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MEMORANDUM

TO: Darrel Olson - City of Baxter Mayor
Baxter City Council Members

FROM: Justin Anibas, PE (MN)

DATE: October 19, 2021

RE: Inglewood Drive Resident Comment Response Memorandum
SEH No. BAXTE 159420

This technical memorandum is in response to the following resident comment emailed to the Baxter City Council members on October 15, 2021. This memorandum will address the resident comment as well as explain the engineering decisions that have resulted in the recommendations for the Inglewood Drive/Foley Road project.

Good Evening,

I would like to make a proposal regarding the Foley Dr construction project.

This idea was brought up in 1997 and was poo poo'd away by MNDOT at the time,,, to solve the Elder Drive traffic issue coming in off hwy 210, I propose changing the proposed plan of moving the stoplight from Knollwood to Inglewood, to moving it actually a little further east to the commercial area by the John Deer Dealership. Hear me out,,, I know MNDOT will have a conniption as that would put the stoplight under the 1 mile restriction from hwy 371/210 light. But how hypocritical is it that they just installed the new light at the Cypress/210 intersection by Super One ?

I measured that today,,, it is exactly 5/10 of a mile to the 371/210 lights,,, 1/2 a mile ! and then there is the Excelsior intersection,, what is that ? 2 blocks ?

if it takes making that a 45 mph zone until you get past those lights, then so be it,,, it would definately solve the Elder Rd issue even if MNDOT decides they want to close it.

How about we as the city of Baxter approach them and say, hey, lets close that intersection and have everyone come in and out of a new stop light by the John Deer dealership,,,

Foley, Knollwood and Inglewood residents would not have all that unnecessary traffic through their neighborhoods.

this also would take care of the problem of completing this project in 2022 and 2-3 years later, a new study is started to figure out how to improve the area and us homeowners get to pay for it again,,,

as long as you are moving the lights and closing and reopening a RR crossing, why not make it a more feasible plan for the commercial district and mitigate any other future traffic studies and threats by MNDOT

MNDOT ACCESS SPACING POLICY

In July 2021, MnDOT completed the TH 210 Baxter Access Study, which studied the existing and future access needs along TH 210 through Baxter. Page 16 of the attached *TH 210 Baxter Access Study Report* discusses MnDOT's access guidelines for Highway 210 within Baxter. The report references a MnDOT Specific Area Access Management Plan for TH 210 through Baxter that was completed in 1997, nearly 25 years ago. As part of that study MnDOT designated TH 210 as an "urban/urbanizing roadway" east of TH

371 and allows primary accesses (i.e. signals) at ½ mile spacing and secondary accesses (i.e. ¾ accesses) at ¼ mile spacing. However, west of TH 371, TH 210 is designated a “rural” roadway where primary accesses are spaced at 1 mile with secondary accesses at ½ mile spacing. In the study, MnDOT is open to possibility of reclassifying the section of TH 210 from TH 371 to Inglewood Drive when it meets the appropriate criteria, but it currently does not meet the criteria for a change to an “urban/urbanizing” roadway.

MNDOT CORRIDOR STUDY FINDINGS

Ultimately, the focus of the Inglewood Drive/Foley Road project is to complete the north-south reliever roadway that will run parallel to TH 371 between County Roads 48 and 77. While the City is aware of the existing safety and operational issues at the Elder Drive access to TH 210, that intersection was a part of MnDOT’s TH 210 Baxter Access Study and was not a part of the Inglewood Drive/Foley Road Project. However, the proposed Inglewood Drive/Foley Road improvements could allow for a future relocation of the Elder Drive intersection.

The City and MnDOT have discussed the existing operational and safety issues at the Elder Drive intersection several times throughout the MnDOT TH 210 Baxter Access Study. That study recommended that the existing Elder Drive access be shifted approximately ¼ mile to the west to line up with Forthun Road and Flintwood Drive (page 34 of attached *TH 210 Baxter Access Study* Report). MnDOT identified this as a “long-term” project that will occur 15 to 20 years from now. MnDOT’s study provided an interim fix of installing a signal at the existing Elder Drive intersection to improve safety for westbound left turns and northbound right turns in the next 5 to 14 years to mitigate the safety and operational issues until the Elder Drive access can be relocated.

When Elder Drive is relocated 15 to 20 years from now, MnDOT’s study recommends a reduced conflict intersection (RCI) at the relocated Elder Drive intersection. However, MnDOT is open to the idea of potentially adjusting their classification of TH 210 between Inglewood Drive and TH 371 at that time to allow for signals at ½ mile spacing, which would allow for the relocated Elder Drive intersection to be signalized.

The existing signal at Knollwood Drive does not currently meet MnDOT’s access spacing guidelines of 1 mile spacing between primary accesses as it is approximately 0.71 miles east of County Road 48. By moving the signal from Knollwood Drive to Inglewood Drive, TH 210 will meet access spacing guidelines with at least 1 mile between each primary access.

While the Inglewood Drive/Foley Road Project started before MnDOT’s TH 210 Baxter Access Study, it is likely that their study would have come to the same conclusion about moving the signal from Knollwood Drive to Inglewood Drive. When the TH 210 Baxter Access Study begun, planning for the Inglewood Drive/Foley Road Project was temporarily paused to ensure that the City’s plan for Inglewood Drive fit within MnDOT’s findings. Based on discussions with MnDOT and the conclusions in their *TH 210 Baxter Access Study* Report, MnDOT supports the City’s plan of moving the signal from Knollwood Drive to Inglewood Drive to provide better north-south connectivity through Baxter. Based on moving the signal to Inglewood Drive, MnDOT concluded an RCI would be the best alternative for the intersection of TH 210 at Knollwood Drive.

CITY OF BAXTER REGIONAL TRANSPORTATION PLAN

The Knollwood Drive intersection was signalized and the southern access at Inglewood Drive was closed in 1998 during a MnDOT project to expand TH 210 and construct local frontage roads between each access point to provide connectivity along TH 210 based on a study completed in 1997. The 1997 TH 210 study did not include input from the City of Baxter and MnDOT chose to install the traffic signal at Knollwood Drive because it provided access south of Highway 210 to County Road 48.

Since the 1997 MnDOT study, the City of Baxter has developed a Long Range Transportation Plan to help support anticipated growth and address existing and future connectivity and access needs. This plan identifies planned parallel reliever roadways to TH 371 between County Roads 48 and 77 within Baxter, shown in Appendix 1 of the attached *2022 Inglewood Drive Railway Crossing and Associated Roadway Improvements – Project History and Purpose* Memorandum. The two parallel reliever roadways identified were Cypress Drive east of TH 371 and Isle Drive/Foley Road/Inglewood Drive west of TH 371. The purpose of these parallel reliever routes is to increase traffic efficiency in Baxter by offering alternate routes that would be chosen/preferred by local traffic over TH 371.

The primary purpose of the proposed Inglewood Drive/Foley Road improvements is to connect Isle Drive to Inglewood Drive to complete the western reliever roadway connecting County Roads 48 and 77, which has been a part of the City's Long Range Transportation Plan for 20+ years.

RAILROAD REQUIREMENTS

BNSF Railroad corridor extends along the south side of TH 210 through Baxter. It is extremely difficult to add railroad crossings and BNSF typically requires the closing of two crossings to add a new crossing. Therefore, the moving of the Inglewood Drive railroad crossing requires the closing of the current crossing at Knollwood Drive. BNSF is supportive of the current proposed Inglewood Drive railroad crossing and the removing of the Knollwood Drive crossing.

MNDOT/RAILROAD/CITY APPROVED PLAN

The recommended improvements for the Inglewood Drive/Foley Road project have a primary purpose of completing the western parallel reliever to TH 371 by connecting Isle Drive to Inglewood Drive, completing the north-south connection between County Roads 48 and 77. The completion of this reliever will improve connectivity and traffic flow through Baxter. In addition, moving the signal and railroad crossing from Knollwood Drive to Inglewood Drive is in line with both MnDOT's and BNSF's access/crossing spacing guidelines.

Attachments:

MnDOT *TH 210 Baxter Access Study* Report – July 2021

2022 Inglewood Drive Railway Crossing and Associated Roadway Improvements – Project History and Purpose Memorandum – April 2021

c: Trevor Walter, PE – City of Baxter Engineer
Trevor Thompson, PE – City of Baxter Assistant Engineer
Scott Hedlund, PE – SEH

Attachment 1 – TH 210 Baxter Access
Study Report – July 2021



Real People. Real Solutions.

TH 210 Baxter Access Study

Study Report

Baxter, MN

July 22, 2021

Submitted by:

Bolton & Menk, Inc.
12224 Nicollet Avenue
Burnsville, MN 55337
P: 952-890-0509
F: 952-890-8065



Certification

Study Report

For

Trunk Highway 210 Baxter Access Study

Minnesota Department of Transportation – District 3

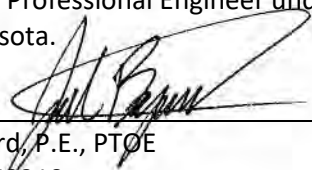
Baxter, MN

T49.M00120

July 22, 2021

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

By:



Jacob Bongard, P.E., PTOE
License No. 52210

Date: 7/22/2021

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Executive Summary

Trunk Highway (TH) 210 is a prominent east-west principal arterial roadway which travels through the cities of Baxter and Brainerd and serves regional traffic through Central Minnesota. Within the study area, beginning at Timberwood Drive and ending at Baxter Drive, TH 210 is primarily a four-lane divided suburban roadway for much of its length. West of Meredith Drive, TH 210 transitions to a two-lane undivided rural highway. The five-mile study area features high speed segments as well as segments introducing slower speeds in advance of entering the central Brainerd commercial area. A railroad under Burlington Northern Santa Fe (BNSF) jurisdiction runs parallel to the trunk highway on the south side, at-grade rail crossings are present at multiple intersections, often within 200 feet of TH 210. The railroad is a freight line serving approximately eight trains per day. **Figure 1** illustrates the project area and notable area features.

The TH 210 Baxter Access Study was initiated by the Minnesota Department of Transportation (MnDOT), in cooperation with the City of Baxter and Crow Wing County. During opportunities to provide feedback relating to the project area, the public noted peak hour delays, unsafe intersections, lack of continuous frontage road network and trails/pedestrian facilities, as well as a variety of other items as issues present within the project area. Evaluation of the corridor focused on three primary criteria: safety, operations, and potential impacts. Safety includes analysis of the crash history and potential crash reduction for vehicles and non-motorized users. Operations include analysis of the vehicular delay for the study area. Impacts consider the construction and financial impacts for potential alternatives considered.

Data from a five-year period (2015-2019) indicates that segments of the TH 210 corridor have a statistically higher crash rate when compared to similar roadways statewide. High numbers of crashes have occurred within this segment of roadway and numerous intersections are experiencing similar issues with trending left turn and right-angle crashes. In general, the alternatives proposed provide improved vehicular safety and operations, allow for safe pedestrian crossings where desired, and provide acceptable access management between primary and secondary intersections.

An inventory of the existing accesses and their locations reveals that inadequate access control is present through much of the corridor. Nearly all existing intersections do not limit or restrict movements and are spaced too closely to adjacent primary intersections. The lack of access management is likely causing operational and safety issues in several areas within the study area. A guided access plan which aligns with MnDOT Access Spacing Guidelines for the corridor while accommodating for local access needs.

Current traffic operations are a concern at several intersections during the normal peak hours. Additionally, increased traffic volumes due to summer cabin tourists further degrade the level of service provided in the study area. While TH 210 has adequate capacity to serve existing and forecast traffic volumes, intersection capacity improvements and adjustments are required to better provide local and regional mobility.

Additionally, extensive delays are observed in the Elder Drive-TH 371 area where a major regional intersection is near a large commercial area. An analysis of short- and long-term solutions at Elder Drive is considered, as well as a planning level analysis screening for potential interchange alternatives for the TH 210/371 intersection.

Two rounds of public engagement were conducted to ensure that the study recommendations align with the needs of the community and are able to gain public support before implementing. The first round of public engagement asked for public comment on the existing conditions of the corridor to assist in identifying problem areas. A second round of engagement was conducted in order to educate the public on general transportation safety and operations concepts used in decision making and to gain feedback on the proposed improvements. Both public outreach efforts were conducted online due to the COVID-19 pandemic and resulted in over 600 responses between both efforts. In general, comments received about

the existing conditions were reflective of the analyses conducted and mirrored feedback from stakeholder engineering and planning staff. Comments received on the proposed improvements were generally favorable and understanding of why certain countermeasures were selected over others.

Multiple alternatives for access management and intersection control were developed for the corridor. Alternatives were evaluated based on their ability to satisfy outlined goals developed by the project stakeholders. In general, the goals of the project were to support multimodal mobility, safely accommodate users, provide efficient and reliable mobility, be environmentally and socially compatible, and develop a fiscally responsible and implementable plan. Once the preferred alternative was identified, the study area was divided into project areas that could be feasibly implemented. This Implementation Plan identifies future project scopes, potential financial impacts, and estimated timelines for each project.

A summarized list of proposed improvements and studies are shown below:

Short-term

- Conduct additional public outreach and education before implementing TH 210 projects
- Restripe TH 210 as a two-lane section between CR 48 and Timberwood Drive
- Relocate $\frac{3}{4}$ access to Fairview Road east of CR 48 to align with Art Ward Drive
- Extend westbound left turn lane at CR 48
- Install an unsignalized Green-T intersection at Memorywood Drive
- Install traffic signal at Inglewood Drive, construct south leg with at-grade rail crossing
- Remove signal and trail crossing at Knollwood Drive and south leg of intersection
- Install RCI at Knollwood Drive with westbound MUT

Mid-term

- Install traffic signal on south half of existing Elder Drive intersection
- Further evaluate commercial area southwest of TH 210/371 intersection

Long-term

- Relocate Elder Drive to Forthun Drive/Flintwood Road, provide $\frac{3}{4}$ access, at-grade rail crossing, and local network improvements

Opportunity Driven

- Further evaluate TH 210/371 interchange
- Further evaluate CR 48 realignment to Memorywood Drive
- Timberwood Drive north leg expansion
- Timberwood Drive safety improvements



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Legend

0 0.25 Miles

Source: MnDOT, Cass County

Study Area

I. Study Introduction

Trunk Highway (TH) 210 is an important east-west principal arterial roadway through the cities of Baxter and Brainerd and serves regional traffic through Central Minnesota. Within the study area, beginning at Timberwood Drive and ending at Baxter Drive, is primarily a four-lane divided suburban roadway for much of its length. However, west of Meredith Drive, TH 210 transitions to a two-lane undivided rural highway. The five-mile study area features a 55 mile per hour posted speed limit from the western limit at Timberwood Drive to the segment between Inglewood Drive and Elder Drive where a 45 mile per hour limit is introduced. The 45 mile per hour limit is reduced to 35 mile per hour just west of Baxter Drive. The TH 210 intersection with TH 371 is signalized and a major junction of the two primary arterials through the greater region. A railroad under BNSF jurisdiction runs parallel to the trunk highway on the south side and deviates from the highway alignment east of TH 371. At grade rail crossings are present at the Timberwood Drive, CR 48, Knollwood Drive, Elder Drive, and TH 371 intersections, often within 200 feet of TH 210. The surrounding area is undeveloped and industrial in the west end of the corridor. The environment transitions to residential and commercial at Meredith Drive. The area becomes heavily commercial between Elder Drive and Baxter Drive. The corridor experiences increased traffic during the summer months due to cabin and tourist traffic. This corridor analysis will evaluate the existing and future conditions for the study area from Timberwood Drive to Baxter Drive.

II. Previous & Ongoing Studies

The study corridor is a crucial link in local and regional mobility and has been regularly studied by MnDOT, Crow Wing County, and City of Baxter forces. Past studies and planning documents have been reviewed and are listed below:

- Traffic Study for Excelsior Rd, Knollwood Dr and Inglewood Dr, City of Baxter – 2010
- Excelsior Road Area Transportation Study, City of Baxter – 2015
- 2020 Fairview Rd, Golf Course Dr, Excelsior Rd and Trail Connection Improvements, MnDOT - 2017
- Forestview Middle & New Elementary School Study TIS, City of Baxter – 2018
- TH 210 Signal Retiming Project, MnDOT – 2019
- TH 210/Washington Street Corridor Study, MnDOT, City of Brainerd – Ongoing, began Winter 2020

III. Recent & Planned Improvements

A MnDOT-led project constructing a $\frac{3}{4}$ intersection at Golf Course Drive and a new signal at Cypress Drive along with local network improvements was completed in 2018 along with signal timing optimization throughout the corridor.

The City of Baxter plans to close the south leg of Knollwood Drive, construct a south leg at Inglewood Drive along with a traffic signal is planned as a short-term improvement, likely beginning construction in 2022.

MnDOT and the City have partnered to fund the installation of lighting at the intersections of Meredith Drive and Memorywood Drive in 2021 to enhance vehicle safety at these currently sidestreet stop-controlled intersections. Efforts will be made to preserve and protect the installed lights with any proposed intersection improvements to avoid wasted funding.

IV. Existing Conditions Analysis

A. Data Collection

The project began during the COVID-19 pandemic which has a significant impact on traffic volumes and patterns on a local and regional level. Collecting traditional traffic count data during the period was not advisable as any collected data would likely not capture data that would be representative of normal traffic patterns in the area. Due to this limitation another approach must be taken utilizing a mix of historical count data and StreetLight Insight.

Traffic volume information from October of 2019 was collected using StreetLight Insight at all study intersections. This period was selected to capture pre-pandemic traffic patterns during a time when no construction was actively impacting local and regional mobility.

Turning movement counts from previously conducted studies were obtained for the following intersections:

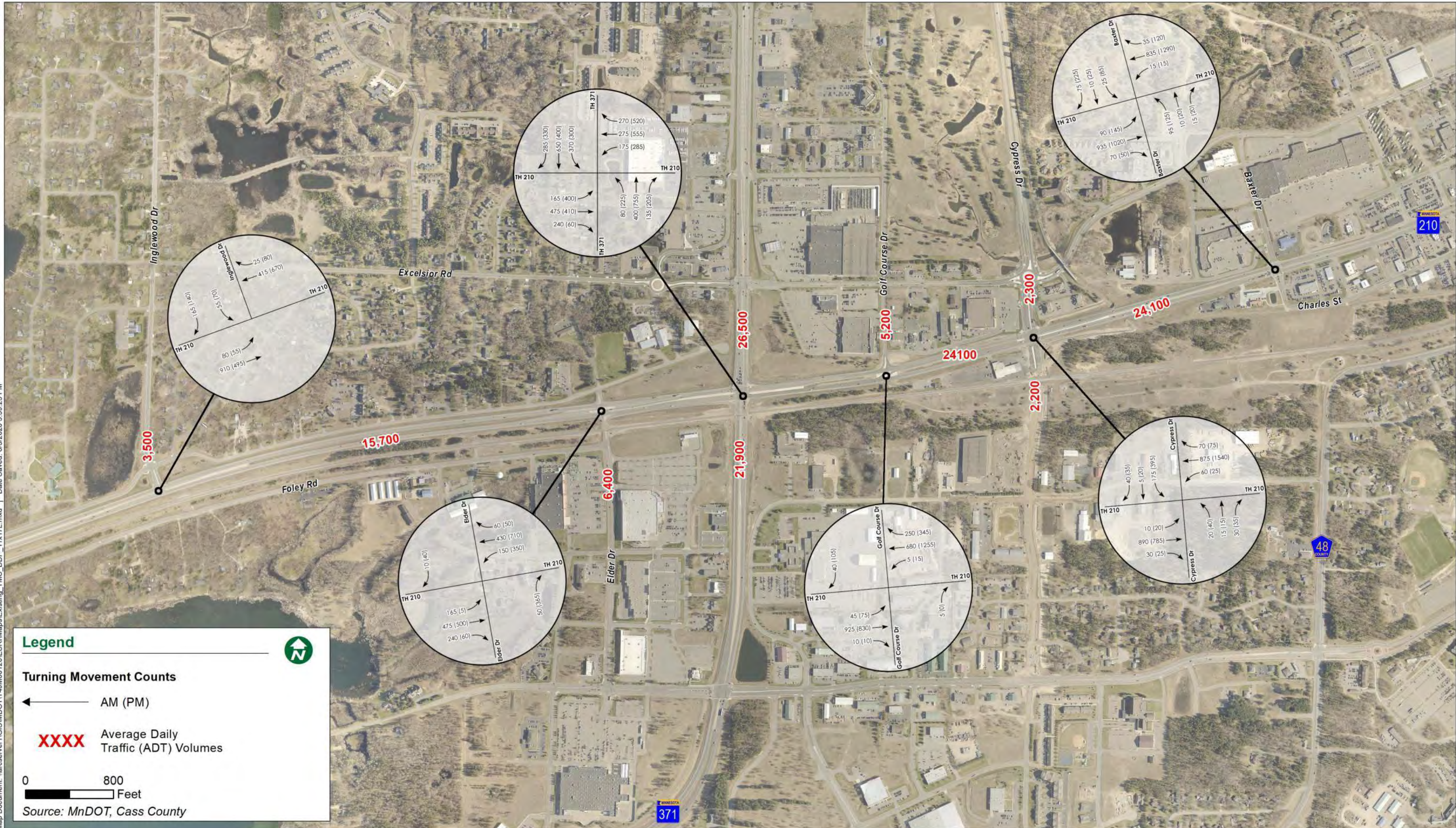
- CR 48, Knollwood Dr, Inglewood Dr – 2018 Study
- Elder Dr – 2015 Study
- TH 371, Golf Course Dr, Cypress Dr – 2018 Signal Retiming

In effort to avoid overreliance on StreetLight data, turning movement counts we developed for the study intersections by calibrating this data with the previously collected turning movement counts and historical AADT's. This process included comparing overall turning movement counts, turning movement proportions, and overall approach volumes in relation to daily traffic volumes. Historical turning movement count data was set as the absolute minimum in effort to be as conservative as possible in estimating the traffic volumes.

Traffic operations analysis typically considers the AM and PM peak hours of the day with the highest traffic volumes. The developed existing peak hour turning movements with most recent MnDOT AADT's are shown in **Figure 2**. Initial analysis determined that the PM peak hour was the controlling peak hour and will be the period observed in the existing and future traffic operations analyses.

Due to limitations in variations in historical data measuring heavy vehicle traffic, 6% heavy vehicles were assumed for thru movement traffic on TH 210 and TH 371, with 2% assumed for all sidestreet and turning traffic movements.





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B. Existing Safety Analysis

State crash data for the last five complete years of data (2015-2019) was reviewed. All crashes involving deer were removed from the analysis. Each intersection and roadway segment were analyzed individually to determine the observed crash rate, statewide average crash rate, critical crash rate and critical index. The crash rate is the number of crashes per million entering vehicles (MEV) for the intersection or segment. The statewide average crash rate is the average crash rate for similar type locations statewide. The critical crash rate is the statistical comparison based on similar locations statewide. The critical index is the comparison of the observed crash rate to the critical crash rate. A critical index greater than 1.0 indicates that the observed crash rate is greater than the critical rate and that the intersection or segment operates outside the expected, normal range. **Tables 1 and 2** summarize the safety analysis results for the intersections and the segments of the TH 210 study area.

