ARDC Planning ARDC

DEPARTMENT OF TRANSPORTATION

Cloquet Area Transportation Plan - Highway 33 Design

Arrowhead Regional Development Commission

October 2023

TKDA

Contents

Executive Summary

Overview

Pedestrian and bicycle safety along Highway 33 through Cloquet has been an ongoing and important conversation within the community. The Arrowhead Regional Development Commission (ARDC) and MnDOT are developing a long-range transportation plan and vision for potential system improvements throughout Cloquet, MN. Improvements outlined here focus on Highway 33 with an emphasis on pedestrian, bicycle, and aesthetic enhancements.

This planning process was funded by the Minnesota Department of Transportation.

Planning Process

In 2022, MnDOT hired ARDC Planning, a division of the Arrowhead Regional Development Commission (ARDC), to facilitate the development of its transportation plan for the City of Cloquet, Minnesota. In turn, ARDC Planning hired TKDA to assist with TH 33 corridor redesign work, which would accompany the plan. Funded by MnDOT with match funding provided by ARDC, the planning process kicked off in July 2022. MnDOT and ARDC Planning staff members gathered information regarding the transportation system in the Cloquet area during the project's initial months.

In August, ARDC Planning convened a group of transportation stakeholders to form a steering committee for the planning process. This steering committee offered its perspectives about preliminary community transportation desires and helped consultants design a tool to empower the public to provide input about transportation issues including an online survey regarding transportation related issues in the area. The steering committee met again in October 2022 to review the public input and draft designs for the TH 33 corridor; based on survey results and their own knowledge. Consultants consolidated all ideas into a draft plan, to be included as a component of the final transportation plan for implementation.

Goals & Objectives

The following goals and objectives were developed to guide the planning process and define the scope and priorities:

- Enhance safety along the corridor for all users
- Improve access to community assets
- Improve pedestrian and bicycle amenities
- Minimize barriers along the corridor for non-motorized users
- Maintain long term goals of the stakeholders

Preferred Alternative

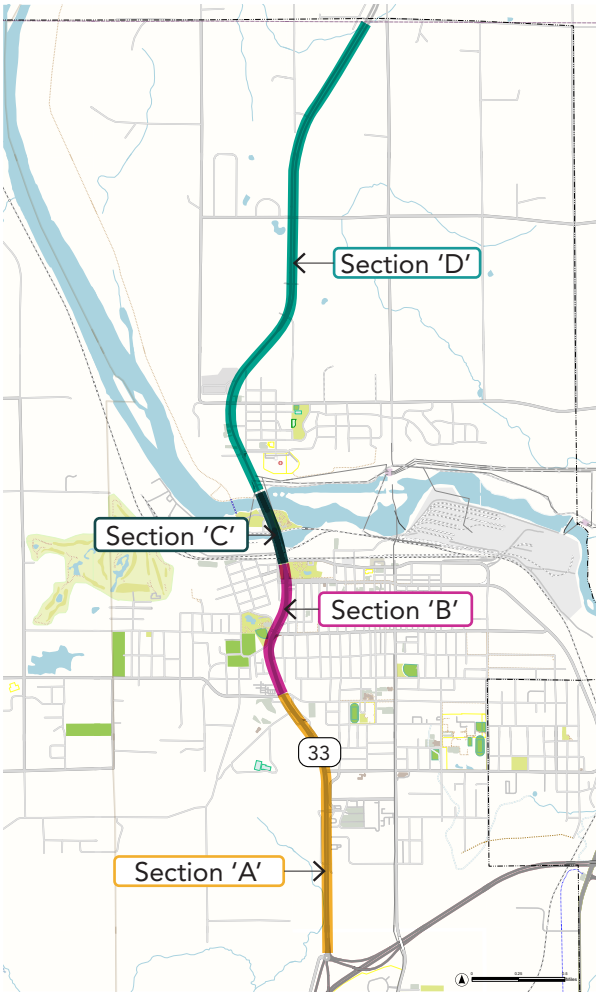
Recommendations are outlined in four sections. Each has a unique character and surrounding land use.

Section 'A' is the most southern section of the corridor. The southern terminus is the roundabout at I-35 and the northern is Big Lake Rd/Doddridge Avenue. Length is approximately 1.5 miles long.

Section 'B' is the narrowest cross section within the corridor, connecting Big Lake Rd/Doddridge Avenue to the St. Louis River bridge. Notably, Pinehurst Park, a popular community park is along the west side of the highway and the historic Frank Lloyd Wright Gas Station is on the east side. Length is approximately 0.75 miles long.

Section 'C' consists of the St. Louis River bridge and connects the north and south ends of the community. Length is approximately 0.5 miles long.

Section 'D' is the northern bookend of the corridor. In addition to the two northbound and southbound lanes, this section also has a center two-way left-turn lane. The highway transitions to a rural section with a center drainage ditch at English Rd. Length is approximately 2.75 miles long.



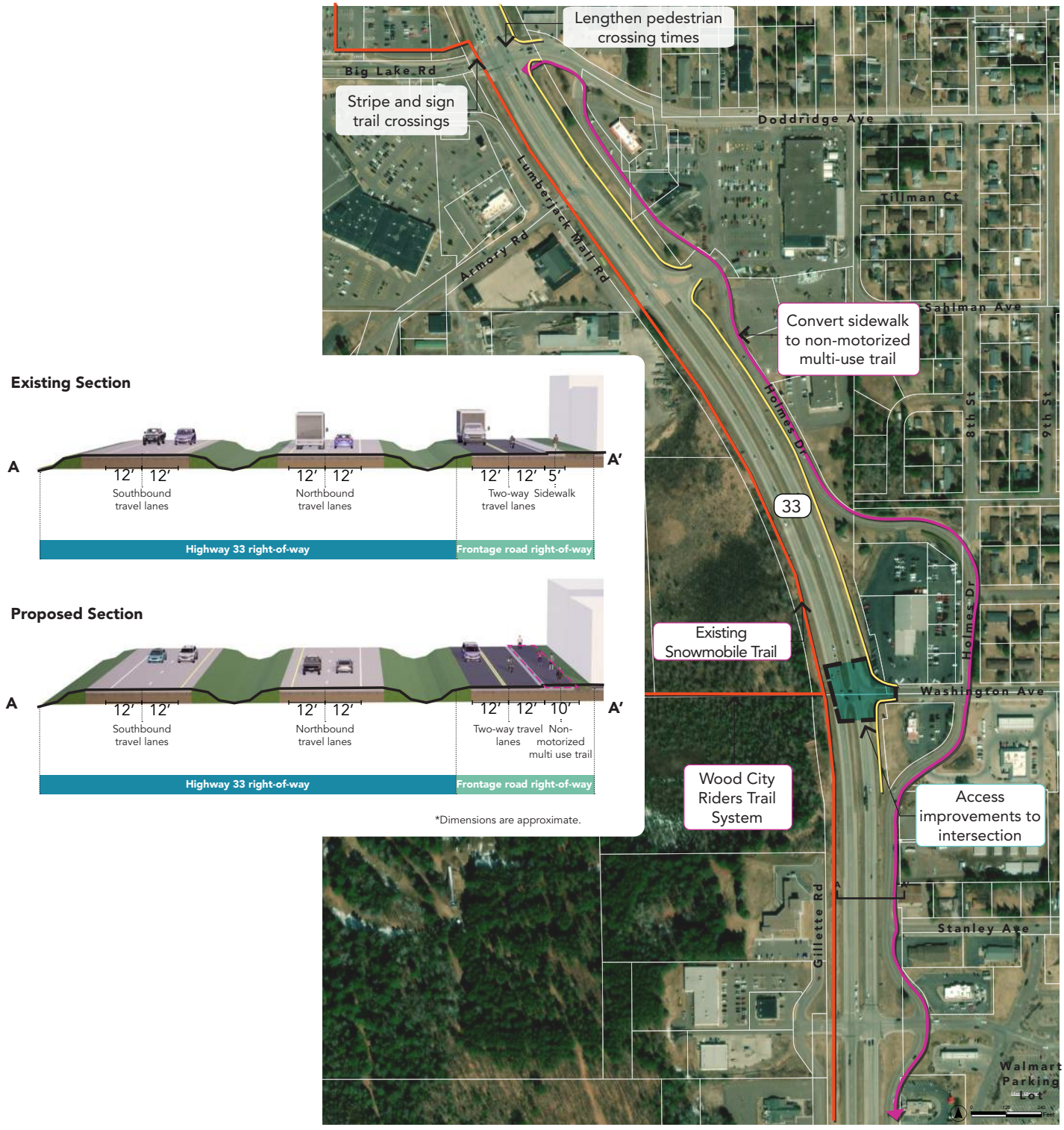


Figure 1 | Section 'A' Improvements

Section 'A' Recommendations

Recommendations in this area include upgrading the existing sidewalk along Holmes Drive to a non-motorized multi-use trail. Additionally, access changes at Washington Avenue are recommended to improve safety.

Figure 2 | Section 'B' Improvements

Section 'B' Recommendations

The recommendations for Section 'B' include a non-motorized multi-use trail along the west side of Highway 33, connecting Pinehurst Park to Big Lake Road. The corridor through this area narrows significantly compared to the southern area. To accommodate the trail, the median will need to be narrowed, and the roadway would shift to the east. Retaining walls may be required along the west and east side; further study is required to confirm the limits.

Figure 3 | Section 'C' Improvements

Section 'C' Recommendations

There is an existing pedestrian bridge west of this area. Improvements to this segment are intended to close the gap for pedestrians and include re-striping the bridge to include on-street bicycle lanes.

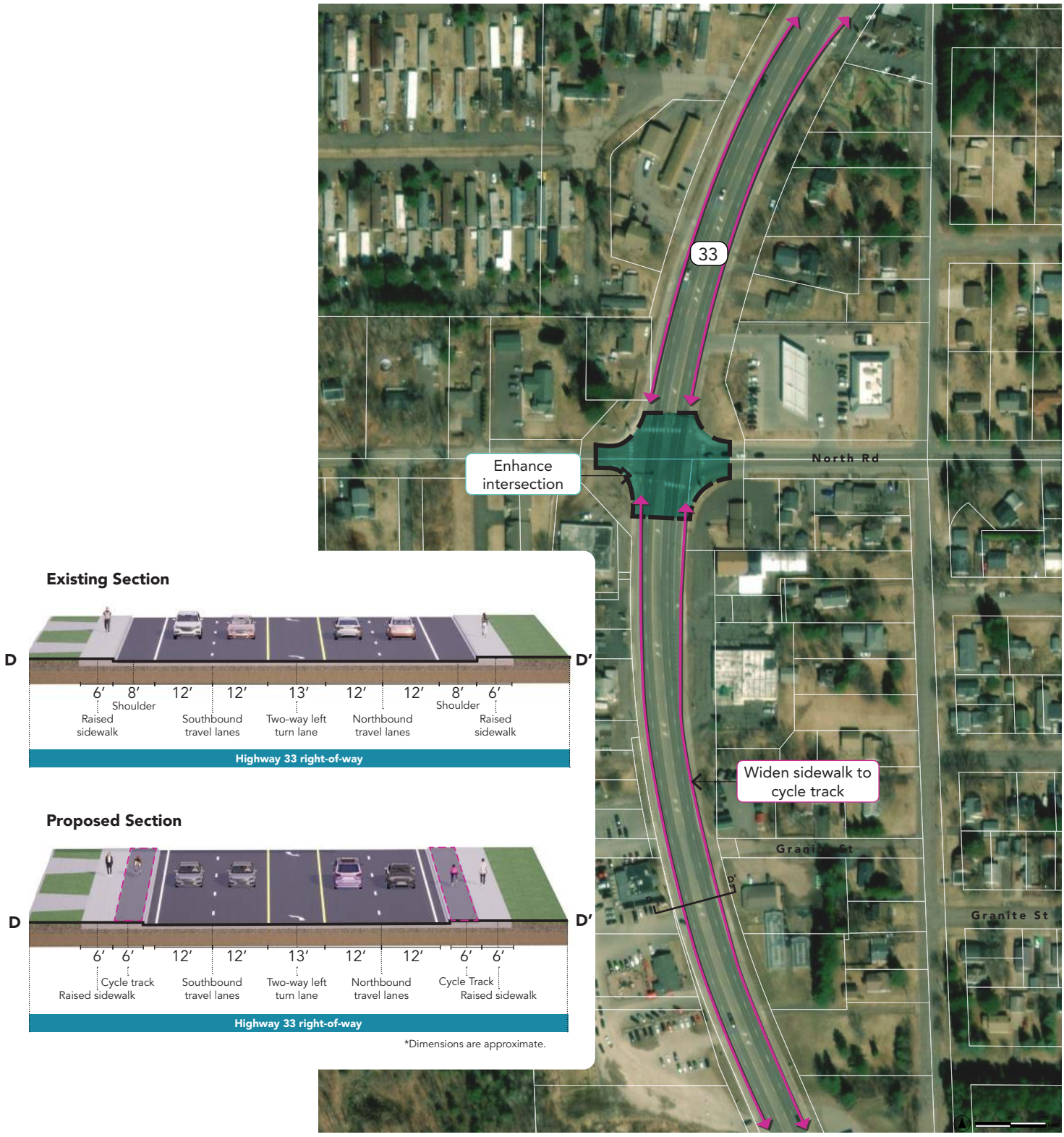


Figure 4 | Section 'D' Improvements

Section 'D' Recommendations

In this area, recommendations include improvements to the intersections to accommodate pedestrians and bicyclists. Some improvements could include bump outs and improved signal timing. Additionally, a cycle track is proposed along the in-place sidewalks. A cycle track is a dedicated bicycle path that sits adjacent to the sidewalk.


MINIT MART

Introduction

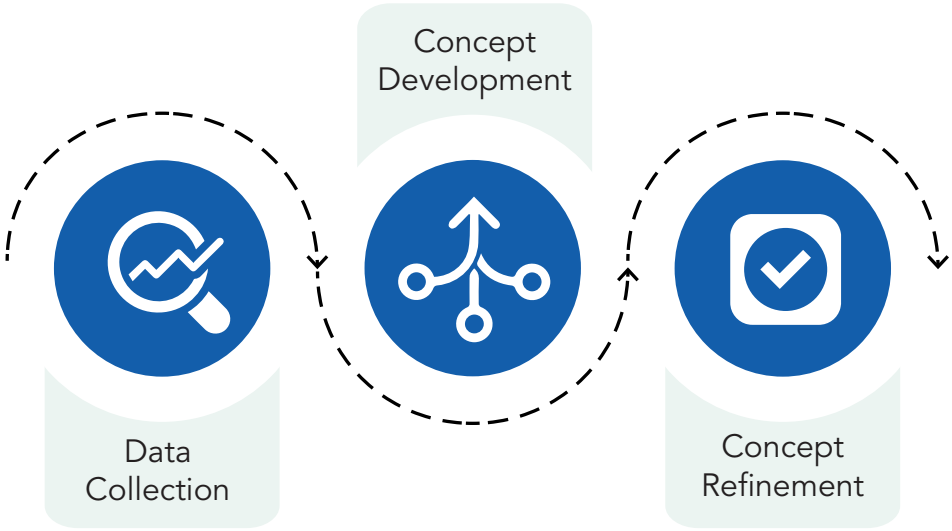
The Cloquet Area Transportation Plan includes recommendations for the improvement of bicycle and pedestrian facilities along the Highway 33 corridor in Cloquet, MN. This report was completed as apart of a long-range transportation plan and vision for potential system improvements throughout Cloquet. Recommendations are based on a participatory process that engaged with the local community, as well as key stakeholders.

Cloquet is a city in Carlton County, Minnesota, United States, at the junction of Interstate 35 and Minnesota State Highway 33. The county settlement began after the Ojibwe ceded the land of the area in the Treaty of 1854. Part of the city lies within the Fond du Lac Band of Lake Superior Chippewa and serves as one of the reservation's three districts. The City of Cloquet began as a group of small settlements around three sawmills: Shaw Town, Nelson Town, and Johnson Town. These became known as Knife Falls, named after a local waterfall over sharp slate rocks, and later as Cloquet. The Ojibwe in the area called the area Mookomaan-onigamiing, meaning "At the Knife Portage", as the portage to avoid Knife Falls connected the three communities.

As of the 2020 U.S. Census, the population was 12,568. The population density was 356.9 inhabitants per square mile (137.8/km2). There were 5,399 housing units at an average density of 153.3 per square mile (59.2/km2). The racial makeup of the city was 80.0% White, 10.9% Native American, 0.8% Black or African American, 0.7% Asian, 0.1% Pacific Islander, 0.5% from other races, and 7.0% from two or more races.

Study Approach

At the onset of the project, the team performed a data collection process that included an inventory and analysis of existing physical and land use conditions along the corridor. A full report of existing conditions can be found in the appendix. Following data collection, several concepts were developed and presented to the Project Management Team. Final concepts were selected and presented to the public for feedback. The preferred recommendations outlined in this report are based on this process.



Stakeholder and Community Engagement

Citizen input and stakeholder engagement were important in the planning process; input received was incorporated into the project recommendations and assisted in the evaluation of alternatives. A Community Engagement Plan was created at the onset of the project and outlined the planning process, goals, and timeline of events. Multiple methods of outreach were utilized including both in-person meetings and online surveys and activities.

Project Management Team

A Project Management Team (PMT) was developed as a team of experts to guide the plan development, build consensus, and assist in decision making. The group was comprised of staff from MnDOT, Carlton County, City of Cloquet, and the Fond du Lac Band of Lake Superior Chippewa. The PMT met at key times during the planning process and provided technical review of the project.

Targeted Outreach

In 2022, ARDC coordinated with Cloquet and Fond du Lac community events to collect public input for the Cloquet Long-Range Transportation Plan, which is a part of the Fond du Lac Reservation Long-Range Transportation Plan. ARDC tabled at the Fond du Lac Health Fair on August 23, 2022 and the Taking Care of Things Event on September 13, 2022. They also held several public meetings for businesses and stakeholders in the area, including snowmobilers and other impacted users. In addition to face-to-face feedback from the public, TKDA and ARDC also provided an online survey that people could fill out with their feedback and ideas.

Overview

Community engagement activities for the Cloquet Area Transportation Plan - Highway 33 Design project began in August 2022 and concluded in December 2022. The planning team engaged with the community in multiple ways. Participants were invited to a self-led online engagement site that included background on the project, anticipated timelines, and a forum to provide comments. An interactive map and survey were used to solicit feedback as well. Additionally, the team met with key stakeholders to gather feedback. The following represents a summary of the engagement.

10+ Touch Points/ Events	**50+** Survey Responses
1,800+ Visits to the Online Site	**55** Map Comments

Common Themes

- 23% of participants reported a desire for bicycle improvements along Highway 33
- 12% of people expressed desire for enhanced pedestrian connections
- Safety for both pedestrians and drivers was a common concern
- Intersection improvements, especially at Highway 33 and Big Lake Road were a common theme

Engagement Word Cloud

The image below represents a word cloud produced from data received from online engagement forums. The larger the word appears, the more often it was mentioned in a comment.

Comment Heat Map

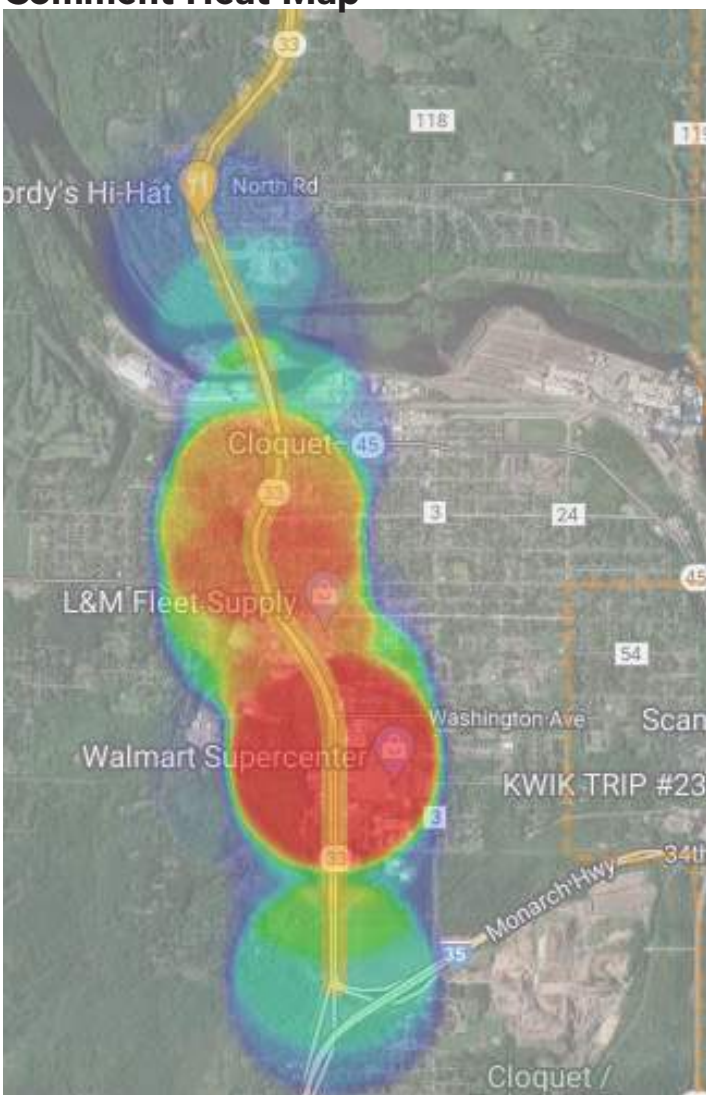


Figure 5 | Concentration of Online Map Comments

Interactive Map - Top Comments

1. "Improve this dirt trail by raising it, moving it further in from the edge of the roadway, adding a safety rail, asphalt, etc for walking, biking, and ATV access."
(25 Likes)

2. "This is a dangerous intersection. If you're trying to head south on 33 from Washington Avenue it can be very dicey especially with the increase of traffic over the last few years. I would suggest maybe a roundabout or traffic lights."
(29 Likes, 4 Dislikes)

3. "Add bike/walking ramp to exit off of the sidewalk on Highway33 down to the playground at Dunlap park."
(14 Likes, 1 Dislike)

4. "When Gordy's is open for the summer it is extremely hard pulling out of the parking lot if you have to cross to the other side."
(16 Likes, 3 Dislikes)

5. "During high traffic season on 33, exiting from hospital can be a challenge based on stop light timing. Can this be addressed?"
(10 Likes)

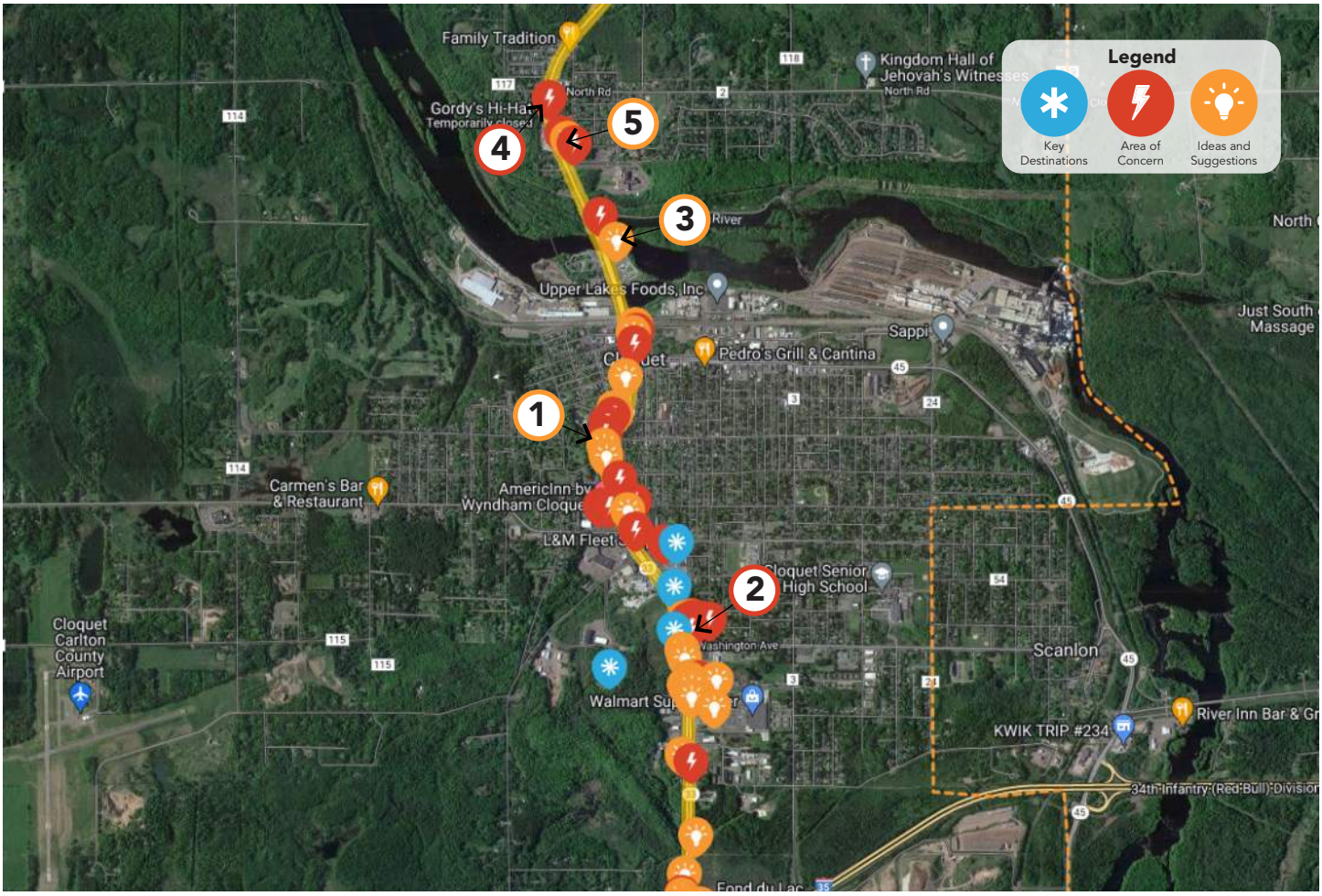


Figure 6 | Diagram of Online Map Activity

Existing Conditions

Highway 33 through the City of Cloquet provides an important thoroughfare but also creates a barrier for pedestrians, bicyclists, and other active transportation. The existing roadway has two northbound and two southbound lanes. A roundabout at the south end of the corridor connects to Interstate 35 and serves as a gateway into the community. The north end of the corridor lacks a formal gateway but connects to Highway 2 and beyond.

