



Final Report

Response Time Improvement & Fire Service Model



Prepared For:
City of Otsego, Minnesota

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October 22, 2018



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Recommendations and Timing

Now/Ongoing

- Recruitment & Retention
- Incidence Reduction/prevention
- Regional cooperation/shared services
- Monitor staffing costs & response time performance

Short term 1-5 years (2019-2024)

- Acquire property(ties)
- Negotiate contracts to facilitate changing response areas

Midterm 6-10 years (2025-2029)

- Early: Design phase
- Change response zones again if necessary
- Later: Construct first station

Long term 11-15 years (2030-2035)

- Build incrementally and potentially acquire equipment
- Alter first response areas based on closest stations
- Use Cost estimates & apparatus deployment suggestions

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Acknowledgements

Beacon GIS would like to thank the City of Otsego governing leadership and community for the opportunity to complete this report. In addition, there were additional persons who contributed to information that was used in the description and analysis of information. Gratitude is extended to the following:

City of Otsego:

Mayor & Council:

Mayor Jessica Stockamp

Mr. Tom Darkenwald

Mr. Vern Heidner

Mr. Jason Warehime

Mr. Corey Tanner

City Staff:

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**Mr. Kurt Neidermeier, Utility
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City of Elk River

Chief T. John Cunningham

Deputy Chief Aaron Surratt

City of Rogers

Chief Brad Feist

Inspector Kris Skow-Fiske

Wright County

Sheriff's Office Communications

Ms. Haley DuBois, PSAP Manager

Geographic Information Systems

Mr. Alek Halverson

State of Minnesota

Fire Marshal's Office

Mr. Tate A. Mills

Executive Summary

Background

The City of Otsego received a grant from the State Fire Marshal's Office to study the fire services within the city presently and develop a future response model using the current fire suppression and rescue service providers in compliance with national guidelines for volunteer response time parameters. Future planning for fire station facilities has been requested based upon plans for development and transportation connectivity previously documented by the City. The City had contracted with Beacon GIS to conduct this study in March 2018. Information was requested and gathered electronically and Beacon GIS conducted an on-site visit in early April 2018 to clarify and gather additional information. Subsequent transfer of data from sources continued into May 2018. A draft review of the initial report was conducted on site by Beacon GIS and city officials in July 2018. Subsequently, additional scenarios were requested in addition to the initial analysis and these are included in this report. The final report was delivered in October 2018.

Findings and scenarios

The three fire suppression and rescue service providers' performance to the City of Otsego was analyzed. It was found that currently the workload is not burdensome and that the data provided reveals that they are performing within national benchmark guidelines for response time and amount of firefighters at the scene of a structure fire. It is recommended that the assigned response areas to each department be altered to reflect a closest station response area based on a modeled travel time analysis. Other findings include:

1. The current facilities are adequate for the time being. The Albertville, Rogers Station 1, and Elk River Station 2 are recent constructions. Elk River Station 1 is older and the ERFD Chief reports that the facility will be in use for several more years. The RFD station 2 is temporary but adequate for the time being as plans for a new station is being formulated.
2. There is an inherent obstacles given the three county involvement in providing fire services. The need for inter-County cooperation is not unique to Otsego but efforts at regional shared efforts and streamlined interoperable communications needs to be encouraged whenever possible to reduce call processing time, purchasing costs, and incident handling coordination.
3. Demand for services is currently low. It accounts for more of the total volume for Albertville FD than for either Elk River FD or Rogers FD. There seems to be no seasonal trend but hourly, more volume is noted in the late afternoon/ early evening hours for the two departments (AFD & ERFD) with the highest service demand volume in Otsego. Demand has increased over the last three years overall, except for fire events specifically.

4. Volunteer firefighter addresses are close by the fire stations. Provided they are at that location and available is advantageous for turnout time intervals.
5. The fire departments are meeting the guidelines of NFPA 1720 especially for structure fires in terms of response time and staffing.
6. The modeled travel time model indicates that the city is well covered for rural response coverage, less for suburban population density areas.
7. The city is not well served for distance from fire stations that factor into property insurance rates. Higher rates may detract from attracting commercial development.
8. Automatic Aid agreements are not being taken advantage of between most departments. This can lead to delay in critical events when they must be summoned after the initial dispatch.
9. Population growth had been explosive from the year 2000 to 2010. It has since tapered off since the recession of 2007-10. Otsego is primarily a young family residential environment with a high percentage of commuters and above median income when compared to the county and the state.
10. Currently, a primarily low risk environment for community loss predominates the existing land use.
11. A detrimental flood risk exists along the rivers. Development in these areas should be reconsidered.

The historic population growth and projections for the future indicates that development, both commercial and residential will continue. Plans to encourage such growth through the expansion of water and sewer service has been adopted by the City. Future land use and transportation planning documents reveal a reception for increasing but controlled development. As this occurs, national fire service benchmarks recommend lower response time performance because the risks to the community have increased. It is projected that by 2030, additional fire and rescue facilities will need to be considered within the City of Otsego. For each scenario, two time periods for travel response was used to determine the computer generated results when weighed expected development risk and population density levels.

However, complications of site location include the potential station relocations by two of the three providers. In addition, the city owns property that has been planned for stations preliminarily before this study was completed that need to be considered. These factors have been applied to the multiple scenarios contained in this report along without consideration of the relocations. The shorter travel time parameter scenarios require more facilities than the longer travel time parameter scenarios as expected with results of three stations versus one station.

Recommendations & Implementation

The best way to fight a fire or treat an injury/illness is to prevent them from occurring. Recommendations include suggested prevention programs and coordinated firefighting efforts. The most likely scenario is one that incorporates both fire partner's station relocations (Scenario D). The recommendations include suggestions to encourage volunteer firefighter recruitment. These should start immediately and continue as facilities in the City are in the design and build stages. The fire rescue facilities built within the city as a reflection of expected growth also will benefit City taxpayers as insurance ratings for property owners may be reduced. This will also encourage continued development. Specifically the recommendations and timing are:

Now/Ongoing:

- Explore the junior fire academy concept to attract older teens to the fire service
- Consider a property tax credit for volunteer firefighters from Otsego.
- Implement a community detector check, installation, and replacement program through the fire marshal.
- Consider requiring residential sprinkler installation ordinance.
- Strictly enforce fire codes and increase inspections to reduce fire potential.
- Support fire prevention education in schools, community events, and senior centers.
- Continue to expand the water system to include hydrant installations.
- Encourage multi-departmental training activities to increase coordination on the fire ground.
- Encourage the fire departments to engage in group purchasing and grant applications to reduce costs.
- Encourage regional standard operating procedures to potentially use shared staff to quickly respond to incidents
- Encourage auto aid agreements with the three fire departments especially for reported fires to improve response times. (I.e: Rogers and Dayton FDs)
- Monitor the non-capital per capita costs of volunteers made by the share of Otsego's contract contributions. When it surpasses level at which career force would be more efficient, encourage the fire departments to consider switching to reduce financial pressure on Otsego.
- Monitor response time performance for each fire service responding to Otsego at least annually to ensure compliance with NFPA 1720 guidelines

Short term 1-5 years (2019-2024)

- Acquire property for fire stations
- Renegotiate fire contracts
- Attempt to find a common compensatory method to the contracted fire departments to ease the implementation of closest response area without increasing cost to the city.
- Change Response Areas if Rogers FD moves Station 2 North.

Midterm 6-10 years (2025-2029)

- Have architectural and construction firms selected
- Approve preliminary designs of stations
- Monitor Elk River Fire Department's activity to build stations as described in its study. Construction of easternmost station in Otsego may need to be fast tracked.

Long term 11-15 years (2030-2035)

- Build station(s) incrementally and lease space to fire departments who own the apparatus and equipment.
- Redraw fire response areas as stations are built based upon the closest station travel time capability.
- Approach the EMS services who may desire rental space for their deployment needs.
- As stations are completed, request that property insurance rating reviews are conducted of the fire departments with the motive to reduce property insurance rates.
- Design stations that encourage gathering for volunteers.

Current Conditions

Service Area Description

The City of Otsego was incorporated in 1990 and is located north and west of the confluence of the Mississippi and Crow Rivers in Central Minnesota. The Mississippi River flows east along the city northern border before making a sharp turn to the south-southeast toward Minneapolis on the city's eastside. Otsego is within Wright County on its northeast border. To the north of the city is Sherburne County and to the southeast is Hennepin County. The city encompasses approximately 30 square miles. Otsego is on the northwest edge of the Minneapolis Metro Area between it and the City of St. Cloud along Interstate 94 that only passes through the very southwest corner of the Otsego. There are no airports or rail traffic within the city. The main thoroughfare in the city is Minnesota Highway 101 on the east side that has been converted into a limited access highway in recent years. It traverses north/south between the City of Elk River and The City of Rogers. Other main arterial routes are indicated in the following map.

Figure 1: Wright County & Minnesota

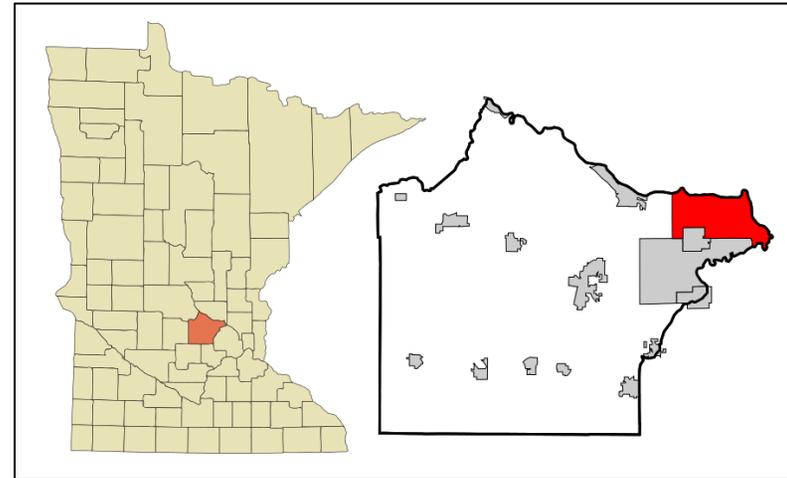
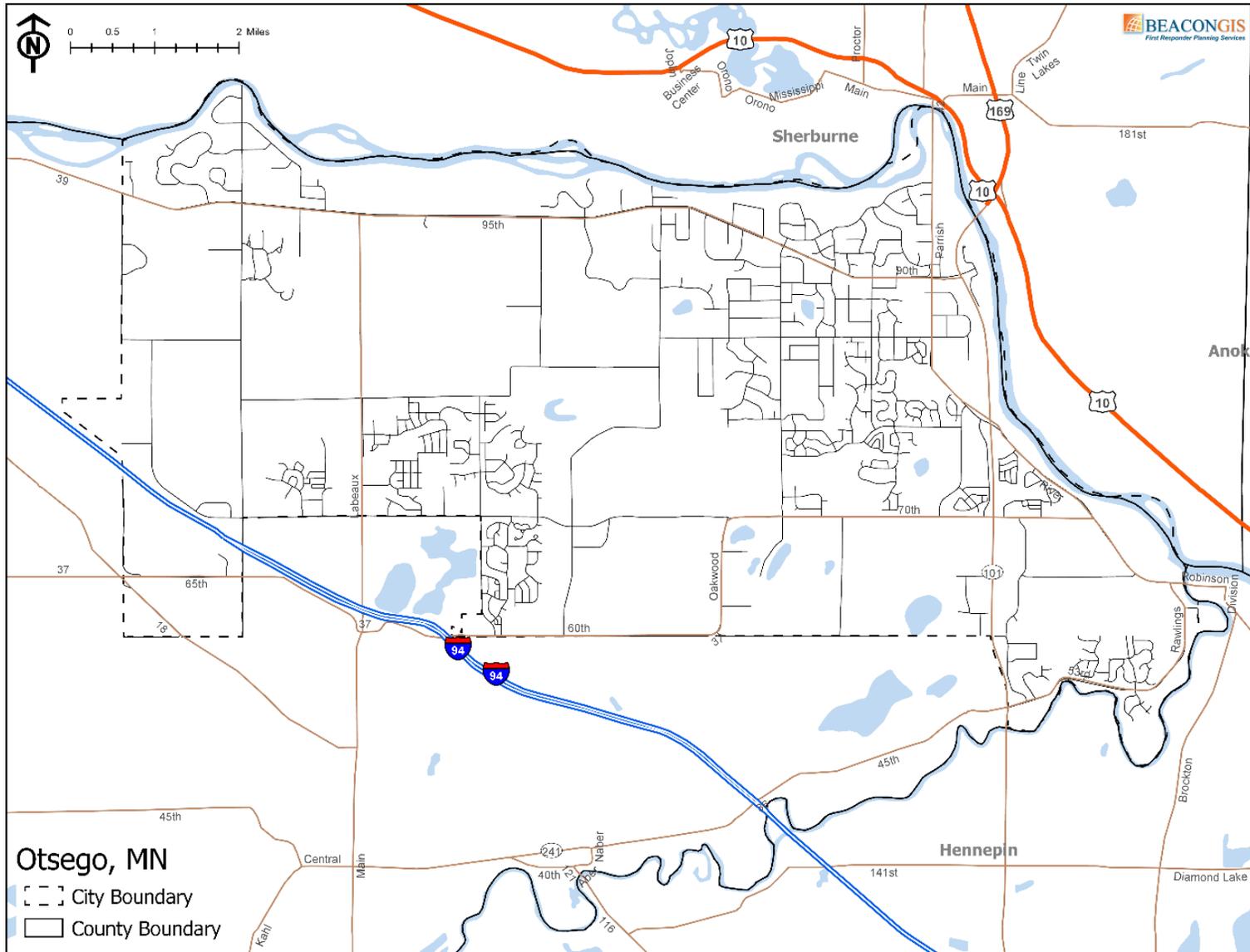


Figure 2: Otsego City Map with current roadways



Present-day Resources & Workload

The residents, visitors, and commercial industry rely upon three neighboring city fire departments that are contracted by the City of Otsego for fire suppression, rescue, and a variety of other services that they perform in lieu of a city operated service. The Wright County Sheriff provides law enforcement services and contracted ambulance services¹ provide 911 emergency medical care. The next section describes the fire departments resources and capabilities.

Albertville Fire Department



The City of Albertville is located along Otsego's southwest border. It operates from one location on 57th Street within Albertville and provides services to a large area within Otsego's central and western areas.

The station was built in 2000, has five non drive-through bays and office space under approximately 10,000 square feet of roof. It contains several apparatus types²:

¹ Allina Health EMS & Elk River Ambulance Service. ERAS is not affiliated with ERFD although the vehicles are red and are collocated in an ERFD Station.
<http://elkriverambulance.org/>

² See Glossary for description

Figure 3: Albertville FD Apparatus

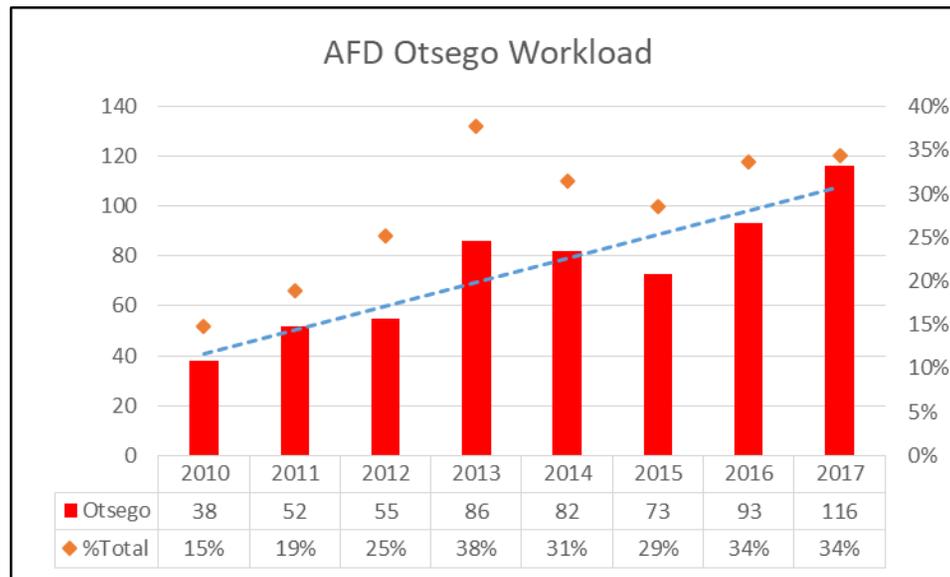
Apparatus Designation	Type	Year	Make / Model	Condition	Minimum Staffing to be Enroute	Pump Capacity	Tank Capacity
Command 1	SUV	2016	Chev Tahoe	New	1	N/A	N/A
Rescue 11	SUV	2017	Chev Suburban	New	2	N/A	N/A
Utility 11	Truck	2011	Ford F-250	Excellent	2	N/A	N/A
Engine 11	Type I	2006	General Spartan	Good	6	1500 gpm	1000
Ladder 11		2002	General Spartan	Good	7	1500 gpm	500
Tender 11	Tender	1995	International	Good	2	150 gpm	2000
Engine 12 (Reserve)		1985	Chevy / Smeal	Good	2	750 gpm	1000

In addition to the chief, 2 lower ranking chiefs, 3 captains, and 3 lieutenants are designated to oversee the currently 22 firefighters and 3 reserve members. Except for the fire chief, all other members are paid per call staff and do not routinely provide duty at the station. Rather, they respond from home, work, school, or wherever if available to do so. 5 city public works employees will respond during the day to drive the apparatus. It is department policy that firefighters do not take their personal vehicles (POV) to a scene unless they are driving by the scene and only at their discretion. Responding to the interstate scenes by POV is prohibited for their safety.

Workload

AFD submitted segregated Otsego incident data for this study. The demand for services from AFD to locations within Otsego has been increasing since 2010. In addition, the percent of Otsego events related to AFD’s total service volume has also increased. Note that nearly 40% of this volume within 2015-2017 is related to medical incidents excluding motor vehicle accidents³.

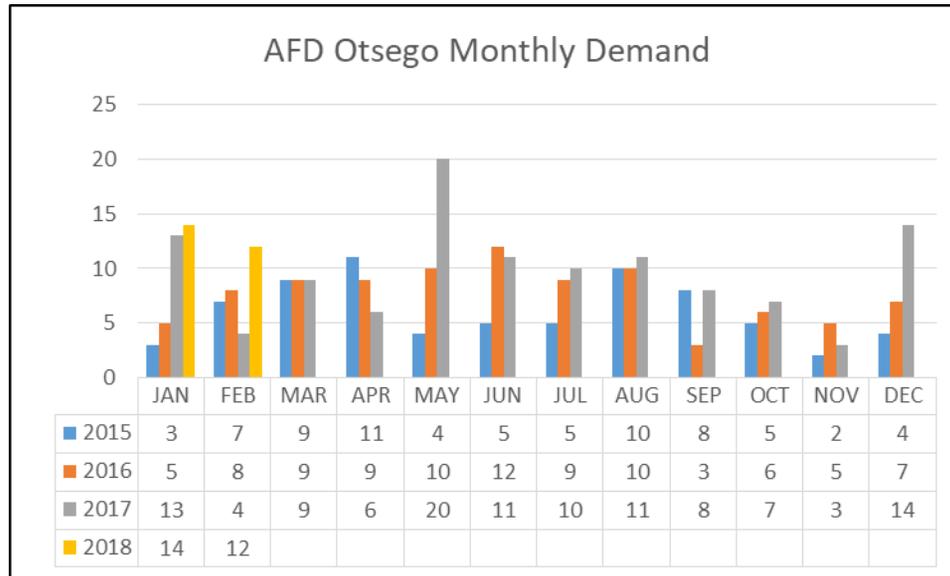
Figure 4: AFD Annual Workload



³ For comparison, Elk River Fire does not routinely respond to medical incidents. This may be higher as the data provided was dispositional that also included cancelled calls not specified.

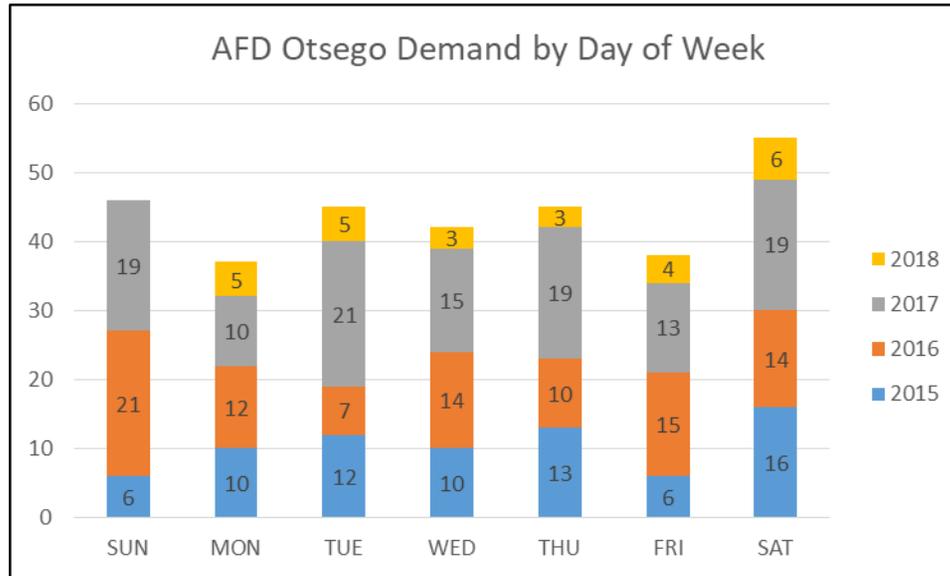
The incident data is examined further temporally from January 2015 to the end of February 2018. The monthly volume for AFD in Otsego vacillates but is consistently higher in the months of March and August.

Figure 5: AFD Monthly Workload



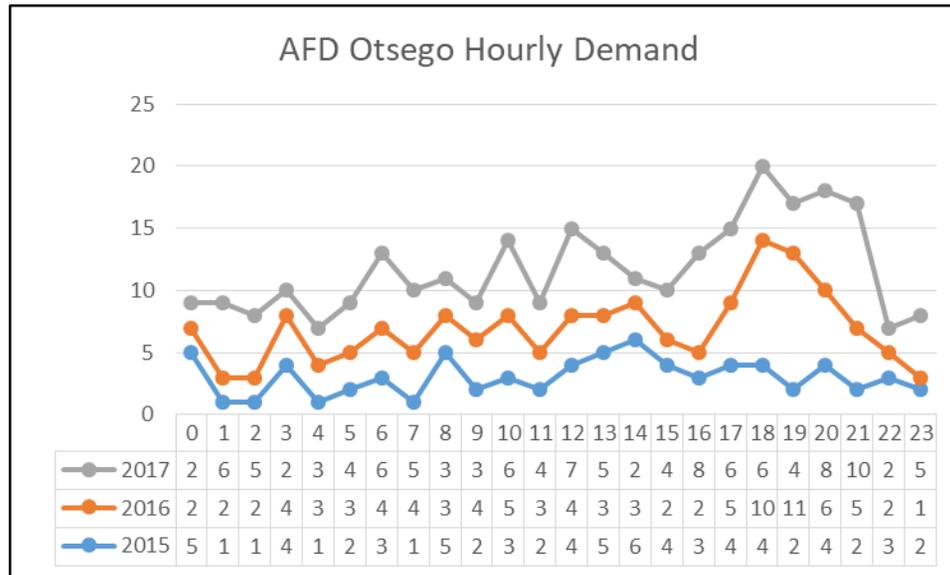
Overall, the daily volume is stable with noted higher requests for service in Otsego on the weekend days.

Figure 6: AFD Day of Week Workload



The following hourly demand chart stacks the changes in demand by hour and year for easier readability. Note that demand is highest in the evening hours from 4 PM to 9 PM.

Figure 7: AFD Hourly Demand



The following table details the workload type for 2015 to end of February 2018 for the AFD.

Figure 8: AFD Workload Detail

Incident Type	Count
Alarm system activation, no fire - unintentional	7
Animal rescue	1
Assist invalid	1
Authorized controlled burning	4
Biological hazard investigation, none found	2
Building fire	16
Camper or recreational vehicle (RV) fire	1
Carbon monoxide detector activation, no CO	1
Carbon monoxide incident	6
CO detector activation due to malfunction	1
Detector activation, no fire - unintentional	1
Dispatched and cancelled en route	59
Dumpster or other outside trash receptacle fire	1
Electrical wiring/equipment problem, other	1
EMS call, excluding vehicle accident with injury	117
False alarm or false call, other	13
Fire in portable building, fixed location	1
Fire, other	1
Gas leak (natural gas or LPG)	22
Gasoline or other flammable liquid spill	4
Grass fire	5
Heat from short circuit (wiring), defective/worn	1
Lightning strike (no fire)	1
Medical assist, assist EMS crew	2
Motor vehicle accident with injuries	19
Motor vehicle accident with no injuries.	1
No incident found on arrival at dispatch address	3
Outside rubbish, trash or waste fire	1
Road freight or transport vehicle fire	1
Smoke detector activation due to malfunction	3
Smoke detector activation, no fire - unintentional	6
Smoke scare, odor of smoke	4
Unauthorized burning	1
Grand Total	308

Elk River Fire Department



The City of Elk River is located in Sherburne County across the Mississippi River on Otsego's northeast corner. The Fire department's primary response area in Otsego is on the east side of the city. The department operates from two stations in Elk River. Station 1 on Jackson Ave. was built in 1972 and closest to Otsego while Station 2 on Orono Parkway was built in 2004 and is further west from Station 1. Station 1 was recently assessed and determined its usable life is for the next 10-15 years, according to the chief. The following is the apparatus detail for the fire stations:

Figure 9: Elk River FD Apparatus

Station #1 (415 Jacskon Ave NW) Agency Elk River Fire Department

Apparatus Designation	Type	Year	Make / Model	Condition	Minimum Staffing	Pump Capacity	Tank Capacity
Engine 1	Engine	2018	Pierce Impel	New	4	1,500	1,000
Engine 3	Engine	2001	Pierce Enforcer	Good	4	1,250	1,000
Tender 1	Tender	1999	Ford/Sterling	Good	2	500	3000
Rescue 1	Heavy Rescue	2011	Pierce Impel	Good	4	NA	NA
Grass 1	Wildland	2017	Ford 550/Type V	New	2	NA	450
Grass 3	Wildland	2004	Ford F350	Good	2	NA	250
Incident Support Trailer	Rehab	2015	ATC 25 Foot Trailer	Good	2	NA	NA
Prevention Truck	Utility	2002	Ford F350	Used	2	NA	NA
Safe Escape House	Prevention	2002	Safe Escape Trailer	Good	1	NA	NA

Station #2 (13073 Orono Pkwy NW)

Apparatus Designation	Type	Year	Make / Model	Condition	Minimum Staffing	Pump Capacity	Tank Capacity
Engine 2	Engine	2005	Pierce Quantum	Good	4	1250	1000
Ladder 1	Platform	1999	Pierce	Refurb 2015	4	1500	200
Tender 2	Tender	2008	Ford/Sterling	Good	2	500	2000
Grass 2	Wildland	2012	Ford F350	Good	2	High Pressure	250
Grass 4	Wildland	2006	Ford F350	Good	2	NA	250
Polaris Side By Side	Wildland	2004	Polaris/Tracks	Good	2	NA	30

Station Staff/Command

Apparatus Designation	Type	Year	Make / Model	Condition	Minimum Staffing	Pump Capacity	Tank Capacity
Chief 1	Command	2015	Chevy Tahoe	Good	1	NA	NA
Chief 2	Command	2018	Chevy Tahoe	New	1	NA	NA
Chief 3	Command	2012	Chevy Tahoe	Good	1	NA	NA
Duty Officer	Command	2011	Chevy Tahoe	Good	1	NA	NA
Inspector	Command	2017	Ford Explorer	New	1	NA	NA

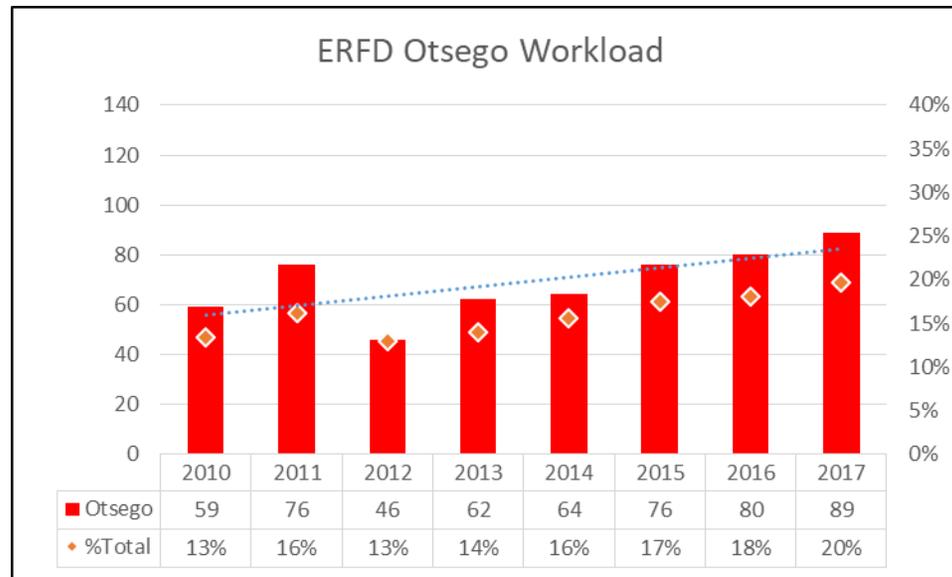
Station 1 is home to an assistant chief, 1 captain, 3 lieutenants and 23 firefighters. Station 2 has a captain, 2 lieutenants, and 13 firefighters. Administrative staff of the Fire Chief, Deputy Chief, Fire Marshal, Prevention Specialist and administrative assistant are city employees. All other members are paid per call staff and do not routinely provide duty at the station, rather responding from home, work, school, or wherever if available to do so.

Workload

The ERFD submitted incidents records submitted to the state fire marshal’s office in the National Fire Incident Reporting System (NFIRS) format. These were not segregated to only Otsego events. While there was a field indicating a district to which there was an “O” designation (indicating Otsego) and a city data column with some incidents with “Otsego”. Data is typically human inputted and can be fraught with error. To reduce the possibility of missed events for analysis, the incidents were geolocated based on the inputted address against the address ranges of the GIS street data. The following analysis is based upon the located incidents within the City of Otsego.

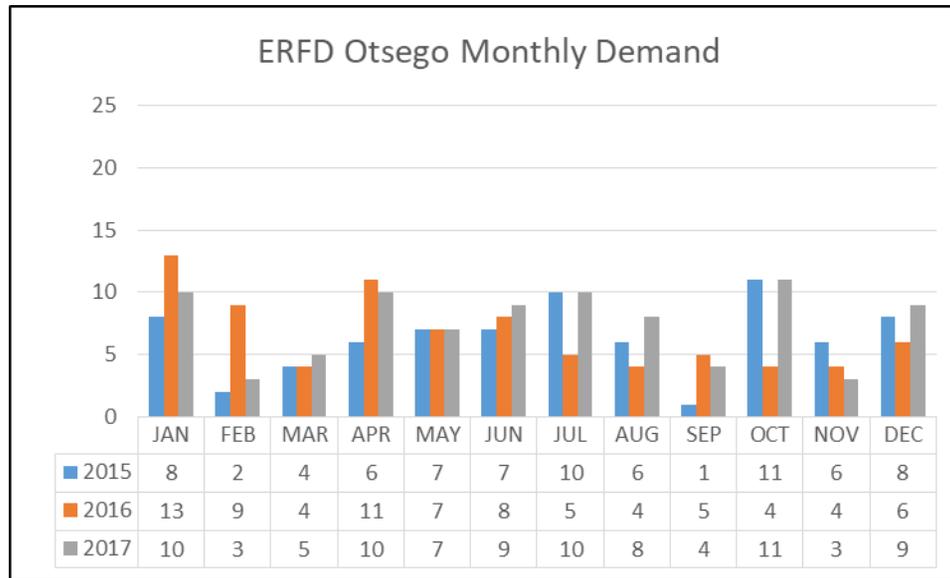
Annual workload within Otsego has been increasing since 2012 as has the percentage of events in Otsego compared to ERFD’s total volume. This share is less than AFD due to ERFD’s larger total service volume.

Figure 10: ERFD Annual Workload



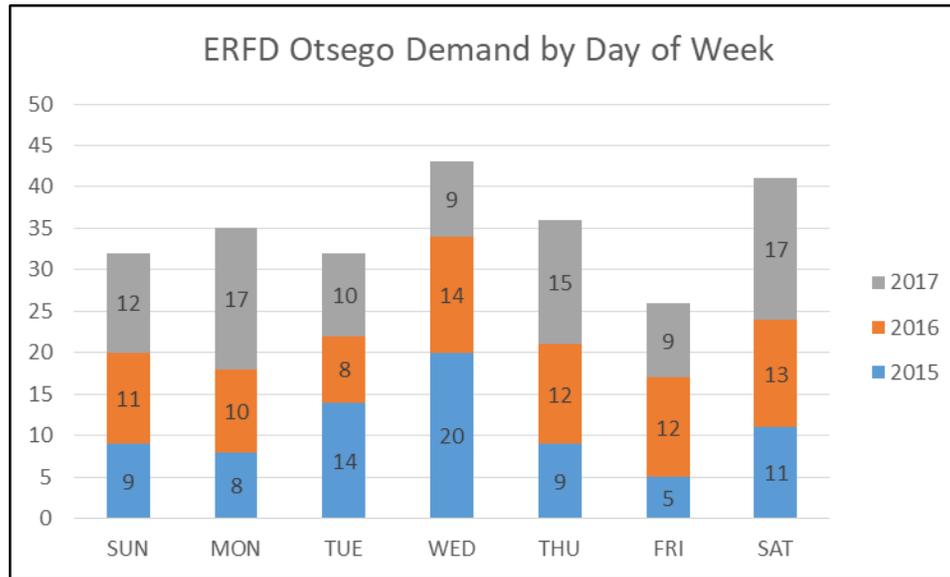
Monthly demand patterns is more chaotic but the busiest months for the past three years has been January and April.

Figure 11: ERFD Otsego Monthly Workload



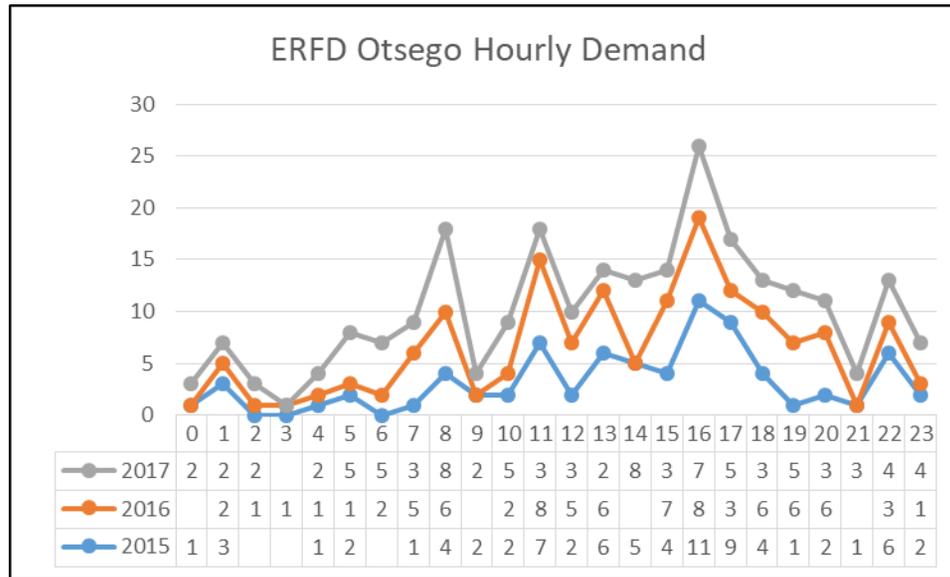
Daily volume for ERFD in Otsego is generally greater on Wednesdays and Saturdays.

Figure 12: ERFD Day of Week Workload



Hourly volume showed in the following stacked chart reveals demand spikes at 8 AM, 11AM, and during the late afternoon beginning at 4 PM.