Table 1: Intersection Crash Data

Intersection	Traffic Control	Total Crashes (2015-2019)	ADT	Crash Rate			
				Int. Rate	Statewide Average	Critical Rate	Crash Index
Timberwood & TH 210	TWSC	0	9,200	0.00	0.18	0.48	0.00
Meredith & TH 210	TWSC	2	9,200	0.12	0.18	0.48	0.25
Memorywood & TH 210	TWSC	13	12,675	0.56	0.18	0.43	1.30
Highland Scenic Dr & TH 210	Signal	13	15,325	0.46	0.40	0.72	0.64
Knollwood Dr & TH 210	Signal	16	15,150	0.58	0.40	0.72	0.81
Inglewood Dr & TH 210	TWSC	15	15,050	0.55	0.16	0.37	1.49
Elder Dr & TH 210	TWSC	45	16,600	1.48	0.18	0.40	3.70
Fairview Rd & TH 210	TWSC	1	13,400	0.04	0.18	0.43	0.09
TH 371 & TH 210	Signal	263	45,750	3.15	0.45	0.65	4.85
Golf Course Dr & TH 210	TWSC	29	29,800	0.53	0.18	0.34	1.56
Cypress Dr & TH 210	Signal	5	26,600	0.10	0.70	1.02	0.10
Baxter & TH 210	Signal	27	24,400	0.61	0.70	1.03	0.59

Rate Exceeds Critical Rate (Critical Index > 1.0)

A number of intersections have observed crash rates greater than the critical rate, indicating the intersection is operating outside of what can be expected. Most notably, the TH 371 and Elder Drive intersection experience a high number of crashes, many of which are rear end collisions. The Inglewood Drive and Memorywood Drive intersection also operate above the expected range and experience a notable number of left turn and right-angle crashes.

A 10-year history (2010-2019) was considered in screening for fatal, or pedestrian-related crashes. Two crashes are noted: one involving an eastbound/northbound right-angle collision at Knollwood Drive, and a pedestrian crash near the Paul Bunyan Trail underpass west of Baxter Drive.

Full intersection screening worksheets and graphics summarizing crash trends at each study intersection are shown in **Appendix A**.

A segment analysis was also conducted. Due to the varying environments present within the study area, the analysis considered three different segments.

Table 2: Segment Crash Data

Segment	To and From	Total Crashes (5 Years)	Crash Rate				Fatal & Serious Injury Rate			Severity Index
			Observed	Statewide Average	Critical Rate	Crash Index	Observed	Statewide Average	Critical Rate	
1	Timberwood Dr to Meredith Dr	2	0.14	0.76	1.39	0.10	0.00	1.97	8.87	0.00
2	Meredith Dr to TH 371	169	2.45	1.64	2.04	1.20	5.81	2.02	24.45	1.18
3	TH 371 to Baxter Dr	186	4.39	1.64	2.16	2.03	2.36	2.02	16.28	0.39

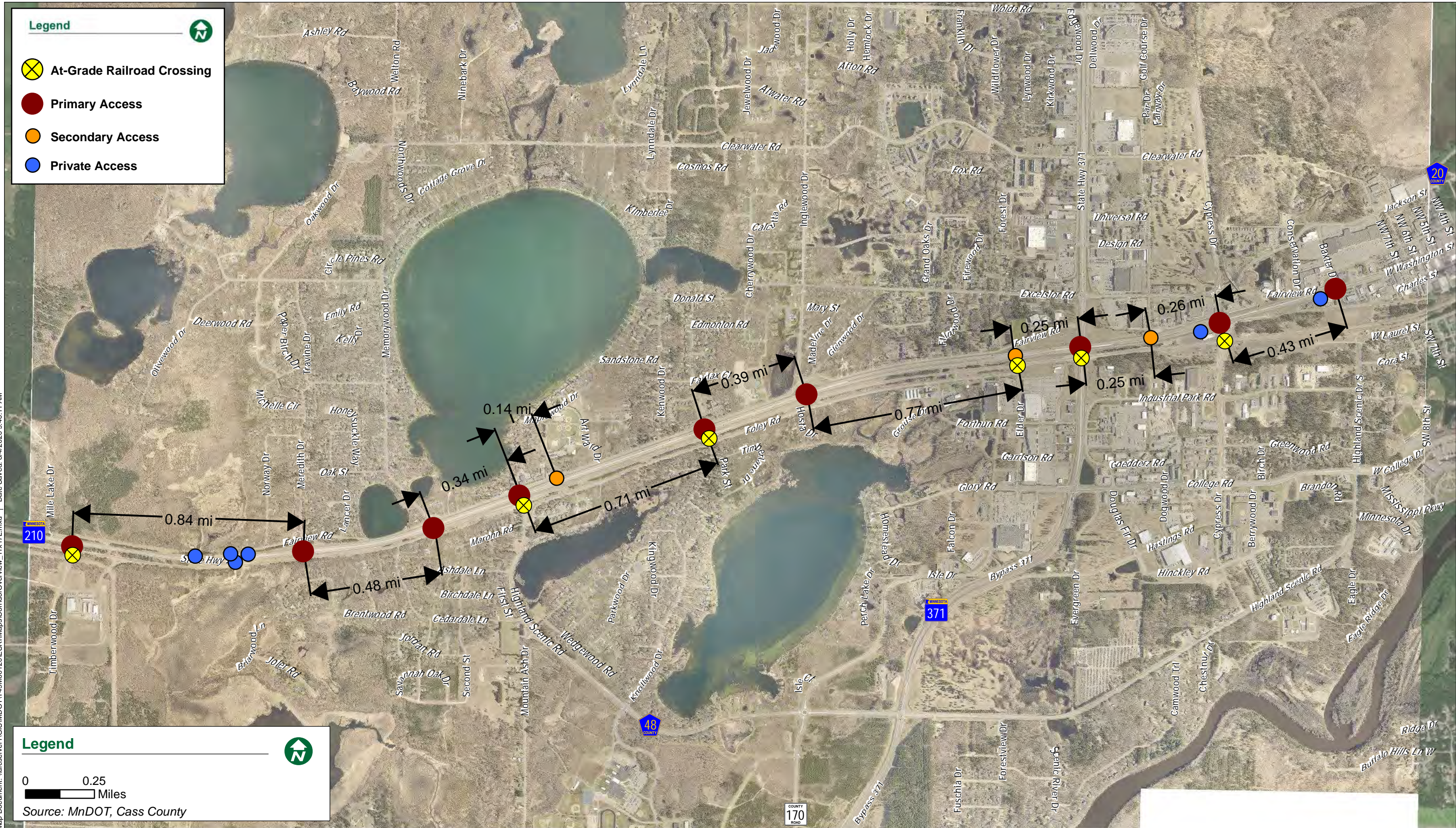
Analysis indicates TH 210 is operating above the expected levels between Meredith Drive to Baxter Drive. Additionally, the segment between Meredith and TH 371 operates with a severity index above 1.0.

C. Existing Access Inventory

An inventory of the existing access locations and types within the project area was conducted and documented, summarized in **Figure 3**. The study area features eight primary access intersections, three secondary access intersections, and six private driveway accesses. As previously noted, at grade rail crossings are present south of TH 210 at six studied intersections.

Primary access intersections have a high number of conflict points which increases the opportunity for vehicle and pedestrian crashes. Conflict points are locations where two vehicle movement paths intersect. Where these paths intersect perpendicularly, collisions are more likely to be severe and are identified as Major Conflict Points. Where vehicle paths intersect in a merging or diverging nature, collisions tend to be less severe, injuries are unlikely, and are termed Minor Conflict Points. Finally, locations where a vehicular path intersects with a pedestrian crossing are pedestrian conflict points.

Large intersections commonly feature a high number of conflict points and often require drivers to make complex judgements when navigating the intersection. Drivers and pedestrians must be aware of multiple lanes of traffic in several directions and find safe gaps in all traffic to successfully traverse the intersection. Establishing restricted movements, allowing drivers to consider one direction of oncoming traffic rather than two, removing unwarranted through lanes, and providing two-stage movements are possible measures that can reduce the number of conflict points, allowing drivers to make simpler and safer decisions. Efforts should be made to balance mobility and safety with proposed intersection improvements and access spacing guidance.



D. Existing Warrant Analysis

Traffic signal and all-way stop control (AWSC) warrants were completed using the turning movement counts collected as part of this study.

Traffic signal warrants have been developed as national guidelines to promote continuity of traffic control devices to ensure that traffic signals are installed at intersections that would benefit from their use. Warrant 1A and B (Eight-hour Vehicular Volumes), Warrant 2 (Four-Hour Vehicular Volume) and Warrant 3 (Peak Hour) as described in the MnMUTCD (Chapter 4C), were investigated as part of this study.

A traffic control signal should not be installed unless one or more of the warrants can be met. However, the satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic signal. Furthermore, a traffic control signal should not be installed unless an engineering study indicates that the traffic control signal will improve the overall safety and operation of the intersection. Finally, the signal should not disrupt the progressive flow of traffic.

Traffic signal warrants were completed using the existing turning movement counts. All intersections, apart from Timberwood Drive and Meredith Drive, meet at least one warrant for signalization.

AWSC can be useful as a safety measure at intersections if safety concerns exist because of high traffic volumes in multiple directions or if there is an insufficient sight distance available to see conflicting traffic on an approach to an intersection. The MnMUTCD states that the need for an AWSC shall be considered if one of the following conditions is met:

- Condition A: Where traffic control signals are justified, an all-way stop can be installed as an interim measure.
- Condition B: Five or more crashes are reported in a 12-month period.
- Condition C: The volume of either vehicles or a combination of vehicles, pedestrians, and bicycles entering the intersection from all approaches for any eight hours of an average day meets the minimum volume requirements set forth in section 2B.7 of the MnMUTCD.

The Knollwood Drive, Elder Drive, TH 371, Cypress Drive and Baxter Drive intersections all meet warrants for AWSC.

Detailed warrant analysis results can be found in **Appendix B**.

E. Existing Traffic Operations Analysis

The operational analysis was performed using the VISSIM software package; an average of 5 to 10 simulation runs were used for modeling each result depending on the alternative modeled. Included in the operations analysis is one train traveling through the area, blocking each at grade crossing for approximately 3 minutes. This assumption was made based on observations from City and MnDOT staff.

The operational analysis results are described as a LOS ranging from A to F as shown in **Table 3**. These letters serve to describe a range of operating conditions for different types of facilities. Levels of service are calculated based on the Highway Capacity Manual 6th edition, which base the level of service on control delay. Control delay is the delay experienced by vehicles slowing down as they are approaching the intersection, the wait time at the intersection, and the time for the vehicle to speed up through the intersection and enter the traffic stream. The average intersection control delay is a volume weighted average of delay experienced by all motorists entering the intersection on all intersection approaches for signalized and roundabout intersections. Level of Service D is commonly taken as an

acceptable design year LOS. The level of service and its associated intersection delay for a signalized and unsignalized intersection is presented below. The delay threshold for unsignalized intersections is lower for each LOS compared to signalized intersections, which accounts for the fact that people expect a higher level of service when at a stop-controlled intersection. Roundabout intersections are evaluated as unsignalized intersection.

Table 3: Level of Service Criteria

	Signalized Intersection	Unsignalized Intersection
LOS	Control Delay per Vehicle (sec.)	Control Delay per Vehicle (sec.)
A	≤ 10	≤ 10
B	>10 and ≤ 20	>10 and ≤ 15
C	>20 and ≤ 35	>15 and ≤ 25
D	>35 and ≤ 55	>25 and ≤ 35
E	>55 and ≤ 80	>35 and ≤ 50
F	>80	>50

Table 4 details the existing PM peak hour traffic operation results for the corridor.

Table 4: Existing Traffic Operations Results

Intersection	Approach	Traffic Delay (sec/veh)				Intersection (Delay - LOS)	Traffic Queuing (feet)								
		Movement (Delay - LOS)			Approach (Delay - LOS)		Left Turn			Through			Right Turn		
		L	T	R			Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
TH 210 & Baxter Dr <i>Signalized Intersection</i>	EB	67 - E	15 - B	4 - A	21 - C	49 - D	375	75	300	-	75	475	625	0	50
	WB	153 - F	76 - E	63 - E	76 - E		350	25	75	825	75	775	200	25	75
	NB	57 - E	71 - E	10 - B	53 - D		100	50	250	-	25	75	100	0	50
	SB	60 - E	69 - E	27 - C	39 - D		150	50	300	125	25	100	125	50	325
TH 210 & Cypress Dr <i>Signalized Intersection</i>	EB	35 - D	3 - A	2 - A	4 - A	19 - B	500	25	75	-	25	150	225	0	25
	WB	23 - C	18 - B	5 - A	18 - B		525	25	50	2150	150	900	500	0	50
	NB	52 - D	70 - E	15 - B	41 - D		200	25	125	-	25	50	200	25	75
	SB	53 - D	47 - D	24 - C	51 - D		200	75	400	375	25	50	200	25	100
TH 210 & Golf Course Dr N <i>Stop Controlled</i>	EB	46 - E	1 - A	1 - A	5 - A	5 - A	200	25	150	-	0	0	200	0	0
	WB	12 - B	5 - A	7 - A	6 - A		250	25	75	-	25	125	350	0	25
	SB	-	-	20 - C	20 - C		-	-	-	-	-	-	100	25	175
TH 210 & TH 371 <i>Signalized Intersection</i>	EB	84 - F	54 - D	8 - A	66 - E	53 - D	625	125	500	1125	75	325	300	25	100
	WB	92 - F	61 - E	31 - C	57 - E		550	100	400	-	125	400	850	100	550
	NB	145 - F	41 - D	6 - A	53 - D		750	250	800	2600	125	675	800	25	150
	SB	74 - E	38 - D	6 - A	39 - D		425	100	350	860	75	475	350	25	225
TH 210 & Elder Dr S <i>Stop Controlled</i>	EB	11 - B	1 - A	2 - A	2 - A	8 - A	650	0	50	-	0	0	225	0	0
	WB	31 - D	3 - A	5 - A	13 - B		600	75	500	1125	0	0	275	0	0
	NB	-	-	5 - A	5 - A		-	-	-	-	-	-	250	25	200
	SB	-	-	10 - B	10 - B		-	-	-	-	-	-	125	25	125
TH 210 & Inglewood Dr <i>Stop Controlled</i>	EB	21 - C	2 - A	-	5 - A	10 - B	300	25	150	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	350	0	0
	SB	129 - F	-	22 - C	56 - F		-	75	400	-	-	-	125	25	200
TH 210 & Knollwood Dr <i>Signalized Intersection</i>	EB	52 - D	17 - B	5 - A	18 - B	19 - B	350	25	100	-	25	250	250	0	75
	WB	42 - D	13 - B	4 - A	16 - B		350	25	175	-	25	275	350	25	100
	NB	32 - C	31 - C	12 - B	28 - C		225	50	325	-	50	325	225	50	325
	SB	36 - D	30 - C	9 - A	31 - C		75	25	200	75	25	200	75	0	50
TH 210 & Highland Scenic Dr <i>Signalized Intersection</i>	EB	-	13 - B	5 - A	12 - B	26 - C	-	-	-	-	25	225	200	25	100
	WB	93 - F	7 - A	-	28 - C		350	125	450	-	25	200	-	-	-
	NB	80 - F	-	12 - B	56 - E		-	75	250	-	-	-	250	25	100
TH 210 & Memorywood Dr <i>Stop Controlled</i>	EB	8 - A	0 - A	-	1 - A	2 - A	375	0	50	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	200	0	0
	SB	32 - D	-	23 - C	31 - D		-	25	150	-	-	-	-	25	175
TH 210 & Meredith Dr <i>Stop Controlled</i>	EB	15 - C	1 - A	-	2 - A	1 - A	250	25	50	-	0	0	-	-	-
	WB	-	0 - A	1 - A	1 - A		-	-	-	-	0	0	225	0	0
	SB	19 - C	-	5 - A	15 - C		-	25	75	-	-	-	-	25	75
TH 210 & Timberwood Dr <i>Stop Controlled</i>	EB	-	0 - A	-	0 - A	2 - A	-	-	-	-	0	0	-	-	-
	WB	7 - A	1 - A	-	2 - A		475	0	50	-	0	0	-	-	-
	NB	44 - E	-	13 - B	16 - C		-	25	75	-	-	-	600	25	75

The intersections are shown to operate at an acceptable LOS D or better overall. However, many sidestreet movements and mainline turning movements are experiencing unacceptable LOS during the PM peak hour. Many of these movements are low volume in comparison to eastbound and westbound thru traffic volumes. Specific traffic operation concerns within the corridor study include:

CR 48 (Highland Scenic Drive)

- Eastbound left turn maximum queues exceed storage length

Knollwood Drive

- Northbound and southbound maximum queues extend into frontage road intersections

Inglewood Drive

- Southbound maximum queues extend into frontage road intersection
- Southbound left turn delays lasting over 2 minutes on average

Elder Drive

- Northbound queues extend past railroad tracks
- Westbound left turn maximum queues approaching capacity
- Complex weaving and interaction between northbound right turning traffic and eastbound thru and left traffic at TH 371 due to close intersection spacing and frequent queues

TH 371

- All left turn movements operate with unacceptable delays
- Northbound left turn maximum queues exceed storage length
- Eastbound and southbound maximum thru queues block turn lane bays

Baxter Drive

- Multiple movements operating with unacceptable levels of delay
- Northbound and southbound maximum queues exceed storage length
- Eastbound and westbound maximum thru queues block turn lane bays

The modeled results were evaluated by MnDOT, County, and City staff and deemed representative of real-world operations during the PM peak hour under normal pre-pandemic conditions.

Additional traffic operations details can be found in **Appendix C**.

F. Public/Stakeholder Issues and Concerns

In addition to the technical analysis of the roadway, the project team utilized MnDOT's MetroQuest tool to involve the public and key stakeholders to get their perspective on the issues and concerns facing the corridor. This engagement was conducted during fall of 2020. Over 40 unique perceived issues were submitted via this engagement and are noted and synthesized into **Figure 4**. Operations and safety issues feedback aligned with results from the safety and operations analyses conducted above.



Timberwood Dr.:

- Bike/Walking Path Needed For Commute Options
- Future Key Crossing Location

Memorywood Dr.:

- Bike/Walking Path Needed For Commute Options
- Traffic Signal Needed
- Narrow Median Creates Difficult Movement to Enter onto TH 210
- Majority of TH 210 Traffic In Left Lane So Can Be Difficult to Enter
- Few Gaps In Traffic During Peaks


Knollwood Drive:

- Concern For Moving Signal Closer to 210/371 Intersection
- Road Used As Shortcut To Pick Up Children From School
- Concern For High Volume of School And Commercial Traffic. Attempt to Move to CSAH 48
- Poor Traffic Flow Options Heading West From Commercial District
- Vehicles Often Run Red Lights At This Intersection

Highland Scenic Dr.:

- Review Signal Detection For Trucks South Of The Railroad Tracks
- Key Pedestrian Crossing For The City

Legend



0 800 Feet

Source: MnDOT, Cass County

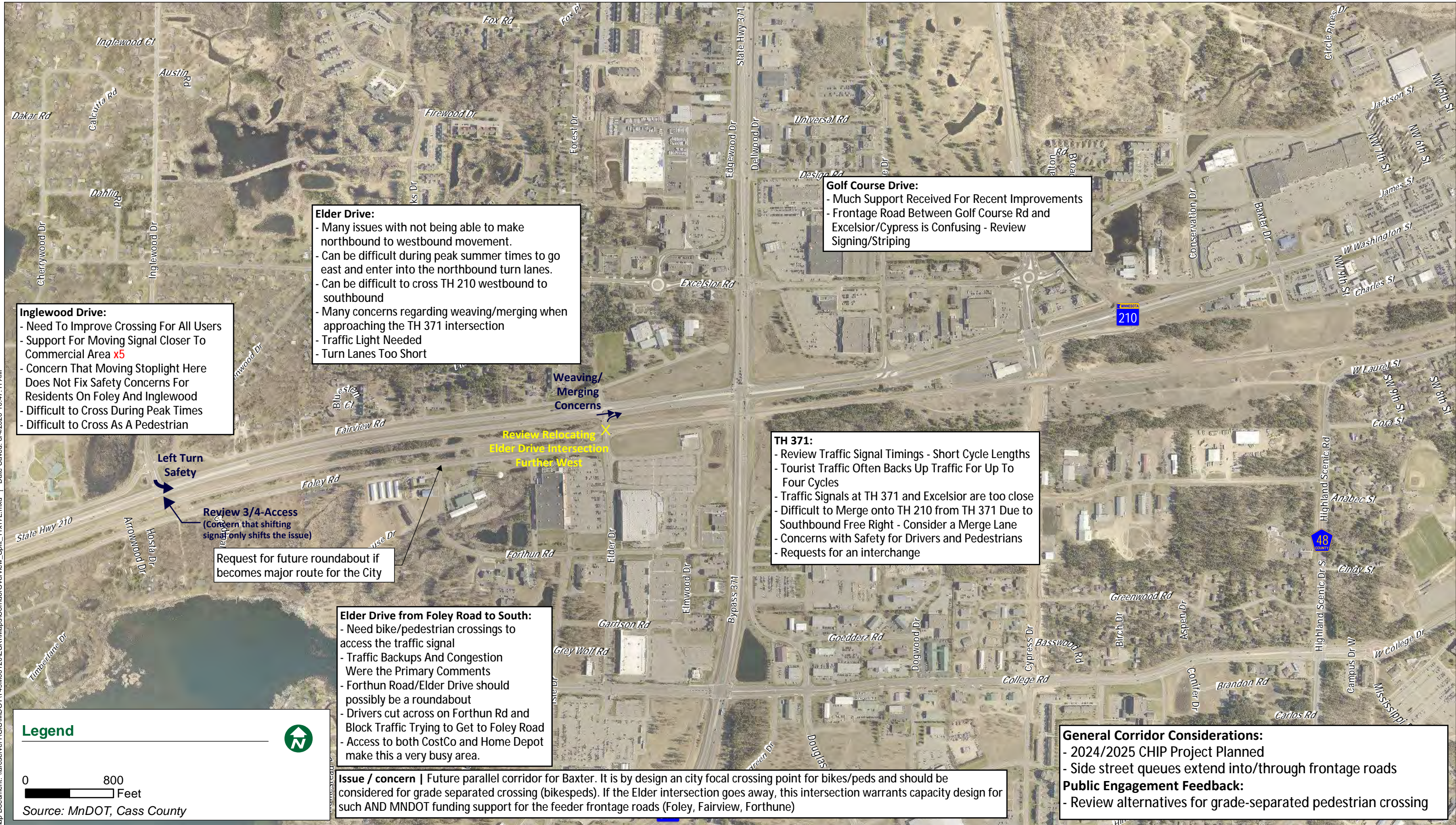
General Corridor Considerations:

- 2024/2025 CHIP Project Planned
- Side street queues extend into/through frontage roads

Public Engagement Feedback:

- Review alternatives for grade-separated pedestrian crossing

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V. Future Conditions Analysis

A. Access Management Plan

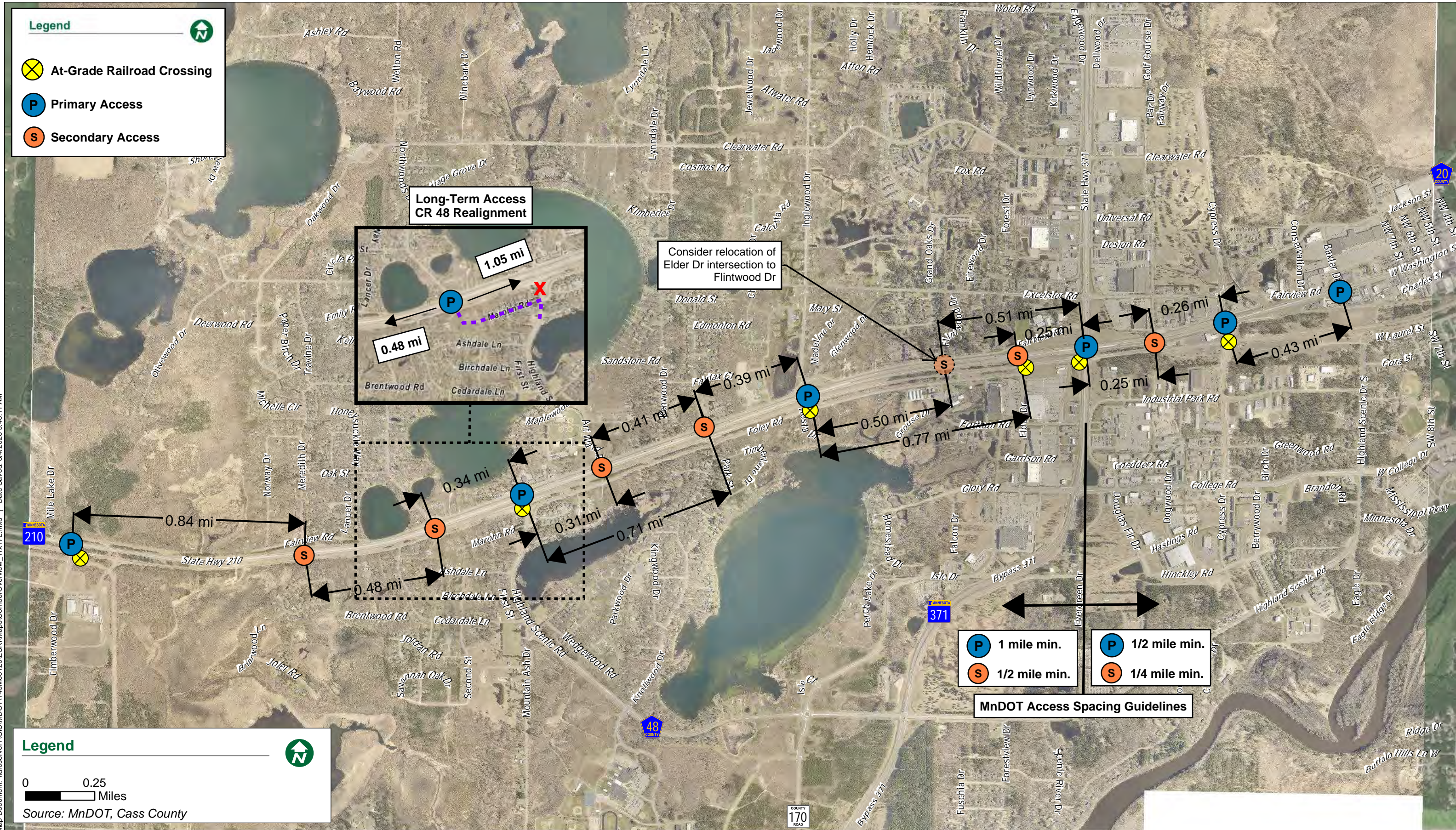
Proper access management and control can enhance local and regional mobility while improving driver safety. MnDOT establishes access spacing guidelines for its facilities depending on various characteristics of the roadway and surrounding environment. Much of this segment of TH 210 was studied by MnDOT in 1997 and assigned a Specific Area Access Management Plan, otherwise known as a Category 7 Corridor, due to the area conditions at the time of the study. This Category 7 Corridor has adopted a 1-mile primary spacing and ½ mile secondary spacing due to historic development and other unique characteristics (such as a parallel railroad corridor) along the corridor. The section from the western city limits to Meredith Drive is recognized as rural and may be reclassified when it meets the appropriate criteria.