Varied land uses exist along the corridor, including a shopping area with frontage roads in the southern portion, a residential area along the center, and key recreation destinations such as Dunlap Island Park and Pinehurst Park. Notably, the historic Frank Lloyd Wright gas station is adjacent to the project area as well.

Pedestrian and bicycle access along the corridor is limited. Pedestrian crossings along the project area are wide and challenging to cross, especially to those with mobility limitations. Other users such as ATVs and snowmobiles travel along and cross the corridor as well.

Figure 7 | Study Area

Socio-Economic Conditions of Cloquet

The following data represents the current demographics for the city of Cloquet. This information represents a snapshot of the city today and its community. Data was collected from the U.S. Census Bureau, the American Community Survey, Minnesota State Demographic Center and from the County.

Population

The US Census estimated the population of Cloquet, MN in 2022 to be 12,603 people. As illustrated in the graph below, the city has gained population nearly consistently since 1990, with greater increases from 2009 to 2010, and most recently from 2019 to 2020.

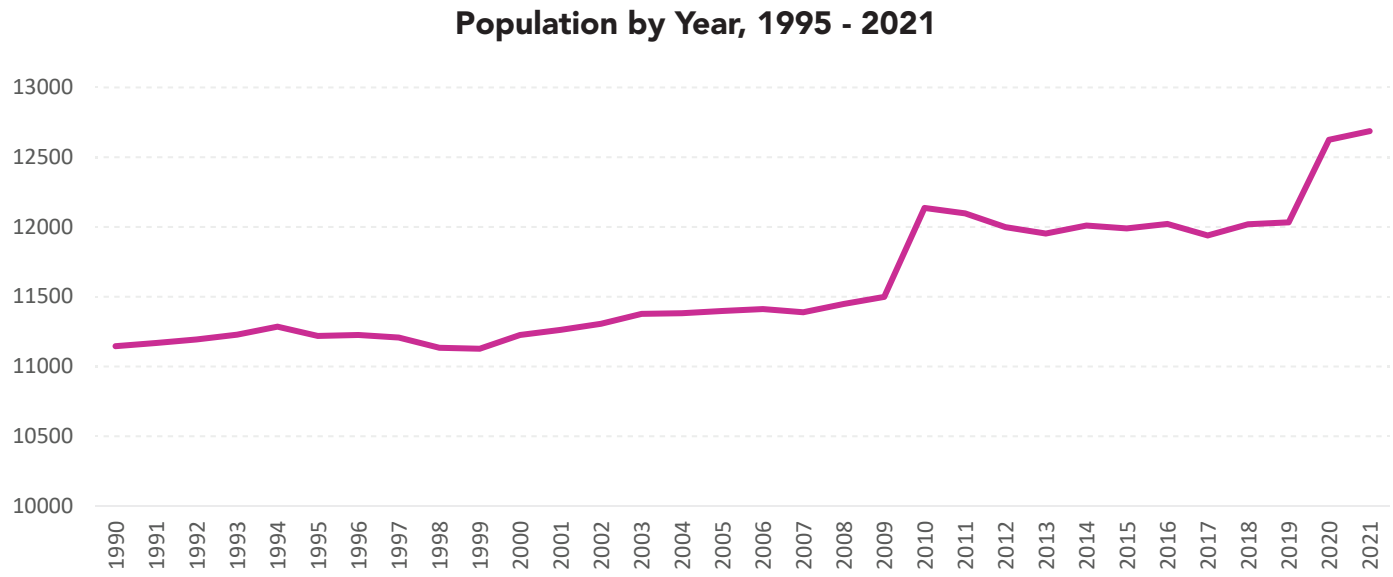


Figure 8 | Population by Year, 1995 - 2021

Source: U.S. Census Bureau

The State Demographer's Office projects future populations of counties. The population of Carlton County is projected to remain relatively stable, decreasing from its current population of 36,409 people to 36,259 people by 2060.

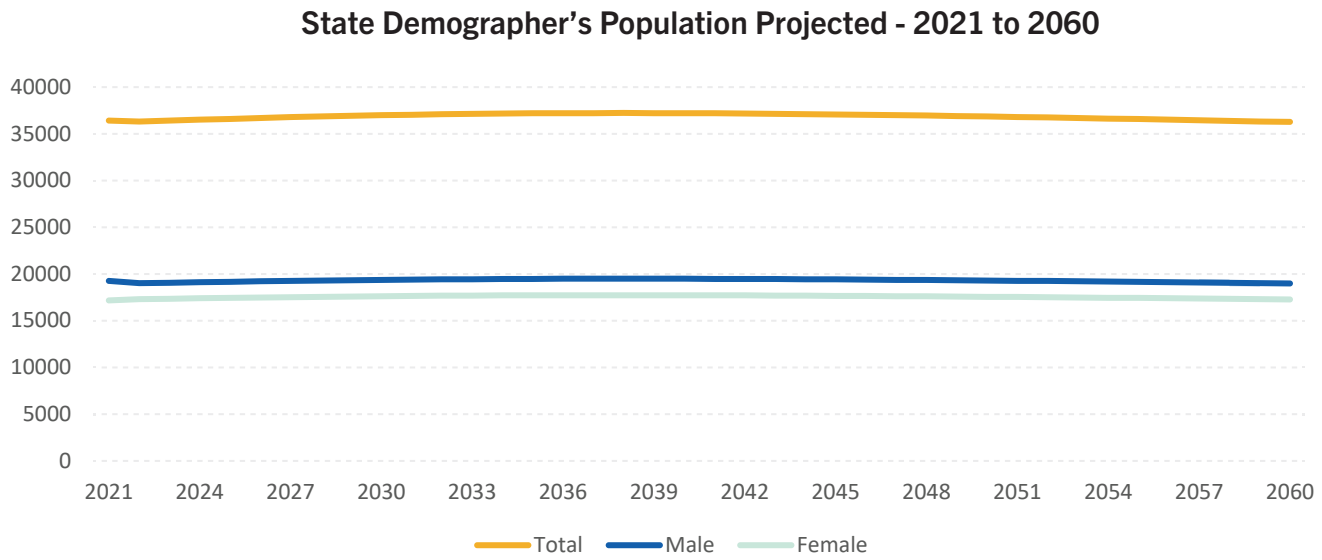
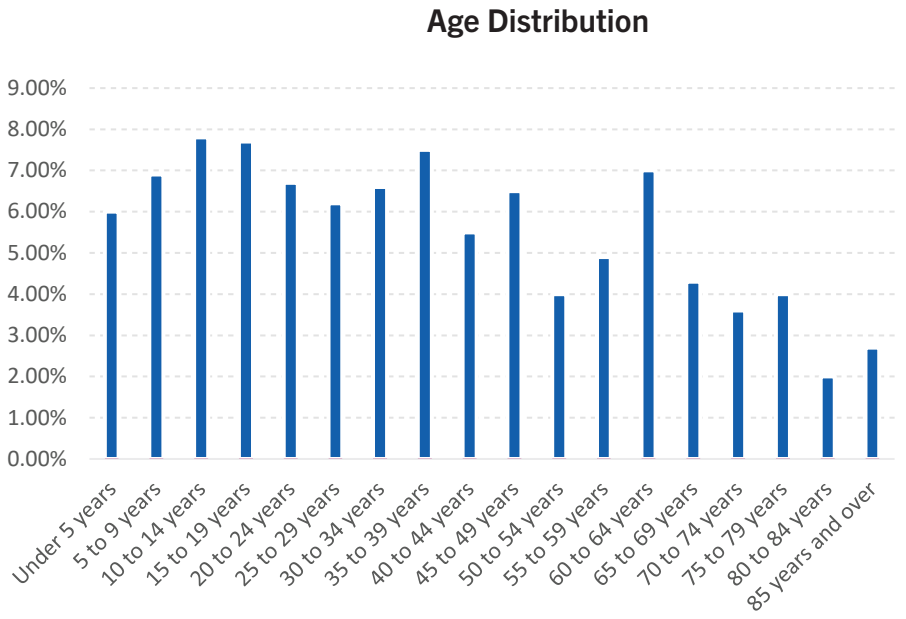


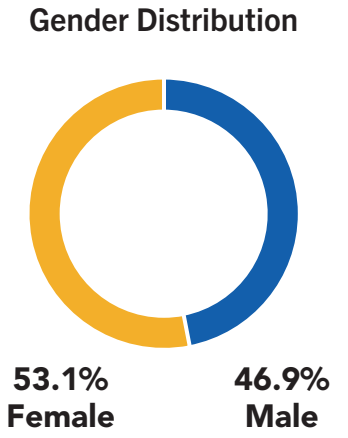
Figure 9 | Population Change Over Time

Source: Minnesota State Demographer

The age distribution in the City of Cloquet is shown below. The city's population has an approximately normal distribution, with the median age being 36.5 years of age in 2021. There is a higher population of females in the City of Cloquet.



Source: U.S. Census Bureau



Source: U.S. Census Bureau

Figure 10 & 11 | Age and Gender Distribution in the City of Cloquet

Racial & Ethnic Makeup - 2021 Estimate

Racial & Ethnic Makeup	Totals	Percent of Total Population
Population:	12,603	
White	11,040	87.6%
Black or African American	126	1.0%
American Indian and Alaska Native	945	7.5%
Asian	100	0.8%
Hispanic or Latino	151	1.2%
Multiracial	403	3.2%

Figure 12 | Racial & Ethnic Makeup - 2021 Estimate

Source: U.S. Census Bureau

Transportation Choices

According to the U.S. Census Bureau, 5,884 of the City of Cloquet's residents age 16 and older are employed. Of those residents, 88.7 percent used a car, truck, or van as their primary means of transportation to work; 0 percent bike to work. The median travel time from home to place of employment is 18.0 minutes, which is six minutes below the statewide average. Travel time from home to work was less than ten minutes for 34.5 percent of employed residents age 16 and older, while 20.3 percent of those residents had a travel time of 30-34 minutes. When compared to other Minnesota municipalities of similar size, this distribution of travel times is typical.

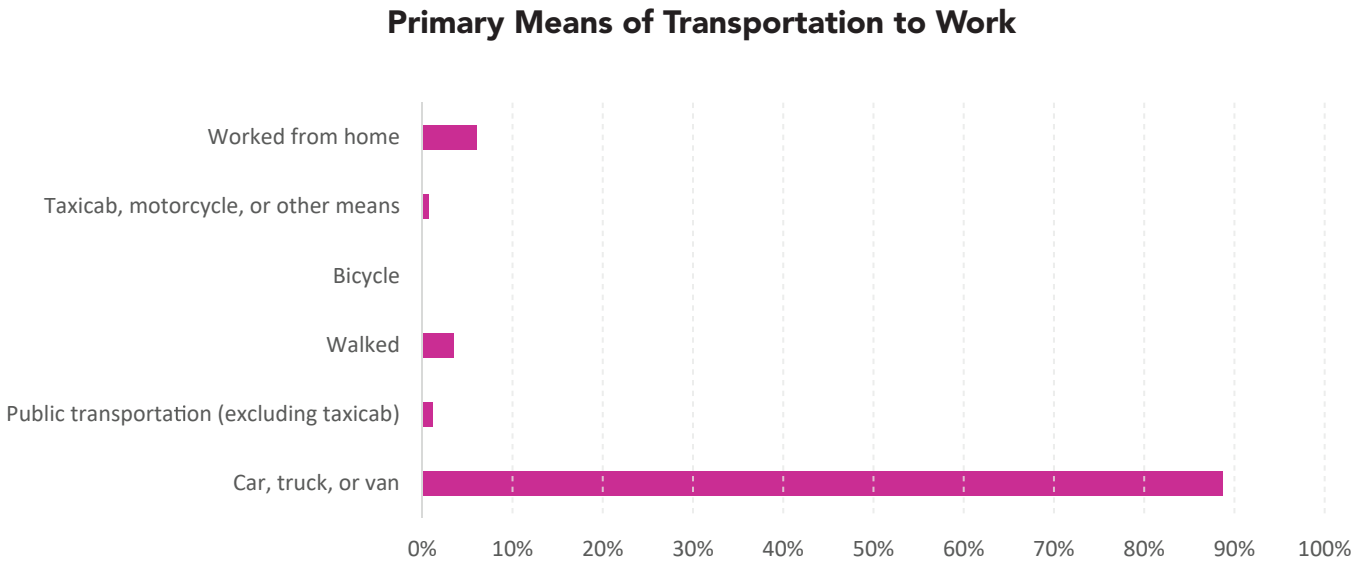


Figure 13 | Primary Means of Transportation to Work

Source: U.S. Census Bureau

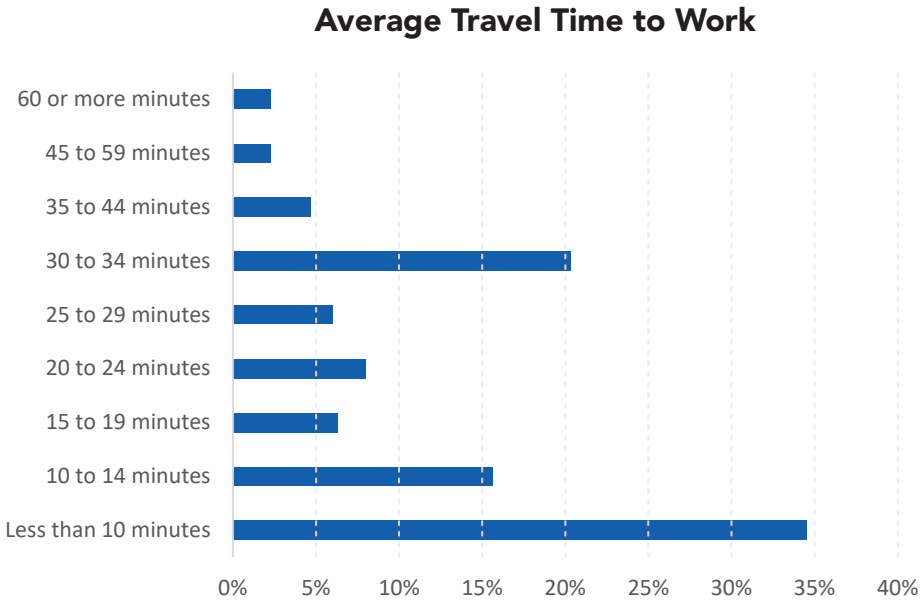
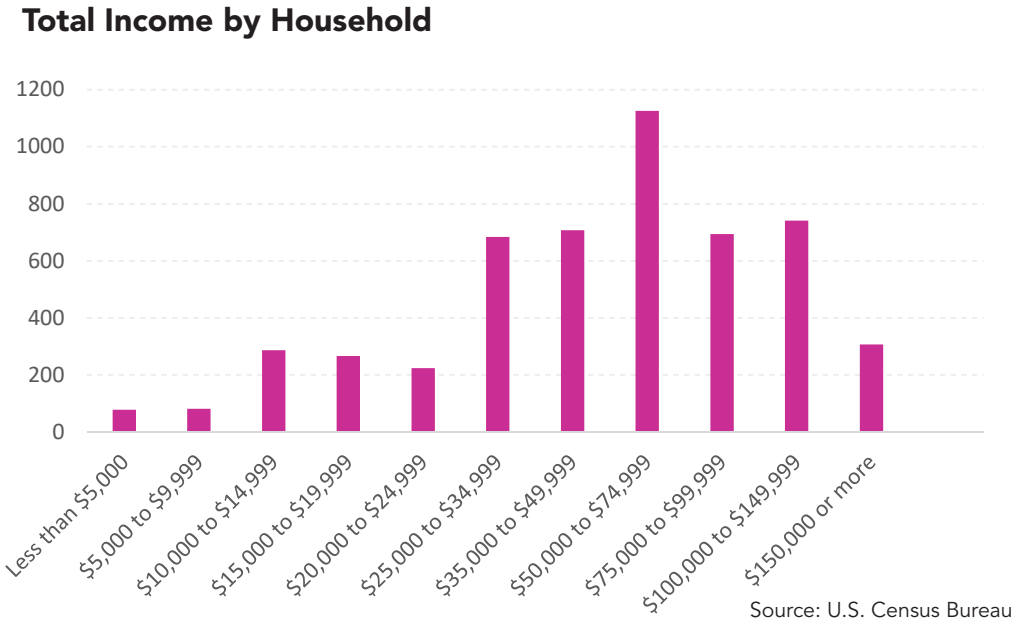


Figure 14 | Average Travel Time to Work

Source: U.S. Census Bureau

Housing & Households

In 2021 the U.S. Census Bureau counted a total of 5,195 occupied housing units in the City of Cloquet. This is a marginal increase in the number of housing units (5,143) from the 2010 U.S Census. Census. The median household income in 2021 was $55,007, which is less than the median household income for the state of Minnesota in 2021 ($77,706). Approximately 18 percent of households had an income of $24,999 or less. Of the City of Cloquet's 5,195 occupied housing units, 68.3 percent are owner-occupied and 31.7 percent were renter-occupied.



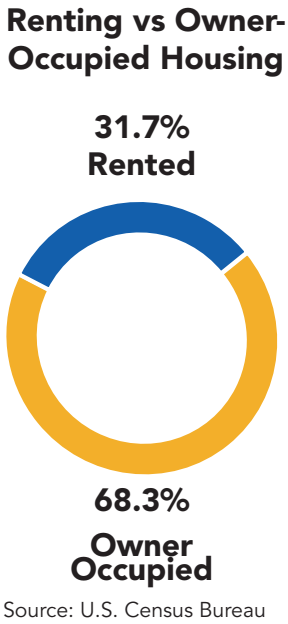


Figure 15 & 16 | Household Income and Occupancy-type

In 2021, 29.8 percent of householders reported living alone. 32.4 percent had one more people under 18, and 39.4 had one or more people 60 years or older. Householders living alone and households with one or more children under 18 experienced a slight decline since 2010, while households with people 60 years or older grew, rising from 33.3 percent to 39.4 percent.

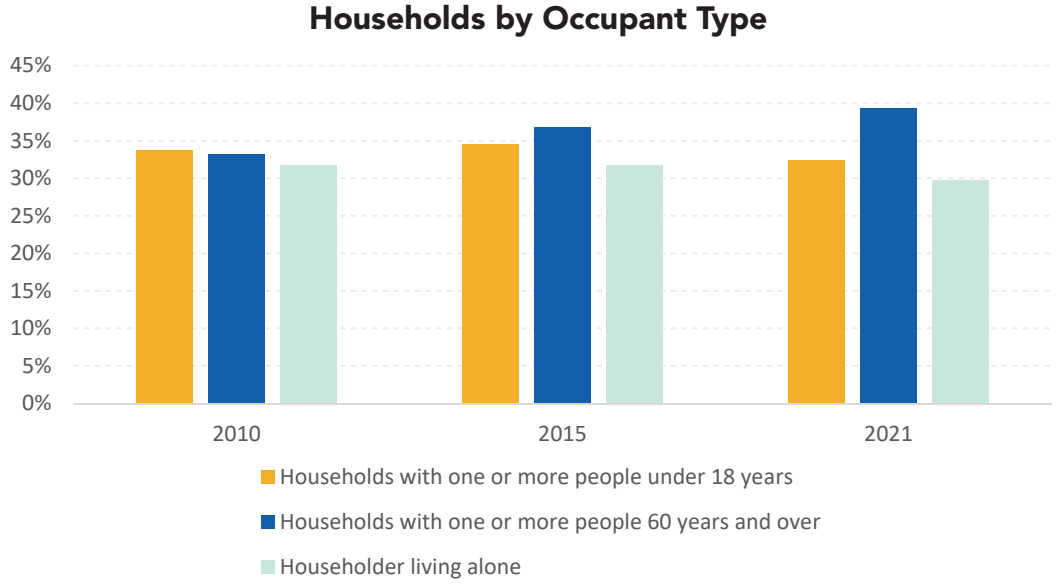


Figure 17 | Households by Occupant Type

Source: U.S. Census Bureau

Infrastructure and Environmental Review

Project Sections

Highway 33 through Cloquet has four distinct sections through the community as illustrated in Figure 18. Each has a unique character and diverse conditions.

Section 'A' is the most southern section of the corridor. The southern terminus is the roundabout at I-35 and the northern is Big Lake Rd/Doddridge Avenue. This portion of highway is primarily Highway Commercial and has several businesses adjacent. Two northbound and two southbound travel lanes are separated by a turf ditch. Additionally, a frontage road runs along the east side of the corridor.

Section 'B' is the narrowest section of the corridor, connecting Big Lake Rd/ Doddridge Avenue to the St. Louis River bridge. Large, mature conifer trees sit on a steep slope along the west side of the roadway, while a drainage ditch is along the east side. Notably, Pinehurst Park, a popular community park is along the west side of the highway and the historic Frank Lloyd Wright Gas Station is on the east side.

Section 'C' consists of the St. Louis River bridge and connects the north and south ends of the community.

Section 'D' is the northern bookend of the corridor. In addition to the two northbound and southbound lanes, this section also has a center two-way left-turn lane. The highway transitions to a rural section with a center drainage ditch at English Rd.

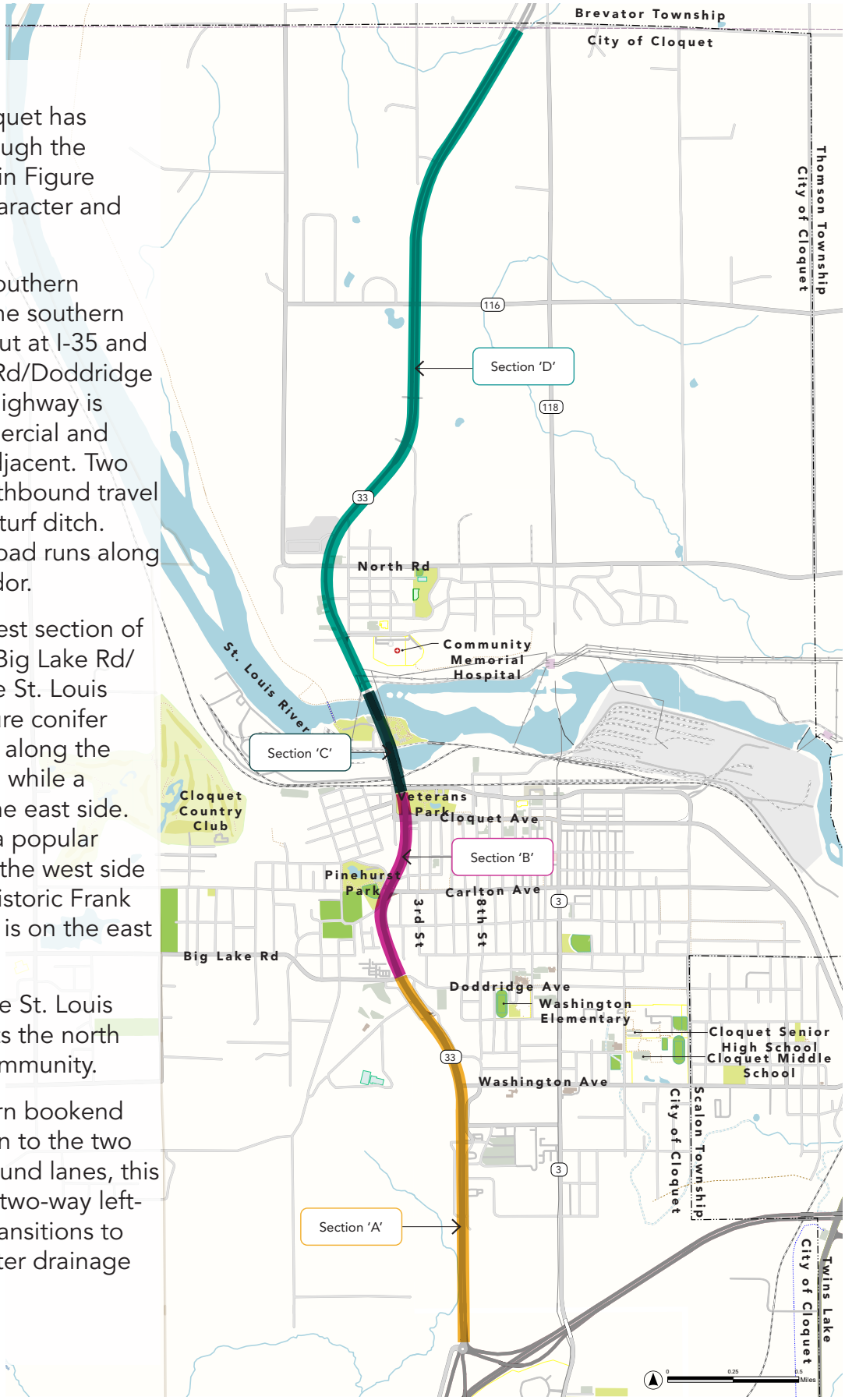


Figure 18 | Study Area Sections

Existing Sections

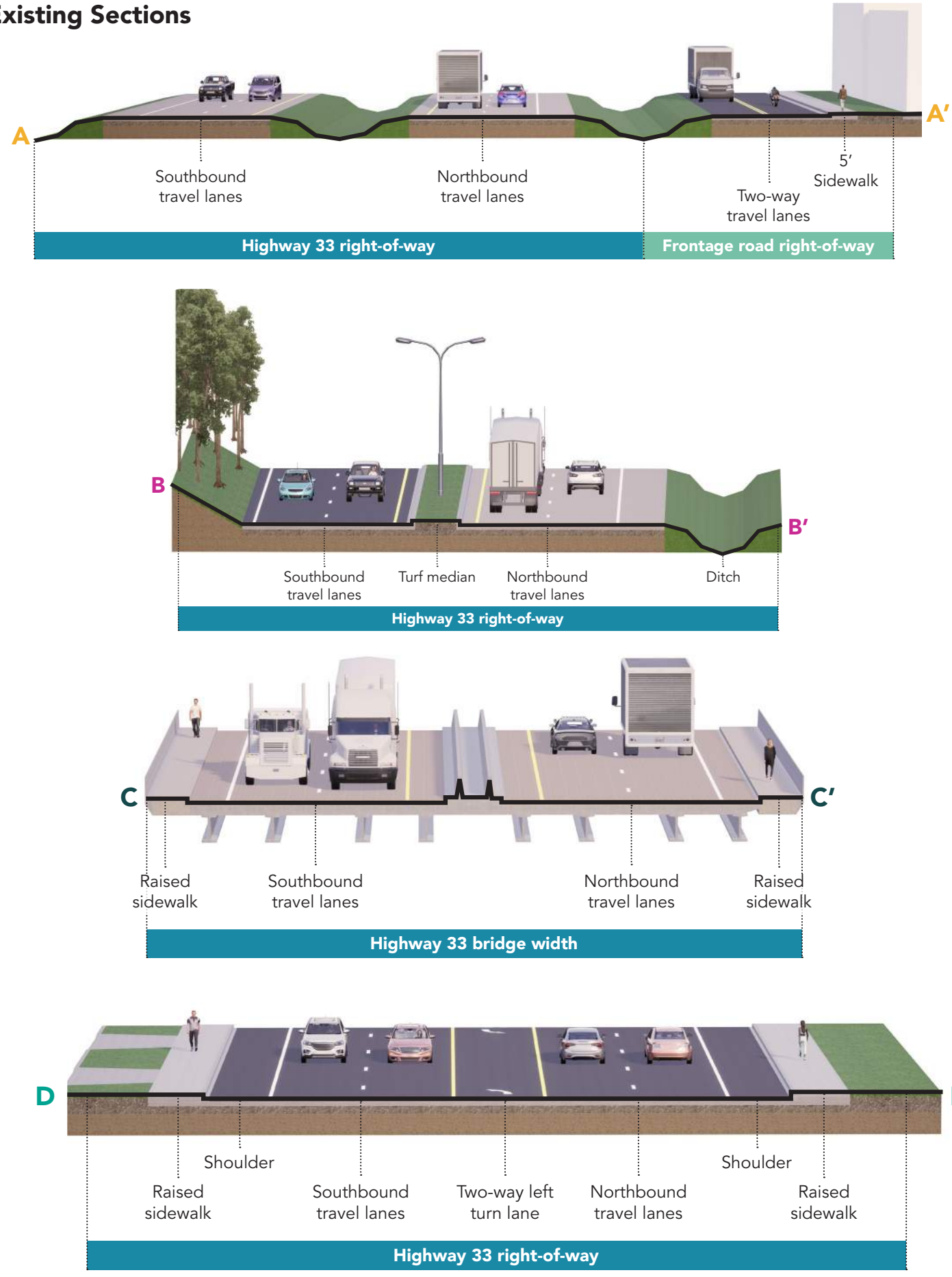


Figure 19 | Typical Sections along the Corridor

Existing Trail Infrastructure

The Cloquet area is unique for its extensive ATV and snowmobile trails. These trails cross and travel alongside Highway 33 at multiple locations. Big Lake Road and St. Louis River Trail are notable multi-use trails on the outer edges of the city. Roadway and accessibility improvements in 2018 resulted in multiple traffic calming facilities around the project area and new bike lanes on Cloquet Avenue. Avenue B was also recently upgraded to include new bike lanes.

