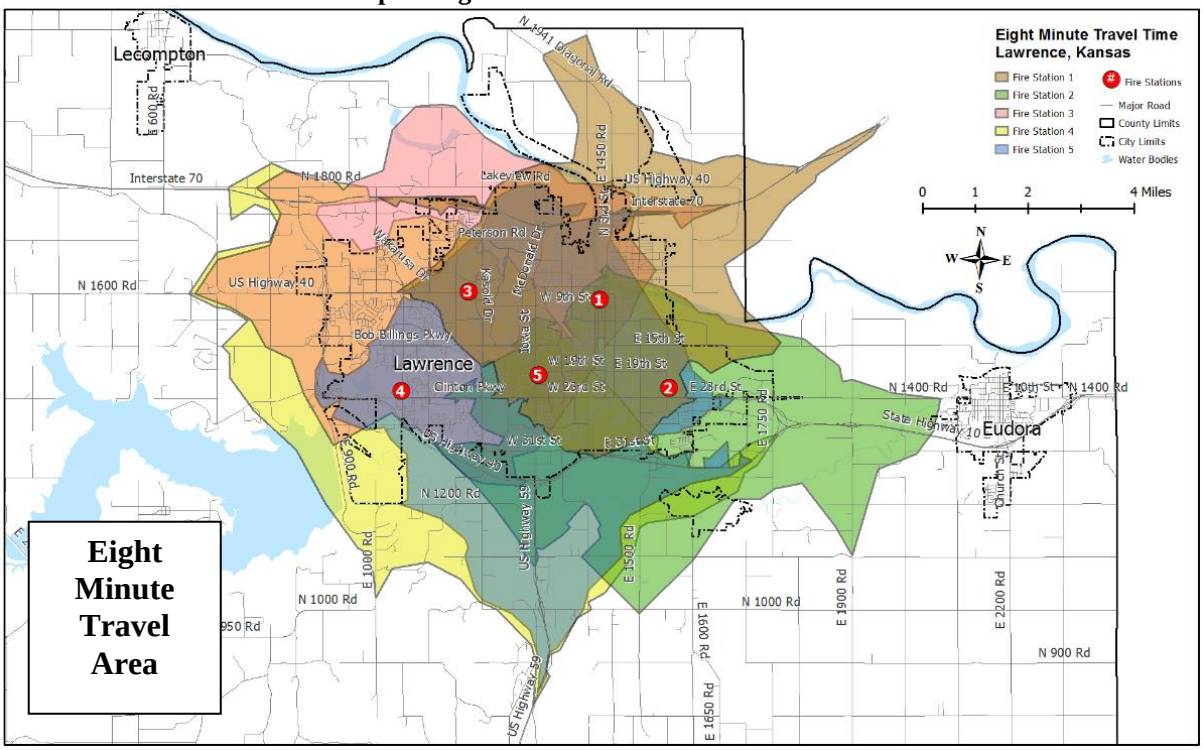
The focus of providing an initial ERF is that it will most likely stop the escalation of the emergency, be it fire or increased illness. Concentration of service delivery is best measured by risk/category type where higher risk areas would require second and third due units in shorter time frames than typical or low risk areas. The department handles responses to all hazards in a similar manner. Services concentration measures are considered in:

- Percent of square miles, or
- Percent of equally sized analysis areas, or
- Percent of total road miles in jurisdiction for the number of total units in the initial effective response force

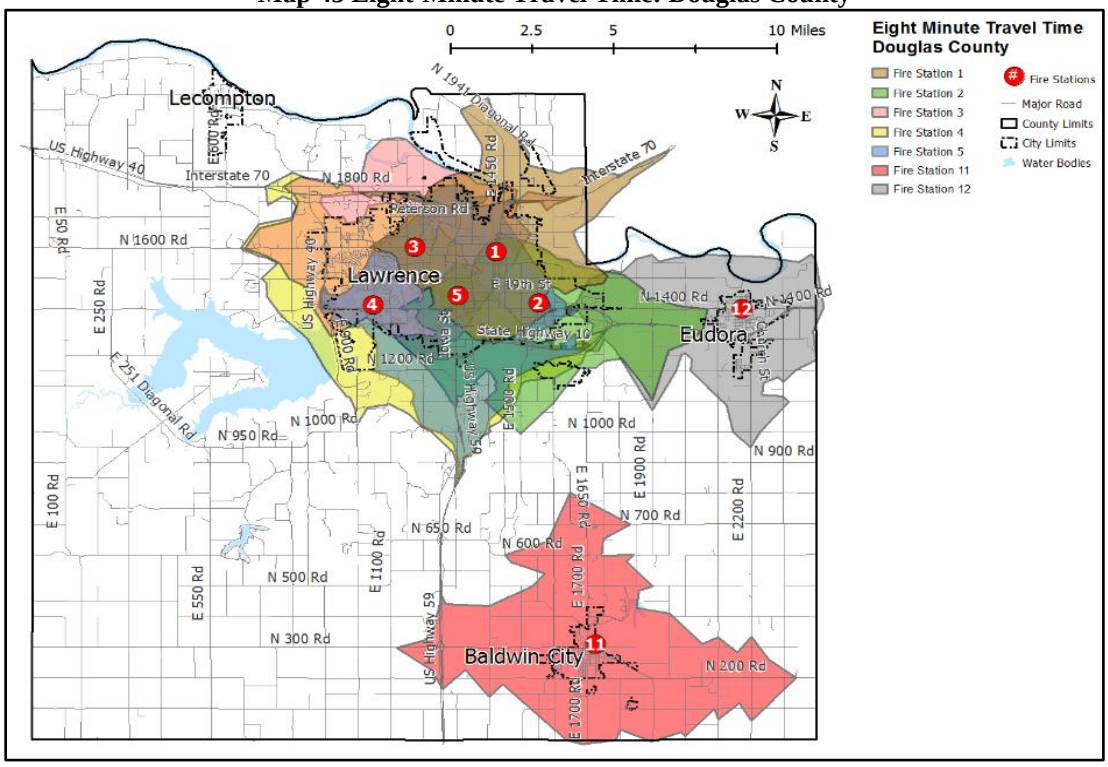
Service concentrations often pull on distribution of resources making evaluating these impacts on service delivery difficult. There is no one perfect solution to this complex decision. The fire chief and staff have developed what is considered to be the best placement of resources and staffing based upon what is known, what is anticipated and what is possible.

In determining concentration, the department has again looked at the risk assessment, call volume, population, and critical tasking.

Map 44 Eight-Minute Travel Time: Lawrence



Map 45 Eight-Minute Travel Time: Douglas County



Drawdown of Resources

During fiscal year 2017, the department was authorized 129 positions in the Operations Division. Shifts were assigned 43 each with a minimum staffing level of 38 for any given day. The department defines an ERF as the minimum amount of equipment and staffing reaching an emergency within the maximum amount of designated total response time. An ERF should be able to respond and control a fire within the maximum prescribed travel time by a full assignment of companies. This assignment, based upon the risk level of the structure, is also based upon staffing, equipment and travel times to that structure.

The department has set the draw-down level as three engine/quint companies and three medic units. When this level is reached and a request for mutual aid is received, notification of the department's inability to respond will be given until or unless off-duty personnel are called back to duty to maintain this minimum draw-down level. Weather conditions and the shift commander's knowledge of resources that are coming available can influence the draw-down level.

The draw-down of resources does not only represent apparatus but personnel. To provide effective, consistent company-level leadership, the department provides for a company officer for each of the first line apparatus. In addition to the regularly assigned company officer, the department also has a number of qualified firefighters certified as acting officers trained to the company officer level that are capable of riding-up as the company officer in the absence of a regular company officer.

The department also understands that there may be the need to staff certain positions within NIMS with personnel regularly assigned to administrative duty. Currently, there are ten members working administrative shifts who can assume NIMS positions. By implementing this option, the number of personnel available on-scene could be increased by as many as 10 additional personnel. This utilization of key personnel resources allows for complete draw-down of department personnel prior to calling upon outside resources to manage an incident.

Exhaustion of Resources

The exhaustion deployment level triggers the shift commander and all company officers to notify recoverable members and immediately cease all activities which might cause response delays. The department has set a minimum resource exhaustion level of two engines/quints and two medic units as the point where off duty personnel will be called backed to duty. Monitoring exhaustion of responsibility of the duty shift commander who may request assistance to manage this task at any time from another chief officer or company officer. In the event that the initial emergency response proves to be inadequate, the department also has the capability to request additional resources from the Kansas City Metro Area fire departments. These additional units are available upon request through the normal communications channels. With the existing systems in place, it is possible to immediately deplete all the available resources to respond to an incident within the jurisdiction. When the cache of local resources is depleted, the department can call upon the regional resources.

Standards, Goals and Objectives

To perform a complete assessment of a department's ability to respond to specific emergencies, it must establish standards. These standards must be made based on an educated understanding of the risk faced both from the source and from the community.

For a community's emergency resources to make a positive impact on the event, they must arrive in time to affect change. In this section, the department will assess and establish a total response time measurement for the service taking into consideration the factors involved in creating effective change in both structural fires and life-threatening emergency medical calls.

Total Response Time

Total response time is a compilation of the elements beginning with alarm handling time, turnout time, and travel time. The total response time concept is simple to grasp but has been extremely hard for fire departments and fire chiefs nationwide to accept. Fire departments nationwide typically have different descriptions for the term "Response Time." Generally, it describes travel time only or turnout and travel time combined. Total response time includes the alarm handling time component often overlooked by most departments. The simple fact is when a customer calls for service they generally are not interested in all the pieces that make up these differing response times. They know they called and it took longer than the department has traditionally said it took to arrive.

The concept of a total response time continuum has evolved from standards set by the National Fire Protection Association (NFPA). This theory of a total time assessment and standard was foreign to the fire service prior to the mid 1980's.

Total Response Time Objectives

The department operates around two basic cycles. The first is the cycle of fire: heat, fuel and oxygen cycle continuously while a fire burns. Firefighters train to break this cycle at any of these three points. The second cycle is the cycle of life: the heart, lungs and brain work continuously to sustain life. When that cycle is broken due to illness or injury, firefighters train to keep this cycle going in an effort to save a life, like performing CPR. One cycle disconnected, one cycle reconnected – both in an effort to save lives, both within a critical few minutes.

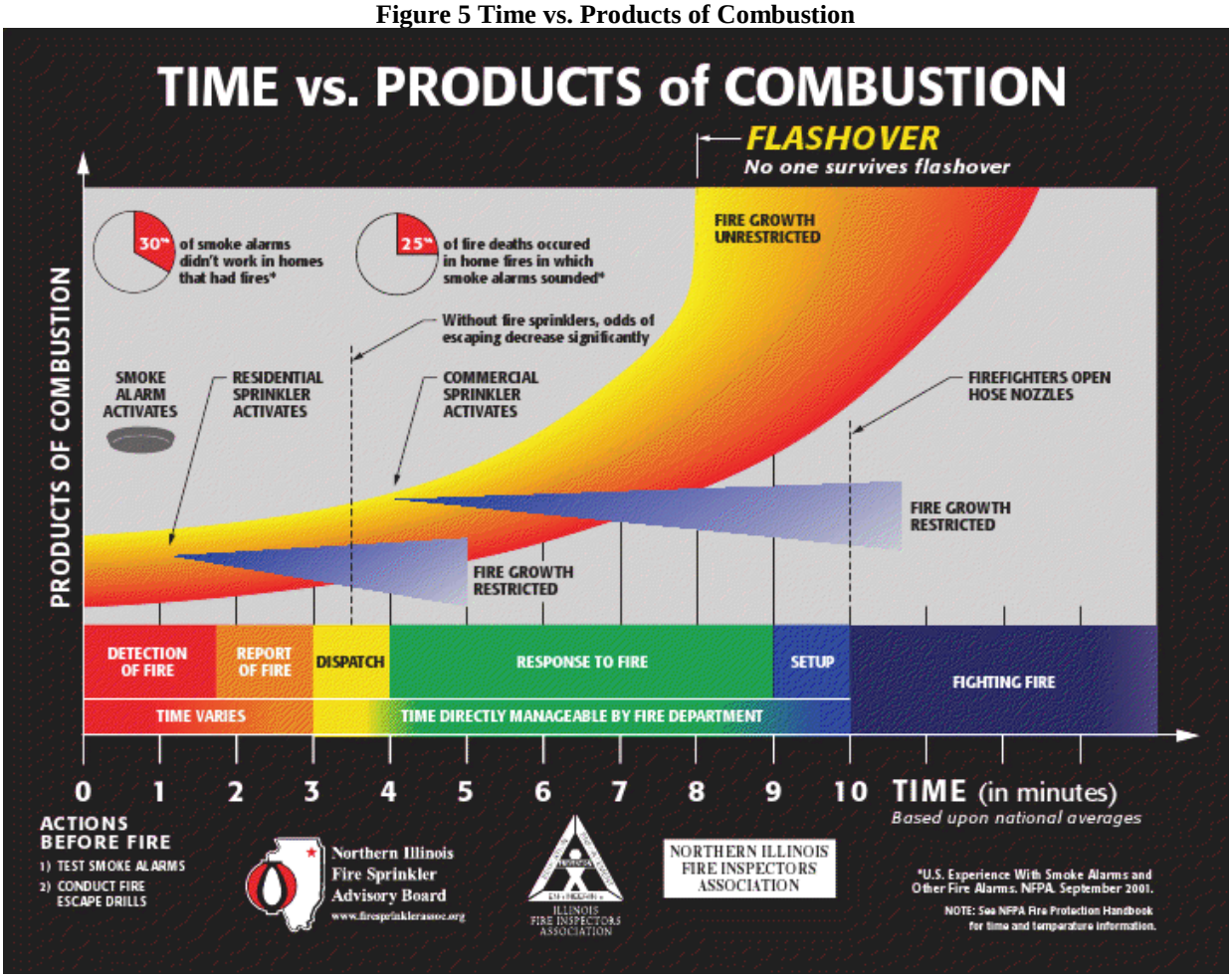
If emergency system designers plan effective response around the benchmark times of flashover and brain death, the measure of time needs to be defined and understood. In an emergency, there are many benchmarks such as ignition point, heart cessation, calling 911, dispatch, travel time and set-up times. The department must plan a system that places effective resources on-scene at department benchmark targets, taking into account all the tasks necessary.

The Cycle of Fire

A fire within a structure can be classified into three defined growth stages. The first is the incipient phase and occurs from ignition to open flame. The second phase of fire is the free burning stage and is characterized by rapid growth and heat production. During this phase of fire growth, the fire can reach the point of flashover. Flashover is the point when the fire dramatically grows from burning the initial contents to all the contents in the space. Flashover is likely to occur if the temperature of

the upper gas layer in an enclosure reaches approximately 1,100 degrees Fahrenheit. The final phase of the fire growth is the smoldering phase, which occurs when the available oxygen is consumed by the fire. At this stage, a rapid introduction of oxygen into the room can lead to a sudden backdraft.

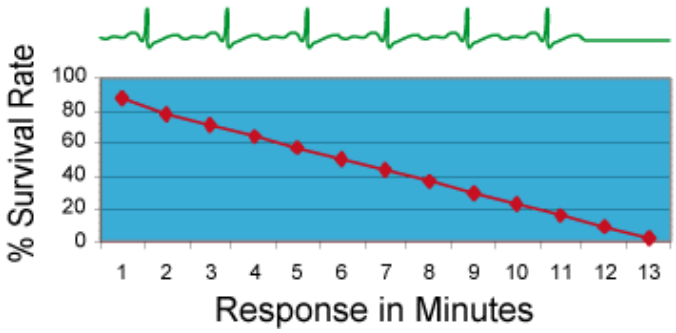
Figure 5 Time vs. Products of Combustion



The Cycle of Life

EMS related incidents have benchmarks in time which critically ill or injured patients need to be stabilized and transported to a medical facility. A key component must be in place for this stabilization to take place. Spontaneous circulation can cease in almost every type of medical emergency whether it is an injury or illness related problem. Physiologically, brain death begins four to six minutes after the cessation of circulation, or cardiac arrest. After ten minutes, based on research, the survivability outcome of a patient who suffers from the loss of spontaneous circulation is considered unlikely, even with advanced life support interventions.

Figure 6 Cardiac Survival vs Response Time



Given these response objectives, how does a community evaluate and measure the department's progress or efficiency? The elected officials annually adopt a fiscal budget which helps to dictate the department's standard of cover. The community, in essence, buys a level of protection for itself. The purpose of defining the factors that determine the SOC allows the community to be informed about the decisions it makes for the provision of emergency services. Before making a decision or establishing a SOC, the following information was examined:

Table 37 Emergency Operations Cascade of Response Elements

Event Initiation	**Pre-Response elements**
Emergency event	
Alarm	
Notification – Alarm is Reported/Received	**Total Response Time**
Alarm Handling	
Turnout Time – Unit Notification/Enroute	
Travel Time – Unit is Responding to Alarm	
On Scene Time - Unit Arrives On Scene	
Initiation of Action – Unit Begins Operations	**Post Response Elements**
Termination of Incident	

Event Initiation

Event initiation is the point at which factors occur that ultimately will result in the activation of the emergency response system. Factors that may contribute to the event initiation may occur from seconds to a day or more prior to leading to the actual emergency event.

Alarm

Alarm is the time it takes for someone to discover that an emergency exists and start the process to get the emergency response system activated. This process may mean dialing a personal cellular phone, driving to a location that has a fixed phone or simply hiking out of the wilderness to find someone with a radio to make the notification.

Notification

Notification is the time which the alarm is received by the communications center and could include walk in citizens, phone calls, or radio reports. Many departments, including LDCFM, enhance the notification process through the use and requirements of automatic alarm notification. In addition, over the past decade the community has experienced a perceived decrease in the reporting time on most alarms do to the proliferation of cellular phones. Previously, reporting of an emergency may have been delayed because of a lack of communications options. Although cellular phones make reporting an emergency quicker the greatest time killer is trying to verify the location of the caller. In cases where the caller is unsure of their location the communications center can attempt to ping the phone for general location with escalating alarm processing times. This is never more evident than when new students flood Lawrence in the late summer, all with cellular phones and many in an unfamiliar location.

Alarm Answering

Alarm answering is the process of answering the call for assistance or service. Alarm answering time is the amount of time from when the call is made until the call is answered by the communications center

Alarm Handling

Alarm handling is the time interval from when the first notification was received and the completion of dispatching the recommended units. The CAD system utilized by the ECC assists in recommending and assigning units to an incident.

Emergency Medical Dispatching (EMD) protocols help to target the correct effective response force and provide instructions for callers of EMS but delay the overall alarm handling time in doing so. Many accredited agencies have discovered that there are competing interest when evaluating the usefulness of an EMD system. The department implemented the priority dispatch EMD system in 2004 and was confident it was making a difference in the overall response efforts.

In pursuit of alarm handling benchmarks, the department will be investigating opportunities for enhancements such as rapid posting EMS calls to get units to turn out while going through the EMD process. These opportunities will be communicated and tested in 2018.

The department has identified over the past several years the elongation of alarm handling. The department has communicated its alarm handling benchmarks with the ECC, but they have never been formally agreed upon by both agencies. They department is in the process of formally agreeing on alarm handling benchmarks in a memorandum of understanding in the year 2018.

Turnout

Turnout time is the time interval, from notification of a station or unit, to the assigned unit responding. Station facilities are equipped with radio tone-alert activation. Turnout time is measured from the time of completion of alerting by dispatch, to the vehicles clearing the stations and announcing "enroute" on the radio or utilizing their mobile data computers.

Newer station designs have not specifically focused on the time to get from any part of the facility to the apparatus and subsequently have had an impact on turnout times. Increased emphasis on never removing a seatbelt while responding has raised levels of safety but also impacted turnout times on many types of calls.

The department turnout time is consistently above the 60 to 80 second recommendations of NFPA 1710. A study was conducted on turnout time in 2011 and is still relevant due to the lack of updates in changes in station design. The department ran a series of turnout time scenarios to better understand what benchmark and baseline turnout times should be. Three scenarios were developed and the shift commander on each shift conducted the testing in every station. Crews were aware the testing would be occurring but there was no schedule and the first test was unannounced in order to capture the protective clothing layout at the apparatus in a normal daily configuration. The individual and overall results are reflected in the following tables.

Turnout Time Study Results

Table 38 Turnout Time Study – Structure Fire from Dorm

Station & Shift	Structure Fire from Dorm				
	First FF At Rig	First FF On	Last FF On	Enroute	Elapsed
1X	19	45	75	86	01:26
1Y	12	40	53	67	01:07
1Z	14	42	53	56	00:56
2X	41	57	105	108	01:48
2Y	29	60	79	92	01:32
2Z	27	56	91	105	01:45
3X	40	49	92	106	01:46
3Y	25	46	53	78	01:18
3Z	40	80	86	100	01:40
4X	45	83	111	114	01:54
4Y	35	60	83	90	01:30
4Z	35	63	90	96	01:36
5X	49	86	97	109	01:49
5Y	40	72	79	88	01:28
5Z	29	55	69	80	01:20
MAX	49	86	111	114	01:54
MIN	12	40	53	56	00:56
90th %					01:49

All times are in seconds except elapsed shown as minutes and seconds

Table 39 Turnout Time Study - MVA from Fitness Room

Station & Shift	MVA From Fitness Room				
	First FF At Rig	First FF On	Last FF On	Enroute	Elapsed
1X	26	64	72	86	01:26
1Y	38	52	70	85	01:25
1Z	31	62	69	79	01:19
2X	19	51	83	94	01:34
2Y	16	50	61	70	01:10
2Z	23	54	75	85	01:25
3X	25	45	72	80	01:20
3Y	12	40	52	69	01:09
3Z	22	53	69	75	01:15
4X	26	69	84	94	01:34
4Y	18	49	59	69	01:09
4Z	29	62	86	91	01:31
5X	28	62	70	80	01:20
5Y	22	48	65	76	01:16
5Z	21	48	76	84	01:24
MAX	38	69	86	94	01:34
MIN	12	40	52	69	01:09
90th %					01:34

All times are in seconds except elapsed shown as minutes and seconds

Table 40 Turnout Time Study - Structure Fire from Dayroom

Station & Shift	Structure Fire From Dayroom				
	First FF At Rig	First FF On	Last FF On	Enroute	Elapsed
1X	10	37	59	68	01:08
1Y	18	44	57	69	01:09
1Z	18	37	50	78	01:18
2X	32	66	101	109	01:49
2Y	19	56	62	76	01:16
2Z	17	52	74	83	01:23
3X	21	37	61	69	01:09
3Y	11	30	53	61	01:01
3Z	15	65	78	95	01:35
4X	27	70	94	108	01:48
4Y	18	54	72	81	01:21
4Z	26	63	84	84	01:24
5X	37	73	88	104	01:44
5Y	26	61	70	78	01:18
5Z	19	45	78	91	01:31
MAX	37	73	101	109	01:49
MIN	10	30	50	61	01:01
90th %					01:48

All times are in seconds except elapsed shown as minutes and seconds

The results and analysis of these turnout times have led the department to believe a benchmark of 60-80 seconds at the 90th percentile may be difficult to achieve. The results of the test indicated that a 90th percentile mark would be closer to 1:45. The department will continue to look at ways to reduce these times without encouraging unsafe practices of running to the apparatus or not donning the proper protective clothing prior to being seated, to reduce the chance of removing the seatbelt.