Figure 13: ERFD Hourly Workload



Rogers Fire Department



The City of Rogers is in Hennepin County south of the Crow River at the southeast corner of Otsego. The fire department operates from two stations. The primary response area in Otsego is north of the Crow River, east of Highway 101, up to the 60th street extended southern border of Otsego. Station 1 is on Memorial Drive and was built in 1997. Station 2 is operating in a temporary location on South Diamond Lake Road closest to Otsego and is north of the interstate. The plan for a permanent Station 2 on 141st Ave North is in 2019. This location will have relatively easy access to the Highway 101 to respond into Otsego. The following are the apparatus located in each station:

Figure 14: Rogers FD Apparatus

Station 1: 21201 Memorial Drive

Apparatus Designation	Type	Year	Make / Model	Condition	Minimum Staffing to be Enroute	Pump Capacity	Tank Capacity
E11	Engine	2006	Pierce	Excellent	5	2000	750
E12	Engine	1996	Custom Fire	Fair	5	1250	1000
A11	Aerial (100' Platform)	2001	Pierce	Excellent	5	2000	300
R11	Rescue	2011	GMC 2500	Excellent	4	X	X
R12	Heavy Rescue	2014	Pierce	Excellent	5	X	X
G11	Grass Rig	2000	Ford F350	Good	2	18 hp	300
G12	ATV	2016	John Deere	Excellent	2	5.5 hp	70
LSU	Rehab trailer	2004	Pace	Good	X	X	X
T11	Tender	1990	Ford L9000	Fair	2	X	3500
SQ1	Squad	2007	GMC Yukon	Good	4	X	X
SQ2	Squad	2016	Ford police Utility	Excellent	4	X	X

Station 2: 22350 S. Diamond Lake Road

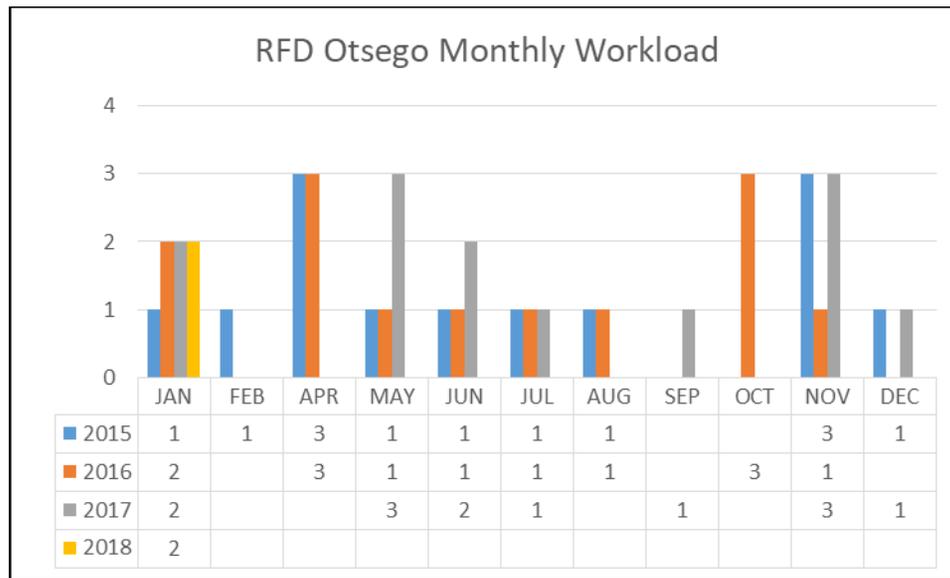
Apparatus Designation	Type	Year	Make / Model	Condition	Minimum Staffing to be Enroute	Pump Capacity	Tank Capacity
E21	Engine	2011	Pierce	Excellent	5	2000	1000
R21	Rescue	2005	GMC Yukon	Good	5	N/A	N/A
T21 (To be acquired)	Tender	2019					3000

The Fire Chief and the Fire Inspector are city employees. 39 firefighter positions are approved, 36 are on the roster. All firefighters are paid per call staff and do not routinely provide duty at the station, rather responding from home, work, school, or wherever if available to do so. Firefighters must live or work within 8 minutes travel time to the station, according to the chief.

Workload

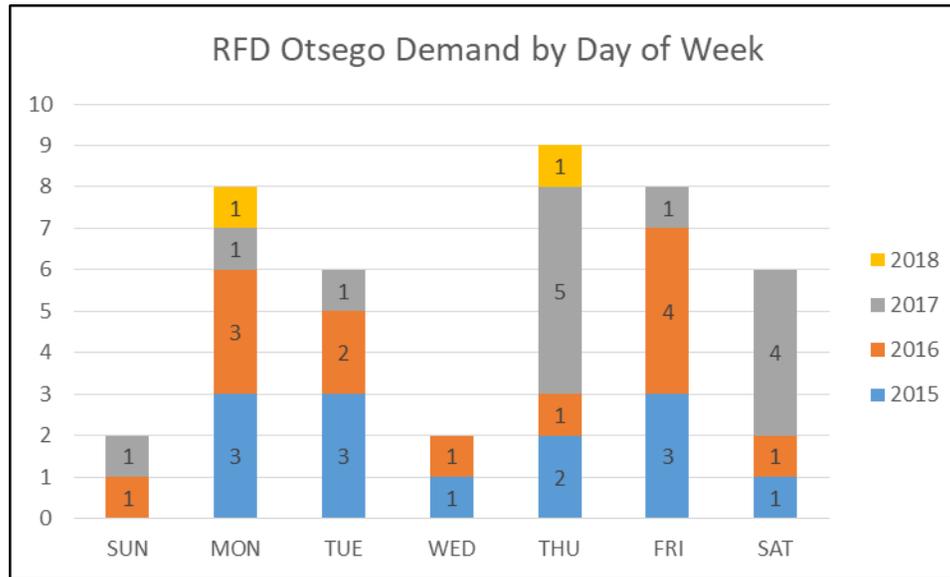
RFD also submitted NFIRS data for this study and Otsego events were segregated in the same manner as ERFD incident data. The workload for the Rogers Fire Department within Otsego and been light and remarkably consistent with total annual counts from 2010 being 12-15 incidents per year. This equates to approximately 3% of RFD’s total annual service volume. Examined workload since January 2015, reveals no surprises given the light volume. In fact, there were no incidents in Otsego in the month of March for the last three years. The ‘busiest’ months had been January and November.

Figure 15: RFD Monthly Workload



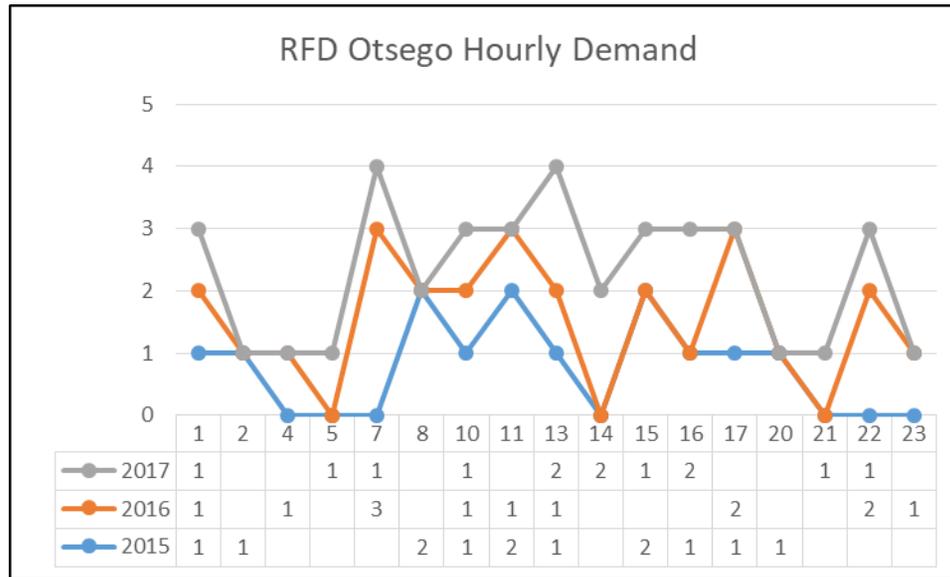
Mondays, Thursdays, and Fridays recorded the cumulative highest volumes by the day of the week.

Figure 16; RFD Demand by Day of Week



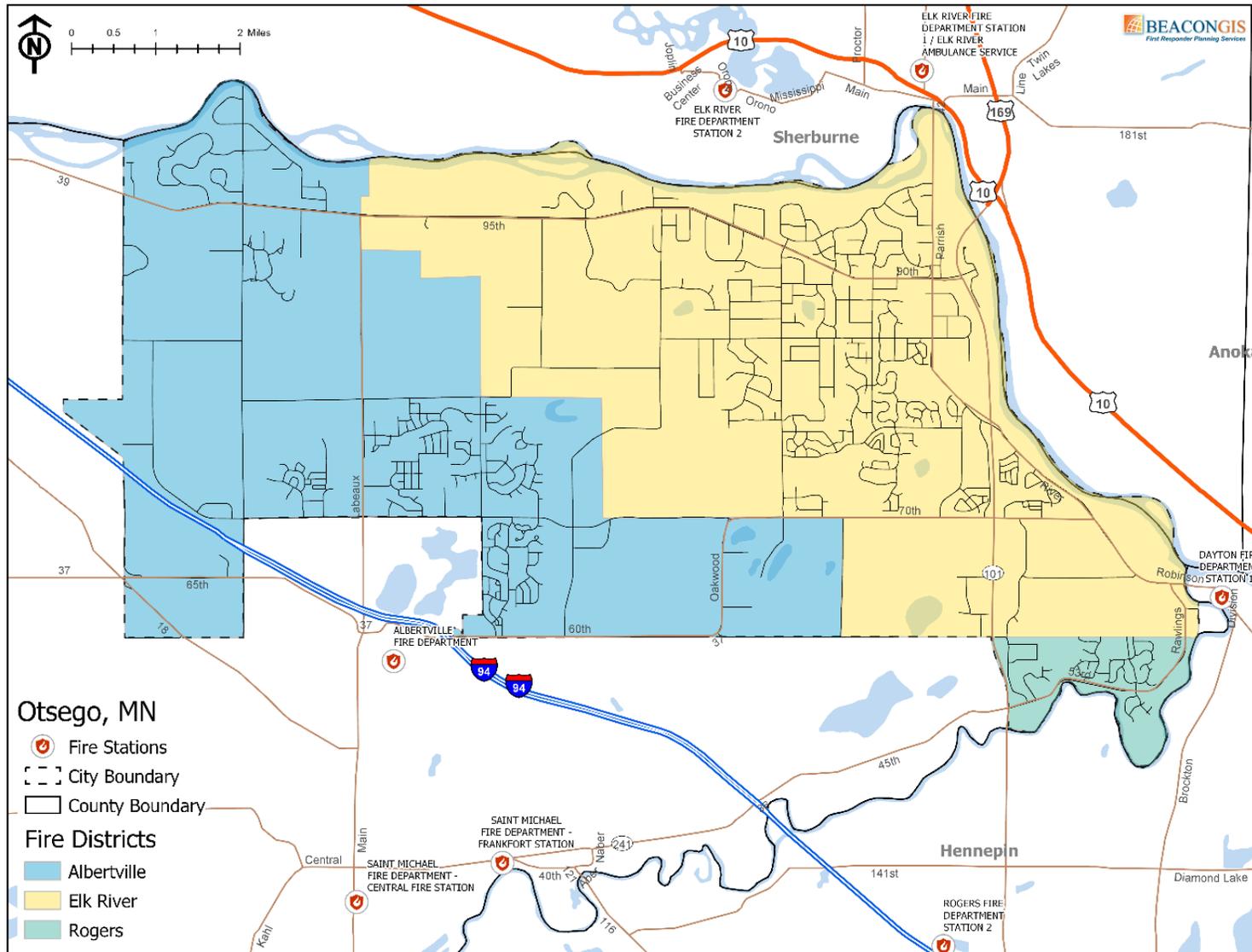
The small size of the dataset reveals no discernable pattern to hourly demand for service in Otsego for the Rogers Fire Department.

Figure 17: RFD Hourly Demand



The following map shows the current fire district areas and fire station locations for the City of Otsego.

Figure 18: Otsego Fire District Areas



National Response Time Guidelines

The National Fire Protection Association (NFPA) has issued a structural fire response time performance recommendation for all or mostly volunteer staffed fire departments. Though not a legal mandate, NFPA 1720⁴ identifies a target response time performance objective for fire departments and a target staffing standard for incident response⁵. Career departments are recommended to adhere to a stricter guideline (NFPA 1710⁶) due to the ready availability of staff.

In recognizing that volunteer departments across the United States cover a variety of communities, the recommended standards are classified according to population densities.

- Communities with populations greater than 1,000 persons per square mile are deemed urban under the 1720 guidelines. Within these types of communities, NFPA 1720 recommends that 15 firefighters arrive at the scene of a structure fire within nine minutes of dispatch, 90% of the time.
- In communities which have 500-1,000 persons per square mile in population, 1720 recommends a response time objective of 10 minutes from time of dispatch, 80% of the time with 10 firefighters.
- A 14 minute response time, 80% of the time with 6 firefighters, is permissible for more rural communities with less than 500 persons per square mile.
- Minimally populated areas in excess of 8 miles from a fire station are considered remote and not subject to a response time guideline but recommends at least four firefighters arrive at the scene. (Not applicable in Otsego)
- The response time measure begins at dispatch notification. A fire service can have more than one type of population density to serve. This guideline does not specify a turnout time parameter. However, the concept of medical first responder is for fire personnel to arrive before ambulance services to begin care.

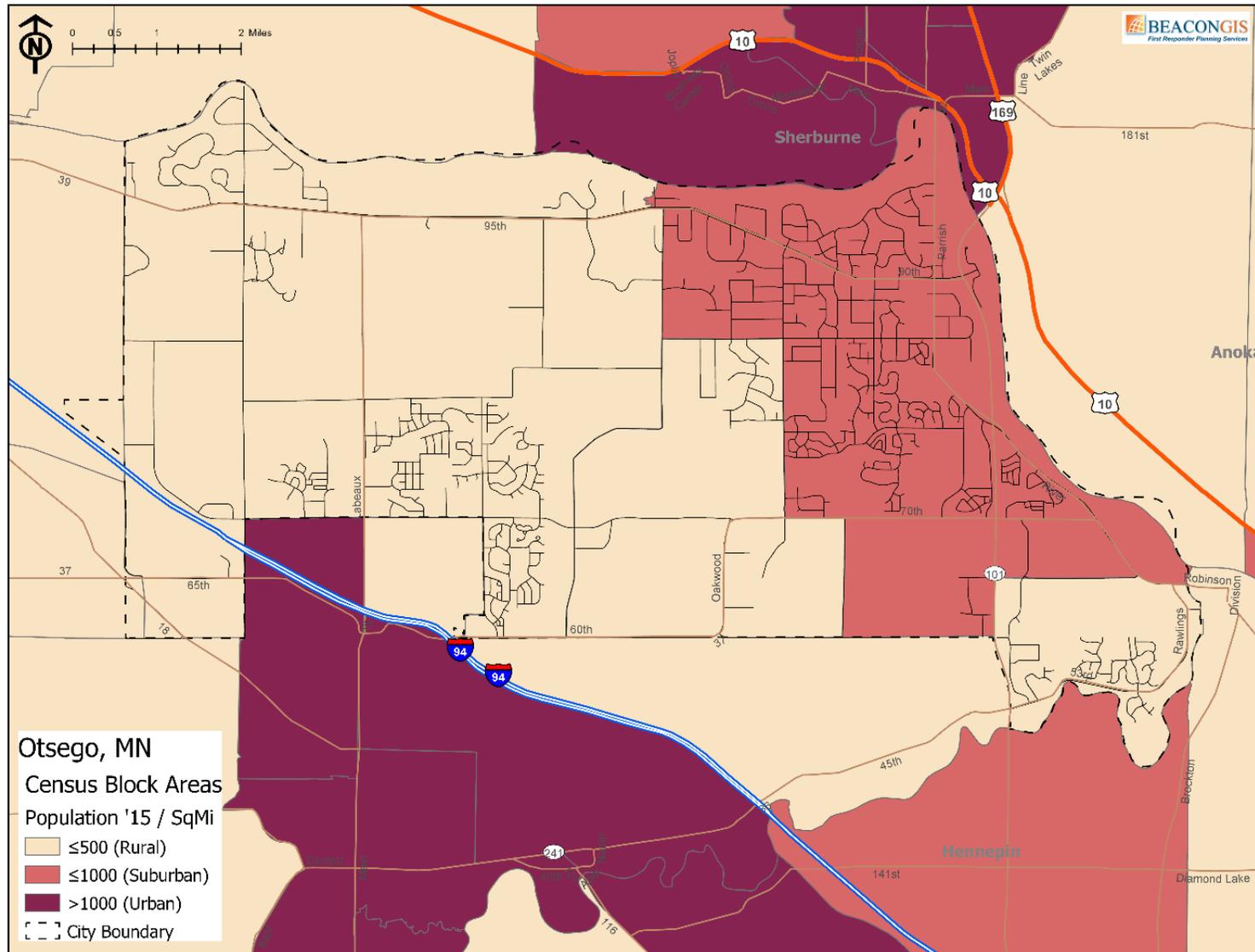
Not all requests for services to the fire department ought to be construed as requiring apparatus to respond emergently or within these time constraints. These should be limited to the most critical emergencies in which they were designed.

⁴ <https://www.nfpa.org/Codes-and-Standards/ARCHIVED/Safer-Act-Grant/NFPA-1720>

⁵ 2000sqft residential without basement

⁶ NFPA 1710 will be discussed in a later section.

Figure 19: Population Density



Response Time Sub-measures

There are sub-elements of response time measures that need to be discussed because interval delays compound to extend the total response time results for fire departments.

Call Processing

Technically this is the time measured between when 911 is answered by an emergency communications agency to when it is alarmed over the radio to the appropriate responders. Notice it doesn't take into account the time from first "ring" of the phone to when it's connected to a telecommunicator. Many 911 communications agencies have internal performance goals. Since many communities have the capabilities to accept text messages of emergencies, similar time intervals can be measured. Because these are career staffed agencies, it should be reported that the NFPA recommends a one minute time cost. However, many situations are in play to disrupt that one minute goal.

The City of Otsego is in an unusual, but not unique, situation. Two of the three fire departments that serve the city are located in two different counties with their own 911 communication agencies. In the areas of Otsego served by these two fire departments (Elk River & Rogers), Wright County transfers the caller to those outside 911 communication Centers. This can create a delay in dispatching resources.

It should also be noted that one of the greatest elements that create dispatch delay is the caller to 911 themselves. Understandably, they may be excited, anxious, scared and may not know or be able to accurately define their location. They may not know all the facts for a telecommunicator to discern the level of urgency beyond the emotions of the caller. This can lead to additional questioning/messaging in the case of text. Legacy technology tied landline telephones with location to aid in the geographic identification. This has become less accurate with cellular technology that is quickly surpassing the type of telecommunication device used for 911 by the public. The towers that process the call may be in another county then where resources are needed. In addition, the location determination is not exact at this point in time but is improving at the speed of technology. Because cellular phones are ubiquitous, an incident may initiate multiple calls to 911, quickly overwhelming the staff in a smaller communications agency.

Wright County tele-communicators do the best to guide the caller into providing location first so that if it needs to be transferred to another county on a dedicated transfer line, it can be done so quickly. The procedure is to provide the receiving communications center with the location and emergency type and then let them proceed as their procedures dictate to handle the remainder of the caller's concern. Different communications centers can have differing technology vendors which makes direct technological transfer difficult or near impossible currently.

Wright County does not currently track performance measures but it would not be surprising if the process averaged at least two minutes as seen in other dispatch centers who do track the process.

Turnout

Turnout Time is the interval between the alarm sounding and the individual apparatus reports that they are leaving the station. The methodology of each department’s staffing response has been discussed previously. The fire department’s report that they only accept members, in part, from a limited distance from the fire station, usually a home address although the firefighters may respond from elsewhere such as school, work, etc. Typically, members are geographically familiar with addresses in their area, once again, technology aids this process significantly. Additionally, the perceived urgency of the event by the firefighters plays a role in the amount of participation.

Apparatus minimums to leave the station have also been supplied by the fire departments for this study. Fortunately, these departments employ technology to see who is answering the alarm and where they are in relation to the station. This avoids leaving with less firefighters than needed if it can be avoided.

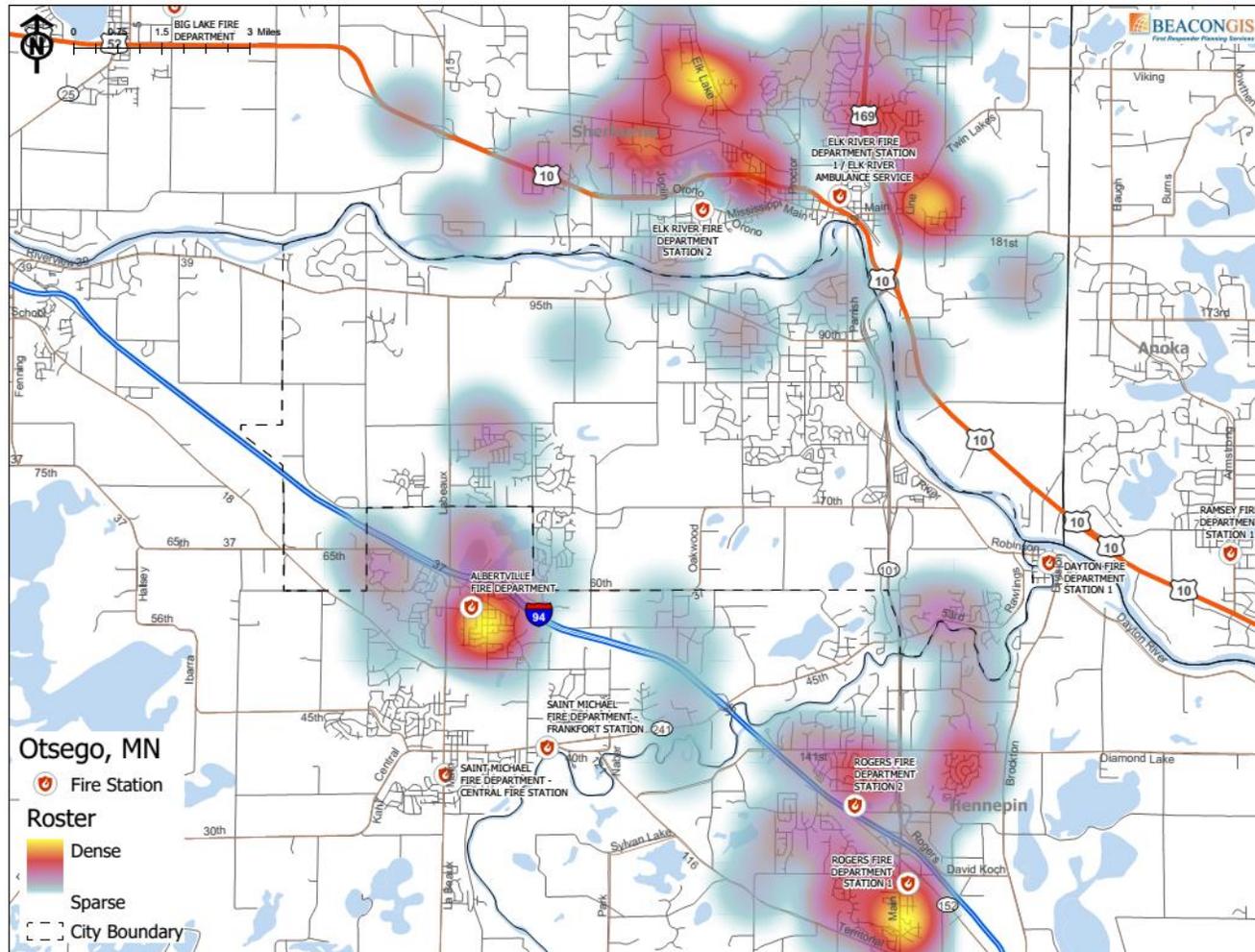
To estimate the turnout time interval, each fire department provided a roster of member addresses that members would likely be responding from. This was applied to the current street network to gauge the amount of turnout time cost based on level of staffing. This model assumes all members are available and responding from the address provided to their current fire department.

Figure 20: Modeled Travel Minutes of Roster Members

# of Firefighters	Albertville	Elk River Stn 1	Rogers Stn 2
2	0.6	2.5	2.6
4	0.9	2.9	2.9
6	1.0	3.2	3.6
8	1.2	3.3	4.1
10	1.3	3.7	4.4
12	2.1	4.1	5.0
14	2.3	4.5	5.1
16	2.4	4.7	6.3

The previous table reflects the travel time only, it does not take into account preparing and getting to a vehicle, arriving at the station parking, going inside, donning gear and assembling upon the apparatus. Most of the volunteer addresses provided are near fire stations as shown in the following figure. This is not unusual as the activities of fire apparatus witnessed spurs volunteer recruitment.

Figure 21: Roster Address Density



Travel

This last sub-element of the total response time measures the interval between when the apparatus leave the station to when it arrives at the scene of an emergency. Here again, multiple situations can impede the process, they include:

- Distance to the emergency
- Weather (snow, rain)
- Traffic Congestion
- Construction, detours, blocked areas
- Multiple units with the same address location (apartments)
- Physical barriers (railroad, limited access highways, one way streets, traffic control/calming, street network connectivity)
- Natural barriers (rivers, lakes, terrain)
- Apparatus Mechanical Capability

Total Response Time

This measure is the summation of the sub-elements (except call processing) just described. Fire departments can only reasonably expected to be measured from the alarm onward and for incidents that occurred within their primary area of responsibility.

Fire Department Response Times

Only identified emergencies within the City of Otsego primary district areas and primary apparatus were analyzed.

*****A note about recorded times:** Accuracy of recorded times are subject to debate. After all, they often depend on human intervention of data input rather than technological automation. Some data may be missing or recorded after the timestamp action indicates. The reader must take this into account when evaluating response time results with the current technology. If relied upon 911 communications center information retrieval, the lack of accuracy and omission of some data needs to be addressed.

Staffing responding totals can be skewed as this may reflect the total responding but not necessarily those who actually responded. Others may have waited at the station or have been turned away if not needed depending on the event.

Albertville FD response analysis

The fire chief reports no impediments to response such as low bridges, poor rail crossings, rail traffic, or traffic calming devices. However, the outlet stores can create traffic congestion for Otsego bound apparatus and in-bound firefighters going to the stations. The response time objective is less than 10 minutes. Otsego is north of Interstate 94 which must be crossed by limited overpasses to respond into Otsego.

The response from staff recorded in the data provided indicated the number of firefighters responding to incidents as seen in the following table:

Figure 22: AFD Staffing Response

Incident Type	Avg Sent Responding	Reserve	Avg Total
Alarm system activation, no fire - unintentional	4.1	4.9	9.0
Animal rescue	3.0	3.0	6.0
Assist invalid	4.0	3.0	7.0
Authorized controlled burning	8.3	4.3	12.5
Biological hazard investigation, none found	6.0	3.0	9.0
Building fire	11.5	5.1	16.6
Camper or recreational vehicle (RV) fire	8.0	3.0	11.0
Carbon monoxide detector activation, no CO	5.0	3.0	8.0
Carbon monoxide incident	6.3	4.2	10.5
CO detector activation due to malfunction	5.0	9.0	14.0
Detector activation, no fire - unintentional	5.0	0.0	5.0
Dispatched and cancelled en route	2.4	8.0	10.3
Dumpster or other outside trash receptacle fire	6.0	6.0	12.0
Electrical wiring/equipment problem, other	7.0	4.0	11.0
EMS call, excluding vehicle accident with injury	4.4	7.7	12.1
False alarm or false call, other	4.4	5.5	9.9
Fire in portable building, fixed location	7.0	8.0	15.0
Fire, other	6.0	6.5	12.5
Gas leak (natural gas or LPG)	5.5	6.5	12.0
Gasoline or other flammable liquid spill	6.8	3.5	10.3
Grass fire	6.8	6.2	13.0
Heat from short circuit (wiring), defective/worn	7.0	3.0	10.0
Lightning strike (no fire)	12.0	8.0	20.0
Medical assist, assist EMS crew	5.5	4.0	9.5
Motor vehicle accident with injuries	8.7	4.6	13.4
Motor vehicle accident with no injuries.	2.0	9.0	11.0
No incident found on arrival at dispatch address	3.3	8.7	12.0
Outside rubbish, trash or waste fire	7.0	4.0	11.0
Road freight or transport vehicle fire	10.0	3.0	13.0
Smoke detector activation due to malfunction	5.0	2.0	7.0
Smoke detector activation, no fire - unintentional	6.0	8.4	14.4
Smoke scare, odor of smoke	11.0	8.7	19.7
Unauthorized burning	8.0	2.0	10.0
Total Average	6.3	5.1	11.4

This includes command staff and POV responders. Reserve column indicates recorded staff standing by at the station according to supplied data⁷. The Albertville FD sends, on average, 2.6 apparatus per incident not including a command vehicle or a privately operated vehicle (POV) where a firefighter may show at an incident without full equipment. Building fires average the most while unintentional alarm activation, receives the least. These results are to be expected.

Figure 23: AFD Apparatus Response

Incident Type	Avg # Apparatus
Alarm system activation, no fire - unintentional	2.3
Animal rescue	2.0
Assist invalid	2.0
Authorized controlled burning	3.5
Biological hazard investigation, none found	2.0
Building fire	3.8
Camper or recreational vehicle (RV) fire	3.0
Carbon monoxide detector activation, no CO	2.0
Carbon monoxide incident	2.0
CO detector activation due to malfunction	2.0
Detector activation, no fire - unintentional	1.0
Dispatched and cancelled en route	1.6
Dumpster or other outside trash receptacle fire	2.0
Electrical wiring/equipment problem, other	3.0
EMS call, excluding vehicle accident with injury	2.1
False alarm or false call, other	2.1
Fire in portable building, fixed location	3.0
Fire, other	3.0
Gas leak (natural gas or LPG)	2.5
Gasoline or other flammable liquid spill	2.5
Grass fire	3.2
Heat from short circuit (wiring), defective/worn	3.0
Lightning strike (no fire)	3.0
Medical assist, assist EMS crew	2.5
Motor vehicle accident with injuries	2.8
Motor vehicle accident with no injuries.	2.0
No incident found on arrival at dispatch address	2.3
Outside rubbish, trash or waste fire	3.0
Road freight or transport vehicle fire	4.0
Smoke detector activation due to malfunction	2.3
Smoke detector activation, no fire - unintentional	2.3
Smoke scare, odor of smoke	3.5
Unauthorized burning	3.0
Total Average	2.6

Albertville FD is achieving the response time goals set in the NFPA 1720 guidelines at 11 minutes overall and 8 minutes specifically for building fires.

⁷ AFD was the only department to segregate staffing data in this manner.

Elk River FD response analysis

A railway used for freight and commuter rail goes through Elk River. It can impact the response from Jackson Ave. station #1 north of the tracks and two of three (Jackson Ave, Main St., and Highway 169) direct possible routes to Otsego. Highway 169 is a viable alternative if Station 1 apparatus is blocked at the tracks. While the freight train does not stop, it reportedly is frequent and has many cars. Reports that it is going at a fair speed through town is surprising given the crossings and lack of horn warning signs. The author of this study was unable to witness a train after waiting near the tracks for an hour. A Metro Transit commuter train also utilizes this rail line. A station stop in Elk River is southeast of the routes in Otsego but the line also traverses onto Big Lake to the west. Times in the morning begin at 5:10 AM with five ride options until 7:28 AM. Evening trains arrive at 4:34 PM until about 7 PM. Weekends have significantly less train option times.⁸ While the Orono Parkway Station #2 is south of the railroad, it is further west. Both stations then meet another barrier, the Mississippi River. There are two bridge crossings. While US 169 is four lane highway, it and Parrish Ave are affected by the morning commuter rush period southbound.

The data provided by the Elk River Fire Department did not include apparatus enroute times therefore, turnout time performance cannot be assessed. Elk River sends an average of 1.64 apparatus (not including command vehicles, trailers, or POVs) to incidents within their primary response area. For building fires specifically, an average of 4.25 apparatus are responding.

Figure 24: ERFD Apparatus Response

Incident Type	Avg. # Apparatus
All Fire	2.68
Medical/Rescue	1.33
Hazard (no Fire)	1.63
Service Call	1.47
Good Intent	0.86
False Call	0.51
Weather	3.00
Total Average	1.64

⁸ <https://www.metrotransit.org/route/888/1>

An average of 6.3 Elk River firefighters respond to incident requests in Otsego. Some incident types require more or less depending upon severity and critical tasks to be completed. There was no indication if these firefighters all responded to the scene or were standing by at the station. In addition, the data could reflect all that responded but may have been cancelled from the assignment.

Figure 25: ERFD Staff Response

Incident Type	Avg. # Staff
All Fire	10.36
Medical/Rescue	6.95
Hazard (no Fire)	7.78
Service Call	6.20
Good Intent	5.17
False Call	3.53
Weather	18.00
Total Average	6.3

Rogers FD response analysis

As with any limited access highway and river, there are limited overpasses available. The railroad track is south of the furthest station (RFD Station 1) from Otsego so it's impact for this study is not a consideration.

The data provided by the Rogers Fire Department did not include alarm or apparatus enroute times, therefore turnout time performance cannot be assessed. However, the total response time performance of less than 10:56 occurs 80% of the time for all events which meets the NFPA 1720 guideline. There were no building fires recorded in the supplied data or indication of response priority. Rogers Fire Department also meets the NFPA 1720 guideline for the number staffing recorded on incidents. RFD sends an average of 2.8 apparatus to incidents during the time period excluding POV's and Command vehicles.

Figure 26: RFD Apparatus Response

Incident Type	Avg # Apparatus
Car Fire	2.0
Medical Call	3.4
Motor Vehicle Accident with injuries	3.3
Motor vehicle Accident with no injuries	3.0
Gas Leak (natural gas or LPG)	3.5
Arched, shorted electrical equipment	5.0
Locked out	2.0
Assist invalid	4.0
Smoke scare	4.0
False alarm or false call	2.0
Extinguishing system activation	1.0
Malfunctioning smoke detector	3.0
Unintentional sprinkler activation (no fire)	2.0
Smoke detector activation (no fire)	3.3
Unintentional detector activation (no fire)	3.0
Unintentional alarm activation (no fire)	3.3
Carbon Monoxide detector activation (no CO detected)	2.0
Dispatched and canceled enroute type 1	2.0
>type 2	3.0
>type 3	1.5
300M	2.0
300U	4.0
Total Average	2.8

The amount of staff listed is detailed in the following table. There was no indication if these firefighters all responded to the scene or were standing by at the station. In addition, the data could reflect all that responded but may have been cancelled from the assignment.

Figure 27: RFD Staff Response

Incident Type	Avg Total
Car Fire	13
Medical Call	13.9
Motor Vehicle Accident with injuries	16.3
Motor vehicle Accident with no injuries	12.0
Gas Leak (natural gas or LPG)	12.5
Arched, shorted electrical equipment	12.0
Locked out	13.0
Assist invalid	11.0
Smoke scare	13.0
False alarm or false call	8.0
Extinguishing system activation	17.0
Malfunctioning smoke detector	24.0
Unintentional sprinkler activation (no fire)	7.0
Smoke detector activation (no fire)	13.3
Unintentional detector activation (no fire)	20.0
Unintentional alarm activation (no fire)	14.8
Carbon Monoxide detector activation (no CO detected)	8.0
Dispatched and canceled enroute type 1	11.0
>type 2	14.0
>type 3	12.5
300M	6.0
300U	14.0
Total Average	13.0

Results vs Standards

The response areas for the Rogers FD and Albertville FD correspond with the rural guidelines described in the NFPA 1720 recommended response measure. Elk River FD population density correlates with both the rural and suburban guidelines described in the NFPA 1720 benchmark. However, fire protection is not limited to population density influence as will be further discussed later in this report since there are commercial properties and infrastructure issues in the community.

Additionally, the staffing levels in the NFPA 1720 guideline pertain primarily to building fires. Most other types of calls can be mitigated with a smaller number of responders. The following table combines the response time performance of the fire departments to Otsego compared to the NFPA 1720 guideline.

Figure 28: Fire Departments Response Times vs. NFPA 1720

80th Percentile Performance '15-'17	AFD	ERFD		RFD
NFPA 1720 Population Density	Rural	Rural	Suburban	Rural
Turnout Interval	0:06:00	Detailed Data not supplied		
Travel Interval	0:05:00	Detailed Data not supplied		
Total Response Time (TRT)	0:11:00	0:14:14	0:12:59	10:56
TRT -Building Fire	0:08:00	0:11:20	0:09:51	No Events
<i>NFPA 1720 Goal</i>	<i>0:14:00</i>	<i>0:14:00</i>	<i>0:10:00</i>	<i>0:14:00</i>
Mets Goal?	Yes	Yes	Yes	
Building Fire Staffing	11	15	16	No Events*
<i>NFPA 1720 Goal</i>	<i>6</i>	<i>6</i>	<i>10</i>	<i>6</i>
Mets Goal?	Yes	Yes	Yes	

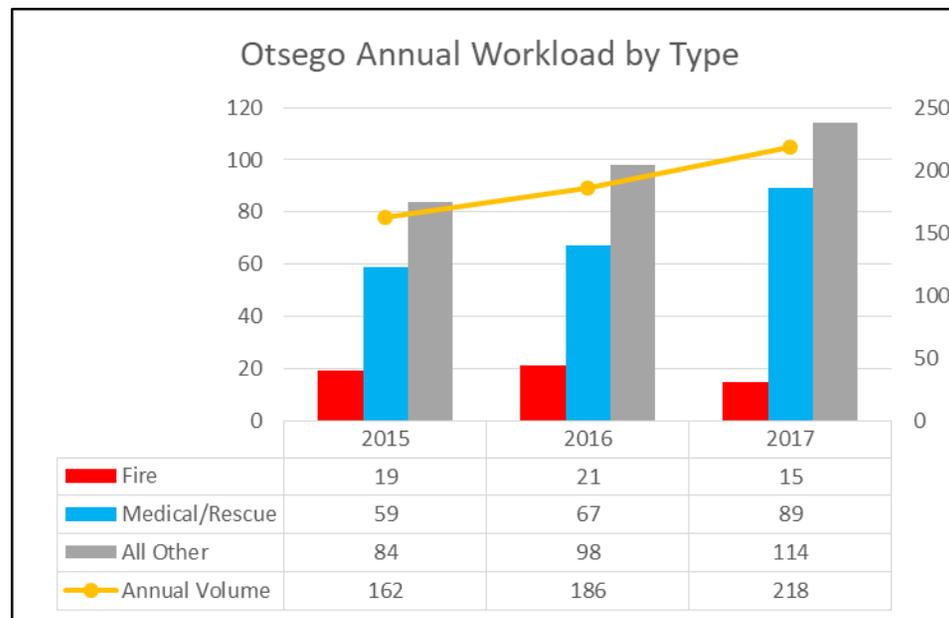
* Avg 13 (all Calls)

All the recorded data from the fire departments indicate that that are within compliance of NFPA 1720 response time performance guidelines.