The Fond du Lac Long Range Transportation Plan, published in 2022, recommends road resurfacing and trail improvements/extensions throughout the reservation. To build upon those goals and improve accessibility, additional bicyclist/pedestrian improvements should be made — particularly by addressing potential improvements along Highway 33.

Existing Traffic

Following the community engagement tasks, and a review of preliminary recommendations, the following intersections were analyzed for potential traffic improvements:

- MN 33 & Big Lake Rd/Doddridge Rd
- MN 33 & Washington Avenue
- MN 33 & Frontage Rd/Gillette Rd (near Walmart)

The following represents an overview of the existing traffic conditions. The full traffic report can be found in the appendix.

Existing Conditions:

Overall, the existing conditions showed that most movements at these intersections have a Level of Service (LOS) of A or B, where A means traffic is free flowing, and B means traffic experiences slight delays. A few movements experienced LOS C, where traffic experiences acceptable delays, and one movement experienced LOS D, which means traffic is approaching unstable flow and experiencing tolerable delay.

MN 33 & Washington Ave The movement with LOS D is the westbound left turn at the intersection of MN 33 & Washington Ave. On average these vehicles experience 34.2 seconds of delay. Since this intersection is not signalized, some vehicles may become impatient and attempt to complete the westbound left turn when there is insufficient gaps in traffic for them to complete this turn.

Over the last 10 years, there have been 15 angle crashes at the intersection of MN 33 & Washington Ave. Of these, 11 were related to the westbound left turn movement, 2 were related to the southbound left turn movement, and 2 were related to the westbound right turn movement. This intersection has an observed crash rate of 0.527 crashes per million entering vehicles, and a critical index of 1.70. The critical index is the ratio of the observed crash rate and the critical rate, wherein the critical rate represents a threshold of crashes that is considered typical for an intersection of this type within the state of Minnesota. Since the critical index is above 1.0 it indicates this intersection has more than the expected number of crashes and should be considered for safety improvements.

MN 33 & Frontage Rd The intersection of MN 33 & Frontage Rd / Gillette Rd (near Walmart) has an observed crash rate of 0.406 crashes per million entering vehicles, and a critical index of 0.46. Since this value is below 1.0, safety improvements would not be pursued at this intersection based on crash history alone. Note that while the observed crash rate at this intersection is similar to the observed crash rate at the MN 33 & Washington Ave intersection, the critical indexes for each intersection are significantly different. Since the Gillette Rd intersection is signalized, the critical rate is higher at this intersection, meaning that it is typical for a greater number of crashes to occur at this intersection compared to a side street stop controlled intersection.

At the intersection of MN 33 & Frontage Rd / Gillette Rd (near Walmart), the westbound traffic experiences queuing that nearly reaches the next intersection to the east. While this queuing is acceptable in the existing condition, queuing in this region should be examined in all proposed conditions to consider if future queuing may block the intersection.

MN 33 & Big Lake Rd/Doddridge Ave
Analysis of the intersection of MN 33 & Big Lake Rd/ Doddridge Ave did not reveal any concerns. Snowmobile use is likely prevalent at this location, however there have been no documented snowmobile related crashes.

Preferred Recommendations

Following a robust analysis of the existing conditions along the corridor, as well as stakeholder and community engagement, a series of alternative concepts were developed. The recommendations were presented to stakeholders and the public for review. The recommendations presented in this section represent the collective shared vision from these groups. Additionally, the preferred recommendations are specific to bicycle facility & pedestrian improvements and will be layered into a wider transportation plan for the City of Cloquet.

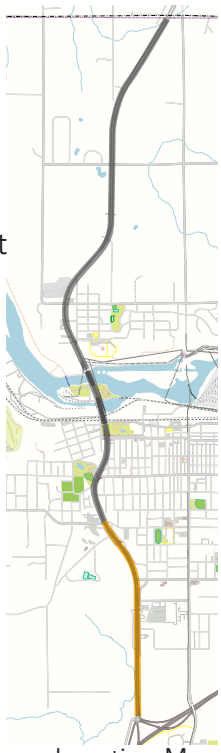
Areas of focus included:

- Improvements to traffic flow and safety at key intersections.
- Connections to broader existing bicycle and pedestrian amenities.
- Connections to the broader community, specifically those who historically have not been well served.
- Minimize impacts to the natural environment.
- Work in partnership between agencies to develop a successful plan for improvements to the pedestrian and bicycle infrastructure in the project area.

Recommendations are broken down into the 4 “sections” described in the existing conditions. A full list of the alternatives explored are included in the appendix.

Section 'A' Recommendations

The frontage road on the east side of Highway 33 provides a great opportunity to provide a north-south pedestrian connection while separating users safely from the busy highway. Recommendations in this area include upgrading the existing sidewalk along Holmes Drive to a non-motorized multi-use trail. Additionally, upgrades to the intersections at Doddridge Avenue, Washington Avenue, and the entrance to Walmart are being explored. Further study of these intersections is recommended as part of the implementation of this plan.



Location Map

Figure 20 | Section 'A' Recommendations

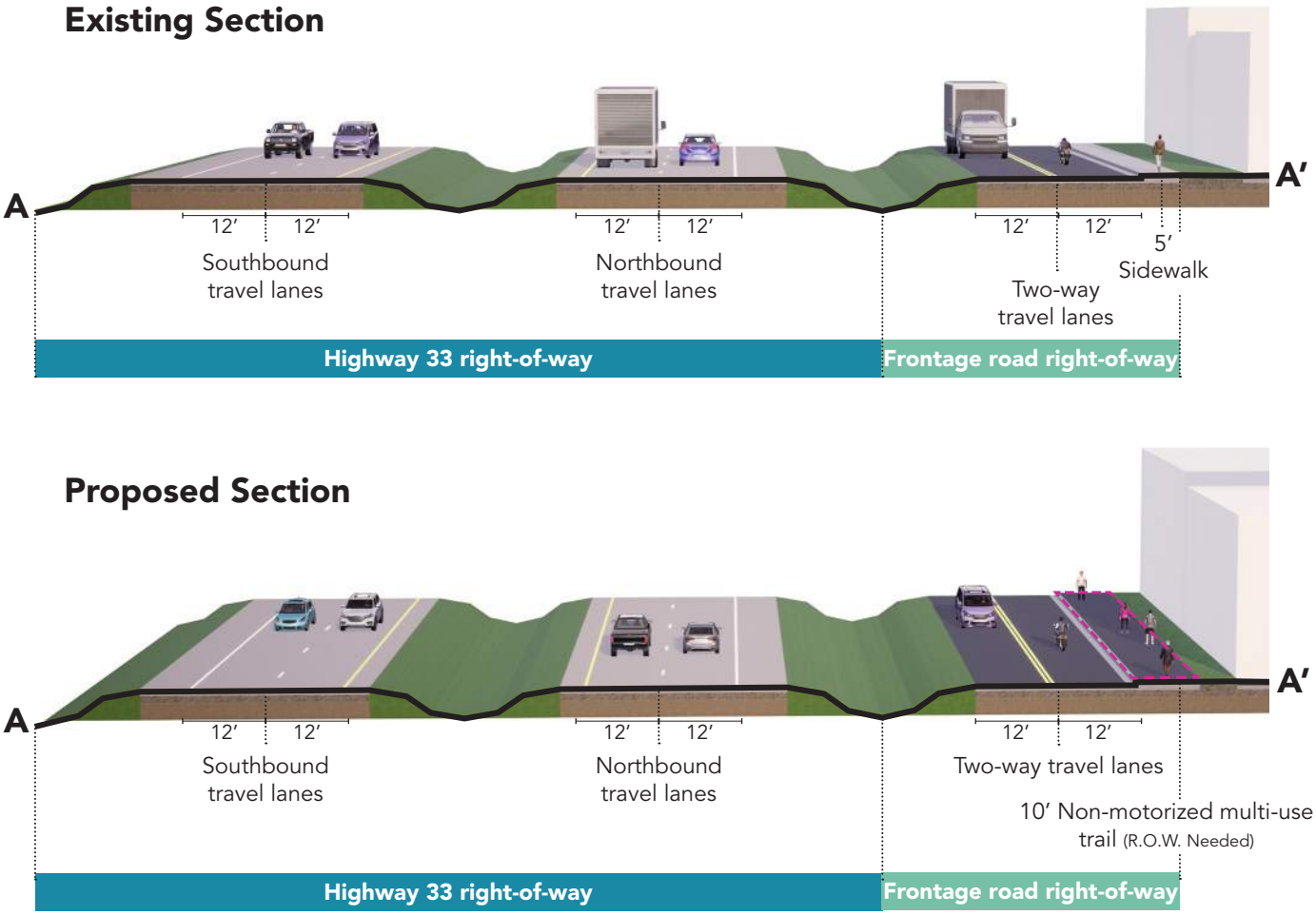


Figure 21 | Typical Section 'A'

The graphics above represent a "typical section", or slice, through Highway 33 in this area. The top shows the existing conditions which include two southbound and northbound travel lanes and a frontage road along the east. The proposed recommendations include upgrading the existing sidewalk along the frontage road to a non-motorized multi-use trail that can accommodate both pedestrians and bicyclists.

The estimated cost for construction for this section of roadway is approximately $1,775,000 (2023).

Note that this does not account for design, engineering, or additional right-of-way costs.

Construction Cost Estimate

DESCRIPTION	COST
REMOVE CURB AND GUTTER	$1,800
REMOVE SIDEWALK	$63,000
COMMON EMBANKMENT (CV)	$74,100
EXCAVATION - COMMON	$36,400
AGGREGATE BASE	$52,400
WEARING COURSE MIXTURE	$746,600
SIDEWALK	$75,900
CONCRETE CURB AND GUTTER DESIGN	$157,500
DRAINAGE	$50,000
LIGHTING	$50,000
UTILITY	$20,000
TRAFFIC CONTROL	$10,000
SUB TOTAL	$1,337,700
25% CONTINGENCY	$334,400
MOBILIZATION (7.5%)	$100,300
TOTAL	**$1,773,000**

Figure 22 | Section 'A' Construction Cost Estimate

Section 'A' Intersection Recommendations

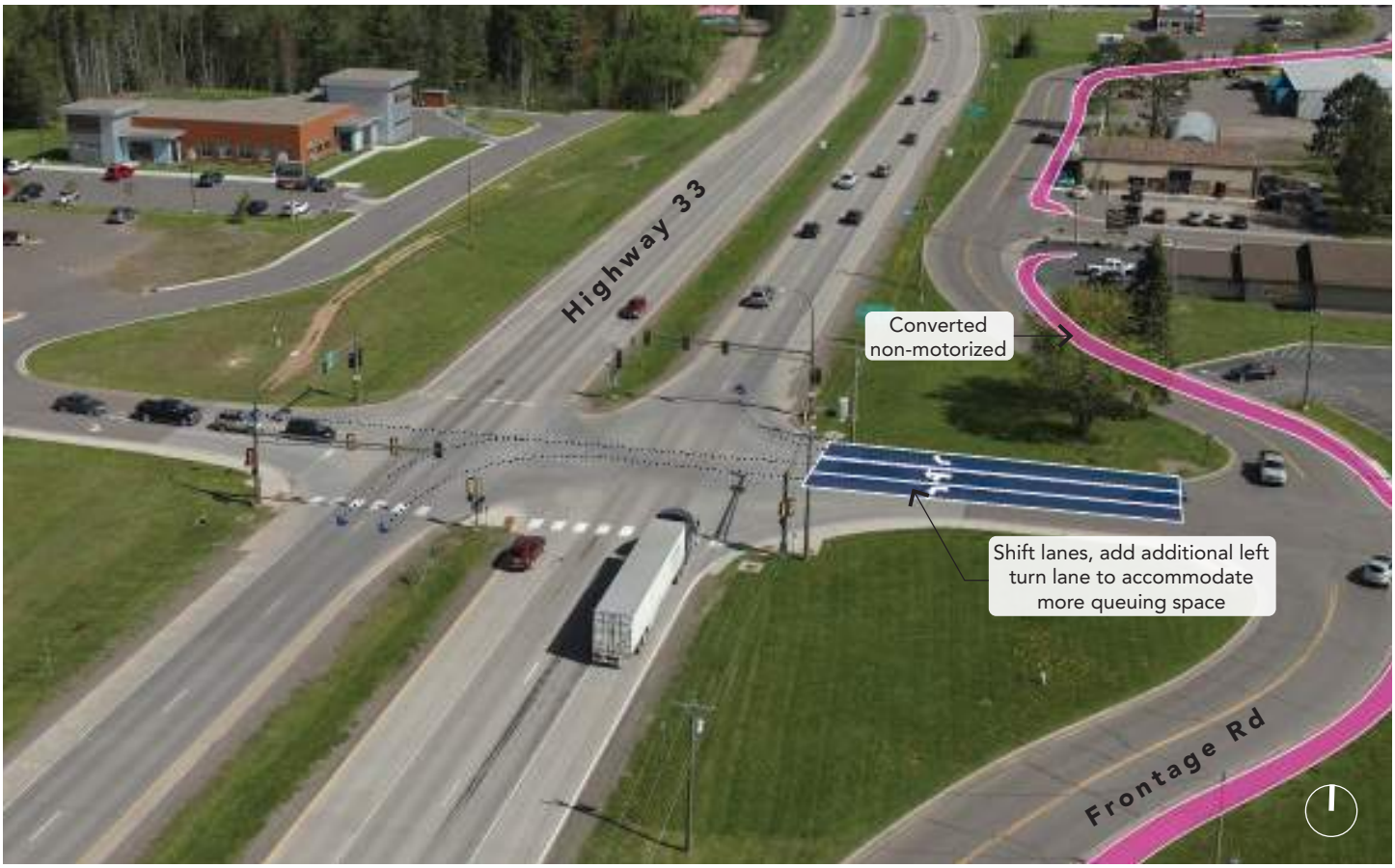


Figure 23 | Intersection Recommendations at Walmart Intersection

Recommended improvements to the Gillette Rd intersection include the addition of a dedicated left turn lane at Gillette Rd and Highway 33. This accommodates additional queuing space, thus reducing demand at the Frontage Road intersection. The figures below represent the improved queuing distances for vehicles with the proposed improvements.

Existing Queuing Distance at Intersection

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	65	28	107	80	35	73	87	37	141	56	79	46
Average Queue (ft)	21	5	41	33	5	31	29	8	58	18	31	6
95th Queue (ft)	53	21	80	62	22	61	67	27	105	46	66	23
Link Distance (ft)	155	155	372			2995	2995			1067	1067	

Proposed Queuing Distance at Intersection

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	72	21	111	84	26	79	96	41	208	67	70	36
Average Queue (ft)	23	4	48	33	4	34	33	8	98	25	25	5
95th Queue (ft)	59	18	87	60	18	70	76	26	168	58	59	20
Link Distance (ft)	155	155	372			2995	2995			1073	1073	

Figure 24 | Traffic Queuing Improvements to Section 'A'

Figure 25 | Intersection Recommendations at Washington Avenue

Converting the intersection at Washington Avenue and Highway 33 to a J-Turn maintains access for vehicles traveling southbound on Highway 33 to still turn onto Washington Avenue, but prevents drivers from making the high-risk turn from Washington Avenue to southbound Highway 33. Instead, those drivers would need to travel north to Big Lake Road or south to Gillette Rd. All traffic modeling presented in this document reflects the anticipated increase in traffic from this arrangement.
This recommendation removes the most high-risk movement in the existing traffic pattern while maintaining access to Washington Avenue from Highway 33. According to a 2016 Traffic Safety Study by MnDOT, this type of intersection reduces the risk of fatal and serious injury crashes. The charts below reflect the anticipated effect to traffic.

Existing Level of Service at Washington Avenue

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	1.3	0.2	0.0	0.3	0.3	0.0	0.1
Total Del/Veh (s)	34.2	4.5	1.4	1.5	9.3	2.4	3.9
Level of Service (LOS)	D	A	A	A	A	A	A

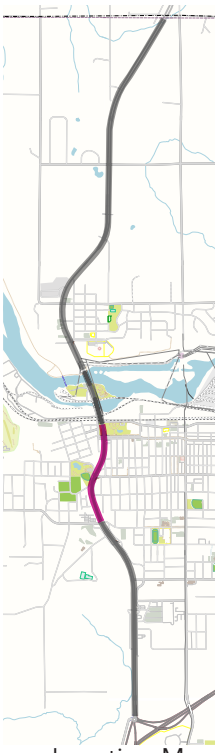
Anticipated Level of Service at Washington Avenue

Movement	WBR	NBT	NBR	SBT	All
Denied Del/Veh (s)	0.2	0.0	0.3	0.0	0.0
Total Del/Veh (s)	5.0	1.4	1.1	0.7	1.5
Level of Service (LOS)	A	A	A	A	A

Figure 26 | Traffic Impacts at Washington Avenue

Section 'B' Recommendations

The recommendations for Section 'B' include a non-motorized multi-use trail along the west side of Highway 33, connecting Pinehurst Park to Big Lake Road. The cross-section through this area narrows significantly compared to the southern area. To accommodate the trail, the median will need to be narrowed, and the roadway would shift to the east. Retaining walls may be required along the west and east side; further study would be required to confirm the limits. Pedestrian access improvements, such as a defined crossing, are recommended to connect users to Pinehurst Park. The proposed trail should continue north, connecting to the existing on-street bike lanes on Cloquet Avenue.



Location Map

Figure 27 | Section 'B' Recommendations

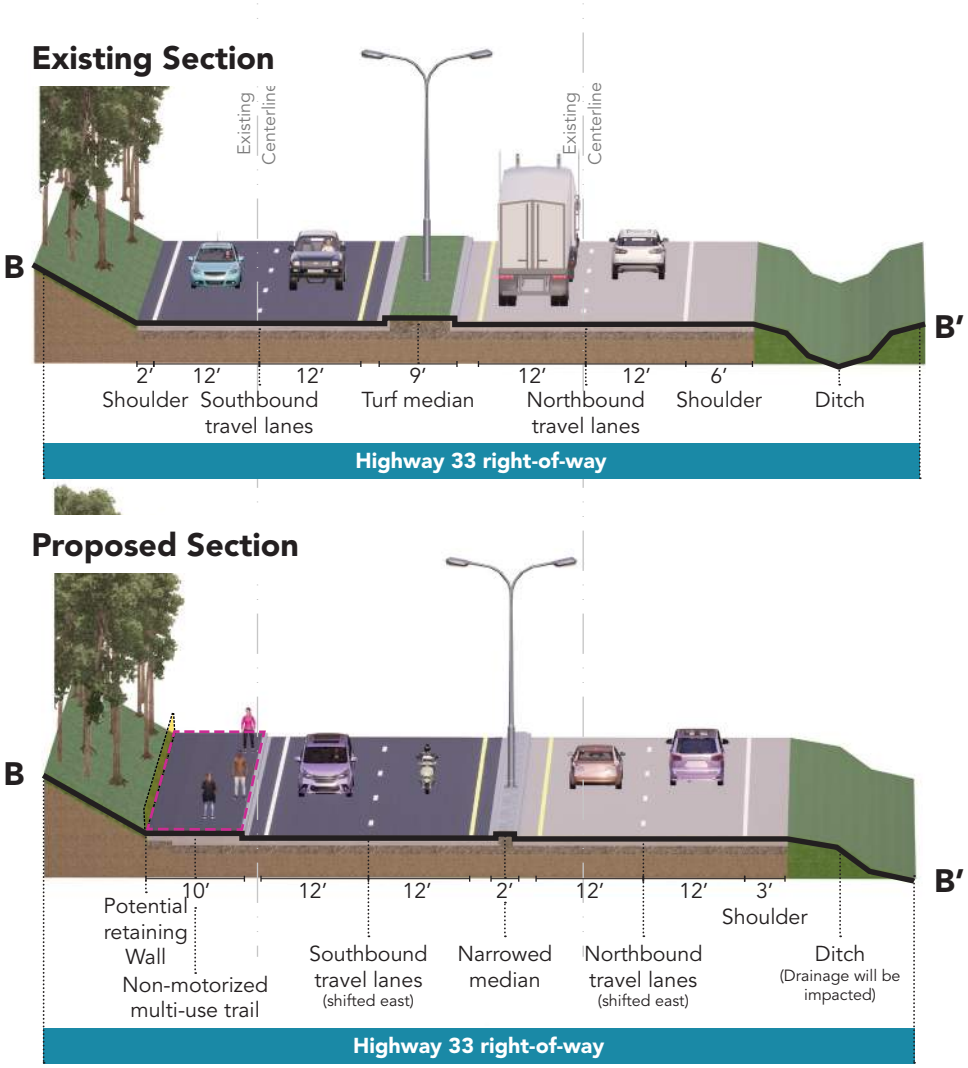


Figure 28 | Typical Section 'B'

As illustrated in Figure 28, the northbound and southbound travel lanes would shift to the east to accommodate a non-motorized multi-use trail along the west side of the road.

The estimated cost for construction for this section of roadway is approximately $1,976,000 (2023). Note that this does not account for design, engineering, or additional right-of-way costs.