Station alerting system utilizes countdown timers to better increase awareness of the time since the station was alerted. Mobile data computers are in place to receive alarm information to do unit status changes such as us enroute, on scene, and available.

Travel

Travel time is the time interval from when the assigned unit going enroute to an emergency until that unit arrives at the emergency and goes “on-scene.” Travel time and safety have been impacted through the use of traffic calming measures and traffic control preemption devices. Traffic preemption devices are installed on all traffic signals in the City of Lawrence and are utilized on each emergency response to reduce the delay at traffic signal controlled intersections. Traffic calming devices, road design standards and gated areas of the community have the opposite effect of slowing travel time to emergencies.

On-Scene

On-scene time is the point at which units have arrived "on-scene" and is generally done in conjunction with a brief initial radio report describing the incident as viewed from the apparatus. Officers use their mobile data computers to change the unit status to on scene.

Initiation of Action

Initiation of action begins with the conclusion of the initial report which will include the action to be taken by the reporting unit as it deploys from the apparatus. Initial actions may include but is not limited to investigation, advancing an attack line, patient assessment. The initiation of action taken may last from moments to days and will result in the mitigation of the incident.

Termination of Incident

This is the time at which units have completed their incident task and are available to respond to another emergency incident.

NFPA 1710 Impact

The department has evaluated the feasibility of meeting NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*. This standard is often quoted as a nationwide standard and outlines an organized approach to defining levels of service, deployment capabilities, and staffing for "substantially" career fire departments. Specifically, NFPA 1710 provides standard definitions for fire apparatus, personnel assigned, procedural guidelines within which they operate, and staffing levels needed to accomplish specific tasks on arrival at an incident.

NFPA 1710 states that fire departments shall establish a performance objective of not less than 90% for each of the following response time objectives:

- Alarm answering time not more than (15 seconds) for at least 95% of the alarms received and not more than (40 seconds) for at least 99% of the alarms received, as specified by NFPA 1221.
- Alarm processing time shall not be more than (64 seconds) for at least 90% of the alarms and not more than (106 seconds) 95% of the time.
- One minute twenty seconds (80 seconds) turnout time for fires and one minute (60 seconds) turnout time for EMS calls.
- Four minutes (240 seconds) or less for the arrival of the first-arriving engine company at a fire suppression incident and/or eight minutes (480 seconds) or less for the arrival of a full first alarm assignment at a fire suppression incident (including one individual for incident command outside of the hazard area).
- 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.

The department evaluates emergency response data in a variety of categories and believes that response time goals can be adjusted for the safety of its members without compromising service to the community. The department has not formally adopted this standard.

Baseline Performance Tables

Low Risk Fire 90th Percentile Times Baseline Performance			2012-2016	2016	2015	2014	2013	2012
Alarm Handling	Pick-up to Dispatch	Urban	02:19	02:36	02:59	01:25	01:22	01:55
		Rural	02:30	02:29	03:10	01:18	01:12	01:56
Turnout Time	Turnout Time 1st Unit	Urban	02:08	02:04	01:54	02:01	02:02	02:35
		Rural	02:28	02:02	02:26	01:55	02:23	02:09
Travel Time	Travel Time 1st Unit **Distribution**	Urban	06:12	06:09	06:22	06:15	06:19	05:57
		Rural	09:39	10:23	05:18	14:57	09:58	07:00
	Travel Time ERF **Concentration**	Urban	06:09	06:03	06:20	06:06	06:17	05:54
		Rural	08:39	10:23	05:18	07:57	07:52	07:13
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	09:21	09:35	10:22	09:19	08:23	09:02
			N=3500	n=693	n=713	n=724	n=682	n=688
		Rural	12:41	17:54	09:43	16:51	11:15	09:58
			n=42	n=6	n=16	n=9	n=5	n=6
	Total Response Time ERF **Concentration**	Urban	09:18	09:35	10:17	09:14	08:19	09:01
			n=3638	n=795	n=741	n=762	n=720	n=720
		Rural	12:01	17:54	09:43	10:33	09:57	10:19
			n=38	n=6	n=16	n=6	n=3	n=8

Moderate Risk Fire 90th Percentile Times Baseline Performance			2012-2016	2016	2015	2014	2013	2012
Alarm Handling	Pick-up to Dispatch	Urban	03:19	02:21	03:21	00:31	N/A	00:50
		Rural	01:19	01:09	N/A	00:51	01:17	N/A
Turnout Time	Turnout Time 1st Unit	Urban	01:40	01:11	02:21	00:39	N/A	00:18
		Rural	01:20	00:36	N/A	00:54	01:25	N/A
Travel Time	Travel Time 1st Unit **Distribution**	Urban	10:06	06:04	12:40	08:29	N/A	06:39
		Rural	14:03	08:04	N/A	05:26	16:01	N/A
	Travel Time ERF **Concentration**	Urban	08:56	08:19	N/A	09:05	N/A	7:50
		Rural	12:58	13:25	N/A	N/A	08:36	N/A
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	15:12	09:30	17:19	09:39	N/A	07:47
			n=8	n=3	n=3	n=1	n=0	n=1
		Rural	16:48	09:49	N/A	09:48	18:48	N/A
			n=5	n=1	n=0	n=1	n=3	n=0
	Total Response Time ERF **Concentration**	Urban	11:26	11:44	N/A	10:15	N/A	08:58
			n=3	n=1	n=0	n=1	n=0	n=1
		Rural	14:47	15:10	N/A	N/A	11:19	N/A
			n=2	n=1	n=0	n=0	n=1	n=0

High Risk Fire 90th Percentile Times Baseline Performance			2012-2016	2016	2015	2014	2013	2012
Alarm Handling	Pick-up to Dispatch	Urban	02:36	02:55	03:12	02:40	01:09	01:51
		Rural	02:04	N/A	N/A	02:14	01:18	N/A
Turnout Time	Turnout Time 1st Unit	Urban	01:38	01:32	01:28	01:37	01:29	01:54
		Rural	01:11	N/A	N/A	01:09	01:11	N/A
Travel Time	Travel Time 1st Unit **Distribution**	Urban	05:41	05:37	05:41	05:06	05:29	06:03
		Rural	12:09	N/A	N/A	06:32	12:50	N/A
	Travel Time ERF **Concentration**	Urban	10:41	09:23	10:03	11:19	10:40	11:24
		Rural	19:10	N/A	N/A	13:35	19:30	N/A
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	08:31	08:39	09:21	08:38	07:11	08:16
			n=1061	n=169	n=207	n=251	n=204	n=230
		Rural	13:59	N/A	N/A	09:55	14:25	N/A
			n=3	n=0	n=0	n=1	n=2	n=0
	Total Response Time ERF **Concentration**	Urban	13:05	12:03	12:20	13:34	12:29	14:00
			n=332	n=45	n=72	n=97	n=72	n=46
		Rural	21:01	N/A	N/A	16:58	21:01	N/A
			n=3	n=0	n=0	n=1	n=2	n=0

Low Risk EMS 90th Percentile Times Baseline Performance			2012-2016	2016	2015	2014	2013	2012
Alarm Handling	Pick-up to Dispatch	Urban	02:35	02:48	02:51	01:33	01:05	N/A
		Rural	01:55	01:45	01:58	N/A	00:38	N/A
Turnout Time	Turnout Time 1st Unit	Urban	01:35	1:52	01:47	01:30	01:24	N/A
		Rural	01:07	00:58	00:49	N/A	01:09	N/A
Travel Time	Travel Time 1st Unit **Distribution**	Urban	07:32	07:16	08:51	07:14	07:26	N/A
		Rural	13:10	12:48	03:22	N/A	13:16	N/A
	Travel Time ERF **Concentration**	Urban	07:48	07:16	08:51	07:17	07:33	N/A
		Rural	13:13	12:48	N/A	N/A	13:16	N/A
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	16:27	20:10	19:26	11:51	08:11	N/A
			n=85	n=19	n=17	n=25	n=24	n=0
		Rural	15:25	15:31	06:09	N/A	15:03	N/A
			n=3	n=1	n=1	n=0	n=1	n=0
	Total Response Time ERF **Concentration**	Urban	16:53	20:10	19:26	11:51	08:12	N/A
			n=81	n=19	n=17	n=24	n=21	n=0
		Rural	15:28	15:31	N/A	N/A	15:03	N/A
			n=2	n=1	n=0	n=0	n=1	n=0

Moderate Risk EMS 90th Percentile Times Baseline Performance			2012-2016	2016	2015	2014	2013	2012
Alarm Handling	Pick-up to Dispatch	Urban	02:54	02:59	03:05	02:03	01:51	03:17
		Rural	03:06	03:06	03:11	02:29	01:23	03:43
Turnout Time	Turnout Time 1st Unit	Urban	01:37	01:28	01:30	01:36	01:30	02:02
		Rural	01:52	01:30	01:30	01:58	01:46	02:15
Travel Time	Travel Time 1st Unit **Distribution**	Urban	06:35	06:13	07:20	06:16	06:22	06:09
		Rural	16:15	18:03	07:53	16:52	15:52	16:49
	Travel Time ERF **Concentration**	Urban	07:46	08:05	09:24	07:28	07:35	07:16
		Rural	16:49	18:03	10:06	17:00	16:49	16:07
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	10:20	10:36	13:11	09:52	08:27	09:56
			n=17843	n=3226	N=3634	n=3378	n=3625	n=3981
		Rural	20:03	22:45	13:54	20:17	18:12	20:46
			n=1599	n=267	n=344	n=309	n=307	n=372
	Total Response Time ERF **Concentration**	Urban	11:07	11:57	13:40	10:45	09:29	10:47
			n=16385	n=2813	N=3280	n=3139	n=3393	n=3760
		Rural	20:10	22:40	14:44	20:17	18:42	21:08
			n=1172	n=266	n=222	n=301	n=300	n=83

High Risk EMS 90th Percentile Times Baseline Performance			2012-2016	2016	2015	2014	2013	2012
Alarm Handling	Pick-up to Dispatch	Urban	02:45	02:39	03:04	02:33	01:14	03:01
		Rural	03:25	03:20	02:38	02:37	00:52	03:36
Turnout Time	Turnout Time 1st Unit	Urban	01:31	01:19	01:20	01:36	01:29	1:51
		Rural	01:50	01:47	02:38	01:53	01:30	01:44
Travel Time	Travel Time 1st Unit **Distribution**	Urban	06:19	06:10	09:16	05:15	05:21	05:03
		Rural	16:44	19:26	11:42	16:32	13:49	15:34
	Travel Time ERF **Concentration**	Urban	08:11	08:08	10:32	8:08	07:01	06:34
		Rural	21:57	19:18	N/A	19:24	29:30	19:47
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	10:01	10:30	13:30	08:43	07:07	08:29
			n=656	n=128	n=156	n=140	n=95	n=137
		Rural	20:38	24:42	19:55	19:26	15:26	18:40
			N=131	N=45	N=21	N=23	N=17	N=25
	Total Response Time ERF **Concentration**	Urban	11:37	10:57	14:26	15:32	08:55	10:08
			N=529	n=88	n=115	N=124	N=84	N=118
		Rural	25:05	25:14	n/a	20:45	31:39	22:11
			N=68	N=27	N=0	N=16	N=11	N=14

Maximum Risk EMS 90th Percentile Times Baseline Performance			2012-2016	2016	2015	2014	2013	2012
Alarm Handling	Pick-up to Dispatch	Urban	03:21	04:47	03:11	02:04	01:01	02:59
		Rural	03:49	03:47	04:01	02:43	01:49	03:52
Turnout Time	Turnout Time 1st Unit	Urban	01:26	01:16	01:10	01:14	01:19	01:27
		Rural	01:56	01:28	01:15	01:28	02:00	02:29
Travel Time	Travel Time 1st Unit **Distribution**	Urban	12:40	08:53	14:10	02:46	10:06	11:46
		Rural	16:08	10:45	16:33	14:10	15:20	16:41
	Travel Time ERF **Concentration**	Urban	20:49	07:52	07:24	17:42	N/A	14:16
		Rural	16:26	16:52	09:44	20:04	18:18	22:51
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	16:45	14:56	18:18	05:23	12:10	15:49
			N=16	N=1	N=3	N=2	N=4	N=6
		Rural	20:44	27:32	20:49	18:06	17:15	21:35
			N=137	N=16	N=13	N=21	N=39	N=48
	Total Response Time ERF **Concentration**	Urban	19:30	N/A	09:38	20:06	N/A	18:01
			N=5	N=0	N=1	N=1	N=0	N=3
		Rural	24:36	28:14	14:21	22:04	20:23	27:28
			N=91	N=13	N=5	N=16	N=26	N=31

Low Risk Technical Rescue 90th Percentile Times Baseline Performance			2012-2016	2016	2015	2014	2013	2012
Alarm Handling	Pick-up to Dispatch	Urban	02:33	01:19	03:06	00:48	01:26	00:35
Turnout Time	Turnout Time 1st Unit	Urban	01:35	01:17	01:26	01:23	01:30	02:19
Travel Time	Travel Time 1st Unit Distribution	Urban	04:43	01:10	05:44	03:58	03:37	00:53
	Travel Time ERF Concentration	Urban	04:43	01:10	05:44	03:58	03:40	01:53
Total Response Time	Total Response Time 1st Unit on Scene Distribution	Urban	08:28	03:46	09:09	05:52	05:33	03:47
			n=16	n=1	n=5	n=4	n=5	n=1
	Total Response Time ERF Concentration	Urban	08:28	03:46	09:09	05:52	05:25	04:44
			n=16	n=1	n=5	n=4	n=4	n=2

Moderate Risk Technical Rescue 90th Percentile Times Baseline Performance			2012-2016	2016	2015	2014	2013	2012
Alarm Handling	Pick-up to Dispatch	Urban	03:05	02:56	03:18	02:10	01:25	03:14
Turnout Time	Turnout Time 1st Unit	Urban	01:47	01:44	01:43	01:42	01:41	02:05
Travel Time	Travel Time 1st Unit Distribution	Urban	05:18	05:04	06:19	04:37	05:00	05:06
	Travel Time ERF Concentration	Urban	06:31	05:33	08:52	06:24	06:50	05:39
Total Response Time	Total Response Time 1st Unit on Scene Distribution	Urban	09:00	08:58	10:18	08:28	08:00	08:53
			n=334	n=62	n=84	n=60	n=59	n=69
	Total Response Time ERF Concentration	Urban	10:13	09:29	11:58	09:47	09:15	09:36
			n=281	n=61	n=63	n=46	n=52	n=59

High Risk Technical Rescue 90th Percentile Times Baseline Performance	2012-2016	2016	2015	2014	2013	2012

Alarm Handling	Pick-up to Dispatch	Urban	01:02	N/A	N/A	00:49	01:03	N/A
Turnout Time	Turnout Time 1st Unit	Urban	01:31	N/A	N/A	01:13	01:30	N/A
Travel Time	Travel Time 1st Unit **Distribution**	Urban	07:12	N/A	N/A	03:04	08:11	N/A
	Travel Time ERF **Concentration**	Urban	N/A	N/A	N/A	N/A	N/A	N/A
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	08:41	N/A	N/A	05:06	09:32	N/A
			N=3	N=0	N=0	N=2	N=1	N=0
	Total Response Time ERF **Concentration**	Urban	N/A	N/A	N/A	N/A	N/A	N/A
			N=0	N=0	N=0	N=0	N=0	N=0

Maximum Risk Technical Rescue 90th Percentile Times Baseline Performance			**2012-2016**	**2016**	**2015**	**2014**	**2013**	**2012**
Alarm Handling	Pick-up to Dispatch	Urban	02:50	02:58	03:36	02:07	01:08	02:42
Turnout Time	Turnout Time 1st Unit	Urban	01:31	01:00	01:32	01:30	01:27	01:49
Travel Time	Travel Time 1st Unit **Distribution**	Urban	06:37	08:42	22:23	04:36	05:42	05:56
	Travel Time ERF **Concentration**	Urban	25:45	12:50	N/A	20:18	26:06	24:50
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	09:24	13:01	26:55	07:14	07:42	08:17
			n=192	n=14	n=10	n=36	n=58	n=74
	Total Response Time ERF **Concentration**	Urban	32:54	47:44	N/A	21:38	28:52	27:17
			n=11	n=3	n=0	n=2	n=3	n=3

Low Risk Hazmat 90th Percentile Times Baseline Performance			**2012-2016**	**2016**	**2015**	**2014**	**2013**	**2012**
Alarm Handling	Pick-up to Dispatch	Urban	02:18	02:55	03:17	01:20	01:26	01:57

Turnout Time	Turnout Time 1st Unit	Urban	02:03	01:46	01:58	02:14	01:56	02:09
Travel Time	Travel Time 1st Unit **Distribution**	Urban	06:15	06:40	06:42	06:01	06:11	05:18
	Travel Time ERF **Concentration**	Urban	06:20	06:40	08:22	06:01	06:29	05:08
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	09:21	10:33	10:59	09:04	08:07	08:54
			n=377	n=67	n=46	n=81	n=105	n=78
	Total Response Time ERF **Concentration**	Urban	09:31	10:33	10:59	09:10	08:27	08:49
			n=312	n=67	n=42	n=42	n=103	n=58

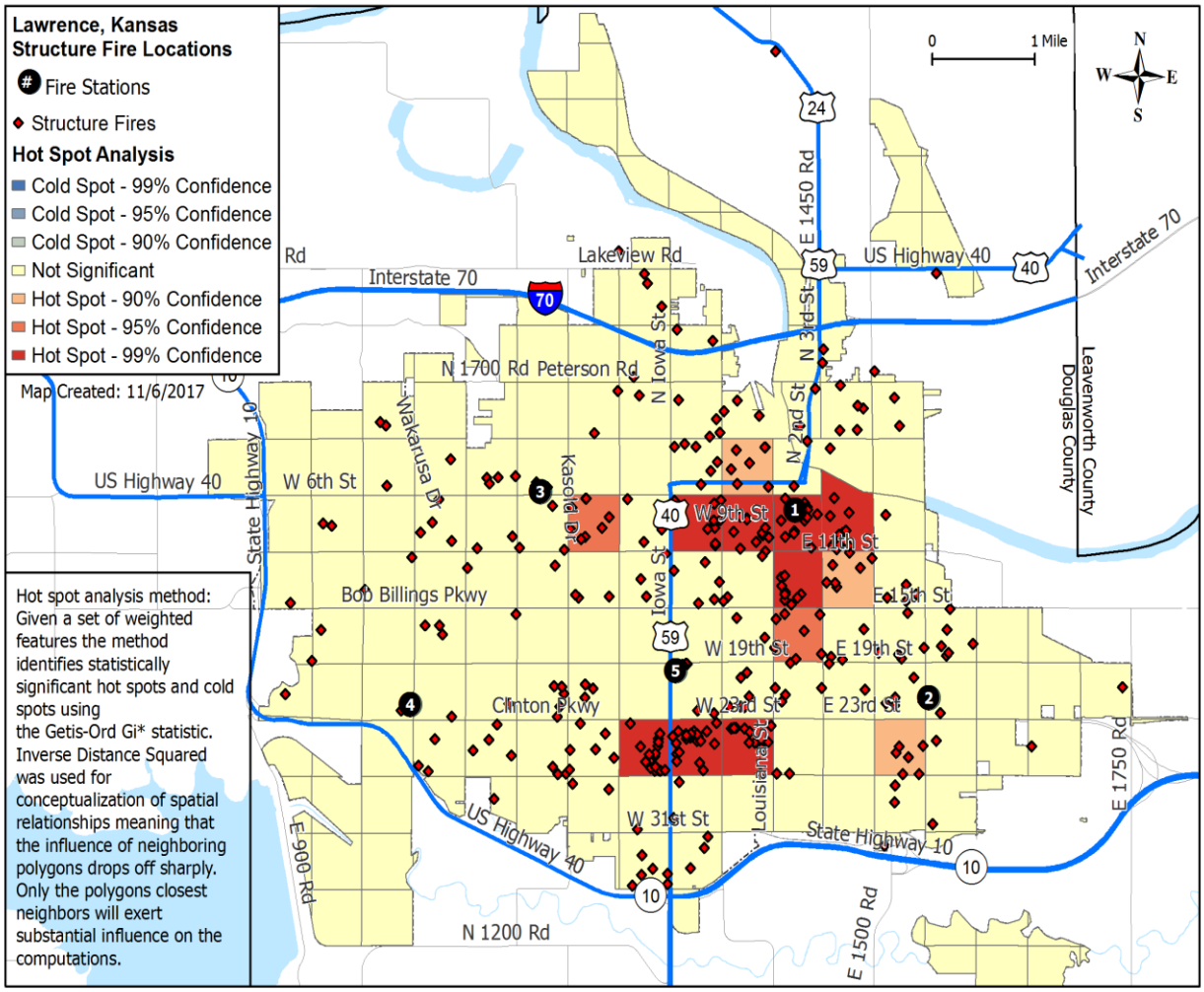
Moderate Risk Hazmat 90th Percentile Times Baseline Performance			**2012-2016**	**2016**	**2015**	**2014**	**2013**	**2012**
Alarm Handling	Pick-up to Dispatch	Urban	02:19	02:26	03:10	01:07	01:36	02:18
Turnout Time	Turnout Time 1st Unit	Urban	02:10	01:46	01:30	02:09	01:58	02:36
Travel Time	Travel Time 1st Unit **Distribution**	Urban	06:59	06:52	06:45	05:29	07:08	06:55
	Travel Time ERF **Concentration**	Urban	08:05	07:58	07:30	08:05	07:14	08:38
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	10:22	10:23	10:46	10:08	09:24	10:14
			n=203	n=50	n=31	n=37	n=42	n=43
	Total Response Time ERF **Concentration**	Urban	11:07	10:43	12:18	11:06	09:31	12:06
			n=211	n=41	n=22	n=56	n=40	n=52