Primary access intersections are defined as intersections where all movements are allowed. Secondary access intersections typically restrict several movements, reducing the number of intersection conflict points, and prioritize mobility on the major street. Best practices develop clear and uniform spacing and progression of primary and secondary intersections within a corridor to best balance regional and local mobility.

The existing access configuration within the corridor does not meet the guidelines set for the area as there are several instances of primary intersections spaced within the minimum distance. Several improvements can be made to meet these guidelines:

- Relocate Elder Drive to align with Forthun Road and Flintwood Drive
- Remove Knollwood Drive signal, trail and at-grade rail crossing, convert to secondary access
- Upgrade Inglewood Drive to a primary access intersection, add south leg with rail crossing and pedestrian facilities
- Close or relocate ¾ access at Speedway Gas station
 - o Relocating this access to Art Ward Drive does not meet access spacing guidelines. However, closing this access may be politically difficult due to the impact to the Speedway Gas station

To meet access spacing recommendations, the frontage road network would need to be expanded to the western project limits to allow for the relocation of a group of private residence driveways currently served by TH 210. Extending frontage roads to these locations would likely be costly. There are no observed safety issues associated with these driveways, therefore, this is not an immediate need. A Guided Access Plan which includes the above recommendations is shown in **Figure 5**.



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Legend

0 0.25
Miles

Source: MnDOT, Cass County

MnDOT Access Spacing Guidelines

P 1 mile min.	P 1/2 mile min.
S 1/2 mile min.	S 1/4 mile min.

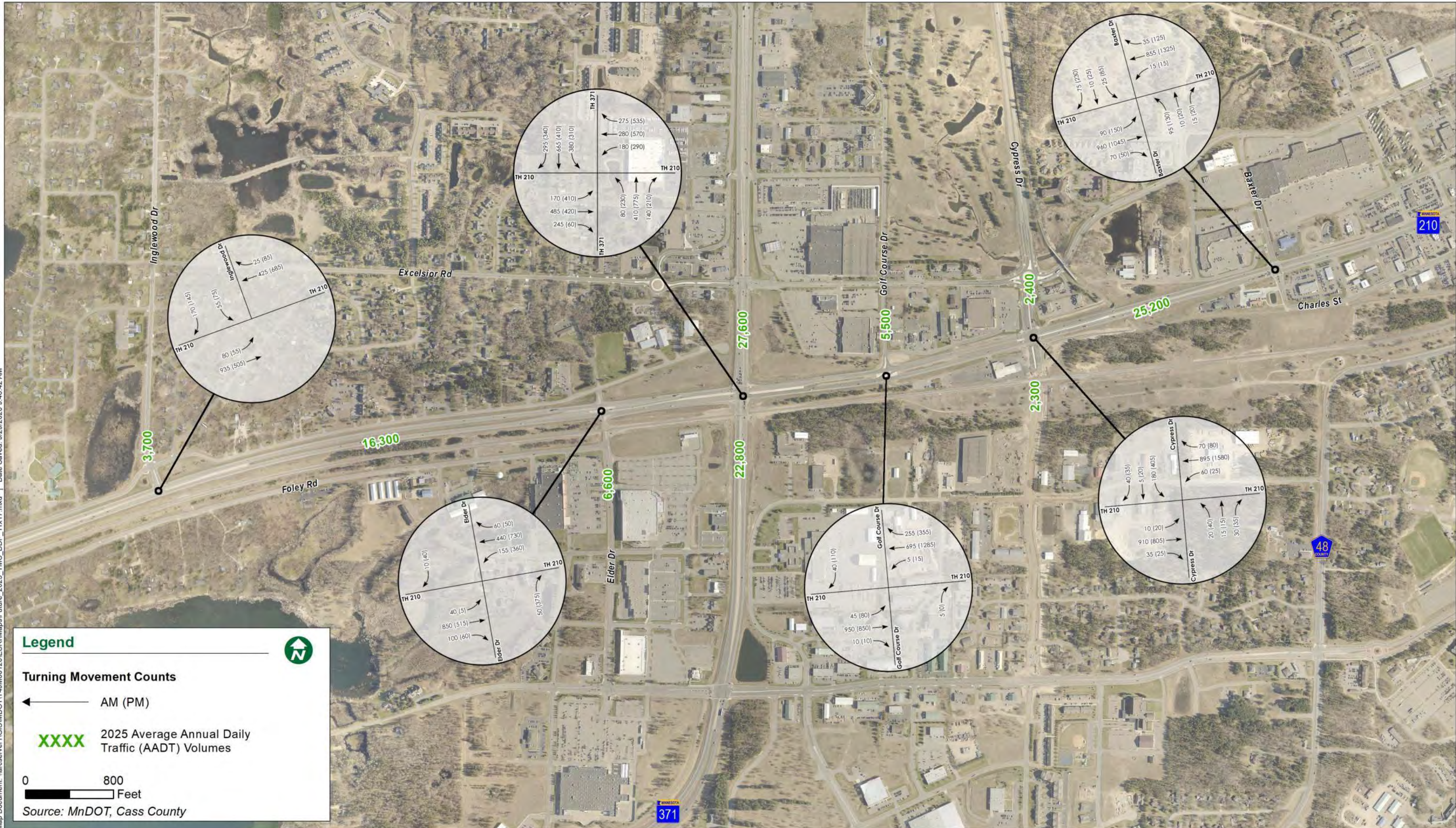
B. Traffic Forecasting

Future traffic volumes were developed for the years 2025 and 2040 by assuming a linear annual growth rate of 0.5% to be consistent with the traffic forecasting methodology used in the TH 210 (Washington Street) Brainerd Corridor Study. The 0.5% growth rate was developed by considering and Crow Wing County historical population growth and state demographer input developed from 2010 census data.

Future traffic operations analysis considers the PM peak hour of the day with the forecasted traffic volumes. Future 2025 and 2040 forecast peak hour turning movement counts and forecast ADT's are shown in **Figures 6 and 7**.



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Turning Movement Counts
 ← AM (PM)

XXXX 2040 Average Annual Daily Traffic (AADT) Volumes

0 800 Feet

Source: MnDOT, Cass County

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C. Future Warrant Analysis

Based on the expected traffic growth, no additional intersections are expected to meet warrants for signals or AWSC upon reaching the future year 2040. Several intersections begin to meet multiple warrants for signalization once these volumes are realized, but the intersections of Timberwood Drive and Meredith Drive fail to meet warrants in this scenario. If area development occurs sooner than expected, warrants should be reevaluated if the associated traffic is significant.

Detailed warrant analysis results can be found in the **Appendix B**.

D. 2040 No Build Operations Analysis

Table 5 details the future 2040 PM peak hour traffic operation results for the corridor under the existing geometry and traffic control configurations. The intersection delay shown represents the overall average delay of all the vehicles traveling through the intersection. The maximum delay and limiting movement detail the traffic movement that has the highest expected delay. 2025 No Build traffic operations results can be found in **Appendix C**.

Table 5: 2040 No Build Traffic Operations Results

Intersection	Approach	Traffic Delay (sec/veh)						Traffic Queuing (feet)									
		Movement (Delay - LOS)			Approach		Intersection (Delay - LOS)	Left Turn			Through			Right Turn			
		L	T	R	Delay	LOS		Approach (Delay - LOS)	Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
TH 210 & Baxter Dr <i>Signalized Intersection</i>	EB	72 - E	16 - B	3 - A	22	C	22 - C	60 - E	375	75	325	-	75	500	625	0	75
	WB	151 - F	97 - F	81 - F	97	F	97 - F		350	25	100	825	175	1250	200	25	100
	NB	58 - E	61 - E	13 - B	54	D	54 - D		100	50	250	-	25	100	100	25	75
	SB	63 - E	76 - E	45 - D	52	D	52 - D		150	50	350	125	25	175	125	100	425
TH 210 & Cypress Dr <i>Signalized Intersection</i>	EB	37 - D	3 - A	1 - A	4	A	4 - A	21 - C	500	25	75	-	25	175	225	0	50
	WB	34 - C	20 - C	6 - A	20	C	20 - C		525	25	75	2150	200	1000	500	0	50
	NB	48 - D	70 - E	18 - B	39	D	39 - D		200	25	125	-	25	50	200	25	75
	SB	57 - E	57 - E	30 - C	55	E	55 - E		200	100	500	375	25	50	200	25	75
TH 210 & Golf Course Dr N <i>Stop Controlled</i>	EB	49 - E	1 - A	1 - A	6	A	6 - A	6 - A	200	25	150	-	0	0	200	0	0
	WB	15 - C	6 - A	7 - A	7	A	7 - A		250	25	75	-	25	225	350	0	50
	SB	-	-	24 - C	24	C	24 - C		-	-	-	-	-	-	100	25	200
TH 210 & TH 371 <i>Signalized Intersection</i>	EB	88 - F	54 - D	7 - A	67	E	67 - E	62 - E	625	150	475	1125	75	350	300	25	100
	WB	121 - F	62 - E	36 - D	65	E	65 - E		550	150	475	-	125	425	850	150	675
	NB	210 - F	52 - D	15 - B	74	E	74 - E		750	425	1175	2600	150	825	800	25	250
	SB	76 - E	40 - D	9 - A	41	D	41 - D		425	100	350	860	75	625	350	25	250
TH 210 & Elder Dr S <i>Stop Controlled</i>	EB	15 - C	1 - A	4 - A	2	A	2 - A	13 - B	650	0	50	-	0	0	225	0	0
	WB	55 - F	5 - A	7 - A	22	C	22 - C		600	175	725	1125	0	0	275	0	0
	NB	-	-	7 - A	7	A	7 - A		-	-	-	-	-	-	250	25	300
	SB	-	-	11 - B	11	B	11 - B		-	-	-	-	-	-	125	25	125
TH 210 & Inglewood Dr <i>Stop Controlled</i>	EB	21 - C	2 - A	-	4	A	4 - A	16 - C	300	25	125	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2	A	2 - A		-	-	-	-	0	0	350	0	0
	SB	219 - F	-	47 - E	102	F	102 - F		-	150	525	-	-	-	125	50	425
TH 210 & Knollwood Dr <i>Signalized Intersection</i>	EB	59 - E	18 - B	5 - A	19	B	19 - B	22 - C	350	25	75	-	25	250	250	0	50
	WB	46 - D	14 - B	4 - A	17	B	17 - B		350	50	175	-	50	275	350	25	75
	NB	38 - D	40 - D	13 - B	33	C	33 - C		225	75	375	-	75	375	225	75	375
	SB	74 - E	39 - D	16 - B	56	E	56 - E		75	50	300	75	50	300	75	0	50
TH 210 & Highland Scenic Dr <i>Signalized Intersection</i>	EB	-	14 - B	6 - A	13	B	13 - B	28 - C	-	-	-	-	25	200	200	25	100
	WB	103 - F	8 - A	-	32	C	32 - C		350	150	675	-	25	200	-	-	-
	NB	87 - F	-	11 - B	59	E	59 - E		-	75	275	-	-	-	250	25	100
TH 210 & Memorywood Dr <i>Stop Controlled</i>	EB	10 - B	0 - A	-	1	A	1 - A	5 - A	375	0	50	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2	A	2 - A		-	-	-	-	0	0	200	0	0
	SB	66 - F	-	43 - E	64	F	64 - F		-	50	225	-	-	-	-	50	250
TH 210 & Meredith Dr <i>Stop Controlled</i>	EB	14 - B	1 - A	-	2	A	2 - A	1 - A	250	25	75	-	0	0	-	-	-
	WB	-	0 - A	1 - A	1	A	1 - A		-	-	-	-	0	0	225	0	0
	SB	26 - D	-	4 - A	20	C	20 - C		-	25	75	-	-	-	-	25	75
TH 210 & Timberwood Dr <i>Stop Controlled</i>	EB	-	0 - A	-	0	A	0 - A	2 - A	-	-	-	-	0	0	-	-	-
	WB	4 - A	1 - A	-	2	A	2 - A		475	0	25	-	0	0	-	-	-
	NB	34 - D	-	14 - B	16	C	16 - C		-	25	75	-	-	-	600	25	75

Increased traffic volumes due to area growth result in worsened traffic operations throughout the corridor. Select intersection are anticipated to operate with unacceptable levels of delay, and most study intersections feature failing movements. Notable results are summarized below:

Memorywood Drive

- Southbound left turning traffic experiences LOS E
- Maximum southbound queues may block the frontage road intersection of Fairview Road

Meredith Drive

- Southbound left turning traffic experiences LOS D

CR 48 (Highland Scenic Drive)

- Northbound and westbound left movements operate at LOS F
- Westbound left maximum queues exceed to turn lane storage length

Knollwood Drive

- The southbound approach operates at LOS E, with the southbound left turn movement operating under unacceptable delays
- Northbound and southbound maximum queues may block adjacent frontage road intersections at Fairview Road and Foley Road

Inglewood Drive

- Southbound traffic experiences LOS E or worse
- Maximum southbound queues may block the frontage road intersection of Fairview Road

Elder Drive

- The westbound left turning movement operates at LOS F with maximum queues exceeding the provided storage length
- Northbound maximum queues may block the adjacent intersection with Foley Road and the at grade railroad crossing

TH 371

- Failing movements are present on all approaches with an overall LOS E provided during the peak hour
- Excessive queuing is anticipated on all approaches with multiple turn lane bays exceeding capacity or blocked by thru queues

Cypress Drive

- Failing movements are anticipated on the northbound and southbound approaches
- Excessive queues may occur in the northbound and westbound directions during the PM peak hour

Baxter Drive

- Failing movements are present on all approaches with an overall LOS E provided during the peak hour
- Operations on the westbound approach are problematic with all movements operating as LOS F and maximum queues extending approximately ¼ mile

Additional traffic operations details can be found in **Appendix C**.

VI. Concept Evaluations and Recommended Alternative Summary

A. Evaluation Criteria

Several preliminary criteria were established for evaluating potential alternatives at the study intersections. These criteria were established in collaboration with project stakeholders to best meet the needs of the community and to balance local and regional priorities.

Operations of both TH 210 and sidestreet traffic are considered in concept evaluation. Maintaining TH 210 operations is important to promote regional travel while improving sidestreet operations is vital to local access in the community. Evaluating whether any sidestreet queues block adjacent frontage road intersection is also considered; this measure indicates the impact on the local network.

Vehicle and pedestrian safety criteria are also included in the evaluation. Intersection control measures are rated on their ability to enhance vehicle safety by eliminating conflict points, channelizing traffic, or implementing a higher level of control through the intersection. The intersection controls considered have varying ability to accommodate and promote pedestrian mobility through the intersection. Intersections that prohibit or complicate pedestrian crossings or may feel unsafe to pedestrians will not score as well as intersections that provide controlled or staged crossings of the trunk highway.

Several intersections within the study area may require the addition of a fourth leg to accommodate future development or realignments of local roadways. Alternatives were evaluated on their ability to accommodate the construction of a fourth leg.

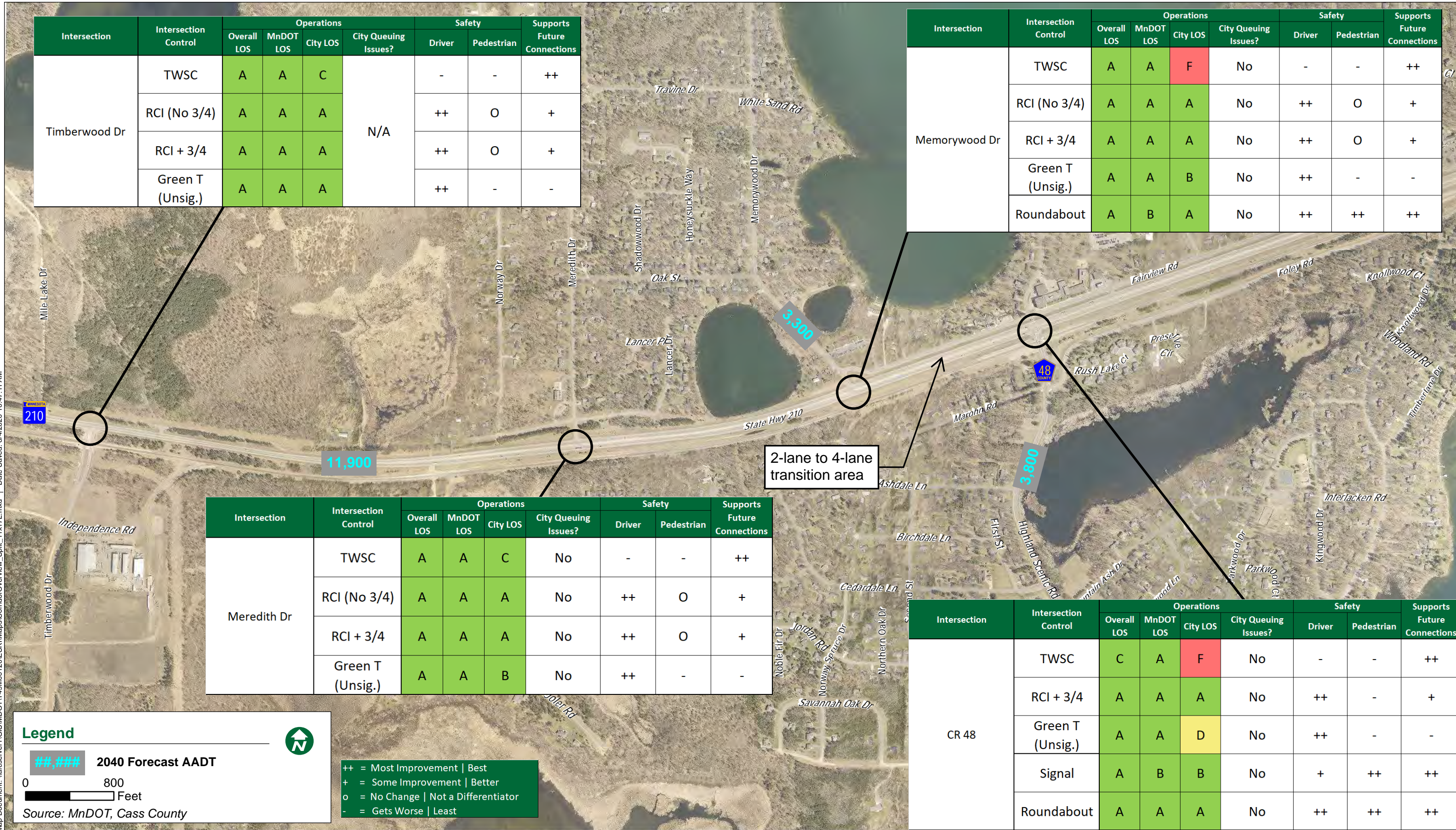
B. West Subarea Operations Analysis

Analysis of the “western subarea” was conducted separately from the rest of the corridor. This area includes the intersections of Timberwood Drive, Meredith Drive, Memorywood Drive and CR 48. Due to the distance between these intersections and the low sidestreet volumes recorded here in comparison to intersections further east, each intersection was modeled individually using Synchro/SimTraffic modeling software. The analysis of these intersections follows the evaluation criteria identified above, the results of which are shown in **Figure 8**.

Alternatives considered align with the guided access plan. Roundabout intersections were eliminated from consideration at this stage of the study as project stakeholders agreed that they do not fit the environment of the TH 210 corridor.

Recommendations:

- Timberwood Drive: further evaluate TWSC
- Meredith Drive: further evaluate TWSC and need for 4-lane section on TH 210
- Memorywood Drive: further evaluate Green-T and need for 4-lane section on TH 210
- CR 48: further evaluate traffic signal and need for turn lane modifications




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##,### 2040 Forecast AADT

0 800 Feet

Source: MnDOT, Cass County



++ = Most Improvement | Best
 + = Some Improvement | Better
 o = No Change | Not a Differentiator
 - = Gets Worse | Least

C. Knollwood-Inglewood-Elder Operations Analysis

Due to the close proximity of the intersections of Elder Drive and TH 371, the interactions between these intersections and the high traffic volumes observed in the area, the area between Knollwood Drive and TH 371 was evaluated in one model. All modeled configurations include the existing TH 371 signal with no modifications made to the intersection. **Table 6**, below, shows the alternatives considered.

Table 6: Knollwood-Inglewood-Elder Considered Alternatives

Option	Intersection Control			
	Knollwood Dr	Inglewood Dr	Elder Dr	TH 371
1A	Signal (3-leg)	Signal (4-leg)	Existing 3/4	Signal
1B	Signal (3-leg)	Signal (4-leg)	Relocated 3/4	Signal
1C	RCI w/ 3/4 Access (3-leg)	Signal (4-leg)	Relocated 3/4	Signal
1D	Signalized Green-T (3-leg)	Signal (4-leg)	Relocated 3/4	Signal
1E	3-Leg RCI w/o 3/4 Access	Signal (4-leg)	Relocated 3/4	Signal
2A	Signal (4-leg)	RCI w/ 3/4 Access (3-leg)	Existing 3/4	Signal
2B	Signal (4-leg)	Green-T (3-leg)	Existing 3/4	Signal

Upon discussion with project stakeholders, Options 2A and 2B were eliminated from further consideration as they do not fit the City’s vision of providing a vehicle and pedestrian friendly north-south corridor along Inglewood Drive. Options 1A and 2B were eliminated from further consideration as maintaining traffic signals at Knollwood Drive and Inglewood Drive does not meet MnDOT Access Spacing Guidelines for the corridor. Similarly, Option 1D was eliminated from further consideration as analysis indicates that a signalized Green-T is required at Knollwood Drive to provide acceptable sidestreet operations which would not align with the established access spacing guidelines.