Figure 29 | Section 'B' Construction Cost Estimate

Construction Cost Estimate

DESCRIPTION	COST
REMOVE CURB AND GUTTER	$44,400
REMOVE CONCRETE MEDIAN	$39,100
REMOVE BITUMINOUS PAVEMENT	$27,100
COMMON EMBANKMENT	$40,600
EXCAVATION - COMMON	$26,200
SELECT GRANULAR EMBANKMENT	$22,100
AGGREGATE BASE CLASS 5	$27,100
CRUSHED ROCK	$17,800
TYPE SP 9.5 WEARING COURSE MIXTURE	$180,000
TYPE SP 9.5 WEARING COURSE MIXTURE	$47,100
MODULAR BLOCK RETAINING WALL	$205,300
CONCRETE MEDIAN	$74,500
CONCRETE CURB AND GUTTER DESIGN	$238,300
DRAINAGE	$30,000
LIGHTING	$30,000
UTILITY	$20,000
TRAFFIC CONTROL	$50,000
SUB TOTAL	$1,119,600
25% CONTINGENCY	$279,900
MOBILIZATION (7.5%)	$84,000
TOTAL	**$1,484,000**

Section 'B' Intersection Recommendations

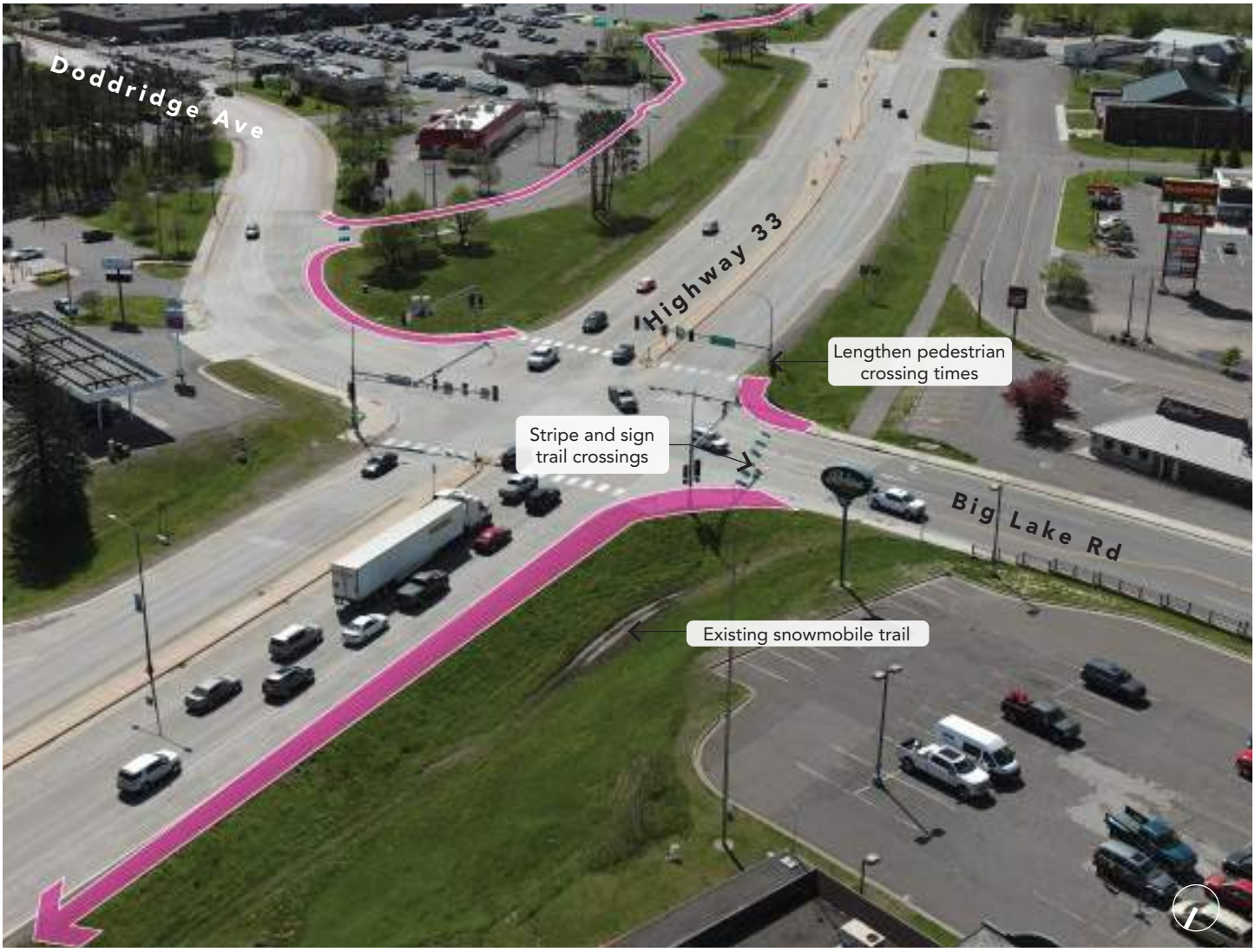


Figure 30 | Intersection Recommendations at Big Lake Rd

Safety concerns for pedestrians and bicyclists were one of the primary issues expressed during the community and stakeholder engagement process. Recommendations at this intersection include expanding the trail crossing striping and lengthening the crossing time at the traffic signals for pedestrians. Further study of this intersection is recommended as part of the implementation of this plan. The tables below reflect the anticipated change to traffic at this intersection.

Existing Level of Service at Washington Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	3.2	0.9	3.2	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.2	3.0	1.0
Total Del/Veh (s)	22.6	21.7	5.2	20.7	26.8	4.0	12.7	6.4	3.7	10.8	12.1	4.4	11.3
Level of Service (LOS)	C	C	A	C	C	A	B	A	A	B	B	A	B

Anticipated Level of Service at Washington Avenue

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	3.3	0.9	3.2	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.2	2.9	0.9
Total Del/Veh (s)	23.3	22.2	5.1	21.0	27.8	3.6	10.9	5.9	3.4	10.0	12.0	4.1	11.0
Level of Service (LOS)	C	C	A	C	C	A	B	A	A	B	B	A	B

Figure 31 | Anticipated Traffic Impacts at Big Lake Rd

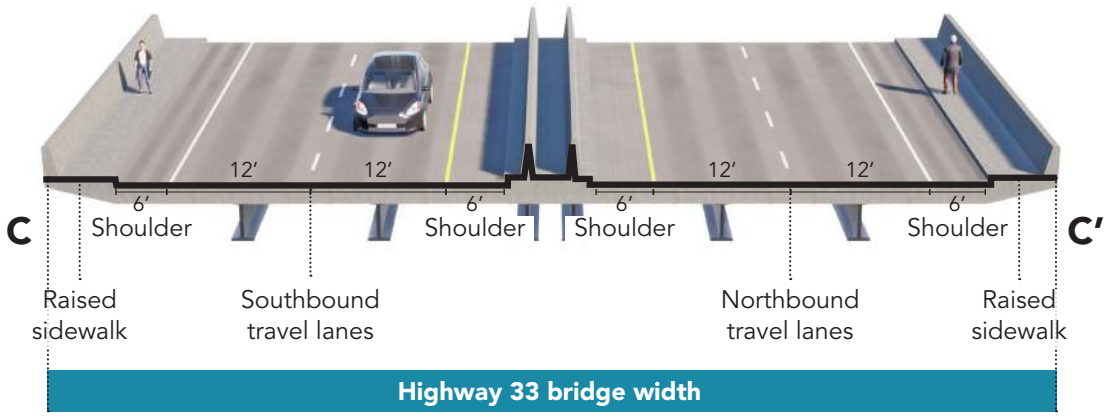
Section ‘C’ Recommendations

Improvements on the bridge include re-striping the roadway to include bike lanes. This will help bicyclists to continue their route north and south along the corridor.

Location Map

Figure 32 | Section ‘C’ Recommendations

Existing Section



Proposed Section

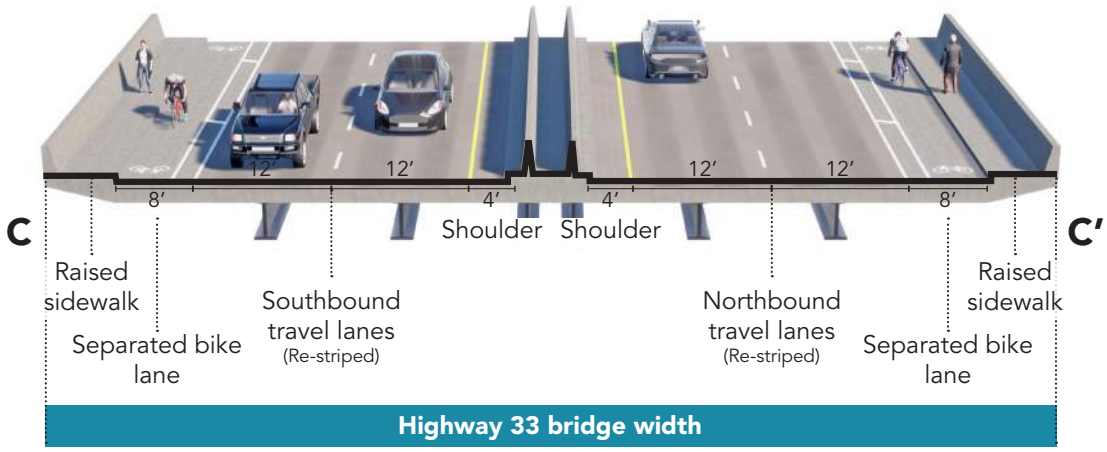


Figure 33 | Typical Section 'C'

No structural changes are proposed to the bridge spanning over the St. Louis River. The existing shoulder is wide enough to accommodate bicycle lanes.

The estimated cost for construction for this section of roadway is approximately $330,000 (2023). Note that this does not account for design, engineering, or additional right-of-way costs.

There is additional access across the St. Louis River by using a pedestrian bridge apart of the St. Louis River trail immediately west of the Highway 33 bridge.

Construction Cost Estimate

DESCRIPTION	COST
PAVEMENT MARKING SPECIAL	$245,700
PAVEMENT MESSAGE PAINT	$700
SUB TOTAL	$246,400
25% CONTINGENCY	$61,600
MOBILIZATION (7.5%)	$18,500
TOTAL	**$327,000**

Figure 34 | Section 'C' Construction Cost Estimate

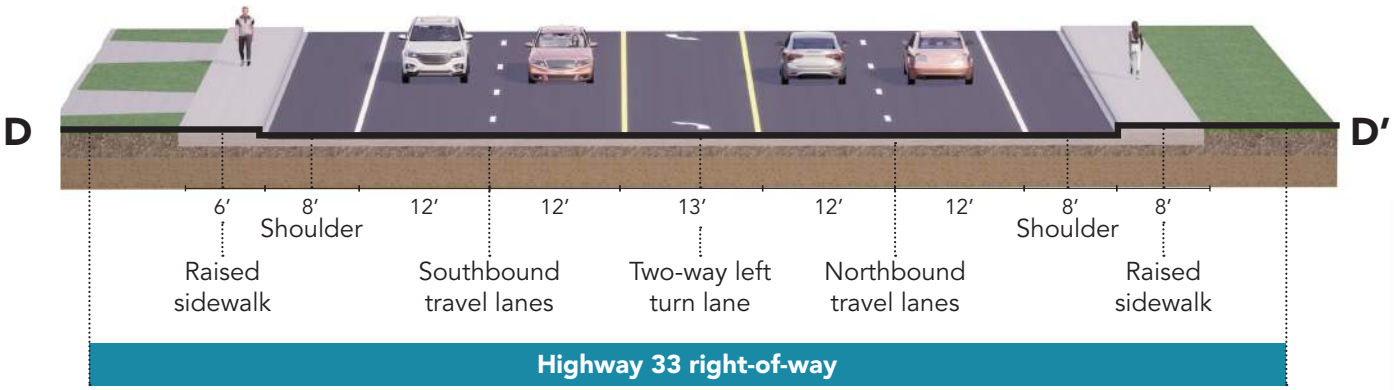
Section ‘D’ Recommendations

The roadway cross-section of Highway 33 north of the St. Louis River widens. In this area, recommendations include making improvements to the intersections to accommodate pedestrians and bicyclists. Further study of this intersection is recommended as part of the implementation of this plan. Additionally, a cycle track is proposed along the in-place sidewalks. A cycle track is a dedicated bicycle path that sits adjacent to the sidewalk.

Location Map

Figure 35 | Section ‘D’ Recommendations

Existing Section



Proposed Section

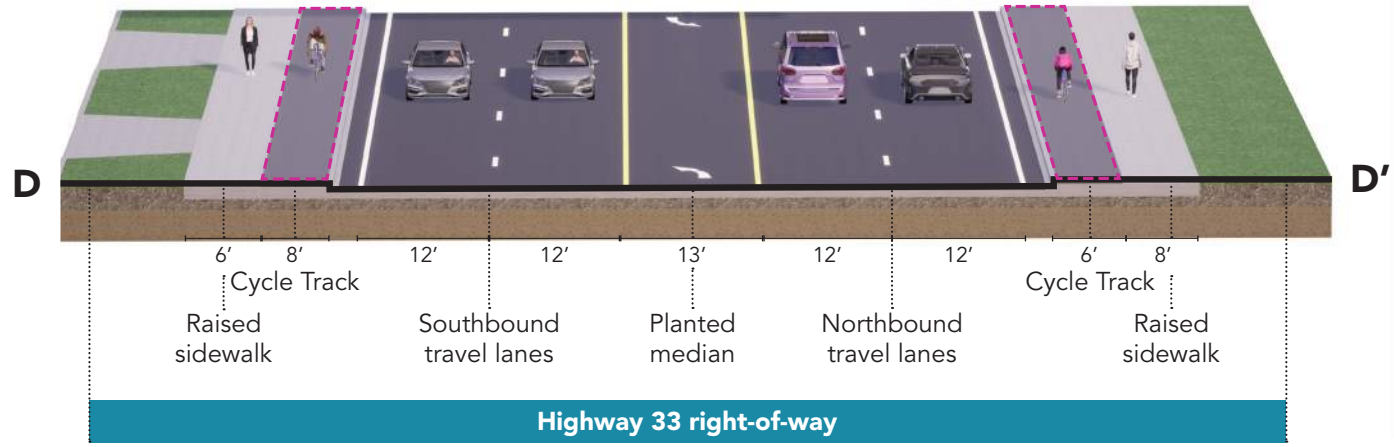


Figure 36 | Typical Section 'C'

The proposed cycle tracks would be located next to the existing sidewalks and be located in the same area as the existing shoulder.

The estimated cost for construction for this section of roadway is approximately $2,650,000 (2023). Note that this does not account for design, engineering, or additional right-of-way costs.

Construction Cost Estimate

DESCRIPTION	COST
REMOVE MANHOLE	$2,900
REMOVE CURB AND GUTTER	$88,000
REMOVE CURB BOX	$8,900
REMOVE SEWER PIPE (STORM)	$89,000
REMOVE BITUMINOUS SHOULDER PAVEMENT	$51,600
COMMON EMBANKMENT (CV)	$7,600
AGGREGATE BASE (CV) CLASS 5	$28,700
30" RC PIPE CULVERT DESIGN 3006	$618,800
CURB BOX	$14,000
INSTALL MANHOLE	$44,000
6" COLORED CONCRETE WALK	$675,900
SIDEWALK	$23,400
CONCRETE CURB & GUTTER DESIGN B624	$322,100
TRAFFIC CONTROL	$10,000
SUB TOTAL	$1,984,900
25% CONTINGENCY	$496,200
MOBILIZATION (7.5%)	$148,900
TOTAL	**$2,630,000**

Figure 37 | Section 'C' Construction Cost Estimate

Appendix

Contents:

Adjacent Businesses

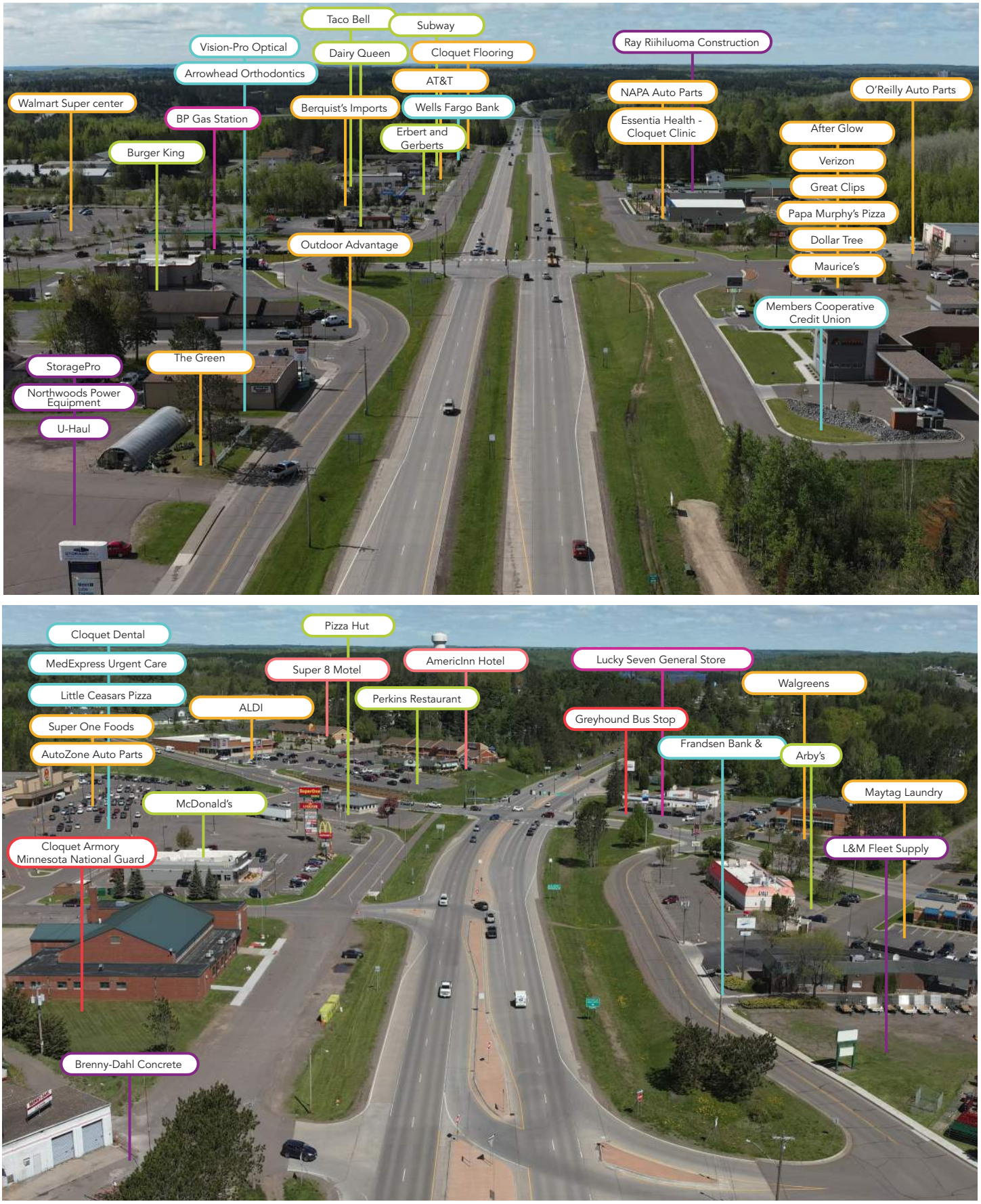


Figure A1 | Adjacent Businesses in the Study Area. Identified June 2022.

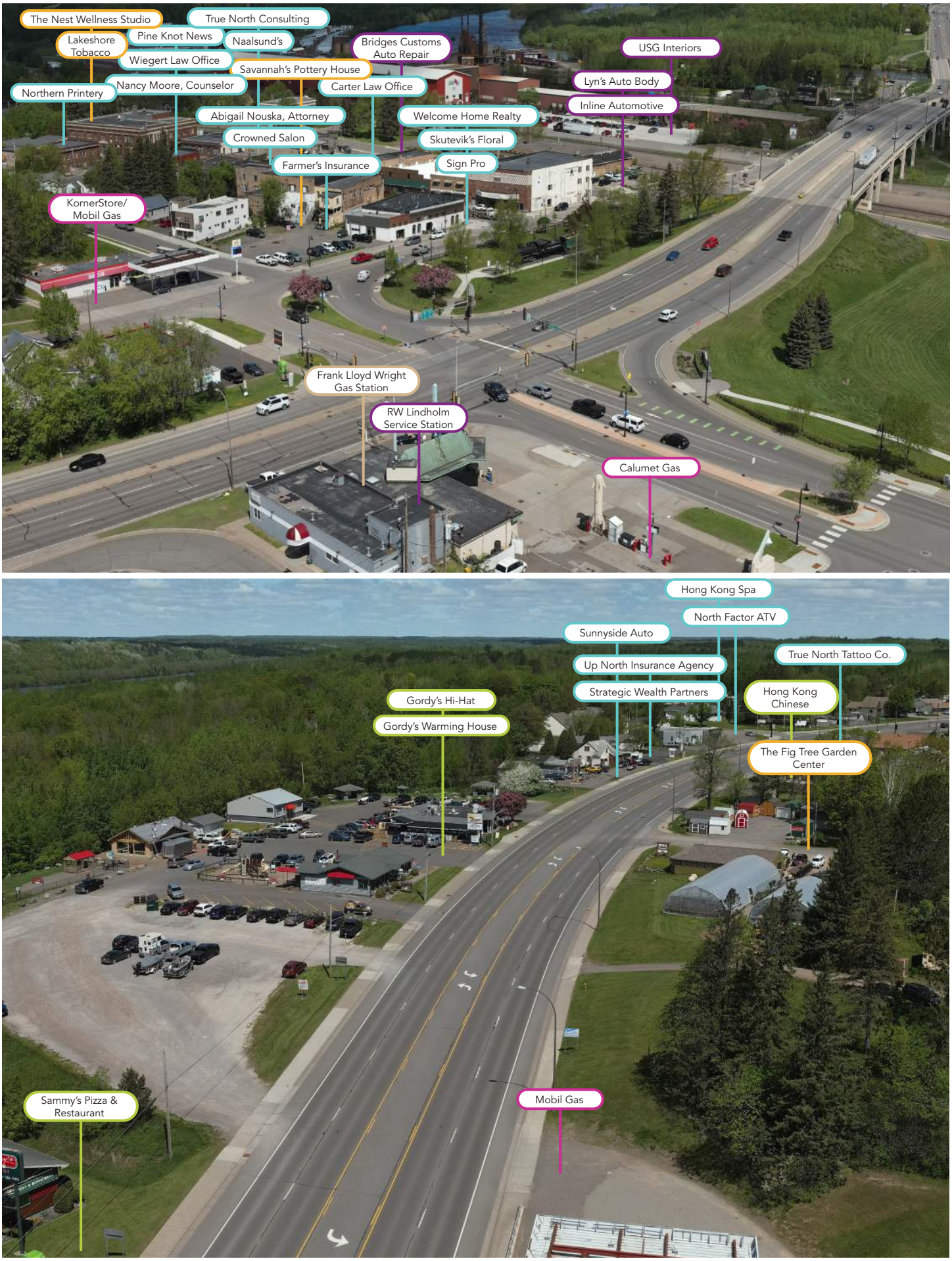
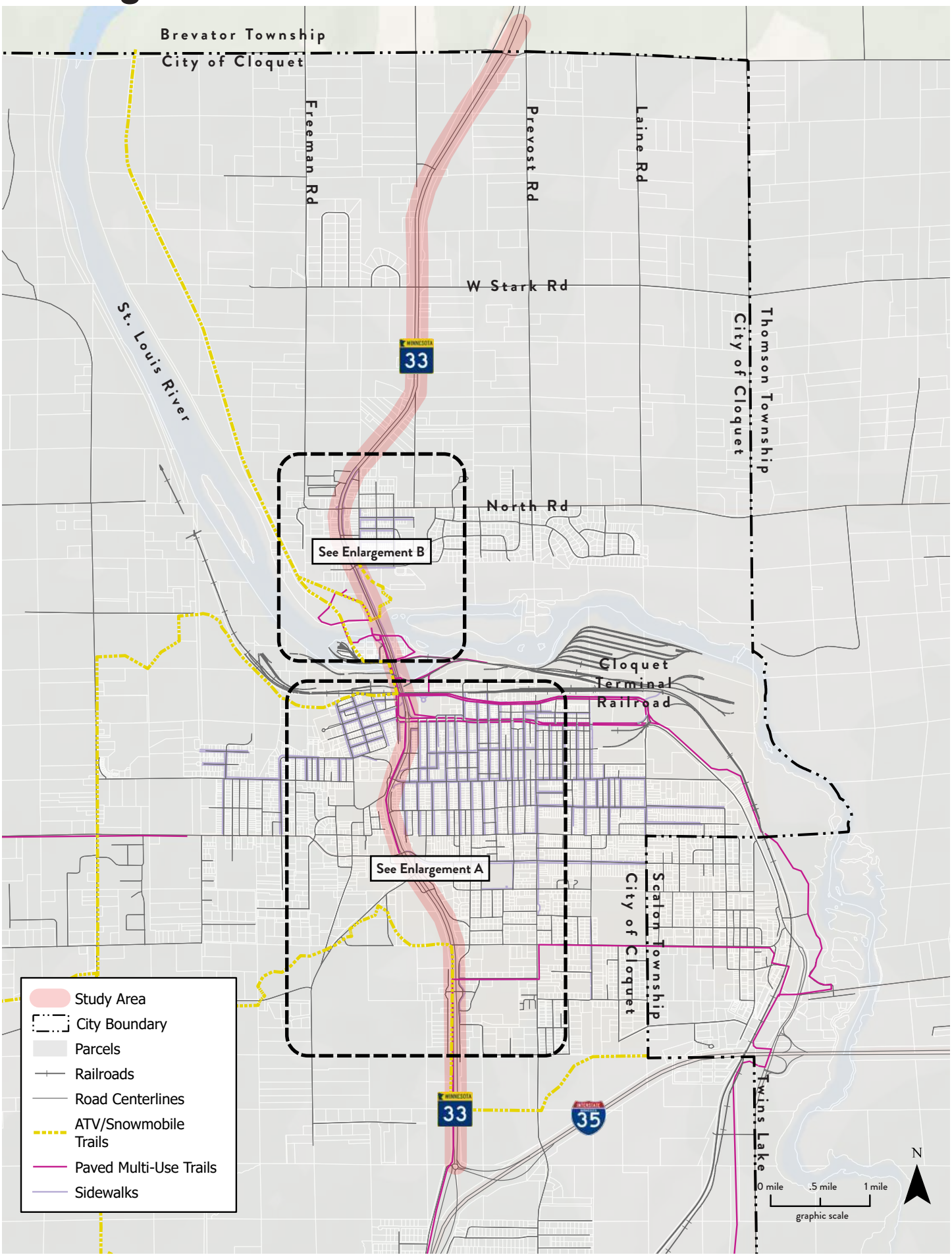


Figure A2 | Adjacent Businesses in the Study Area. Identified June 2022.