High Risk Hazmat 90th Percentile Times Baseline Performance			**2012-2016**	**2016**	**2015**	**2014**	**2013**	**2012**
Alarm Handling	Pick-up to Dispatch	Urban	03:11	03:10	04:49	03:08	01:34	02:23
		Rural	02:18	N/A	02:48	01:46	01:27	02:27
Turnout Time	Turnout Time 1st Unit	Urban	01:50	01:54	01:22	01:46	01:36	01:54
		Rural	01:48	01:46	01:20	00:42	01:06	01:44
Travel Time		Urban	7:41	07:25	06:12	06:52	13:33	05:36

	Travel Time 1st Unit **Distribution**	Rural	26:46	N/A	N/A	21:54	26:47	23:07
	Travel Time ERF **Concentration**	Urban	27:17	24:06	12:43	10:50	23:17	N/A
		Rural	1:17:17	N/A	N/A	N/A	N/A	1:17:17
Total Response Time	Total Response Time 1st Unit on Scene **Distribution**	Urban	12:16	11:39	12:42	12:10	20:30	09:54
			n=60	n=7	n=13	n=11	n=15	n=14
		Rural	29:28	N/A	N/A	27:59	28:49	27:08
			n=5	n=0	n=0	n=1	n=2	n=2
	Total Response Time ERF **Concentration**	Urban	30:25	27:52	15:21	11:50	27:44	N/A
			n=10	n=4	n=1	n=1	n=4	n=0
		Rural	01:20:24	N/A	N/A	N/A	N/A	01:20:24
			n=1	n=0	n=0	n=0	n=0	n=1

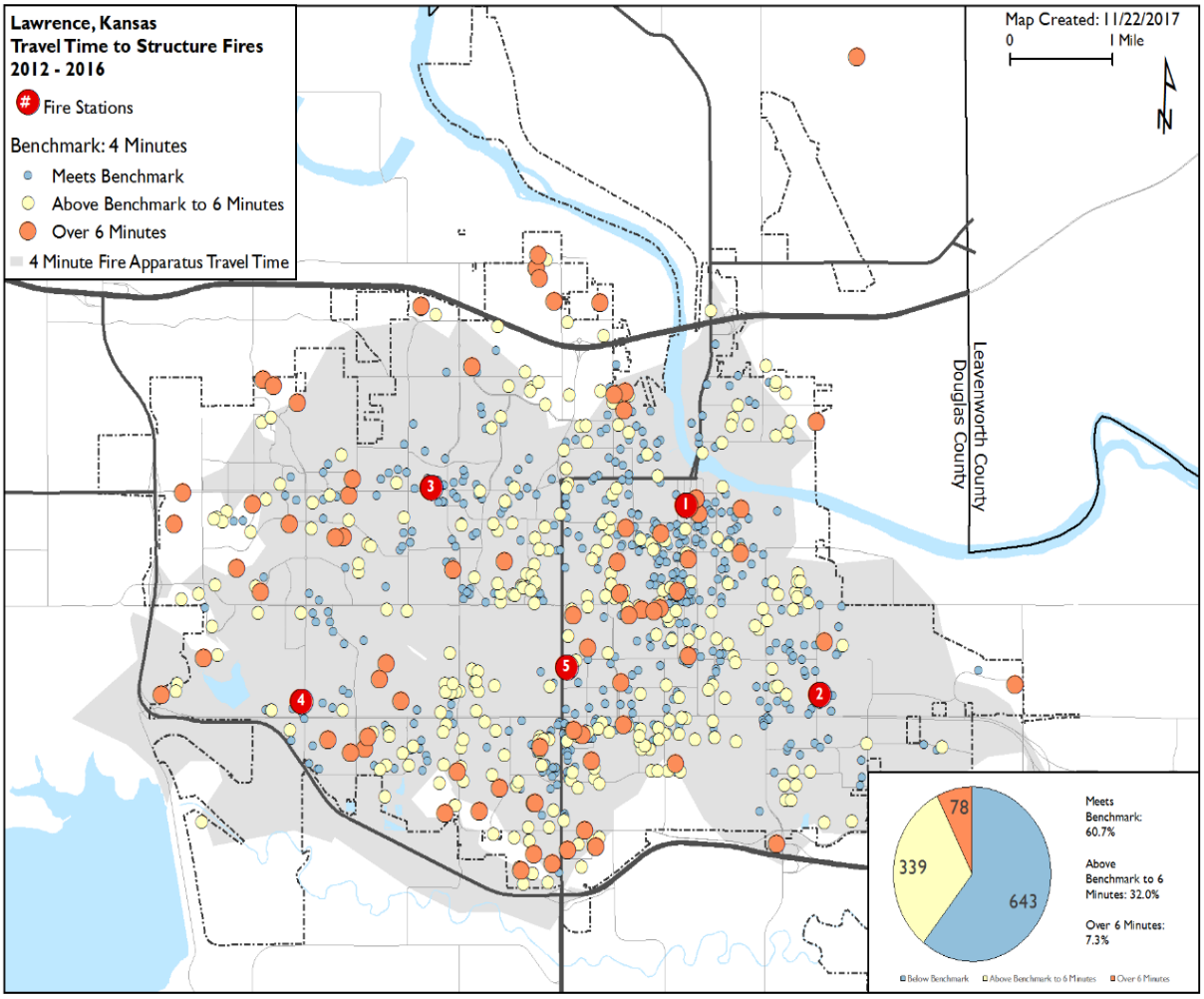
Historical Performance

Map 46 High Risk Structure Fires in Lawrence, 2012-2016



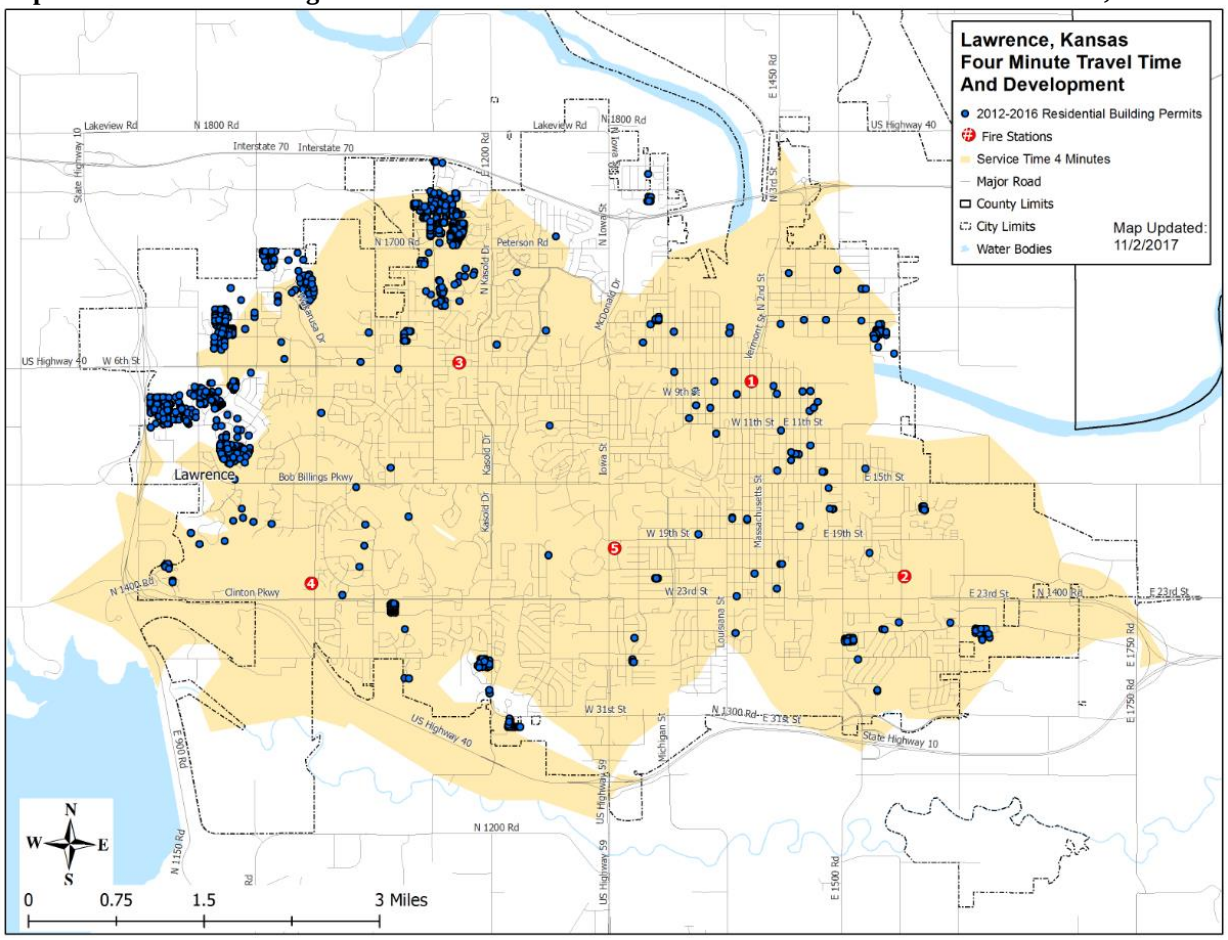
This map plots structure fires showing statistical significance, by emergency service zone. The emergency service zone is shaded light to dark depending on the concentration of occurrences within each zone. Geographically structure fires were concentrated north of 19th Street and east of Massachusetts Street. Structure fires were also concentrated south of 23rd Street and west of Louisiana Street.

Map 47 Structure Fires in Lawrence, 2012-2016, Incorporating Response Performance



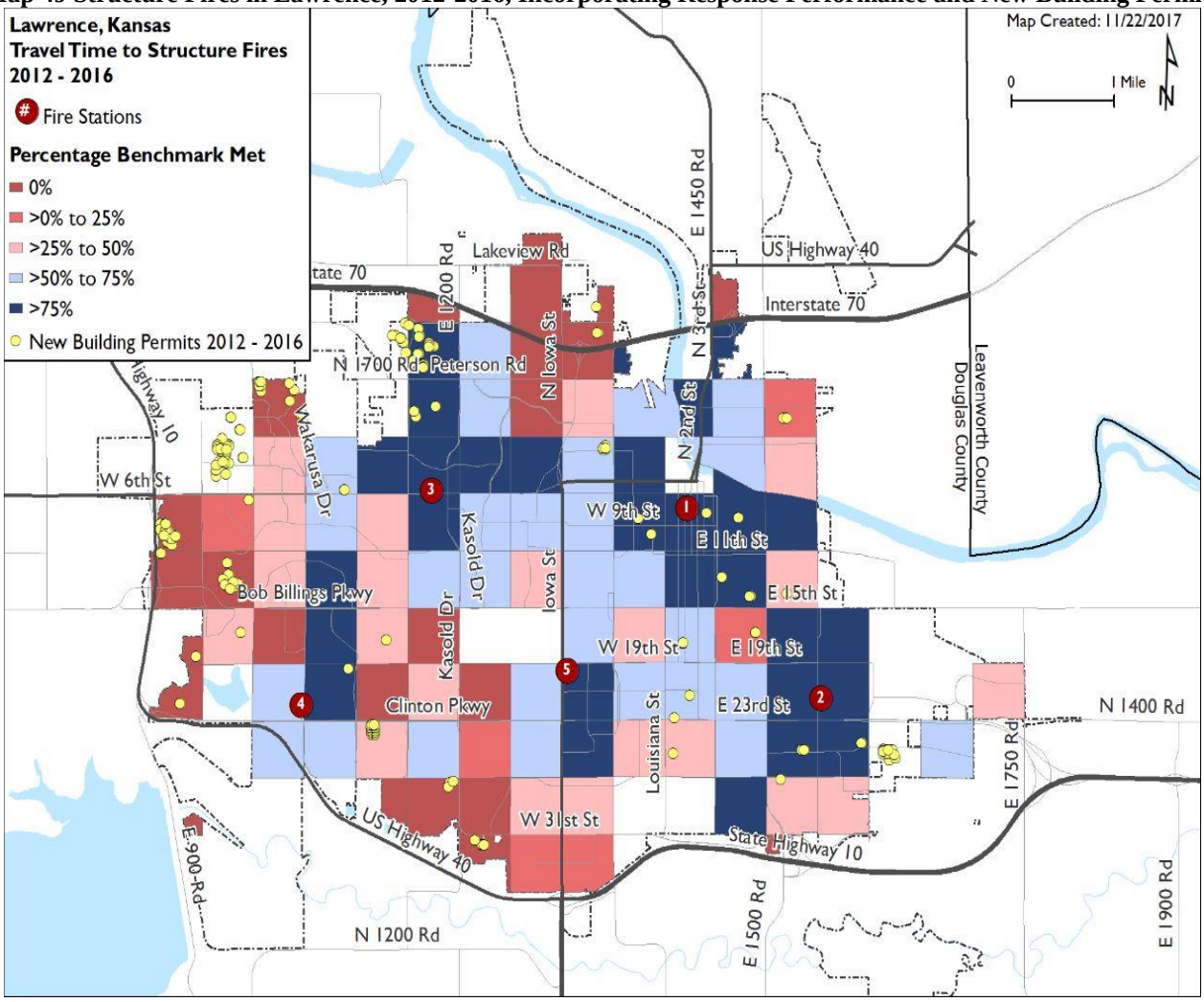
Incorporating historical response performance indicated when all units are available and positioned within their stations response coverage does not cover the entire city against benchmark travel time for the first arriving unit. Fire apparatus reliability has an effect on response performance. Fire apparatus are not always available to respond from their stations to emergency incidents. They may be assigned to other emergencies or assignments. Weather and road conditions can also impact response quality.

Map 48 Residential Building Permits and ESRI GIS Four-Minute Travel Time from Fire Stations, 2012-2016



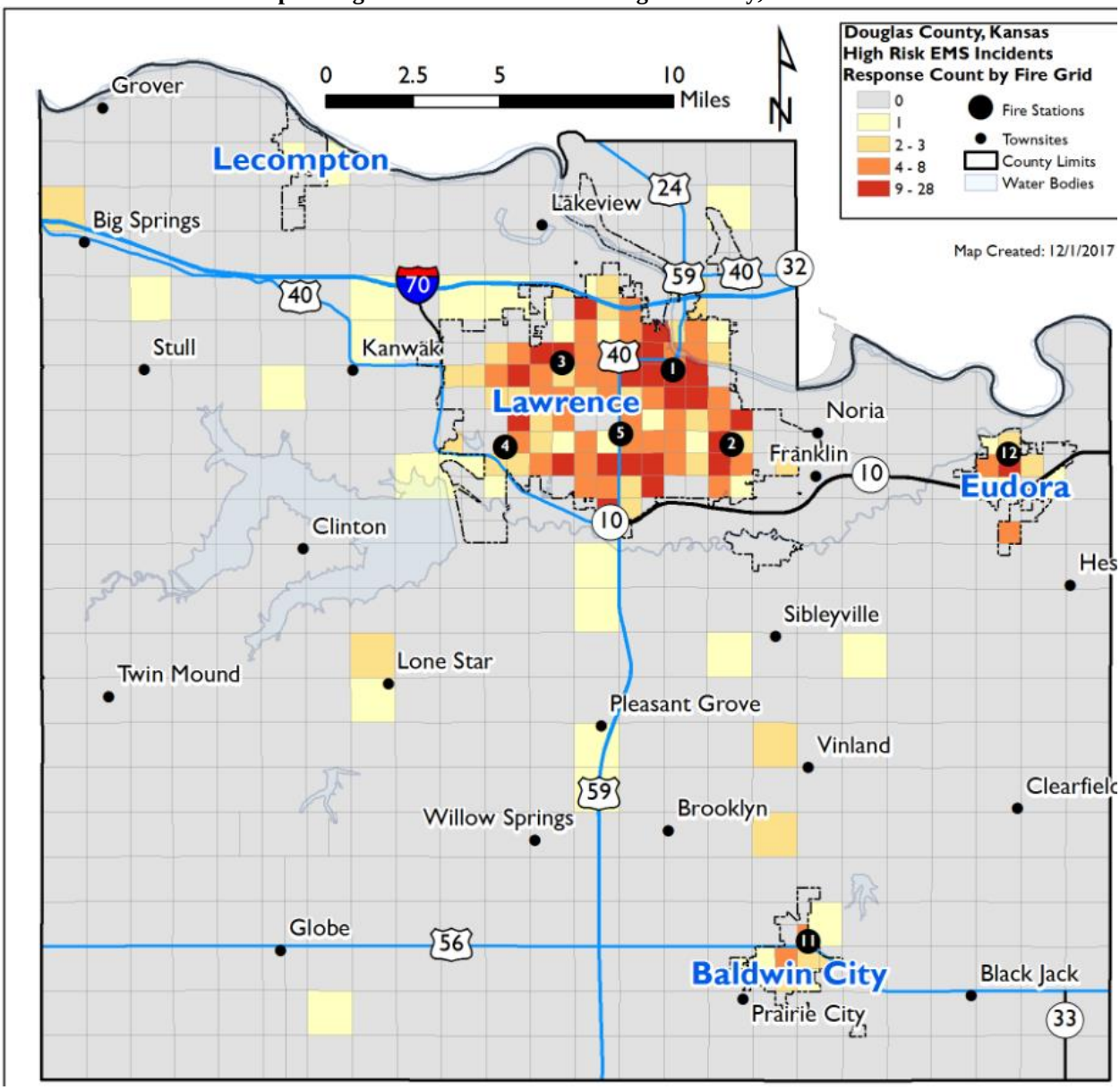
By plotting residential growth against potential benchmark response quality, new growth is occurring in areas beyond quality coverage capabilities.

Map 49 Structure Fires in Lawrence, 2012-2016, Incorporating Response Performance and New Building Permits



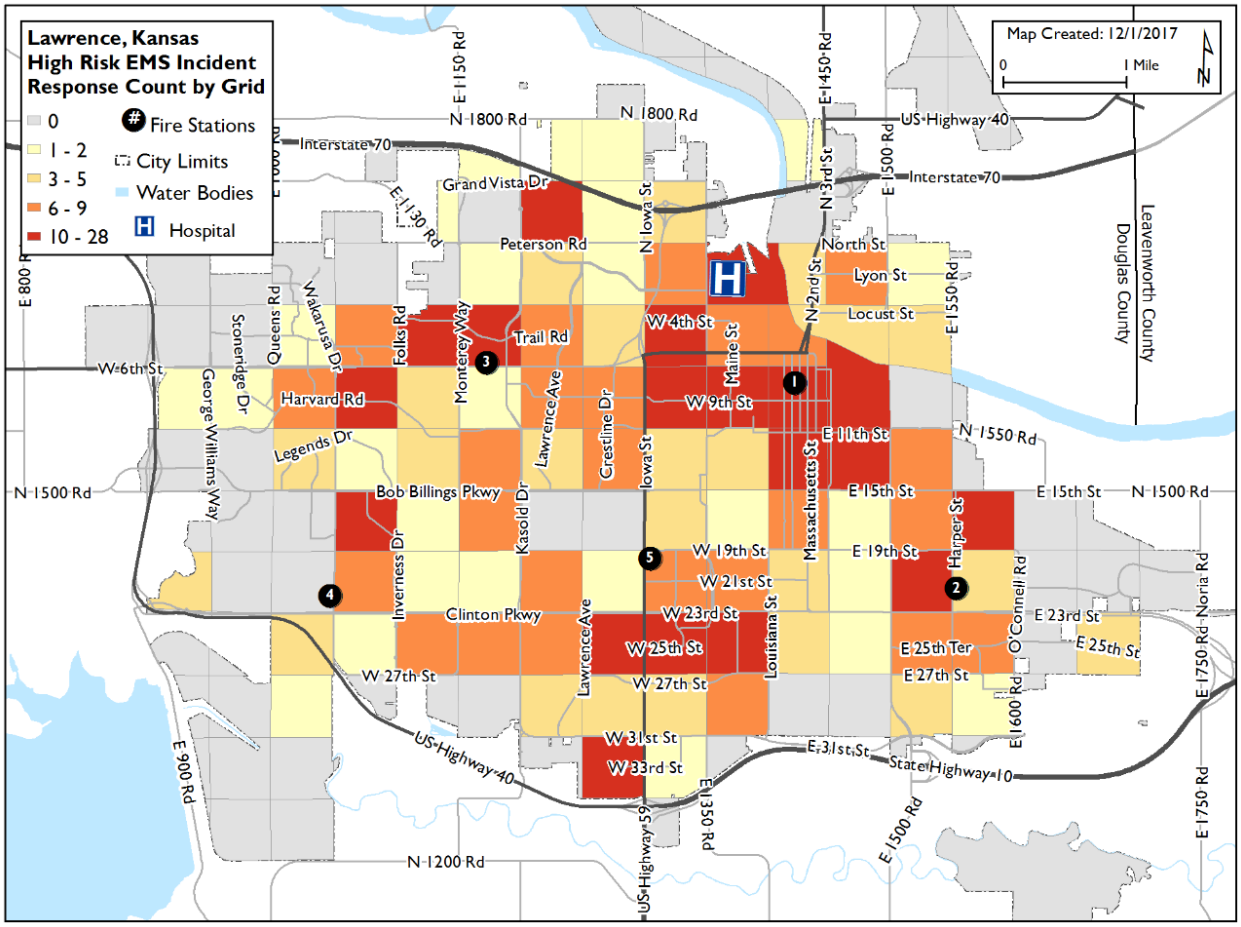
This map mixes performance history with the planning period community growth. Historical response quality by emergency service zone is married with community development. The geographical concentration of development to the northwest is in an area of poor baseline historical performance.