Options 1C and 1E were identified as favorable alternatives as they best align with City goals and were selected for further analysis. Further discussion with project stakeholders deemed that while eastbound left turning volumes at Knollwood Drive may not warrant providing ³/₄ access to accommodate the movement, not providing the movement would limit local mobility and be politically difficult to pursue and gain public support.

Results of the preliminary analyses considering the established evaluation criteria can be found in **Appendix D**.

The potential safety benefits shown for RCI intersection in the evaluation are justified by the reduction of conflict points the geometry provides in comparison to a traditional full access intersection. Furthermore, a 2017 MnDOT study of the traffic safety at reduced conflict intersections found a 100% reduction in fatal and serious-injury right-angle collisions, a 77% reduction in all right-angle crashes, and a 50% reduction in all injury crashes. Similarly, a Federal Highway Administration (FHWA) study of the safety of continuous green T intersections was conducted in 2016 and estimated an overall Crash Modification Factor (CMF) of 0.958 for intersections converted from side street stop-control. This CMF is enhanced when reducing the cross section of the major street from four to two lanes through reduced conflict points.

Operations analysis was conducted to determine the impacts of not providing a median u-turn (MUT) location for the westbound u-turn movement associated with the Knollwood RCI. Analysis determined that not providing the MUT would add approximately 1 mile of travel distance to users originally making the southbound left turn movement. Additionally, the

MUT is anticipated to operate at LOS B or better whereas delays associated with making a u-turn at the CR 48 signal would add nearly 80 seconds of delay to making the movement.

The relocation of Elder Drive to align with the access spacing guidelines established for the corridor will likely benefit both operations and safety at Elder Drive as well as the eastbound approach of TH 371. However, due to difficulties in coordinating and negotiating the relocating of the at grade railroad crossing, implementing this improvement may not be feasible without significant reconfiguration of the TH 371 intersection and other crossing of the railroad. To improve operations in the conflict zone between Elder Drive and TH 371, project stakeholders developed a partially signalized concept which would serve the intersection in the interim before the intersection may be located. The signal would control the eastbound thru and right movements, as well as the westbound left and northbound right movements.

Recommendations:

- Knollwood Drive: close south leg, evaluate RCI with $\frac{3}{4}$ geometry and MUT
- Inglewood Drive: evaluate traffic signal with added south leg
- Elder Drive: evaluate partial signalization at current intersection location

D. Recommended Build Analysis

Recommendations developed by the western subarea and Knollwood-Inglewood-Elder subarea were further evaluated in VISSIM in one continuous model to best evaluate any interactions between the intersections. The intersections of Golf Course Drive, Cypress Drive and Baxter Drive were modeled in their existing conditions assuming the study that led to the area improvements considered area traffic growth and deemed the made improvements to have adequate capacity to serve a 20-year life cycle. Trips were redistributed as needed for the closure of the south leg of Knollwood Drive and addition of the south leg at Inglewood Drive.

Table 7 details the future 2040 PM peak hour traffic operation results for the corridor under the recommended build conditions.

Table 7: Recommended Build 2040 Traffic Operations Results

		2040 PM Peak																	
Intersection	Approach	Traffic Delay (sec/veh)					Intersection (Delay - LOS)	Traffic Queuing (feet)											
		Movement (Delay - LOS)				Approach (Delay - LOS)		U Turn			Left Turn			Through			Right Turn		
		U	L	T	R			Storage	Avg	Max	Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
TH 210 & Baxter Dr <i>Signalized Intersection</i>	EB	-	70 - E	15 - B	4 - A	21 - C	61 - E	-	-	-	375	75	300	-	75	500	625	25	75
	WB	-	162 - F	99 - F	80 - F	99 - F		-	-	-	350	25	75	825	150	1200	200	25	75
	NB	-	56 - E	61 - E	14 - B	52 - D		-	-	-	100	50	275	-	25	100	100	0	50
	SB	-	61 - E	79 - E	45 - D	52 - D		-	-	-	150	50	300	125	25	150	125	100	425
TH 210 & Cypress Dr <i>Signalized Intersection</i>	EB	-	50 - D	3 - A	2 - A	4 - A	21 - C	-	-	-	500	25	100	-	25	175	225	0	50
	WB	-	31 - C	21 - C	7 - A	21 - C		-	-	-	525	25	75	2150	200	1025	500	0	75
	NB	-	49 - D	67 - E	14 - B	38 - D		-	-	-	200	25	125	-	25	75	200	25	75
	SB	-	56 - E	53 - D	30 - C	54 - D		-	-	-	200	100	475	375	25	75	200	25	100
TH 210 & Golf Course Dr N <i>Stop Controlled</i>	EB	-	54 - F	1 - A	1 - A	6 - A	6 - A	-	-	-	200	50	175	-	0	0	200	0	0
	WB	-	14 - B	5 - A	7 - A	6 - A		-	-	-	250	25	50	-	25	200	350	0	25
	SB	-	-	-	27 - D	27 - D		-	-	-	-	-	-	-	-	100	25	225	
TH 210 & TH 371 <i>Signalized Intersection</i>	EB	-	90 - F	52 - D	7 - A	67 - E	61 - E	-	-	-	625	150	500	1125	75	350	300	25	100
	WB	-	108 - F	62 - E	37 - D	63 - E		-	-	-	550	125	450	-	125	450	850	150	650
	NB	-	214 - F	49 - D	13 - B	73 - E		-	-	-	750	425	1250	2600	150	750	800	25	250
	SB	-	74 - E	41 - D	10 - B	41 - D		-	-	-	425	100	350	860	75	700	350	25	300
TH 210 & Elder Dr S <i>Partially Signalized</i>	EB	-	14 - B	9 - A	7 - A	9 - A	9 - A	-	-	-	650	0	50	-	25	250	225	0	0
	WB	-	25 - D	4 - A	5 - A	11 - B		-	-	-	600	50	425	1125	0	0	275	0	0
	NB	-	-	-	6 - A	6 - A		-	-	-	-	-	-	-	-	250	25	200	
	SB	-	-	-	12 - B	12 - B		-	-	-	-	-	-	-	-	125	25	100	
TH 210 & Inglewood Dr <i>Signalized Intersection</i>	EB	-	91 - F	14 - B	3 - A	26 - C	30 - C	-	-	-	300	50	250	-	25	275	300	0	50
	WB	-	85 - F	20 - C	4 - A	24 - C		-	-	-	300	50	175	-	50	400	350	25	100
	NB	-	67 - E	72 - E	10 - B	58 - E		-	-	-	200	50	250	200	25	200	200	25	75
	SB	-	67 - E	74 - E	13 - B	36 - D		-	-	-	150	50	200	150	25	125	150	25	175
TH 210 & Knollwood Dr N <i>RCI with 3/4 access</i>	EB	-	20 - C	0 - A	-	1 - A	2 - A	-	-	-	350	25	75	-	0	0	-	-	
	WB	-	-	2 - A	3 - A	3 - A		-	-	-	-	-	-	-	0	0	325	0	25
	SB	-	-	-	17 - C	17 - C		-	-	-	-	-	-	-	-	100	25	150	
TH 210 & Highland Scenic Dr <i>Signalized Intersection</i>	EB	-	-	23 - C	9 - A	21 - C	33 - C	-	-	-	-	-	-	-	50	275	200	25	100
	WB	-	74 - E	12 - B	-	33 - C		-	-	-	650	150	650	-	50	525	-	-	
	NB	-	70 - E	-	12 - B	54 - D		-	-	-	-	100	450	-	-	-	250	25	100
TH 210 & Memorywood Dr <i>Stop Controlled - Green T</i>	EB	-	13 - B	0 - A	-	1 - A	4 - A	-	-	-	375	25	50	-	0	0	-	-	
	WB	-	-	2 - A	3 - A	3 - A		-	-	-	-	-	-	-	0	0	200	0	0
	SB	-	47 - E	-	17 - C	43 - E		-	-	-	-	25	175	-	-	-	-	25	75
TH 210 & Meredith Drive <i>Stop Controlled</i>	EB	-	13 - B	1 - A	-	2 - A	2 - A	-	-	-	250	25	50	-	0	0	-	-	
	WB	-	-	1 - A	1 - A	1 - A		-	-	-	-	-	-	-	0	0	225	0	0
	SB	-	30 - D	-	15 - C	26 - D		-	-	-	-	25	75	-	-	-	-	25	100
TH 210 & Timberwood <i>Stop Controlled</i>	EB	-	-	0 - A	-	0 - A	2 - A	-	-	-	-	-	-	-	0	0	-	-	
	WB	-	6 - A	1 - A	-	2 - A		-	-	-	475	0	50	-	0	0	-	-	
	NB	-	64 - F	-	14 - B	18 - C		-	-	-	-	25	100	-	-	-	-	25	100
Knollwood U-Turn	EB	-	-	2 - A	-	2 - A	1 - A	-	-	-	-	-	-	-	0	0	-	-	
	WB	10 - B	-	0 - A	-	1 - A		-	-	-	25	125	-	-	-	0	0	-	-

The proposed improvements are shown to provide significant operational benefits in comparison to the no build conditions under 2040 peak hour traffic volumes. Notable results are summarized below:

Timberwood Drive

- Northbound left turning traffic experiences LOS F, an increased delay from the no build analysis. This difference is likely due to random gaps in TH 210 traffic and the low volumes on Timberwood Drive.

Meredith Drive

- Southbound left turning traffic experiences LOS D, similar to the existing four-lane section.

Memorywood Drive

- Southbound traffic experiences LOS E, improved from LOS F experienced under existing TWSC.

CR 48 (Highland Scenic Drive)

- Northbound and westbound left movements operate at LOS E, improved from LOS F under existing conditions.
- Adequate storage is provided for anticipated westbound left turn queues with the relocation of the Fairview Road access.

Knollwood Drive

- All movements, including u-turn location, operate at LOS C or better.
- Southbound maximum queues may extend into frontage road intersection.

Inglewood Drive

- All left turn movements operate at LOS E or worse.
- Sidestreet thru movements operate at LOS E.
- Sidestreet maximum queues may block frontage road intersections or extend across the at grade rail crossing. Additional analysis of interactions between TH 210 intersection and frontage roads should be considered.
- The City of Baxter is leading an effort to construct a traffic signal and south leg at this location in 2022. The intersection should be monitored for operational and safety concerns as traffic grows in future years.

Elder Drive

- Westbound left turn delays are improved from LOS F to LOS D.
- All movements operate with acceptable delays, LOS D or better.
- Northbound maximum queues may extend through the at grade rail crossing.

Additional traffic operations details can be found in **Appendix C**.

E. Public Feedback on Proposed Improvements

It is vital that planned improvements meet the needs of the general public and are able to be supported. Controversial improvements cause division among the public and decision makers as well as between agencies. In effort to promote a transparent and open study, a second round of public engagement was conducted to present the proposed improvements and allow for opportunity to comment on the work performed. Background information was also provided during engagement to help the public understand the guiding transportation planning, operations, and safety principals that led to the proposed improvements. Successful engagement results in a clear understanding of public opinion on the planned improvements and identifies potential areas where further education and engagement is needed.

The proposed improvements were presented via MetroQuest during spring of 2021, resulting in over 400 participants providing feedback. Most participants indicated they commute via the TH 210 study area and a notable proportion self-identified as Baxter residents. Survey participants were shown educational material explaining the RCI and Green-T intersections and asked to rate the proposed improvements on a scale of one star (least favorable) to five stars (most favorable). A summary of the ratings received is shown in **Figure 9**.



Figure 9: Proposed Improvement Public Engagement Ratings

All improvements presented to survey participants scored an average of three stars or more, indicating that the improvements are generally supported by the public. While results skewed to be mostly favorable, notable ratings and comments indicate that additional education and outreach is needed to gain further public support for and understanding of these improvements.

Survey takers generally understood the safety benefits of better access spacing and progression and the benefits of the continuous Green-T. Participants did not rate the RCI concept as favorably as the Green-T, likely due to confusion in how an RCI operates. The survey did not include information that the Inglewood intersection is planned to be signalized in 2022 as part of a city-led project. Many participants expressed concern that the removal of the Knollwood signal would leave local traffic with less access to the highway, as well as concern about the implications for the existing pedestrian crossing at this location. Due to the majority of participants identifying as commuter traffic, many comments received expressed resistance to improvements that would add delay to thru traffic on TH 210 and to/from the Elder Drive commercial area. Additional comments were received indicating more education is needed in helping the public understand the benefits of a two-lane section in the west end of the study area. A full list of comments received on the proposed improvements can be found in **Appendix E**.

VII. Additional Considerations

The following sections detail the additional analysis completed as part of the TH 210 Baxter Access Study.

A. Summer Peak Operations Analysis

The Baxter-Brainerd area is a regional destination during the summer months. Summer traffic volumes and patterns are notably different during this period and require consideration in defining appropriate corridor improvements. Analysis was conducted for the 2040 PM peak hour under summer volumes. Again, due to the impact on traffic volumes by the COVID-19 pandemic, collecting data during this period was not feasible. Project stakeholders determined a 30% increase in thru traffic would be a conservative approach in representing the traffic volumes experienced during the summer months. Results of the summer analysis under proposed conditions is summarized in **Table 8**.

Table 8: Recommended Build 2040+Summer Traffic Operations Results

		2040 PM Peak (Summer)																	
Intersection	Approach	Traffic Delay (sec/veh)					Intersection (Delay - LOS)	Traffic Queuing (feet)											
		Movement (Delay - LOS)				Approach (Delay - LOS)		U Turn			Left Turn			Through			Right Turn		
		U	L	T	R			Storage	Avg	Max	Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
TH 210 & Baxter Dr Signalized Intersection	EB	-	71 - E	18 - B	4 - A	24 - C	69 - E	-	-	-	375	75	275	-	100	675	625	25	75
	WB	-	154 - F	112 - F	98 - F	112 - F		-	-	-	350	25	75	825	300	1450	200	25	100
	NB	-	56 - E	60 - E	14 - B	52 - D		-	-	-	100	50	275	-	25	100	100	0	50
	SB	-	67 - E	88 - F	59 - E	64 - E		-	-	-	150	50	325	125	25	200	125	125	525
TH 210 & Cypress Dr Signalized Intersection	EB	-	59 - E	3 - A	2 - A	4 - A	23 - C	-	-	-	500	25	100	-	25	200	225	0	25
	WB	-	41 - D	25 - C	10 - B	25 - C		-	-	-	525	25	75	2150	300	1175	500	25	75
	NB	-	50 - D	67 - E	17 - B	40 - D		-	-	-	200	25	125	-	25	75	200	25	75
	SB	-	57 - E	54 - D	37 - D	56 - E		-	-	-	200	100	475	375	25	75	200	25	100
TH 210 & Golf Course Dr N Stop Controlled	EB	-	79 - F	1 - A	2 - A	7 - A	12 - B	-	-	-	200	75	275	-	0	200	0	0	
	WB	-	20 - C	12 - B	9 - A	12 - B		-	-	-	250	25	50	-	50	625	350	0	25
	SB	-	-	-	76 - F	76 - F		-	-	-	-	-	-	-	-	100	75	425	
TH 210 & TH 371 Signalized Intersection	EB	-	92 - F	52 - D	9 - A	66 - E	78 - E	-	-	-	625	150	525	1125	100	450	300	25	75
	WB	-	132 - F	137 - F	44 - D	105 - F		-	-	-	550	125	450	-	475	1200	850	175	700
	NB	-	287 - F	62 - E	22 - C	89 - F		-	-	-	750	600	1600	2600	250	1150	800	25	250
	SB	-	76 - E	42 - D	14 - B	43 - D		-	-	-	425	100	325	860	100	900	350	25	375
TH 210 & Elder Dr S Partially Signalized	EB	-	19 - C	10 - B	7 - A	10 - B	10 - B	-	-	-	650	0	50	-	25	350	225	0	0
	WB	-	26 - D	5 - A	6 - A	11 - B		-	-	-	600	50	400	1125	0	0	275	0	0
	NB	-	-	-	7 - A	7 - A		-	-	-	-	-	-	-	-	250	25	175	
	SB	-	-	-	13 - B	13 - B		-	-	-	-	-	-	-	-	125	25	100	
TH 210 & Inglewood Dr Signalized Intersection	EB	-	92 - F	15 - B	4 - A	25 - C	29 - C	-	-	-	300	50	250	-	50	325	300	0	50
	WB	-	90 - F	21 - C	5 - A	25 - C		-	-	-	300	50	200	-	75	450	350	25	100
	NB	-	70 - E	73 - E	11 - B	60 - E		-	-	-	200	50	275	200	25	150	200	25	75
	SB	-	68 - E	76 - E	16 - B	38 - D		-	-	-	150	50	225	150	25	125	150	25	175
TH 210 & Knollwood Dr N RCI with 3/4 access	EB	-	26 - D	0 - A	-	1 - A	3 - A	-	-	-	350	25	75	-	0	0	-	-	
	WB	-	-	2 - A	3 - A	3 - A		-	-	-	-	-	-	-	0	0	325	0	0
	SB	-	-	-	22 - C	22 - C		-	-	-	-	-	-	-	-	100	25	175	
TH 210 & Highland Scenic Dr Signalized Intersection	EB	-	-	23 - C	9 - A	21 - C	31 - C	-	-	-	-	-	-	-	50	325	200	25	100
	WB	-	72 - E	14 - B	-	30 - C		-	-	-	650	125	525	-	75	900	-	-	
	NB	-	70 - E	-	14 - B	54 - D		-	-	-	-	100	450	-	-	-	250	25	125
TH 210 & Memorywood Dr Stop Controlled - Green T	EB	-	18 - C	0 - A	-	1 - A	6 - A	-	-	-	375	25	50	-	0	0	-	-	
	WB	-	-	2 - A	3 - A	3 - A		-	-	-	-	-	-	-	0	0	200	0	0
	SB	-	84 - F	-	24 - C	76 - F		-	-	-	-	50	250	-	-	-	-	25	75
TH 210 & Meredith Drive Stop Controlled	EB	-	16 - C	1 - A	-	2 - A	2 - A	-	-	-	250	25	50	-	0	0	-	-	
	WB	-	-	1 - A	1 - A	1 - A		-	-	-	-	-	-	-	0	0	225	0	0
	SB	-	41 - E	-	20 - C	36 - E		-	-	-	-	25	100	-	-	-	-	25	100
TH 210 & Timberwood Stop Controlled	EB	-	-	0 - A	-	0 - A	2 - A	-	-	-	-	-	-	-	0	0	-	-	
	WB	-	7 - A	1 - A	-	2 - A		-	-	-	475	0	25	-	0	0	-	-	
	NB	-	68 - F	-	17 - C	21 - C		-	-	-	-	25	100	-	-	-	-	25	100
Knollwood U-Turn	EB	-	-	2 - A	-	2 - A	2 - A	-	-	-	-	-	-	-	0	0	-	-	
	WB	11 - B	-	1 - A	-	2 - A		-	-	-	25	125	-	-	-	0	0	-	-

Modeled results show that the increase in eastbound and westbound traffic does increase delays experienced on the sidestreet movements within the study area. Signal timings are able to be adjusted to accommodate the increased traffic, but this has an adverse effect on the minor movements at these intersections. Notable operations results noted below:

Timberwood Drive

- Northbound left turning traffic experiences LOS F, slightly increased from the normal 2040 volumes scenario

Meredith Drive

- Southbound left turning traffic experiences LOS E, increased from LOS D experienced under the normal 2040 volumes scenario

Memorywood Drive

- Southbound traffic experiences LOS F, increased from LOS E experienced under the normal 2040 volumes scenario

Knollwood Drive

- Minimal increases in delays under increased traffic volumes
- Southbound maximum queues may extend through the frontage road intersection

Inglewood Drive

- Minimal increases in delays and queuing under increased traffic volumes

Elder Drive

- Minimal increases in delays under increased traffic volumes

Additional traffic operations details can be found in **Appendix C**.

B. TH 371 Cap-X Analysis

CAP-X is a planning level tool developed by the FHWA that is used to determine if at grade intersection designs or grade separated interchanges will serve the forecasted traffic. It is used as the first step to determine what could work and how an alternative would be anticipated to function. CAP-X shows the volume to capacity ratio (v/c ratio) for peak hourly traffic for various intersection and interchange types. The v/c ratio is the total demand volume entering an intersection divided by the theoretical capacity of the intersection or interchange. A v/c ratio less than 0.85 shows adequate capacity is available and no significant delay or queuing is expected. A v/c ratio at or over 1.00 shows that the intersection is over capacity which would show high delay and problematic queuing issues. A v/c ratio between 0.85 and 1.00 would show some delay and queuing.

CAP-X was used to determine the feasibility of various intersection and interchange alternatives for the TH 210 and TH 371 junction. This major intersection serves local and regional mobility via these two principal arterials serving Central Minnesota. The analysis considered 2040+Summer traffic volumes during the PM peak hour. The resulting volume-to-capacity ratios of the top-ten intersection and interchange alternatives are shown in **Table 9**.

Table 9: TH 210/371 2040+Summer CAP-X Results

TYPE OF INTERSECTION	Overall V/C Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Partial Cloverleaf A E-W	0.47	1	3.0	Poor	Poor	Good
Partial Cloverleaf B E-W	0.63	2	3.0	Poor	Poor	Good
Diverging Diamond Interchange E-W	0.66	3	6.7	Good	Good	Good
Single Point E-W	0.66	3	4.8	Fair	Fair	Good
Displaced Left Turn	0.70	5	4.8	Fair	Fair	Good
Displaced Left Turn (Interchange) E-W	0.71	6	4.8	Fair	Fair	Good
Diamond E-W	0.82	7	4.8	Fair	Fair	Good
Partial Displaced Left Turn N-S	0.95	8	4.8	Fair	Fair	Good
Quadrant Roadway N-W	0.96	9	4.4	Fair	Fair	Fair
Quadrant Roadway N-E	1.00	10	4.4	Fair	Fair	Fair

Results reveal that a grade separated interchange is a likely solution in providing adequate capacity to serve the volumes predicted to travel the intersection. Only a displaced left turn intersection or quadrant roadway configuration are able to provide the needed capacity without utilizing a grade separation. These at-grade configurations will likely require significant right-of-way and/or complex signal phasing due to the proximity of the BNSF railroad.

However, additional traffic analysis is required to better understand the operations of the considered interchange configurations and their interactions with nearby intersections and the local network. Furthermore, preliminary design considerations must be made in weighing the impacts of a grade separation on both the TH 210 and TH 371 corridors, as well as the railroad.

Full CAP-X results can be found in **Appendix F**.

Recommendation:

- Conduct interchange feasibility study, considering various interchange geometries, impacts on adjacent intersections, and plan to leverage various funding sources

C. Elder Drive Relocation

As noted in the guided access plan, the existing Elder Drive location does not meet MnDOT's access management guidelines established for the section of TH 210 west of TH 371. The proximity of the two intersections is likely causing the elevated number of crashes at this location. The guided access plan identifies a location 0.5 miles west of TH 371, in alignment with Forthun Road and Flintwood Drive, as a potential placement of a secondary access intersection that could replace the existing Elder Drive intersection.

As previously noted, relocating this intersection to meet the guided access plan will require the relocation of an at-grade rail crossing of the BNSF line along TH 210. Historically, BNSF has not allowed an at-grade crossing relocation without the removal of another at-grade crossing. In short, it may prove difficult to relocate this crossing without making accommodations to the railroad elsewhere along the corridor, making the Elder Drive relocation project not feasible as a standalone project.