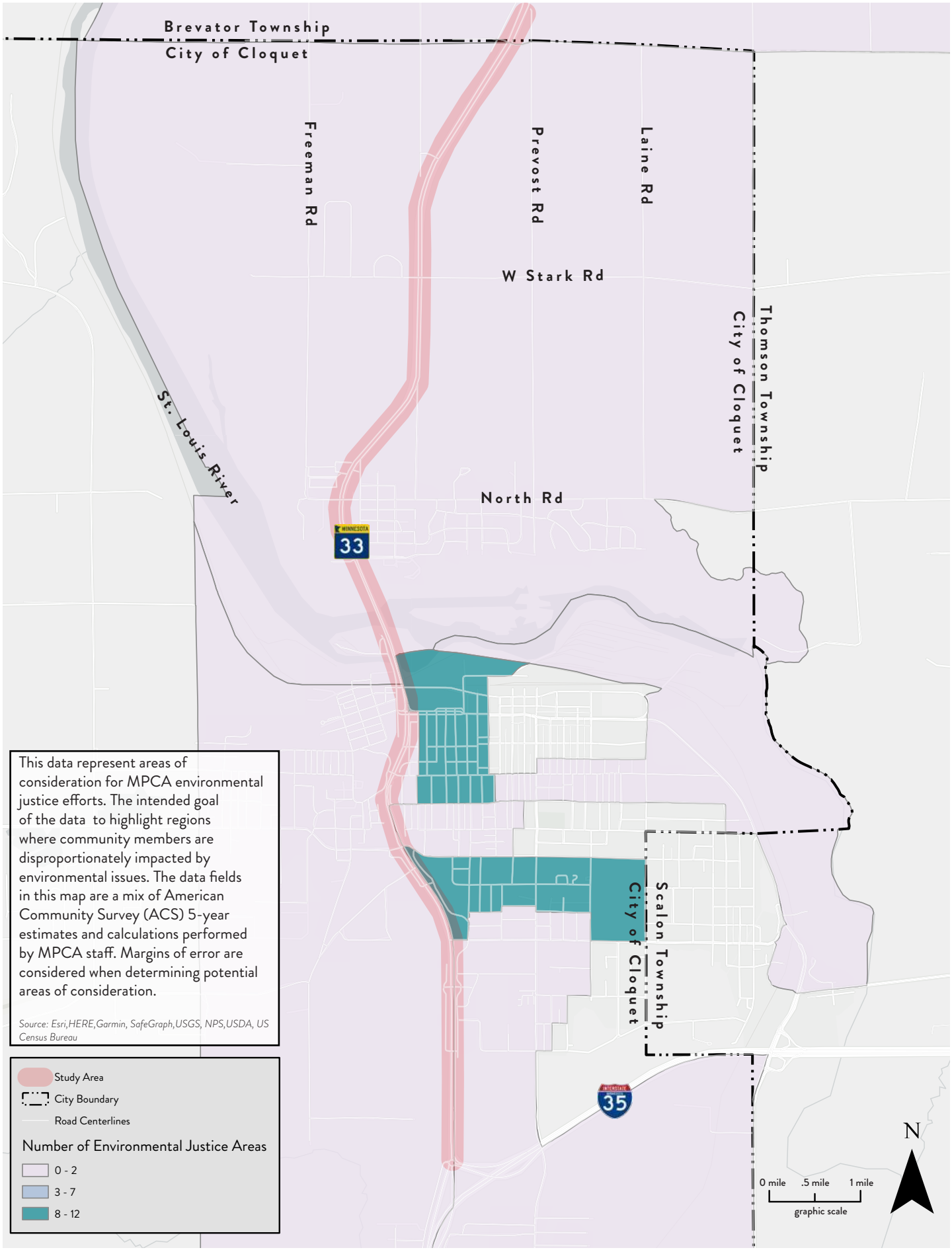
Existing Conditions



Enlargement A

Enlargement B

Environmental Justice Area



This data represent areas of consideration for MPCA environmental justice efforts. The intended goal of the data to highlight regions where community members are disproportionately impacted by environmental issues. The data fields in this map are a mix of American Community Survey (ACS) 5-year estimates and calculations performed by MPCA staff. Margins of error are considered when determining potential areas of consideration.

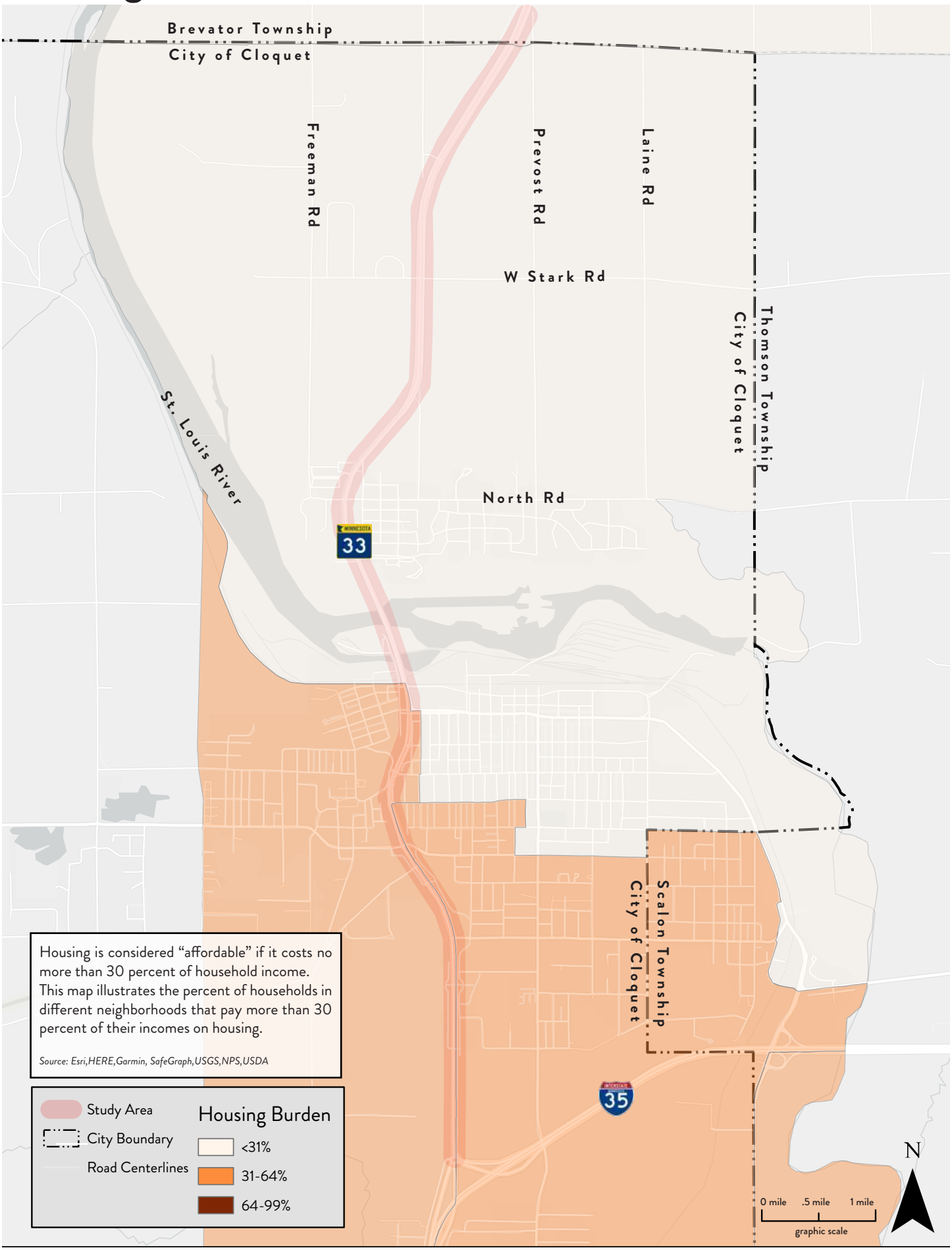
Source: Esri,HERE,Garmin, SafeGraph,USGS, NPS,USDA, US Census Bureau

Study Area
City Boundary
Road Centerlines

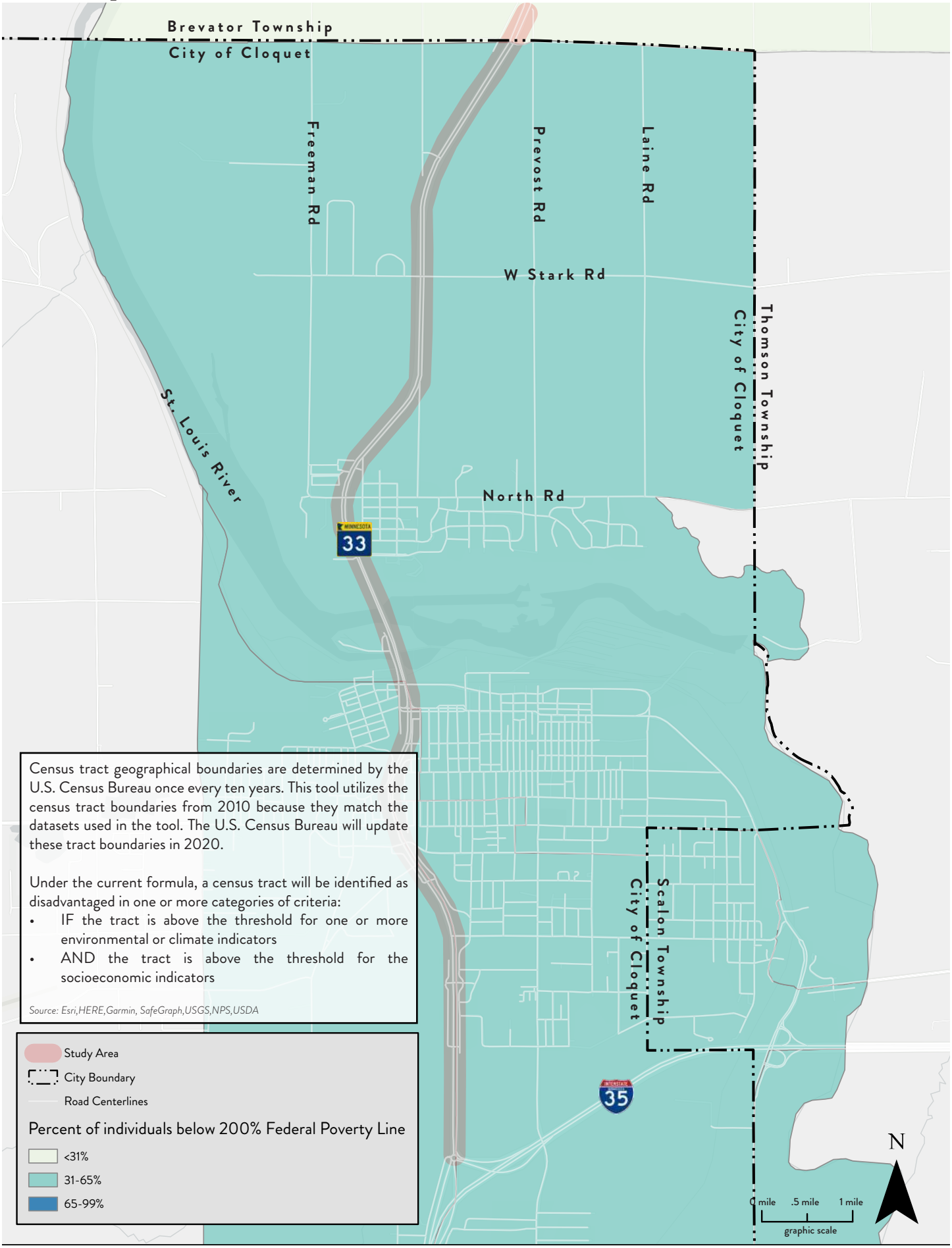
Number of Environmental Justice Areas

0 - 2
3 - 7
8 - 12

Housing Cost Burden Area



Poverty Rate



Census tract geographical boundaries are determined by the U.S. Census Bureau once every ten years. This tool utilizes the census tract boundaries from 2010 because they match the datasets used in the tool. The U.S. Census Bureau will update these tract boundaries in 2020.

Under the current formula, a census tract will be identified as disadvantaged in one or more categories of criteria:

- IF the tract is above the threshold for one or more environmental or climate indicators
- AND the tract is above the threshold for the socioeconomic indicators

Source: Esri,HERE,Garmin, SafeGraph,USGS,NPS,USDA

Study Area

City Boundary

Road Centerlines

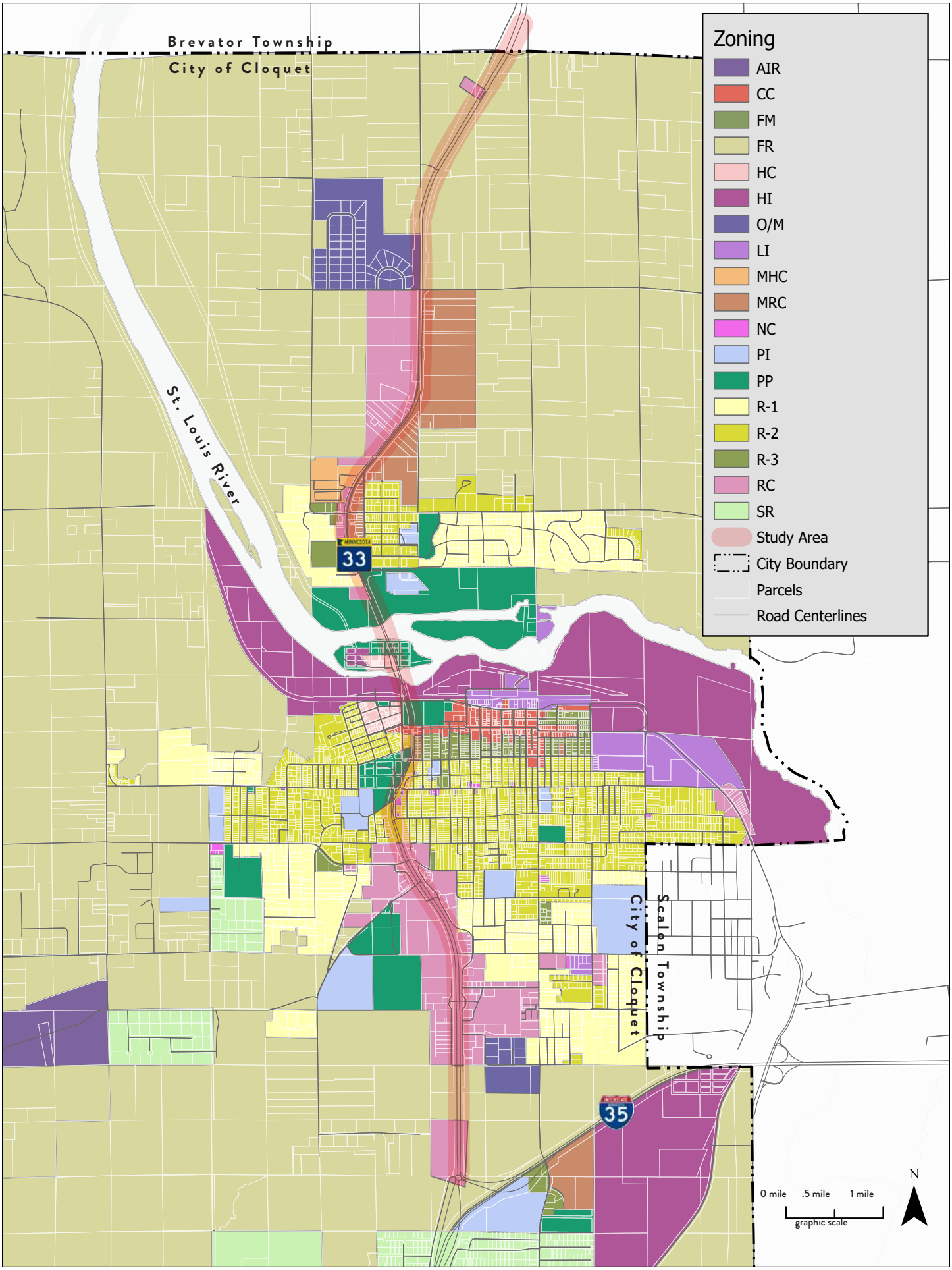
Percent of individuals below 200% Federal Poverty Line

<31%

31-65%

65-99%

Zoning


Brevator Township
City of Cloquet
St. Louis River
33
35
City of Cloquet
Scanlon Township
Zoning
AIR
CC
FM
FR
HC
HI
O/M
LI
MHC
MRC
NC
PI
PP
R-1
R-2
R-3
RC
SR
Study Area
City Boundary
Parcels
Road Centerlines
0 mile
.5 mile
1 mile
graphic scale
N

Memorandum

To:	Page Melius	**Project Reference:**	Cloquet, MN
Copies To:	Project Management Team		Traffic Analysis Summary
		TKDA Project No.:	18526.000
From:	Lindsay Gaines, PE (TKDA)	**Client No.:**	
Date:	December 8, 2022		

Cloquet, MN – Traffic Analysis Summary
Preliminary traffic analysis was conducted for three intersections in the city of Cloquet, MN. This analysis was performed with Synchro 11, see results tables attached.

The intersections analyzed were:

- MN 33 & Big Lake Rd / Doddridge Rd
- MN 33 & Washington Ave
- MN 33 & Frontage Rd / Gillette Rd (near Walmart)

Existing Conditions:

Overall, the existing conditions showed that most movements at these intersections have a Level of Service (LOS) of A or B, where A means traffic is free flowing, and B means traffic experiences slight delays. A few movements experienced LOS C, where traffic experiences acceptable delays, and one movement experienced LOS D, which means traffic is approaching unstable flow and experiencing tolerable delay.

The movement with LOS D is the westbound left turn at the intersection of MN 33 & Washington Ave. On average, these vehicles experience 34.2 seconds of delay. Since this intersection is not signalized, some vehicles may become impatient and attempt to complete the westbound left turn when there is insufficient gaps in traffic for them to complete this turn. Over the last 10 years, there have been 15 angle crashes at this intersection. Of these, 11 were related to the westbound left turn movement, 2 were related to the southbound left turn movement, and 2 were related to the westbound right turn movement. This intersection has a critical index of 1.70. This means that this intersection has about 170% of the expected number of crashes for an intersection of this type, compared to similar intersections within the state of Minnesota. The intersection of MN 33 & Frontage Rd / Gillette Rd (near Walmart) has a critical index of 0.46. Note that since the Gillette Rd intersection is signalized, is it expected that a greater number of crashes would occur at that intersection.

At the intersection of MN 33 & Frontage Rd (near Walmart), the westbound traffic experiences queueing that nearly reaches the next intersection to the east. While this queuing is acceptable in the existing condition, queuing in this region should be examined in all proposed conditions to consider if future queueing may block the intersection.

Analysis of the intersection of MN 33 and Big Lake Rd / Doddridge Rd did not reveal any concerns.

Proposed Condition #1 – Right In, Right Out at Washington Ave:

This condition proposes to reconstruct the median of MN 33 at Washington Ave to dis-allow left turns. The southbound left turn and the westbound left turn would no longer be possible, and instead, traffic is assumed to travel to the Frontage Rd intersection (near Walmart) to make their turn.

This improvement removes the safety concern associated with the westbound left at Washington Ave. The Washington Ave intersection would be expected to have excellent LOS, queuing, and safety. However, since traffic is redirected to the Frontage Rd intersection, the westbound queuing is expected to extend and block the nearby intersection several times in an hour. While signing can be implemented, stating “DO NOT BLOCK

INTERSECTION", compliance with signing is never 100%. The LOS at the Gillette Rd intersection near Walmart would be expected to somewhat worsen, but overall the effect is mild.

Proposed Condition #2 – Right In, Right Out at Washington Ave, with additional left turn lane at Frontage Rd:

This condition proposes the modifications included in Proposed Condition #1, plus adding a dedicated westbound left turn lane at the MN 33 & Frontage Rd (near Walmart) intersection. This additional left turn lane will allow for additional storage of left turning vehicles, and thus reducing the length of the westbound queue. In this scenario, the queues are expected to be shorter than the existing condition, even with the additional traffic re-directed from the Washington Ave intersection.

Proposed Condition #3 – J turn for westbound lefts at Washington Ave

To provide more access at Washington Avenue than a right-in, right-out design, while still providing most of the safety benefits of a right-in, right-out design, a J turn could be provided. In order to go south, westbound traffic would need to take a right turn, change lanes to the left lane, and then change lanes again to a proposed U turn lane. Traffic would then wait for a gap in southbound traffic and complete their U-turn.

At Washington Ave, the level of service for all movements would be essentially the same as the right-in, right-scenario, which is a LOS A. The level of service at the U-turn is also modeled at an LOS A. In total, drivers would experience the delay at Washington (about 5 seconds), the time to reach the U-turn (unknown number of seconds), and the delay at the U-turn (about 5 seconds).

The westbound queueing at the Frontage Rd/Gillette Rd intersection near Walmart would be less in the J-turn scenario compared to the right-in, right-out scenario. This because the right-in, right-out scenario re-directed westbound left turning at Washington Ave to the Frontage Rd/Gillette Rd intersection near Walmart. This increase in vehicles for that scenario resulted in an increase in queue length. In the J-turn scenario, the maximum westbound queue near Walmart is about 10 feet longer than the available space. The 95th percentile queue is within the available space. Thus, about once per hour one could expect a queued vehicle to partially block the Frontage Road. To mitigate this queuing, an additional left turn lane could be provided.

Proposed Condition #4 – Signalize TH 33 & Washington Ave intersection

Instead of a right-in, right-out, this condition proposes to signalize the Washington Ave intersection. Signalized intersections typically reduce the number of angle crashes, which is the type of crash associated with the existing condition's westbound left turn issue. At a signal, a left turning driver knows they eventually will have a green light, so they are less likely to attempt a risky left. However, signals are also known to increase the number of rear end crashes, and can increase the total number of crashes. Signals should only be installed when warranted, due to the potential for unintended consequences. Before a signal can be installed, a Signal Justification Report must be completed to prove that the signal is warranted.

Signalizing at Washington Ave results in improved LOS for the westbound movement, with approximately 20.0 seconds of delay, instead of 32.2 seconds. All other movements remain an LOS A or LOS B. The queueing at the TH 33 & Frontage Rd intersection would remain essentially the same as the existing condition, since no changes would be proposed at that intersection.

Proposed Condition #5 – Roundabout at Big Lake Rd & Doddridge Ave intersection

Due to public comments about the poor operation of this intersection, a roundabout was modeled as a possible improvement. In the existing condition, the worst movement is expected to have about 26.8 seconds of delay, which is considered an LOS C (stable flow, acceptable delays). Overall, in the existing condition this intersection had LOS A or B for the northbound and southbound traffic along MN 33, and an LOS C for eastbound and westbound traffic along Big Lake Rd and Doddridge Ave. With a two-lane roundabout, the worst movement would have about 8.1 seconds of delay, which is considered an LOS A (free flow).

Safety Data

In the past 10 years, 27 crashes have been recorded at the MN 33 & Washington Ave intersection, and 25 crashes have been recorded at the MN 33 and Frontage Rd / Gillette Rd (near Walmart) intersection. The main difference between these intersections is that while the Gillette Rd intersection has less angle crashes (9 versus 15), it also has more rear end crashes (10 versus 5). This is consistent with typical crash patterns for unsignalized versus signalized intersections. Considering only those crashes which included a minor injury or possible injury, at Washington Ave all 6 injury or possible injury crashes were angle crashes and at the Gillette Rd intersection 5 were angle crashes, another 5 were rear end crashes, and a further 2 were “other” crashes. There were no serious injury or fatal crashes recorded at either intersection in the last 10 years.