Map 50 High Risk EMS Events in Douglas County, 2012-2016



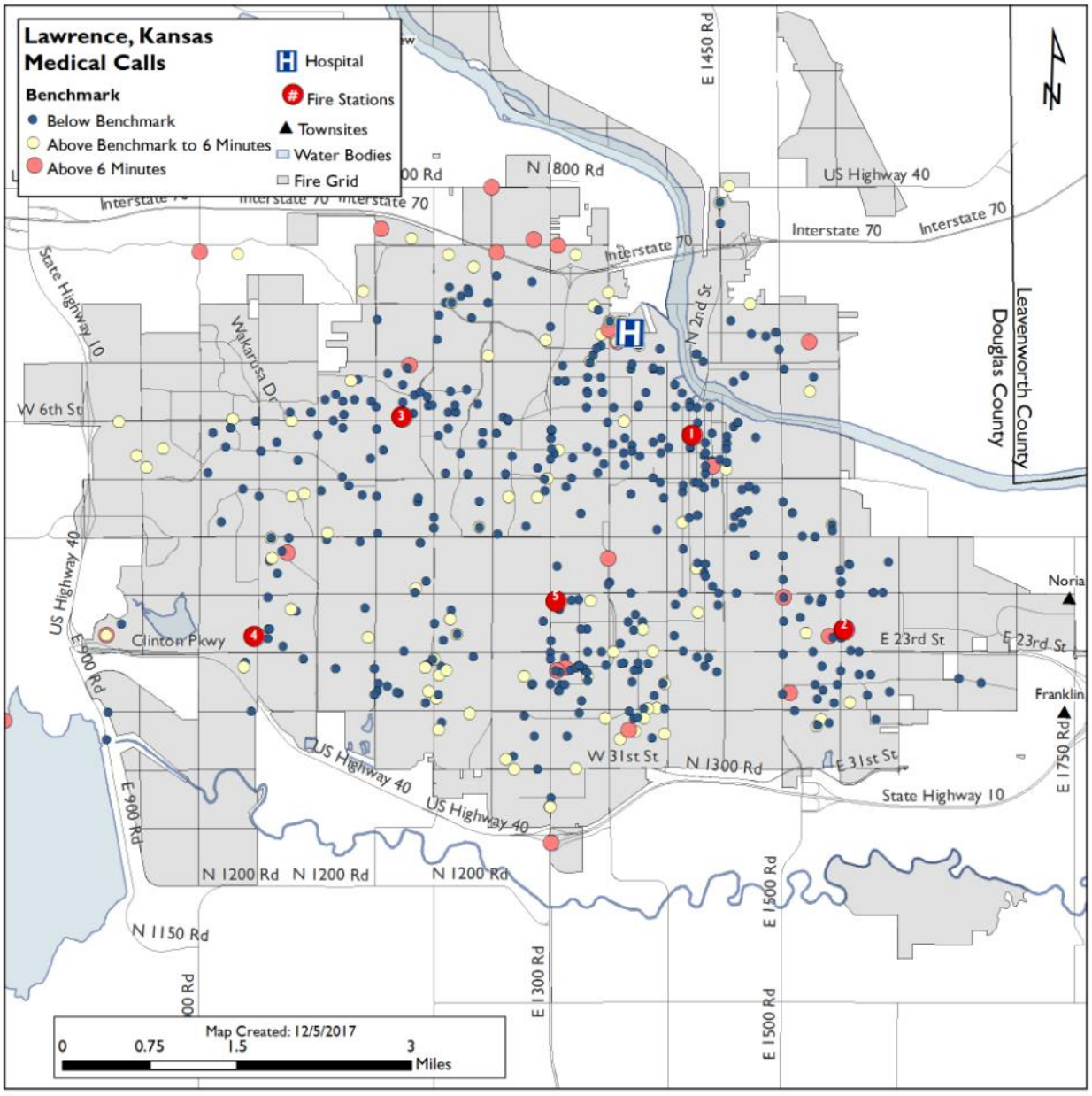
The concentration of high-risk EMS events within the county correlates with the established cities or towns. The primary location of historical occurrence has occurred within the City of Lawrence. High-risk EMS events are primarily cardiac arrest event types but also include electrocutions, drownings, shootings, and stabbings.

Map 51 High Risk EMS in Lawrence, 2012-2016



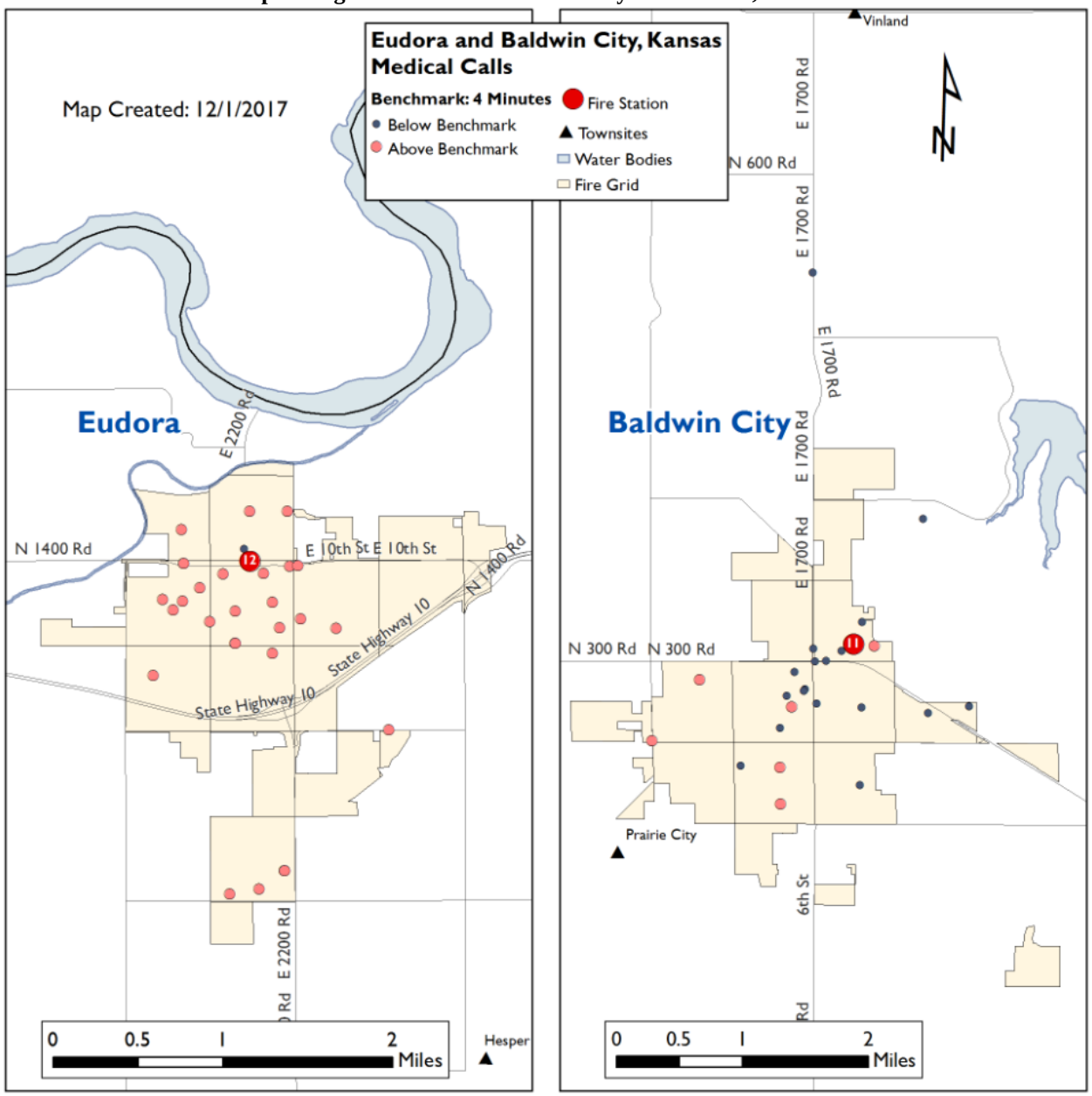
The frequency of high-risk medical events has correlated with a concentration around fire stations, particularly station #1. High-risk EMS events are primarily cardiac arrest event types but also include electrocutions, drownings, shootings, and stabbings.

Map 52 High Risk EMS in Lawrence, 2012-2016, Incorporating Response Time Performance



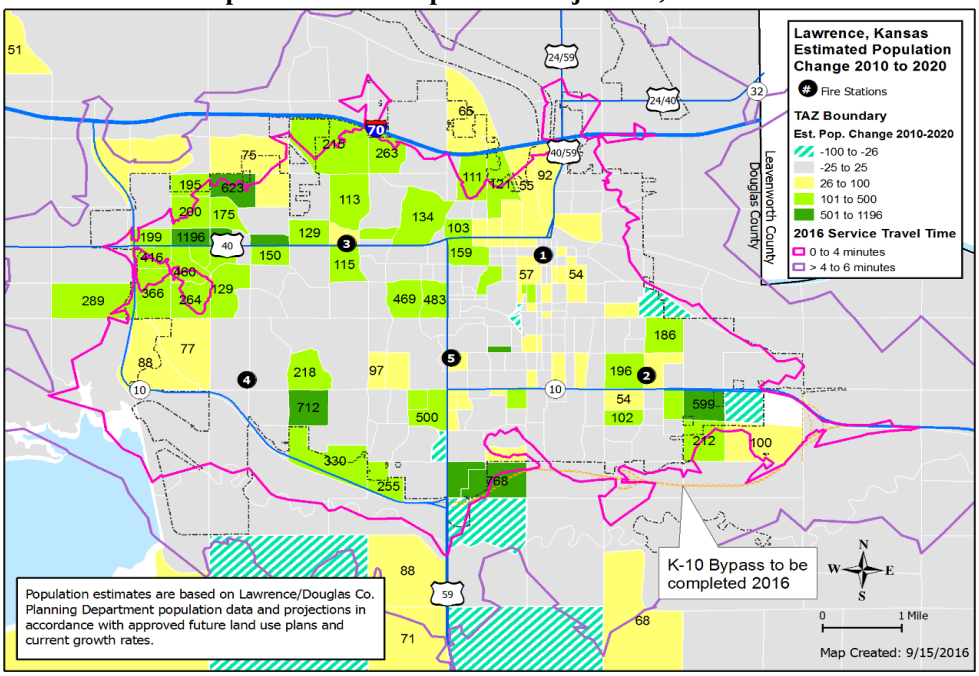
The primary location of delayed responses has been to the outer boundaries of the city, but also in areas of what should be close travel time proximity from fire stations. Again, resources are not always available due to their utilization or drawdown. Resource resiliency plays a factor in their reliability to provide quality response times. High-risk EMS events are primarily cardiac arrest event types but also include electrocutions, drownings, shootings, and stabbings.

Map 53 High Risk EMS in Baldwin City and Eudora, 2012-2016

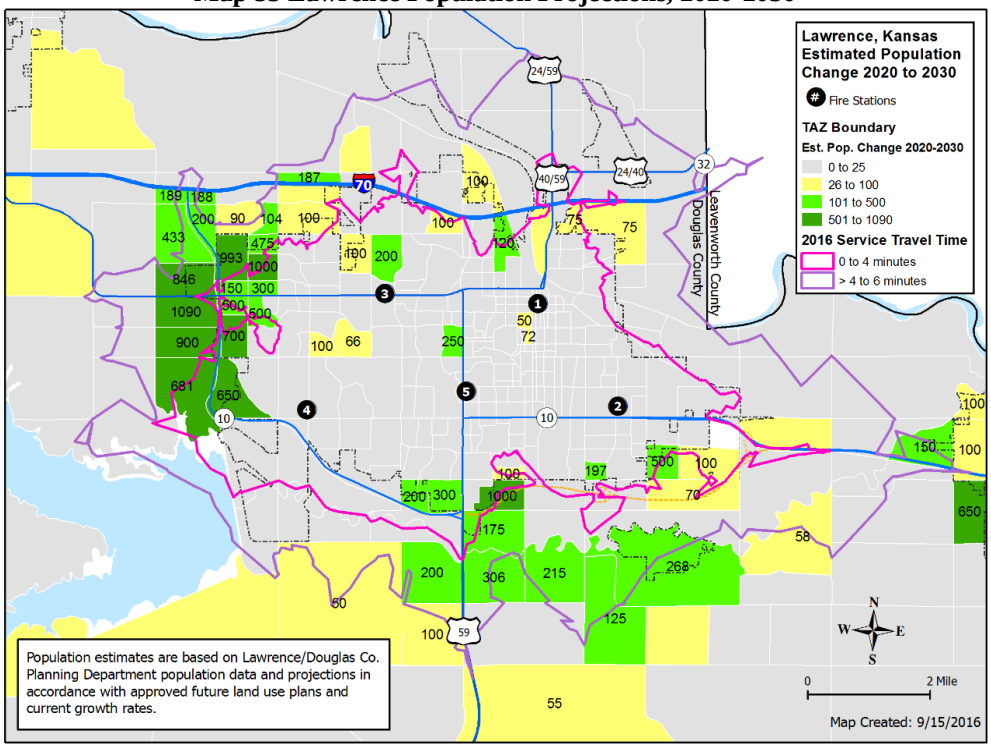


The frequency of benchmark response quality is correlated to the proximity to the fire stations. There are some responses within Eudora which did not meet the benchmark response time. During this data cycle, there was not an LDCFM apparatus stationed within Eudora. An ambulance was added in February of 2017 to station #12.

Map 54 Lawrence Population Projections, 2010-2020

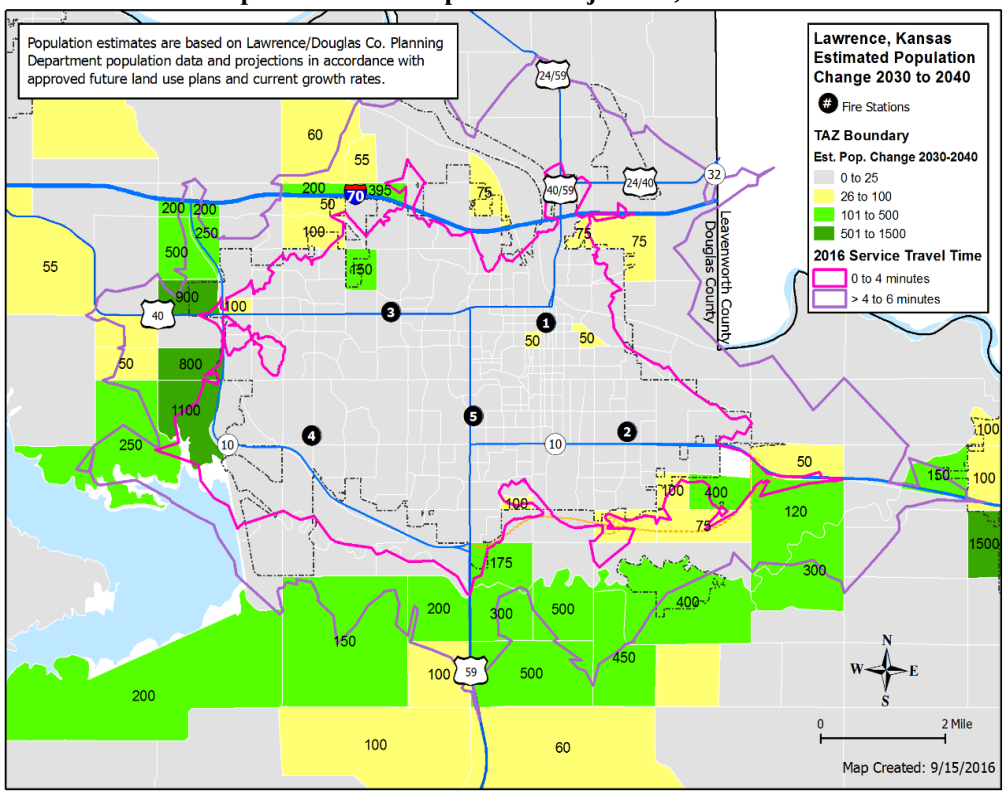


Map 55 Lawrence Population Projections, 2020-2030



Population growth is projected to continue to occur in the northwest and southeast portions of the city. Beyond the areas of quality response time for the first arriving emergency resource.

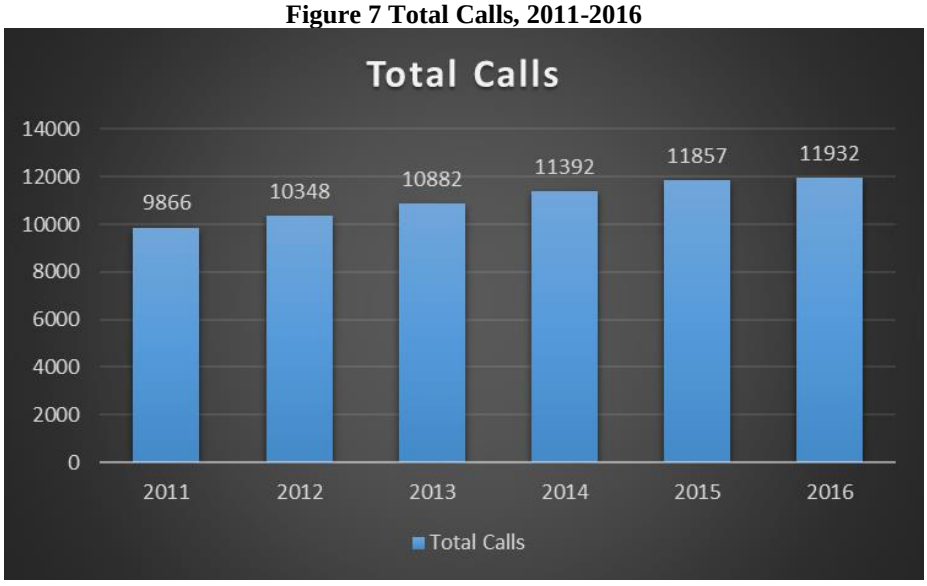
Map 56 Lawrence Population Projections, 2030-2040



Population growth projections beyond 2030 continue to grow in the northwest and southern areas of the city.

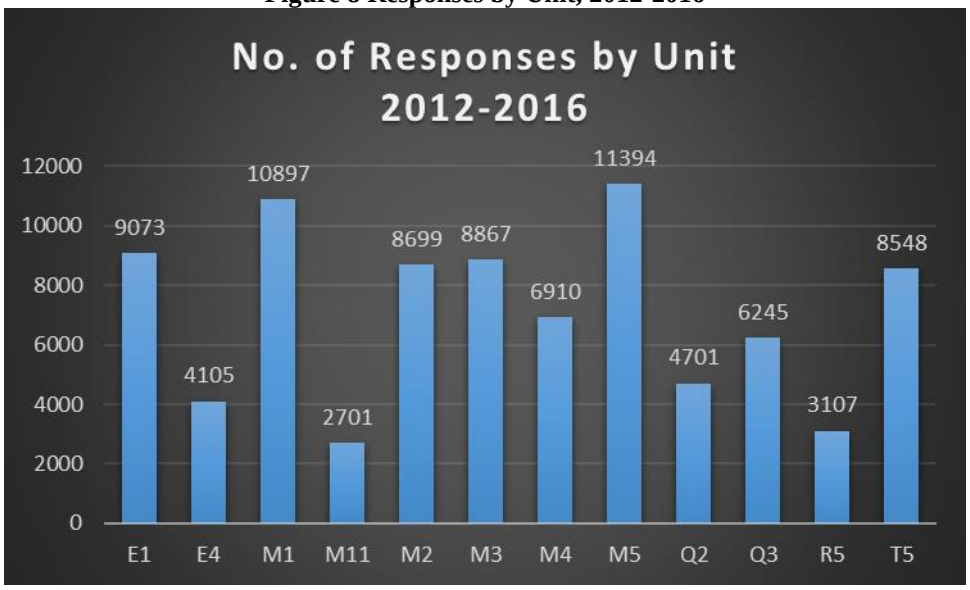
Historical Data

Figure 7 Total Calls, 2011-2016



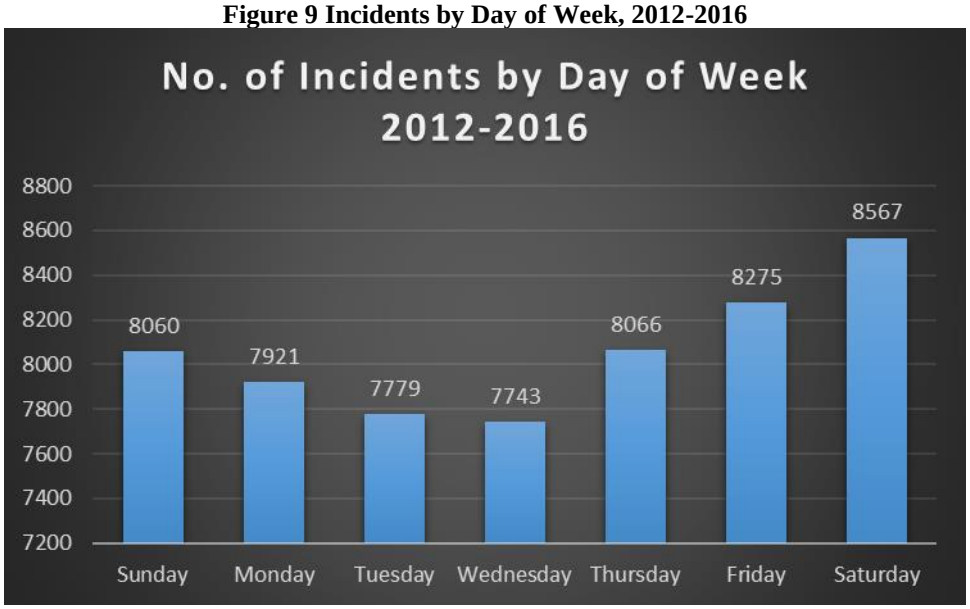
From 2012-2016 the total calls have increased 15.30%. The department is on track to exceed the total demand for 2016 in 2017.

Figure 8 Responses by Unit, 2012-2016



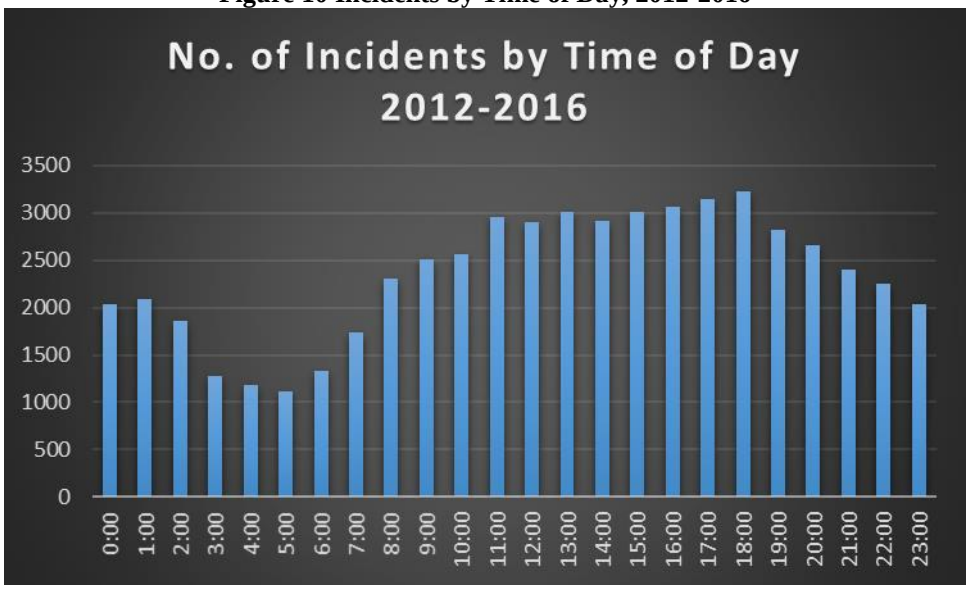
The heaviest demand on units from 2012-2016 was Engine 1 and Medic 1, followed by Truck 5 and Medic 5.