The exploration of a grade separated interchange of TH 210 and TH 371 may provide an opportunity and a need to relocate this intersection and rail crossing if it eliminates the at-grade crossing of TH 371. Further study of the interchange feasibility and ongoing coordination with the railroad should be considered.

Relocating Elder Drive will require the reconfiguration of the local network within the commercial area it serves. This area is home to several big box stores and generates high traffic volumes year-round. An in-depth study of the area, its accesses to TH 210 and TH 371, and the local network should be further studied to determine the impacts of relocating Elder Drive and any potential improvements to the local network that may improve site circulation.

Recommendations:

- Study internal site circulation of commercial area and access needs via TH 210, TH 371, and CR 48
- Consider Elder Drive relocation with TH 210/371 interchange evaluation study
- Determine impacts and requirements on local network of relocating Elder Drive separately from TH 210/371 interchange
- Project is identified as a long-term project which may be implemented in advance of, or concurrently with a TH 210/371 interchange

D. CR 48 & Memorywood Drive Realignment

City planning documents identify the potential realignment of CR 48 (Highland Scenic Drive) to form a south leg at Memorywood Drive and TH 210. Neither the City or County have a developed plan or immediate need to make this improvement due to uncertainty in exact alignment and need for railroad coordination. Most notably, significant right-of-way acquisition, including several full take properties, is likely to be required to properly realign the roadway to Memorywood Drive. Therefore, this improvement is viewed as a low priority, long-term to opportunity driven project. Investigation into various alignments, considering realigning CR 48 to Memorywood Drive, or closing Memorywood Drive and forming a north leg at CR 48 via Maplewood Drive and Fairview Road.

A preliminary operations analysis was conducted to determine the feasibility of realigning

CR 48 to the Memorywood Drive location and implementing a traffic signal or RCI. Operations results for these two alternatives under 2040 PM peak traffic volumes is summarized below in **Table 10**.

Table 10: CR 48 Realignment Traffic Operations Results

Intersection	Approach	Traffic Delay (sec/veh)					Intersection (Delay - LOS)	PM Traffic Queuing (feet)											
		Movement (Delay - LOS)				Approach (Delay - LOS)		U Turn			Left Turn			Through			Right Turn		
		U	L	T	R			Storage	Avg	Max	Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
HWY 210 & Memorywood Dr <i>Signalized Intersection</i>	EB	-	32 - C	20 - C	5 - A	18 - B	14 - B	-	-	-	370	25	50	-	100	175	250	25	75
	WB	-	25 - C	10 - B	2 - A	13 - B		-	-	-	300	100	200	-	75	150	250	25	50
	NB	-	19 - B	26 - C	6 - A	15 - B		-	-	-	150	50	125	-	50	100	-	50	100
	SB	-	16 - B	24 - C	6 - A	16 - B		-	-	-	125	50	100	-	25	75	-	25	75
TH 210 & West U-Turn <i>MUT</i>	EB	-	-	0 - A	-	0 - A	1 - A	-	-	-	-	-	-	-	-	-	-	-	
	WB	3 - A	-	0 - A	-	1 - A		300	25	50	-	-	-	-	-	-	-	-	
	NB	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	
	SB	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	
TH 210 & Memorywood Dr <i>RCI</i>	EB	-	5 - A	1 - A	0 - A	1 - A	2 - A	-	-	-	370	25	25	-	-	-	250	0	25
	WB	-	6 - A	1 - A	0 - A	2 - A		-	-	-	300	50	125	-	-	-	250	0	25
	NB	-	-	-	5 - A	5 - A		-	-	-	-	-	-	-	-	-	-	50	100
	SB	-	-	-	6 - A	6 - A		-	-	-	-	-	-	-	-	-	-	50	75
TH 210 & East U-Turn <i>MUT</i>	EB	11 - B	-	1 - A	-	3 - A	2 - A	300	50	100	-	-	-	-	-	-	-	-	
	WB	-	-	1 - A	-	1 - A		-	-	-	-	-	-	-	-	-	-	-	
	NB	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	
	SB	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	

Both the traffic signal and RCI are anticipated to provide acceptable operations for all movements during the PM peak hour under forecasted 2040 traffic volumes. Intersection alternatives should be further analyzed once a final alignment is identified.

Recommendations:

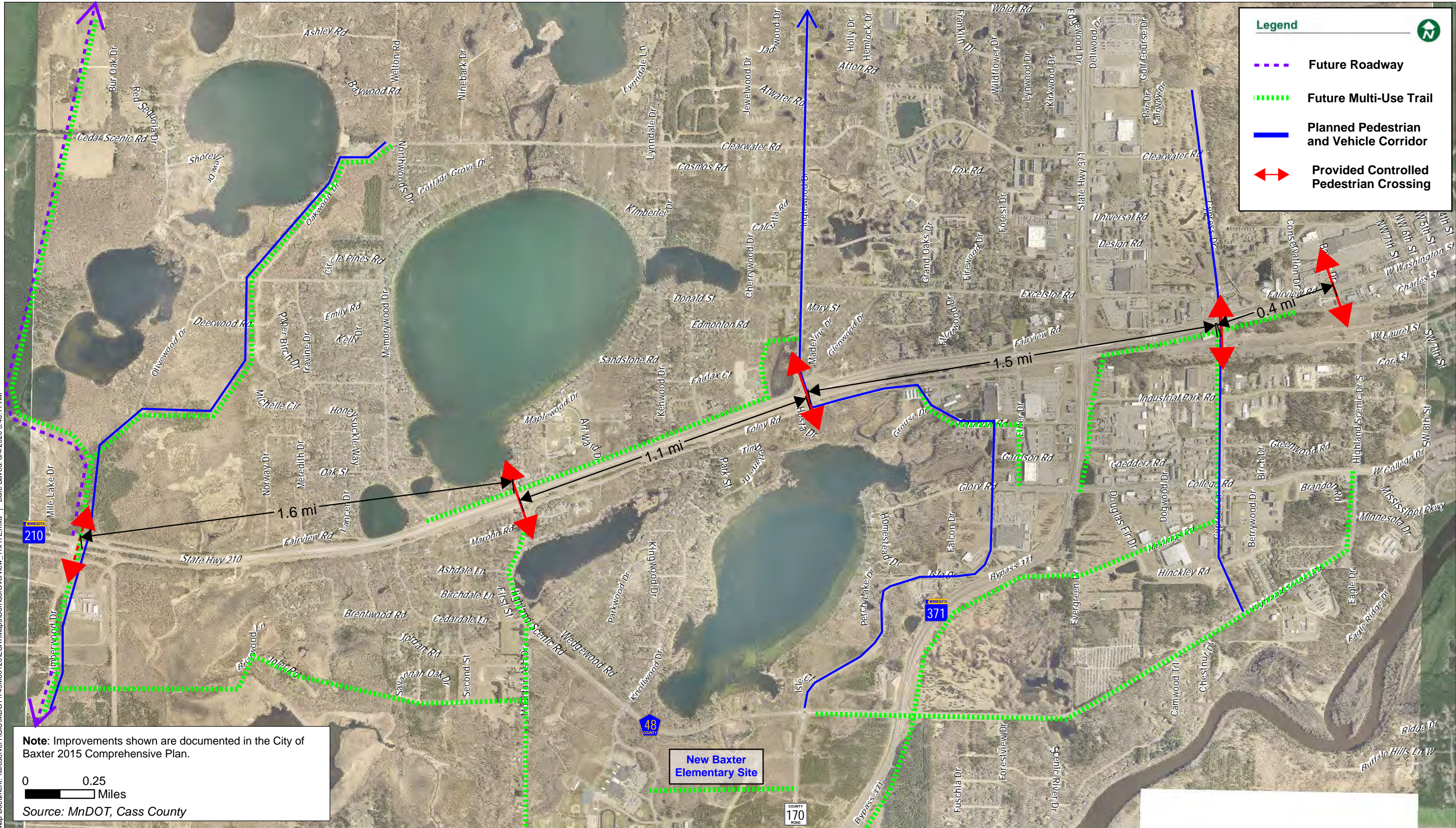
- Develop and assess alignment alternatives, consider impacts of TH 210 to TH 371 cut through traffic via CR 48
- Further evaluate intersection control alternatives meeting guided access plan criteria
- Project is identified as an opportunity project, driven by City and County goals

E. Pedestrian Considerations

The City of Baxter has identified five locations for prioritized pedestrian crossings of the TH 210 as highlighted in **Figure 10** TH 210 is seen as a major obstacle to safe pedestrian travel, dividing north and south Baxter. The proposed intersection improvements align with the City identified crossing locations and accommodate safe and familiar pedestrian mobility across the high-speed, high-volume highway. The provided crossings eliminate the need for grade-separated pedestrian facilities which would be costly and likely require railroad coordination to avoid impacting BNSF right-of-way.

Recommendation:

- Maintain and promote pedestrian mobility at key intersections as documented by City plans



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VIII. Recommended Alternatives

Based on the project goals, concept evaluation, and public input, the following alternatives are recommended for the TH 210 Baxter Access Study area:

Typical Section

- Restripe segment between CR 48 and Timberwood Drive as a two-lane segment, allowing for two-stage crossing in median opening at Meredith Drive

Access Management

- Relocate $\frac{3}{4}$ access to Fairview Road east of CR 48 to align with Art Ward Drive
- Relocate Elder Drive to Forthun Drive/Flintwood Road, provide $\frac{3}{4}$ access, at-grade rail crossing, and local network improvements – Long-term improvement

Intersections Control/Geometry

- Extend westbound left turn lane at CR 48
- Install an unsignalized Green-T intersection at Memorywood Drive
- Install traffic signal at Inglewood Drive, construct south leg with at-grade rail crossing
- Remove signal and trail crossing at Knollwood Drive and south leg of intersection
- Install RCI at Knollwood Drive with westbound MUT
- Install traffic signal on south half of existing Elder Drive intersection – Mid-term improvement

Requires Further Study

- Further evaluate commercial area southwest of TH 210/371 intersection
- Further evaluate TH 210/371 interchange
- Further evaluate CR 48 realignment to Memorywood Drive

Several projects that can be implemented in the short- or mid-term are well enough defined to produce planning level concept figures and cost estimates. Concept figures for the recommended improvements and brief narratives listing any design assumptions in concept and cost development are listed below and shown in **Figures 11-15**. All concepts were shared with MnDOT's Geometric Design Support Unit (GDSU) for an over the shoulder review, these comments helped refine the concept designs for a better understanding of geometric impacts and costs.

- Restriped TH 210 at Meredith Drive – **Figure 11**
 - No impacts are anticipated outside of pavement markings and signing. Work should be performed with planned pavement resurfacing project.
- Unsignalized Green-T at Memorywood Drive – **Figures 12 & 13**
 - Any median impacts or additions can be sawcut into existing roadway.
 - Reconstruction of pavement in only the impacted areas is anticipated, with pavement resurfacing project improving conditions outside of Green-T needs.
 - Planned 2021 lighting is not anticipated to be impacted. Additional lights may be required with Green-T geometry.
 - Further investigation into drainage needs and snowplow turning movements (u-turns) with channelized Green-T is required.
- Fairview Road Access Relocation to Art Ward Drive – **Figure 14**
 - Any median impacts or additions can be sawcut into existing roadway.
 - Reconstruction of pavement in only the impacted areas is anticipated, with pavement resurfacing project improving conditions outside of relocation limits.
 - Westbound left turn lane at CR 48 is extended to provided required capacity shown in 2040 operations analysis.
- RCI at Knollwood Drive – **Figure 15**
 - Removal and regrading of south leg, removal of pedestrian facilities included in

cost.

- Full pavement reconstruction is anticipated for eastbound lanes impacted by required widening.
- Planned 2021 lighting is not anticipated to be impacted. Lighting should be added for the MUT location.
- MUT is designed to accommodate a school bus. Large trucks are not anticipated to be common and can utilize frontage roads if necessary.

Figure 11: Meredith Drive Concept Figure

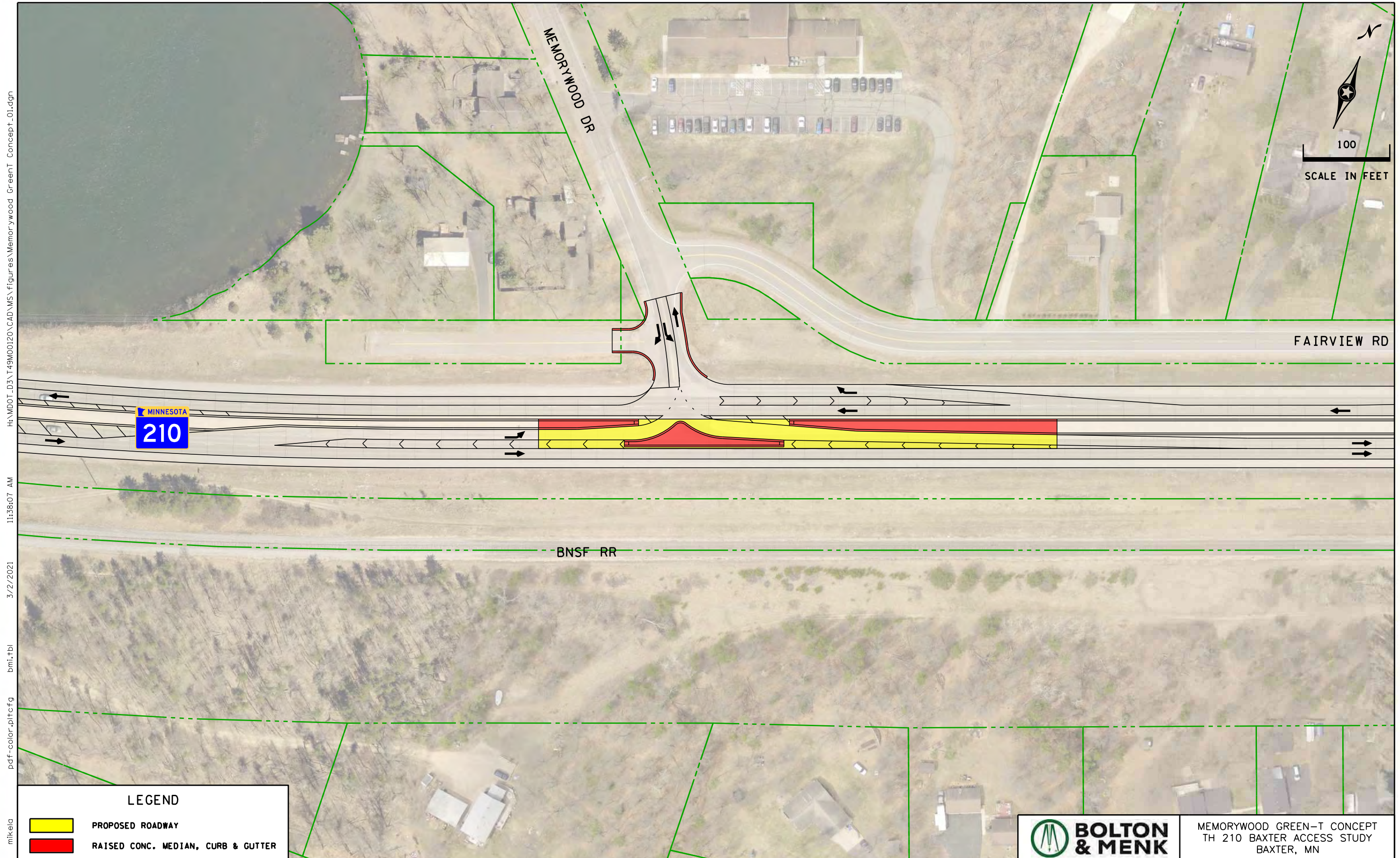


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MEREDITH TWSC
TH 210 BAXTER ACCESS STUDY
BAXTER, MN

Figure 12: Memorywood Drive Channelized Unsignalized Green-T Concept Figure



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Figure 13: Memorywood Drive Striped Unsignalized Green-T Concept Figure

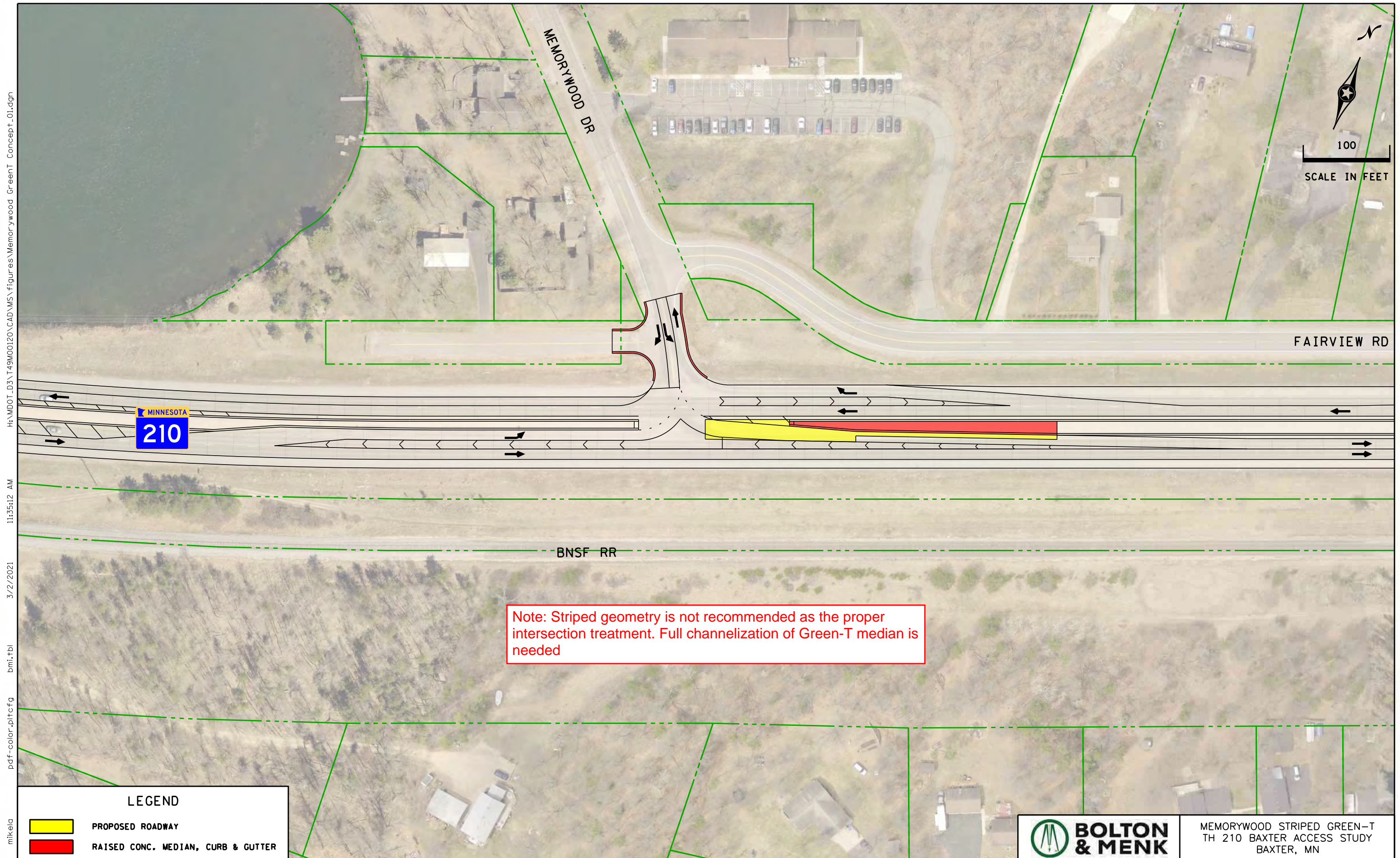


Figure 14: Art Ward Drive Concept Figure

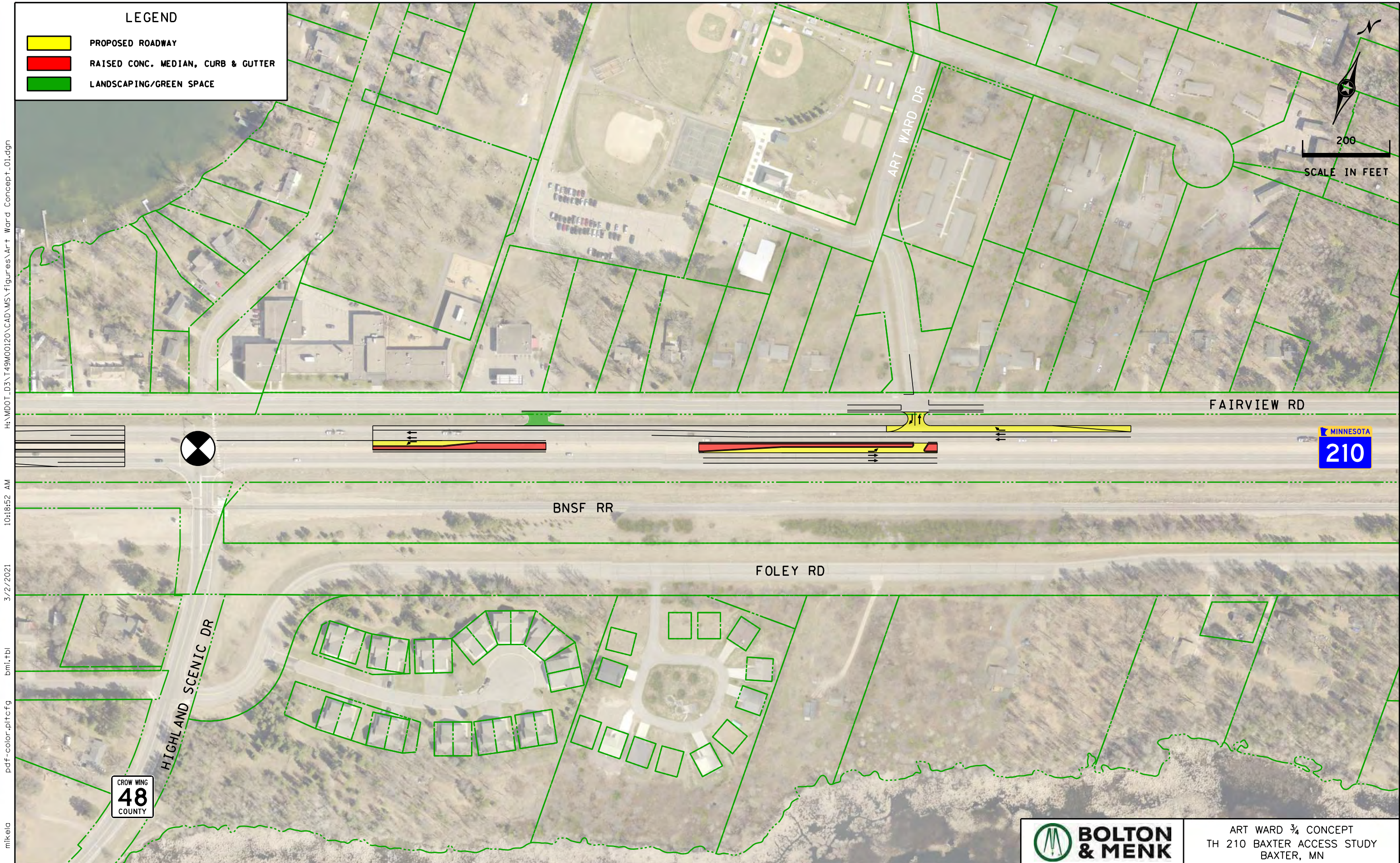
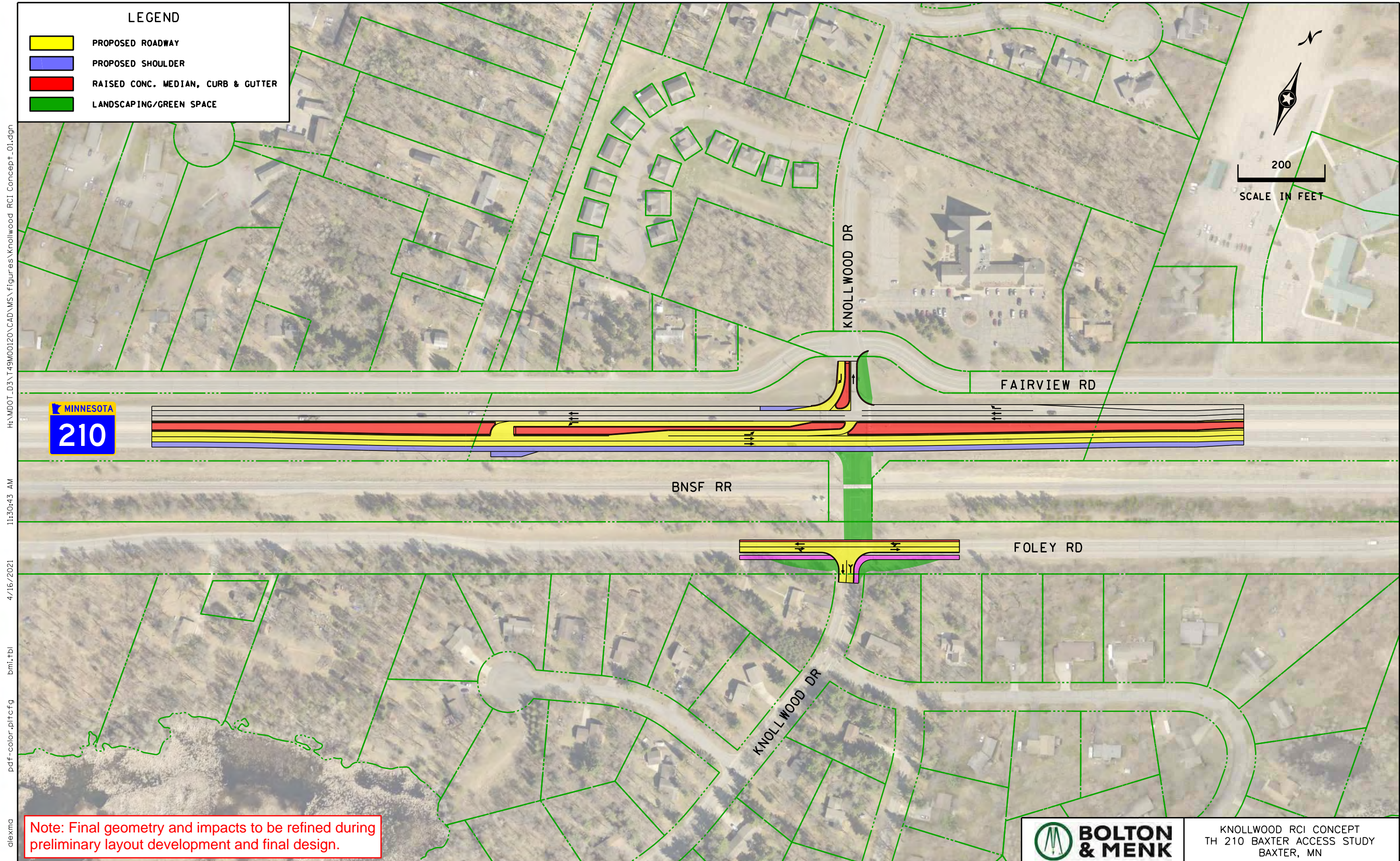