LKG:slv
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3: MN 33 & Washington Ave Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	1.3	0.2	0.0	0.3	0.3	0.0	0.1
Total Del/Veh (s)	34.2	4.5	1.4	1.5	9.3	2.4	3.9
Level of Service (LOS)	D	A	A	A	A	A	A

5: MN 33 & Gillette Rd/Frontage Rd near Walmart Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.6	0.6	3.7	0.1	0.1	0.1	0.0	0.0	0.1	0.5
Total Del/Veh (s)	17.8	15.6	4.3	18.2	16.0	4.9	11.3	4.9	1.9	12.4	3.9	1.6	6.7
Level of Service (LOS)	B	B	A	B	B	A	B	A	A	B	A	A	A

8: MN 33 & Big Lake Rd/Doddridge Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	3.2	0.9	3.2	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.2	3.0	1.0
Total Del/Veh (s)	22.6	21.7	5.2	20.7	26.8	4.0	12.7	6.4	3.7	10.8	12.1	4.4	11.3
Level of Service (LOS)	C	C	A	C	C	A	B	A	A	B	B	A	B

Total Network Performance

Denied Del/Veh (s)	1.2
Total Del/Veh (s)	17.2
Level of Service (LOS)	B

Intersection: 3: MN 33 & Washington Ave

Movement	WB	WB	NB	SB
Directions Served	L	R	R	L
Maximum Queue (ft)	83	68	29	100
Average Queue (ft)	30	32	3	47
95th Queue (ft)	70	58	17	84
Link Distance (ft)		1869		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	270		375	300
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: MN 33 & Gillette Rd/Frontage Rd near Walmart

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	65	28	107	80	35	73	87	37	141	56	79	46
Average Queue (ft)	21	5	41	33	5	31	29	8	58	18	31	6
95th Queue (ft)	53	21	80	62	22	61	67	27	105	46	66	23
Link Distance (ft)	155	155	372			2995	2995			1067	1067	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)				100	300			300	560			360
Storage Blk Time (%)			0	0								
Queuing Penalty (veh)			1	0								

Intersection: 8: MN 33 & Big Lake Rd/Doddridge Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	128	105	93	76	112	47	110	86	88	48	62	160	108	72
Average Queue (ft)	56	42	39	26	49	17	52	32	50	13	25	74	33	25
95th Queue (ft)	103	86	71	56	94	38	93	69	81	39	53	131	80	55
Link Distance (ft)		1005			323			2421	2421			1070	1070	
Upstream Blk Time (%)														
Queuing Penalty (veh)														
Storage Bay Dist (ft)	130		225	110		310	310			310	250			250
Storage Blk Time (%)	0	0			1									
Queuing Penalty (veh)	1	0			1									

Network Summary

Network wide Queuing Penalty: 3

3: Performance by movement MN 33 & Washington Ave

Movement	WBR	NBT	NBR	SBT	All
Denied Del/Veh (s)	0.2	0.0	0.2	0.2	0.1
Total Del/Veh (s)	4.8	1.4	1.4	0.8	1.5
Level of Service (LOS)	A	A	A	A	A

5: Performance by movement MN 33 & Frontage Rd (near Walmart)

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.6	0.7	3.6	0.2	0.1	0.1	0.1	0.0	1.2	0.5
Total Del/Veh (s)	19.1	20.7	2.7	23.2	20.6	6.1	9.6	5.5	2.4	18.6	3.9	1.4	9.8
Level of Service (LOS)	B	C	A	C	C	A	A	A	A	B	A	A	A

Total Network Performance

Denied Del/Veh (s)	0.5
Total Del/Veh (s)	11.4
Level of Service (LOS)	B

Intersection: 3: MN 33 & Washington Ave

Movement	WB
Directions Served	R
Maximum Queue (ft)	73
Average Queue (ft)	32
95th Queue (ft)	58
Link Distance (ft)	1869
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: MN 33 & Frontage Rd (near Walmart)

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	68	21	160	120	35	74	88	33	294	79	77	37
Average Queue (ft)	19	3	64	40	4	32	32	9	116	31	27	7
95th Queue (ft)	49	14	120	86	21	62	69	27	214	64	62	24
Link Distance (ft)	155	155	372			2995	2995			1067	1067	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)				100	300			300	560			360
Storage Blk Time (%)			2	0								
Queuing Penalty (veh)			3	0								

Network Summary

Network wide Queuing Penalty: 3

3: MN 33 & Washington Ave Performance by movement

Movement	WBR	NBT	NBR	SBT	All
Denied Del/Veh (s)	0.2	0.0	0.2	0.2	0.1
Total Del/Veh (s)	4.8	1.3	1.3	0.9	1.5
Level of Service (LOS)	A	A	A	A	A

5: MN 33 & Gillette Rd/Frontage Rd near Walmart Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.2	0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.0	1.0	0.1
Total Del/Veh (s)	25.4	23.9	3.0	27.1	25.8	5.8	9.0	4.6	2.5	16.9	3.3	1.1	9.4
Level of Service (LOS)	C	C	A	C	C	A	A	A	A	B	A	A	A

8: Frontage Rd near Walmart Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.0	0.1	3.7	0.3	0.3	0.2	0.1	0.1	0.2	0.2	0.1	0.2
Total Del/Veh (s)	0.9	1.2	0.7	8.0	7.8	4.5	8.9	10.9	6.1	7.6	10.3	3.7	4.2
Level of Service (LOS)	A	A	A	A	A	A	A	B	A	A	B	A	A

Total Network Performance

Denied Del/Veh (s)	0.2
Total Del/Veh (s)	11.9
Level of Service (LOS)	B

Intersection: 3: MN 33 & Washington Ave

Movement	WB
Directions Served	R
Maximum Queue (ft)	85
Average Queue (ft)	33
95th Queue (ft)	64
Link Distance (ft)	1869
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: MN 33 & Gillette Rd/Frontage Rd near Walmart

Movement	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	L	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	65	20	75	81	89	31	56	69	43	222	64	73	25
Average Queue (ft)	21	3	41	33	41	3	26	28	9	108	24	20	4
95th Queue (ft)	51	13	71	65	72	18	52	61	27	192	53	55	16
Link Distance (ft)	156	156	137	137	137		2991	2991			1058	1058	
Upstream Blk Time (%)				0									
Queuing Penalty (veh)				0									
Storage Bay Dist (ft)						300			300	560			360
Storage Blk Time (%)													
Queuing Penalty (veh)													

Intersection: 8: Frontage Rd near Walmart

Movement	EB	WB	WB	NB	SB
Directions Served	LTR	L	TR	LTR	LTR
Maximum Queue (ft)	32	38	103	97	75
Average Queue (ft)	2	12	51	38	32
95th Queue (ft)	17	37	84	65	56
Link Distance (ft)	137		185	173	140
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		100			
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Network Summary

Network wide Queuing Penalty: 0

3: MN 33 & Washington Ave Performance by movement

Movement	WBR	NBT	NBR	SBT	All
Denied Del/Veh (s)	0.2	0.0	0.3	0.0	0.0
Total Del/Veh (s)	5.0	1.4	1.1	0.7	1.5
Level of Service (LOS)	A	A	A	A	A

5: MN 33 & Gillette Rd/Frontage Rd near Walmart Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.6	0.3	3.8	0.1	0.1	0.2	0.1	0.0	1.2	0.5
Total Del/Veh (s)	21.9	23.1	4.1	25.4	30.0	5.4	9.4	5.2	2.1	14.5	3.5	1.3	8.4
Level of Service (LOS)	C	C	A	C	C	A	A	A	A	B	A	A	A

8: MN 33 & Big Lake Rd/Doddridge Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	3.3	0.9	3.2	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.2	2.9	0.9
Total Del/Veh (s)	23.3	22.2	5.1	21.0	27.8	3.6	10.9	5.9	3.4	10.0	12.0	4.1	11.0
Level of Service (LOS)	C	C	A	C	C	A	B	A	A	B	B	A	B

12: MN 33 & J Turn Performance by movement

Movement	NBU	NBT	SBT	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0
Total Del/Veh (s)	4.0	0.9	1.9	1.4
Level of Service (LOS)	A	A	A	A

Total Network Performance

Denied Del/Veh (s)	1.1
Total Del/Veh (s)	16.5
Level of Service (LOS)	B

Intersection: 3: MN 33 & Washington Ave

Movement	WB
Directions Served	R
Maximum Queue (ft)	81
Average Queue (ft)	40
95th Queue (ft)	70
Link Distance (ft)	1867
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Intersection: 5: MN 33 & Gillette Rd/Frontage Rd near Walmart

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	72	21	111	84	26	79	96	41	208	67	70	36
Average Queue (ft)	23	4	48	33	4	34	33	8	98	25	25	5
95th Queue (ft)	59	18	87	60	18	70	76	26	168	58	59	20
Link Distance (ft)	155	155	372			2995	2995			1073	1073	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)				100	300			300	560			360
Storage Blk Time (%)			0	0								
Queuing Penalty (veh)			0	0								

Intersection: 8: MN 33 & Big Lake Rd/Doddridge Ave

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	120	143	76	84	116	35	107	89	103	47	55	145	116	75
Average Queue (ft)	58	49	35	26	42	11	47	31	48	13	23	74	38	24
95th Queue (ft)	106	107	64	61	88	26	84	72	86	40	49	123	86	49
Link Distance (ft)		1005			319			1378	1378			1070	1070	
Upstream Blk Time (%)														
Queuing Penalty (veh)														
Storage Bay Dist (ft)	130		225	110		310	310			310	250			250
Storage Blk Time (%)	1	0			0									
Queuing Penalty (veh)	2	1			0									

Intersection: 12: MN 33 & J Turn

Movement	NB
Directions Served	U
Maximum Queue (ft)	48
Average Queue (ft)	18
95th Queue (ft)	45
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	150
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 5

3: MN 33 & Washington Ave Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	1.3	0.2	0.0	0.2	1.7	0.2	0.3
Total Del/Veh (s)	20.0	5.5	3.6	2.2	10.5	3.0	4.8
Level of Service (LOS)	B	A	A	A	B	A	A

5: MN 33 & Gillette Rd/Frontage Rd near Walmart Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.7	0.6	3.7	0.2	0.1	0.1	0.0	0.0	0.2	0.5
Total Del/Veh (s)	18.3	19.3	3.2	18.1	19.6	5.1	10.7	4.9	2.3	11.6	4.2	1.7	6.7
Level of Service (LOS)	B	B	A	B	B	A	B	A	A	B	A	A	A

Total Network Performance

Denied Del/Veh (s)	0.7
Total Del/Veh (s)	11.3
Level of Service (LOS)	B

Intersection: 3: MN 33 & Washington Ave

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	83	69	87	92	57	110	105	69
Average Queue (ft)	29	30	33	35	16	52	39	23
95th Queue (ft)	62	58	75	81	45	92	84	59
Link Distance (ft)		1869	1067	1067			1467	1467
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	270				375	300		
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 5: MN 33 & Gillette Rd/Frontage Rd near Walmart

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	61	26	108	84	35	76	96	41	112	74	82	33
Average Queue (ft)	21	4	41	34	5	28	28	8	56	23	29	6
95th Queue (ft)	48	19	79	65	24	63	70	27	93	52	66	21
Link Distance (ft)	155	155	372			2995	2995			1067	1067	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)				100	300			300	560			360
Storage Blk Time (%)			0	0								
Queuing Penalty (veh)			0	0								

Network Summary

Network wide Queuing Penalty: 0

3: MN 33 & Washington Ave Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Del/Veh (s)	1.3	0.2	0.0	0.2	0.3	0.0	0.1
Total Del/Veh (s)	25.2	4.6	1.4	1.5	8.6	2.0	3.5
Level of Service (LOS)	D	A	A	A	A	A	A

5: MN 33 & Gillette Rd/Frontage Rd near Walmart Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.1	0.1	0.1	0.7	0.7	3.7	0.2	0.1	0.1	0.0	0.0	0.2	0.6
Total Del/Veh (s)	18.5	18.2	3.3	17.9	17.8	5.0	9.8	4.9	2.4	12.0	4.1	1.4	6.6
Level of Service (LOS)	B	B	A	B	B	A	A	A	A	B	A	A	A

8: MN 33 & Big Lake Rd/Doddridge Ave Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3	0.2	0.1
Total Del/Veh (s)	5.6	6.6	5.2	4.6	5.7	3.8	8.1	6.4	4.8	6.3	6.8	4.1	6.1
Level of Service (LOS)	A	A	A	A	A	A	A	A	A	A	A	A	A

Total Network Performance

Denied Del/Veh (s)	0.5
Total Del/Veh (s)	12.5
Level of Service (LOS)	B

Intersection: 3: MN 33 & Washington Ave

Movement	WB	WB	NB	NB	NB	SB
Directions Served	L	R	T	T	R	L
Maximum Queue (ft)	71	59	4	4	32	94
Average Queue (ft)	28	30	0	0	3	44
95th Queue (ft)	60	51	0	0	17	77
Link Distance (ft)		1869	1067	1067		
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	270				375	300
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 5: MN 33 & Gillette Rd/Frontage Rd near Walmart

Movement	EB	EB	WB	WB	NB	NB	NB	NB	SB	SB	SB	SB
Directions Served	LT	R	LT	R	L	T	T	R	L	T	T	R
Maximum Queue (ft)	64	40	115	94	26	77	83	42	138	64	71	39
Average Queue (ft)	20	5	39	36	4	28	28	7	56	22	30	6
95th Queue (ft)	52	23	77	65	19	60	67	26	101	54	62	25
Link Distance (ft)	155	155	372			2995	2995			1067	1067	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)				100	300			300	560			360
Storage Blk Time (%)			0	0								
Queuing Penalty (veh)			0	0								

Intersection: 8: MN 33 & Big Lake Rd/Doddridge Ave

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	LT	R	LT	R	LT	R
Maximum Queue (ft)	111	87	75	49	160	54	129	61
Average Queue (ft)	45	40	29	14	65	12	55	21
95th Queue (ft)	86	72	61	40	124	39	104	52
Link Distance (ft)	1017	1017	340	340	2422	2422	1071	1071
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)								
Storage Blk Time (%)								
Queuing Penalty (veh)								

Network Summary

Network wide Queuing Penalty: 0

Highway Capacity Manual, 2016

Signalized intersection level of service (LOS) is defined in terms of the average total vehicle delay of all movements through an intersection. Vehicle delay is a method of quantifying several intangible factors, including driver discomfort, frustration, and lost travel time. Specifically, LOS criteria are stated in terms of average delay per vehicle during a specified time period (for example, the PM peak hour). Vehicle delay is a complex measure based on many variables, including signal phasing (i.e., progression of movements through the intersection), signal cycle length, and traffic volumes with respect to intersection capacity. Table 1 shows LOS criteria for signalized intersections, as described in the *Highway Capacity Manual* (Chapters 19 & 20, 2016).

Table 1. Level of Service Criteria for Signalized Intersections

Level of Service	Average Control Delay (sec/veh)	General Description (Signalized Intersections)
A	≤10	Free Flow
B	>10 - 20	Stable Flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Unsignalized intersection LOS criteria can be further reduced into two intersection types: all-way stop-controlled and two-way stop-controlled. All-way, stop-controlled intersection LOS is expressed in terms of the average vehicle delay of all of the movements, much like that of a signalized intersection. Two-way, stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement(s). This is because the performance of a two-way, stop-controlled intersection is more closely reflected in terms of its individual movements, rather than its performance overall. For this reason, LOS for a two-way, stop-controlled intersection is defined in terms of its individual movements. With this in mind, total average vehicle delay (i.e., average delay of all movements) for a two-way, stop-controlled intersection should be viewed with discretion. Table 2 shows LOS criteria for unsignalized intersections (both all-way and two-way, stop-controlled).

Table 2. Level of Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	0 - 10
B	>10 - 15
C	>15 - 25
D	>25 - 35
E	>35 - 50
F	>50

Intersection Safety Screening

Intersection: MN 33 & Washington Avenue

Statewide Averages based on 2016-2020 crashes

Crashes by Crash Severity	
Fatal (K)	0
Serious Injury (A)	0
Minor Injury (B)	2
Possible Injury (C)	0
Property Damage (PDO)	14
Total Crashes	16

Intersection Characteristics	
Entering Volume	16,632
Environment	Urban
Lighting	Unlit
Traffic Control	Thru-Stop

Annual crash cost = $128,400

Statewide comparison = Urban, Thru/STOP

Total Crash Rate	
Observed	0.527
Statewide Average	0.128
Critical Rate	0.310
Critical Index	**1.70**

Fatal & Serious Injury Crash Rate	
Observed	0.000
Statewide Average	0.311
Critical Rate	3.250
Critical Index	**0.00**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference (i.e. observed crash rate ÷ critical crash rate).

The observed total crash rate for this period is 0.53 per MEV; this is 1.7 times the critical rate. If crashes were reduced by 7 over five years, this intersection would perform within normal range.

The observed fatal and serious injury crash rate for this period is 0.00 per 100 MEV; this is 100% below the critical rate. The intersection operates within the normal range.

Intersection Safety Screening

Intersection: MN 33 & Gillette Rd / Frontage Rd (near Walmart)

Statewide Averages based on 2016-2020 crashes

Crashes by Crash Severity	
Fatal (K)	0
Serious Injury (A)	0
Minor Injury (B)	2
Possible Injury (C)	2
Property Damage (PDO)	7
Total Crashes	11

Intersection Characteristics	
Entering Volume	14,835
Environment	Urban
Lighting	Lit
Traffic Control	Signal

Annual crash cost = $158,200

Statewide comparison = Signal, Low Volume (<=20K)

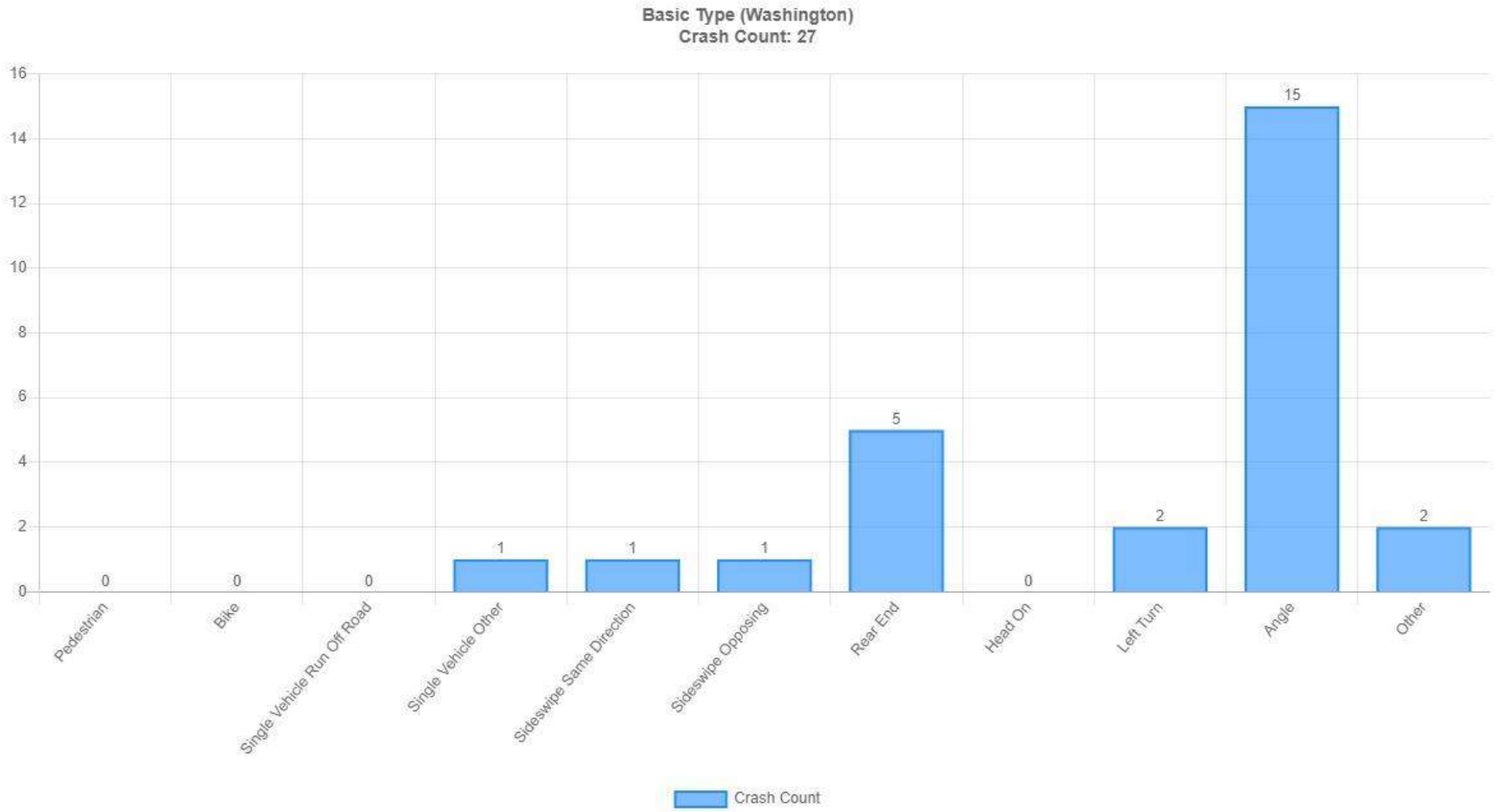
Total Crash Rate	
Observed	0.406
Statewide Average	0.508
Critical Rate	0.880
Critical Index	**0.46**

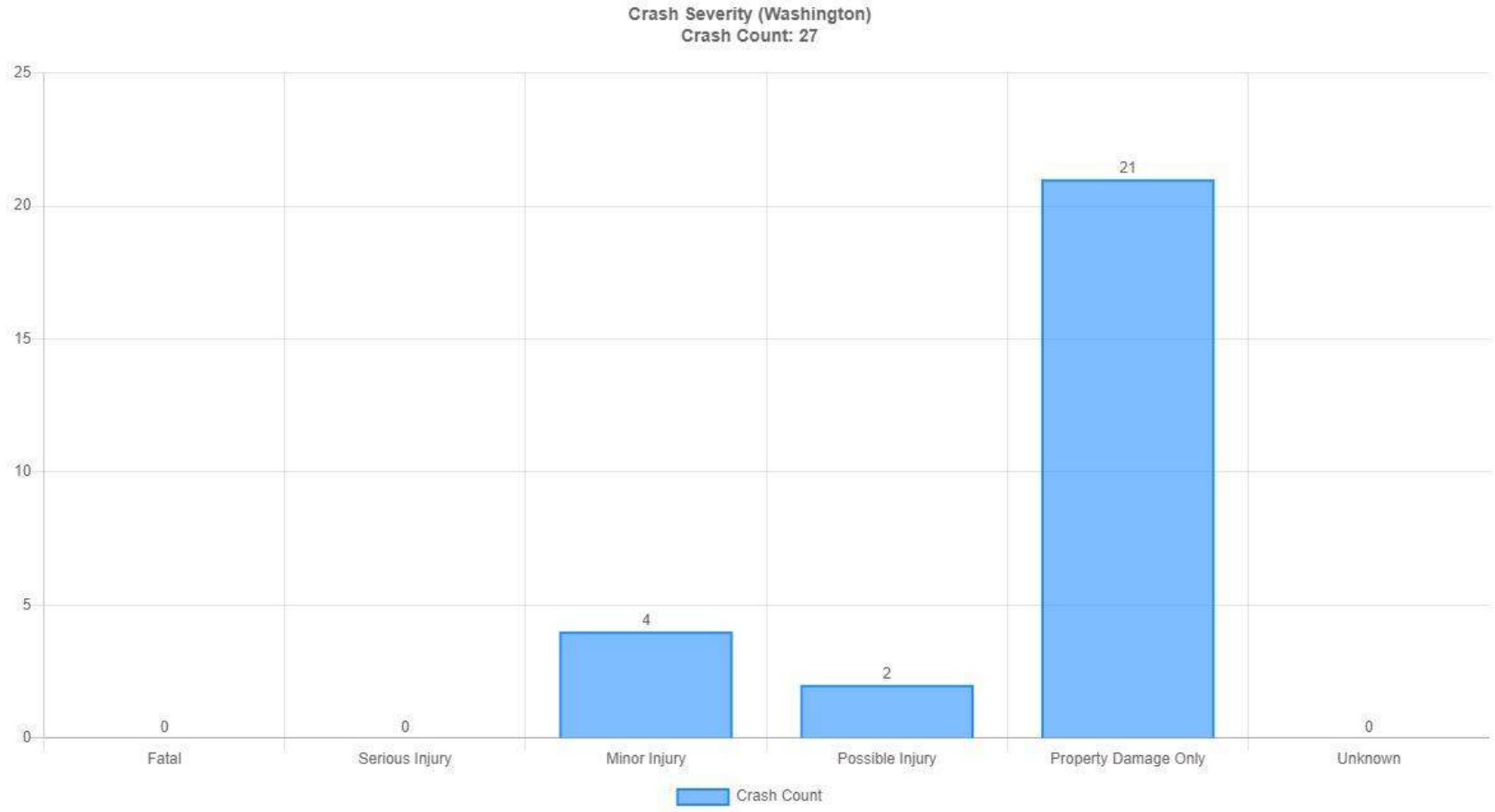
Fatal & Serious Injury Crash Rate	
Observed	0.000
Statewide Average	0.690
Critical Rate	4.580
Critical Index	**0.00**

The observed crash rate is the number of crashes per million entering vehicles (MEV). The critical rate is a statistical comparison based on similar intersections statewide. An observed crash rate greater than the critical rate indicates that the intersection operates outside the expected, normal range. The critical index reports the magnitude of this difference (i.e. observed crash rate ÷ critical crash rate).

The observed total crash rate for this period is 0.41 per MEV; this is 54% below the critical rate. Based on similar statewide intersections, an additional 13 crashes over the five years would indicate this intersection operates outside the normal range.

The observed fatal and serious injury crash rate for this period is 0.00 per 100 MEV; this is 100% below the critical rate. The intersection operates within the normal range.