Figure 9 Incidents by Day of Week, 2012-2016



Statistically, Saturday has been the busiest day of the week which trends down in demand through Wednesday, then trends up again through Friday.

Figure 10 Incidents by Time of Day, 2012-2016



The time of day with heaviest demand was from 10:00 through 20:00. Peaking at 18:00.

I. Evaluation of Service Delivery

Performance Objectives – Benchmarks

The following statements are descriptors of performance goals relative to time. The statements include the mobilization of assets both human and physical, incorporating time, towards a quality outcome relative to a risk category and classification. A benchmark is defined as a quality standard or target from which something can be judged. Pursuing the benchmark or target will help define superior performance of the product, service or process. The department will be pursuing the benchmark or target with the goal of providing better outcomes to the community.

Fire Suppression Services Program

Distribution / First unit to stop loss

For 90 percent of all low, moderate, and high risk fire responses, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total, shall be: 6 minutes and 30 seconds within urban areas and 12 minutes and 30 seconds in rural areas. The first arriving unit shall be capable of: establishing command; completing an initial size up; establishing water supply; and initiating fire attack and/or rescue. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all moderate risk fire responses, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total, shall be: 6 minutes and 30 seconds within urban areas and 12 minutes and 30 seconds in rural areas. The first arriving unit shall be capable of: establishing command; completing an initial size up; establishing water supply; and initiating fire attack and/or rescue. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all high risk fire responses, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total, shall be: 6 minutes and 30 seconds within urban areas and 12 minutes and 30 seconds in rural areas. The first arriving unit shall be capable of: establishing command; completing an initial size up; establishing water supply; and initiating fire attack and/or rescue. These operations shall be performed utilizing safe operational procedures.

Concentration / Effective Response Force

For 90 percent of all low risk fire responses, the total response time for the arrival of the effective response unit (ERF), with a minimum of 3 firefighters and 1 officer, (4) total, shall be: 6 minutes and 30 seconds within urban areas and 12 minutes and 30 seconds in rural areas. The first arriving unit shall be capable of: establishing command; completing an initial size up; establishing water supply; and initiating fire attack and/or rescue. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all moderate risk fire responses, the total response time for the arrival of the effective response force (ERF), with a minimum of 7 firefighters and 3 officers; (10) total, shall be:

10 minutes and 30 seconds within urban areas and 18 minutes and 30 seconds in rural areas. The ERF shall be capable of: establishing command; providing a water supply; advancing an attack line and a backup line for fire control; complying with the requirements of two in-two out; searching and rescuing at-risk victims. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all high risk fire responses, the total response time for the arrival of the effective response force (ERF), with a minimum of 10 firefighters and 6 officers; (16) total, shall be: 10 minutes and 30 seconds within urban areas and 18 minutes and 30 seconds in rural areas. The ERF shall be capable of: establishing command; safety; providing an uninterrupted water supply or rural water operation; advancing an attack line and a backup line for fire control; complying with the requirements of two in-two out; establishing a rapid intervention team; completing forcible entry; searching and rescuing at-risk victims; evacuation; ventilating; exposure protection; controlling utilities; and performing salvage and overhaul. These operations shall be performed utilizing safe operational procedures.

Emergency Medical Services Program

Distribution / First unit to stop loss

For 90 percent of low risk emergency medical incidents, the total response time for the arrival of the first-due unit, with a minimum of 1 Advanced Emergency Medical Technician (AEMT); (1) total, shall be: 6 minutes and 30 seconds in urban areas, and 12 minutes and 30 seconds in rural areas. The first-due unit shall be capable of establishing command; performing cardiopulmonary resuscitation; and utilizing an automated external defibrillator. These operations shall be performed utilizing safe operational procedures.

For 90 percent of moderate risk emergency medical incidents, the total response time for the arrival of the first-due unit, with a minimum of 1 AEMT; (1) total, shall be: 6 minutes and 30 seconds in urban areas, and 12 minutes and 30 seconds in rural areas. The first-due unit shall be capable of establishing command; performing cardiopulmonary resuscitation; and utilizing an automated external defibrillator. These operations shall be performed utilizing safe operational procedures.

For 90 percent of high risk emergency medical incidents, the total response time for the arrival of the first-due unit, with a minimum of 1 AEMT; (1) total, shall be: 6 minutes and 30 seconds in urban areas, and 12 minutes and 30 seconds in rural areas. The first-due unit shall be capable of establishing command; performing cardiopulmonary resuscitation; and utilizing an automated external defibrillator. These operations shall be performed utilizing safe operational procedures.

For 90 percent of maximum risk emergency medical incidents, the total response time for the arrival of the first-due unit, with a minimum of 1 AEMT; (1) total, shall be: 6 minutes and 30 seconds in urban areas, and 12 minutes and 30 seconds in rural areas. The first-due unit shall be capable of establishing command; performing cardiopulmonary resuscitation; and utilizing an automated external defibrillator. These operations shall be performed utilizing safe operational procedures.

Concentration / Effective Response Force

For 90 percent of low risk emergency medical incidents, the total response time for the arrival of the effective response force, with a minimum of 1 paramedic and 1 AEMT; (2) total, shall be: 6 minutes and 30 seconds in urban areas and 12 minutes and 30 seconds in rural areas. The ERF shall be capable of: establishing command; conducting initial patient assessment; obtaining vitals and patient's medical history; performing cardiopulmonary resuscitation; and utilizing an automatic external defibrillator. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all moderate risk emergency medical incidents, the total response time for the arrival of the ERF (ALS unit), with a minimum of 1 paramedic and 1 AEMT; (2) total, shall be: 10 minutes and 30 seconds in urban areas, and 18 minutes and 30 seconds in rural areas. The ERF shall be capable of: establishing command; conducting primary and secondary patient assessment; triaging the patient; electrocardiogram interpretation; medication administration; bio-com communications with medical control; application of standing and physician orders; patient and equipment packaging for transport; and transportation to the hospital. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all high risk emergency medical incidents, the total response time for the arrival of the ERF (ALS unit), with a minimum of 1 paramedic, and 2 AEMTs; (3) total, shall be: 10 minutes and 30 seconds in urban areas, and 18 minutes and 30 seconds in rural areas. The ERF shall be capable of: establishing command; communicating with family or other witnesses; scene documentation; conducting primary and secondary patient assessment; triaging the patient; electrocardiogram interpretation; medication administration; bio-com communications with medical control; application of standing and physician orders; patient and equipment packaging for transport; and transportation to the hospital. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all maximum risk emergency medical incidents, the total response time for the arrival of the ERF (ALS unit), with a minimum of 2 paramedics and 2 AEMTs; (4) total, shall be: 10 minutes and 30 seconds in urban areas, and 18 minutes and 30 seconds in rural areas. The ERF shall be capable of: establishing command; communicating with family or other witnesses; scene documentation; conducting primary and secondary patient assessment; triaging the patient; electrocardiogram interpretation; medication administration; bio-com communications with medical control; application of standing and physician orders; patient and equipment packaging for transport; and transportation of multiple patients to the hospital. These operations shall be performed utilizing safe operational procedures.

Hazardous Materials Services Program

Distribution / First unit to stop loss

For 90 percent of all low risk hazardous materials response incidents, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total; shall be: 6 minutes and 30 seconds in urban areas and 12 minutes and 30 seconds in rural areas. The first-due unit shall be capable of: establishing command; performing an initial scene assessment; performing

air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; and requesting additional resources. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all moderate risk hazardous materials response incidents, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total; shall be: 6 minutes and 30 seconds in urban areas and 12 minutes and 30 seconds in rural areas. The first-due unit shall be capable of: establishing command; performing an initial scene assessment; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; and requesting additional resources. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all high risk hazardous materials response incidents, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total; shall be: 6 minutes and 30 seconds in urban areas and 12 minutes and 30 seconds in rural areas. The first-due unit shall be capable of: establishing command; performing an initial scene assessment; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; and requesting additional resources. These operations shall be performed utilizing safe operational procedures.

Concentration / Effective Response Force

For 90 percent of all low risk hazardous materials response incidents, the total response time for the arrival of the effective response force (ERF), with a minimum of 3 firefighters and 1 officer, (4) total; shall be: 6 minutes and 30 seconds in urban areas and 12 minutes and 30 seconds in rural areas. The effective response force shall be capable of: establishing command; performing an initial scene assessment; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; and requesting additional resources. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all moderate risk hazardous materials response incidents, the total response time for the arrival of the effective response force (ERF), with a minimum of 4 firefighters and 2 officers, (6) total; shall be: 6 minutes and 30 seconds in urban areas and 18 minutes and 30 seconds in rural areas. The effective response force shall be capable of: establishing command; performing an initial scene assessment; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; providing a hose line for protection; providing advanced medical care; transporting the patient to the hospital; and requesting additional resources. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all high risk hazardous materials response incidents, the total response time for the arrival of the effective response force (ERF), with a minimum of 10 firefighters and 6 officers, (16) total, 4 being hazardous materials technicians; shall be: 6 minutes and 30 seconds in urban areas and 18 minutes and 30 seconds in rural areas. The effective response force shall be capable of:

establishing command; performing an initial scene assessment; establishing a hazard zone; establishing a hazmat group; performing research; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; performing technical decontamination; providing a hose line for fire protection; providing advanced medical care; transporting the patient to the hospital; and requesting additional resources. These operations shall be performed utilizing safe operational procedures.

Technical Rescue Services Program

Distribution / First unit to stop loss

For 90 percent of all low, moderate, high, and maximum risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 2 firefighters and 1 officer; (3) total, shall be: 6 minutes and 30 seconds in urban areas. The first due shall be capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; These operations shall be performed utilizing safe operational procedures.

For 90 percent of all moderate risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 2 firefighters and 1 officer; (3) total, shall be: 10 minutes and 30 seconds in urban areas. The first due shall be capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; These operations shall be performed utilizing safe operational procedures.

For 90 percent of all high risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 2 firefighters and 1 officer; (3) total, shall be: 10 minutes and 30 seconds in urban areas. The first due shall be capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; These operations shall be performed utilizing safe operational procedures.

For 90 percent of all maximum risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 2 firefighter and 1 officer; (3) total, shall be: 10 minutes and 30 seconds in urban areas. The first due shall be capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; These operations shall be performed utilizing safe operational procedures.

Concentration / Effective Response Force

For 90 percent of all low risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 2 firefighters and 1 officer; (3) total, shall be: 6 minutes and 30 seconds in urban areas. The first due shall be capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; These operations shall be performed utilizing safe operational procedures.

For 90 percent of all moderate risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 4 firefighters and 2 officers; (6) total, shall be: 10 minutes and 30 seconds in urban areas. The effective response force shall be capable of: establishing

command; assessing scene safety; performing a scene assessment; requesting additional resources; hazard mitigation; providing patient care; providing transportation to the hospital. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all high risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 6 firefighters and 4 officers; (10) total, shall be: 10 minutes and 30 seconds in urban areas. The effective response force shall be capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; hazard mitigation; performing mechanical extrication; providing patient care; providing transportation to the hospital. These operations shall be performed utilizing safe operational procedures.

For 90 percent of all maximum risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 10 firefighters and 6 officers; 4 being technician level rescuers; (16) total, shall be: 10 minutes and 30 seconds in urban areas. The effective response force shall be capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; hazard mitigation; performing mechanical extrication; performing air-quality analysis; performing a confined space rescue; performing a trench rescue; performing a water/ice rescue; performing a high angle rescue; providing patient care; providing transportation to the hospital. These operations shall be performed utilizing safe operational procedures.

Performance Objectives – Baselines

The following statements are descriptors of historical response time performance relative to risk category and class representing qualifying responses between 2012 and 2016. The statements include the mobilization of assets both human and physical, incorporating time, towards a quality outcome relative to a risk category and classification. A baseline is the measurement of actual performance in an organizational context. Pursuing the benchmark or target from the baseline will help define superior performance of the product, service or process. The department will be pursuing the benchmark or target with the goal of providing better outcomes to the community.

Fire Suppression Services Program

Distribution / First unit to stop loss

For 90 percent of all low risk fire responses, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total, is: 9 minutes and 21 seconds within urban areas and 12 minutes and 41 seconds in rural areas. The first arriving unit is capable of: establishing command; completing an initial size up; establishing water supply; and initiating fire attack and/or rescue. These operations are performed utilizing safe operational procedures.

For 90 percent of all moderate risk fire responses, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total, is: 14 minutes and 46 seconds within urban areas and 16 minutes and 48 seconds in rural areas. The first arriving unit is capable of:

establishing command; completing an initial size up; establishing water supply; and initiating fire attack and/or rescue. These operations are performed utilizing safe operational procedures.

For 90 percent of all high risk fire responses, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total, is: 8 minutes and 31 seconds within urban areas and 13 minutes and 59 seconds in rural areas. The first arriving unit is capable of: establishing command; completing an initial size up; establishing water supply; and initiating fire attack and/or rescue. These operations are performed utilizing safe operational procedures.

Concentration / Effective Response Force

For 90 percent of all low risk fire responses, the total response time for the arrival of the effective response unit (ERF), with a minimum of 3 firefighters and 1 officer, (4) total, is: 9 minutes and 21 seconds within urban areas and 12 minutes and 1 second in rural areas. The ERF is capable of: establishing command; completing an initial size up; establishing water supply; and initiating fire attack and/or rescue. These operations are performed utilizing safe operational procedures.

For 90 percent of all moderate risk fire responses, the total response time for the arrival of the effective response force (ERF), with a minimum of 7 firefighters and 3 officers; (10) total, is: 14 minutes and 46 seconds within urban areas and 14 minutes and 47 seconds in rural areas. The ERF is capable of: establishing command; providing a water supply; advancing an attack line and a backup line for fire control; complying with the requirements of two in-two out; searching and rescuing at-risk victims. These operations are performed utilizing safe operational procedures.

For 90 percent of all high risk fire responses, the total response time for the arrival of the effective response force (ERF), with a minimum of 10 firefighters and 6 officers; (16) total, is: 13 minutes and 5 seconds within urban areas and 21 minutes and 1 second in rural areas. The ERF shall be capable of: establishing command; safety; providing an uninterrupted water supply; advancing an attack line and a backup line for fire control; complying with the requirements of two in-two out; establishing a rapid intervention team; completing forcible entry; searching and rescuing at-risk victims; evacuation; ventilating; exposure protection; controlling utilities; and performing salvage and overhaul. These operations are performed utilizing safe operational procedures.

Emergency Medical Services Program

Distribution / First unit to stop loss

For 90 percent of low, risk emergency medical incidents, the total response time for the arrival of the first-due unit, with a minimum of 1 AEMT; (1) total, is: 16 minutes and 27 seconds in urban areas, 15 minutes and 25 seconds in rural areas. The first-due unit is capable of establishing command; performing cardiopulmonary resuscitation; and utilizing an automated external defibrillator. These operations are performed utilizing safe operational procedures.

For 90 percent of moderate, risk emergency medical incidents, the total response time for the arrival of the first-due unit, with a minimum of 1 AEMT; (1) total, is: 10 minutes and 20 seconds in urban areas, 20 minutes and 3 seconds in rural areas. The first-due unit is capable of establishing command;

performing cardiopulmonary resuscitation; and utilizing an automated external defibrillator. These operations are performed utilizing safe operational procedures.

For 90 percent of high, risk emergency medical incidents, the total response time for the arrival of the first-due unit, with a minimum of 1 AEMT; (1) total, is: 10 minutes and 1 second in urban areas, 20 minutes and 38 seconds in rural areas. The first-due unit is capable of establishing command; performing cardiopulmonary resuscitation; and utilizing an automated external defibrillator. These operations are performed utilizing safe operational procedures.

For 90 percent of maximum, risk emergency medical incidents, the total response time for the arrival of the first-due unit, with a minimum of 1 AEMT; (1) total, is: 12 minutes and 40 seconds in urban areas, 16 minutes and 8 seconds in rural areas. The first-due unit is capable of establishing command; performing cardiopulmonary resuscitation; and utilizing an automated external defibrillator. These operations are performed utilizing safe operational procedures.

Concentration / Effective Response Force

For 90 percent of low risk emergency medical incidents, the total response time for the arrival of the effective response force, with a minimum of 1 paramedic and 1 AEMT; (2) total, is: 13 minutes and 40 seconds in urban areas and 15 minutes and 28 seconds in rural areas. The ERF is capable of: establishing command; conducting initial patient assessment; obtaining vitals and patient's medical history; performing cardiopulmonary resuscitation; and utilizing an automatic external defibrillator. These operations are performed utilizing safe operational procedures.

For 90 percent of all moderate risk emergency medical incidents, the total response time for the arrival of the ERF (ALS unit), with a minimum of 1 paramedic and 1 AEMT; (2) total, is: 11 minutes and 07 seconds in urban areas, 20 minutes and 10 seconds in rural areas. The ERF is capable of: establishing command; conducting primary and secondary patient assessment; triaging the patient; electrocardiogram interpretation; medication administration; bio-com communications with medical control; application of standing and physician orders; patient and equipment packaging for transport; and transportation to the hospital. These operations are performed utilizing safe operational procedures.

For 90 percent of all high risk emergency medical incidents, the total response time for the arrival of the ERF (ALS unit), with a minimum of 1 paramedic, and 2 AEMTs; (3) total, is: 11 minutes and 37 seconds in urban areas, 25 minutes and 5 seconds in rural areas. The ERF is capable of: establishing command; communicating with family or other witnesses; scene documentation; conducting primary and secondary patient assessment; triaging the patient; electrocardiogram interpretation; medication administration; bio-com communications with medical control; application of standing and physician orders; patient and equipment packaging for transport; and transportation to the hospital. These operations are performed utilizing safe operational procedures.

For 90 percent of all maximum risk emergency medical incidents, the total response time for the arrival of the ERF (ALS unit), with a minimum of 2 paramedics and 2 AEMTs; (4) total, shall be: 19

minutes and 30 seconds in urban areas, 24 minutes and 36 seconds in rural areas. The ERF shall be capable of: establishing command; communicating with family or other witnesses; scene documentation; conducting primary and secondary patient assessment; triaging the patient; electrocardiogram interpretation; medication administration; bio-com communications with medical control; application of standing and physician orders; patient and equipment packaging for transport; and transportation of multiple patients to the hospital. These operations shall be performed utilizing safe operational procedures.

Hazardous Materials Services Program

Distribution / First unit to stop loss

For 90 percent of all low risk hazardous materials response incidents, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total; is: 9 minutes and 21 seconds in urban areas. The first-due unit is capable of: establishing command; performing an initial scene assessment; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; and requesting additional resources. These operations are performed utilizing safe operational procedures.

For 90 percent of all moderate risk hazardous materials response incidents, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total; is: 10 minutes and 22 seconds in urban areas. The first-due unit is capable of: establishing command; performing an initial scene assessment; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; and requesting additional resources. These operations are performed utilizing safe operational procedures.

For 90 percent of all high risk hazardous materials response incidents, the total response time for the arrival of the first-due unit, with a minimum of 3 firefighters and 1 officer, (4) total; is: 12 minutes and 16 seconds in urban areas 29 minutes and 28 seconds in rural areas. The first-due unit is capable of: establishing command; performing an initial scene assessment; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; and requesting additional resources. These operations are performed utilizing safe operational procedures.

Concentration / Effective Response Force

For 90 percent of all low risk hazardous materials response incidents, the total response time for the arrival of the effective response force (ERF), with a minimum of 3 firefighters and 1 officer, (4) total; is: 9 minutes and 31 seconds in urban areas. The effective response force is capable of: establishing command; performing an initial scene assessment; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; and requesting additional resources. These operations are performed utilizing safe operational procedures.

For 90 percent of all moderate risk hazardous materials response incidents, the total response time for the arrival of the effective response force (ERF), with a minimum of 4 firefighters and 2 officers,

(6) total; is: 11 minutes and 7 seconds in urban areas. The effective response force is capable of: establishing command; performing an initial scene assessment; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; providing a hose line for protection; providing advanced medical care; transporting the patient to the hospital; and requesting additional resources. These operations are performed utilizing safe operational procedures.

For 90 percent of all high risk hazardous materials response incidents, the total response time for the arrival of the effective response force (ERF), with a minimum of 10 firefighters and 6 officers, (16) total, 4 being hazardous materials technicians; is: 30 minutes and 25 seconds in urban areas and 1 hour, 20 minutes and 24 seconds in rural areas. The effective response force is capable of: establishing command; performing an initial scene assessment; establishing a hazard zone; establishing a hazmat group; performing research; performing air quality analysis; assisting with an evacuation; ventilating a structure; performing gross decontamination; performing technical decontamination; providing a hose line for fire protection; providing advanced medical care; transporting the patient to the hospital; and requesting additional resources. These operations are performed utilizing safe operational procedures.

Technical Rescue Services Program

Distribution / First unit to stop loss

For 90 percent of all low risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 2 firefighters and 1 officer; (3) total, is: 8 minutes and 28 seconds in urban areas. The first due is capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; These operations are performed utilizing safe operational procedures.

For 90 percent of all moderate risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 2 firefighters and 1 officer; (3) total, is: 9 minutes and 0 seconds in urban areas. The first due is capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; These operations are performed utilizing safe operational procedures.

For 90 percent of all high risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 2 firefighters and 1 officer; (3) total, is: 8 minutes and 41 seconds in urban areas. The first due is capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; These operations are performed utilizing safe operational procedures.

For 90 percent of all maximum risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 2 firefighters and 1 officer; (3) total, is: 9 minutes and 24 seconds in urban areas. The first due is capable of: establishing command; assessing scene safety;

performing a scene assessment; requesting additional resources; These operations are performed utilizing safe operational procedures.

Concentration / Effective Response Force

For 90 percent of all low risk technical rescue incidents, the total response time for the arrival of the effective response force (ERF), with a minimum of 2 firefighters and 1 officer; (3) total, is: 8 minutes and 28 seconds in urban areas. The first due is capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; These operations are performed utilizing safe operational procedures.

For 90 percent of all moderate risk technical rescue incidents, the total response time for the arrival of the effective response force (ERF), with a minimum of 4 firefighters and 2 officers; (6) total, is: 10 minutes and 13 seconds in urban areas. The effective response force is capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; hazard mitigation; providing patient care; providing transportation to the hospital. These operations are performed utilizing safe operational procedures.