Compilation of Otsego Data

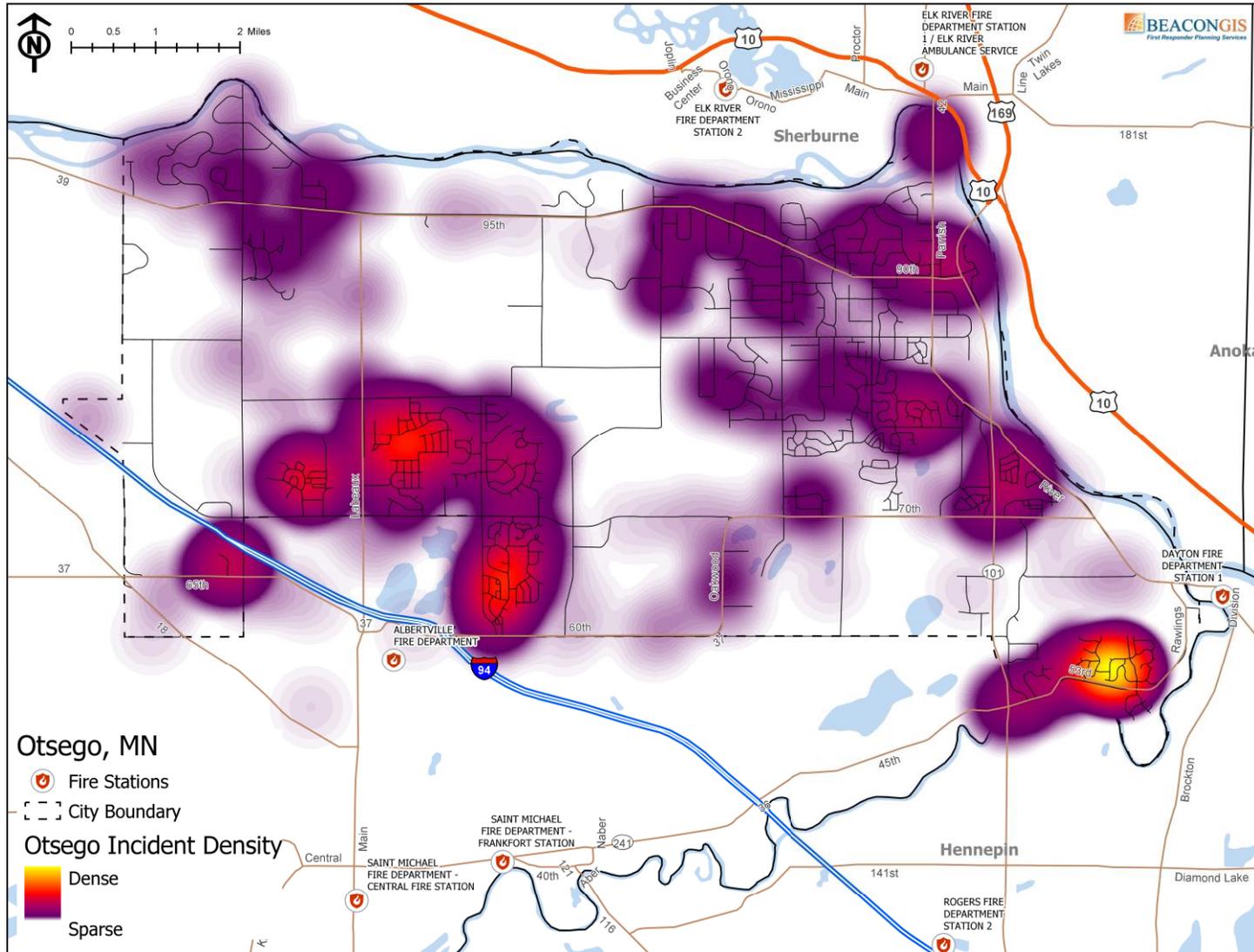
Until this point in the document, the fire departments have been examined separately for resources and performance from 1/2015- EOY 2017. Going forward, the City of Otsego as it relates to fire protection will be discussed. The following graph summarizes the workload of the fire departments by incident type over the study time period.

Figure 29: Otsego Fire Rescue Workload



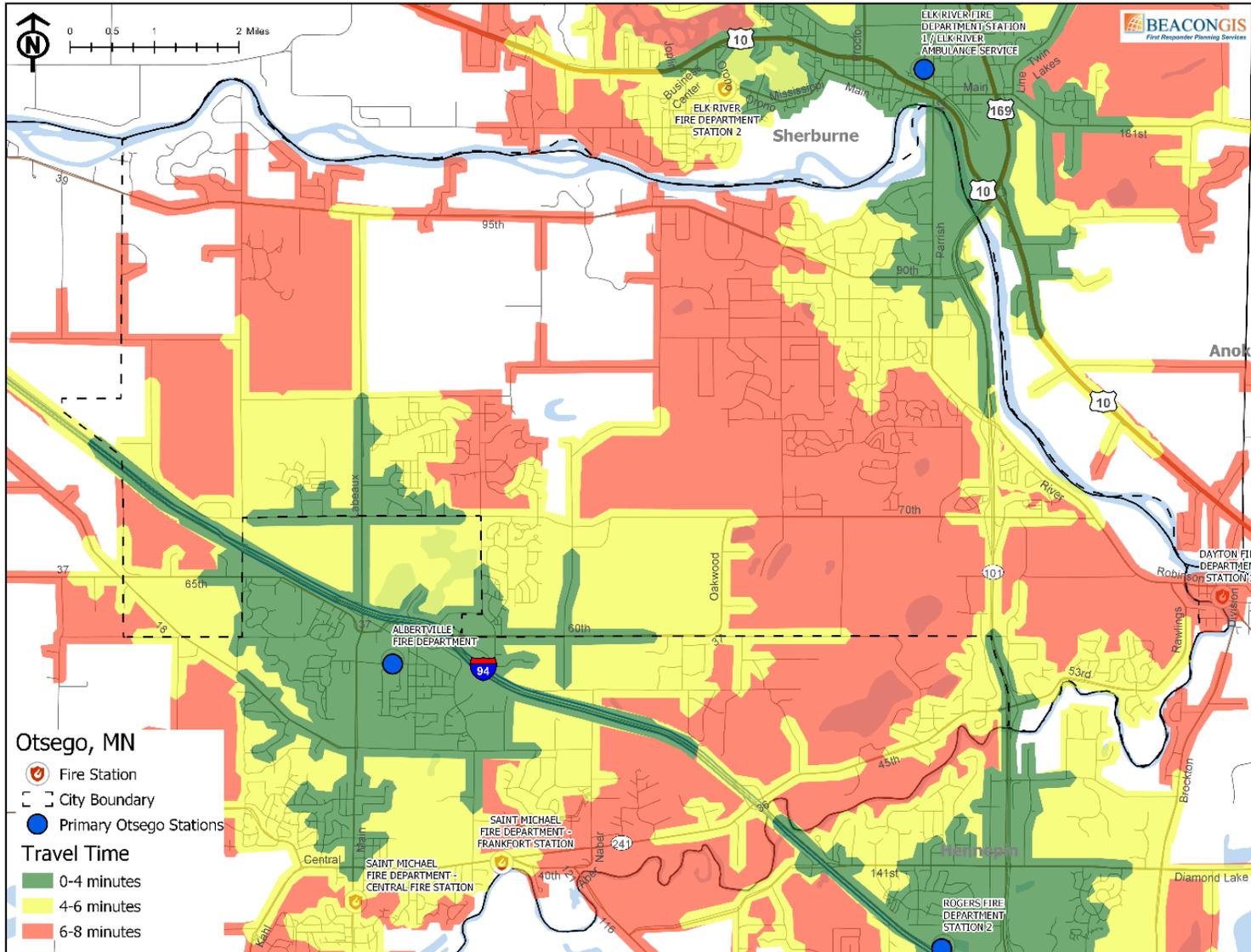
Fortunately, the incidence of actual fires has remained generally steady rather than increasing. However, the variety of medical, rescue, and all other types of incidents that occur in Otsego is increasing. Total incident volume increased 15% from 2015 to 2016 and 17% the year after. The following map show the density of incident points from the incident records.

Figure 30: Otsego Demand Density



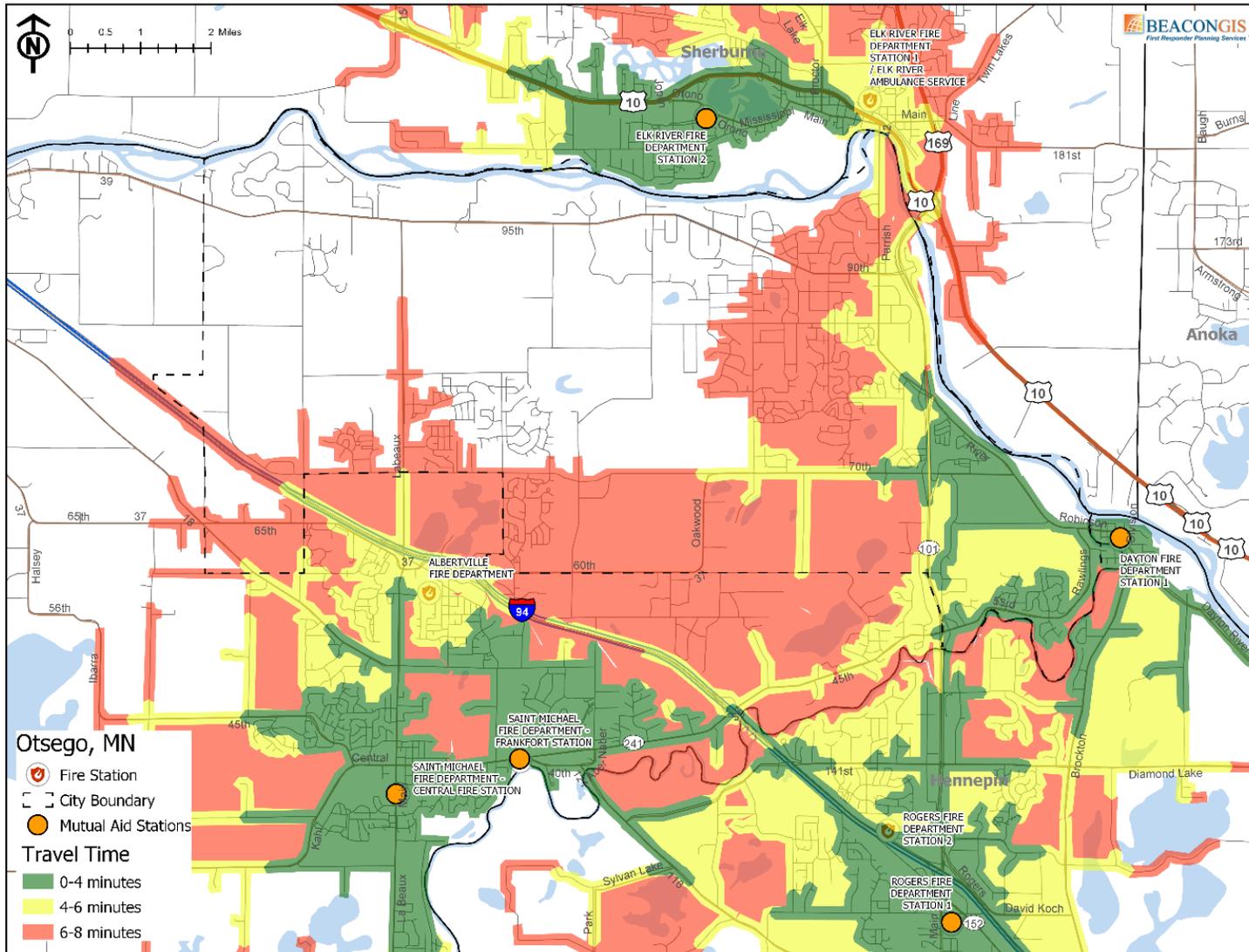
Note that the clusters of demand are denser in areas of residential development. Data does indicate certain intersection areas with Highway 101 have a history of motor vehicle collisions. The following figure illustrates the travel time capability from the primary response fire stations to Otsego at differing lengths of time allowing for turnout time interval. The road network uses the speed limits attributed to the street segment and penalizes time for deceleration/reacceleration and turns. It does not account for weather, traffic congestion, constructions, or detours. Compared to the demand for services, 96.6% incidents are within the 8 minute travel time, 71.4% within 6 minutes and 21% within 4 minute of drive time. For structure fires, 93.5% occurred within an 8 minute drive, 62.5% within a 6 minutes, and 6% occurred within a 4 minute drive from the primary response fire stations.

Figure 31: Current Travel Time Capability



Structure fires require multiple apparatus from multiple stations, some of which are from other fire departments nearby. Mutual aid from distant stations are also used if the host fire department will be unable to assemble another crew in the event of concurrent events. Although the three fire departments in Otsego have mutual aid agreements, only Rogers FD has an automatic aid agreement with the nearby Dayton Fire Department. Mutual aid is activated when requested by the host fire district, automatic aid denotes simultaneous dispatching of departments on certain types of incidents. The following figure shows the travel time extent of nearby mutual aid stations into Otsego. Monticello FD was included but did not reach Otsego within 8 minutes of modeled travel time. Mutual Aid is important to reach the staffing levels as outlined in the NFPA 1720 guidelines within the time objectives. A large region of Otsego remains outside the time objectives. This map can also be viewed in comparison to the previous figure when ERFD may send resources from Station 2 if a train is blocking Station 1 apparatus although rerouting using US169 would be more advantageous as discussed.

Figure 32: Mutual Aid Travel Time Capability

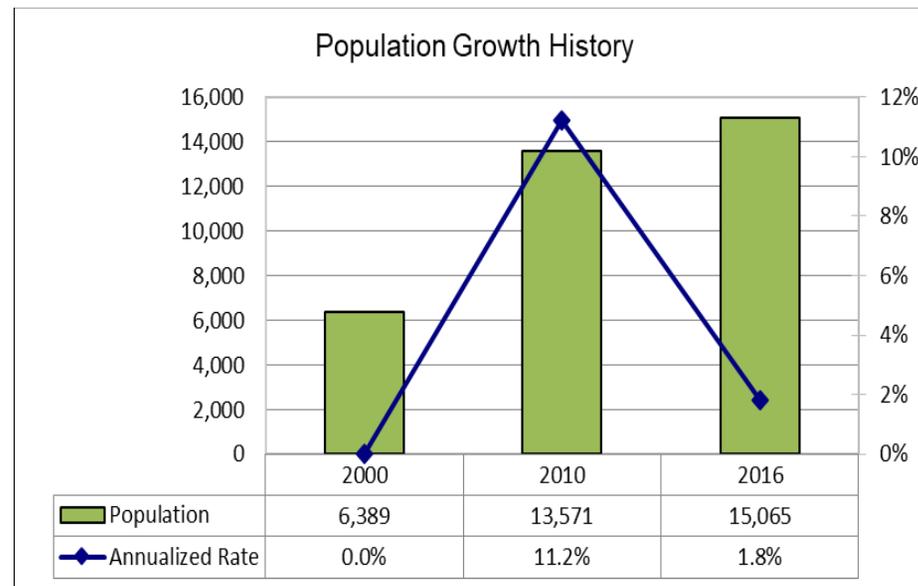


Community Risk

Fire protection and Rescue services should be prepared to mitigate most incidents that occur based upon the risks faced by the community. Risk correlates with demand and community impact. These agencies must do so with facilities, equipment and with the transportation street network connectivity. Two broad factors provide insight into the risks of a community. There are demographics/socioeconomics and structural assets.

Demographics & Socioeconomics

The City of Otsego is home to an estimated 15,605 residents according to the U.S. Census Bureau⁹. Since the year 2000, residential population has more than doubled when the residential census was measured at 6,389 persons. Population has been growing slower since 2010 at nearly 2% per year.

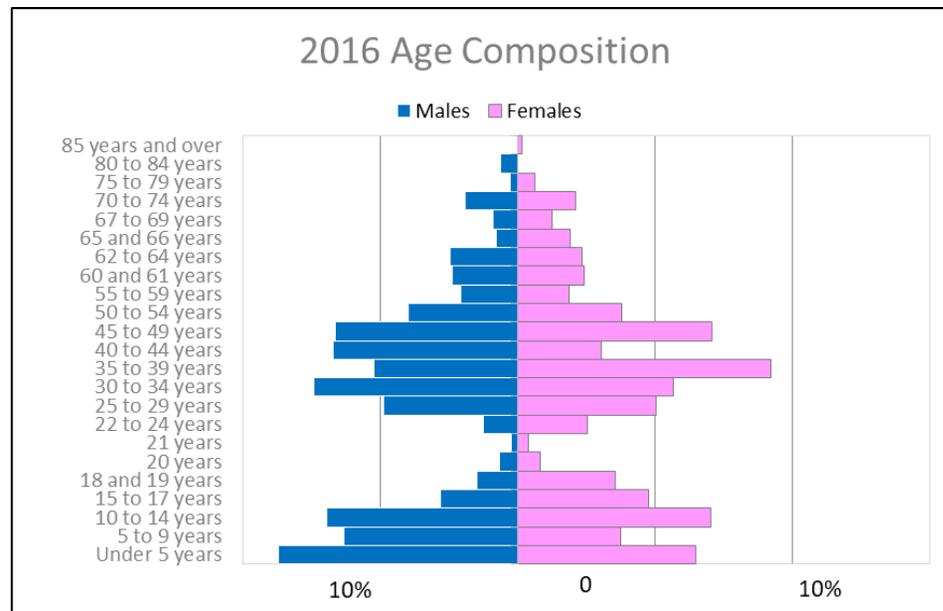


⁹ 2012-2016 American Community Survey 5-Year Estimates

This does not take into account visitors to Otsego who shop at stores, eat at restaurants, drive along the roads, work within its industries, and stay in hotels or with family. The census bureau does estimate that almost 76% of the residential population work outside of Wright County¹⁰.

The median age in Otsego is 33.2. Compared to 35.8 for the county, and 37.8 for the state. The composition of age is important to fire services as children are known to hide during a fire creating the need for rescue by the firefighters. Senior citizens can have mobility issues that are troublesome in an event that requires rapid egress, such as a fire. Also seniors and impending seniors can develop medical conditions that result in the need for fire district rescue services. The following chart indicates that Otsego is home to mostly middle aged adults with young children. The census bureau indicates that 93% of this population is one race; white.

Figure 33: Population Age Composition



¹⁰ 2012-2016 American Community Survey 5-Year Estimates S0801

The age composition history indicates that although the young population has risen, so has the population from age 45 to 74. It should be noted that 5% of the population is less than 5 years of age and 7% is over the age of 65.

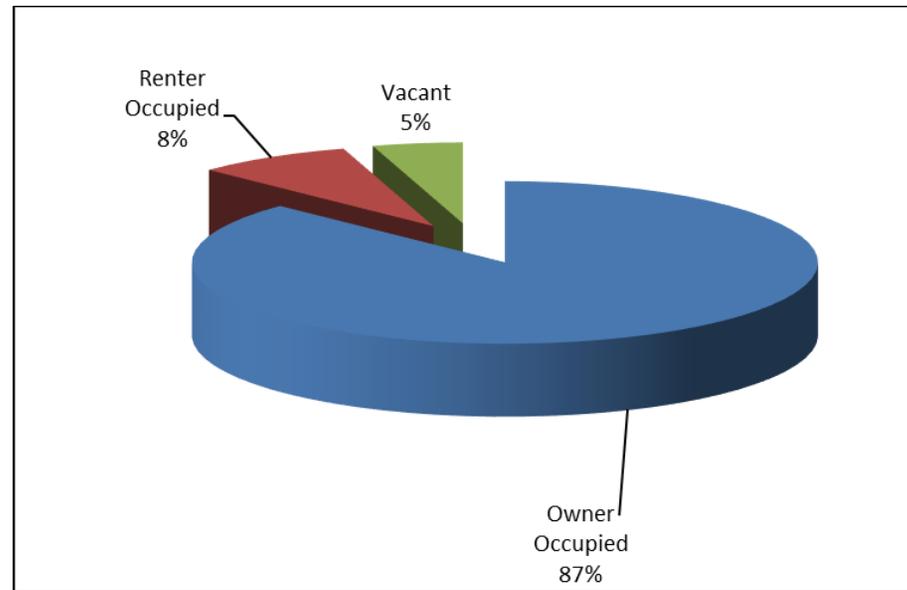
Figure 34: Age Composition Change

Demographic Change- 2010 to 2016								
	Total Pop	Age <5	5 to 24	25 to 44	45 to 54	55 to 64	65 to 74	75 and up
2016 est.	15,065	1,517	4,266	4,728	2,149	1,353	886	166
2010	13,571	1,342	3,759	4,782	1,716	1,201	530	241
change	11%	13%	13%	-1%	25%	13%	67%	-31%

Housing

Examining housing is not as clear as it used to be. In the past, a higher percentage of owner-occupied housing correlated with stable, high income communities, while a high rental and vacant percentage correlated with lower socioeconomic communities (except in college towns and vacation areas). However, the recession of the late last decade left many in the rental market. Changing generational trends are showing that millennials and younger age groups prefers mobility versus rooting in a home.

Figure 35: Housing by Occupancy



The majority of housing in the City of Otsego is owner occupied. However, post-recession growth has been in rental properties as vacant units have been steady in number.

Figure 36: Occupancy Change

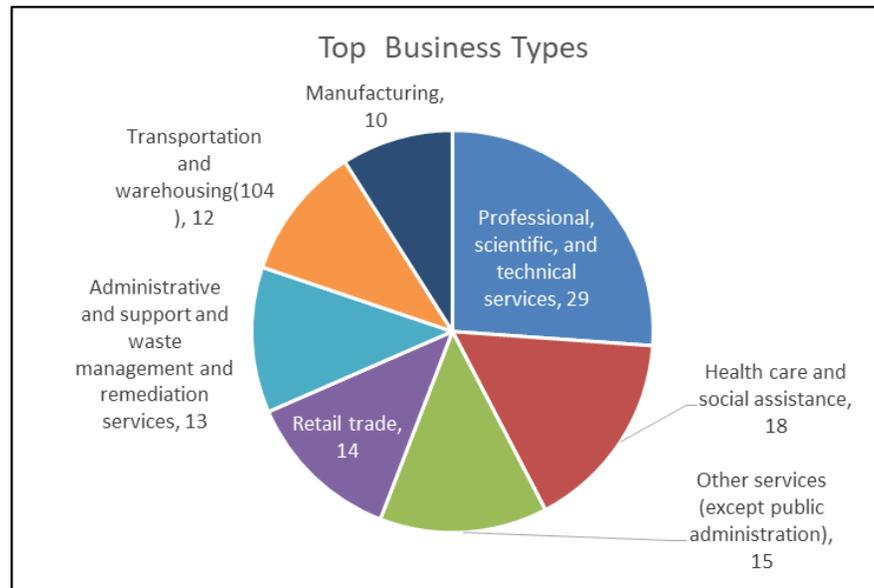
Housing Information- 2010 to 2016				
	Housing Units	Owner Occupied	Renter Occupied	Vacant
2016 est.	5,424	4,731	440	253
2010	4,736	4,335	401	286
change	15%	9%	10%	-12%

Socioeconomics

The median annual income for residents of the City of Otsego is \$89, 556 compared to \$75,705 for the County and less for the statewide figure. Poverty is low in Otsego at 1.8% compared to the County at 5.6% and higher statewide. Unemployment rates are also lower in Otsego than the County or statewide percentages¹¹. These figures indicate that Otsego residents are generally doing well financially. These factors can affect the staffing of fire departments as will be discussed later.

There were 735 commercial enterprises in Otsego. The following chart details the top commercial entity types in Otsego according the 2012 US Economic Census. Of these, healthcare and social assistance had the most employees and highest payroll but the retail trade sector had the most sales revenue.

Figure 37: Otsego Commercial Profile



¹¹ 2012-2016 American Community Survey 5-Year Estimates

Otsego is primarily a residential community of commuters to the Minneapolis metro area. Industry is being encouraged in the city and efforts to support that along Highway 101 and plans for an industrial area the southwest side of town are ongoing. One great factor in encouraging this type of development is the availability of water and sewer on the southeast and southwest regions of the city. Plans for expansion in the central area and northwest side will also encourage commercial interest. However, it will also encourage higher density residential development.

Structural Risk

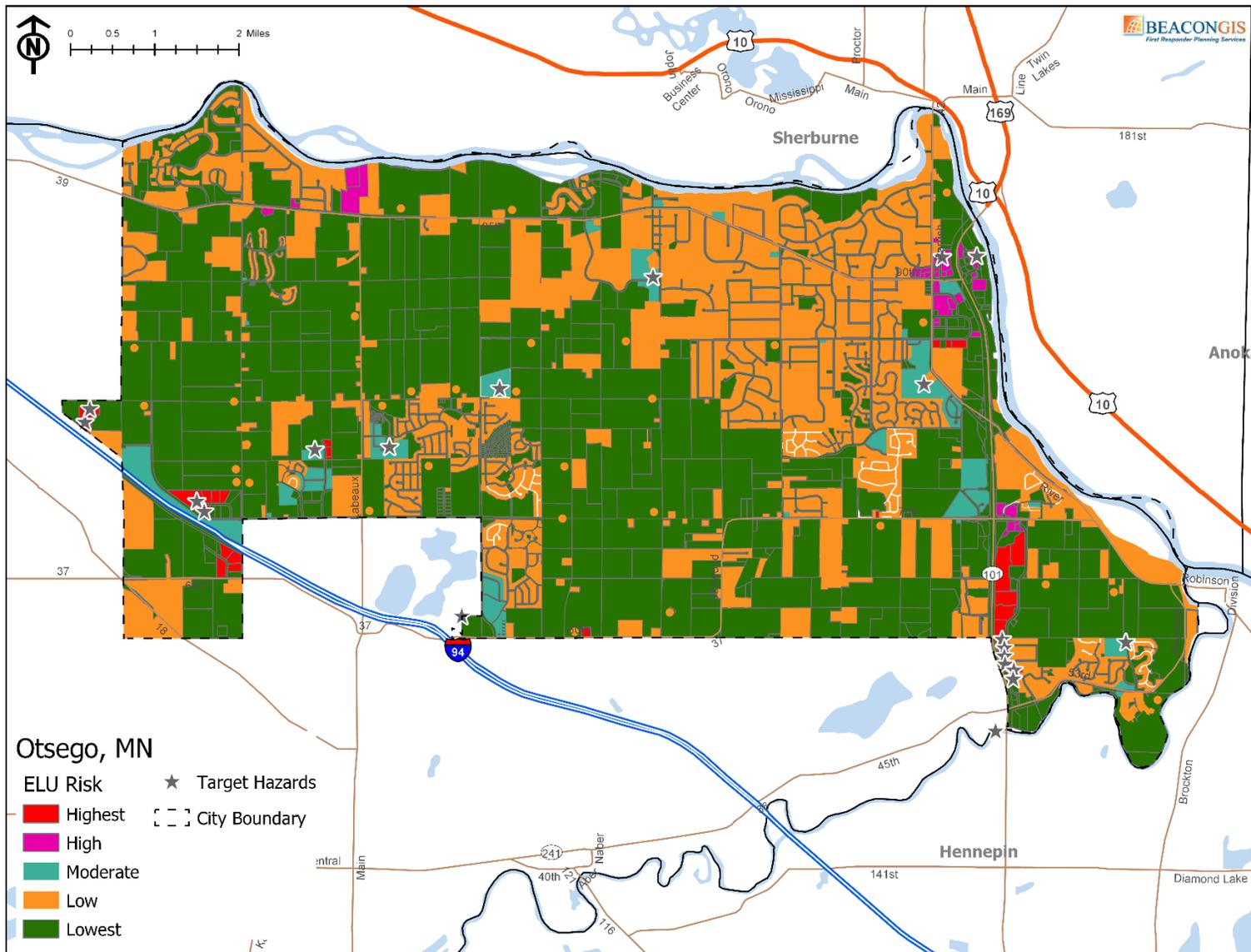
The types, use, age, and size of structures, whether currently utilized or permissible pose differing levels of risk to the community that fire departments must maintain awareness of and be ready in case of an incident for fire. This is because such relative loss has a coincident impact upon the community with regard to life, job, income, and tax loss.

These risks can be defined as follows:

1. Highest - Refineries, large industry, hospitals, school dormitories, lumber yards, and propane storage facilities;
2. High - High-rise hotels and residential buildings, large shopping centers, and commercial complexes;
3. Medium - High-density and medium density residential buildings due to close exposure and public facilities
4. Low – Lower density Single-family dwellings
5. Lowest – Vacant land, parks, Open Space, ROWs.

Examining the existing land use by this criteria, the next map shows area of Otsego where the greatest risk to the community are located. In addition, the fire chiefs were queried as to the locations of special target hazards that they identify as especially hazardous to the community at large in the case of a fire. These are signified with a star on the map.

Figure 38: Existing Land Use Risk



Examination of the map reveals that a large industrial area east of Highway 101 in the southeast region of the city and some industry straddling Interstate 94 in the southwest. Commercial development is concentrated near the 90th Street and Highway 101 interchange. Public facilities and higher density housing are scattered within the city limits. Primarily the current land use are low density residential and undeveloped/protected land.

Figure 39: Identified Target Hazards

Company	Fire Dept	Address	City	State
Brett Admixtures	Albertville	9660 NE 71st St NE	Otsego	MN
Knife River Concrete	Albertville	9625 NE 71st St NE	Otsego	MN
Minnesota Native Landscapes	Albertville	8740 77th St NE	Otsego	MN
Minnesota Medical Solutions	Albertville	8740 77th St NE	Otsego	MN
Albertville Wastewater Treatment (Chemical Spill)	Albertville	11822 63rd St NE,	Albertville	MN
Otsego Water Treatment (Chemical Spill)	Albertville	77th st NE	Otsego	MN
Riverview Landing (senior housing)	Elk River	9200 Quantrelle Ave. NE	Otsego	MN
Otsego Elementary	Elk River	8125 River Rd NE	Otsego	MN
Prairie View Elementary	Elk River	12220 80th St NE	Otsego	MN
City Hall	Elk River	13400 90th St NE	Otsego	MN
Holiday Inn(Chemical Spill)	Elk River	9200 Quaday Ave NE	Otsego	MN
Crow River (Chemical Spill)	Rogers	Crow River	Otsego	MN
Highway 101 (Chemical Transportation Incident)	Rogers	Highway 101 south of 60th	Otsego	MN
Queens Avenue Industrial (No Hydrants)	Rogers	Queens Ave south of 60th	Otsego	MN
Otsego Wastewater Treatment(Chemical Spill)	Rogers	Randolph Ave NE	Otsego	MN

On Queen’s Avenue, hydrants do reach to the 60th Street line, but the industrial buildings south do not therefore Rogers FD will have tankers to respond in case of an incident.

While the transportation infrastructure risk has already been discussed, it would be appropriate to note that new residential development style for the last several years has been to limit the access to these communities with perhaps one or two access points to reduce traffic. In addition, devices such as speed humps to reduce speed are favored by families with younger children. These designs, though attractive to property owners

detract from fire services ability to respond efficiently. Conversely, traffic circles, or roundabouts, encourage traffic flow and enhance responding apparatus efficiency in travel.

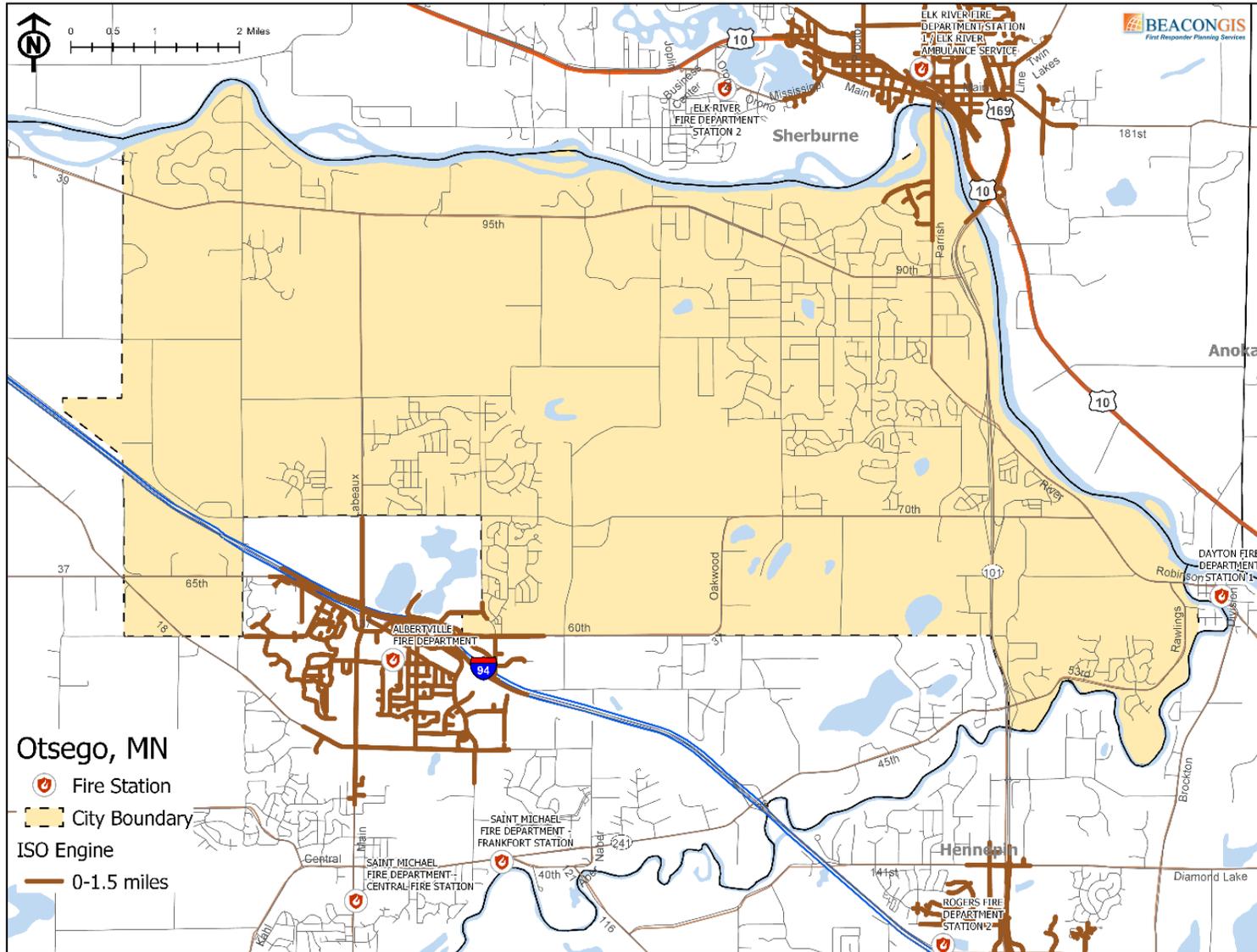
ISO Criteria

Providing risk loss coverage is the function of the insurance industry. Many insurers rely upon the Fire Suppression Rating Schedule utilized by the Insurance Services Office (ISO) in its evaluation of municipal fire suppression capabilities includes fire station locations with objective mileage-based criteria.

The ISO considers insured properties beyond five miles of a fire station to be at highest risk for rating purposes. The ISO considers the optimum physical location of engine companies and ladder companies essential to earning maximum credits under the Fire Department Item in the Schedule. Obviously, engine companies and ladder companies are placed in fire stations. So it is the location of the fire station that becomes important to the evaluation process used by the ISO. These are very conservative estimates, based on a 1970's study in a gridded street environment using a constant 35 mph to generate the distance. The problem with using mileage alone is that, speed capability of the road affects the time travelled; the ISO criterion has since been revised to take this into account based upon response time performance. It should be strongly noted that ISO apparatus distance is only one of many criteria to which the ISO evaluates a district to include water supply, equipment, testing, and dispatching. A number 1 overall rating of a fire department is the best and decline through a rating of 9. A rating of 10 would be areas outside of a five mile limit and deemed "uncovered".