Figure 15: Knollwood Drive Concept Figure



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IX. Project Implementation and Cost

The **Implementation Plan – TH 210 – Timberwood Drive to Baxter Drive** packet included at the end of this report documents the recommended Implementation Plan and associated projects in the study area. The recommended projects will not be constructed or completed all at once, however, the projects will be driven by the needs of the area. The improvements are separated into recommended projects and potential timeframes based on project needs, available funding, and stakeholder input. The implementation plan describes individual projects, potential funding sources, lead agency, project cost, and the anticipated timeframes for completion. Right-of-Way (ROW) costs are not fully understood for future projects and will be finalized during the preliminary design phases of the specific projects. Project cost do not include City utility improvements. **Figure 16** illustrates project locations, general timeframes, and approximate project costs.

Public outreach performed during the study found general support for the proposed improvements but there are still portions of the public that indicated confusion or disagreement with some of the planned projects. Additional public outreach should be conducted prior to implementing the proposed improvements to give the public another opportunity to view and comment on project details. Additional education on agency decision making processes and how alternative intersection designs function may also be beneficial. Transparent and open communication with the public is vital for the success of the individual projects, as well as the greater TH 210 corridor.

Projects identified as short-term generally align with those improvements included in MnDOT's four-year Statewide Transportation Improvement Program (STIP), such as the City of Baxter's LPP funded project in 2022 and District 3's 2024 resurfacing project. Projects identified as mid-term timeframe would be considered as planned improvements in District 3's 10-year CHIP or implemented locally. Long-term improvements identified in the report are improvements that require partnership coordination and funding to implement. Lastly, opportunity/development driven projects, as the name suggests, are those projects that will be driven locally or as opportunities for funding them become realized.

Short-term projects, expected to occur in the next four years, may be constructed concurrently with a MnDOT-led pavement reconditioning project identified in the MnDOT 10-year Capital Highway Investment Plan (CHIP) to be constructed in 2024. Implementing the following projects identified in this study with the CHIP project may reduce construction costs and impacts to local traffic:

1. Constructing a Green-T at Memorywood Drive
2. Construct an RCI at Knollwood Drive
3. Restriping TH 210 to a two-lane section between CR 48 and Timberwood Drive
4. Relocate Fairview Road $\frac{3}{4}$ access to Art Ward Drive

A City of Baxter led project improving the Inglewood Drive intersection with a fourth leg and traffic signal, and reconstructing Knollwood Drive as an RCI is currently in the design-phase and is scheduled to be constructed in 2022. This, and the projects listed above, are identified as short-term improvements as they address immediate safety and operation needs and can be easily implemented without the need for extensive study, coordination, or funding acquisition.

Short-term construction projects are expected to cost between 2.68 and 2.96 million dollars at the time of completion. These costs include project development and delivery, ROW acquisition, and inflation based on the expected project timelines.

Mid-term projects, expected to occur in the next five to fourteen years, include:

1. Signalize the southern half of the Elder Drive intersection

2. Perform a study of the commercial area southwest of the TH 210/371 intersection, developing a Small Area Plan

Mid-term construction and planning projects are expected to cost between \$520,000 and \$620,000 at the time of completion. These costs include the same assumptions as noted above. The projects are identified as mid-term as they serve an identified need along the corridor but may be difficult to quickly implement due to construction costs and impacts.

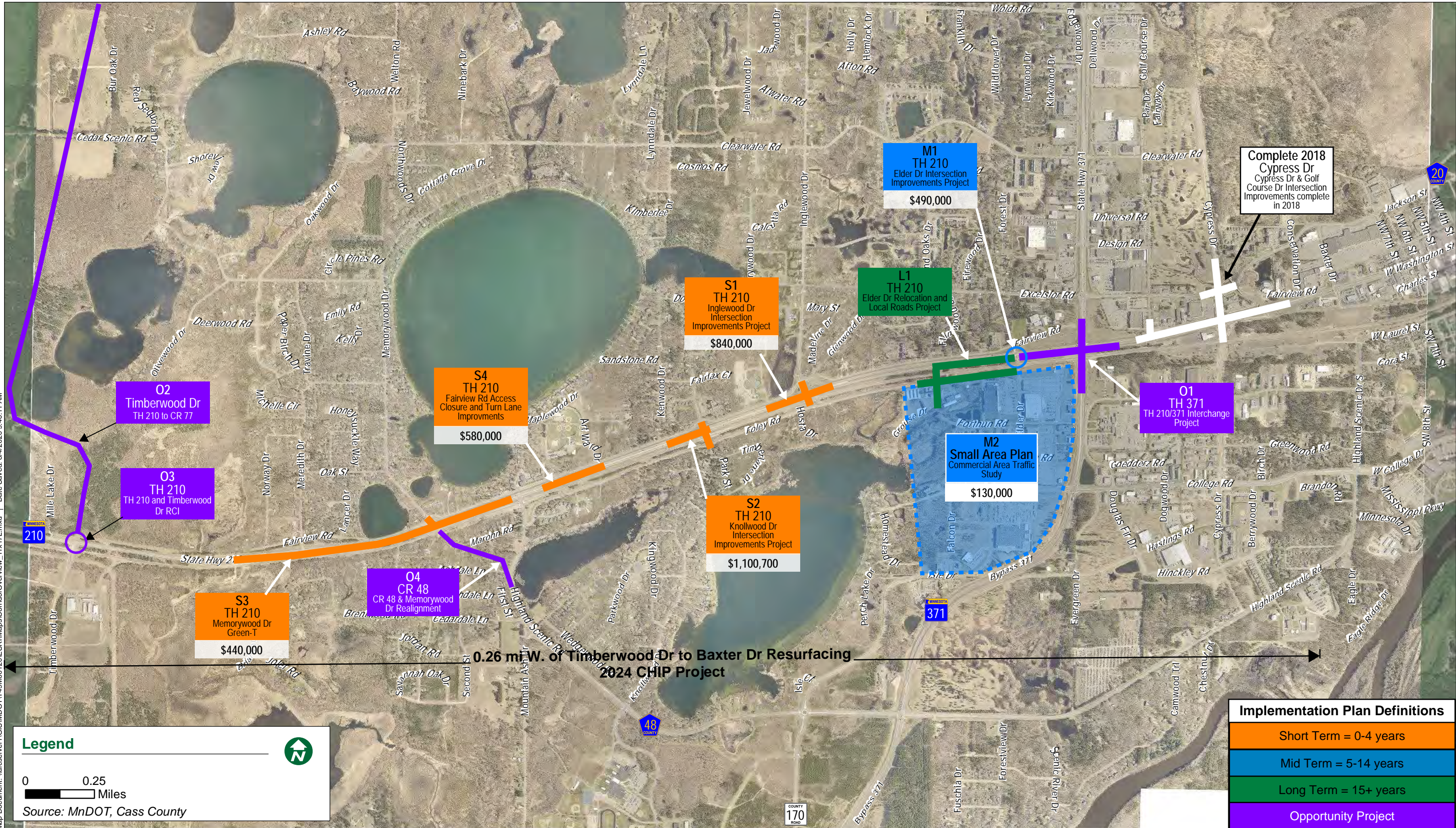
The long-term project, expected to occur in the next fifteen to twenty years, includes completing *relocation of Elder Drive to Forthun Road/Flintwood Drive*. This project was identified as a long-term project because of the need for further study of the commercial area and in the impacts of relocating Elder Drive will have on the internal site circulation, and due to the need for coordination and negotiation with BNSF relating to the relocation of the at-grade rail crossing. The exact scope of the project will be better identified by the Small Area Plan developed in the mid-term. Similarly, this project will likely need to be coordinated with a study of the feasibility of a TH 210/371 interchange. The project likely needs to either precede the construction of an interchange or be included in the interchange project due to construction impacts of creating a grade separated junction as well as navigating adjustments to the BNSF network. Due to uncertainty in final project scope and design, no estimated costs are provided for this project.

Several future opportunity projects were identified as part of the TH 210 Baxter Access Study:

1. *TH 210/371 Interchange*. This priority intersection impacts local and regional mobility and is likely to be a highly impactful and politically charged project requiring a large amount of funding to be leveraged to deliver the project. The intersection is overcapacity and needs expansion but impacts to adjacent intersections, area businesses and the railroad must be considered.
2. *Timberwood Drive North Expansion*. The northwest area of Baxter is currently undeveloped and is zoned for commercial and residential use. This area will be served by a planned expansion of Timberwood Drive from TH 210 to CR 77. The exact alignment, typical section, and intersection control at TH 210 will need to be determined as development type, size, and intensity becomes clearer. Appropriate traffic control at the TH 210 intersection will also be determined once development is better defined.
3. *Timberwood Drive Safety Improvements*. The Timberwood Drive intersection currently operates acceptably and does not have any safety concerns. If area development does not occur and a north leg is not warranted, the intersection should be monitored for safety issues. If reported crashes become more frequent, the intersection could be improved to provide a higher level of safety for Timberwood Drive traffic, most likely an RCI. Exact needs should be analyzed if traffic safety issues arise.
4. *CR 48 Realignment*. County and City planning documents show the realignment of CR 48 to Memorywood Drive as a future project but neither stakeholder have any immediate plan nor need to make this improvement. The project will likely require railroad coordination, significant right-of-way acquisition and further study of the exact alignment to be selected.

Due to uncertainty in project scope, timing, or approximate design, estimated costs are not provided for the projects listed above. Project prioritizations should be discussed at a City, County, and State level to determine when additional studies should be conducted, how local funds should be proportioned, and where additional state and/or federal funding streams can be leveraged.

All timeframes identified in the implementation plan are approximate, however, this plan gives MnDOT, Crow Wing County, and the City of Baxter a guide to focus efforts for future construction projects in a logical manner. Additional implementation plan details can be found in the **Implementation Plan – TH 210 – Timberwood Drive to Baxter Drive** packet included at the end of this report. Cost estimates are provided for projects developed by this corridor study. Where cost estimates are not provided, planning level costs are used.



Complete 2018
Cypress Dr
Cypress Dr & Golf Course Dr Intersection
Improvements complete in 2018

M1
TH 210
Elder Dr Intersection
Improvements Project
\$490,000

L1
TH 210
Elder Dr Relocation and
Local Roads Project

S1
TH 210
Inglewood Dr
Intersection
Improvements Project
\$840,000

S4
TH 210
Fairview Rd Access
Closure and Turn Lane
Improvements
\$580,000

M2
Small Area Plan
Commercial Area Traffic
Study
\$130,000

O1
TH 371
TH 210/371 Interchange
Project

S2
TH 210
Knollwood Dr
Intersection
Improvements Project
\$1,100,700

O3
TH 210
TH 210 and Timberwood
Dr RCI

O4
CR 48
CR 48 & Memorywood
Dr Realignment

S3
TH 210
Memorywood Dr
Green-T
\$440,000

**0.26 mi. W. of Timberwood Dr to Baxter Dr Resurfacing
2024 CHIP Project**

Legend

0 0.25
Miles

Source: MnDOT, Cass County

Implementation Plan Definitions

Short Term = 0-4 years
Mid Term = 5-14 years
Long Term = 15+ years
Opportunity Project

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Corridor Implementation Plan – TH 210 – Timberwood Drive to Baxter Dr



Highway 210 Baxter Access Study Implementation Plan July 2021



Priority	Project Number	Years Estimated	Project Description	Potential Funding	Lead Agency	Cost														Comments		
						Construction		Right-of-Way		Project Development and Delivery		Total (2021 Dollars)		Year	Total Expected Cost (with 3% inflation)							
Short-Term	S1	1-2 Years	Inglewood Drive Intersection Improvements <i>Inglewood Signal and South Knollwood Realignment</i>	Local, LPP	City	\$637,000	to	\$700,000	-	to	-	\$105,000	to		\$120,000	\$742,000	to	\$820,000	2022	\$760,000	to	\$840,000
	S2	1-2 Years	Knollwood Drive Intersection Improvements <i>Knollwood RCI</i>	Local, LPP	City	\$848,000	to	\$921,000	-	to	-	\$140,000	to	\$152,000	\$988,000	to	\$1,090,000	2022	\$1,013,500	to	\$1,100,700	
	S3	3-4 Years	Memorywood Drive Intersection Improvements <i>Memorywood Green-T</i>	CO, Local, TH	MnDOT	\$300,000	to	\$330,000	-	to	-	\$60,000	to	\$70,000	\$360,000	to	\$400,000	2024	\$390,000	to	\$440,000	
	S4	3-4 Years	Fairview Road and Art Ward Drive Access Modifications	CO, Local, TH	MnDOT	\$400,000	to	\$440,000	-	to	-	\$80,000	to	\$90,000	\$480,000	to	\$530,000	2024	\$520,000	to	\$580,000	
	Subtotal						\$2,185,000	to	\$2,391,000	\$0	to	\$0	\$385,000	to	\$432,000	\$2,570,000	to	\$2,840,000		\$2,683,500	to	\$2,960,700
Mid-Term	M1	5-7 Years	Elder Drive Intersection Improvements <i>3/4 Access Signalization</i>	CO, Local, TH	MnDOT	\$300,000	to	\$350,000	\$0	to	\$0	\$60,000	to	\$70,000	\$360,000	to	\$420,000	2026	\$420,000		\$490,000	
	M2	7-9 Years	Small Area Plan - TH 210/371 SW Commercial Area <i>Area Traffic Study and Planning</i>	Local	City	\$0	to	\$0	\$0	to	\$0	\$75,000	to	\$100,000	\$75,000	to	\$100,000	2030	\$100,000		\$130,000	
	Subtotal						\$300,000	to	\$350,000	\$0	to	\$0	\$135,000	to	\$170,000	\$435,000	to	\$520,000		\$520,000	to	\$620,000
Long-Term	L1	15-20 Years	Elder Drive Relocation and Local Roads Project	Local, LRIP, LPP, HSIP	County	-	to	-	-	to	-	-	to	-	-	to	-	2035	TBD	to	TBD	
	Subtotal						\$0	to	\$0	\$0	to	\$0	\$0	to	\$0	\$0	to	\$0		\$0	to	\$0
Total 20 Year Investment						\$2,485,000	to	\$2,741,000	\$0	to	\$0	\$520,000	to	\$602,000	\$3,005,000	to	\$3,360,000		\$3,203,500	to	\$3,580,700	
Opportunity / Development Driven	O1		TH 210/371 Interchange	CO, Local, TH, CoC, BUILD	MnDOT	-	to	-	-	to	-	-	to	-	-	to	-	TBD	TBD	to	TBD	Requires study of TH 210/371 area and railroad coordination
	O2		Local Roads - City of Baxter <i>Timberwood Drive, North Extension to CR 77</i>	Local, Private	Local	-	to	-	-	to	-	-	to	-	-	to	-	TBD	TBD	to	TBD	Development driven
	O3		Timberwood Drive Intersection Safety Improvements <i>Timberwood RCI</i>	CO, Local, HSIP, LPP	City, MnDOT	-	to	-	-	to	-	-	to	-	-	to	-	TBD	TBD	to	TBD	Safety driven
	O4		CR 48 Realignment <i>Highland Scenic Drive to Memorywood Drive Connection</i>	Local, LPP	County	-	to	-	-	to	-	-	to	-	-	to	-	TBD	TBD	to	TBD	Requires railroad coordination, significant ROW impacts

FUNDING KEY

CO	County State Aid Highway, County Sales Tax, Wheelage, or Other County Funds	MHFP	Minnesota Highway Freight Program Funds (State)	Note: Construction and Project Development and Delivery cost are estimate cost plus 20% Note: Construction Cost do NOT include City Utilities (Sanitary/Watermain) Note: Right-of-Way costs are preliminary and will be finalized at a later date
HSIP	Highway Safety Improvement Program Funds (Federal)	PRIV	Private Funding / Development (Private)	
LOCAL	City Funding MSAS	RS	Regional Solicitation (Federal)	
LPP	Local Partnership Program	SRTS	Safe Routes to School	
LRIP	Local Road Improvement Program Funds (State)	TH	Trunk Highway Funds (State)	
CoC	Corridors of Commerce Program Funds (State)	BUILD	Better Utilizing Investments to Leverage Development Grant (Federal)	

POTENTIAL SCHEDULE ADJUSTMENTS

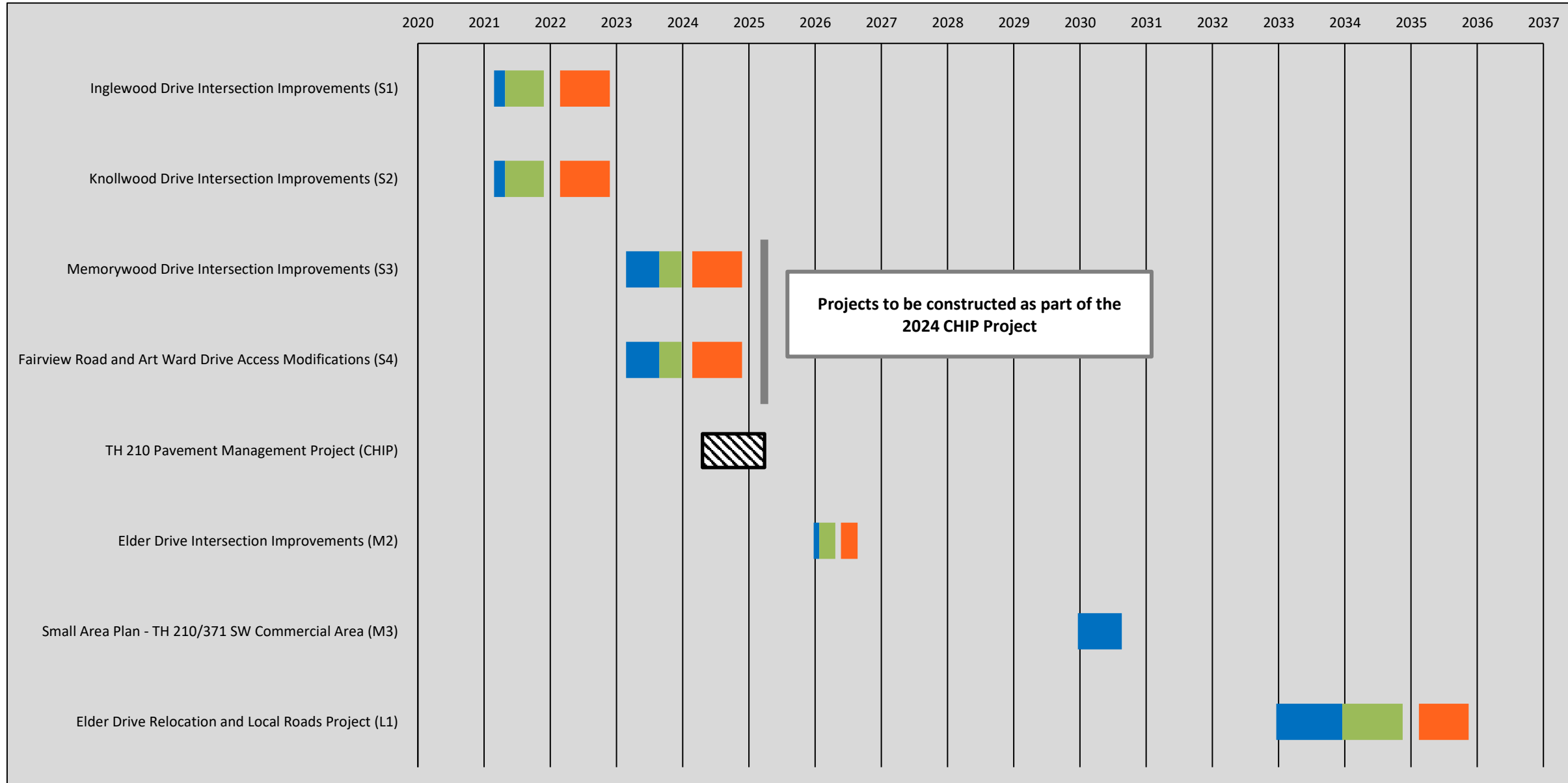
- CHANGE:** O1 moves to established timeline or schedule, concurrent with L1
- CHANGE:** L1 is advanced to a mid-term project
- CHANGE:** O3 moves to established timeline or schedule

- CAUSE:** Interchange study and project scope include relocation of or modifications to Elder Drive intersection
- CAUSE:** Results of M3 produce immediately implementable project that do not rely on O1 study or construction
- CAUSE:** Safety and operations concerns arise at the Timberwood Drive Intersection

Highway 210 Baxter Access Study

Schedule to Deliver Key Projects

June 2021



Projects to be constructed as part of the 2024 CHIP Project



Preliminary Design Opinion of Probable Cost
TH 210 & Inglewood Drive Cost-Sharing
 Preliminary Cost Estimate