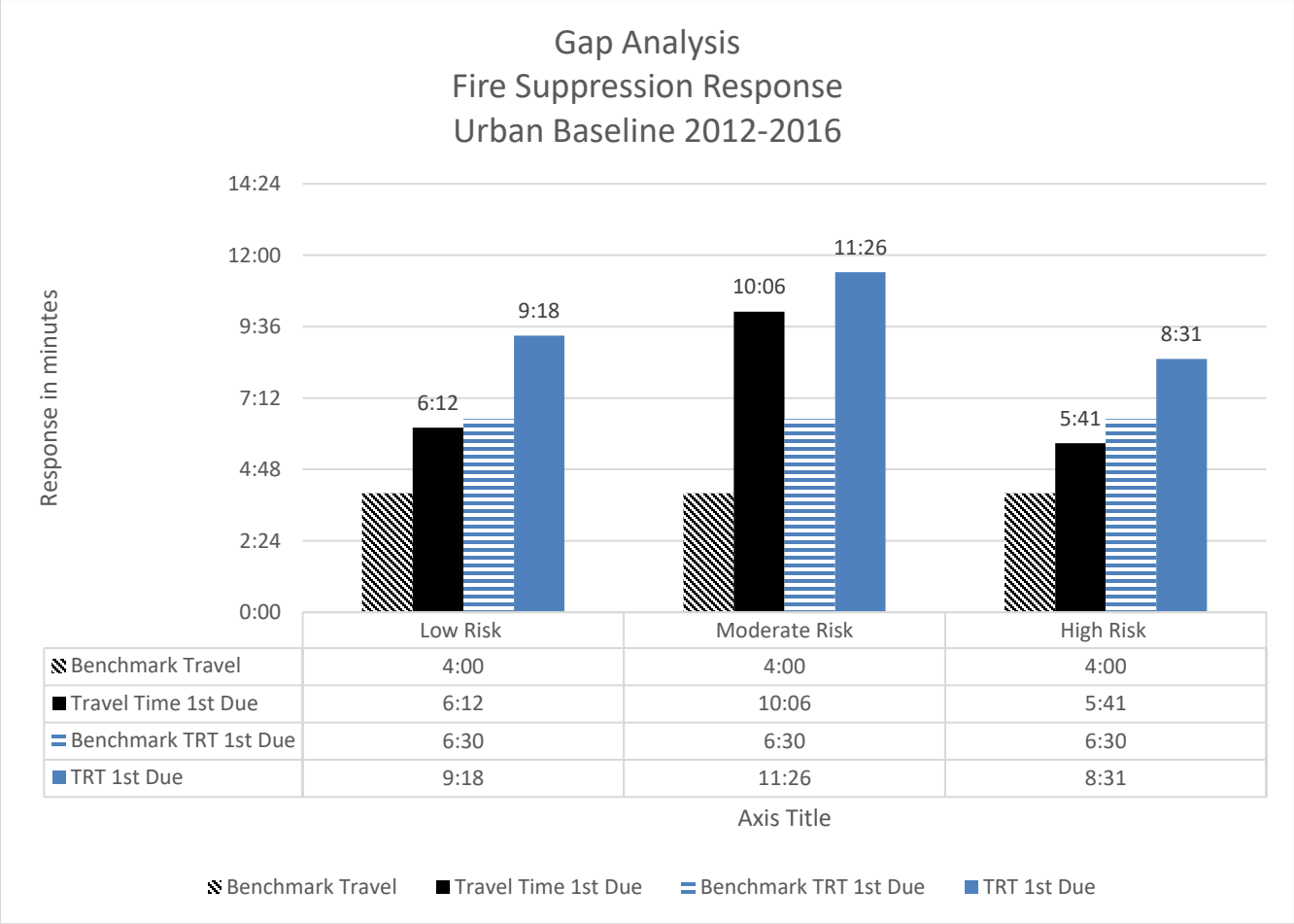
For 90 percent of all high risk technical rescue incidents, the total response time for the arrival of the effective response force (ERF), with a minimum of 6 firefighters and 4 officers; (10) total, is: not applicable because there were no qualifying incidents in urban areas. The effective response force is capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; hazard mitigation; performing mechanical extrication; providing patient care; providing transportation to the hospital. These operations are performed utilizing safe operational procedures.

For 90 percent of all maximum risk technical rescue incidents, the total response time for the arrival of the first due unit, with a minimum of 10 firefighters and 6 officers; 3 being technician level rescuers; (16) total, is: 32 minutes and 54 seconds in urban areas. The effective response force is capable of: establishing command; assessing scene safety; performing a scene assessment; requesting additional resources; hazard mitigation; performing mechanical extrication; performing air-quality analysis; performing a confined space rescue; performing a trench rescue; performing a water/ice rescue; performing a high angle rescue; providing patient care; providing transportation to the hospital. These operations are performed utilizing safe operational procedures.

Performance Gaps – Baseline to Benchmark Time Gap

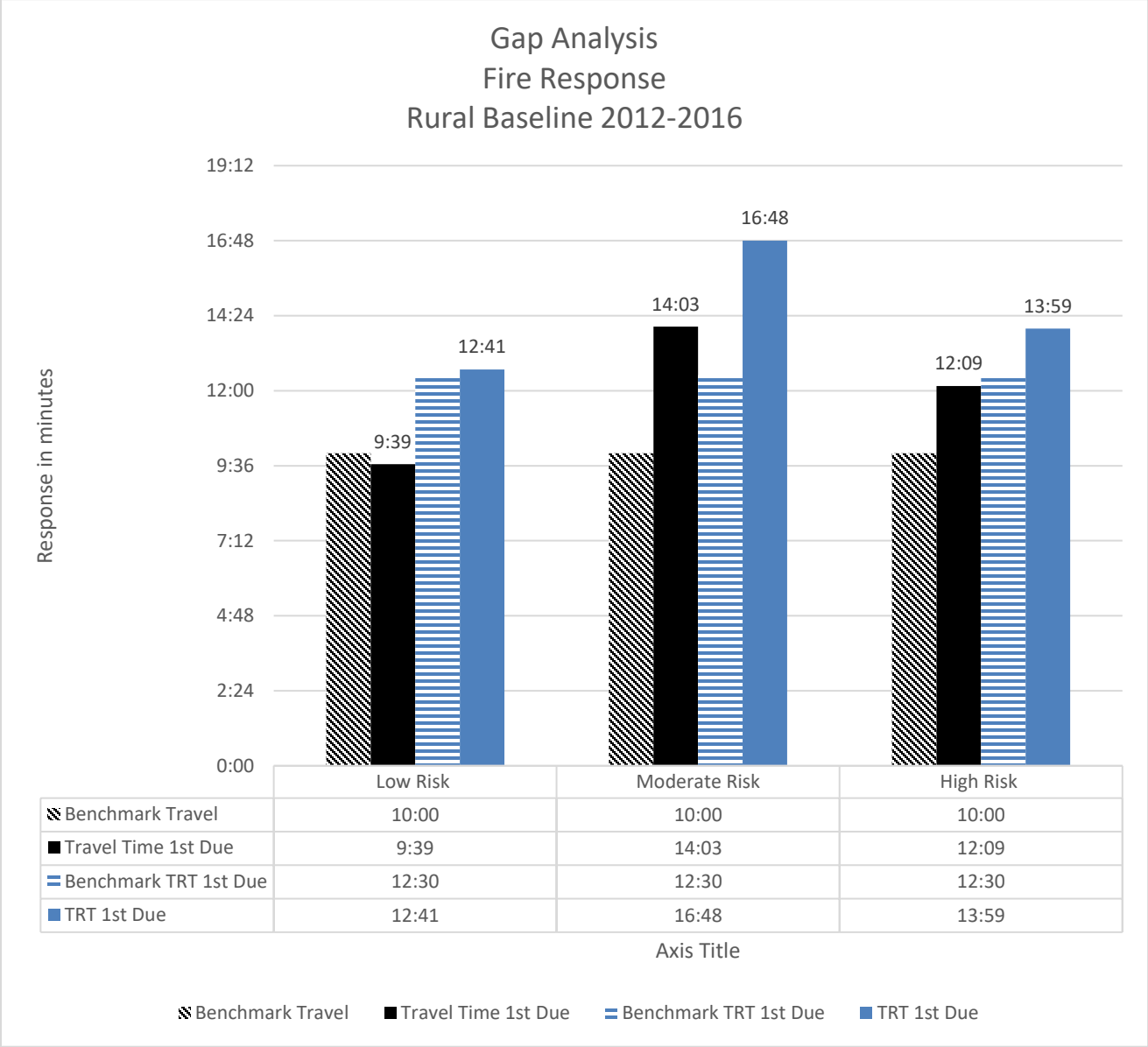
Fire Suppression Services Program

Figure 11 Baseline-Benchmark Gap Analysis - Fire Suppression, Urban, 2012-2016



Urban Baseline and Benchmark Distribution Gap Analysis						
Fire Suppression	Travel Time 1st Due	Benchmark Travel	Travel Time Gap	TRT 1st Due	Benchmark TRT 1st Due	TRT Gap
Low Risk	6:12	4:00	2:12	9:18	6:30	2:48
Moderate Risk	10:06	4:00	6:06	11:26	6:30	4:56
High Risk	5:41	4:00	1:41	8:31	6:30	2:01

Figure 12 Baseline-Benchmark Gap Analysis - Fire Response, Rural, 2012-2016

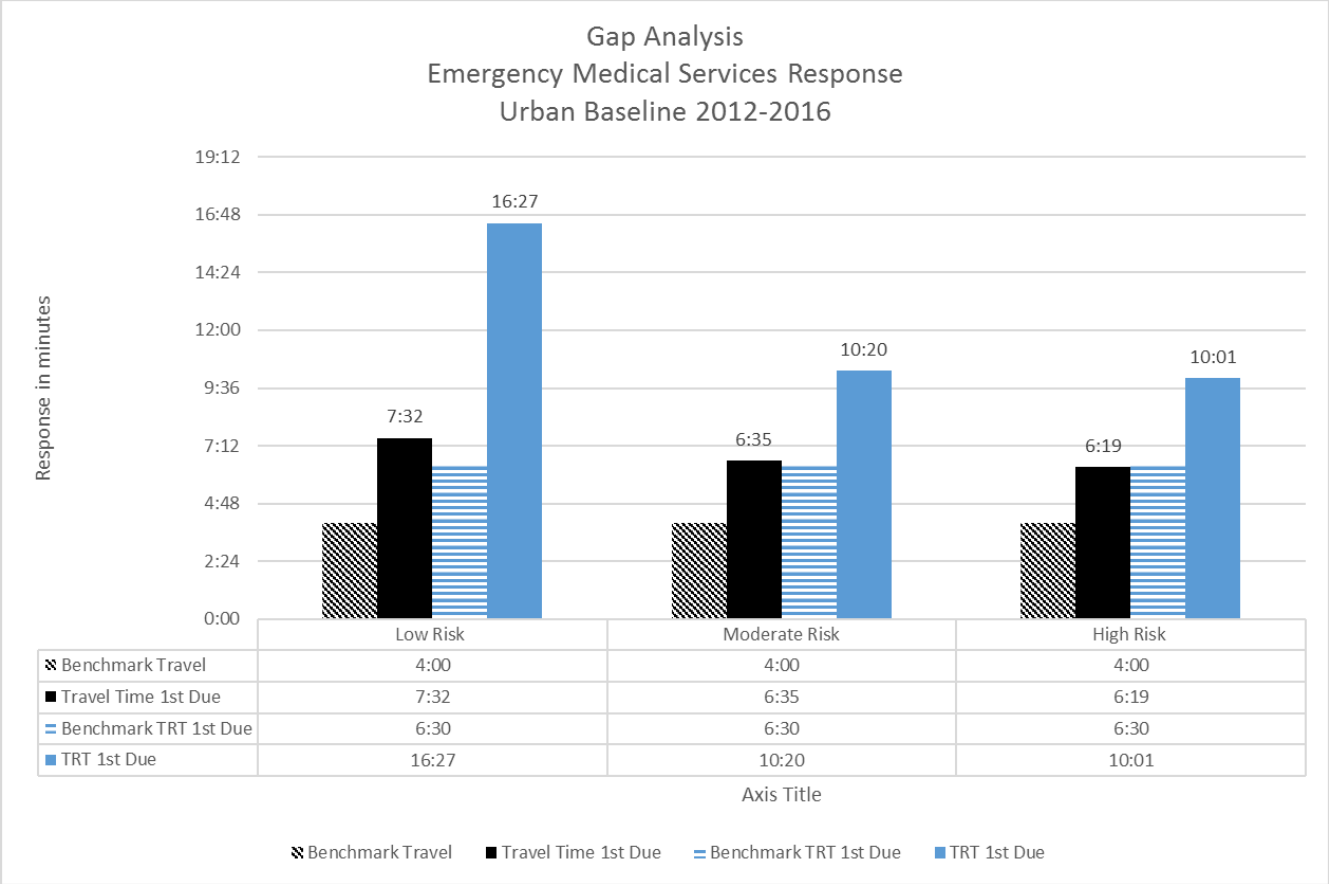


Rural Baseline and Benchmark Distribution Gap Analysis

Fire Suppression	Travel Time 1st Due	Benchmark Travel	Travel Time Gap	TRT 1st Due	Benchmark TRT 1st Due	TRT Gap
Low Risk	9:31	10:00	-00:29	12:41	14:30	-01:49
Moderate Risk	14:03	10:00	4:03	16:48	14:30	2:18
High Risk	12:09	10:00	2:09	13:59	14:30	-00:31

Emergency Medical Services Program

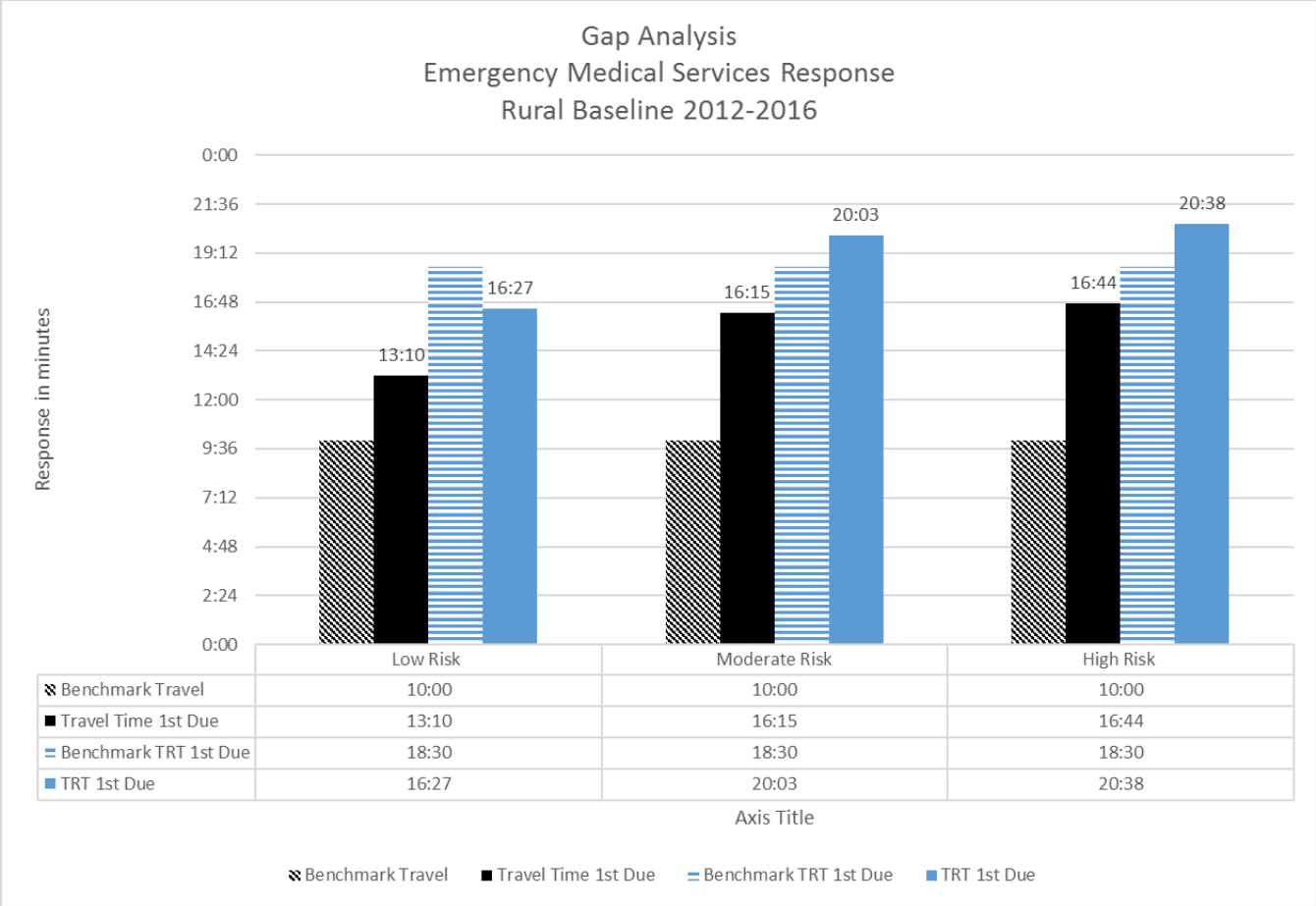
Figure 13 Baseline-Benchmark Gap Analysis - EMS, Urban, 2012-2016



Baseline and Benchmark Distribution Gap Analysis

Emergency Medical Services	Travel Time 1st Due	Benchmark Travel	Travel Time Gap	TRT 1st Due	Benchmark TRT 1st Due	TRT Gap
Low Risk	7:32	4:00	3:32	16:27	6:30	9:57
Moderate Risk	6:35	4:00	2:35	10:20	6:30	3:50
High Risk	6:19	4:00	2:19	10:01	6:30	3:31
Maximum Risk	12:40	4:00	8:40	16:45	6:30	10:15

Figure 14 Baseline-Benchmark Gap Analysis - EMS, Rural, 2012-2016

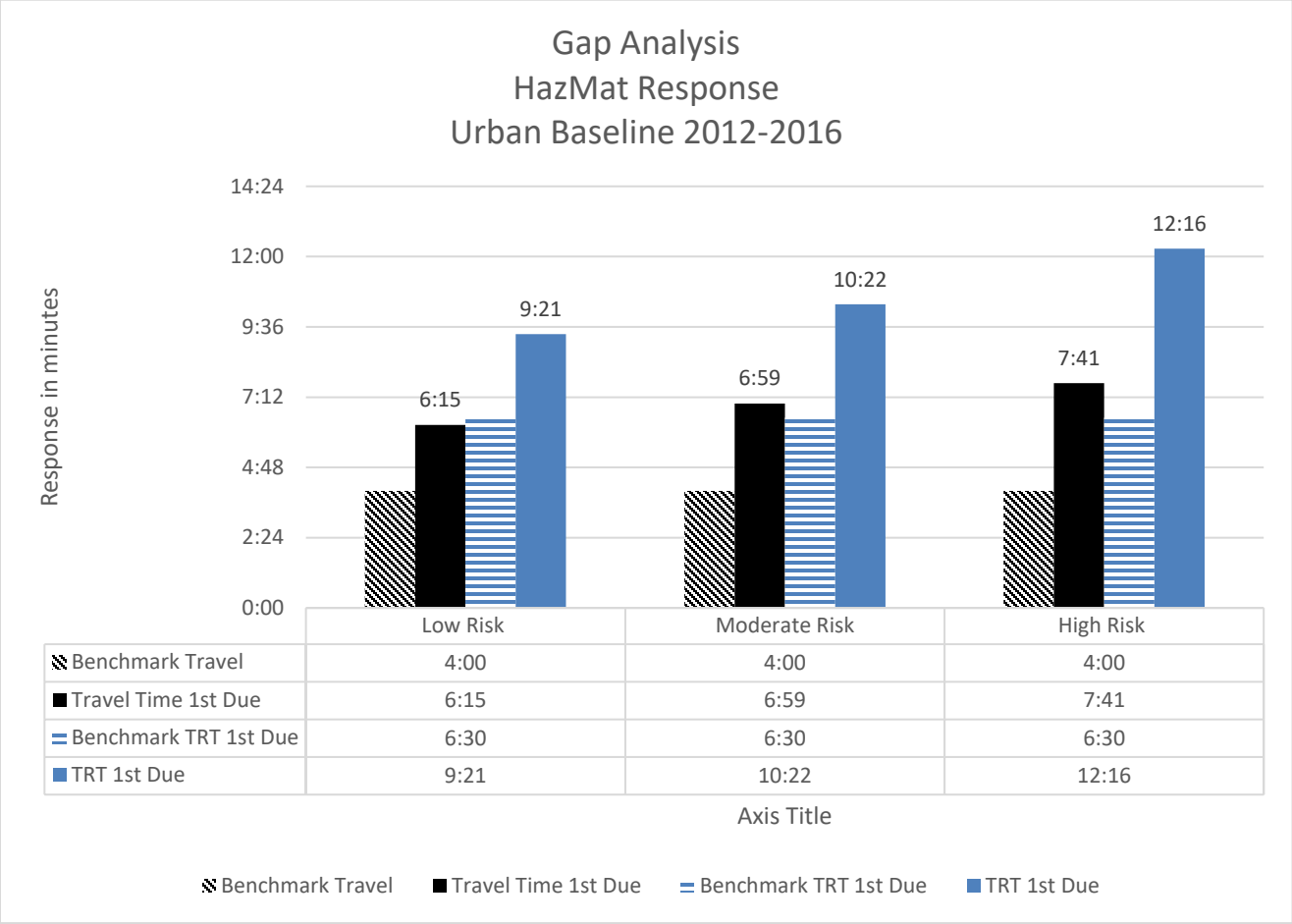


Baseline and Benchmark Distribution Gap Analysis

Emergency Medical Services	Travel Time 1st Due	Benchmark Travel	Travel Time Gap	TRT 1st Due	Benchmark TRT 1st Due	TRT Gap
Low Risk	13:10	10:00	3:10	16:27	18:30	-02:03
Moderate Risk	16:15	10:00	6:15	20:03	18:30	1:33
High Risk	16:44	10:00	6:44	20:38	18:30	2:08
Maximum Risk	16:08	10:00	6:08	20:44	18:30	2:14