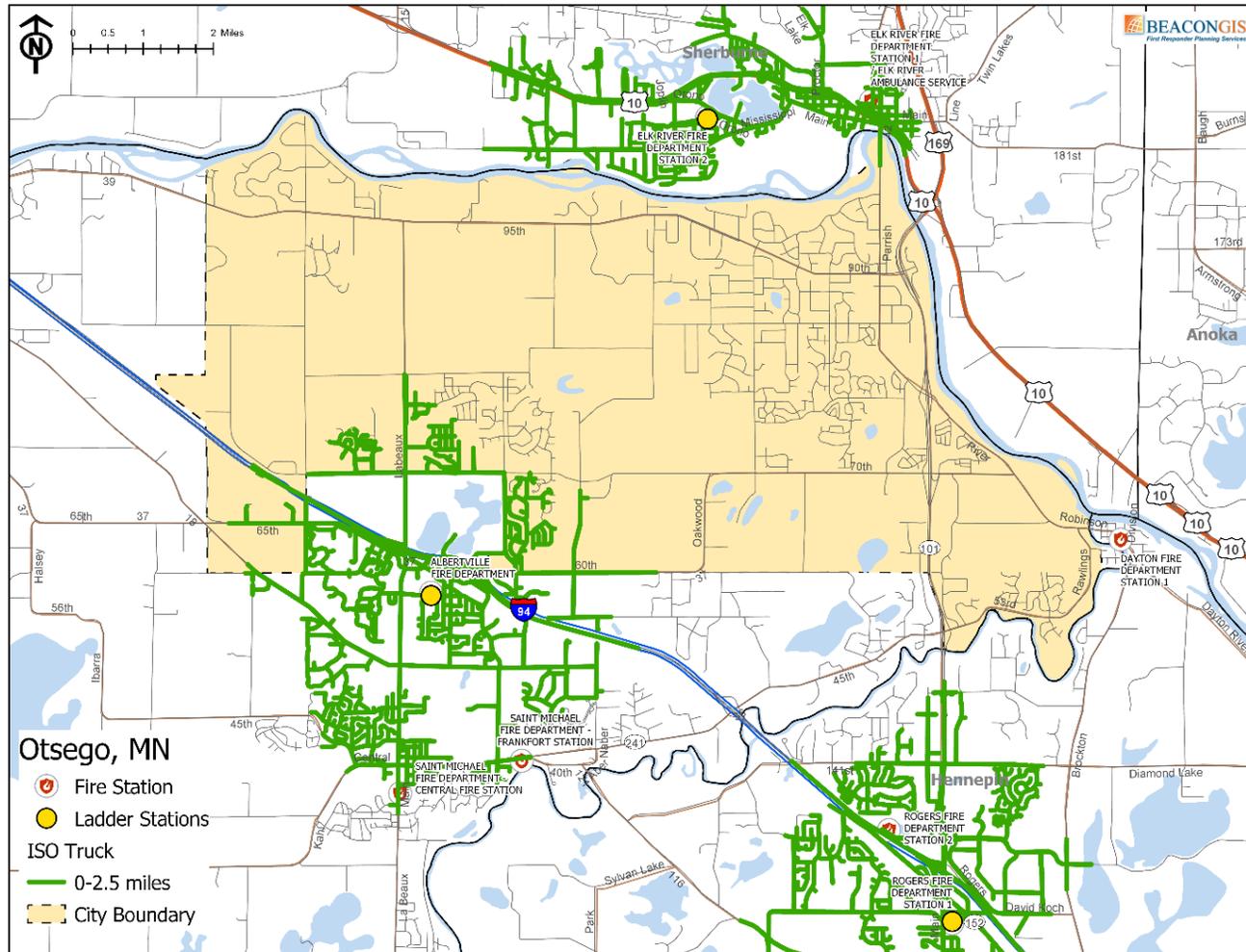
The ISO recommends that an engine apparatus be within 1.5 miles of a developed area. The developed area is defined by ISO as an area with hydrants. The lack of hydrants and distance from fire stations also negatively affects rural property owners insurance rates. Based upon the next figure, few property owners would be within the optimal distance from an engine type apparatus and likely have higher insurance rates.

Figure 40: ISO Engine Distance



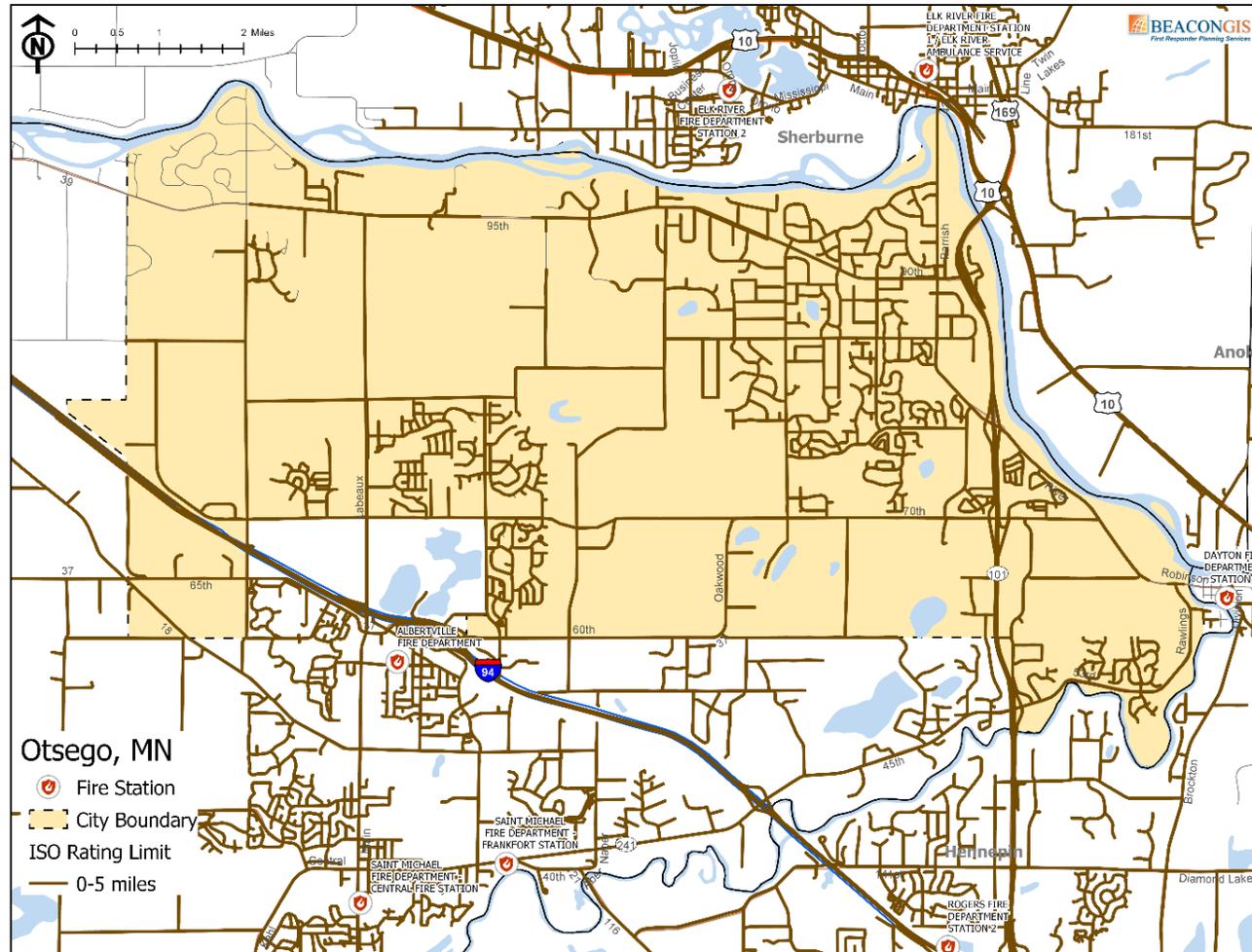
Ladder apparatus are usually placed in areas where multiple storied buildings or single floor structures with significant square footage (“Big Box” stores) are located to maximize credits under the ISO schedule. This is because a survey of buildings is a part of the schedules’ needed fire flow calculations. The recommended distance from each station that is equipped with a ladder apparatus is shown in the following figure.

Figure 41: ISO Truck Distance



The property owners who benefit the most from a nearby ladder apparatus that are within AFD's station receive the most favorable insurance rates. Remember that properties outside a five mile distance have the most unfavorable rates. The northwest corner of the city is outside of the ISO's rating limit and property owners may receive the rating of a 10 and highest insurance rates. This extent is shown in the next figure.

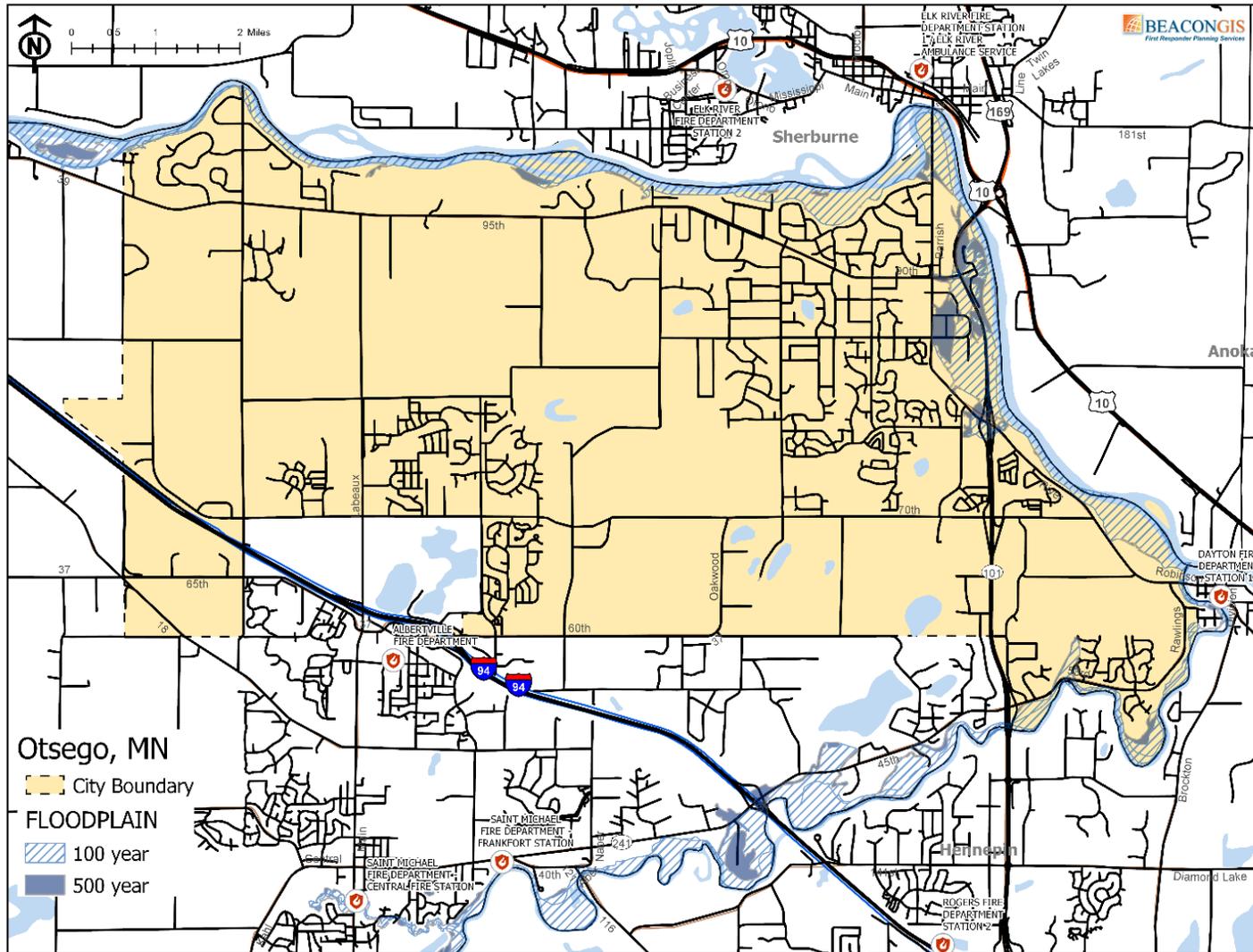
Figure 42: ISO Rating Limit



Natural Risk

Another type of risk to the community that requires fire service capabilities and hinders them are naturally occurring, primarily severe weather. Whether it be a snowstorm, tornado/wind, torrential downpours, or severe heat; fire departments are deployed. These events can inhibit firefighters in the performance of their duties and restrict access for responding apparatus using the road infrastructure. Many of these natural events can damage structures as well causing the need for evacuation or rescue. Some of them come with little warning such as a tornado, others give us time to prepare and known vulnerable locations such as a flood. Being bordered by rivers, this is especially concerning in Otsego. The following map shows the 100 and 500 year floodplains. A flood could impair the Parrish Road access into Otsego from the Elk River Fire department assets. These would need to be repositioned or mutual aid from other departments would be required for coverage. Highway 169 is a potential access point. Rogers FD access via Highway 101 is elevated and could be clear for access to Otsego. In any event such as this, the fire department would likely have “all hands” available and be quite busy. Please note the areas along Highway 101 and 90th, 85th and Quantrelle Avenues. Homes and businesses are in direct threat of rising waters and require fire department assistance with evacuation. The soon to be completed senior housing is within the flood zone. 4.6% of the parcels in the city intersect the floodplains. An analysis indicates that 235 buildings would be affected with a structural market value of 1.2 billion dollars according to parcel data.

Figure 43: Floodplains



Findings

1. The current facilities are adequate for the time being. The Albertville, Rogers Station 1, and Elk River Station 2 are recent constructions. Elk River Station 1 is older and the ERFD Chief reports that the facility will be in use for several more years. The RFD station 2 is temporary as plans for a new station are being formulated.
2. There is an inherent obstacles given the three county involvement in providing fire services. The need for inter-County cooperation is not unique to Otsego but efforts at regional shared efforts and streamlined interoperable communications needs to be encouraged whenever possible to reduce call processing time, purchasing costs, and incident handling coordination.
3. Demand for services is currently low. It accounts for more of the total volume for Albertville FD than for either Elk River FD or Rogers FD. There seems to be no seasonal trend but hourly, more volume is noted in the late afternoon/ early evening hours for the two departments (AFD & ERFD) with the highest service demand volume in Otsego. Demand has increased over the last three years overall, except for fire events specifically.
4. Volunteer firefighter addresses are close by the fire stations. Provided they are at that location and available is advantageous for turnout time intervals.
5. The fire departments are meeting the guidelines of NFPA 1720 especially for structure fires in terms of reported response time and staffing.
6. The modeled travel time model indicates that the city is well covered for rural response coverage, less for suburban population density.
7. The city is not well served for distance from fire stations that factor into property insurance rates. Higher rates may detract from attracting commercial development.
8. Automatic Aid agreements are not being taken advantage of between most departments. This can lead to delay in critical events when they must be summoned after the initial dispatch.
9. Population growth had been explosive from the year 2000 to 2010. It has since tampered off since the recession of 2007-10. Otsego is primarily a young family residential environment with a high percentage of commuters with above median income when compared to the county and the state.
10. Currently, a primarily low risk environment for community loss predominates the existing land use.
11. A detrimental flood risk exists along the rivers. Development in these areas should be reconsidered.

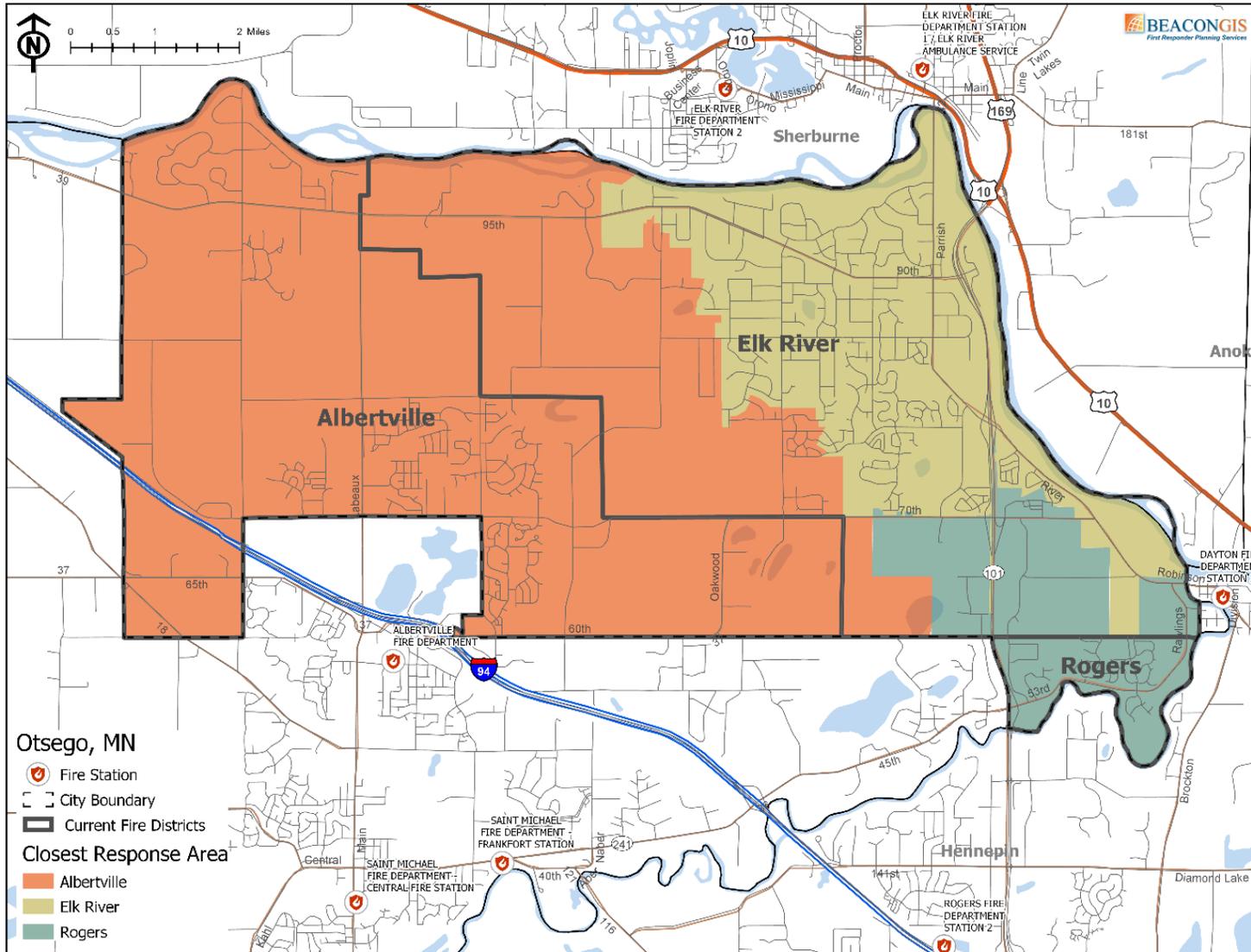
Current Operational Improvements

While the fire departments are performing currently within the NFPA 1720 guidelines, there are programs that can enhance the capabilities of the fire department in the present time. Since major capital funding for future appropriations have yet to be approved based on the results in the next section of this report, lower or minimal cost programs to improve response times currently can be adopted.

Primary Response Areas

According to the travel speed time model, the current fire district areas in Otsego are not optimized for response from the primary fire stations. When the travel time model is programmed to mirror fire apparatus responding toward each other on every street, where they meet becomes the closest area boundary.

Figure 44: Closest Response Area



The travel model has the Elk River FD to be the fastest southbound on Highway 101 to 53rd Street southbound entrance ramp. Northbound, Rogers FD is fastest to the River Road interchange. The Elk River Fire Department would yield the most total area according to the model. This will change the compensatory amounts to each of the districts based on the current contractual funding methodology for the fire district. While it shows potential response time improvement, this may not be a financially viable option under the current contracts.

Recruitment and Retention

The current stations, equipment, and apparatus have been funded. Volunteers are compensated based on the number of calls that they individually answer. The fire departments are approved for a number of firefighters based upon the ability to provide gear and training. The Rogers Fire Chief estimates it costs \$6,000 per volunteer to become a full functioning, equipped member of the department.

Recruitment and Retention of volunteers has been a sustaining issue for fire departments since inception. The issues and struggles that persist are well documented in the referenced article by the NFPA.¹² The article, however, was short on solutions.

In growing communities, the risks and demand for services can increase to a dangerous point with existing resources and staffing. It can be the best financial interests of a community to maintain a volunteer force as long as possible. Career staffing naturally cost more in wage and benefits. In addition, appropriate gender specific quarters, workspace, and potential collective bargaining must be addressed.

Fire department recruitment is most attractive to the young and in a labor intensive task, they are needed. Older, experienced firefighters must be maintained to mentor and teach these recruits. Fire department rosters are just that, a roster. How active any members are varies with a variety of factors including other demands upon their time.

1. One way to supplement the up and coming volunteers is to introduce the concept of civic service early. Allowing teens (16+) to enroll in a junior fire academy at their school or training facility for course credit can be attractive. This can be extended to homeschooled children and early community college-aged participants as well.
2. Retention of trained/experienced firefighters can also be an issue due to demands upon their time. A property tax (or at the state level; income tax) credit for service and varied by the level of activity can serve to provide incentive to retain and activate responders. There are few members of the fire departments that live in the City of Otsego, this could help the recruitment of more city residents.

¹² <https://www.nfpa.org/news-and-research/publications/nfpa-journal/2017/july-august-2017/features/rural>

3. The only way to reduce the turnout time of apparatus is to have a staff at the station. This would require duty times that may be met with chagrin by volunteers (demand on time). In addition, gender specific facilities such as restrooms and individual sleeping quarters would need to be retrofitted into stations. Part of the attraction for the fire service is to have a facility that is conducive to gathering of the members besides responding to incidents. While it may seem extravagant, rooms with large screen TVs, game systems, pool tables, and small kitchen fulfill this purpose. This helps forestall a career staff conversion.
4. A referral bonus to current firefighters to recruit Otsego residents (Junior members go to the same schools) and a retention incentive for new recruits after one year of service is a way to bolster the roster in Otsego.

Volunteers are not free. The fire district compensates the firefighters based upon service activity. In addition, there is a cost to recruit, train, equip, supervise and provide administrative oversight. Research indicates that if the associated supporting costs per volunteer exceeds \$1,883 (2018 dollars), compensation as the fire districts that serve Otsego provide, a combination of career duty and volunteers need to be considered. Over the amount of \$3,383 (2018 dollars) per volunteer is the point where a full time career department is recommended economically¹³. This dollar figure excludes capital expenditures such as stations and apparatus, supplies, or utilities. Based on contractual amounts paid to the fire districts, the roster count, administrative staff, Otsego's cost per collective fire department staff is \$4,571.4 for 2017. However, that figure INCLUDES capital expenditures provided by the fire departments.

Incidence Reduction

Incidence of fire and rescue events correlate with population activity. In a growing community, the demand for services can increase to become overwhelming to a volunteer department if it allowed to ferment without attention. However, rates of fire events has reduced over the decades. According to the US Fire Administration, national fire rates are down 19% from 2006. Both deaths and injuries from fires have also been reduced. Dollar loss reduction matches the percentage drop in fire incidence. 50% of fires are caused by cooking in both residential and nonresidential structures¹⁴. These are nationwide figures that include volunteer and career staff fire departments. Reducing the growth of demand for services can maintain the volunteer staff model.

1. When a fire does occur, a fast response by firefighters and apparatus is essential. But once at the scene, training, command, and adequate water supply take over as priority. Otsego is in the process of developing and expanding its water supply and therefore hydrant infrastructure. While purposeful in attracting commercial development, this should be encouraged additionally for the reduction of loss during a fire event.

¹³ Brudney, J. & Duncombe, W. (1992) "An Economic Evaluation of Paid, Volunteer, and Mixed Staffing Option for Public Services" *Public Administration Review*, 52(5) pp. 474.

¹⁴ <https://www.usfa.fema.gov/data/statistics/#tab-1>

2. Continual training in fire tactics and command is also essential for provision of resources in an event. Not only do firefighting tactics change with improved technology but the threats change. Farms have storage of chemicals on site that weren't used in abundance several decades ago. The modern home is made of and contains more plastic and fast burning materials than homes of generations ago. Continual training requires cost, time, and facilities. Otsego can support these efforts as they translate directly to effectiveness during a fire or rescue event. Support for mutual aid training sessions since multiple departments would respond in the event of a structural fire.
3. Apparatus takes time to respond and the longer the time a fire has to formulate the chances of significant damage increase. Many fires go unnoticed until it reaches a point of significant loss. Therefore, detection systems are the first line of warning. Detectors can be encouraged and supported by free product, installation, and battery checks (hardwired with battery back-up is best). In many volunteer fire communities, this has become another duty of the fire marshal.
4. Fire codes stipulate some commercial sprinkler/suppression system requirements. Requiring residential suppression systems at new construction and retrofitting can be met with resistance. Not all systems are water based. Since 50% of all fires are related to cooking, consider minimally providing stovetop suppression systems to homeowners, require for new construction, and require the same for commercial kitchens.
5. Incidence of fire have reduce 19% since 2006 as stated earlier. Fire used to consume cities in the 19th and early 20th centuries and two efforts are responsible for the reduction, Fire prevention education of both children and adults have led to safer lifestyles and continues today with school programs featuring the likes of Sparky the Fire dog [™], smoke house tours, and fire station open houses. Smoky the Bear [™], the educational outreach of the US Forest Service continues to educate the prevention of wildfires. Programs to train civilians in the use of fire extinguishers also help provide an early intervention to small fires. Such programs need to be continued and valued as an effective measure to reduce fire events.

Prevention Education should not be limited to fire safety. Most of the incidents that fire departments respond to involve injury or illness. Proper chemical storage and handling, safe driving programs, and injury prevention from falls, cooking, and other activities have not had the attention that fire safety programs. As such, rescue and medical incidents continue to increase as the population grows.

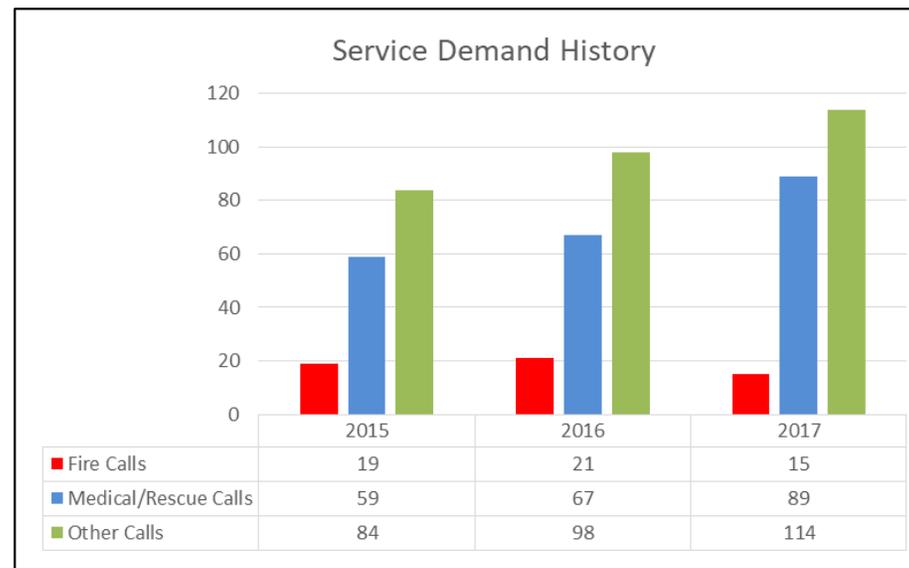
6. Strict Code Enforcement has been the most effective method of fire prevention. This is being undermined across the country. The use of engineered wood in multifamily/tenant structures and composite I-beams that fail quicker under fire are being allowed to proliferate. Fire Marshal's need the support, tools, and training to investigate and mediate code violations. The City should take steps to educate itself regarding the risks of new style construction and neighborhood design. Methods that inhibit or endanger citizen and emergency responders should not be allowed to be built within the city.
7. Group purchasing efforts between the fire departments or regionally can be a method to reduce cost of equipment and apparatus. Collaboration of grant application to assist in recruitment and prevention programs should also be initiated.
8. If the fire departments shared the same standards and operating procedures, potentially the use of shared staff responders could improve apparatus response. For example, an Elk River firefighter shopping at the Albertville outlets could be notified of an event and respond with AFD firefighters to assist.

While all of these suggestions have some cost, some can be financed with grant assistance. Another less costly implementation would be for automatic aid between the fire departments serving Otsego, especially for reported fires so that response time for a first alarm of staffing and multiple apparatus can be assembled quicker.

Future Planning

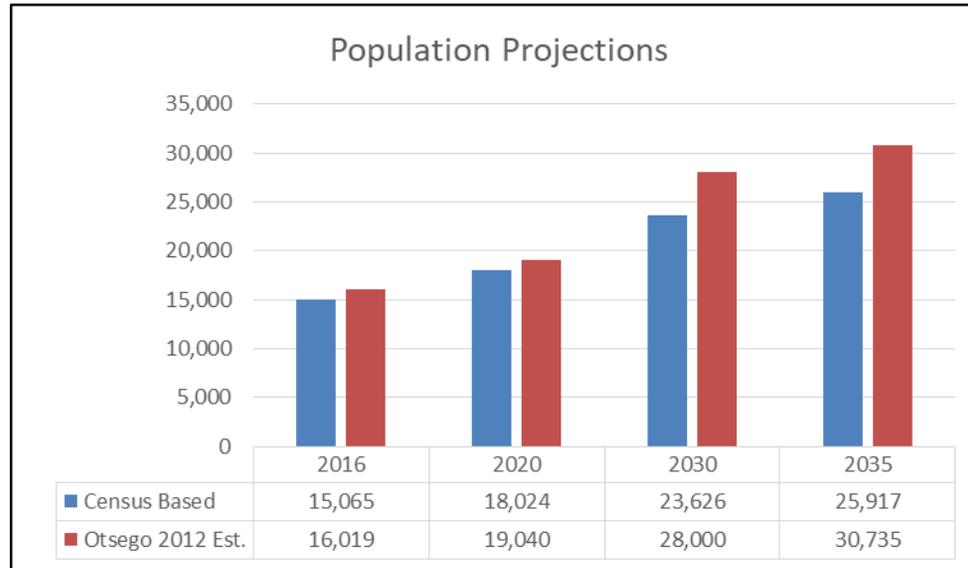
This section looks into the future to gauge the forecasted changes in risk, workload, development, and demographics for the City of Otsego as it relates to the fire services. A quick review of workload of fire services in Otsego over the last three years indicate that incidence of fires are relatively stable while non-fire responses have increased. Other calls include all that are not categorized as series 100 (fire) or series 300 (medical/rescue) according to NFIRS coding standards.

Figure 45: Otsego Total Service Demand Summary



We begin by reviewing the population forecast that was detailed in the city comprehensive plan. According to the US Census Bureau, Otsego is the 4th fastest growing city in the state. (Rogers was #1, Albertville was 19th). Population is expected to continue its upward trend. The comprehensive plan was published in 2012. Census history since 2000 was also used to forecast the years detailed in the city’s planning document. This method did not yield as robust projections as the local analysis had earlier.

Figure 46: Population Projections



Residential development has slowed since the economic recession of 2007-10. Prior to the recession, building permits were near 400 per year. During recovery, it has been about half that rate. Development of residential and commercial property is limited not only based upon zoning but the areas that are served within the current water and sewer service area. Development beyond these areas shown in the city’s Urban Service Staging Plan map is limited to a quarter mile buffer beyond the border if the project meets certain criteria. Two existing areas, one to the southwest bordering Albertville and one along the eastside surrounding Highway 101 and expanding to the rivers. Higher density residential and commercial development is permitted here currently in areas where water and sewer service is available. The utility service is expanding in these areas as development occurs.

Short term 1-5 years (2019-2024)

It is expected that the population of Otsego will be nearing the 20,000 level by the end of the period. This is based upon expected development within the current sewer district areas of over 1,850 living units and a current average of 2.86 persons per household¹⁵. There is a small extension

¹⁵ 2016 ACS US Census Bureau Table QT—P11

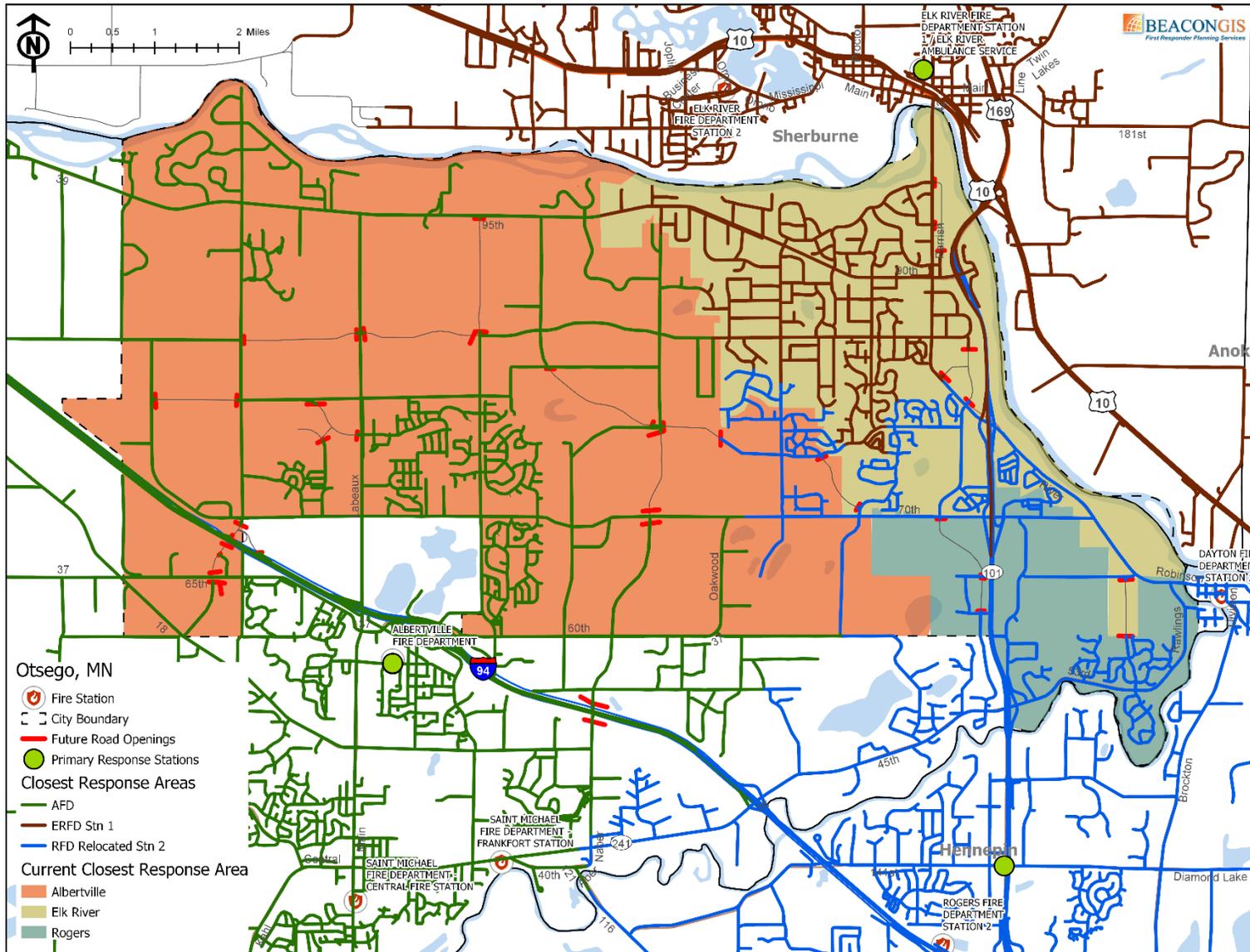
into the E1 expansion area adjacent to the current east service area. Another small extension in W2 expansion area due to a possible junior high school built next to the new Prairie View Elementary School.

With this increase in residential development, commercial development typically follows as the market for goods and services increase. Beacon GIS projects a 15% increase in fire department service demand, most not related to structural fires that is expected to remain stable.

There are two major changes planned during this period that will affect the provision of fire services within Otsego. The first is the planned relocation and construction of Rogers Fire Station 2. This 3 bay expandable 2 story station on 1.5 acres is planned to be budgeted in the next fiscal year (2019) and located further north on 141st Street N near Highway 101. This will benefit responses into Otsego and enable the apparatus to be closer to more area within the city. The second is the planned road extensions during this period. The 85th Street to McIver extension will improve connectivity and the proposed minor collector streets through the Boulder Creek and Crimson Ponds developments. This would change the closest response areas for the three fire services.

The map that follows show the shaded closest response area before Rogers FD relocates Station 2. The colored streets reflect the change in closest response area after the Rogers FD Station 2 relocation.

Figure 47: Relocated RFD Station 2 showing future roadways



During this period, contracts with the fire departments are due for renewal. Negotiations must keep in mind any change in response boundaries and the effect upon fiscal responsibilities. The simplest method would be to designate one rate for properties for fire protection. This way if response boundaries change, it does not impact the city financially. It should be expected that the increase in parcel count, property values and cost of services will increase with the development described in this section. Long term outlook for future fire station land acquisition (see later subsection) ought to be initiated in this time period.

Midterm 6-10 years (2025-2029)

If development continues at a similar pace within the water/sewer district it is expected that additional developments may emerge within the stage 1 eastern and western urban service expansion areas especially bordering the current water/sewer district areas. Otherwise residential development in expansion areas is limited to 1 unit per at least 10 acres which should deter any higher density housing development. The population is expected to be within 23,000-28,000 range with fire service workload increasing by 17% primarily non-structure fires. Road extension planned projects continue to be constructed as development encroaches further in the urban service areas¹⁶. Unknown is the nature of subdivision development, unit count, and street network as they yet to be envisioned. During this period, land acquisition should be complete with a focus turning to design phase of future facilities.