Basic Type (Washington)
Crash Count: 27
16
14
12
10
8
6
4
2
0
0
0
0
1
1
1
5
0
2
15
2
Pedestrian
Bike
Single Vehicle Run Off Road
Single Vehicle Other
Sideswipe Same Direction
Sideswipe Opposing
Rear End
Head On
Left Turn
Angle
Other
Crash Count


Crash Severity (Washington)
Crash Count: 27
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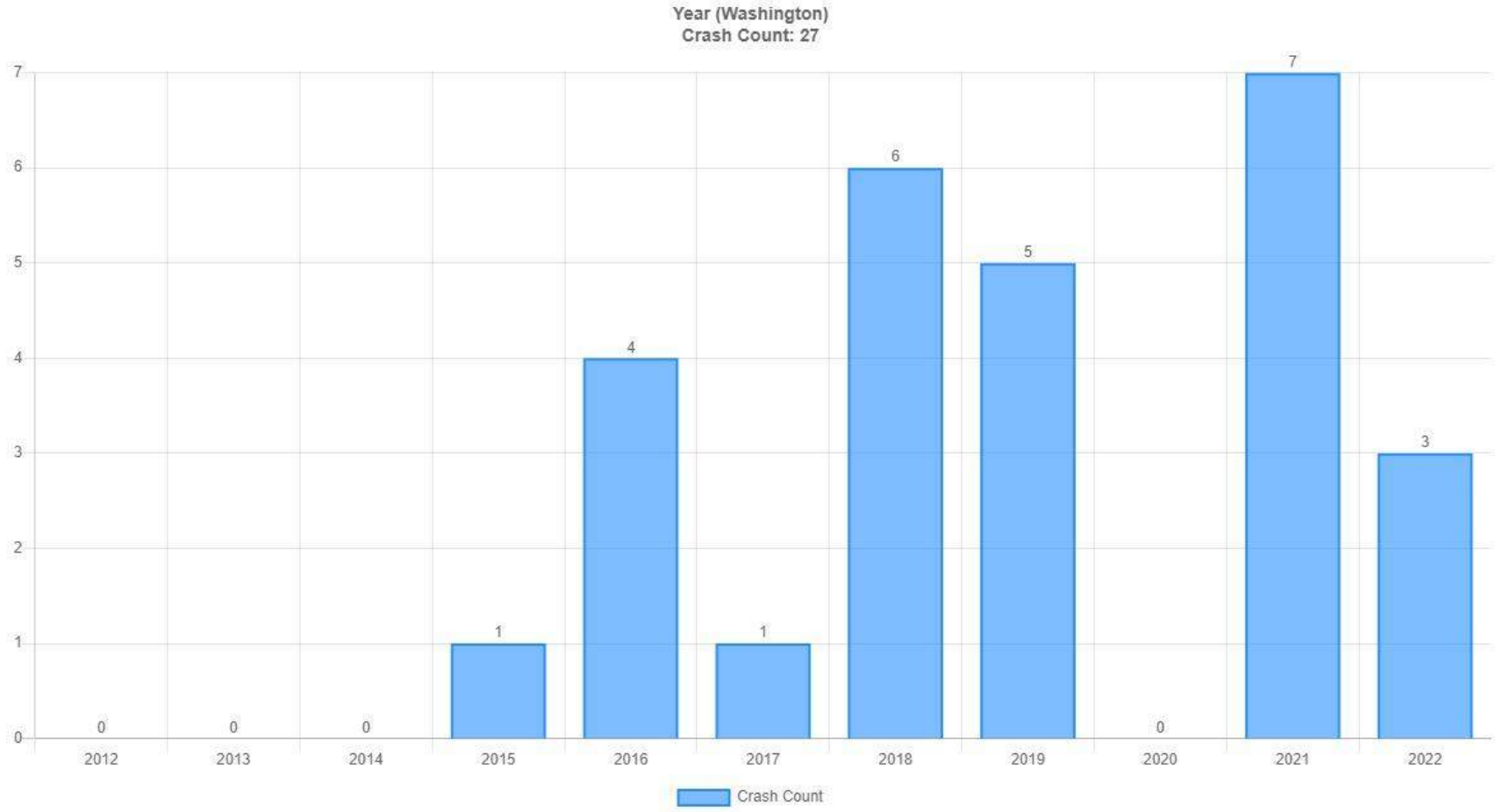
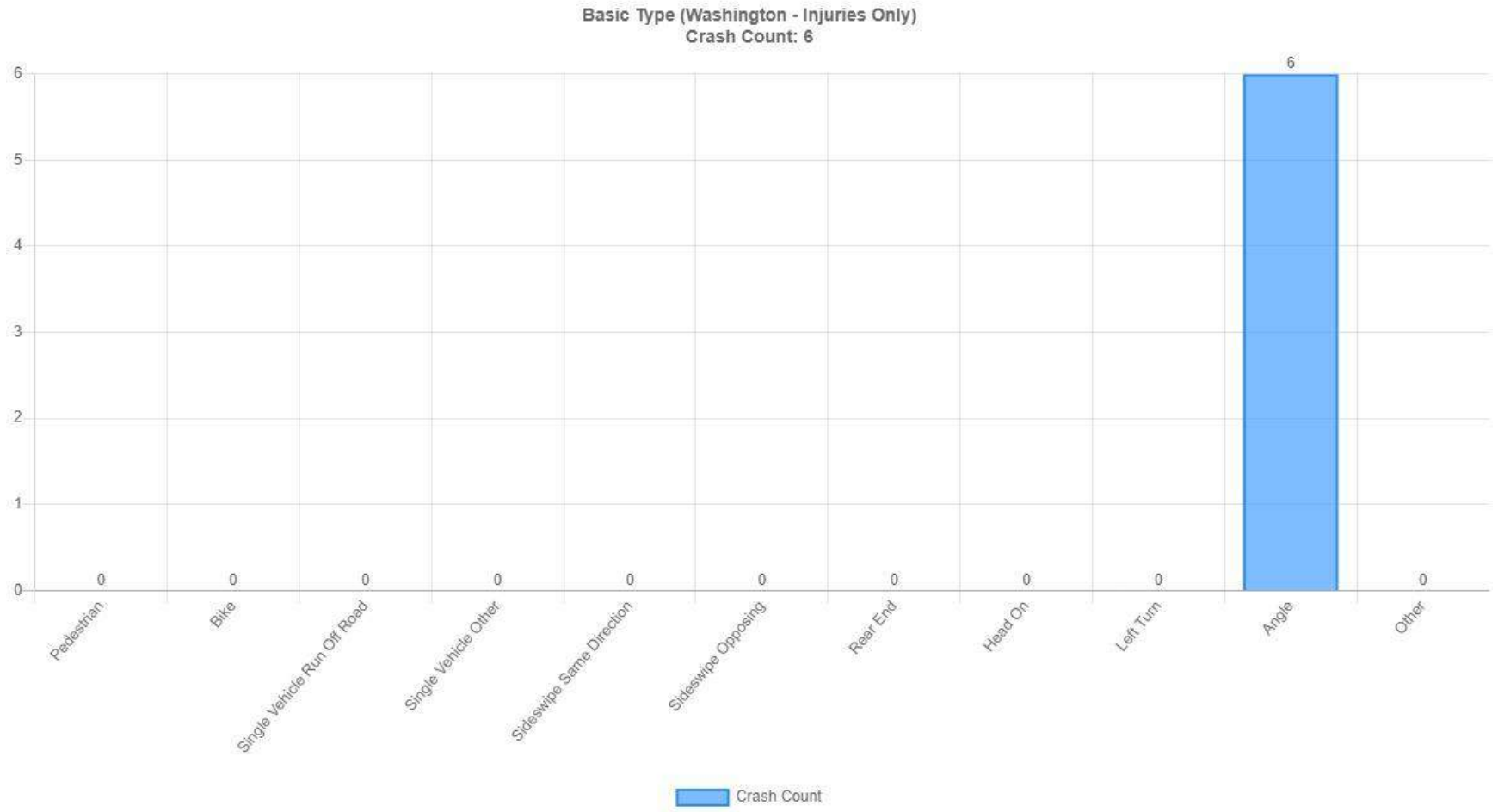
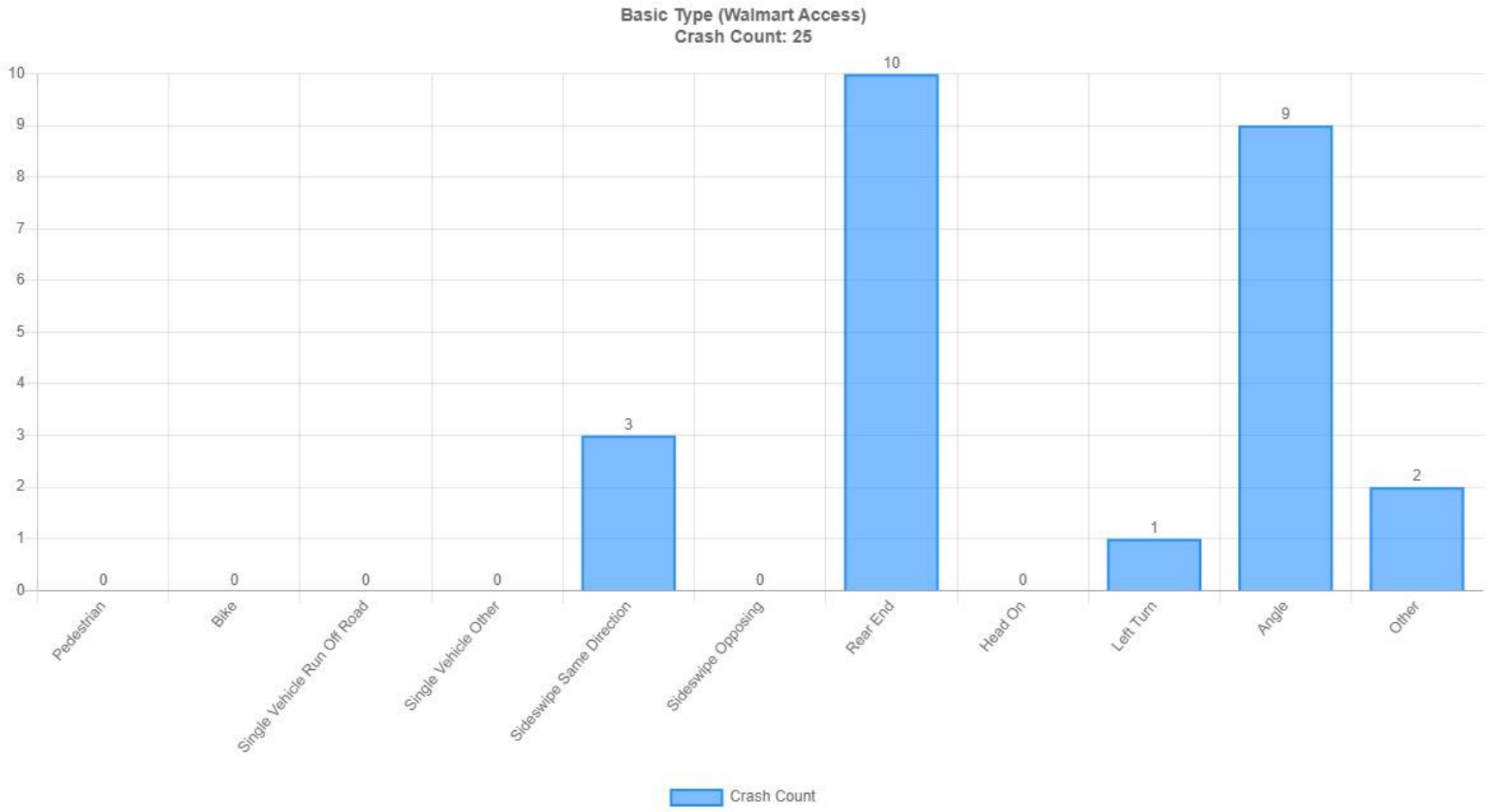
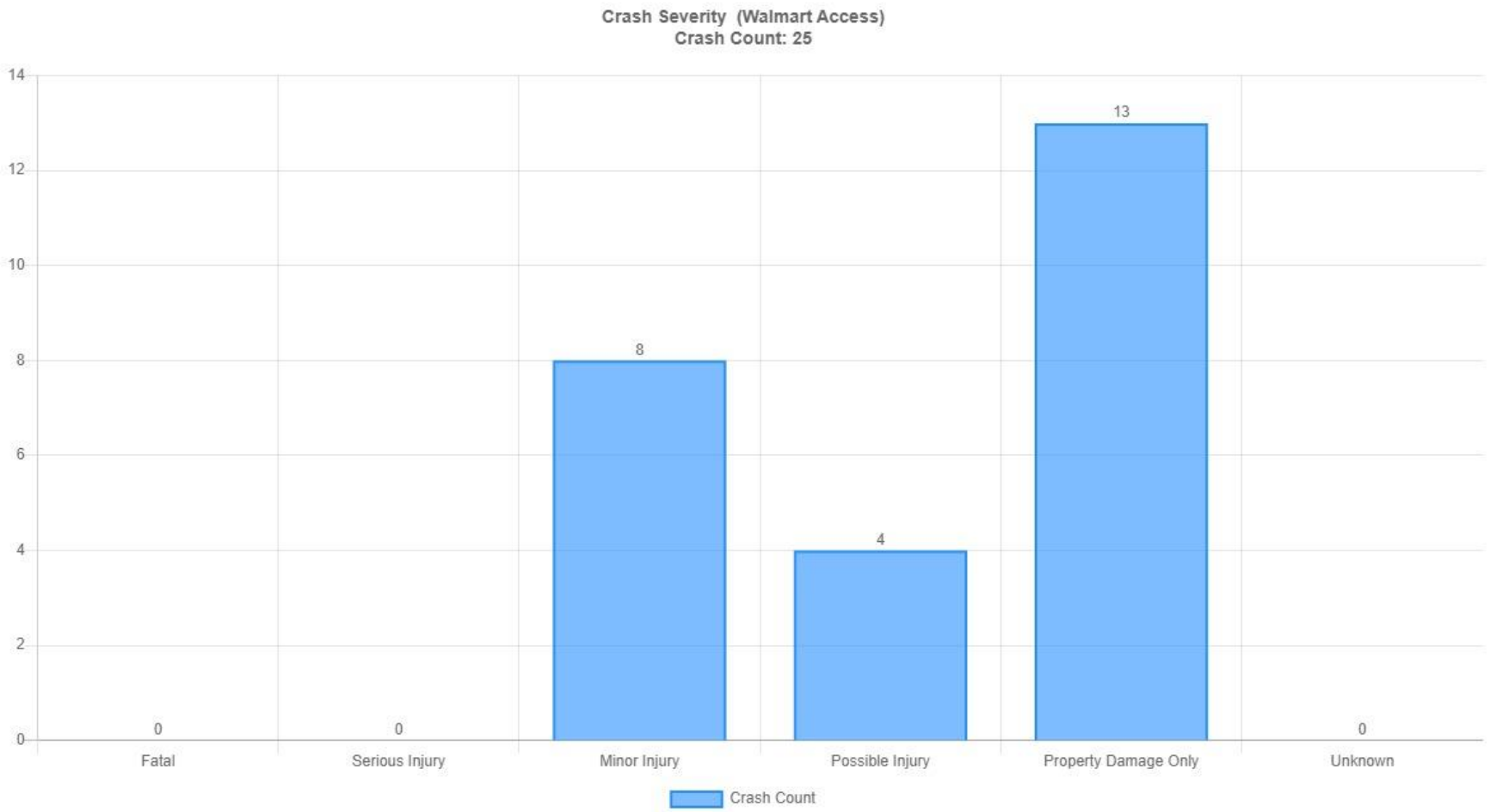
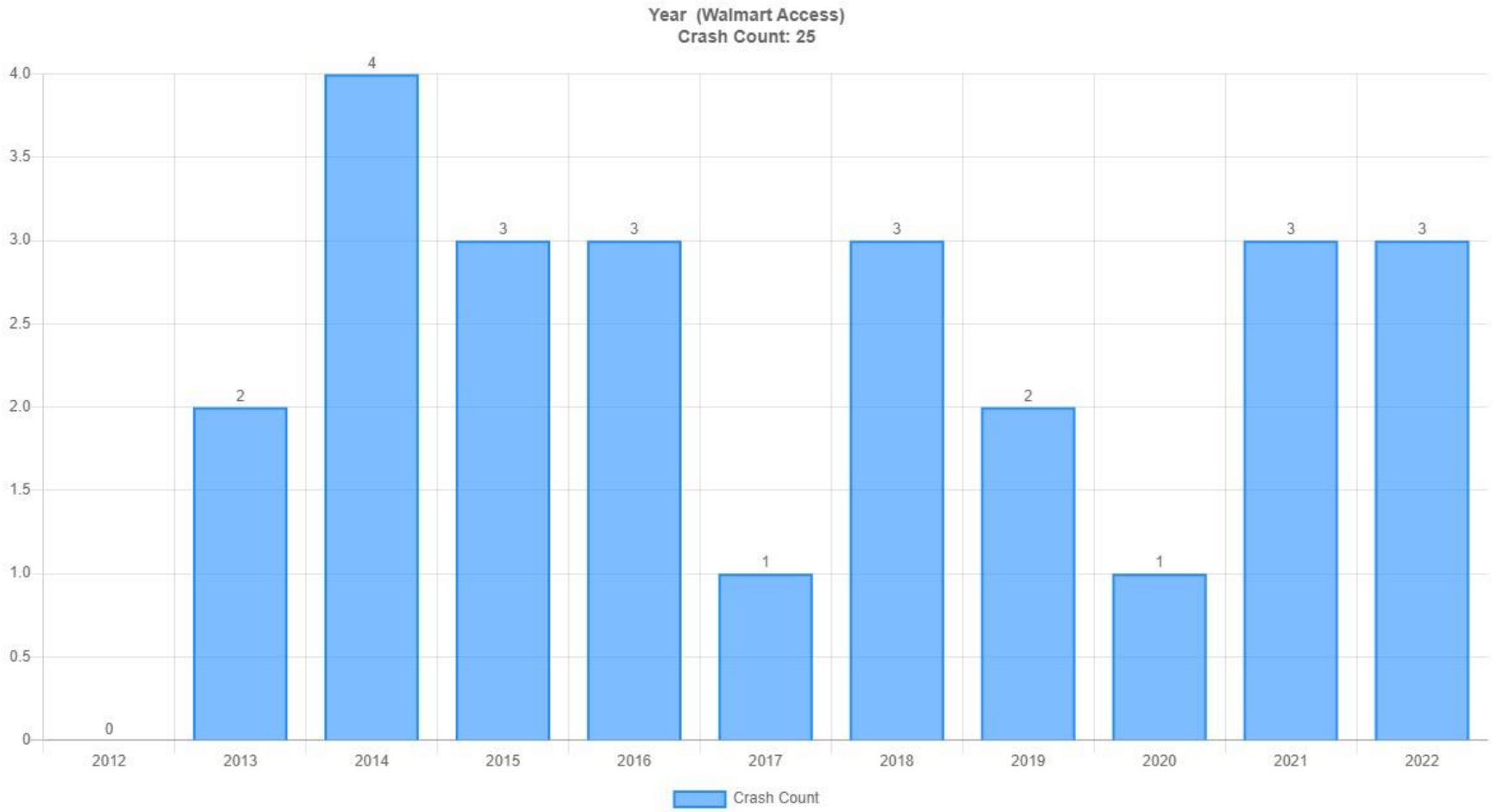
20
15
10
5
0
0
0
4
2
21
0
Fatal
Serious Injury
Minor Injury
Possible Injury
Property Damage Only
Unknown
Crash Count

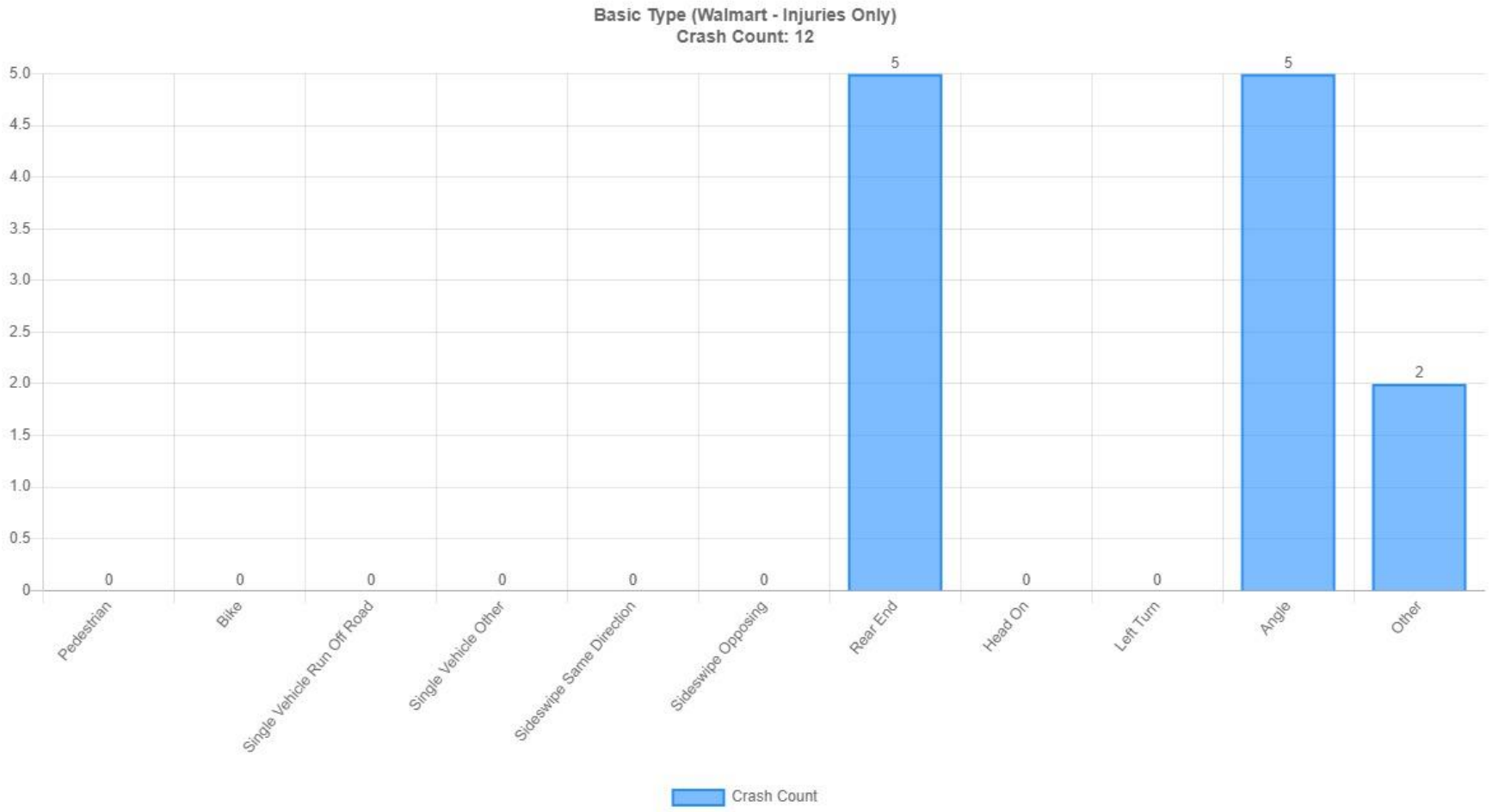

Year (Washington)
Crash Count: 27
7
6
5
4
3
2
1
0
0
0
0
1
4
1
6
5
0
7
3
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Crash Count


Basic Type (Washington - Injuries Only)
Crash Count: 6
6
5
4
3
2
1
0
0
0
0
0
0
0
0
0
0
6
0
Pedestrian
Bike
Single Vehicle Run Off Road
Single Vehicle Other
Sideswipe Same Direction
Sideswipe Opposing
Rear End
Head On
Left Turn
Angle
Other
Crash Count

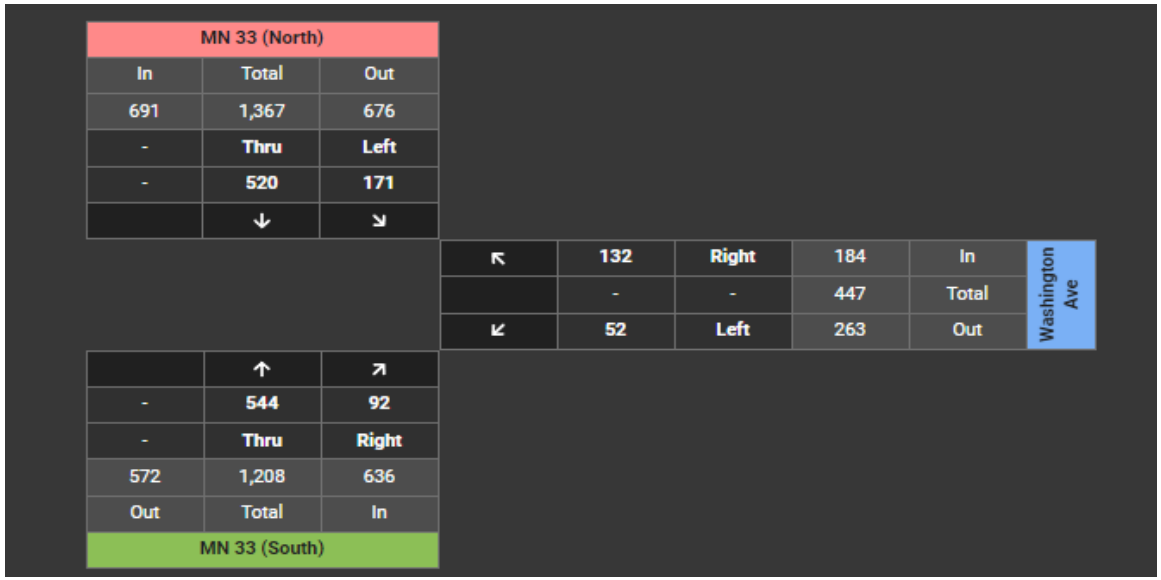

Basic Type (Walmart Access)
Crash Count: 25
10
9
8
7
6
5
4
3
2
1
0
0
0
0
0
3
0
10
0
1
9
2
Pedestrian
Bike
Single Vehicle Run Off Road
Single Vehicle Other
Sideswipe Same Direction
Sideswipe Opposing
Rear End
Head On
Left Turn
Angle
Other
Crash Count


Crash Severity (Walmart Access)
Crash Count: 25
14
12
10
8
6
4
2
0
0
0
8
4
13
0
Fatal
Serious Injury
Minor Injury
Possible Injury
Property Damage Only
Unknown
Crash Count

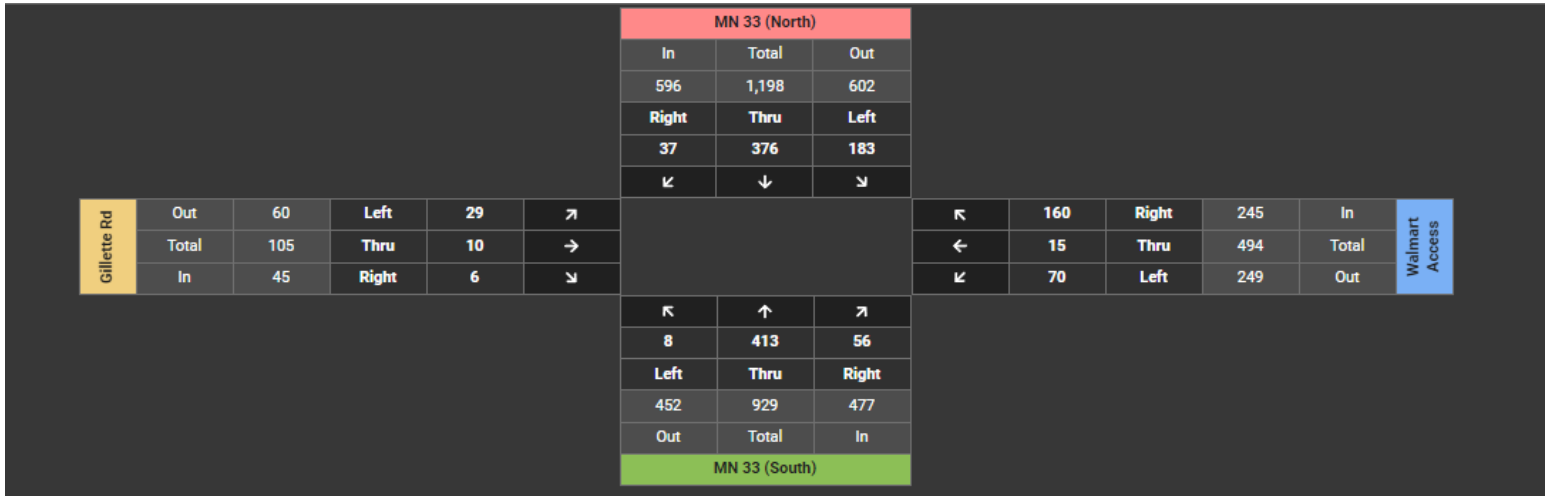

Year (Walmart Access)
Crash Count: 25
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
0
2
4
3
3
1
3
2
1
3
3
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Crash Count