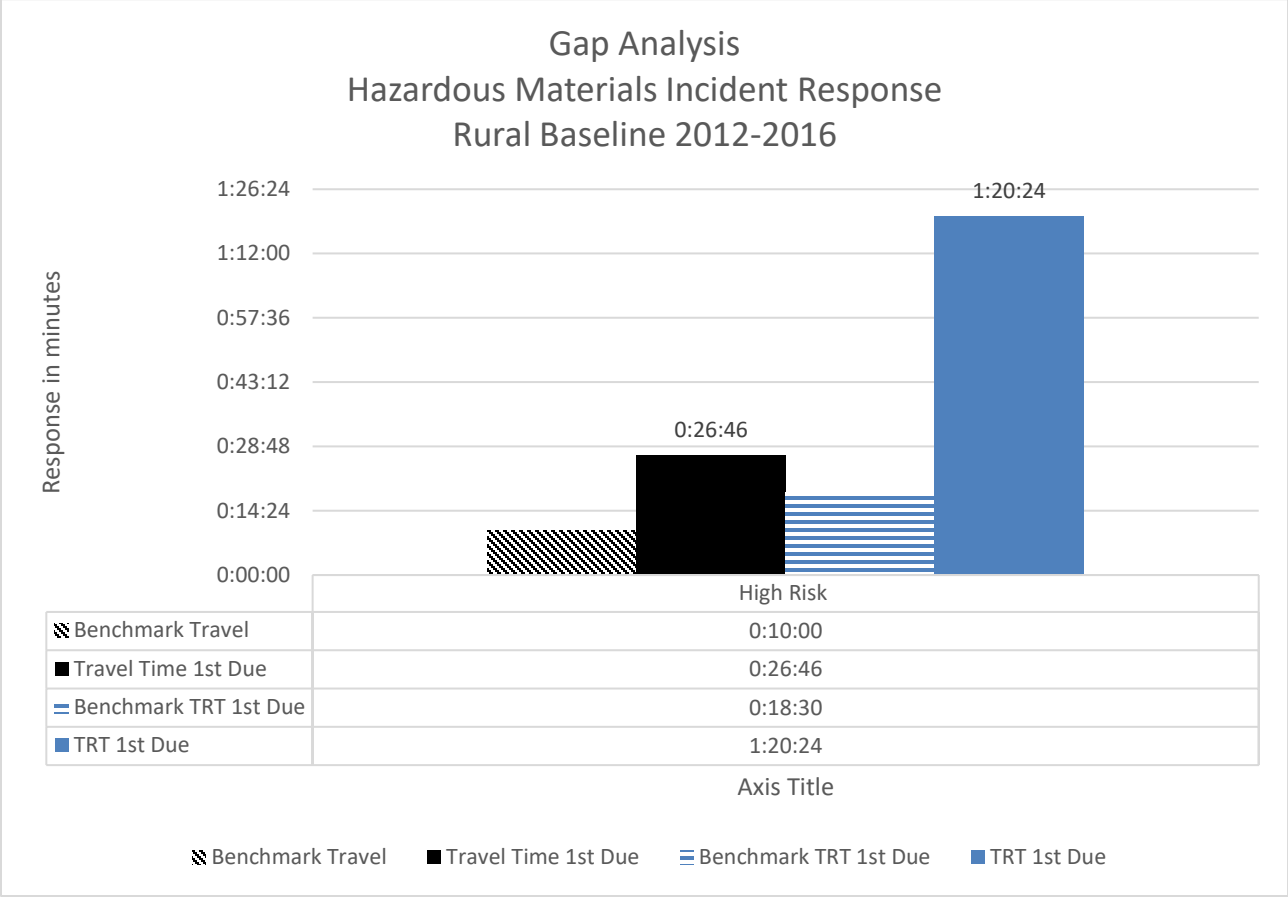
Hazardous Materials Services Program

Figure 15 Baseline-Benchmark Gap Analysis - HazMat, Urban, 2012-2016



Hazardous Materials Services	Travel Time 1st Due	Benchmark Travel	Travel Time Gap	TRT 1st Due	Benchmark TRT 1st Due	TRT Gap
Low Risk	6:15	4:00	2:15	9:21	6:30	2:51
Moderate Risk	6:59	4:00	2:59	10:22	6:30	3:52
High Risk	7:41	4:00	3:41	12:16	6:30	5:46

Figure 16 Baseline-Benchmark Gap Analysis - HazMat, Rural, 2012-2016

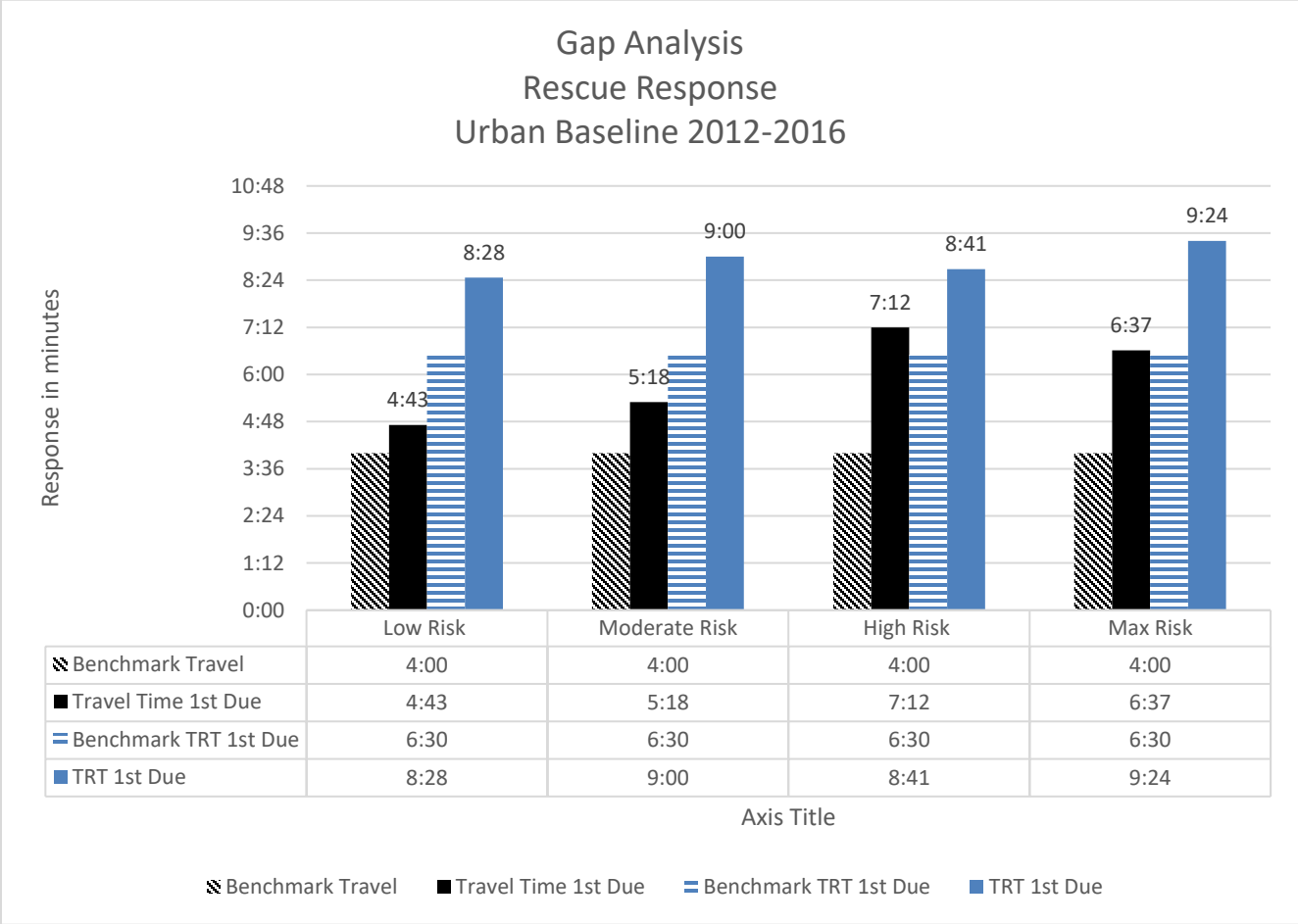


Rural Baseline and Benchmark Distribution Gap Analysis

Hazardous Materials Services	Travel Time 1st Due	Benchmark Travel	Travel Time Gap	TRT 1st Due	Benchmark TRT 1st Due	TRT Gap
High Risk	26:46	10:00	16:46	01:20:24	14:30	05:54

Technical Rescue Services Program

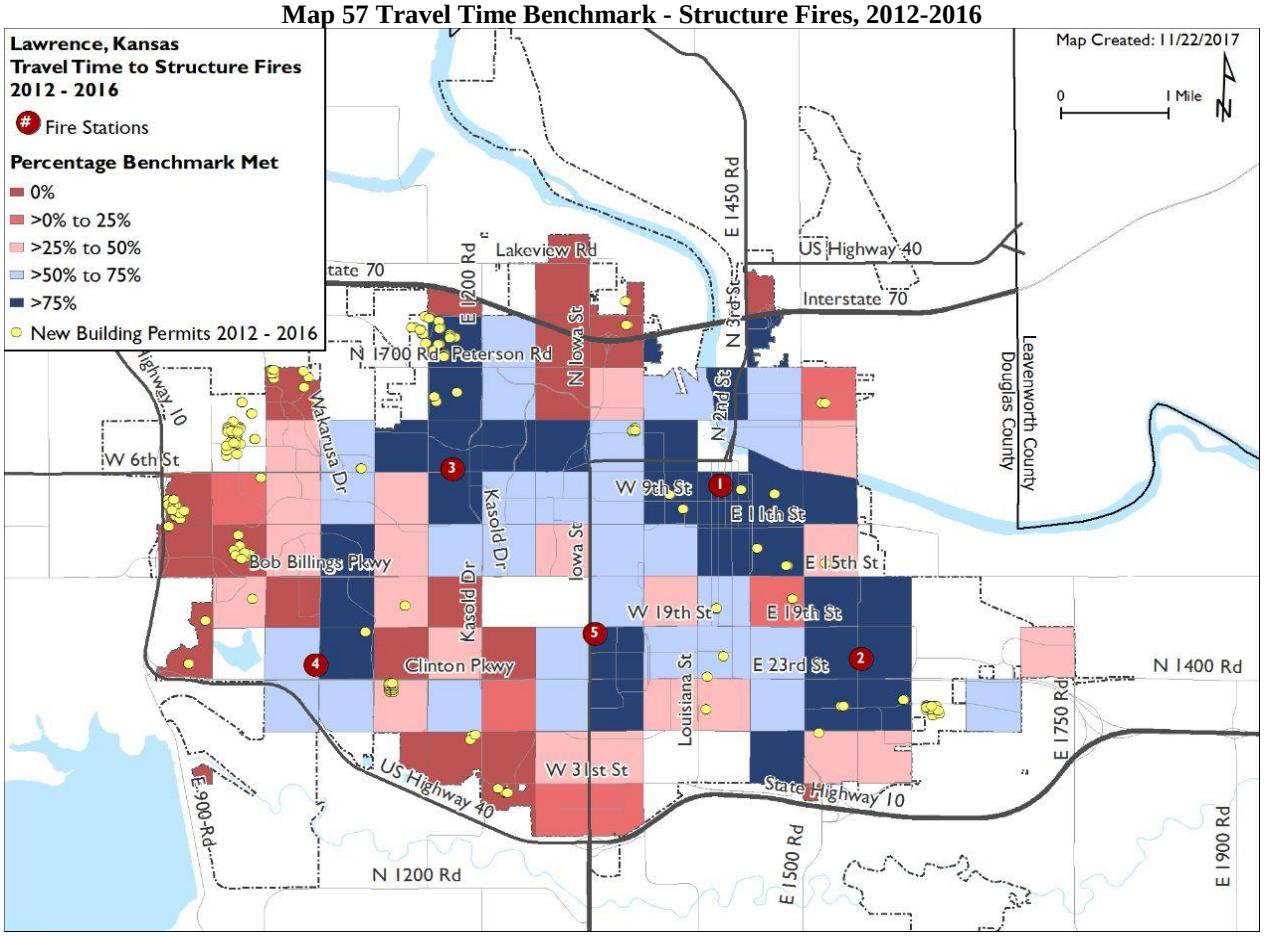
Figure 17 Baseline-Benchmark Gap Analysis - Rescue, Urban, 2012-2016



Technical Rescue	Travel Time 1st Due	Benchmark Travel	Travel Time Gap	TRT 1st Due	Benchmark TRT 1st Due	TRT Gap
Low Risk	4:43	4:00	0:43	8:28	6:30	1:58
Moderate Risk	5:18	4:00	1:18	9:00	6:30	2:30
High Risk	7:12	4:00	3:12	8:41	6:30	2:11
Maximum Risk	6:37	4:00	2:37	9:24	6:30	2:54

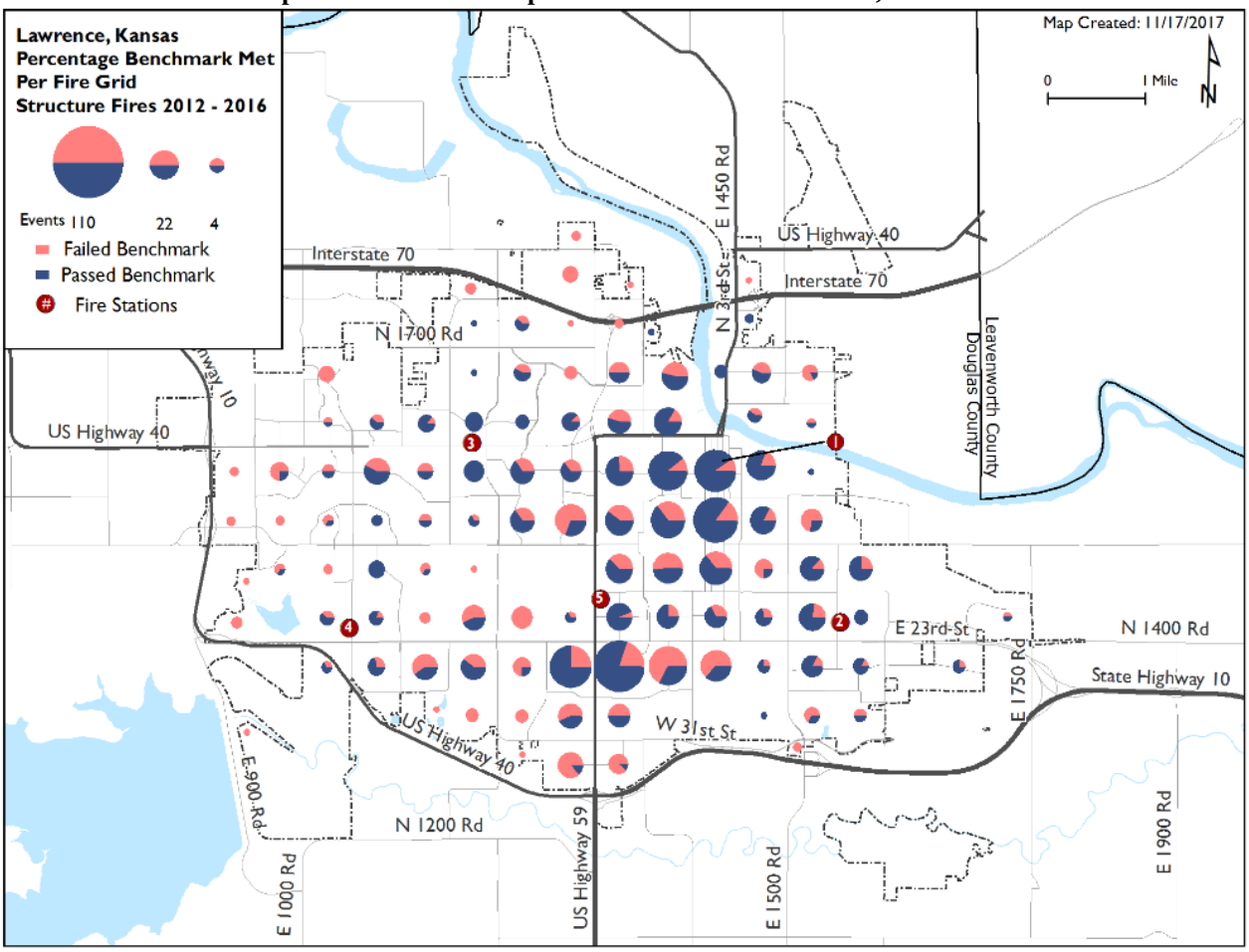
Areas of Program Delivery and Coverage Improvement

Map 57 Travel Time Benchmark - Structure Fires, 2012-2016



Historical responses have not met performance benchmarks in the northwest and southern portions of the city.

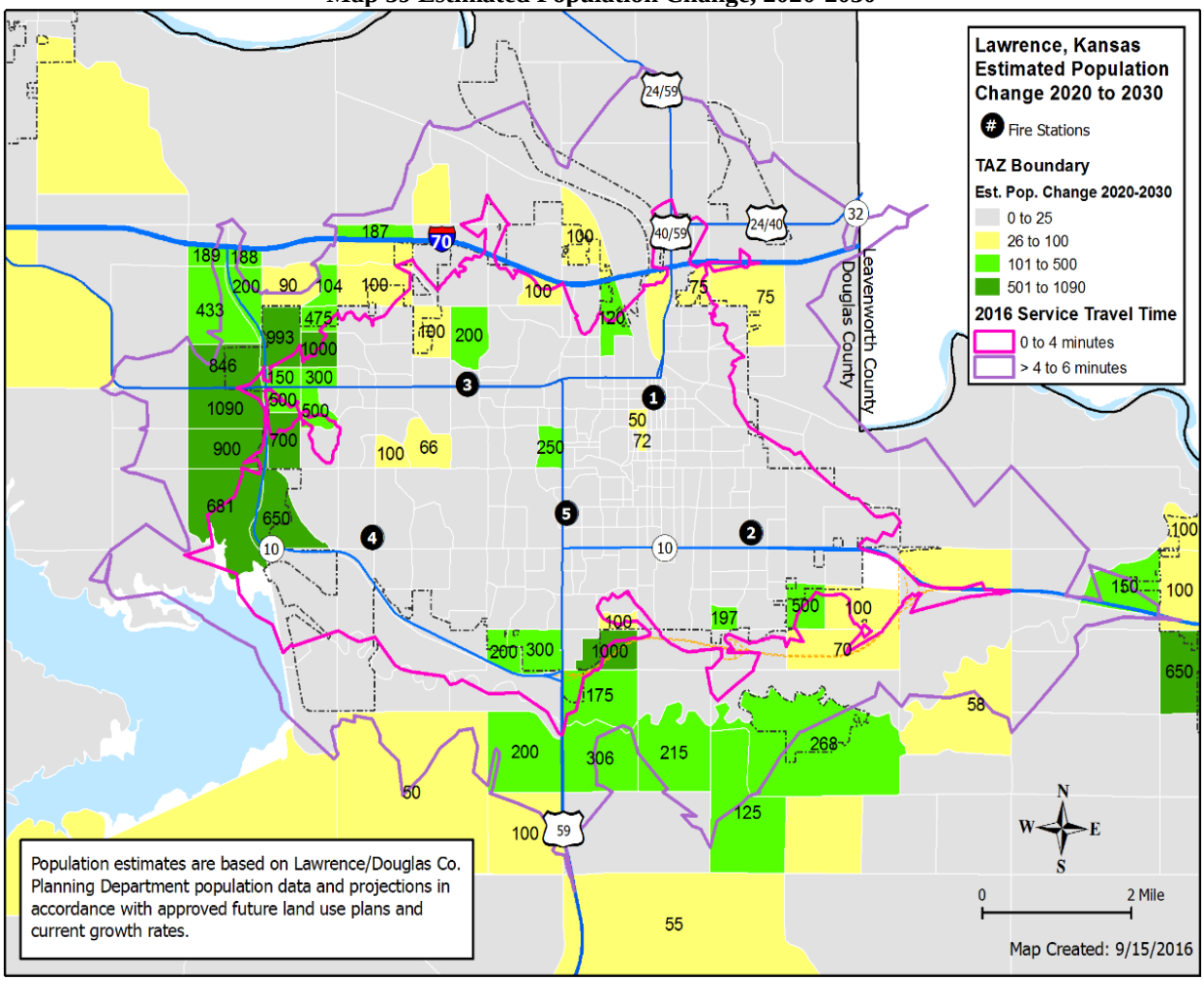
Map 58 Benchmark Met per Fire Grid - Structure Fires, 2012-2016



The size of the pie depicts the number of incidents within each emergency service zone relative to each other. The pie shade indicates the response quality meeting the benchmark response time or not for the first arriving resource. Again, areas to the northwest and south are not consistently receiving benchmark response times.

City of Lawrence Population Growth Projections 2020 to 2030

Map 59 Estimated Population Change, 2020-2030



Community growth projections are in areas of delayed coverage relative to established response time benchmarks. Exceeding the four-minute travel time benchmark for the first arriving resource and the eight-minute benchmark for the arrival of an effective response force.

Recommendations for Improved Effectiveness in Deployment and Coverage

The department has identified time-specific recommendations, based on the information available at the time of this publication, to address performance gaps and assist in the effectiveness of deployment and coverage. These objectives were identified to address challenges ranging from administrative support to assist with statistical analysis, technology enhancements, and operational expansion to embrace the dynamic changes to the community and county.

Immediate Recommendations (within 18 months):

1. Investigate solutions for improvements in performance monitoring processes on emergency response data to include both computer software and internal system controls.
2. Develop and facilitate training on data entry to ensure the quality of information remains at a high level for performance and outcome measurements.
3. Work collaboratively with Douglas County Emergency Communications to establish time-based performance objectives for alarm answering and alarm processing. The objectives should be formally established in a written agreement with Douglas County Emergency Communications.
4. Add a second operations chief officer to manage county-wide emergency resources. This position should be included in daily minimum staffing and would be a total increase of three Assistant Shift Commanders/Battalion Chiefs.
    a. Currently, daily minimum staffing includes one operations chief. The operations chief is responsible for fire, medical, hazardous material, and technical rescue resource management in the City of Lawrence. The operations chief is also responsible for resource management with medical and hazardous materials incidents in all of Douglas County. The operations chief provides resource management for the entire Douglas County area, 475 square miles. When high-risk events occur, such as a working structure fire within Lawrence, a hazardous materials event, or a cardiac arrest in the county, the chief officer is committed to the incident as the incident commander performing all associated command staff tasks until they can be delegated. On these incidents, the operations chief manages, supervises and delegates activities while simultaneously monitoring system wide resource availability. One operations chief can no longer effectively manage incident command responsibilities and county-wide emergency resources.
5. The department should analyze and recommend alternative solutions for staffing ambulances for medical transfers outside of Douglas County. Currently, medical transfers are performed by emergency ambulances dedicated to the standards of cover within Douglas County. During the period of a transfer, an ambulance is taken from the area of coverage resulting in an elongated incident commit time decreasing the reliability of quality coverage to the County.
6. Continue to communicate through management channels the need to increase operational staffing on the rescue unit to be consistent with other fire apparatus. This request has been proposed each year since 2006. Currently, the rescue unit is not compliant with the OSHA "2-in 2-out" rule for emergency rescue operations with firefighters engaged in interior structural

firefighting. Operational objectives cannot be maintained city-wide in an efficient, effective and safe manner with three-member staffing.