The Elk River Fire Department had commissioned a study in 2017 that recommended the city discontinue the use of Fire Station 1 due to age and a variety of other factors in a decade and relocate further northward. While another station is also suggested for the northeast area of the city, neither of these options benefit Otsego. The study suggested an Otsego Station on 85th near Parrish Road but based upon the incident clustering shown in that study's map appendix, this station could spend a significant amount of time responding into downtown Elk River. Without it, the downtown area of Elk River can be exposed to longer response times from the other remaining station and proposed locations.

Should Elk River relocate its Station1 northward and a station not be built in Otsego, the closest response area would have the Rogers Fire Department closest to the vast majority of the eastern side of the town.

Long term 11-15 years (2030-2035)

At this point, it projected that Otsego will have between 26,000 -30,000 residents. This would elevate the overall population density from rural to suburban under NFPA 1720 guidelines, suggesting lower response times and more staff per incident as the community builds.

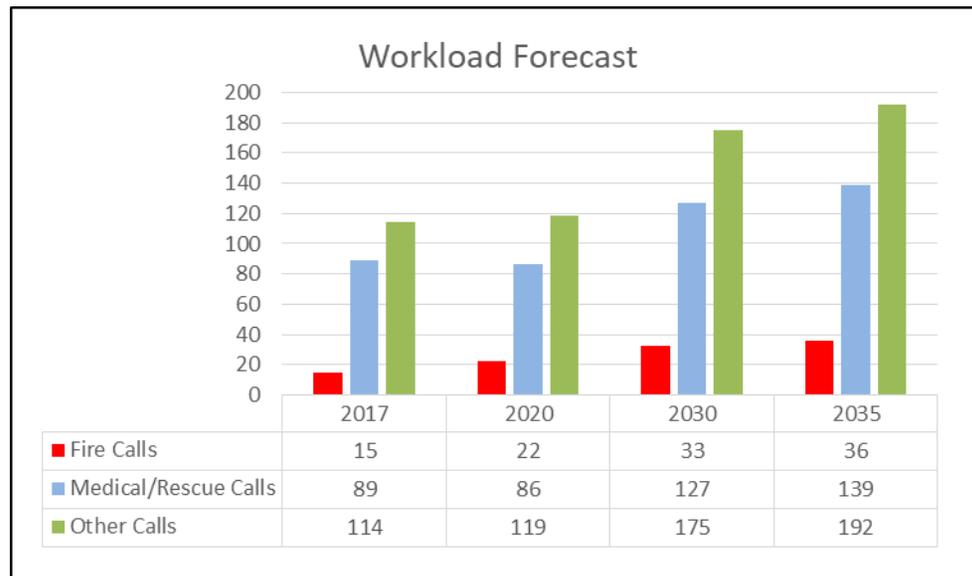
¹⁶ City of Otsego 2012 Comprehensive plan page91. See revised April 2018 map.

Higher density development may expand into the stage 2 and 3 urban service areas. Longer term road projects including additional interchanges on I-94 will encourage more development in Otsego.

There will be more residential, commercial, and industrial properties along with increased traffic congestion. The life and property risk will increase with this development. The use and storage of hazardous materials will become more common place in the City. A future water pipeline connection between the water service areas is planned to support development along the city’s south central region. With more development, the fees paid to the fire departments would potentially increase further as parcel count increases, lots are developed and valued more. The costs of operating a department increases as risk increases (HAZmat, ladder, recruitment).

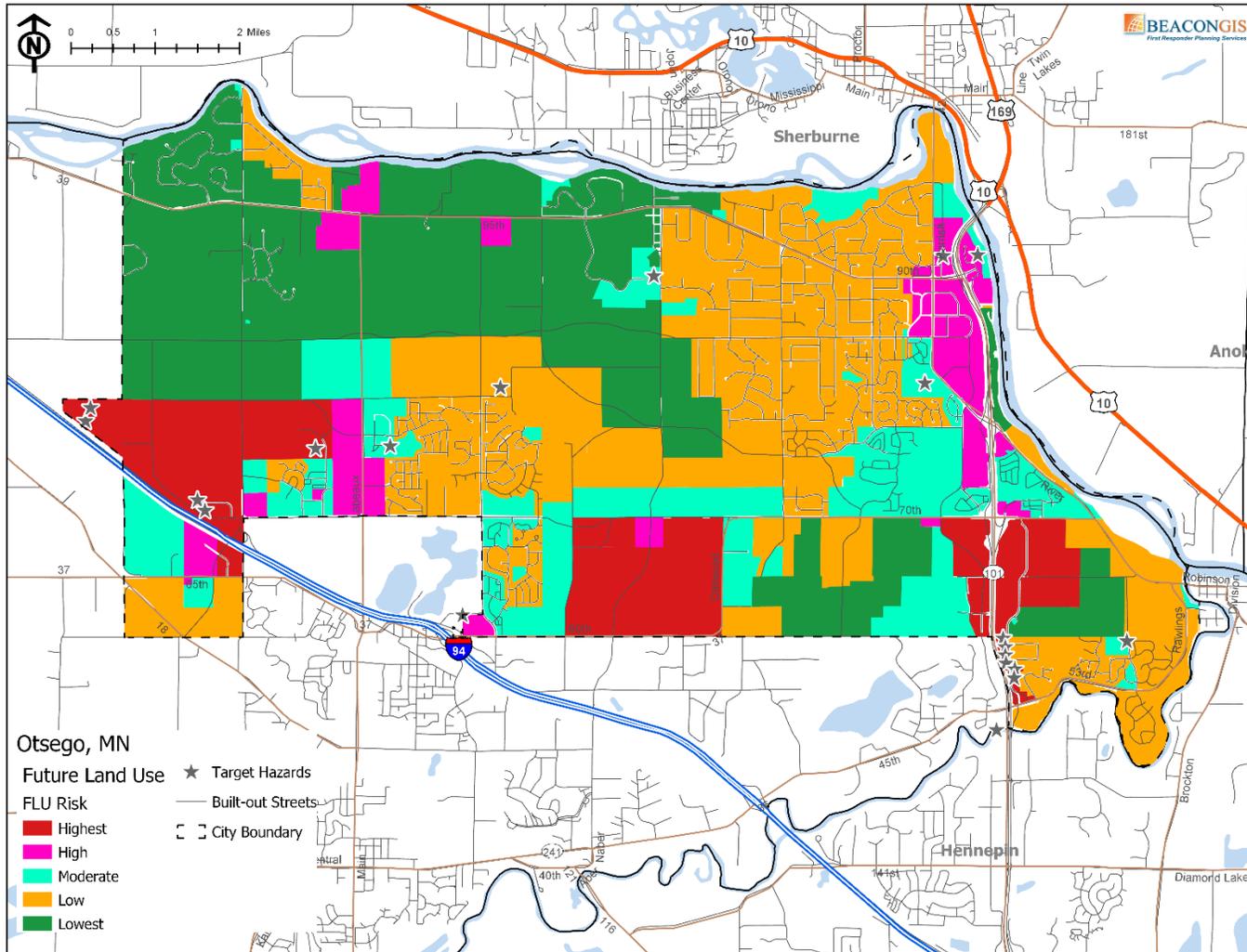
The following graph projects the workload within the City of Otsego through 2035.

Figure 48: Projected Otsego Fire Service Demand



The future land use and roadway network from the City's comprehensive plan is shown here with the risk categories as the existing land use map shown earlier ([Click here](#)).

Figure 49: Future Land Use Risk



Within the map, future major arterials and collectors as detailed in the transportation plan are shown. Two Interstate 94 interchanges are planned that would have a significant impact on development, traffic, and fire apparatus travel time capability. One is planned on the southwest side of the city with Kadler Avenue. The other is southeast of this location in the Town of St. Michael's that connects with Naber Street. Both streets provide for northern routes into the city.

At the 1720 suburban level, it is unlikely that a travel model greater than four minutes is feasible given the potential six minute turnout time performance and the guideline to arrive within less than 10 minutes from being dispatched. According to USFA statistics¹⁷, once a community exceeds 25,000 population, the *tendency* is to have a career staffed fire service. The fire department's home communities will also have grown, and they may have already transitioned to a career staffed department. In doing so, the response time performance objectives recommended by the NFPA become more stringent.

Specifically, the NFPA 1710 Guideline for paid/career fire departments describes the objectives for delivery of services, response capabilities, incident management, and strategy. This includes the following benchmarks related to call receipt and processing time, turnout time, and response (travel) time:

- Call receipt and processing time (time from 911 call pick-up to dispatch of an assignment) of thirty seconds on all calls;
- Turnout time (time from dispatch to being enroute to an assignment) of eighty seconds on fire suppression calls; sixty seconds for EMS calls.
- The fire department's fire suppression resources are deployed to provide for the arrival of an engine company within a four-minute travel time and/or the initial full alarm assignment within an eight-minute travel time to 90 percent of the incidents;
- The first responder medical or basic life support EMS resources are deployed to provide for the arrival of resources and care providers within a four-minute travel time and/or advanced level paramedic services within an eight-minute travel time to 90 percent of the incidents;

These departments are not necessarily required to respond to Otsego under these guidelines as they are contracted but turnout time interval would be reduced significantly and minimum staffing would be on hand to respond. Should these department become contractually required to meet these guidelines, they would fail without properly placed facilities from which to respond.

Aside from the potential of career departments, using the four minute travel model response extent capability would serve for planning purposes as well for NFPA 1720 suburban density guideline. While there has been a tendency for career ambulance services to follow the police model of

¹⁷ <https://www.usfa.fema.gov/data/statistics/#tab-1>

dynamic deployment (patrolling/posting rather than station based). This model for fire departments have several difficulties in implementation. Obviously, this model cannot be staffed by volunteers. Fire stations are located, in part, based on fixed location structural risk to the community. Because the other two emergency services are more directly related to human activity, they can fully employ such a strategy. Fire apparatus are costly pieces of equipment, they carry water that cannot freeze or it will damage the apparatus. Keeping crew warm or cool require the motor to run that will increase fuel cost and engine maintenance cost as the hours running increase significantly.

Fire Station Determination Methodology

There are primarily two risks that influence fire station locations. One, previously mentioned, is fixed location structural type and use risk. This has been discussed in existing land use and applied to the future land use plan here. The other is the level of population within these structures and land use. While structural risk is based on function, population levels vary based on this structural type and correlate with activity and expected service demand. Combining the future structural risk levels and the expected future population density levels provides a composite vulnerability risk index (VRI) for a property.

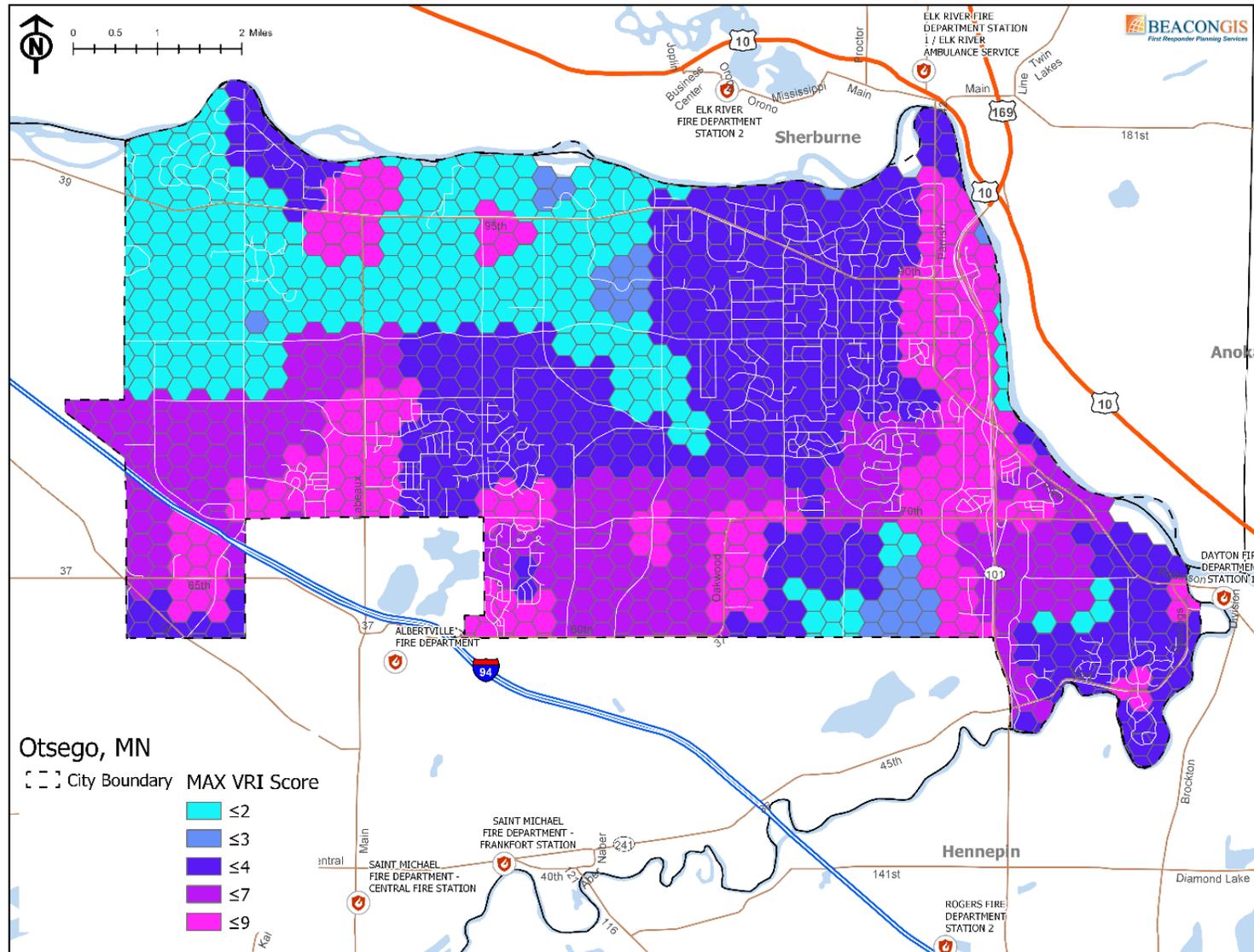
Figure 50: Vulnerability Risk Index

Future Land Use	Score	Population Density	Score	VRI
Rural	1	Lowest	1	2
Rural Residential	1	Lowest	1	2
Large Lot Residential	1	Low	2	3
Public/Quasi Public	2	Lowest	1	3
LD Residential	2	Low	2	4
LD/MD Residential	3	Moderate	3	6
Industrial	5	Low	2	7
Commercial	4	Moderate	3	7
Office	4	High	4	8
MD/HD Residential	4	Highest	5	9

See City 2012 Comprehensive Plan page 71-88 for descriptions/use types

Because properties come in different area sizes, they were segmented into equal quarter mile hexagonal cells each with an index score. Large properties are usually subdivided during development. To avoid minimizing or over tabulating VRI, this equalization normalizes the data in a similar way as per capita or per square mile does. This will also serve as a guidance for determining optimal fire station location areas.

Figure 51: VRI Score Grid



The total city score is 5410, the amount covered in four minutes travel by closest and available fire apparatus from current stations is 1114, leaving 79.4% with longer response times. To determine potential cells for future fire stations, heritage preservation areas, parks, and wetlands/flood plains were excluded. The model strives to achieve the greatest score with each added station so the tendency is to located closer to cells with highest score and farther from lower score cells when facilities are limited. In other words less time to urban areas and longer to rural areas to reflect NFPA 1720 response time performance 80% coverage guidelines. This will be based upon the future roadway network as discussed in the city comprehensive plan.

Fire Stations in Otsego

Development pattern trend is planned from east along the Highway 101 corridor and the southern border, infilling northward. So it is suggested that station construction proceed accordingly as development and demand for services increase. This must be monitored on an annual basis to identify geographic trends to be proactive in constructing stations. The VRI model suggests the order in which the stations should be considered by the amount of coverage it can deliver. Future Fire stations will require water and sewer service eventually, laundry that may contaminate groundwater can be transported to a proper facility for cleaning but this requires multiple sets due to transfer time. Apparatus can travel to a near hydrant to fill its tank but this may affect the positioning of the asset for response purposes. There are several potential scenarios that may occur that will be analyzed to determine locations of future fire stations in Otsego.

Scenario A- Current Station Locations

This scenario is based upon the current locations of the primary contracted closest fire stations and determines the optimal location of stations while maximizing the VRI score. This could be the long term plan if funding for relocation of RFD Station 2 and ERFD Station 1 is denied. Iterations from one to subsequently additional stations to reach or come close to 80% of VRI score coverage within four minutes of travel time was analyzed via the GIS software using the built-out street network. Locations of potential stations changed as each additional station was added.

Figure 52: Scenario A-Subsequent Additional Station Stats

Scenario A		
Station Added	VRI % Coverage	Incremental Change %
Current closest 3	21%	0%
Otsego 1	49%	28%
Otsego 2	70%	21%
Otsego 3	82%	12%

It was determined that to achieve at least 80% of the total VRI score, three Otsego stations are required. However, with each additional station, the amount of percentage coverage of total VRI score of the current closest stations diminishes as the Otsego stations are placed closer to the VRI score locations.

Figure 53: Scenario A: End Result Coverage Stats

Scenario A			
Station	VRI % Coverage	Incremental	Location
Current closest 3	7%	7%	AFD, ERFD1, RFD2
Otsego 1	32%	39%	Odean & 75th
Otsego 2	25%	64%	80th & Labeaux
Otsego 3	18%	82%	70th and River Rd

If turnout time interval can be reduced by two minutes, the travel time can be increased to six minutes. This would reduce the future station needs from three to one. Using the same methodology but increasing the reach to six minutes, one station in Otsego in addition to the three closest current stations can provide more than 80% VRI score coverage.

Figure 55: Scenario A6- Subsequent Additional Station Stats

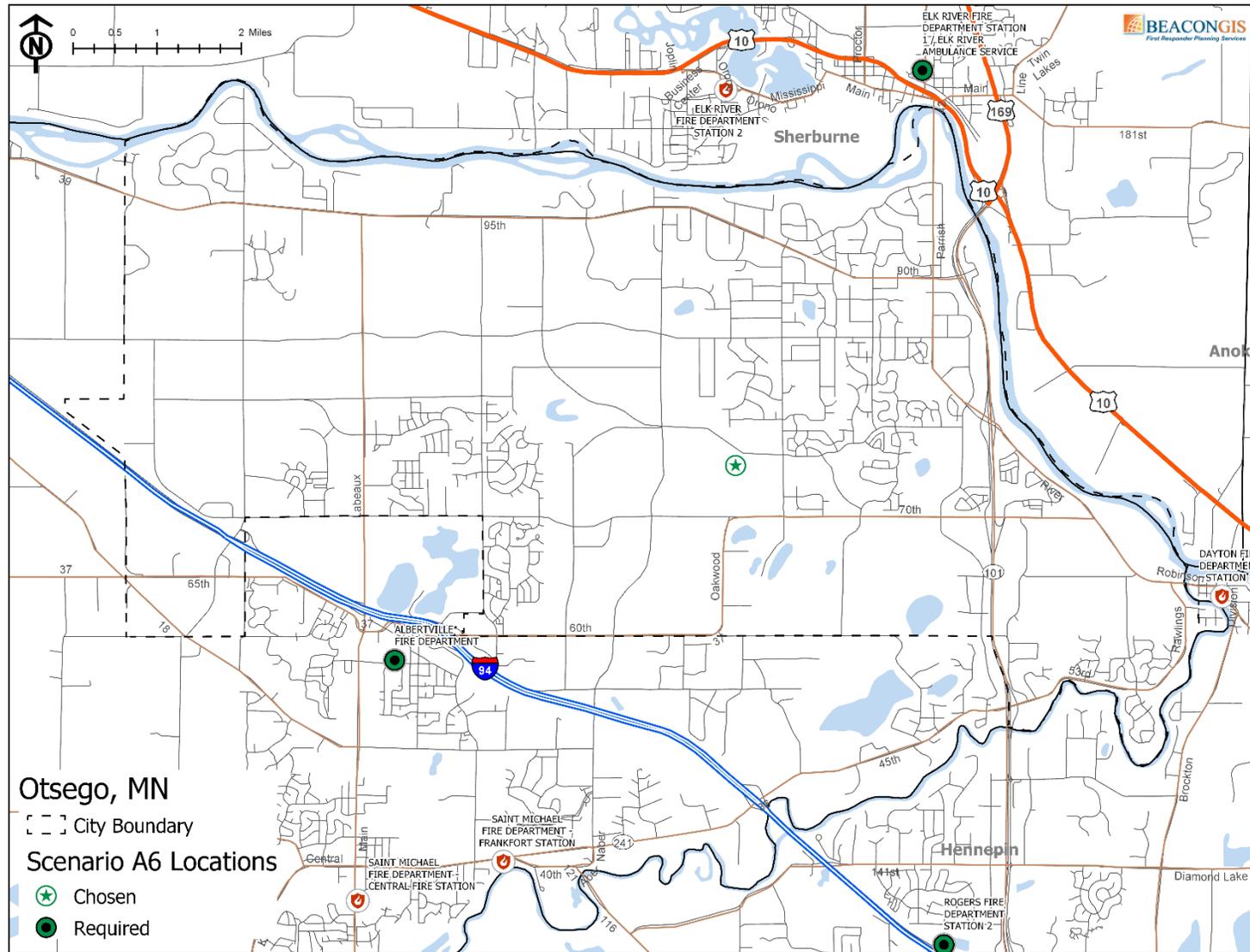
Scenario A (6 minutes)		
Station Added	VRI % Coverage	Incremental Change %
Current closest 3	54%	0%
Otsego 1	92%	38%

In this scenario the current station coverage increased in end result coverage with an additional Otsego Fire Stations due to the increased travel time capability.

Figure 56: Scenario A6-End Result Coverage Stats

Scenario A (6 Minutes)			
Station	VRI % Coverage	Incremental	Location
Current closest 3	40%	40%	AFD, ERFD1, RFD2
Otsego 1	52%	92%	75th st ext from Odean to Nashua

Figure 57: Scenario A6 Future Stations



Scenario B- RFD relocates Station 2

This scenario reflects the planned relocation of Rogers FD Station 2 northward near 141st St and Highway 101. The results are similar to that of Scenario A in that 3 stations in Otsego are needed to reach at least 80% of the VRI Score.

Figure 58: Scenario B- Subsequent Additional Station Stats

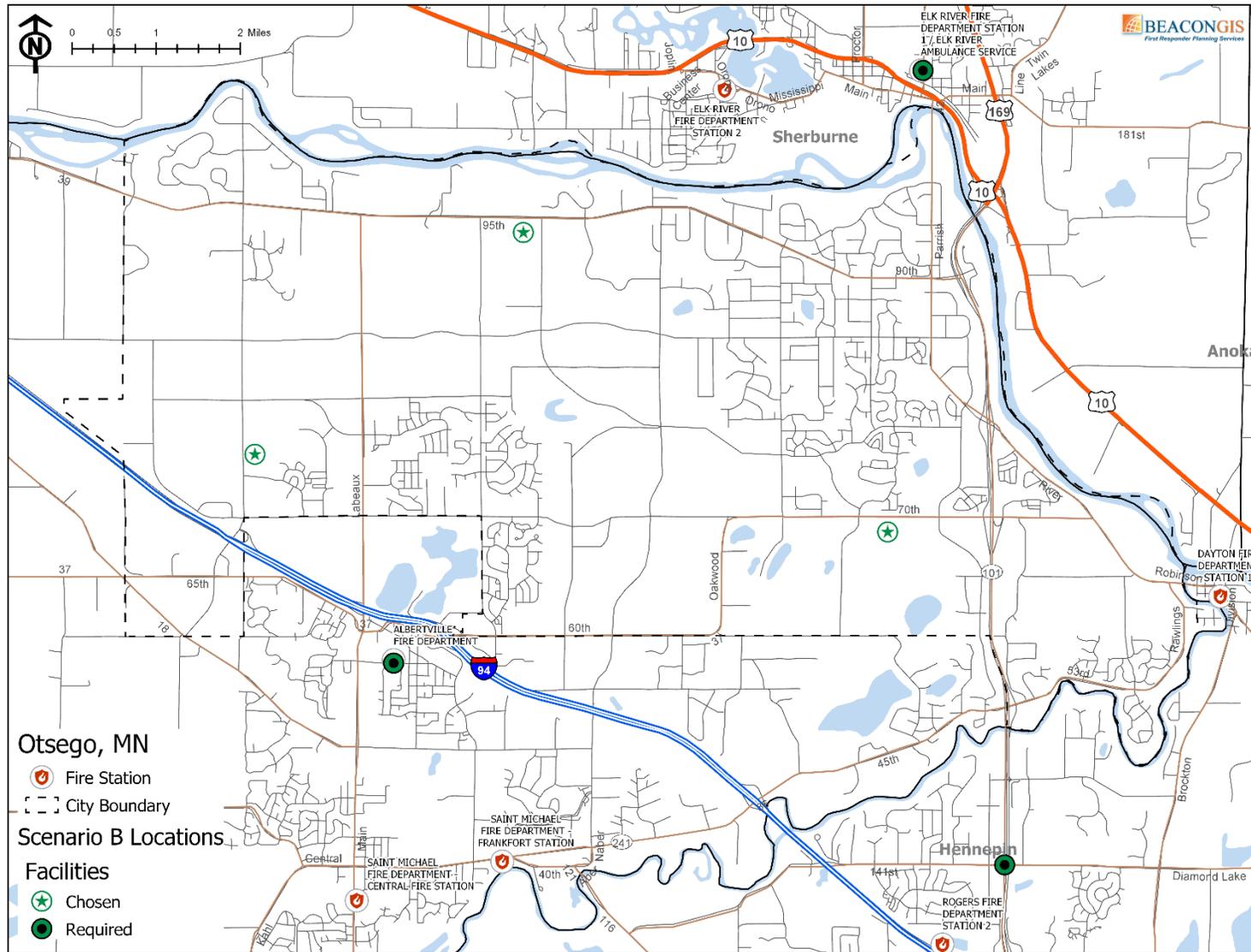
Scenario B		
Station Added	VRI % Coverage	Incremental Change %
Closest 3	28%	0%
Otsego 1	53%	25%
Otsego 2	74%	21%
Otsego 3	87%	12%

Because of the relocation, the closest primary response stations can reach more VRI cells than previously but as more stations are added to the set, the incremental benefit of coverage decreases. The following table details the locations of potential stations in this scenario.

Figure 59: Scenario B- End Result Coverage Stats

Scenario B			
Station	VRI % Coverage	Incremental	Location
Closest 3	10%	10%	AFD, ERFD1, Relocated RFD2
Otsego 1	34%	45%	70th east of Packard
Otsego 2	22%	66%	Kadler Ave between 80th & 70th Sts
Otsego 3	21%	87%	95th & Mason

Figure 60: Scenario B Future Stations



Once again if turnout time interval of firefighters reaching the station and becoming enroute is reduced by two minutes, a six minute travel time can be modeled to locate future stations in Otsego. This reduces in number the selected locations for coverage.

Figure 61: Scenario B6- Subsequent Additional Station Stats

Scenario B (6 minutes)		
Station Added	VRI % Coverage	Incremental Change %
Closest 3	72%	0%
Otsego 1	96%	24%

Figure 62: Scenario B6- End Result Coverage Stats

Scenario B (6 Minutes)			
Station	VRI % Coverage	Incremental	Location
Closest 3	53%	53%	AFD, ERFD1, Relocated RFD2
Otsego 1	43%	96%	75th st ext from Nashua to 83rd

Scenario C- ERFD relocates Station 1

This scenario analyzes the need for future fire stations in Otsego given an earlier ERFD study recommended Station 1 move north on Proctor Rd. Despite the recommendation for a third station east of Highway 169 near Twin lakes School on Cleveland Rd, ERFD Station 2 on Orono Parkway becomes the closest station to Otsego without the study’s suggestion for the 85th and Park Ave NE Otsego Fire Station. This scenario assumes that Rogers FD Station 2 relocation was denied.

Figure 64: Scenario C- Subsequent Additional Station Stats

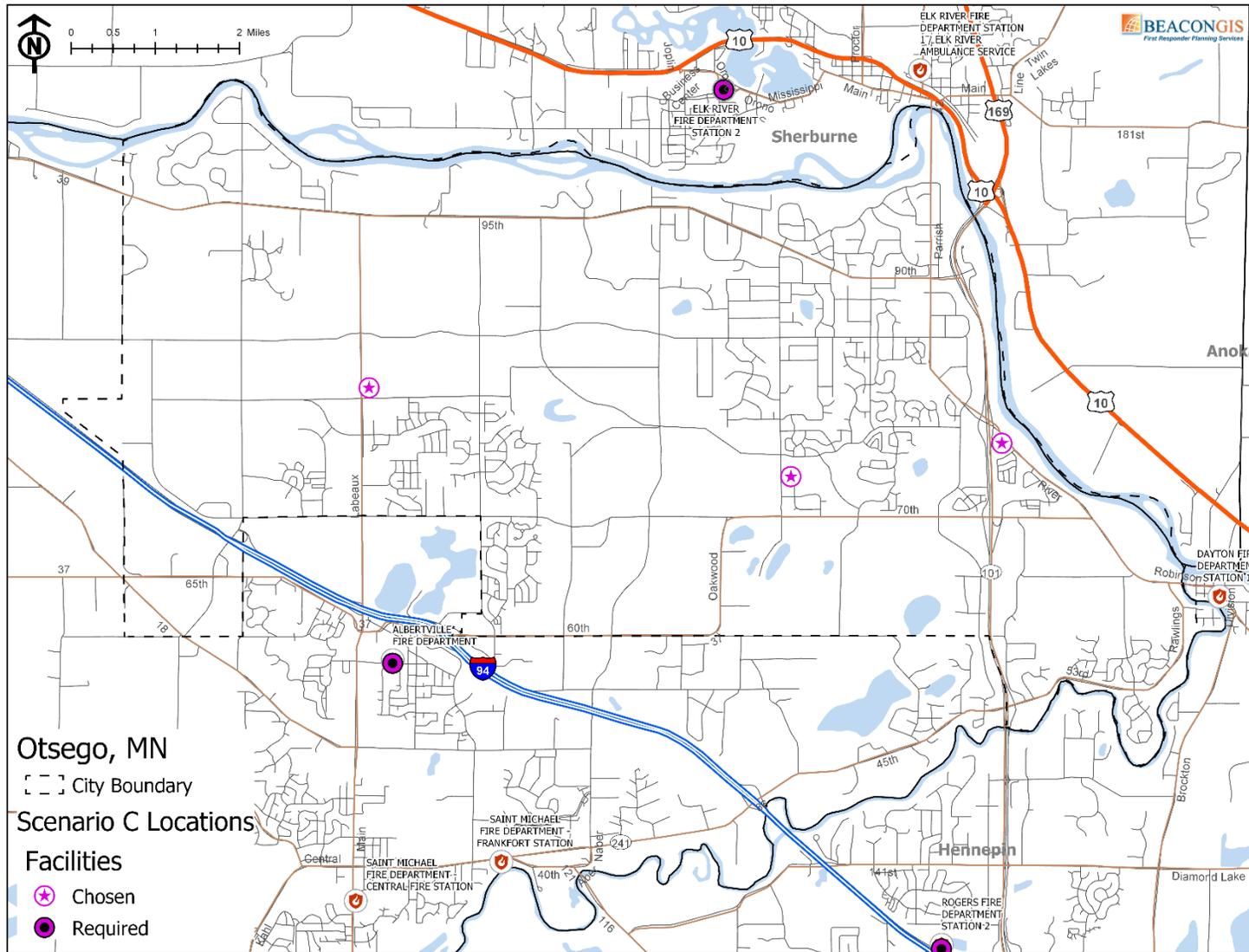
Scenario C		
Station Added	VRI % Coverage	Incremental Change %
Closest 3*	8%	0%
Otsego 1	46%	38%
Otsego 2	66%	20%
Otsego 3	80%	14%

Although the analysis with a four minute travel time was applied to the closest primary fire stations, ERFD cannot reach into Otsego according to the travel model from Station 2 and therefore not impactful.

Figure 65: Scenario C- End Result Coverage Stats

Scenario C			
Station	VRI % Coverage	Incremental	Location
Closest 3*	3%	3%	AFD, ERFD2, RFD2
Otsego 1	33%	36%	Odean & 72nd
Otsego 2	25%	61%	Labeaux & 80th
Otsego 3	19%	80%	River Rd & Hwy 101

Figure 66: Scenario C -Future Stations



Using the six minute travel time model that shortens the turnout time interval to four minutes, the reduction of needed stations in Otsego is shown in the following table.

Figure 67: Scenario C6- Subsequent Additional Station Stats

Scenario C (6 minutes)		
Station Added	VRI % Coverage	Incremental Change %
Closest 3	47%	0%
Otsego 1	91%	43.90%

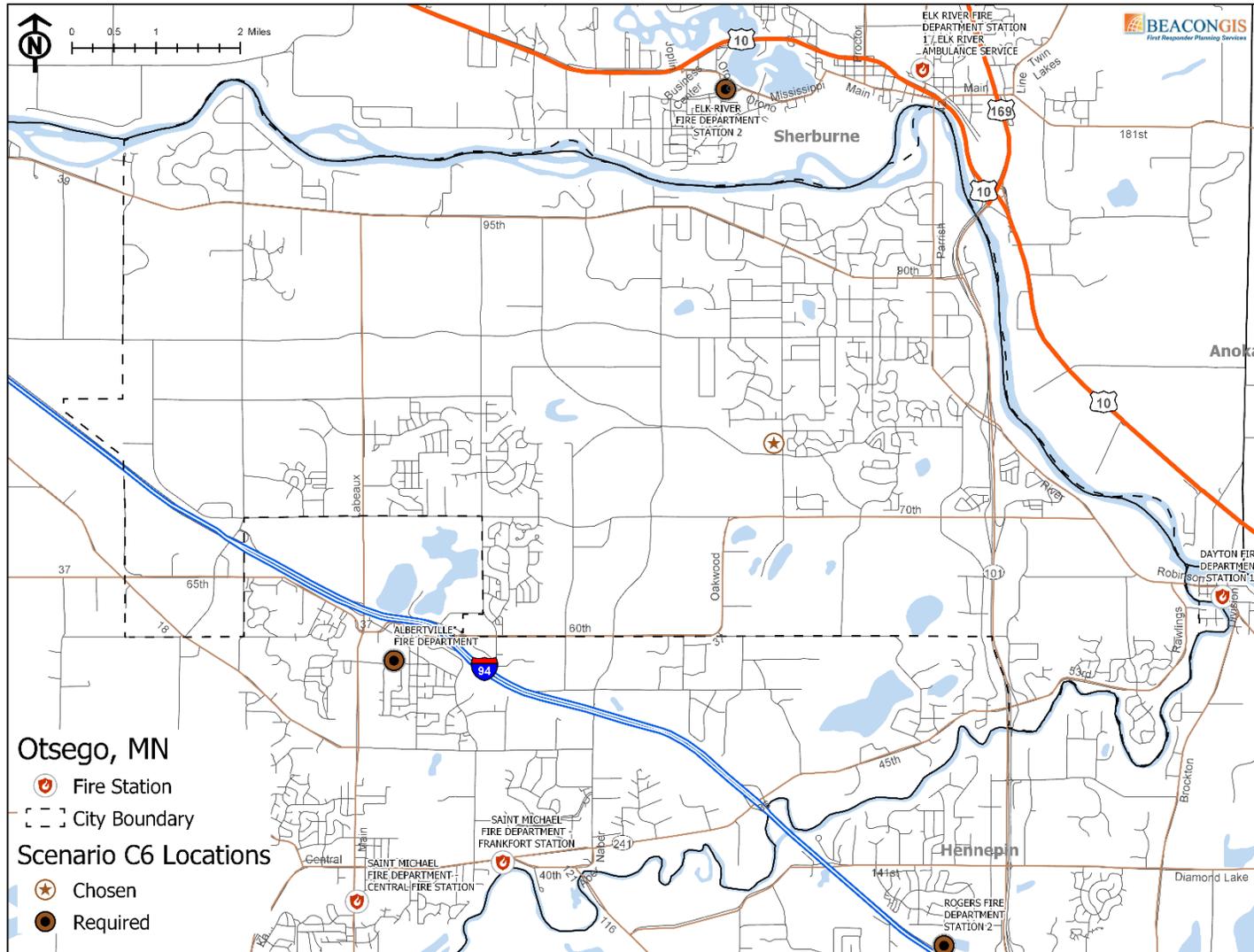
Similar to Scenario A6, one station site was selected in Otsego to provide at least 80% coverage of the VRI score.

Figure 68: Scenario C6- End Result Coverage Stats

Scenario C (6 Minutes)			
Station	VRI % Coverage	Incremental	Location
Closest 3	33%	33%	AFD, ERFD2, RFD2
Otsego 1	58%	91%	Odean & 75th St

The following map graphically illustrates the location relative to the study area.

Figure 69: Scenario C6-Future Stations



Scenario D- RFD Station 2 relocates & ERFD relocates Station 1

This scenario reflects the planned relocation of Elk River Station 1 northward, resulting in ERFD Station 2 on Orono Parkway becoming the closest station to Otsego as in Scenario C. This scenario combines with Scenario B by relocating Rogers Station 2 north to 141st and Highway 101. As in all the previous scenarios, to reach 80% of the VRI score using a four minute travel model, three stations are needed.