City of Baxter

6/18/2021

APPENDIX A

S1 - Inglewood Design Estimate

Item	Unit	Quantities				Costs					
		Subtotal: MnDOT Participation		Subtotal: City of Baxter Participation	Total Qty	Unit Price	Subtotal: MnDOT Participation		Subtotal: City of Baxter Participation	Total Cost	
		TH 210 to Outside Shoulder Edge	Shoulder Edge to MnDOT/BNSF R/W Line	BNSF Railroad R/W Section (3)			TH 210 to Outside Shoulder Edge	Shoulder Edge to MnDOT/BNSF R/W Line	BNSF Railroad R/W Section (3)		
MAJOR ROADWAY											
	REMOVE BITUMINOUS PAVEMENT	SY	1,050	-	-	1,050	\$ 5.00	\$ 5,300	-	-	\$ 5,300
	REMOVE CURB & GUTTER	LF	125	-	-	125	\$ 5.00	\$ 600	-	-	\$ 600
	REMOVE CONCRETE MEDIAN	SY	40	-	-	40	\$ 8.00	\$ 300	-	-	\$ 300
	SAWING BITUMINOUS PAVEMENT FULL DEPTH	LF	770	-	-	770	\$ 3.00	\$ 2,300	-	-	\$ 2,300
	COMMON EMBANKMENT (CV)	CY	315	500	1000	1,815	\$ 15.00	\$ 4,700	\$ 7,500	\$ 15,000	\$ 27,200
(1)	AGGREGATE BASE (CV) CLASS 5	CY	170	70	130	370	\$ 30.00	\$ 5,100	\$ 2,100	\$ 3,900	\$ 11,100
(1)	SELECT GRANULAR EMBANKMENT (CV)	CY	680	260	510	1,450	\$ 14.00	\$ 9,500	\$ 3,600	\$ 7,100	\$ 20,200
(1)	TYPE SP BITUMINOUS MIX (ROAD - WEARING)	TON	184	71	137	392	\$ 88.00	\$ 16,200	\$ 6,200	\$ 12,100	\$ 34,500
(1)	TYPE SP BITUMINOUS MIX (ROAD - NON WEARING)	TON	184	71	137	392	\$ 85.00	\$ 15,600	\$ 6,000	\$ 11,600	\$ 33,200
	4" CONCRETE WALK/MEDIAN	SF	35	50	2050	2,135	\$ 10.00	\$ 400	\$ 500	\$ 20,500	\$ 21,400
	CURB AND GUTTER	LF	20	105	525	650	\$ 22.00	\$ 400	\$ 2,300	\$ 11,600	\$ 14,300
	Subtotal							\$ 60,400	\$ 28,200	\$ 81,800	\$ 170,400
OTHER ROADWAY ITEMS											
	DRAINAGE INFRASTRUCTURE	LS	1	-	1	2	\$ 800.00	\$ 800	-	\$ 800	\$ 1,600
	TRAFFIC CONTROL SIGNAL SYSTEM	LS	1	-	-	1	\$ 315,500.00	\$ 315,500	-	-	\$ 315,500
	COMMON LABORERS	HOUR	20	-	-	20	\$ 100.00	\$ 2,000	-	-	\$ 2,000
	MOTOR GRADER	HOUR	10	-	-	10	\$ 170.00	\$ 1,700	-	-	\$ 1,700
	STREET SWEEPER (WITH PICKUP BROOM)	HOUR	5	-	-	5	\$ 110.00	\$ 550	-	-	\$ 550
	Subtotal							\$ 320,600	\$ -	\$ 800	\$ 321,400
PERCENTAGE ITEMS											
	MOBILIZATION			10.0%			of all	\$ 38,100	\$ 2,800	\$ 8,300	\$ 49,200
	MISC REMOVALS (SIGNS, TREES, ETC.)			2.0%			of all	\$ 7,600	\$ 600	\$ 1,700	\$ 9,900
	SIGNING & PAVEMENT MARKINGS			5.0%			of all	\$ 19,100	\$ 1,400	\$ 4,100	\$ 24,600
	TRAFFIC CONTROL			2.5%			of all	\$ 9,500	\$ 700	\$ 2,100	\$ 12,300
	CONTINGENCY			10.0%			of all	\$ 38,100	\$ 2,800	\$ 8,300	\$ 49,200
	CONTINGENCY FOR COVID-19 CONSIDERATIONS			10.0%			of all	\$ 38,100	\$ 2,800	\$ 8,300	\$ 49,200
	LEGAL AND ADMINISTRATION			2.0%			of all	-	-	\$ 1,700	\$ 1,700
	BONDING			2.0%			of all	-	-	\$ 1,700	\$ 1,700
	Subtotal							\$ 150,500	\$ 11,100	\$ 36,200	\$ 145,200
Construction Cost (2021 Dollars)								\$ 531,500	\$ 39,500	\$ 119,000	\$ 637,000
(2) Construction Cost (2022 Dollars)								\$ 547,500	\$ 40,700	\$ 122,600	\$ 656,200
Design Engineering Cost (8%)								\$ 44,000	\$ 3,500	\$ 10,000	\$ 52,500
Construction Admin Cost (8%)								\$ 44,000	\$ 3,500	\$ 10,000	\$ 52,500
Total Cost (2022 Dollars)								\$ 635,500	\$ 47,700	\$ 142,600	\$ 761,200

Notes:

- Roadway Section = 3" Bit (wear) - 3" Bit (non-wear) - 6" Agg Base - 24" Select Granular
- 3% Inflation
- Costs do not include any BNSF Infrastructure like gate arms, service cabinets, queue cutter signal, etc.

Preliminary Design Opinion of Probable Cost
TH 210 & Knollwood Drive Full RCI with Mill & Overlay
 Preliminary Cost Estimate
 City of Baxter
 6/28/2021

S2 - Knollwood RCI Design Estimates

Item	Unit	Quantities						Costs				
		Subtotal: Median and Roadway Widening	Subtotal: North Leg Improvements	Subtotal: South Leg Removal	Subtotal: Loon Head	Total Qty	Unit Price	Subtotal: Median and Roadway Widening	Subtotal: North Leg Improvements	Subtotal: South Leg Removal	Subtotal: Loon Head	Total Cost
MAJOR ROADWAY												
REMOVE BITUMINOUS PAVEMENT	SY	2,680	160	600	-	3,440	\$ 5.00	\$ 13,400	\$ 800	\$ 3,000	-	\$ 17,200
REMOVE BITUMINOUS WALK	SF	135	1200	1550	-	2,885	\$ 2.00	\$ 300	\$ 2,400	\$ 3,100	-	\$ 5,800
REMOVE CONCRETE WALK	SF	425	1700	1030	-	3,155	\$ 2.00	\$ 900	\$ 3,400	\$ 2,100	-	\$ 6,400
REMOVE CURB & GUTTER	LF	2,760	150	115	-	3,025	\$ 5.00	\$ 13,800	\$ 800	\$ 600	-	\$ 15,200
REMOVE CONCRETE MEDIAN	SY	2,000	-	-	-	2,000	\$ 8.00	\$ 16,000	-	-	-	\$ 16,000
REMOVE SIGNAL SYSTEM	LS	1	-	-	-	1	\$ 35,000.00	\$ 35,000	-	-	-	\$ 35,000
SAWING BITUMINOUS PAVEMENT FULL DEPTH	LF	2000	530	40	-	2,570	\$ 3.00	\$ 6,000	\$ 1,600	\$ 100	-	\$ 7,700
EXCAVATION - COMMON	CY	5,000	-	5000	-	10,000	\$ 10.00	\$ 50,000	-	\$ 50,000	-	\$ 100,000
TURF ESTABLISHMENT	LS	-	-	1	-	1	\$ 5,000.00	-	-	\$ 5,000	-	\$ 5,000
COMMON EMBANKMENT (CV)	CY	560	-	-	10	570	\$ 15.00	\$ 8,400.00	-	-	\$ 200	\$ 8,600
(1) AGGREGATE BASE (CV) CLASS 5	CY	470	10	-	20	500	\$ 30.00	\$ 14,100.00	\$ 300	-	\$ 600	\$ 15,000
(1) SELECT GRANULAR EMBANKMENT (CV)	CY	1,870	40	-	70	1,980	\$ 14.00	\$ 26,200.00	\$ 600	-	\$ 1,000	\$ 27,800
(1) TYPE SP BITUMINOUS MIX (ROAD - WEARING)	TON	505	10	-	20	535	\$ 75.00	\$ 37,900.00	\$ 800	-	\$ 1,500	\$ 40,200
(1) TYPE SP BITUMINOUS MIX (ROAD - NON WEARING)	TON	505	10	-	20	535	\$ 73.00	\$ 36,900.00	\$ 700	-	\$ 1,500	\$ 39,100
MILL BITUMINOUS SURFACE (3.0")	SY	5,720	-	-	-	5,720	\$ 2.50	\$ 14,300.00	-	-	-	\$ 14,300
4" CONCRETE WALK/MEDIAN	SF	20,560	640	-	-	21,200	\$ 5.00	\$ 102,800.00	\$ 3,200	-	-	\$ 106,000
CURB AND GUTTER	LF	3,220	240	-	-	3,460	\$ 22.00	\$ 70,800.00	\$ 5,300	-	-	\$ 76,100
Subtotal								\$ 446,800	\$ 19,900	\$ 63,900	\$ 4,800	\$ 535,400
LIGHTING ITEMS												
LIGHTING UNIT TYPE 9-40	EACH	8	-	-	-	8	\$ 3,100.00	\$ 24,800.00	-	-	-	\$ 24,800
LIGHTING FOUNDATION DESIGN E	EACH	8	-	-	-	8	\$ 1,450.00	\$ 11,600.00	-	-	-	\$ 11,600
2" NON-METALLIC CONDUIT	LF	3,500	-	-	-	3,500	\$ 7.50	\$ 26,300.00	-	-	-	\$ 26,300
3" NON-METALLIC CONDUIT (DIRECTIONAL BORE)	LF	300	-	-	-	300	\$ 8.50	\$ 2,600.00	-	-	-	\$ 2,600
UNDERGROUND WIRE 1 COND NO 6	LF	3,300	-	-	-	3,300	\$ 1.50	\$ 5,000.00	-	-	-	\$ 5,000
SERVICE EQUIPMENT	EACH	2	-	-	-	2	\$ 1,000.00	\$ 2,000.00	-	-	-	\$ 2,000
EQUIPMENT PAD B	EACH	2	-	-	-	2	\$ 1,100.00	\$ 2,200.00	-	-	-	\$ 2,200
INSTALL HANDHOLLE	EACH	4	-	-	-	4	\$ 1,500.00	\$ 6,000.00	-	-	-	\$ 6,000
ELECTRICAL SERVICE	LS	1	-	-	-	1	\$ 5,000.00	\$ 5,000.00	-	-	-	\$ 5,000
Subtotal								\$ 85,500	\$ -	\$ -	\$ -	\$ 85,500
OTHER ROADWAY ITEMS												
DRAINAGE INFRASTRUCTURE	LS	1	-	-	-	1	\$ 35,000.00	\$ 35,000	-	-	-	\$ 35,000
COMMON LABORERS	HOUR	20	-	-	-	20	\$ 100.00	\$ 2,000	-	-	-	\$ 2,000
MOTOR GRADER	HOUR	10	-	-	-	10	\$ 170.00	\$ 1,700	-	-	-	\$ 1,700
STREET SWEEPER (WITH PICKUP BROOM)	HOUR	5	-	-	-	5	\$ 110.00	\$ 550	-	-	-	\$ 550
Subtotal								\$ 39,300	\$ -	\$ -	\$ -	\$ 39,300
PERCENTAGE ITEMS												
MOBILIZATION				10.0%			of all	\$ 57,200	\$ 2,000	\$ 6,400	\$ 500	\$ 66,100
MISC REMOVALS (SIGNS, TREES, ETC.)				2.0%			of all	\$ 11,400	\$ 400	\$ 1,300	\$ 100	\$ 13,200
SIGNING & PAVEMENT MARKINGS				5.0%			of all	\$ 28,600	\$ 1,000	\$ 3,200	\$ 200	\$ 33,000
TRAFFIC CONTROL				2.5%			of all	\$ 14,300	\$ 500	\$ 1,600	\$ 100	\$ 16,500
CONTINGENCY FOR MISSING ITEMS				10.0%			of all	\$ 57,200	\$ 2,000	\$ 6,400	\$ 500	\$ 66,100
CONTINGENCY FOR COVID-19 CONSIDERATIONS				10.0%			of all	\$ 57,200	\$ 2,000	\$ 6,400	\$ 500	\$ 66,100
Subtotal								\$ 225,900	\$ 7,900	\$ 25,300	\$ 1,900	\$ 261,000
Construction Cost (2021 Dollars)								\$ 797,500	\$ 28,000	\$ 89,000	\$ 6,500	\$ 921,000
(2) Construction Cost (2022 Dollars)								\$ 821,500	\$ 28,900	\$ 91,700	\$ 6,700	\$ 948,700
Design Engineering Cost (8%)								\$ 65,500	\$ 2,500	\$ 7,500	\$ 500	\$ 76,000
Construction Admin Cost (8%)								\$ 65,500	\$ 2,500	\$ 7,500	\$ 500	\$ 76,000
Total Cost (2022 Dollars)								\$ 952,500	\$ 33,900	\$ 106,700	\$ 7,700	\$ 1,100,700

- Notes:
- Roadway Section = 3" Bit (wear) - 3" Bit (non-wear) - 6" Agg Base - 24" Select Granular
 - 3% Inflation
 - Costs do not include any BNSF Infrastructure removals



Preliminary Design Opinion of Probable Cost
TH 210 & Knollwood Drive Full RCI with Mill & Overlay and 4' Min. EB Shoulder
Preliminary Cost Estimate
City of Baxter
6/28/2021

S2 - Knollwood RCI Design Estimates

Item	Unit	Quantities						Costs					
		Subtotal: Median and Roadway Widening	Subtotal: North Leg Improvements	Subtotal: South Leg Removal	Subtotal: Loon Head	Total Qty	Unit Price	Subtotal: Median and Roadway Widening	Subtotal: North Leg Improvements	Subtotal: South Leg Removal	Subtotal: Loon Head	Total Cost	
MAJOR ROADWAY													
REMOVE BITUMINOUS PAVEMENT	SY	2,680	160	600	-	3,440	\$ 5.00	\$ 13,400	\$ 800	\$ 3,000	-	\$ 17,200	
REMOVE BITUMINOUS WALK	SF	135	1200	1550	-	2,885	\$ 2.00	\$ 300	\$ 2,400	\$ 3,100	-	\$ 5,800	
REMOVE CONCRETE WALK	SF	425	1700	1030	-	3,155	\$ 2.00	\$ 900	\$ 3,400	\$ 2,100	-	\$ 6,400	
REMOVE CURB & GUTTER	LF	2,760	150	115	-	3,025	\$ 5.00	\$ 13,800	\$ 800	\$ 600	-	\$ 15,200	
REMOVE CONCRETE MEDIAN	SY	2,000	-	-	-	2,000	\$ 8.00	\$ 16,000	-	-	-	\$ 16,000	
REMOVE SIGNAL SYSTEM	LS	1	-	-	-	1	\$ 35,000.00	\$ 35,000	-	-	-	\$ 35,000	
SAWING BITUMINOUS PAVEMENT FULL DEPTH	LF	2000	530	40	-	2,570	\$ 3.00	\$ 6,000	\$ 1,600	\$ 100	-	\$ 7,700	
EXCAVATION - COMMON	CY	5,000	-	5000	-	10,000	\$ 10.00	\$ 50,000	-	\$ 50,000	-	\$ 100,000	
TURF ESTABLISHMENT	LS	-	-	1	-	1	\$ 5,000.00	-	-	\$ 5,000	-	\$ 5,000	
COMMON EMBANKMENT (CV)	CY	560	-	-	10	570	\$ 15.00	\$ 8,400.00	-	-	\$ 200	\$ 8,600	
(1) AGGREGATE BASE (CV) CLASS 5	CY	300	10	-	30	340	\$ 30.00	\$ 9,000.00	\$ 300	-	\$ 900	\$ 10,200	
(1) SELECT GRANULAR EMBANKMENT (CV)	CY	1,200	40	-	110	1,350	\$ 14.00	\$ 16,800.00	\$ 600	-	\$ 1,500	\$ 18,900	
(1) TYPE SP BITUMINOUS MIX (ROAD - WEARING)	TON	324	10	-	30	364	\$ 75.00	\$ 24,300.00	\$ 800	-	\$ 2,300	\$ 27,400	
(1) TYPE SP BITUMINOUS MIX (ROAD - NON WEARING)	TON	324	10	-	30	364	\$ 73.00	\$ 23,700.00	\$ 700	-	\$ 2,200	\$ 26,600	
MILL BITUMINOUS SURFACE (3.0")	SY	5,765	-	-	-	5,765	\$ 2.50	\$ 14,400.00	-	-	-	\$ 14,400	
4" CONCRETE WALK/MEDIAN	SF	20,560	640	-	-	21,200	\$ 5.00	\$ 102,800.00	\$ 3,200	-	-	\$ 106,000	
CURB AND GUTTER	LF	3,220	240	-	-	3,460	\$ 22.00	\$ 70,800.00	\$ 5,300	-	-	\$ 76,100	
Subtotal								\$ 405,600	\$ 19,900	\$ 63,900	\$ 7,100	\$ 496,500	
LIGHTING ITEMS													
LIGHTING UNIT TYPE 9-40	EACH	8	-	-	-	8	\$ 3,100.00	\$ 24,800.00	-	-	-	\$ 24,800	
LIGHTING FOUNDATION DESIGN E	EACH	8	-	-	-	8	\$ 1,450.00	\$ 11,600.00	-	-	-	\$ 11,600	
2" NON-METALLIC CONDUIT	LF	3,500	-	-	-	3,500	\$ 7.50	\$ 26,300.00	-	-	-	\$ 26,300	
3" NON-METALLIC CONDUIT (DIRECTIONAL BORE)	LF	300	-	-	-	300	\$ 8.50	\$ 2,600.00	-	-	-	\$ 2,600	
UNDERGROUND WIRE 1 COND NO 6	LF	3,300	-	-	-	3,300	\$ 1.50	\$ 5,000.00	-	-	-	\$ 5,000	
SERVICE EQUIPMENT	EACH	2	-	-	-	2	\$ 1,000.00	\$ 2,000.00	-	-	-	\$ 2,000	
EQUIPMENT PAD B	EACH	2	-	-	-	2	\$ 1,100.00	\$ 2,200.00	-	-	-	\$ 2,200	
INSTALL HANDHOLLE	EACH	4	-	-	-	4	\$ 1,500.00	\$ 6,000.00	-	-	-	\$ 6,000	
ELECTRICAL SERVICE	LS	1	-	-	-	1	\$ 5,000.00	\$ 5,000.00	-	-	-	\$ 5,000	
Subtotal								\$ 85,500	\$ -	\$ -	\$ -	\$ 85,500	
OTHER ROADWAY ITEMS													
DRAINAGE INFRASTRUCTURE	LS	1	-	-	-	1	\$ 35,000.00	\$ 35,000	-	-	-	\$ 35,000	
COMMON LABORERS	HOUR	20	-	-	-	20	\$ 100.00	\$ 2,000	-	-	-	\$ 2,000	
MOTOR GRADER	HOUR	10	-	-	-	10	\$ 170.00	\$ 1,700	-	-	-	\$ 1,700	
STREET SWEEPER (WITH PICKUP BROOM)	HOUR	5	-	-	-	5	\$ 110.00	\$ 550	-	-	-	\$ 550	
Subtotal								\$ 39,300	\$ -	\$ -	\$ -	\$ 39,300	
PERCENTAGE ITEMS													
MOBILIZATION				10.0%			of all	\$ 53,000	\$ 2,000	\$ 6,400	\$ 700	\$ 62,100	
MISC REMOVALS (SIGNS, TREES, ETC.)				2.0%			of all	\$ 10,600	\$ 400	\$ 1,300	\$ 100	\$ 12,400	
SIGNING & PAVEMENT MARKINGS				5.0%			of all	\$ 26,500	\$ 1,000	\$ 3,200	\$ 400	\$ 31,100	
TRAFFIC CONTROL				2.5%			of all	\$ 13,300	\$ 500	\$ 1,600	\$ 200	\$ 15,600	
CONTINGENCY FOR MISSING ITEMS				10.0%			of all	\$ 53,000	\$ 2,000	\$ 6,400	\$ 700	\$ 62,100	
CONTINGENCY FOR COVID-19 CONSIDERATIONS				10.0%			of all	\$ 53,000	\$ 2,000	\$ 6,400	\$ 700	\$ 62,100	
Subtotal								\$ 209,400	\$ 7,900	\$ 25,300	\$ 2,800	\$ 245,400	
								Construction Cost (2021 Dollars)	\$ 740,000	\$ 28,000	\$ 89,000	\$ 10,000	\$ 866,500
								(2) Construction Cost (2022 Dollars)	\$ 762,200	\$ 28,900	\$ 91,700	\$ 10,300	\$ 892,500
								Design Engineering Cost (8%)	\$ 61,000	\$ 2,500	\$ 7,500	\$ 1,000	\$ 71,500
								Construction Admin Cost (8%)	\$ 61,000	\$ 2,500	\$ 7,500	\$ 1,000	\$ 71,500
								Total Cost (2022 Dollars)	\$ 884,200	\$ 33,900	\$ 106,700	\$ 12,300	\$ 1,035,500

- Notes:
- Roadway Section = 3" Bit (wear) - 3" Bit (non-wear) - 6" Agg Base - 24" Select Granular
 - 3% Inflation
 - Costs do not include any BNSF Infrastructure removals



Preliminary Design Opinion of Probable Cost
TH 210 & Knollwood Drive Full RCI with Fog Seal
Preliminary Cost Estimate
City of Baxter
6/28/2021