Basic Type (Walmart - Injuries Only)
Crash Count: 12
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
0
0
0
0
0
5
0
0
5
2
Pedestrian
Bike
Single Vehicle Run Off Road
Single Vehicle Other
Sideswipe Same Direction
Sideswipe Opposing
Rear End
Head On
Left Turn
Angle
Other
Crash Count

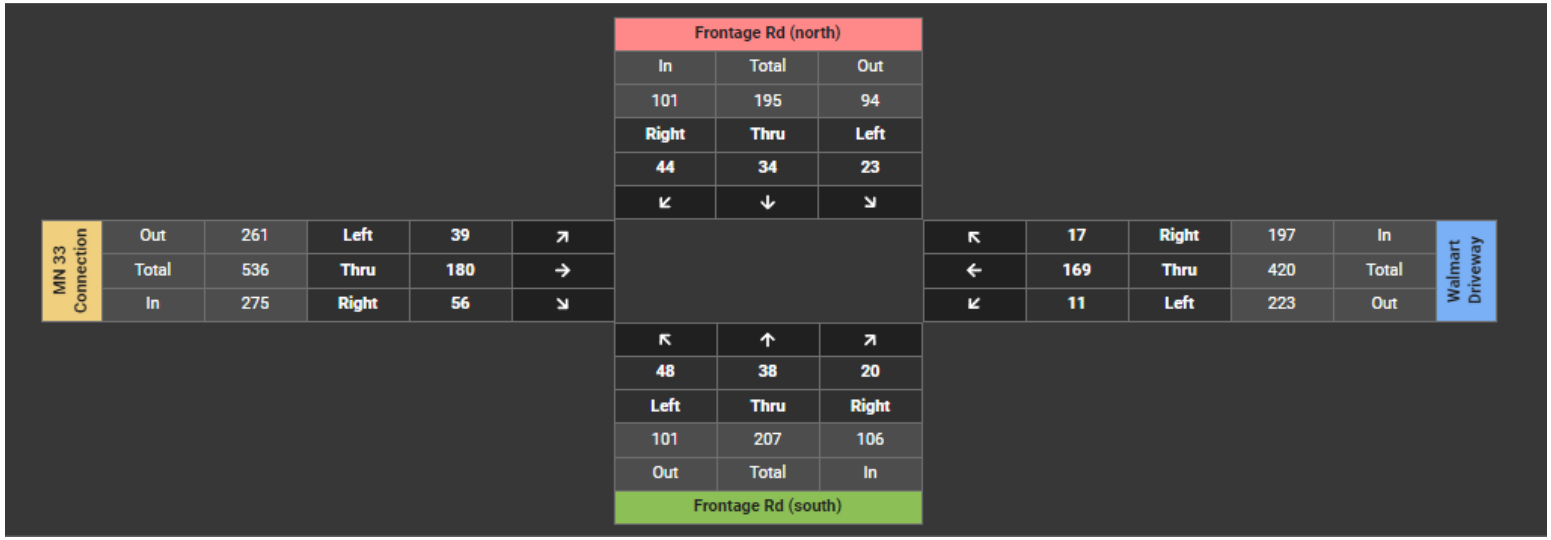
PM Peak volumes at MN 33 & Washington Ave



PM Peak Volumes at TH 33 & Frontage Rd (near Walmart)



PM Peak Volumes at the Frontage Road/Walmart Driveway intersection (just east of MN 33)



PM Peak Volumes at MN 33 & Big Lake Rd / Doddridge Ave

Overall Concept Map

Section ‘A’ Enlargement | Concept

Big Lake Rd

Improvements to intersection - see Enlargement ‘B’ concepts

Doddridge Ave

Tillman Ct

Lumberjack Mall Rd

Armory Rd

Sahlman Ave

Convert sidewalk to multi-use trail

8th St

9th St

Holmes Dr

33

Holmes Dr

Washington Ave

A

A′

Gillette Rd

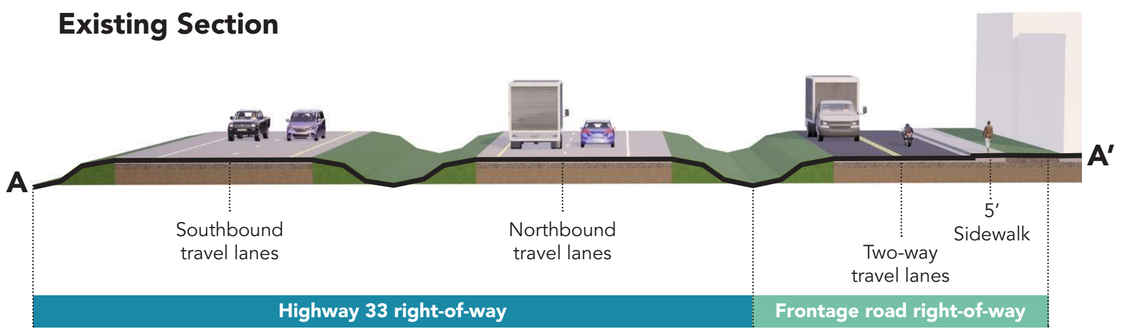
Stanley Ave

Connect to south gateway

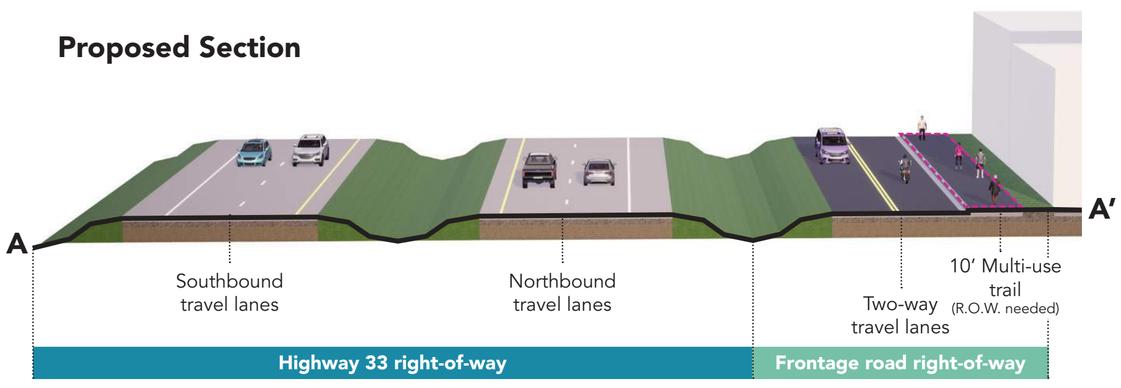
Walmart Parking Lot

0 120 240 Feet

Existing Section



Proposed Section



Section ‘B’ Enlargement | Concept 1

Enhanced crossing to Pinehurst Park

Grade separated crossing

Narrow turn lane

Multi-use trail on west side of roadway

Retaining wall required, impact to trees

Reduce median, shift lanes east

Enhance crossing with refuge island

See Enlargement ‘A’

Pinehurst Park

Carlton Ave

Pinehurst Park Dr

Lake Ave

3rd St

Selmser Ave

2nd St

Geihan Way

Ann Cir

Helen Cir

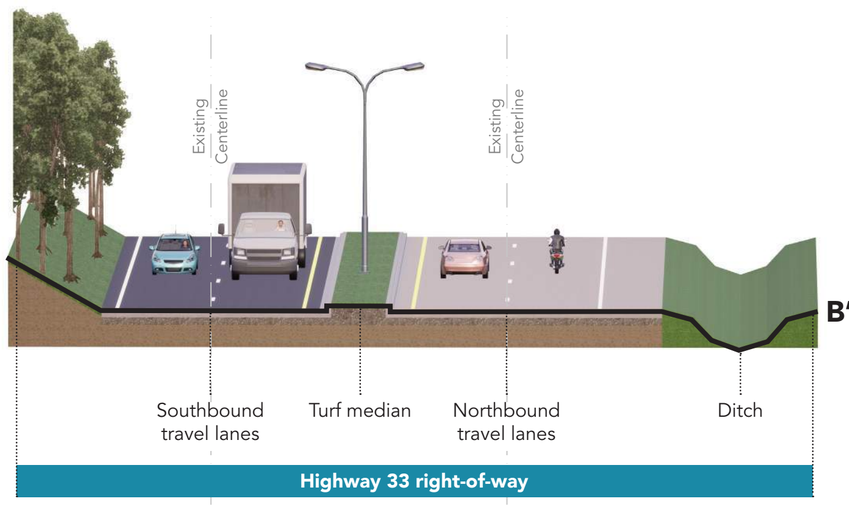
Big Lake Rd

33

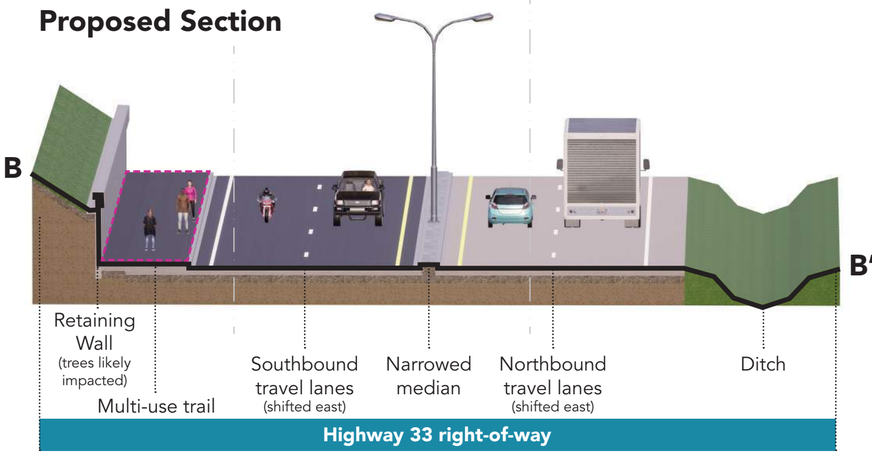
B

B′

Existing Section



Proposed Section



0 60 120 Feet

Section ‘B’ Enlargement | Concept 2

Enhance crossing with refuge island

Remove segement of Pinehurst Park Dr

Snowmobile trail on west side of roadway

Trail crossing

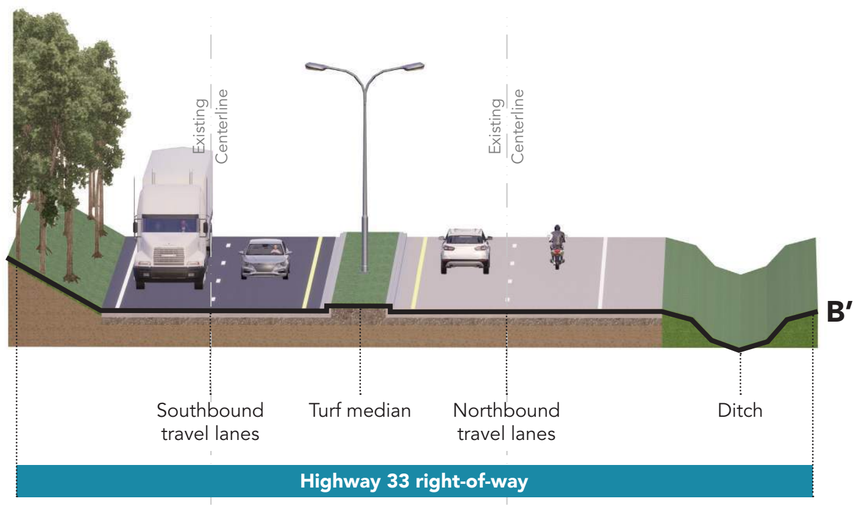
Reduce median, shift lanes east

Multi-use trail on east side of roadway

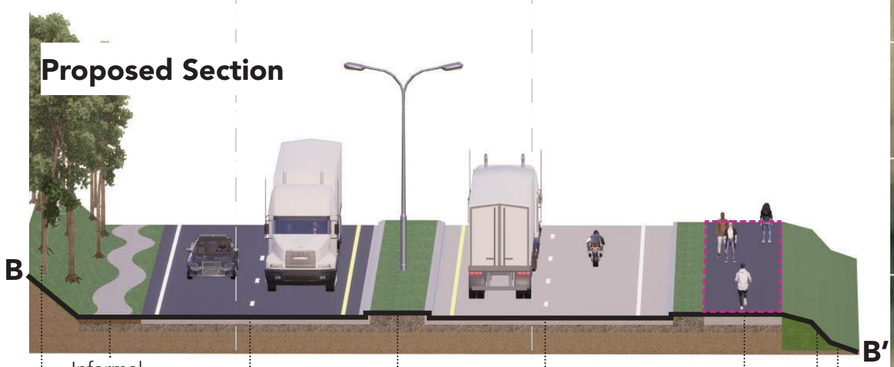
Trail crossing

See Enlargement ‘A’

Existing Section



Proposed Section



Pinehurst Park

Carlton Ave

Pinehurst Park Dr

33

Lake Ave

3rd St

Selmser Ave

Geihan Way

Ann Cir

Helen Cir

2nd St

3rd St

Big Lake Rd

0 60 120 Feet

Section ‘B’ Enlargement | Concept 3

Enhanced crossing to Pinehurst Park

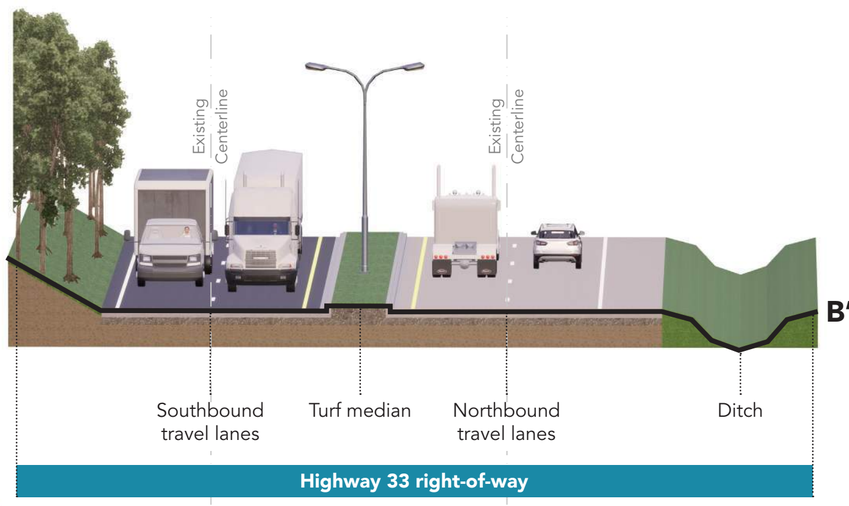
Grade separated crossing

Narrow turn lane

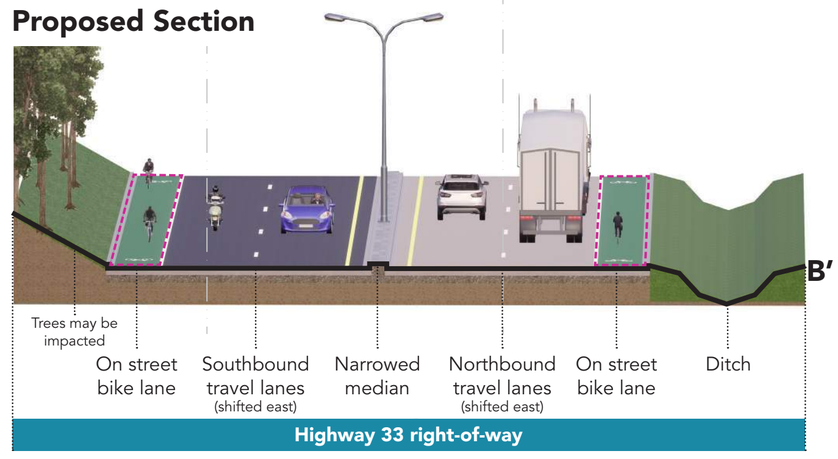
Pinehurst Park

Carlton Ave

Existing Section



Proposed Section



Pinehurst Park Dr

Lake Ave

3rd St

33

Selmser Ave

On street bike lanes, retaining wall may be required along west side of roadway

Reduce median, shift lanes east

Geihan Way

Ann Cir

Helen Cir

2nd St

3rd St

B

B′

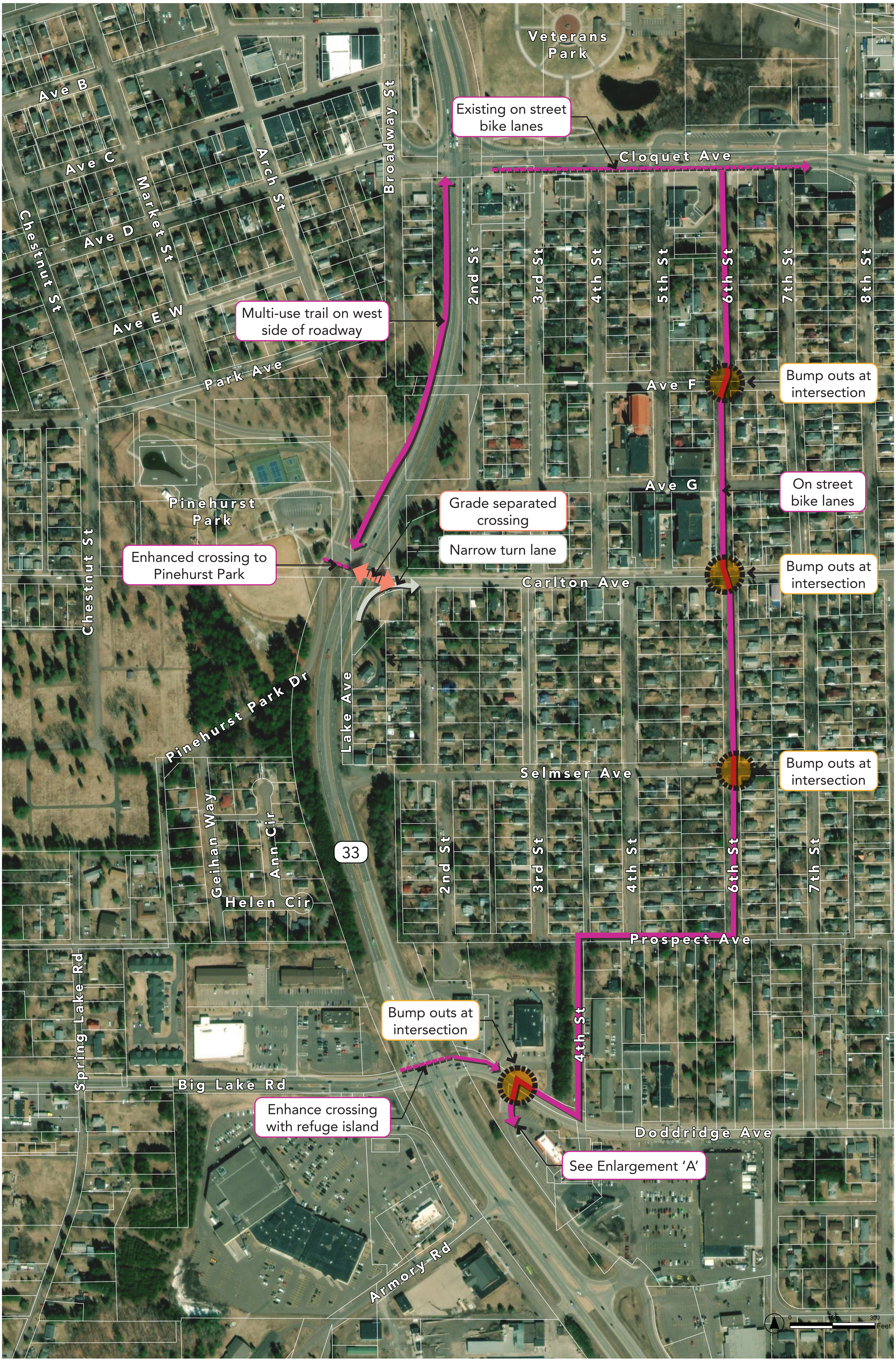
Enhance crossing with refuge island

See Enlargement ‘A’

0 60 120 Feet

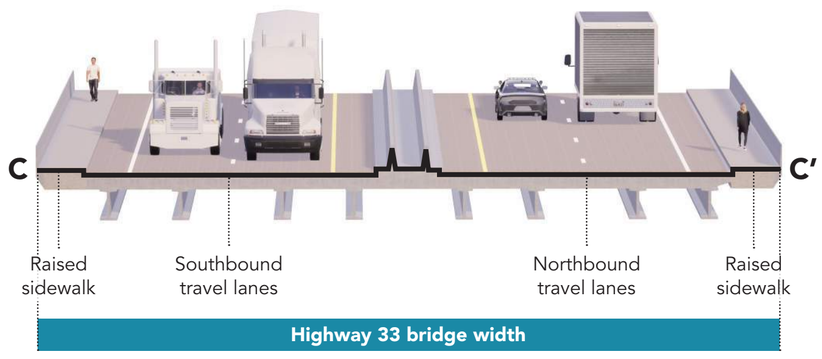
Big Lake Rd

Section ‘B’ Enlargement | Concept 4

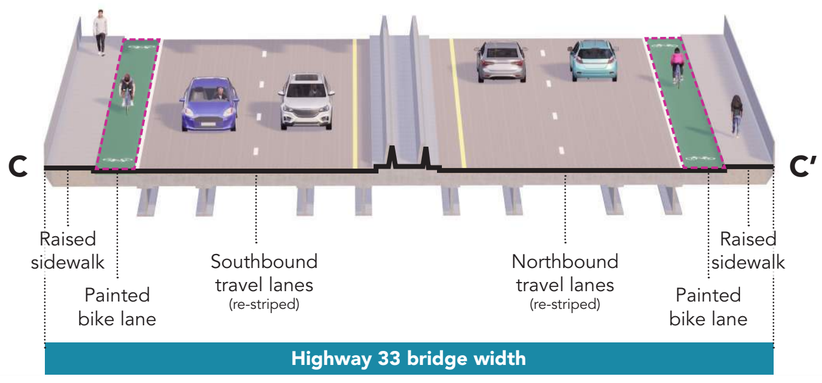


Section ‘C’ Enlargement | Concept

Existing Section



Proposed Section



Broadway St

33

St. Louis River

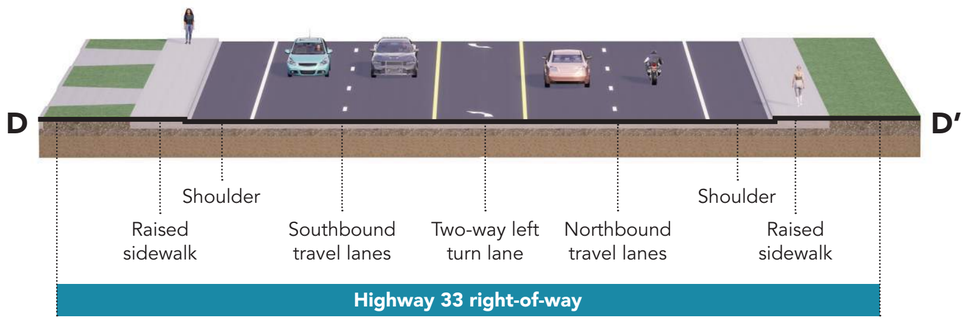
C

Re-stripe bridge deck to include on-street bike lanes

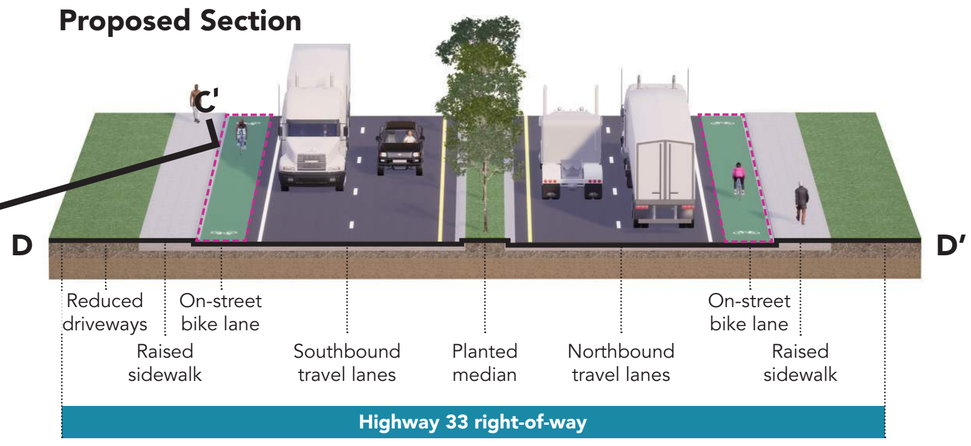
0 20 40 Feet

Section ‘D’ Enlargement | Concept

Existing Section



Proposed Section



C

C'

33

North Rd

Enahnce intersection, north gateway

Slate St

Agate St

Granite St

Adams St

On-street bike lanes

D

D'

Reduce driveways

Planted median

0 60 120 Feet