Figure 70: Scenario D- Subsequent Additional Station Stats

Scenario D		
Station Added	VRI % Coverage	Incremental Change %
Closest 3*	13%	0%
Otsego 1	49%	36%
Otsego 2	71%	22%
Otsego 3	84%	13%

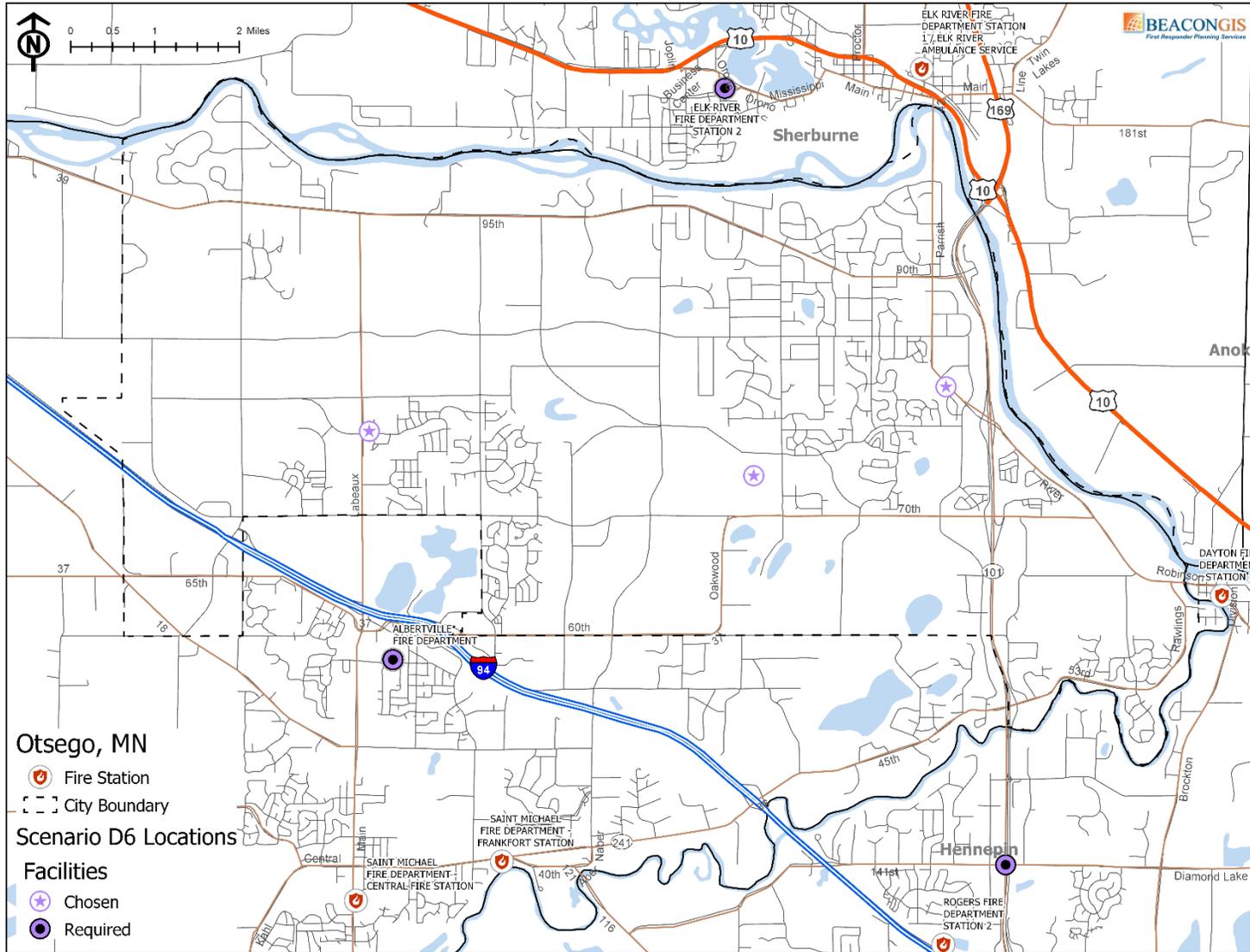
As in Scenario C. ERFD Station 2 did not reach Otsego within the four minute travel time, so had no impact on the coverage results. As added station iterations were run, the current primary stations of AFD and RFD had less impact as added stations became closer to the VRI scores.

Figure 71: Scenario D- End Result Coverage Stats

Scenario D			
Station	VRI % Coverage	Incremental	Location
Closest 3*	7%	7%	AFD, ERFD2, Relocated RFD2
Otsego 1	30%	37%	Odean & 75th St
Otsego 2	27%	64%	River Road near Elementary School
Otsego 3	20%	84%	Labeuax & 77th

The following map shows these locations within the City of Otsego.

Figure 72: Scenario D-Future Stations



As in other scenarios, a six minute travel time with a reduced turnout time performance yields significant less stations. As the table that follows shows, 94% of coverage can be achieved by one station added to 95th Street and Odean Ave.

Figure 73: Scenario D6- Subsequent Additional Station Stats

Scenario D (6 minutes)		
Station Added	VRI % Coverage	Incremental Change %
Closest 3	66%	0%
Otsego 1	94%	28.02%

This station on 95th would cover nearly half of the bulk of the VRI scores in the city.

Figure 74: Scenario D6- End Result Coverage Stats

Scenario D (6 Minutes)			
Station	VRI % Coverage	Incremental	Location
Closest 3	52%	52%	AFD, ERFD2, Relocated RFD2
Otsego 1	42%	94%	95th & Odean

Scenario E- 85th & Park Otsego Station

This scenario acknowledges that procuring property to construct fire stations can be difficult. The city has property previously designated as a potential fire station site on 85th across from Park Ave. Other scenarios also designated River Road by the elementary school that is near this site. This scenario addresses if a fire station were to be constructed on this site, where would others be designated as sites?

Once again ERFD Station 2 cannot reach Otsego within the four minute travel time and is not impactful. Similar results as other scenarios and sited three station locations as shown in the table that follows.

Figure 76: Scenario E- Subsequent Additional Station Stats

Scenario E		
Station Added	VRI % Coverage	Incremental Change %
Closest 3*	13%	0%
Otsego 1	36%	23%
Otsego 2	64%	28%
Otsego 3	80%	15%

Figure 77: Scenario E- End Result Coverage Stats

Scenario E			
Station	VRI % Coverage	Incremental	Location
Closest 3*	8%	8%	AFD, ERFD2, Relocated RFD2
Otsego 1	23%	31%	85th & Park <i>(Required)</i>
Otsego 2	29%	60%	70th & Mclver
Otsego 3	19%	80%	95th & Mason

The following map shows the locations of the above scenario within the City of Otsego.

Because only one station was needed and in this scenario required at 85th and Park, the resultant coverage is listed in the following tables.

Figure 79: Scenario E6- Subsequent Additional Station Stats

Scenario E (6 minutes)		
Station Added	VRI % Coverage	Incremental Change %
Closest 3*	38%	0%
Otsego 1	88%	49.98%

Figure 80: Scenario E6- End Result Coverage Stats

Scenario E (6 Minutes)			
Station	VRI % Coverage	Incremental	Location
Closest 3*	48%	48%	AFD, ERFD2, Relocated RFD2
Otsego 1	40%	88%	85th & Park <i>(Required)</i>

The following map show the locations within the City of Otsego.

Scenario F- City Hall Station

This scenario examines the siting of an Otsego fire station alternatively on the city hall property since there is space and it is currently owned by the city. It was also listed as a potential site in the 2012 City Comprehensive plan. As expected, three stations are needed for 80% VRI coverage using the four minute travel model. As with other scenarios that model the move of ERFD Station 1 relocation, there is no impact from ERFD Station 2 within four minutes

Figure 82: Scenario F- Subsequent Additional Station Stats

Scenario F		
Station Added	VRI % Coverage	Incremental Change %
Closest 3*	13%	0%
Otsego 1	31%	17%
Otsego 2	59%	29%
Otsego 3	81%	21%

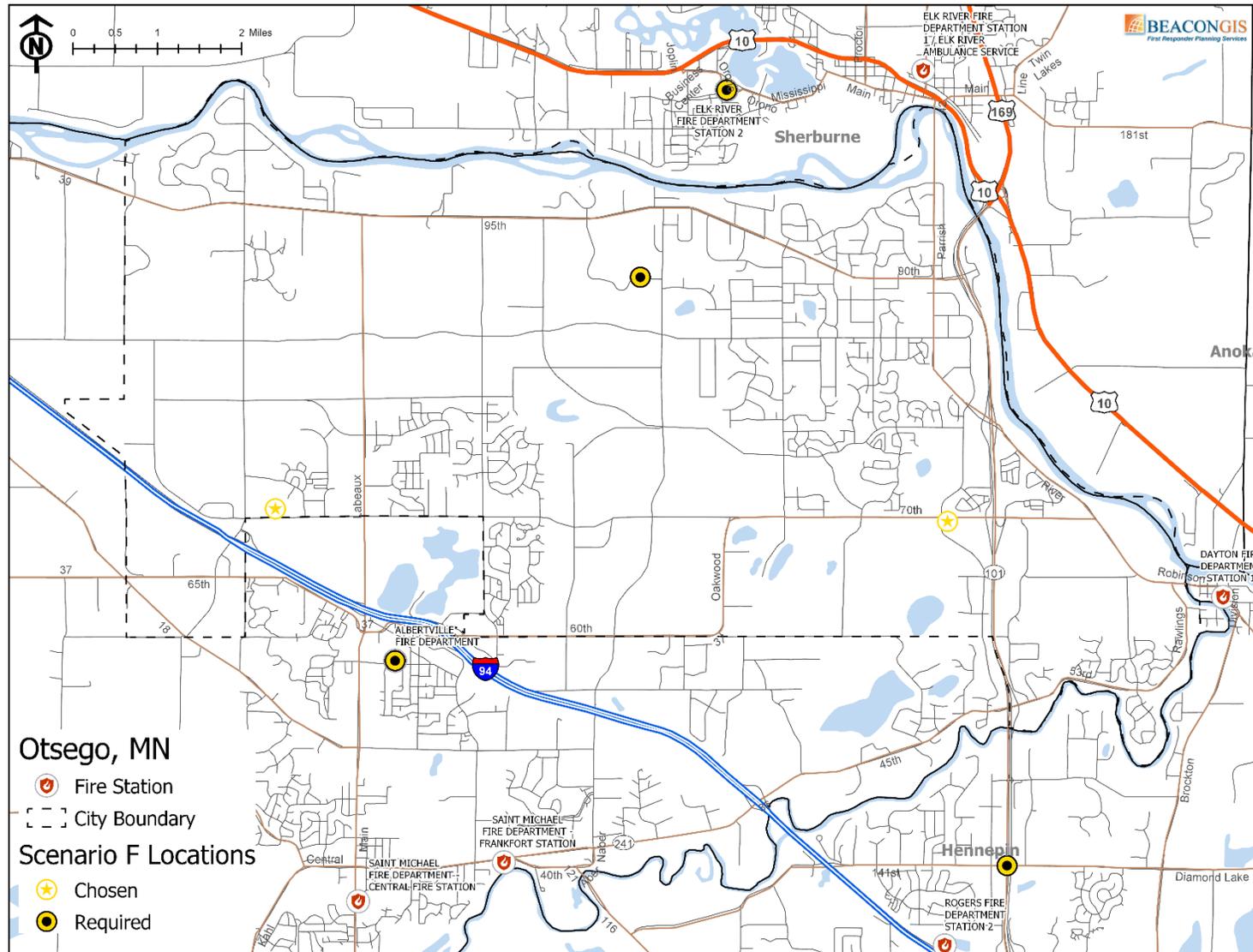
The total coverage percentage in this scenario is the poorest performer of the collective scenarios. The future site selections as seen in the following table.

Figure 83: Scenario F- End Result Coverage Stats

Scenario F			
Station	VRI % Coverage	Incremental	Location
Closest 3*	6%	6%	AFD, ERFD2, Relocated RFD2
Otsego 1	16%	22%	City Hall <i>(Required)</i>
Otsego 2	32%	54%	70th & Quaday Ave
Otsego 3	26%	81%	70th east of Kadler

The following map shows the locations chosen within the City of Otsego.

Figure 84: Scenario F-Future Stations



Similarly to Scenario E6, one station is required for coverage parameters and it was the site required in the analysis, City Hall.

Figure 85: Scenario F6- Subsequent Additional Station Stats

Scenario F (6 minutes)		
Station Added	VRI % Coverage	Incremental Change %
Closest 3	66%	0%
Otsego 1	91%	25.62%

Figure 86: Scenario F6- End Result Coverage Stats

Scenario F (6 Minutes)			
Station	VRI % Coverage	Incremental	Location
Closest 3	56%	56%	AFD, ERFD2, Relocated RFD2
Otsego 1	35%	91%	City Hall <i>(Required)</i>

The vicinity of Odean and 75th was chosen by the technological analytics in at least five scenario runs. It was requested during the study draft review to compare this single location against the city owned property in Scenario E (85th & Park) utilizing the current road network and the future roadway network. A brief was written and submitted to the city for review. It is included in the appendix however, the result once again demonstrated the superiority of the Odean and 75th area for a station location.

Scenario G (Requested by City) - Without regard to nearby fire station coverage

This scenario examines the siting of Otsego fire stations without considering the locations of nearby fire stations providing service from the contracted providers. This scenario may site stations very close to the other fire stations not considered that are near the border of the City of Otsego.

Figure 88: Scenario G- Subsequent Additional Station Stats

Scenario G		
Station Added	VRI % Coverage	Incremental Change %
Otsego 1	40%	40%
Otsego 2	67%	26%
Otsego 3	81%	14%

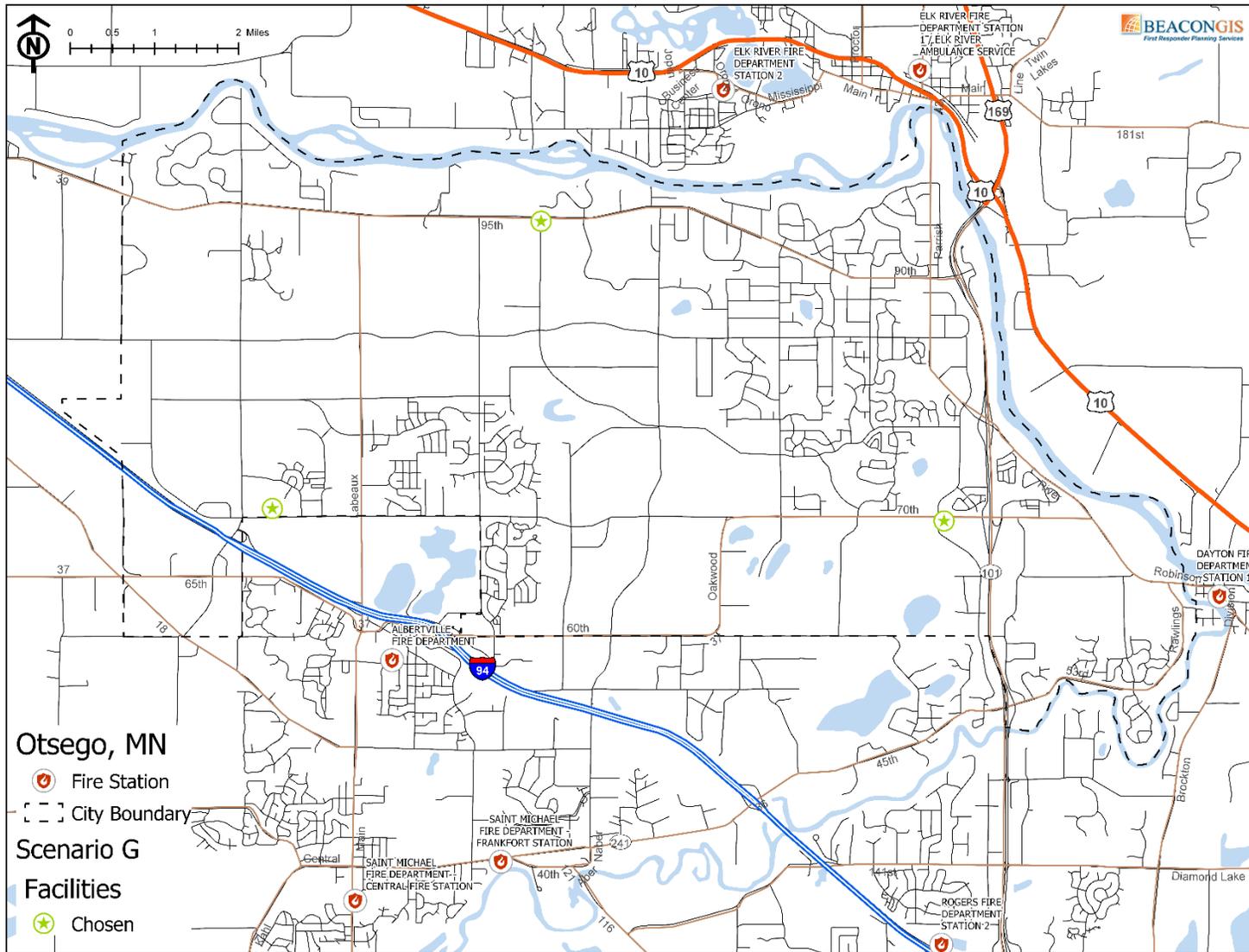
The total coverage percentage in this scenario matches one of the poorest performer of the previous scenarios. The future site selections as seen in the following table.

Figure 89: Scenario G- End Result Coverage Stats

Scenario G			
Station	VRI % Coverage	Incremental	Location
Otsego 1	36%	36%	70th & Quaday Ave
Otsego 2	25%	62%	70th between Kadler and Kitteridge
Otsego 3	19%	81%	95th & Mason

The following map shows these locations chosen within the City of Otsego.

Figure 90: Scenario G-Future Stations



Unlike previous scenarios using a six minute travel time, two stations, instead of one are required to exceed the coverage benchmark.

Figure 91: Scenario G6- Subsequent Additional Station Stats

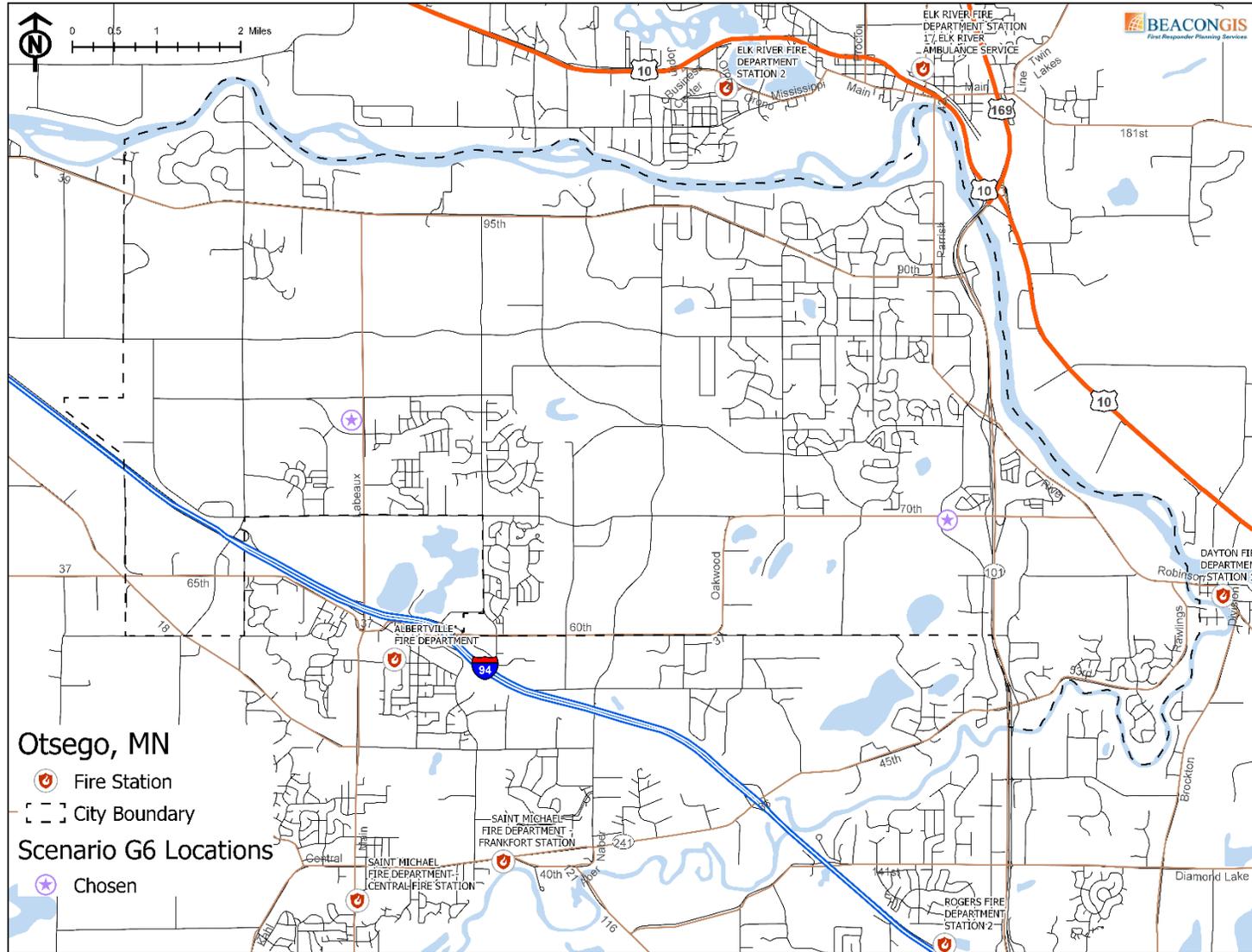
Scenario G (6 minutes)		
Station Added	VRI % Coverage	Incremental Change %
Otsego 1	74%	73.92%
Otsego 2	98%	24.53%

Interestingly, one location on 70th St repeats as a selected site but it must be reminded that Rogers FD is in process of moving it's station 2 northward although that is not considered in this scenario.

Figure 92: Scenario G6- End Result Coverage Stats

Scenario G (6 Minutes)			
Station	VRI % Coverage	Incremental	Location
Otsego 1	55%	55%	70th & Quaday Ave
Otsego 2	43%	98%	Labeaux & 77th

Figure 93: Scenario G6-Future Stations



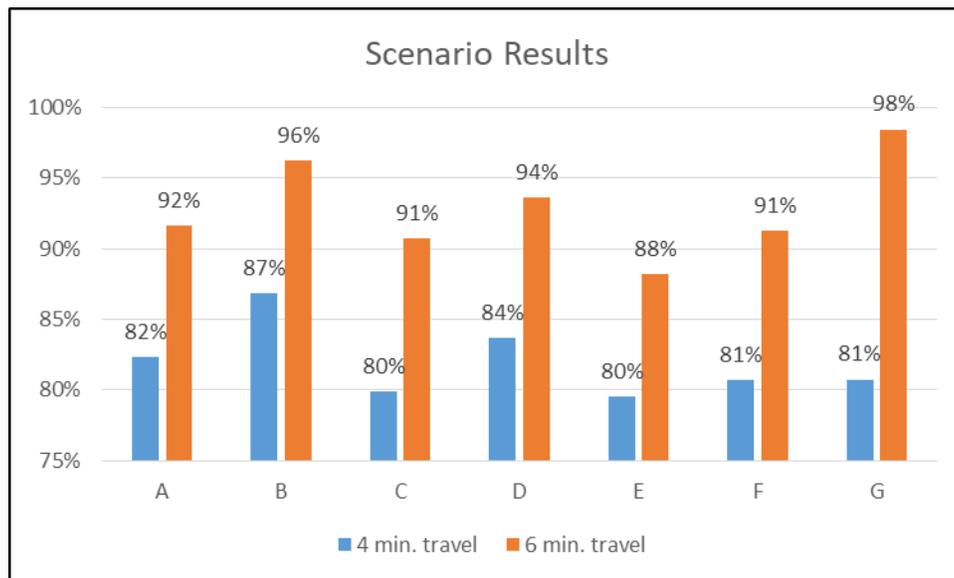
The previous scenario (Scenario G) was also requested to be analyzed using the current roadway network. The results were worse in terms of coverage, increased the number of stations needed and subsequently, the amount of apparatus and associated equipment. This scenario (Scenario H) is within the appendix to this document.

Scenario Summary

The following tables summarize the results of the various scenarios VRI coverage percentage.

Figure 94: Scenario Summary Statistics

Scenario	Description of Assumptions	4 min. travel		6 min. travel	
		% Coverage	#Otsego Stns	% Coverage	#Otsego Stns
A	Current/No Stations move	82%	3	92%	1
B	Rogers FD moves Stn 2 Northward	87%	3	96%	1
C	Elk River moves Stn 1 Northward	80%	3	91%	1
D	Both Rogers and Elk River move stations	84%	3	94%	1
E	Required use of 85th and Park Dr. city property	80%	3	88%	1
F	Required use of City Hall property	81%	3	91%	1
G	No outside FD partners / Future Road Network	81%	3	98%	2



Whichever scenario develops, and depending upon which fire department operates from which stations, the closest response areas should be redrawn as each station is constructed. Ultimately, the station should be built as close as practical to the cells selected. It is realized that some cells may not materialize as available but one nearby would suffice.

Station Cost

Fire stations are costly ventures. They are built and designed to last several decades which is why a deployment location study such as this document, ought to be undertaken before acquiring property. The stations in Otsego are to be operated by the existing fire service contracted departments but the intent of the study according to the request for proposals was that the City would build and own the asset. The fire departments would be the owners of the apparatus and manage the staff.

Since the services will be provided by the current fire departments, any future fire station in Otsego would not need administrative facilities as they are within other stations. Classrooms and other training elements can be preserved at other locations and ideally serve the region. ERFD's relocated Station 1 has planned training facilities according to its study.

Since the use of volunteers is continued, there is no current need for an extensive quarters including a kitchen or overnight quarters. However, an environment that is conducive to members to gather can be an incentive to join the ranks. These aspects may be needed in the future if one of the departments implement a career staffing model and should be considered in the design planning forward. In addition, administrative offices may be considered in case of a career staff ranking officers are stationed there.

Designs can vary depending upon the apparatus, crew needs, and lot size restrictions. To estimate cost, the Rogers Fire Chief has shared the cost estimate of its planned 13,112 square foot Station 2 on a relocated on a 1.5 acre site. The station would be a 3 bay drive through built with two stories to accommodate the lot restrictions. It would not have a kitchen, training area, or overnight quarters. The cost per square foot, not including land cost is estimated to be approximately \$177. For the Otsego Station within the ERFD study, the design firm used national and local ratings to establish a high estimate of \$316 per square foot and a low estimate of \$216. The plan was also for a three bay station but included training, kitchen, and overnight quarters that increases total square footage. The average cost per square foot was calculated to be \$255 per square foot.

According to the 2017 National Building Cost Manual¹⁸, the square footage cost of a single story fire station at 16,000 square feet ranges from \$103 to \$213 per square foot. The Building Journal construction estimator¹⁹ suggests that a similar fire station in the Minneapolis market is \$150 per square foot at the median. The high estimate is \$199 and the low of \$128 per square foot. There would be additional legal, design fees, insurance, and cost of land itself. Two story stations cost more to construct.

Figure 95: Station Cost Estimates

	Per Square Foot	13,000 Sqft	2 Stations	3 Stations
High	\$199	\$2,587,000	\$5,174,000	\$7,761,000
Median	\$150	\$1,950,000	\$3,900,000	\$5,850,000
Low	\$128	\$1,664,000	\$3,328,000	\$4,992,000

This study is not suggesting that the station(s) should be 13,000 square feet as this is for comparison purposes when the city seeks design firms for the pre-construction phase. A good source for design considerations is located in the footnote.²⁰ Three to four bays should be considered because stations usually house more than one apparatus, it leaves room for expansion using today's dollar, and can be rented to EMS services for their deployment needs. If only one apparatus was in the station, after the initial crew leaves, the subsequent responders are left without one.

The acreage needed for a station depends on the availability and size of the building. Rogers FD has a plan for a two story structure on 1.5 acres, many urban areas have such designs of two stories on less area. A single story station will require a larger footprint area. More land may be necessary based upon wastewater needs in certain areas. In addition, drive through bays require larger lots to allow for the turning radius of apparatus to line up. Architects and engineers have a variety of styles that can fit in to available parcels. Generally, the minimum lot size is 1 acre. Land cost is variable depending on location and fiscal negotiations.

The following table detailed space needs based on a 2, 3, or a 4 bay station with an option for administrative offices based upon the apparatus count detailed in the next section and 20 firefighters serving the station²¹.

¹⁸ https://www.craftsman-book.com/media/static/previews/2017_NBC_book_preview.pdf page 68

¹⁹ <http://www.buildingjournal.com/construction-estimating.html>

²⁰ <https://www.wbdg.org/building-types/community-services/fire-station>

²¹ Guyer, J.Paul, Introduction to Design: Fire Stations, CED Engineering, NY, 2010

Figure 96: Station Space Needs Estimates

Station Square Footage Estimate				
# of BAYS	2	3	4	4 HQ
Apparatus and Maintenance				
Large apparatus bays	2,340	3,510	4,680	4,680
PPE Gear Storage (20 FF)	200	200	200	200
Hose Storage				54
SCBA Maintenance Room				144
SCBA Compressor Room				50
Protective Clothing Laundry				400
Equipment Wash/Decon	150	150	150	150
Equip. Maintenance room	150	150	150	150
Vehicle Parts Storage	400	400	400	400
EMS Storage	12	12	12	12
Administrative				
Officer/Watch room	119	120	120	120
Chief				345
Deputy Chief				120
Lobby				100
Admin Asst				64
Spare office (Training/Prevention)				120
Training Classroom	560	560	560	560
Training storage	80	80	80	80
Admin Storage	80	80	80	80
Residential and Living				
Day Room/Lounge	1,296	1,944	2,592	2,592
Single Dorm Rooms	2,160	2,160	2,160	2,160
Bathrooms showers changing	500	750	1,000	1,000
Fitness Room	437	437	437	437
Vending	20	20	20	20
Total Station Sqft	8,504	10,573	12,641	14,038
Site Space Needs				
FF Parking	9,000	9,000	9,000	9,000
Site approach to bays	4,000	6,000	8,000	8,000
Outside Storage	48	48	48	48
Patio Area	150	150	150	150
Site Needed	21,702	25,771	29,839	31,236

Apparatus

The following tables are suggestions for apparatus deployment in each scenario's stations. These are suggestions, not mandates as the three fire departments will be the owner-operators of the apparatus serving Otsego. Certain apparatus are suggested based upon the areal needs in the future and to improve insurance ratings. Every station will need the base apparatus which is an engine. Due to the growing industrial and commercial development plans, and ladder truck is recommended near these areas. Tenders are reserved for stations located in areas that will take the longest for water supply installation. Rescue units are placed near highways and industrial areas. Squads are suggested if medical first response is to be continued by AFD and RFD. The current apparatus in the various existing stations is taken into account within proximity to Otsego Stations.

Figure 97: Apparatus Needs (4 minute travel scenarios)

Four Minute Travel Time Scenarios								
Scenario A		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Current closest 3	AFD, ERFD1, RFD2	ALL	AFD	ALL	AFD,ERFD1	AFD	-----	-----
Otsego 1	Odean & 75th	X	X		X		3	3
Otsego 2	80th & Labeaux	X					1	2
Otsego 3	70th and River Rd	X				X	2	3
Otsego Apparatus Needs:		3	1	0	1	1	6	
Scenario B		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3	AFD, ERFD1, Relocated RFD2	ALL	AFD	ALL	ALL	AFD	-----	-----
Otsego 1	70th east of Packard	X	X				2	3
Otsego 2	Kadler Ave between 80th & 70th Sts	X				X	2	2
Otsego 3	95th & Mason	X			x		2	2
Otsego Apparatus Needs:		3	1	0	1	1	6	
Scenario C		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3*	AFD, ERFD2, RFD2	ALL	AFD/ERFD2	AFD,RFD2	AFD,ERFD2	AFD	-----	-----
Otsego 1	Odean & 72nd	X	X		X		3	3
Otsego 2	Labeaux & 80th	X					1	2
Otsego 3	River Rd & Hwy 101	X				X	2	2
Otsego Apparatus Needs:		3	1	0	1	1	6	
Scenario D		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3*	AFD, ERFD2, Relocated RFD2	ALL	AFD/ERFD2	AFD,RFD2	ALL	AFD	-----	-----
Otsego 1	Odean & 75th St	X			x	X	3	3
Otsego 2	River Road near Elementary School	X	X				2	3
Otsego 3	Labeaux & 77th	X					1	2
Otsego Apparatus Needs:		3	1	0	1	1	6	
Scenario E		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3*	AFD, ERFD2, Relocated RFD2	ALL	AFD/ERFD2	AFD,RFD2	ALL	AFD	-----	-----
Otsego 1	85th & Park (Required)	X	X			X	3	3
Otsego 2	70th & Mclver	X					1	2
Otsego 3	95th & Mason	X			X		2	2
Otsego Apparatus Needs:		3	1	0	1	1	6	
Scenario F		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3*	AFD, ERFD2, Relocated RFD2	ALL	AFD/ERFD2	AFD,RFD2	ALL	AFD	-----	-----
Otsego 1	City Hall (Required)	X			X	X	3	3
Otsego 2	70th & Quaday Ave	X	X				2	3
Otsego 3	70th east of Kadler	X					1	2
Otsego Apparatus Needs:		3	1	0	1	1	6	
Scenario G		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Otsego 1	70th & Quaday Ave	X	X	X			3	3
Otsego 2	70th between Kadler and Kitteridge	X				X	2	3
Otsego 3	95th & Mason	X			X		2	2
Otsego Apparatus Needs:		3	1	1	1	1	7	

Figure 98: Apparatus Needs (6 minute travel scenarios)

Six Minute Travel Time Scenarios								
Scenario A6		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Current closest 3	AFD, ERFD1, RFD2	ALL	AFD	ALL	AFD,ERFD1	AFD	-----	-----
Otsego 1	75th st ext from Odean to Nashua	X	X		X	X	4	4
Otsego Apparatus Needs:		1	1	0	1	1	4	
Scenario B6		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3	AFD, ERFD1, Relocated RFD2	ALL	AFD	ALL	ALL	AFD	-----	-----
Otsego 1	75th st ext from Odean to 83rd	X			X	X	3	3
Otsego Apparatus Needs:		1	0	0	1	1	3	
Scenario C6		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3	AFD, ERFD2, RFD2	ALL	AFD/ERFD2	ALL	AFD,ERFD2	AFD	-----	-----
Otsego 1	Odean & 75th St	X	X		X	X	4	4
Otsego Apparatus Needs:		1	1	0	1	1	4	
Scenario D6		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3	AFD, ERFD2, Relocated RFD2	ALL	AFD/ERFD2	AFD,RFD2	ALL	AFD	-----	-----
Otsego 1	95th & Odean	X	X		X	x	4	4
Otsego Apparatus Needs:		1	1	0	1	1	4	
Scenario E6		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3*	AFD, ERFD2, Relocated RFD2	ALL	AFD/ERFD2	AFD,RFD2	ALL	AFD	-----	-----
Otsego 1	85th & Park (Required)	X	X		X	X	4	4
Otsego Apparatus Needs:		1	1	0	1	1	4	
Scenario F6		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Closest 3	AFD, ERFD2, Relocated RFD2	ALL	AFD/ERFD2	AFD,RFD2	ALL	AFD	-----	-----
Otsego 1	City Hall (Required)	X	X		X	X	4	4
Otsego Apparatus Needs:		1	1	0	1	1	4	
Scenario G6		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Otsego 1	70th & Quaday Ave	X	X	X			3	3
Otsego 2	Labeaux & 77th	X			X	X	3	3
Otsego Apparatus Needs:		2	1	1	1	1	6	

Another type of apparatus, called a Quint, that combines aspects of an engine and a ladder is an option for stations that need both. However, maintenance effectively eliminates the use of two units but it can be less expensive to procure than two separate apparatus.

Apparatus Cost

Fire apparatus are either bought used or built new (custom) for the department. Being custom built can widely vary the price point off a particular apparatus. Trying to get a straight answer from manufacturers without a bid specification is difficult. Of course, volume purchasing reduces unit prices. The best gauge is to review the latest apparatus procurements from the three fire departments serving Otsego.

In general, an engine can be \$550K or more plus \$200K in equipment. A ladder truck can be \$1M or more plus \$200K in equipment. Tankers/Tenders can range \$300K-800K plus equipment. Squads/wildland trucks can be \$100K. Rescue Trucks can be very expensive based upon its specialty and size and easily reach \$1M.

Should Otsego elect to purchase the apparatus it can expect a price tag from \$2.1M to \$4.5M to procure and equip the apparatus suggested in the previous figures.

Figure 99: Apparatus Cost Estimates in \$ thousands

Apparatus Type	Base Price x000s	Four Minute Travel Time Scenarios						
		Engine	Ladder	Rescue	Tender	Squad	Equipment	Totals
Engine	\$550	3	1	0	1	1	-----	6
Ladder	\$1,000	\$1,650	\$1,000	\$0	\$500	\$100	\$1,200	\$4,450
Rescue	\$1,000	Six Minute Travel Time Scenarios						
Tender	\$500	Engine	Ladder	Rescue	Tender	Squad	Equipment	Totals
Squad	\$100	1	1	0	1	1	-----	4
Equipment	\$200	\$550	\$1,000	\$0	\$500	\$100	\$800	\$2,150

The City may also opt to provide firefighter gear (Helmet, coat, pants, etc). Firefighter gear set is estimated at \$9,410 each.²² The following tables summarize the estimated costs of stations²³, apparatus including equipment, and firefighter turnout based on 40 sets for each scenario to estimate a total cost per option.