7. The Prevention Division's needs continue to grow with the community. With the current staffing, the division can no longer meet the time-sensitive demands of the developing community. The division should add an additional inspector to address the needs of the program. The expansion request would be for (1) FTE within the Prevention Division.
8. In 2017, an administrative support position was eliminated as part of a workforce reduction. The impact of the position elimination was significant to the administrative operations of the department. Currently, there are two positions for six organizational divisions and 149 FTEs. The expansion request would be for (1) administrative support FTE. Operations staff and Division Chiefs have been utilized to perform administrative duties, which has increased cost and displaced resources associated with the standards of cover.

Short-term Recommendations (within 36 months):

1. Due to the rapid growth in the northwestern portion of the city, the department should secure a funding source for fire station #6 and other resources to provide reliable, effective response coverage, consistent with other areas of the city.
2. The department should closely analyze the resiliency of fire apparatus within high demand areas of the city. In addition, the department should communicate needs to retain resource reliability in those areas. These resources would also assist with the arrival of the effective response force on higher risk incidents within the city.

Long-term Recommendations (with the next five years):

1. Construct station (station #6) in service to provide reliable coverage to an area of rapid growth in the northwestern portion of the city.

Due to planned growth in the southern and southeastern portion of the city, the department should secure a funding source for fire station #7 and other resources to be able to provide reliable and effective response coverage, consistent with other areas of the city.

J. Performance Maintenance and Improvement Plans

The department has an established a compliance methodology to guide the overall monitoring, assessing, and reporting of the ability of the existing delivery system to meet expected outcomes and identifies the remedial actions most in need of attention. To maintain an appropriate and adequate methodology, consistent with the standards set forth by the Fire and Emergency Medical Services Self-Assessment Manual, the department has instituted compliance teams. The accreditation manager, division chief of administration, and the fire chief oversee the compliance process.

Compliance Team / Responsibility

An internal compliance team consisting of the department's accreditation manager, division chief of administration and other designated members will continue to evaluate the response performance

compliance and the associated outcomes in weekly, monthly, quarterly, and annual reports. The team will report to the fire chief monthly on their analysis. The fire chief will communicate with the authority having jurisdiction (AHJ) on an annual basis to share the capabilities and capacities of the department relative to maintaining the approved service level by the community.

Performance Evaluation and Compliance Strategy

The department performance evaluation process includes all components of total response time (TRT) for all risk categories and classifications. In addition to response times, the department documents incident outcomes in two records management systems, Firehouse, and ESO.

In the routine compliance reports, different performance indicators are monitored and communicated to the fire chief in monthly meetings. Examples of some of the performance indicators are components of TRT, cardiac arrest survivability, time-critical diagnosis, life loss from fire, injuries from fire, structural flame extension and evolution, occupancy displacement, and the number of days a business was impacted by fire.

Department training is facilitated annually on data entry for incident report writing and how the data is used internally and externally.

Table 41 Compliance Teams, Members, Responsibilities, Schedule

Compliance Teams	Members	Role and Responsibilities	Meeting Schedule	Manager
Accreditation Team	• Chief Officers • Accreditation Manager • Assistant Accreditation Manager • Fire Chief • Administrative Support	• Communicate and publish emergency response performance on a monthly, quarterly and annual basis. • Monitor changes in risk and service demands. • Coordinate quality assurance and control strategies. • Review response emergency performance data and outcomes on a monthly, quarterly, and annual basis. • Provide appropriate reports to Fire Chief for communication with the AHJ and elected officials.	Monthly	Accreditation Manager
Outcome Team	• Chief Officers • Technology Specialist • Emergency Communications Representative • Accreditation Manager	• Determine and establish accurate and sustainable outcome measures to assess the department's impact and consequences of program goals.	Monthly	Chief of Administration and Accreditation Manager
Manager's Group and Executive Team	Chief Officers and Captains	• Conduct annual program appraisals to determine the effectiveness of the program. • Review response emergency performance data and outcomes on a monthly, quarterly, and annual basis. • Interpret the data and determine if any system adjustments are necessary.	The fourth Tuesday of every month	Fire Chief

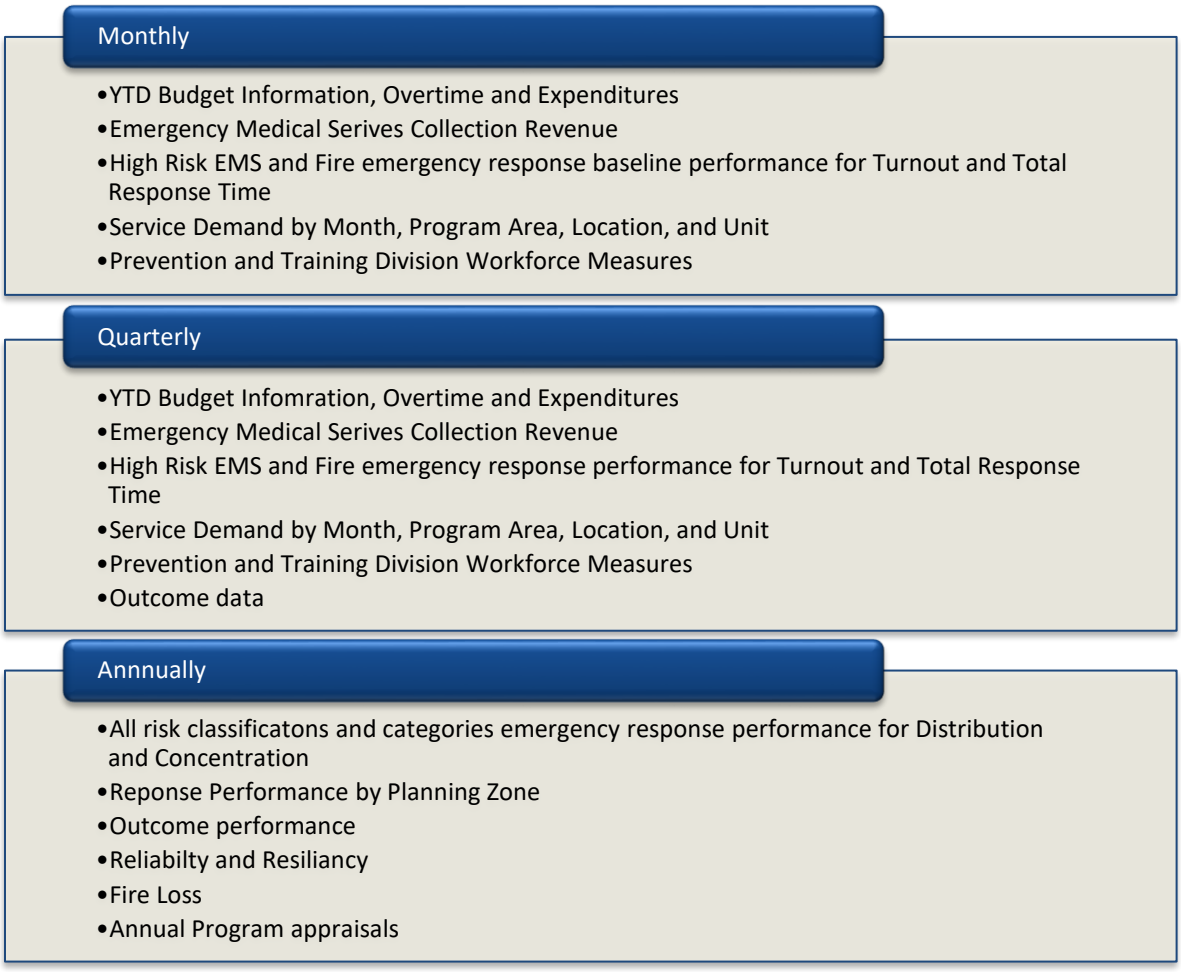
Compliance Verification Reporting

Verification reporting is established in several ways in daily, monthly, quarterly, and annually time periods for reporting.

LDCFM will have a documented and adopted methodology for assessing performance adequacies, consistencies, reliabilities, resiliencies, and opportunities for improvement for the total response area. The following data objectives have been established for monitoring performance quality on input, output and outcome measures.

Components of the response system that will be measured and assessed. The frequency of the monitoring activities is identified below.

Figure 18 Compliance Monitoring Schedule



Constant Improvement Strategy

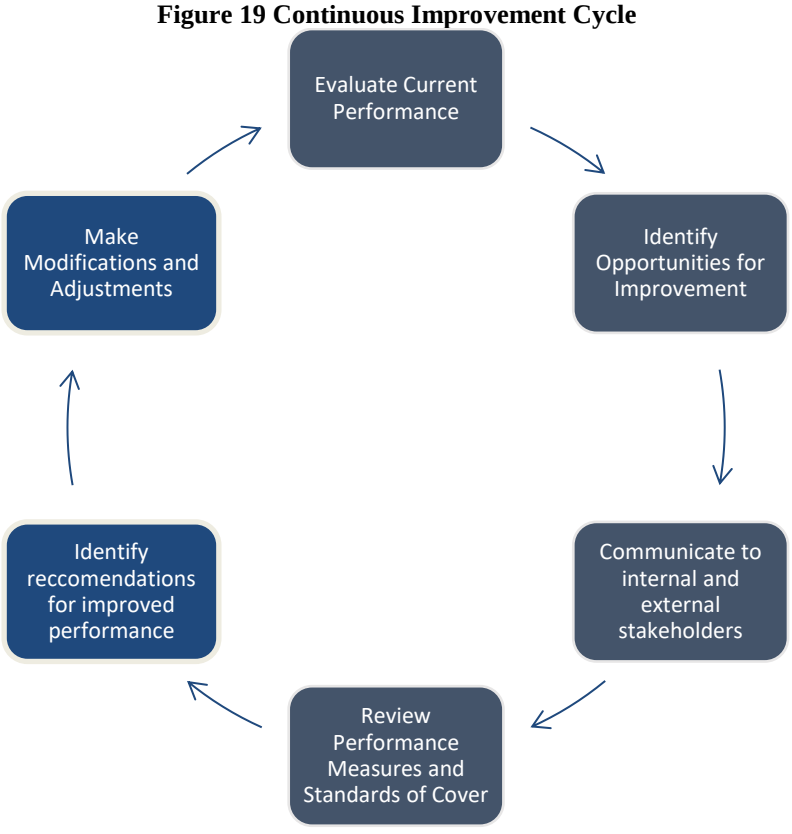
To ensure the agency is meeting current service level objectives, continuous monitoring of service level baselines must be conducted in a regular basis. The accreditation team will review service level baselines on a quarterly basis. Included in the review shall be a summary of the results of the service level objectives, a comparison of current results to previous results and calculations of the difference in results between time periods.

In addition to the review of service level objectives, the executive team will review the response demands within each zone and the identified risks within. The accreditation team will determine if there have been any changes within a planning zone, changes to service demands or changes in standards or operations that impact the service level objectives or the standards of cover (SOC) document. These reviews will be conducted on an annual basis.

To aid in the collection and presentation of this information, the accreditation team will work as a group to assemble all required information and assist the accreditation manager in the interpretation of data and considerations for improvement towards achieving targets (benchmarks).

The department will utilize the following continuous improvement cycle to monitor performance.

Figure 19 Continuous Improvement Cycle



Reporting

The fire chief, with assistance from the accreditation team, is responsible for annually reporting to the AHJ regarding gaps. Monthly, quarterly, and annual reports are submitted by the fire chief to the AHJ for both the City of Lawrence and Douglas County. The reports are also available on the department's internal intranet site and the public website for citizen access. Accomplishments related to established goals and objectives are documented in the annual program appraisal process. Identify processes to maintain services where performance is superior and fix where performance is less than satisfactory. The department will publish and annual compliance report to the Commission and an updated SOC document as consistent with the requirements outlines by the CFAI.

K. Appendix A – RAPTOR Scoring Criteria

Each of us have our own idea of risk when we think about our community

Types of risk:

- Risk of having a call at a particular location fire, EMS or other
- Risk of having a type of call no specific location (past experience)
- Fire risk (Needed Fire Flow)
- Risk of occupants not being able to escape fire
- Risk of building collapse under fire
- Risk of firefighters being injured or dying inside a building on fire
- Risk of economic impact to community
- Risk of negative impact on department due to an incident
- Risk of fire spread potential (conflagration or single exposure)
- Risk to firefighters in reaching occupants or fire (inside access = stairs or outside access = aerial)

Risk reducers

Fire protection systems and alerting system
Internal education and practice to escape or stop risk
Strong codes and inspections practices
Firefighter training
Pre-planning

SPECIFIC PROPERTY USE

	Assembly	
0	Property Use, Other	0
100	Assembly, Other	25
110	Fixed-use recreation places, other	25
111	Bowling establishment	25
112	Billiard center, pool hall	25
113	Electronic amusement center	25
114	Ice rink: indoor, outdoor	25
115	Roller rink: indoor or outdoor	25
116	Swimming facility: indoor or outdoor	25
120	Variable-use amusement, recreation places, other	25
121	Ballroom, gymnasium	25
122	Convention center, exhibition hall	25
123	Stadium, arena	25
124	Playground	25
129	Amusement center: indoor/outdoor	25
130	Places of worship, funeral parlors, other	25
131	Church, mosque, synagogue, temple, chapel	25
134	Funeral parlor	25
140	Clubs, Other	25
141	Athletic/health club	25
142	Clubhouse	25
143	Yacht Club	25
144	Casino, gambling clubs	25
150	Public or government, Other	25
151	Library	25
152	Museum	25
154	Memorial structure, including monuments & statues	25
155	Courthouse	25
160	Eating, drinking places, other	25
161	Restaurant or cafeteria	25
162	Bar or nightclub	25
170	Passenger terminal, Other	25
171	Airport passenger terminal	25
173	Bus station	25
174	Rapid transit station	25
180	Studio/theater, Other	25
181	Live performance theater	25
182	Auditorium, concert hall	25
183	Movie theater	25
185	Radio, television studio	25
186	Film/movie production studio	25

	Education	
200	Educational, Other	15
210	Schools, non-adult, other	5
211	Preschool	20
213	Elementary school, including kindergarten	5
215	High school/junior high school/middle school	5
241	Adult education center, college classroom	5
254	Day care, in commercial property	20
255	Day care, in residence, licensed	20
256	Day care in residence, unlicensed.	25
	Institutional	
300	Health care, detention, & correction, Other	20
311	24-hour care Nursing homes, 4 or more persons	20
321	Mental retardation/development disability facility	20
322	Alcohol or substance abuse recovery center	20
323	Asylum, mental institution	20
331	Hospital - medical or psychiatric	20
332	Hospices	20
340	Clinics, doctors offices, hemodialysis center, other	15
341	Clinic, clinic-type infirmary	15
342	Doctor, dentist or oral surgeon office	20
343	Hemodialysis unit	15
361	Jail, prison (not juvenile)	20
363	Reformatory, juvenile detention center	20
365	Police station	5
	Residential	
400	Residential, Other	25
419	1 or 2 family dwelling	1
429	Multifamily dwelling	10
439	Boarding/rooming house, residential hotels	75
449	Hotel/motel, commercial	75
459	Residential board and care	75
460	Dormitory-type residence, other	50
462	Sorority house, fraternity house	50
464	Barracks, dormitory	50

	Mercantile/Business	
500	Mercantile, business, Other	30
511	Convenience store	10
519	Food and beverage sales, grocery store	10
529	Textile, wearing apparel sales	10
539	Household goods, sales, repairs	30
549	Specialty shop	10
557	Personal service, including barber & beauty shops	5
559	Recreational, hobby, home repair sales, pet store	30
564	Laundry, dry cleaning	30
569	Professional supplies, services	5
571	Service station, gas station	30
579	Motor vehicle or boat sales, services, repair	30
580	General retail, Other	10
581	Department or discount store	10
592	Bank	5
593	Office: veterinary or research	10
596	Post office or mailing firms	5
599	Business office	5
	Factory Hazardous Misc.	
600	Ind., utility, defense, agriculture, mining, other	25
610	Energy production plant, Other	25
614	Steam or heat-generating plant	25
615	Electric-generating plant	25
629	Laboratory or science laboratory	50
631	Defense, military installation	25
635	Computer center	5
639	Communications center	5
640	Utility or Distribution system, Other	25
642	Electrical distribution	25
644	Gas distribution, gas pipeline	25
645	Flammable liquid distribution, F.L. pipeline	25
647	Water utility	10
648	Sanitation utility	10
655	Crops or orchard	10
659	Livestock production	25
669	Forest, timberland, woodland	25
679	Mine, quarry	50
	Factory	
700	Manufacturing, processing	10

	Storage	
800	Storage, Other	10
807	Outside material storage area	10
808	Outbuilding or shed	10
816	Grain elevator, silo	100
819	Livestock, poultry storage	25
839	Refrigerated storage	10
849	Outside storage tank	50
880	Vehicle storage, Other	30
881	Parking garage, (detached residential garage)	10
882	Parking garage, general vehicle	30
888	Fire station	5
891	Warehouse	10
898	Dock, marina, pier, wharf	10
899	Residential or self-storage units	100
	Other	
900	Outside or special property, Other	10
919	Dump, sanitary landfill	10
921	Bridge, trestle	30
922	Tunnel	50
926	Outbuilding, protective shelter	10
931	Open land or field	10
935	Campsite with utilities	10
936	Vacant lot	10
937	Beach	0
938	Graded and cared-for plots of land	0
940	Water area, Other	0
941	Open ocean, sea or tidal waters	0
946	Lake, river, stream	0
951	Railroad right-of-way	10
952	Railroad yard	30
960	Street, Other	0
961	Highway or divided highway	0
962	Residential street, road or residential driveway	0
963	Street or road in commercial area	0
965	Vehicle parking area	25
972	Aircraft runway	0
973	Aircraft taxiway	0
974	Aircraft loading area	25
981	Construction site	25
982	Oil or gas field	25
983	Pipeline, power line or other utility right-of-way	0
984	Industrial plant yard - area	25
NNN	None	0
UUU	Undetermined	10

Building Class

0	Building Code Occupancy Type Not Applicable	20
A1	Assembly Fixed Seating	10
A2	Assembly for Food and Drink Consumption	10
A3	Assembly for Worship, Recreation or Amusement	10
A4	Assembly for Indoor Sporting Events	10
A5	Assembly for Outdoor Activities	5
B1	Business Occupancies	5
E1	Educational 12th Grade or Below, With 6 and up OL	5
E2	Building for Day-Care of More Than 5 Children	20
F1	Factory Industrial Moderate Hazard	30
F2	Factory Industrial Low Hazard	15
H1	Occupancies with High Explosion Hazard	50
H2	Occupancies with Moderate Explosion Hazard	40
H3	Occupancies That Present High Fire/Physical Hazard	30
H4	Health Hazards	25
H5	Semiconductor Fabrication	20
I1	More Than 16 People 24 Hour Care	20
I2	24 Hour Medical Care	20
I2-A	24 Hour Child Care 5+ Occupants Under Age 2 1/2	20
I3	Mental Hospitals, Jails, Inmates Restrained	20
I4	Day Care Facilities	20
M1	Occupancies for Display and Sale of Merchandise	20
R1	Hotels, Etc. More Than 10 Persons	10
R2	Residential More Than 2 Dwelling Units	10
R3	Dwellings and Lodging Houses	10
R4	Assisted Care for 4 to 16 Persons	10
S1	Moderate Hazard Storage	30
S2	Low Hazard Storage	10
U	Utility and Miscellaneous Occupancies	20

Suppression Systems

Automatic Extinguishment System	**Type**	
	Wet system with special agent in some areas	-25
Present,	Full Coverage Wet and Dry Systems Combined	-50
Partial System Present,	Full Coverage Dry Sprinkler System	-50
None Present, and	Full Coverage Wet Sprinkler system	-50
Undetermined	No Sprinkler System	0
	Partial Coverage Dry and Wet System Combined	-25
	Partial Coverage Dry Sprinkler System	-25
	Partial Coverage Wet Sprinkler System	-25
	Special Agent System	-25

Structure Type

0	Structure type, Other	10
1	Enclosed building	5
2	Fixed portable or mobile structure	6
3	Open structure	10
4	Air supported structure	10
5	Tent	10
6	Open platform	1
7	Underground structure work areas	5
8	Connective structure	3

Building Status

0	Other	20
1	Under construction	25
2	In normal use	1
3	Idle, not routinely used	5
4	Under major renovation	25
5	Vacant and secured	15
6	Vacant and unsecured	25
7	Being demolished	50
U	Undetermined	20

Roof Covering

0	Roof Covering Undetermined/Not Reported	5
1	Tile (clay, cement, slate, etc.)	1
2	Composition Shingles	10
3	Wood Shakes/Shingles (Treated)	15
4	Wood Shakes/Shingles (Untreated)	25
6	Metal	1
7	Built-Up	5
8	Structure Without Roof	0
9	Roof Covering Not Class	5

Construction Type

0	Undetermined	20
1	Fire Resistive	0
2	Heavy Timber	10
3	Protected Non-combustible	5
4	Unprotected Non-combustible	5
5	Protected Ordinary	10
6	Unprotected Ordinary	25
7	Protected Wood Frame	15
8	Unprotected Wood Frame	25
9	Not Classified	5

Stories Above Grade		
0	No Data	0
1	Floor	1
2	Floor	2
3	Floor	3
4	Floor	4
5	Floor	10
6	Floor	15
7	Floor	20
8	Floor	25
9	Floor	30
10	Floor	35
11	Floor	40
12	Floor	45

Stories Below Grade		
0	floor	0
1	Floor	5
2	Floor	10
3	Floor	15
4	Floor	20
5	Floor	25

Required Fire Flow		
500	gpm	10
1000	gpm	20
1500	gpm	30
2000	gpm	40
2500	gpm	50
3000	gpm	60
4000	gpm	70
5000	gpm	80
6000	gpm	90
7000	gpm	100
8000	gpm	110
9000	gpm	120
100000	gpm	13