Figure 100: Scenarios Estimated Total Costs

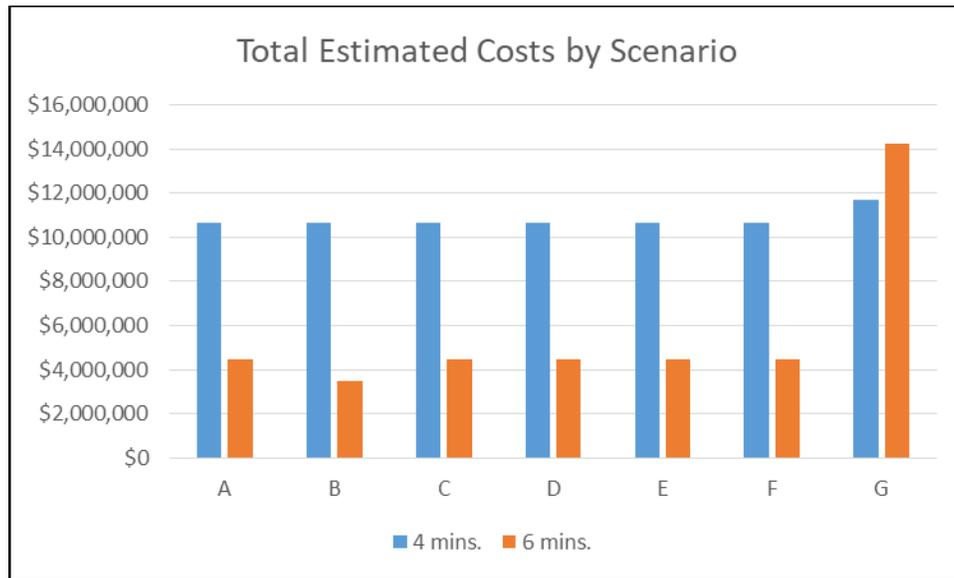
Scenario	Description of Assumptions	Four Minute Travel Time Scenarios					Estimated Total Cost
		Stations	Cost	Veh & Equip.	Cost	FF Gear (40)	
A	Current/No Stations move	3	\$5,850,000	6	\$4,450,000	\$376,400	\$10,676,400
B	Rogers FD moves Stn 2 Northward	3	\$5,850,000	6	\$4,450,000	\$376,400	\$10,676,400
C	Elk River moves Stn 1 Northward	3	\$5,850,000	6	\$4,450,000	\$376,400	\$10,676,400
D	Both Rogers and Elk River move stations	3	\$5,850,000	6	\$4,450,000	\$376,400	\$10,676,400
E	Required use of 85th and Park Dr. city property	3	\$5,850,000	6	\$4,450,000	\$376,400	\$10,676,400
F	Required use of City Hall property	3	\$5,850,000	6	\$4,450,000	\$376,400	\$10,676,400
G	No outside FD partners / Future Road Network	3	\$5,850,000	7	\$5,450,000	\$376,400	\$11,676,400

Scenario	Description of Assumptions	Six Minute Travel Time Scenarios					Estimated Total Cost
		Stations	Cost	Veh & Equip.	Cost	FF Gear (40)	
A	Current/No Stations move	1	\$1,950,000	4	\$2,150,000	\$376,400	\$4,476,400
B	Rogers FD moves Stn 2 Northward	1	\$1,950,000	3	\$1,150,000	\$376,400	\$3,476,400
C	Elk River moves Stn 1 Northward	1	\$1,950,000	4	\$2,150,000	\$376,400	\$4,476,400
D	Both Rogers and Elk River move stations	1	\$1,950,000	4	\$2,150,000	\$376,400	\$4,476,400
E	Required use of 85th and Park Dr. city property	1	\$1,950,000	4	\$2,150,000	\$376,400	\$4,476,400
F	Required use of City Hall property	1	\$1,950,000	4	\$2,150,000	\$376,400	\$4,476,400
G	No outside FD partners / Future Road Network	2	\$3,900,000	6	\$9,950,000	\$376,400	\$14,226,400

²² <https://www.iafc.org/topics-and-tools/resources/resource/cost-to-outfit-a-firefighter>

²³ Uses the median cost per square foot in figure 97 for a 13k square foot facility

Figure 101: Total Estimated Costs per Scenario Chart



Staffing

Volunteers are needed nearby to respond to these stations. Most of the rosters of volunteer firefighters live near the current fire stations and have relationships with others who are in the fire department. It is hopeful that the recruitment and retention efforts detailed previously, along with a visible community presence would boost the volunteerism of city residents that is not evident currently (See [Figure 21](#)). Without volunteers, an empty building with parked apparatus may expensively improve insurance ratings but does nothing to improve response times.

However, Otsego is not typical when it comes to the type of community that is ideally suited for volunteer fire department recruitment. Community activism has been waning nationally for years as other demands on attention and responsibilities leave little time for recruits. Since Otsego is primarily a commuter community, time away from the city and time spent driving or rail rides away takes its toll. Typical workweeks are routinely greater than 40 hours and the recent economic recession required more people to take on multiple employment positions. As a fast growing city, many residents are new and do not yet have the roots in the community that fosters volunteerism and commitment. A wealthier community also can afford other activities such as sports, technology, and events that compete with the image of firefighting. Speaking of which, the image of firefighting quickly fades in today's youth as the reality of fundraising and minor (less fire) events are the norm. Complicating matters is that many employer's today are increasingly less likely to allow responders to leave to answer calls for service.

Therefore, a concerted effort to bolster the ranks of the volunteer departments by the citizens of Otsego must be undertaken to preserve the system that currently exists with an eye toward the cost of such that may make it more expensive than a career staff. The Otsego volunteer ranks would primarily come from residential developments. The proposed stations are nearby these current and future planned

developments. Review of the population composition, ([Figure 46](#)) shows that in the next 5 years, a large proportion of late teens will be residents of Otsego and prime for recruitment to the fire services.

During construction, recruitment signs and community event media can be utilized to call for action from Otsego residents.

Recommendations and Timing

Now/Ongoing:

- Explore the junior fire academy concept to attract older teens to the fire service
- Consider a referral to current firefighters and sign-on bonus program to Otsego residents
- Consider a property tax credit for volunteer firefighters from Otsego.
- Implement a community detector check, installation, and replacement program through the fire marshal.
- Consider requiring residential sprinkler installation ordinance.
- Strictly enforce fire codes and increase inspections to reduce fire potential.
- Support fire prevention education in schools, community events, and senior centers.
- Continue to expand the water system to include hydrant installations.
- Encourage multi-departmental training activities to increase coordination on the fire ground.
- Encourage the fire departments to engage in group purchasing and grant applications to reduce costs.
- Encourage regional standard operating procedures to potentially use shared staff to quickly respond to incidents
- Encourage auto aid agreements with the three fire departments especially for reported fires to improve response times. (I.e.: Rogers and Dayton FDs)
- Monitor the non-capital per capita costs of volunteers made by the share of Otsego's contract contributions. When it surpasses level at which career force would be more efficient, encourage the fire departments to consider switching to reduce financial pressure on Otsego.
- Monitor response time performance for each fire service responding to Otsego at least annually to ensure compliance with NFPA 1720 guidelines. Consider performance requirements.
- Adjust the current fire response areas to reflect the closest response area as depicted in figure 44. Page 65.

Short term 1-5 years (2019-2024)

- Acquire property for fire stations
- Renegotiate fire contracts
- Attempt to find a common compensatory method to the contracted fire departments to ease the implementation of closest response area without increasing cost to the city.
- Change Response Areas if Rogers FD moves Station 2 North.

Midterm 6-10 years (2025-2029)

- Have architectural and construction firms selected
- Approve preliminary designs of stations
- Monitor Elk River Fire Department's activity to build stations as described in its study. Construction of easternmost station in Otsego may need to be fast tracked.

Long term 11-15 years (2030-2035)

- Build station(s) incrementally and lease space to fire departments who own the apparatus and equipment.
- Redraw fire response areas as stations are built based upon the closest station travel time capability.

- Approach the EMS services who may desire rental space for their deployment needs.
- As stations are completed, request that property insurance rating reviews are conducted of the fire departments with the motive to reduce property insurance rates.
- Design stations that encourage gathering for volunteers.

Glossary

AKA- Also known as...

Apparatus: Vehicles

Command- a sedan or SUV used by fire administrative staff. Limited equipment, no water capacity.

Rescue – a specialty vehicle typically used for rescue situations like vehicle extrication, trench and confined space rescue, trapped persons in machinery, etc.

Utility- can be used for brush or grass fires, may also be utilized for medical assistance incidents.

Engine – Primary responder for reports of structural fire or smoke. Pump capacity, hoses, and limited ladders

Ladder- A variety of ladders and specialty tools for ventilation. Usually has a long ladder across its top either rear mounted or mid-mounted. Another variety is a Tower that has a bucket that can be extended to height. Both can be used to train water on multi-storied structures and buildings with large square footage footprint, like a ‘big box’ store. AKA Aerial

Tender-AKA tanker. Used to carry high volumes of water to a structure fire located in an area without access to hydrant service.

Quint- meaning five, and refers to the five functions that a quint provides: pump, water tank, fire hose, aerial device, and ground ladders.

EMS-Emergency Medical Service(s)

FD- Fire Department

FEMA- Federal Emergency Management Agency, sub agency of US Department of Homeland Security

GPM-gallons per minute

HP-Horsepower

NFIRS-National Fire Incident Reporting System

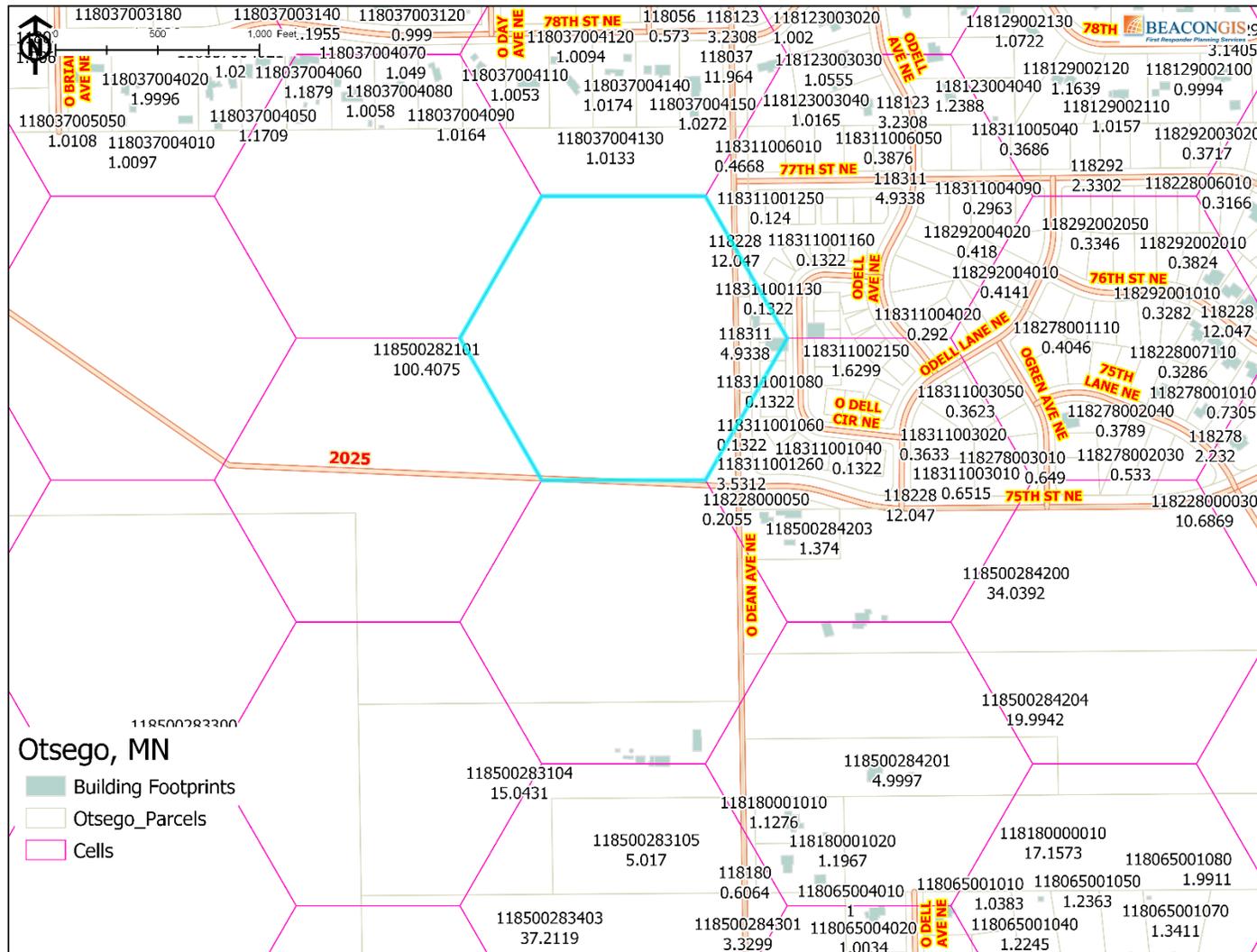
POV- Personal Operated Vehicle

USFA-United States Fire Administration, subsection of FEMA

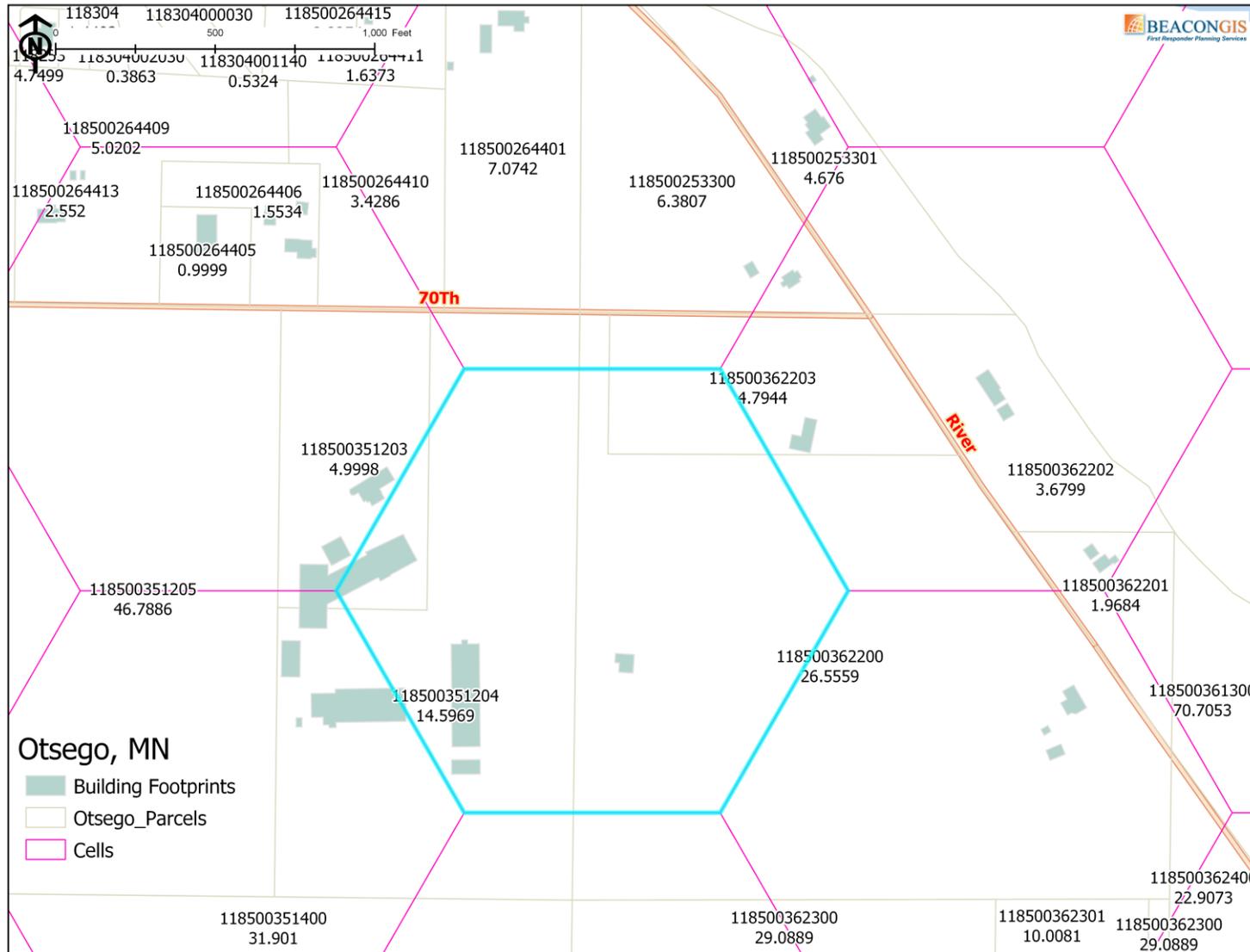
VRI-Vulnerability Risk Index

Appendix

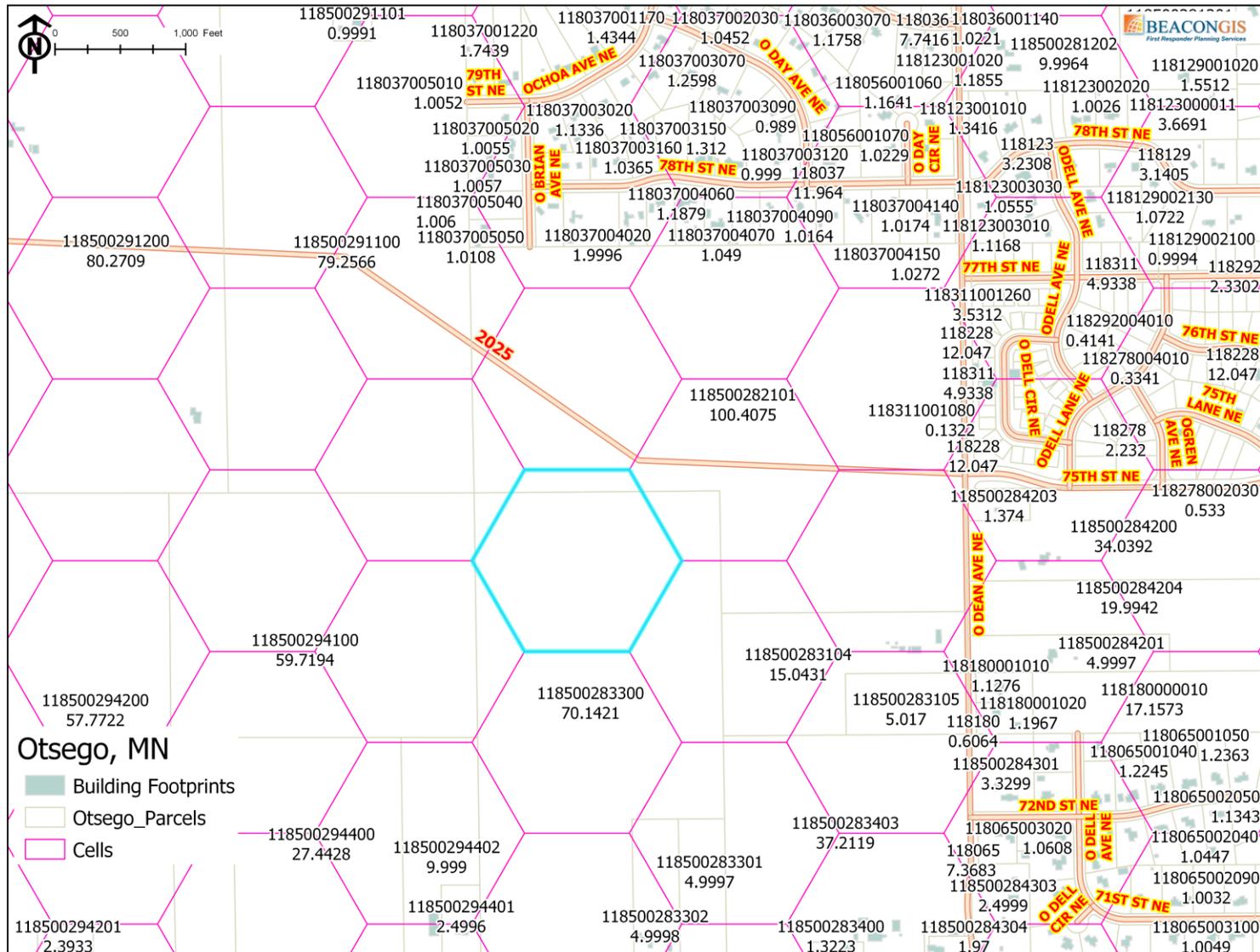
Proposed Station Scenario A: Station 1



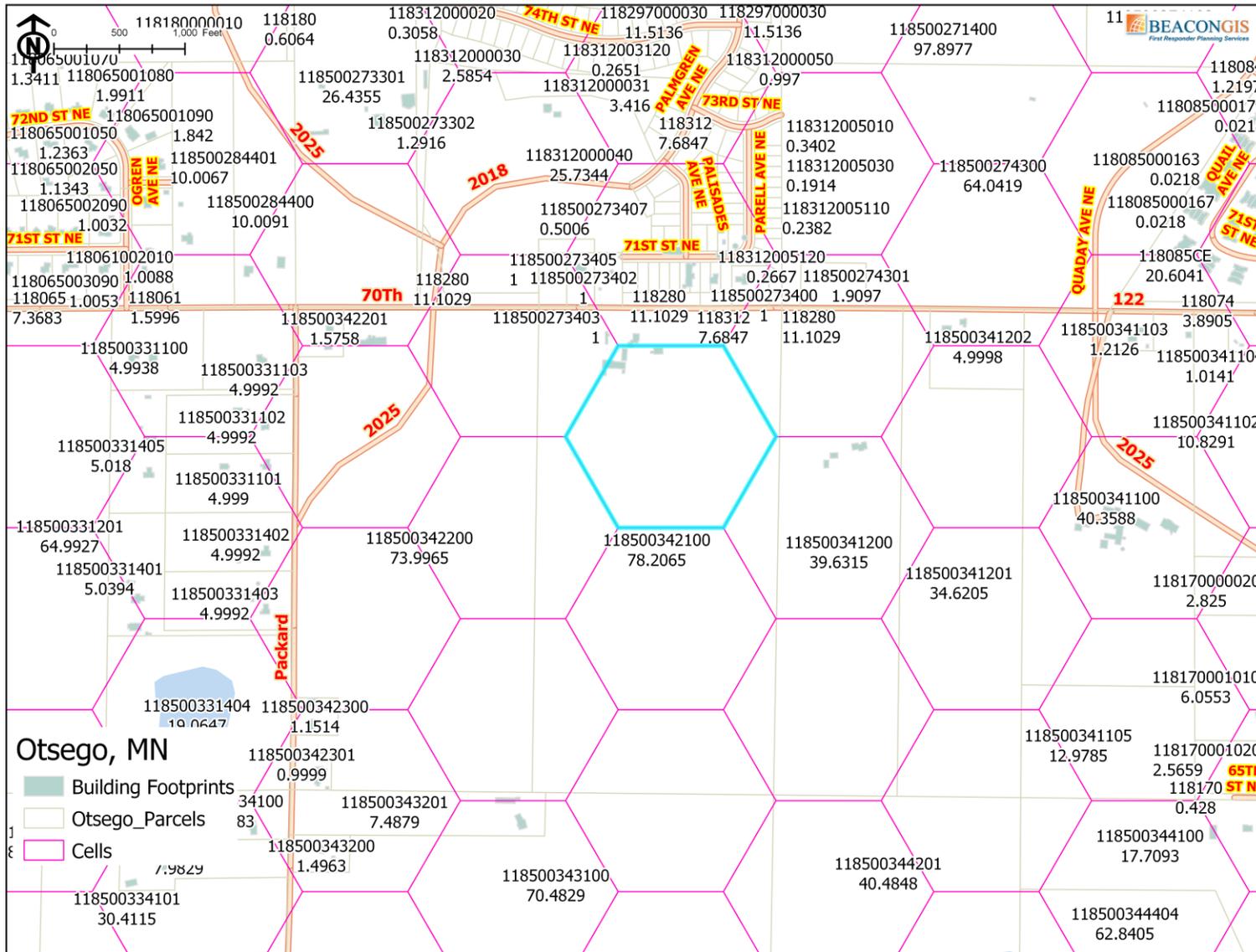
Scenario A: Station 3



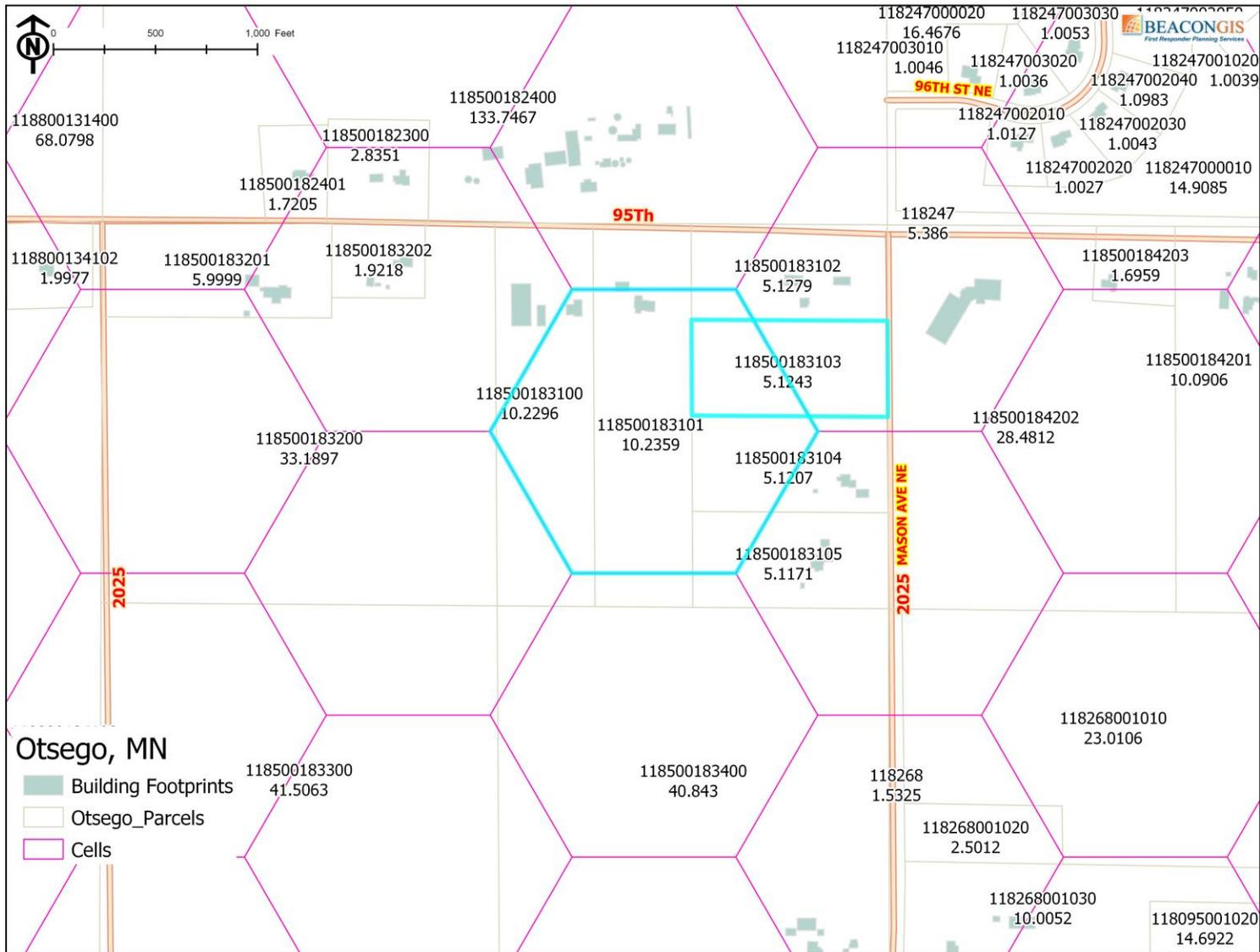
Scenario A6: Only Station



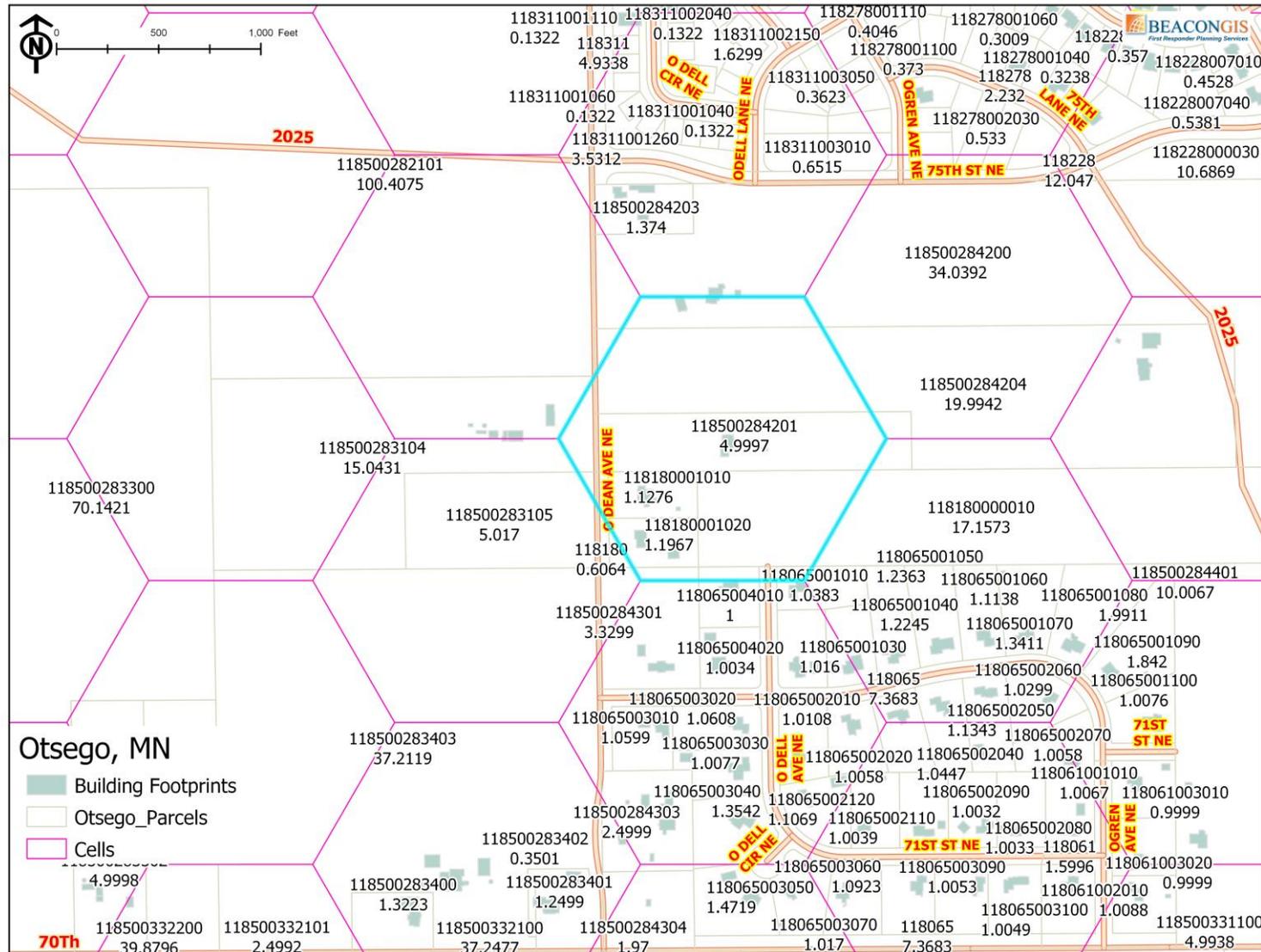
Station B: Station 1



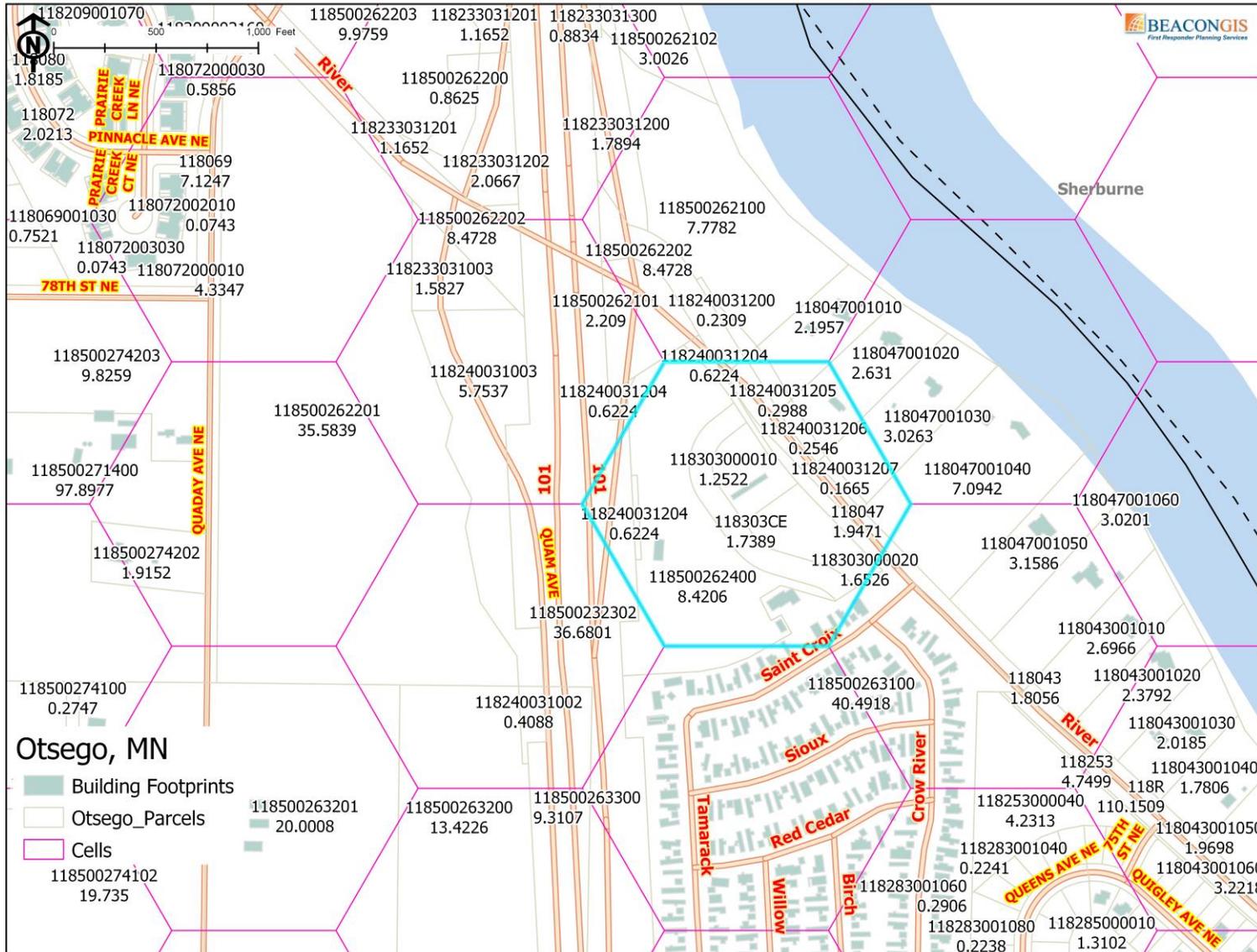
Scenario B: Station 2 / Scenario E: Station 2 / Scenario G: Station 3



Scenario C: Station 1



Scenario C: Station 3 (See Station 2 earlier with Scenario A: Station 2)



Scenario D6: Only Station

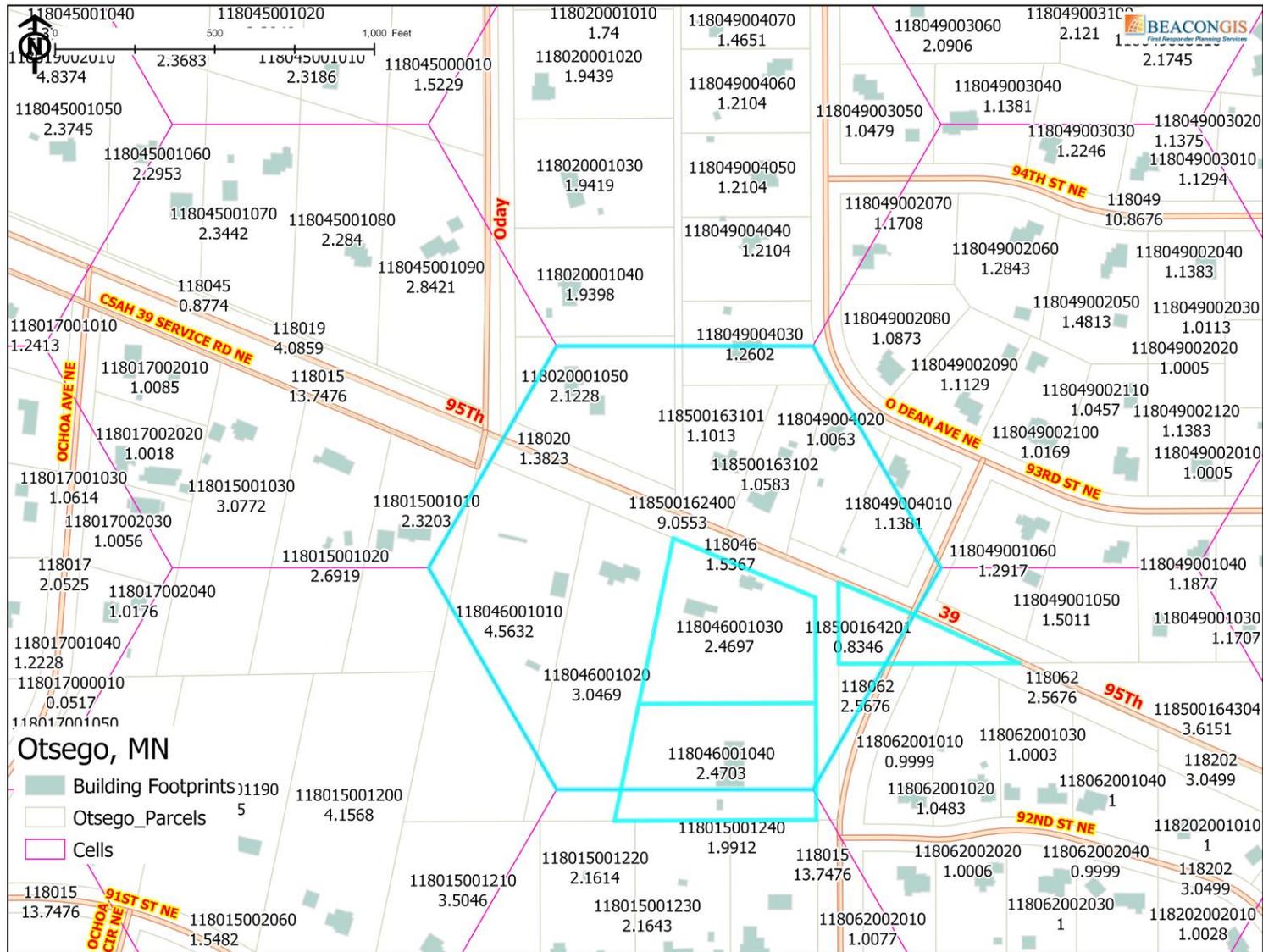


Figure: Scenario H Station 2

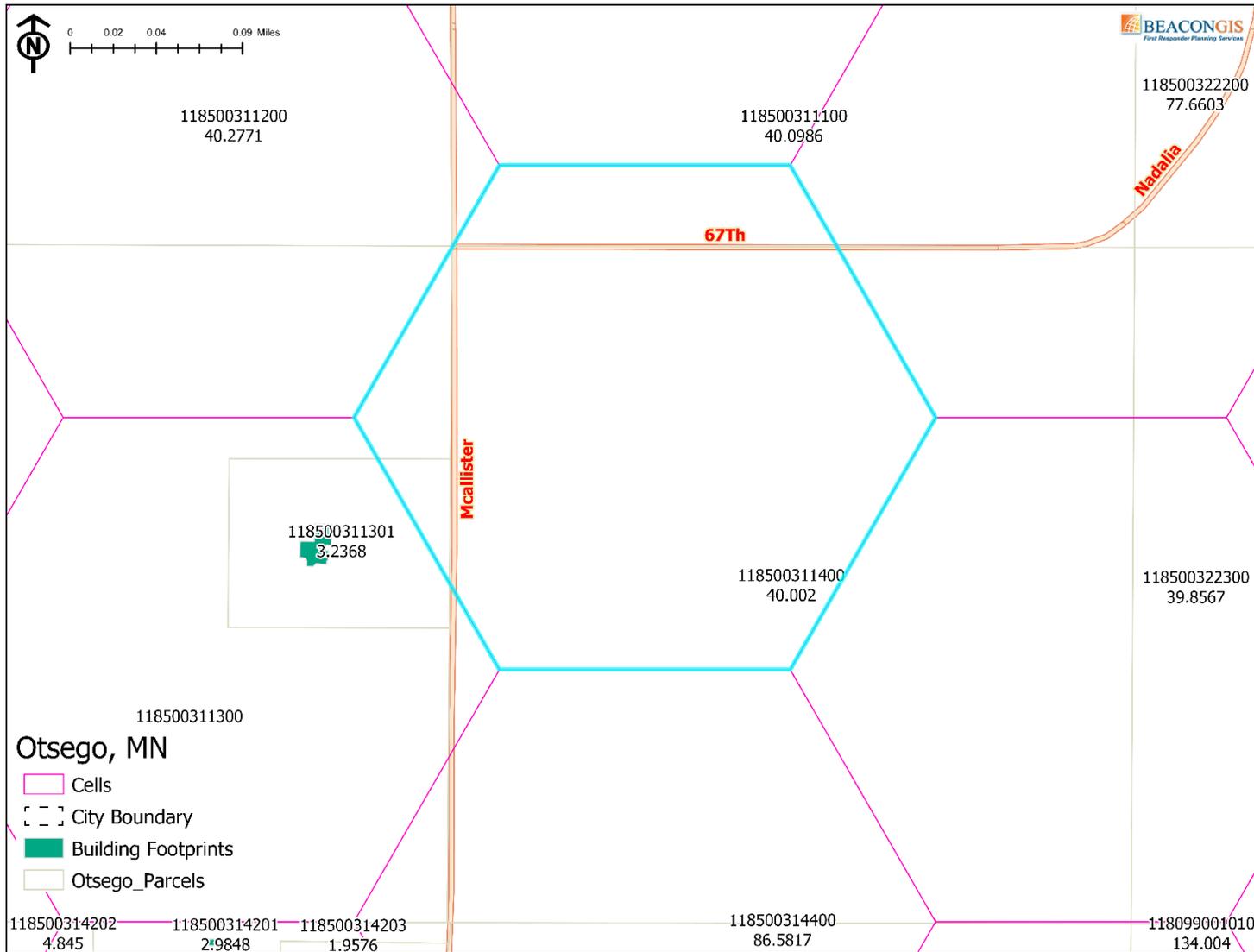


Figure: Scenario H Station 3

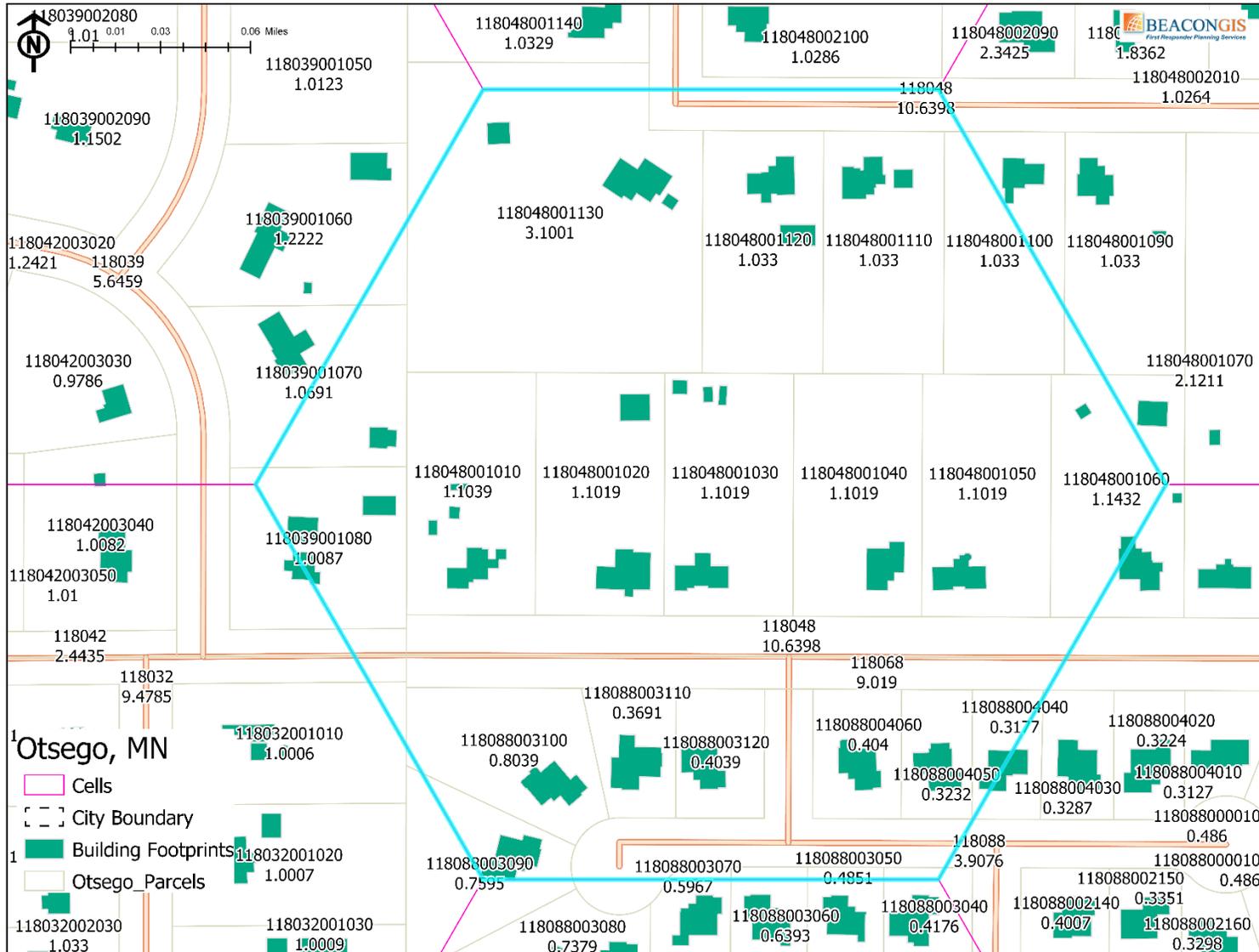
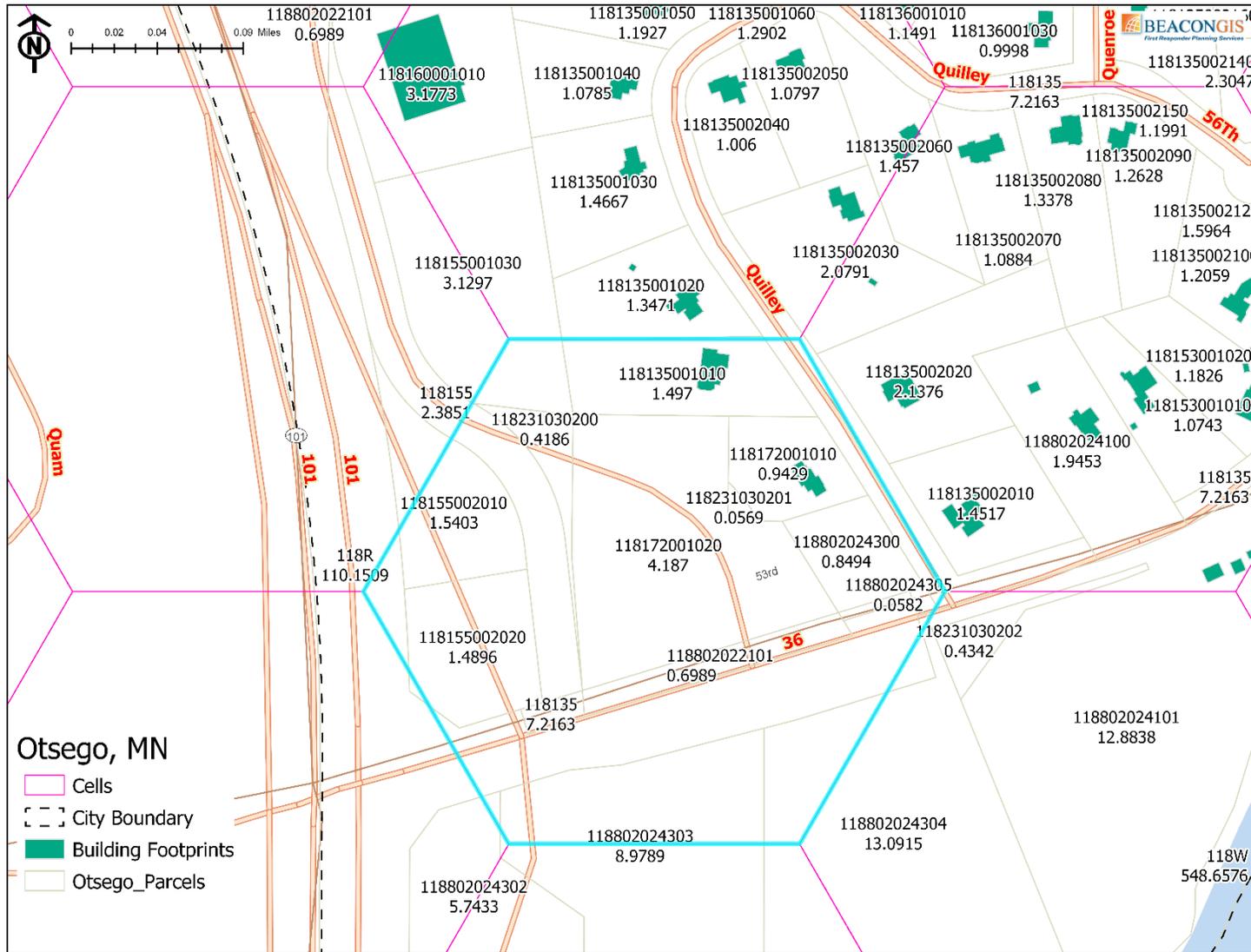


Figure: Scenario H Station 4



Supplemental Scenarios

After the draft review of the report for Response Time Improvement and Fire Services Plan in late July 2018, some council members questioned the methodology of future fire station placement based on planned future roadways described in the city's transportation plan. They were having doubts that many of the roadways will be built within the planned time period or at all. There did not seem to be an issue with the use of the future land use plan and expected population density factors that factored into the VRI scoring methodology.

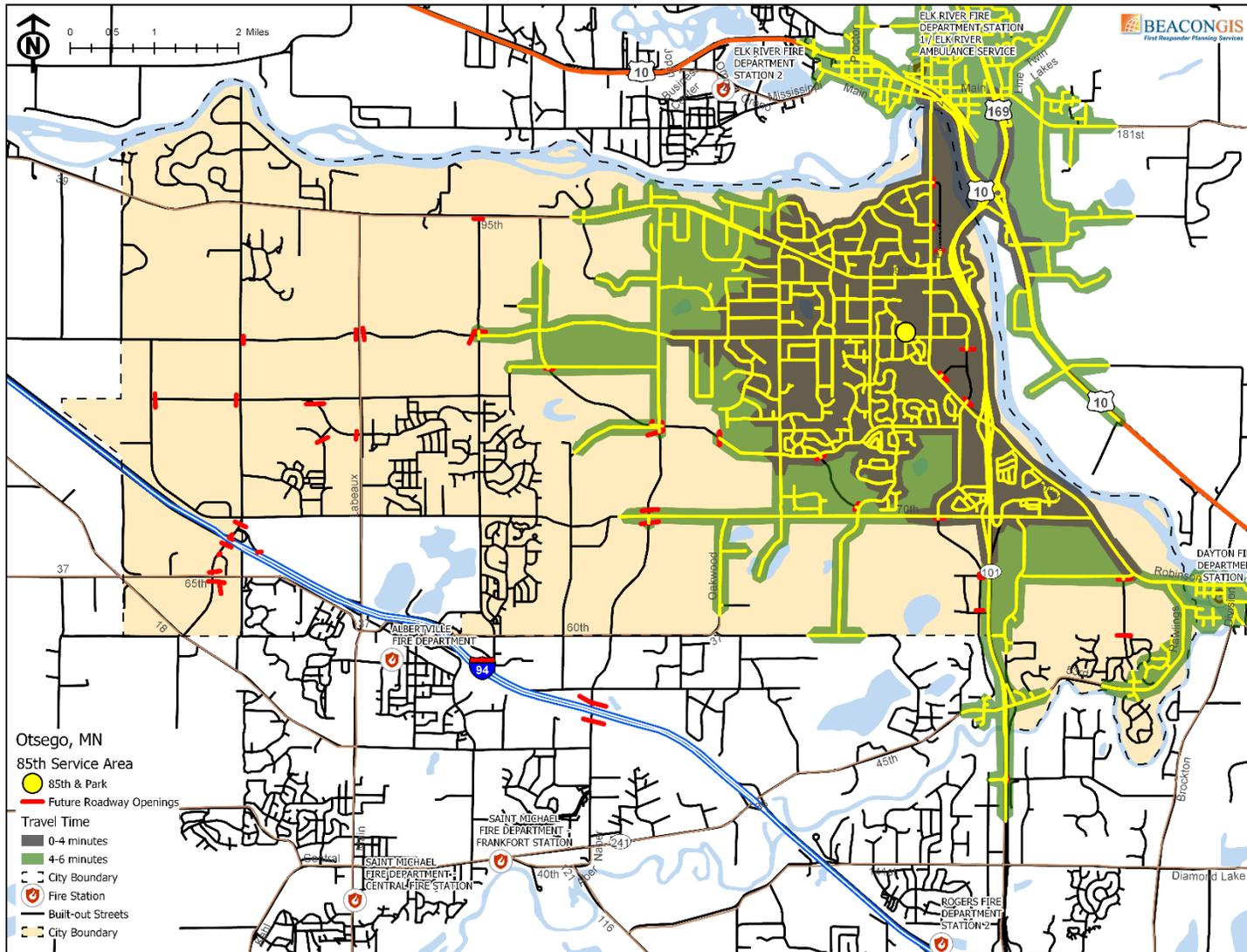
It was requested by a member of the city council that two specific locations that are near sites selected in several of the other scenarios previously presented in the draft report, be evaluated based on the current street network. One site was 85th and Park, a city owned parcel and subject within Elk River Fire Department expansion plan. The other being near Odean and 75th.

Furthermore, it was requested that these scenarios exclude the effect of the current closest fire station partners. The council member requested that the locations travel time extent measure current infrastructure and incidents. Two measures of four and six minutes travel time range extent from these specified locations be utilized. The draft report indicated that currently, the fire service partners are performing within national guidelines. It also indicated that currently, there is no need for a fire station but that in the expected future, fire station(s) are anticipated to become necessary due to development and population growth.

The following map show the travel time extent from the 85th and Park location. Note that it provides coverage primarily on the northeast region of the city that is currently most developed. It also reaches into the City of Elk River and takes advantage of the proximity to Highway 101 to provide ample coverage on that roadway.

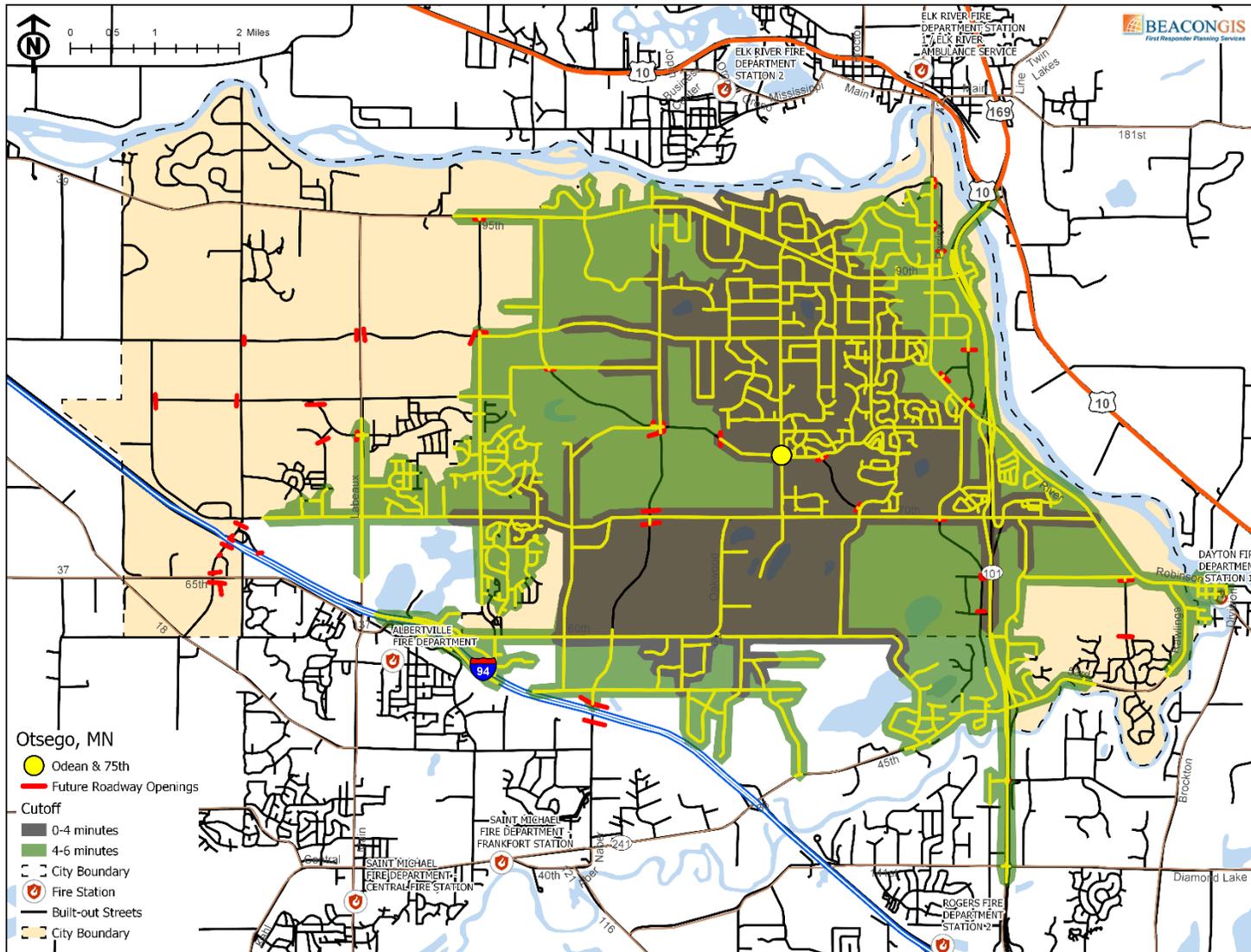
The maps show the planned build out of the roadway network but future roads have access blocked to reflect the current street connectivity.

Figure 102: 85th & Park Travel Time Extent



The following map show the travel time extent from the 75th and Odean location. Note that it provides coverage primarily to a more centrally located region of the city that is currently less developed but still provides coverage to the eastern side of the city. It reaches into the Town of St. Michael but not into the City of Elk River. It also takes advantage of the proximity to Highway 101 to provide ample coverage for the roadway. It also reaches westward to the developed area north of Albertville.

Figure 103: 75th & Odean Travel Time Extent



An examination of current infrastructure and service incident coverage by the travel time extents between the two locations reveals that the 75th & Odean location is superior in four of the six factors measured.

Figure 104: Current Factors Travel Time Coverage

Using Current Roads		85th & Park				75th & Odean			
		4 mins		6 mins		4 mins		6 mins	
Travel Time		%	Count	%	Count	%	Count	%	Count
Current	Address points	44%	3220	52%	3828	31%	2255	71%	5240
	Buildings	44%	3668	59%	4917	31%	2576	73%	6126
	Service Incidents	24%	139	36%	210	34%	199	56%	330

The factors that it was found inferior was address points (registered property, not necessarily with a building) and buildings at the four minute travel time extent. Both of these factors are expected to increase in the future. The future land use and expected population density that combined for the VRI score was also measured for coverage by the two locations using the current roadway network. The resultant scores are higher than the previous scenarios as the influence of the external fire station coverage have been removed as requested.

Figure 105: VRI Travel Time Coverage

Using Current Roads		85th & Park				75th & Odean			
		4 mins		6 mins		4 mins		6 mins	
Travel Time		%	Count	%	Count	%	Count	%	Count
Future	VRI SCORE	26%	1399	44%	2397	45%	2485	68%	3656

Based upon this scenario using the current roadway network, the 75th and Odean location remains superior to the 85th and Park location.

Scenario H- Without regard to nearby fire station coverage (Current Street Network)

This scenario examines the siting of Otsego fire stations without considering the locations of nearby fire stations providing service from the contracted providers. This scenario is also unrealistic in the event of a structure fire as multiple apparatus and multiple firefighters will be needed as quickly as possible. This scenario disregards the transportation plan of future connectivity documented in the city planning information.

Figure 1: Scenario H- Subsequent Additional Station Stats

Scenario H		
Station Added	VRI % Coverage	Incremental Change %
Otsego 1	35%	35%
Otsego 2	58%	23%
Otsego 3	71%	14%
Otsego 4	80%	9%

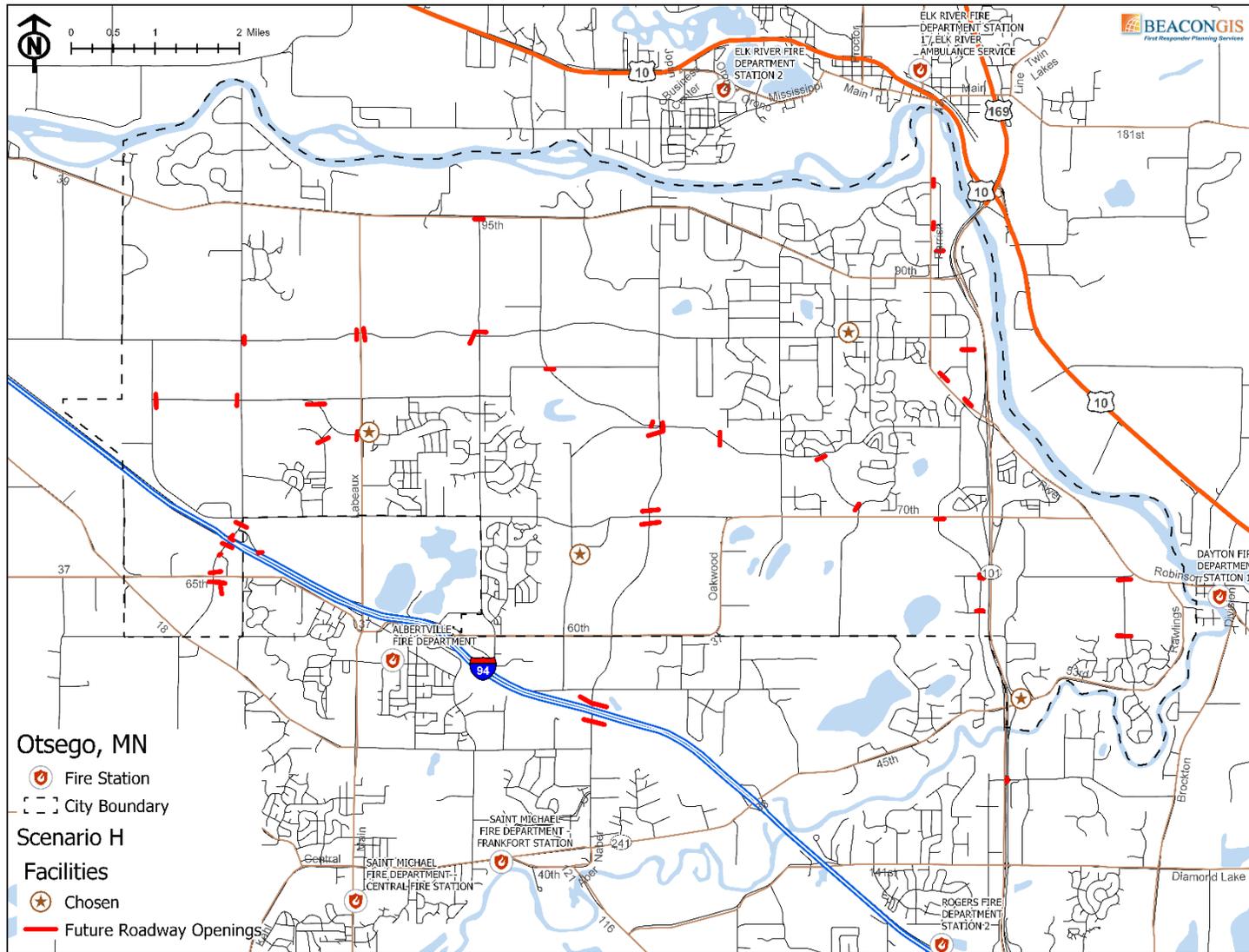
The total coverage percentage in this scenario also matches one of the poorest performer of the previous scenarios and requires an additional station than all the other scenarios. The future site selections as seen in the following table.

Figure 2: Scenario H- End Result Coverage Stats

Scenario H			
Station	VRI % Coverage	Incremental	Location
Otsego 1	23%	23%	Labeaux & 77th
Otsego 2	22%	45%	McAllister & 67th
Otsego 3	21%	66%	85th & Padgett
Otsego 4	15%	80%	53rd & Queens

The following map shows these locations chosen within the City of Otsego.

Figure 3: Scenario H-Future Stations



The apparatus recommended requires two more vehicles and equipment than the other previous scenarios (A-F) and is detailed in the following table.

Figure 4: Scenario H Apparatus

Scenario H		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Otsego 1	Labeaux & 77th	X			X		2	2
Otsego 2	McAllister & 67th	X				X	2	2
Otsego 3	85th & Padgett	X	X				2	2
Otsego 4	53rd & Queens	X		X			2	2
Otsego Apparatus Needs:		4	1	1	1	1	8	

Unlike previous scenarios using a six minute travel time, two stations, instead of one are required to exceed the coverage benchmark.

Figure 106: Scenario H6- Subsequent Additional Station Stats

Scenario H (6 minutes)		
Station Added	VRI % Coverage	Incremental Change %
Otsego 1	67%	67.01%
Otsego 2	90%	23.46%

The 70th St site repeats once again as a selected site in the scenario as shown in the following table.

Figure 6: Scenario H6- End Result Coverage Stats

Scenario H (6 Minutes)			
Station	VRI % Coverage	Incremental	Location
Otsego 1	51%	51%	70th & Quaday
Otsego 1	40%	90%	Labeaux & 73rd

Figure 7: Scenario H6-Future Stations

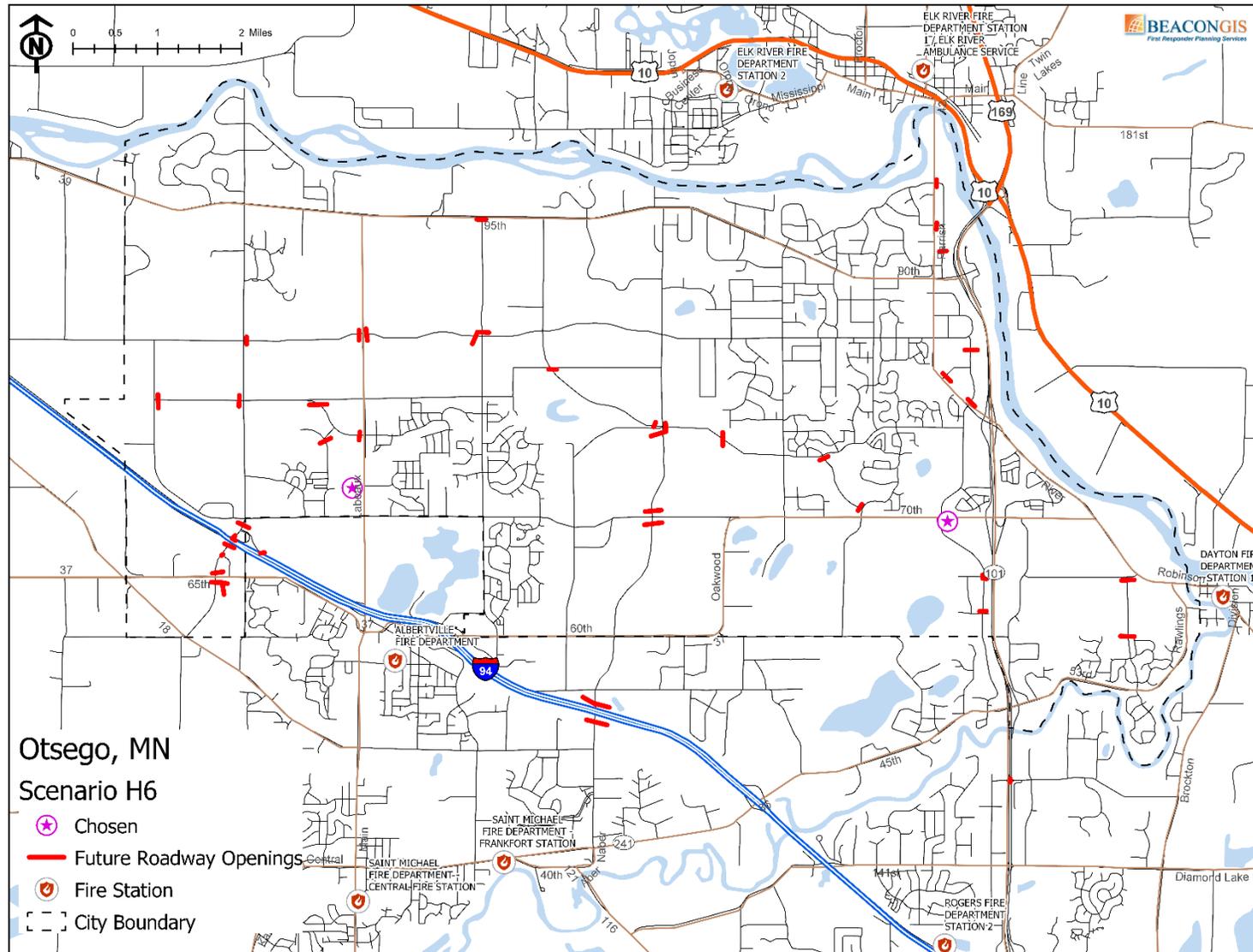


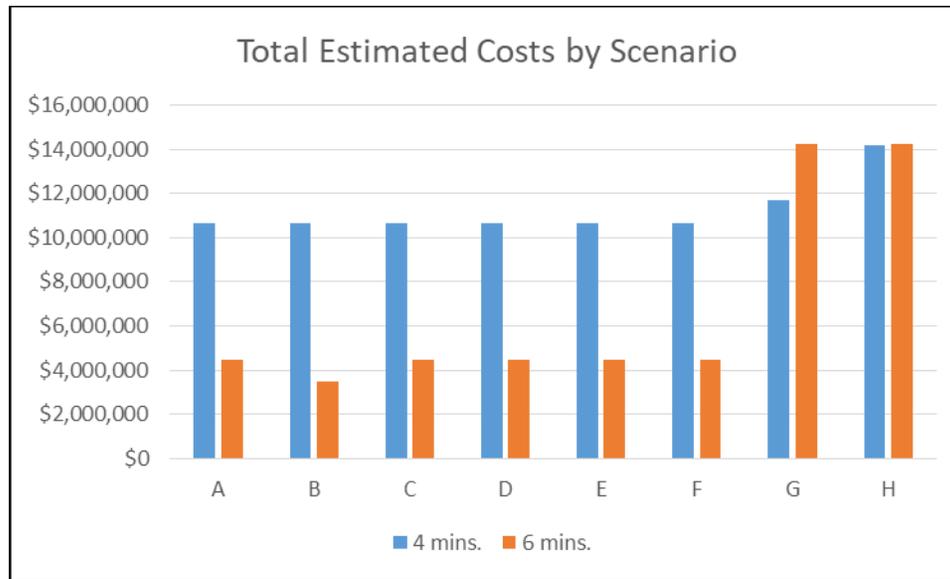
Figure 7: Scenario H6 Apparatus

Scenario H6		Apparatus Needs						
Station	Location	Engine	Ladder	Rescue	Tender	Squad	Total	BAYS
Otsego 1	70th & Quaday Ave	X	X	X			3	3
Otsego 2	Labeaux & 73rd	X			X	X	3	3
Otsego Apparatus Needs:		2	1	1	1	1	6	

Figure 8: Updated Scenario Coverage and Stations

Scenario	Description of Assumptions	4 min. travel		6 min. travel	
		% Coverage	#Otsego Stns	% Coverage	#Otsego Stns
A	Current/No Stations move	82%	3	92%	1
B	Rogers FD moves Stn 2 Northward	87%	3	96%	1
C	Elk River moves Stn 1 Northward	80%	3	91%	1
D	Both Rogers and Elk River move stations	84%	3	94%	1
E	Required use of 85th and Park Dr. city property	80%	3	88%	1
F	Required use of City Hall property	81%	3	91%	1
G	No outside FD partners / Future Road Network	81%	3	98%	2
H	No outside FD partners / Current Road Network	80%	4	90%	2

Figure 9: Total Estimated Costs per scenario Summary Chart





About Beacon GIS

Beacon GIS was founded in 2005 and is based in Charlotte, NC. Its mission is to be the leader in fire rescue geographic intelligence and data analytics to help communities with first responder planning. Robert McNally is the president of the firm. He has practical experience as a firefighter/paramedic. He has earned a Bachelor's degree with honors in Public Administration and a Master's degree in Geography focusing on the use of GIS in urban/regional planning for public safety. Beacon GIS has experience with nearly 200 public safety studies in the United States and Canada.

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