S2 - Knollwood RCI Design Estimates

Item	Unit	Quantities						Costs				
		Subtotal: Median and Roadway Widening	Subtotal: North Leg Improvements	Subtotal: South Leg Removal	Subtotal: Loon Head	Total Qty	Unit Price	Subtotal: Median and Roadway Widening	Subtotal: North Leg Improvements	Subtotal: South Leg Removal	Subtotal: Loon Head	Total Cost
MAJOR ROADWAY												
REMOVE BITUMINOUS PAVEMENT	SY	2,680	160	600	-	3,440	\$ 5.00	\$ 13,400	\$ 800	\$ 3,000	-	\$ 17,200
REMOVE BITUMINOUS WALK	SF	135	1200	1550	-	2,885	\$ 2.00	\$ 300	\$ 2,400	\$ 3,100	-	\$ 5,800
REMOVE CONCRETE WALK	SF	425	1700	1030	-	3,155	\$ 2.00	\$ 900	\$ 3,400	\$ 2,100	-	\$ 6,400
REMOVE CURB & GUTTER	LF	2,760	150	115	-	3,025	\$ 5.00	\$ 13,800	\$ 800	\$ 600	-	\$ 15,200
REMOVE CONCRETE MEDIAN	SY	2,000	-	-	-	2,000	\$ 8.00	\$ 16,000	-	-	-	\$ 16,000
REMOVE SIGNAL SYSTEM	LS	1	-	-	-	1	\$ 35,000.00	\$ 35,000	-	-	-	\$ 35,000
SAWING BITUMINOUS PAVEMENT FULL DEPTH	LF	2000	530	40	-	2,570	\$ 3.00	\$ 6,000	\$ 1,600	\$ 100	-	\$ 7,700
EXCAVATION - COMMON	CY	5,000	-	5000	-	10,000	\$ 10.00	\$ 50,000	-	\$ 50,000	-	\$ 100,000
TURF ESTABLISHMENT	LS	-	-	1	-	1	\$ 5,000.00	-	-	\$ 5,000	-	\$ 5,000
COMMON EMBANKMENT (CV)	CY	560	-	-	10	570	\$ 15.00	\$ 8,400.00	-	-	\$ 200	\$ 8,600
(1) AGGREGATE BASE (CV) CLASS 5	CY	470	10	-	20	500	\$ 30.00	\$ 14,100.00	\$ 300	-	\$ 600	\$ 15,000
(1) SELECT GRANULAR EMBANKMENT (CV)	CY	1,870	40	-	70	1,980	\$ 14.00	\$ 26,200.00	\$ 600	-	\$ 1,000	\$ 27,800
(1) TYPE SP BITUMINOUS MIX (ROAD - WEARING)	TON	505	10	-	20	535	\$ 75.00	\$ 37,900.00	\$ 800	-	\$ 1,500	\$ 40,200
(1) TYPE SP BITUMINOUS MIX (ROAD - NON WEARING)	TON	505	10	-	20	535	\$ 73.00	\$ 36,900.00	\$ 700	-	\$ 1,500	\$ 39,100
BITUMINOUS MATERIAL FOR FOG SEAL	SY	858	-	-	-	858	\$ 1.00	\$ 900.00	-	-	-	\$ 900
4" CONCRETE WALK/MEDIAN	SF	20,560	640	-	-	21,200	\$ 5.00	\$ 102,800.00	\$ 3,200	-	-	\$ 106,000
CURB AND GUTTER	LF	3,220	240	-	-	3,460	\$ 22.00	\$ 70,800.00	\$ 5,300	-	-	\$ 76,100
Subtotal								\$ 433,400	\$ 19,900	\$ 63,900	\$ 4,800	\$ 522,000
LIGHTING ITEMS												
LIGHTING UNIT TYPE 9-40	EACH	8	-	-	-	8	\$ 3,100.00	\$ 24,800.00	-	-	-	\$ 24,800
LIGHTING FOUNDATION DESIGN E	EACH	8	-	-	-	8	\$ 1,450.00	\$ 11,600.00	-	-	-	\$ 11,600
2" NON-METALLIC CONDUIT	LF	3,500	-	-	-	3,500	\$ 7.50	\$ 26,300.00	-	-	-	\$ 26,300
3" NON-METALLIC CONDUIT (DIRECTIONAL BORE)	LF	300	-	-	-	300	\$ 8.50	\$ 2,600.00	-	-	-	\$ 2,600
UNDERGROUND WIRE 1 COND NO 6	LF	3,300	-	-	-	3,300	\$ 1.50	\$ 5,000.00	-	-	-	\$ 5,000
SERVICE EQUIPMENT	EACH	2	-	-	-	2	\$ 1,000.00	\$ 2,000.00	-	-	-	\$ 2,000
EQUIPMENT PAD B	EACH	2	-	-	-	2	\$ 1,100.00	\$ 2,200.00	-	-	-	\$ 2,200
INSTALL HANDHOLLE	EACH	4	-	-	-	4	\$ 1,500.00	\$ 6,000.00	-	-	-	\$ 6,000
ELECTRICAL SERVICE	LS	1	-	-	-	1	\$ 5,000.00	\$ 5,000.00	-	-	-	\$ 5,000
Subtotal								\$ 85,500	\$ -	\$ -	\$ -	\$ 85,500
OTHER ROADWAY ITEMS												
DRAINAGE INFRASTRUCTURE	LS	1	-	-	-	1	\$ 35,000.00	\$ 35,000	-	-	-	\$ 35,000
COMMON LABORERS	HOUR	20	-	-	-	20	\$ 100.00	\$ 2,000	-	-	-	\$ 2,000
MOTOR GRADER	HOUR	10	-	-	-	10	\$ 170.00	\$ 1,700	-	-	-	\$ 1,700
STREET SWEEPER (WITH PICKUP BROOM)	HOUR	5	-	-	-	5	\$ 110.00	\$ 550	-	-	-	\$ 550
Subtotal								\$ 39,300	\$ -	\$ -	\$ -	\$ 39,300
PERCENTAGE ITEMS												
MOBILIZATION				10.0%			of all	\$ 55,800	\$ 2,000	\$ 6,400	\$ 500	\$ 64,700
MISC REMOVALS (SIGNS, TREES, ETC.)				2.0%			of all	\$ 11,200	\$ 400	\$ 1,300	\$ 100	\$ 13,000
SIGNING & PAVEMENT MARKINGS				5.0%			of all	\$ 27,900	\$ 1,000	\$ 3,200	\$ 200	\$ 32,300
TRAFFIC CONTROL				2.5%			of all	\$ 14,000	\$ 500	\$ 1,600	\$ 100	\$ 16,200
CONTINGENCY FOR MISSING ITEMS				10.0%			of all	\$ 55,800	\$ 2,000	\$ 6,400	\$ 500	\$ 64,700
CONTINGENCY FOR COVID-19 CONSIDERATIONS				10.0%			of all	\$ 55,800	\$ 2,000	\$ 6,400	\$ 500	\$ 64,700
Subtotal								\$ 220,500	\$ 7,900	\$ 25,300	\$ 1,900	\$ 255,600
Construction Cost (2021 Dollars)								\$ 778,500	\$ 28,000	\$ 89,000	\$ 6,500	\$ 902,500
(2) Construction Cost (2022 Dollars)								\$ 801,900	\$ 28,900	\$ 91,700	\$ 6,700	\$ 929,600
Design Engineering Cost (8%)								\$ 64,000	\$ 2,500	\$ 7,500	\$ 500	\$ 74,500
Construction Admin Cost (8%)								\$ 64,000	\$ 2,500	\$ 7,500	\$ 500	\$ 74,500
Total Cost (2022 Dollars)								\$ 929,900	\$ 33,900	\$ 106,700	\$ 7,700	\$ 1,078,600

- Notes:
1. Roadway Section = 3" Bit (wear) - 3" Bit (non-wear) - 6" Agg Base - 24" Select Granular
 2. 3% Inflation
 3. Costs do not include any BNSF Infrastructure removals



Preliminary Design Opinion of Probable Cost
TH 210 & Knollwood Drive Full RCI with Fog Seal and 4' Min. EB Shoulder
Preliminary Cost Estimate
City of Baxter
6/28/2021

S2 - Knollwood RCI Design Estimates

Item	Unit	Quantities						Costs					
		Subtotal: Median and Roadway Widening	Subtotal: North Leg Improvements	Subtotal: South Leg Removal	Subtotal: Loon Head	Total Qty	Unit Price	Subtotal: Median and Roadway Widening	Subtotal: North Leg Improvements	Subtotal: South Leg Removal	Subtotal: Loon Head	Total Cost	
MAJOR ROADWAY													
REMOVE BITUMINOUS PAVEMENT	SY	2,680	160	600	-	3,440	\$ 5.00	\$ 13,400	\$ 800	\$ 3,000	-	\$ 17,200	
REMOVE BITUMINOUS WALK	SF	135	1200	1550	-	2,885	\$ 2.00	\$ 300	\$ 2,400	\$ 3,100	-	\$ 5,800	
REMOVE CONCRETE WALK	SF	425	1700	1030	-	3,155	\$ 2.00	\$ 900	\$ 3,400	\$ 2,100	-	\$ 6,400	
REMOVE CURB & GUTTER	LF	2,760	150	115	-	3,025	\$ 5.00	\$ 13,800	\$ 800	\$ 600	-	\$ 15,200	
REMOVE CONCRETE MEDIAN	SY	2,000	-	-	-	2,000	\$ 8.00	\$ 16,000	-	-	-	\$ 16,000	
REMOVE SIGNAL SYSTEM	LS	1	-	-	-	1	\$ 35,000.00	\$ 35,000	-	-	-	\$ 35,000	
SAWING BITUMINOUS PAVEMENT FULL DEPTH	LF	2000	530	40	-	2,570	\$ 3.00	\$ 6,000	\$ 1,600	\$ 100	-	\$ 7,700	
EXCAVATION - COMMON	CY	5,000	-	5000	-	10,000	\$ 10.00	\$ 50,000	-	\$ 50,000	-	\$ 100,000	
TURF ESTABLISHMENT	LS	-	-	1	-	1	\$ 5,000.00	-	-	\$ 5,000	-	\$ 5,000	
COMMON EMBANKMENT (CV)	CY	560	-	-	10	570	\$ 15.00	\$ 8,400.00	-	-	\$ 200	\$ 8,600	
(1) AGGREGATE BASE (CV) CLASS 5	CY	300	10	-	30	340	\$ 30.00	\$ 9,000.00	\$ 300	-	\$ 900	\$ 10,200	
(1) SELECT GRANULAR EMBANKMENT (CV)	CY	1,200	40	-	110	1,350	\$ 14.00	\$ 16,800.00	\$ 600	-	\$ 1,500	\$ 18,900	
(1) TYPE SP BITUMINOUS MIX (ROAD - WEARING)	TON	324	10	-	30	364	\$ 75.00	\$ 24,300.00	\$ 800	-	\$ 2,300	\$ 27,400	
(1) TYPE SP BITUMINOUS MIX (ROAD - NON WEARING)	TON	324	10	-	30	364	\$ 73.00	\$ 23,700.00	\$ 700	-	\$ 2,200	\$ 26,600	
BITUMINOUS MATERIAL FOR FOG SEAL	SY	865	-	-	-	865	\$ 1.00	\$ 900.00	-	-	-	\$ 900	
4" CONCRETE WALK/MEDIAN	SF	20,560	640	-	-	21,200	\$ 5.00	\$ 102,800.00	\$ 3,200	-	-	\$ 106,000	
CURB AND GUTTER	LF	3,220	240	-	-	3,460	\$ 22.00	\$ 70,800.00	\$ 5,300	-	-	\$ 76,100	
Subtotal								\$ 392,100	\$ 19,900	\$ 63,900	\$ 7,100	\$ 483,000	
LIGHTING ITEMS													
LIGHTING UNIT TYPE 9-40	EACH	8	-	-	-	8	\$ 3,100.00	\$ 24,800.00	-	-	-	\$ 24,800	
LIGHTING FOUNDATION DESIGN E	EACH	8	-	-	-	8	\$ 1,450.00	\$ 11,600.00	-	-	-	\$ 11,600	
2" NON-METALLIC CONDUIT	LF	3,500	-	-	-	3,500	\$ 7.50	\$ 26,300.00	-	-	-	\$ 26,300	
3" NON-METALLIC CONDUIT (DIRECTIONAL BORE)	LF	300	-	-	-	300	\$ 8.50	\$ 2,600.00	-	-	-	\$ 2,600	
UNDERGROUND WIRE 1 COND NO 6	LF	3,300	-	-	-	3,300	\$ 1.50	\$ 5,000.00	-	-	-	\$ 5,000	
SERVICE EQUIPMENT	EACH	2	-	-	-	2	\$ 1,000.00	\$ 2,000.00	-	-	-	\$ 2,000	
EQUIPMENT PAD B	EACH	2	-	-	-	2	\$ 1,100.00	\$ 2,200.00	-	-	-	\$ 2,200	
INSTALL HANDHOLLE	EACH	4	-	-	-	4	\$ 1,500.00	\$ 6,000.00	-	-	-	\$ 6,000	
ELECTRICAL SERVICE	LS	1	-	-	-	1	\$ 5,000.00	\$ 5,000.00	-	-	-	\$ 5,000	
Subtotal								\$ 85,500	\$ -	\$ -	\$ -	\$ 85,500	
OTHER ROADWAY ITEMS													
DRAINAGE INFRASTRUCTURE	LS	1	-	-	-	1	\$ 35,000.00	\$ 35,000	-	-	-	\$ 35,000	
COMMON LABORERS	HOUR	20	-	-	-	20	\$ 100.00	\$ 2,000	-	-	-	\$ 2,000	
MOTOR GRADER	HOUR	10	-	-	-	10	\$ 170.00	\$ 1,700	-	-	-	\$ 1,700	
STREET SWEEPER (WITH PICKUP BROOM)	HOUR	5	-	-	-	5	\$ 110.00	\$ 550	-	-	-	\$ 550	
Subtotal								\$ 39,300	\$ -	\$ -	\$ -	\$ 39,300	
PERCENTAGE ITEMS													
MOBILIZATION				10.0%			of all	\$ 51,700	\$ 2,000	\$ 6,400	\$ 700	\$ 60,800	
MISC REMOVALS (SIGNS, TREES, ETC.)				2.0%			of all	\$ 10,300	\$ 400	\$ 1,300	\$ 100	\$ 12,100	
SIGNING & PAVEMENT MARKINGS				5.0%			of all	\$ 25,800	\$ 1,000	\$ 3,200	\$ 400	\$ 30,400	
TRAFFIC CONTROL				2.5%			of all	\$ 12,900	\$ 500	\$ 1,600	\$ 200	\$ 15,200	
CONTINGENCY FOR MISSING ITEMS				10.0%			of all	\$ 51,700	\$ 2,000	\$ 6,400	\$ 700	\$ 60,800	
CONTINGENCY FOR COVID-19 CONSIDERATIONS				10.0%			of all	\$ 51,700	\$ 2,000	\$ 6,400	\$ 700	\$ 60,800	
Subtotal								\$ 204,100	\$ 7,900	\$ 25,300	\$ 2,800	\$ 240,100	
								Construction Cost (2021 Dollars)	\$ 721,000	\$ 28,000	\$ 89,000	\$ 10,000	\$ 848,000
								(2) Construction Cost (2022 Dollars)	\$ 742,700	\$ 28,900	\$ 91,700	\$ 10,300	\$ 873,500
								Design Engineering Cost (8%)	\$ 59,500	\$ 2,500	\$ 7,500	\$ 1,000	\$ 70,000
								Construction Admin Cost (8%)	\$ 59,500	\$ 2,500	\$ 7,500	\$ 1,000	\$ 70,000
								Total Cost (2022 Dollars)	\$ 861,700	\$ 33,900	\$ 106,700	\$ 12,300	\$ 1,013,500

Notes:

- Roadway Section = 3" Bit (wear) - 3" Bit (non-wear) - 6" Agg Base - 24" Select Granular
- 3% Inflation
- Costs do not include any BNSF Infrastructure removals

Preliminary Design Opinion of Probable Cost
S3 - Memorywood Drive Intersection Improvements
June 2021
City of Baxter
6/30/2021

Item	Unit	Total Qty	Unit Price	Total Cost
MAJOR ROADWAY AND TRAIL				
REMOVE BITUMINOUS PAVEMENT	SY	2,000	\$ 5.00	\$ 10,000
REMOVE CONCRETE MEDIAN	SY	1,000	\$ 8.00	\$ 8,000
SAWING BITUMINOUS PAVEMENT FULL DEPTH	LF	820	\$ 3.00	\$ 2,500
EXCAVATION - COMMON	CY	2,610	\$ 10.00	\$ 26,000
COMMON EMBANKMENT (CV)	CY	1,000	\$ 15.00	\$ 15,000
(1) AGGREGATE BASE (CV) CLASS 5	CY	400	\$ 30.00	\$ 12,000
(1) SELECT GRANULAR (CV)	CY	1,600	\$ 14.00	\$ 22,000
(1) TYPE SP BITUMINOUS MIX (ROAD - WEARING)	TON	250	\$ 70.00	\$ 18,000
(1) TYPE SP BITUMINOUS MIX (ROAD - NON WEARING)	TON	250	\$ 65.00	\$ 16,000
4" CONCRETE WALK/MEDIAN	SF	6,000	\$ 5.00	\$ 30,000
CURB AND GUTTER	LF	1,500	\$ 22.00	\$ 33,000
Subtotal				\$ 193,000
OTHER ROADWAY ITEMS				
DRAINAGE	LS	1	\$ 15,000.00	\$ 15,000
Subtotal				\$ 15,000
PERCENTAGE ITEMS				
MOBILIZATION		5.0%	of all	\$ 10,000
MISC REMOVALS (SIGNS, TREES, ETC.)		2.0%	of all	\$ 4,000
SIGNING & PAVEMENT MARKINGS		3.0%	of all	\$ 6,000
TURF ESTABLISHMENT AND EROSION CONTROL		4.0%	of all	\$ 10,000
TRAFFIC CONTROL		2.5%	of all	\$ 5,000
CONTINGENCY FOR MISSING ITEMS		20.0%	of all	\$ 40,000
Subtotal				\$ 75,000
Construction Cost (2021 Dollars)				\$ 300,000
Engineering Cost (2021 Dollars)				\$ 60,000
Total Cost (2021 Dollars)				\$ 360,000

Notes:

1. Roadway Section = 3" Bit (wear) - 3" Bit (non-wear) - 6" Agg Base - 12" Select Granular

Preliminary Design Opinion of Probable Cost
S4 - Art Ward Drive Access Modifications
June 2021
City of Baxter
6/30/2021

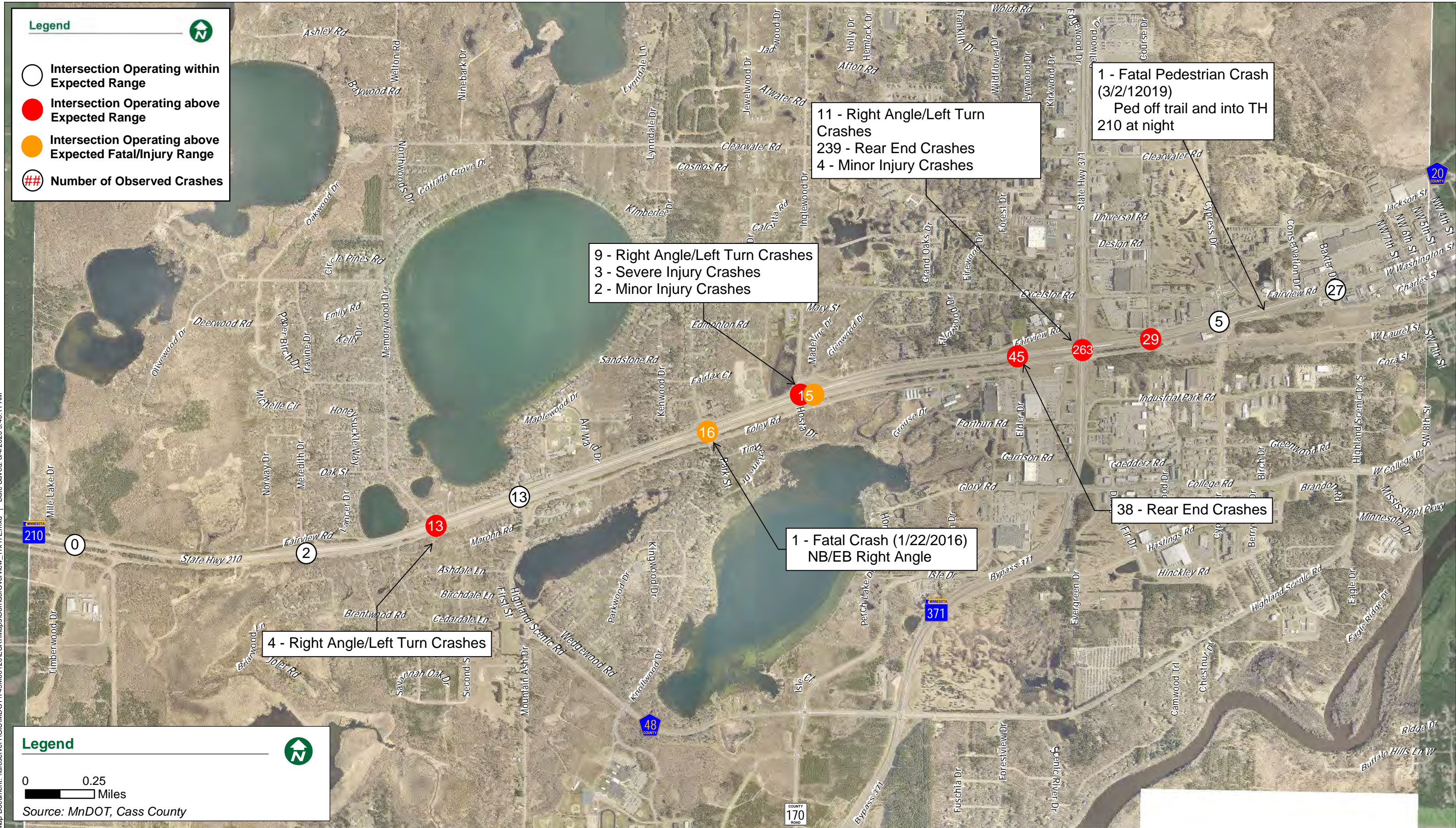
Item	Unit	Total Qty	Unit Price	Total Cost
MAJOR ROADWAY AND TRAIL				
REMOVE BITUMINOUS PAVEMENT	SY	3,000	\$ 5.00	\$ 15,000
REMOVE CONCRETE MEDIAN	SY	2,000	\$ 8.00	\$ 16,000
SAWING BITUMINOUS PAVEMENT FULL DEPTH	LF	2,850	\$ 3.00	\$ 8,600
EXCAVATION - COMMON	CY	3,750	\$ 10.00	\$ 38,000
COMMON EMBANKMENT (CV)	CY	1,000	\$ 15.00	\$ 15,000
(1) AGGREGATE BASE (CV) CLASS 5	CY	600	\$ 30.00	\$ 18,000
(1) SELECT GRANULAR (CV)	CY	1,100	\$ 14.00	\$ 15,000
(1) TYPE SP BITUMINOUS MIX (ROAD - WEARING)	TON	350	\$ 70.00	\$ 25,000
(1) TYPE SP BITUMINOUS MIX (ROAD - NON WEARING)	TON	350	\$ 65.00	\$ 23,000
4" CONCRETE WALK/MEDIAN	SF	9,000	\$ 5.00	\$ 45,000
CURB AND GUTTER	LF	1,900	\$ 22.00	\$ 42,000
Subtotal				\$ 261,000
OTHER ROADWAY ITEMS				
DRAINAGE	LS	1	\$ 25,000.00	\$ 25,000
Subtotal				\$ 25,000
PERCENTAGE ITEMS				
MOBILIZATION		5.0%	of all	\$ 14,000
MISC REMOVALS (SIGNS, TREES, ETC.)		2.0%	of all	\$ 6,000
SIGNING & PAVEMENT MARKINGS		5.0%	of all	\$ 14,000
TURF ESTABLISHMENT AND EROSION CONTROL		4.0%	of all	\$ 11,000
TRAFFIC CONTROL		2.5%	of all	\$ 7,000
CONTINGENCY FOR MISSING ITEMS		20.0%	of all	\$ 60,000
Subtotal				\$ 112,000
Construction Cost (2021 Dollars)				\$ 400,000
Engineering Cost (2021 Dollars)				\$ 80,000
Total Cost (2021 Dollars)				\$ 480,000

Notes:

1. Roadway Section = 3" Bit (wear) - 3" Bit (non-wear) - 6" Agg Base - 12" Select Granular

Appendix A

Crash Data Analysis



Legend

- Intersection Operating within Expected Range
- Intersection Operating above Expected Range
- Intersection Operating above Expected Fatal/Injury Range
- ## Number of Observed Crashes

Legend

0 0.25 Miles

Source: MnDOT, Cass County

11 - Right Angle/Left Turn Crashes
239 - Rear End Crashes
4 - Minor Injury Crashes

1 - Fatal Pedestrian Crash (3/2/2019)
Ped off trail and into TH 210 at night

9 - Right Angle/Left Turn Crashes
3 - Severe Injury Crashes
2 - Minor Injury Crashes

1 - Fatal Crash (1/22/2016)
NB/EB Right Angle

38 - Rear End Crashes

4 - Right Angle/Left Turn Crashes

Map Document: \\arcserver1\GIS\MDOT\49M00120\ESRI\Maps\CorridorOverview_11x17L.mxd | Date Saved: 8/4/2020 9:40:11 AM

Intersection	Traffic Control	Total Crashes (2015-2019)	ADT	Crash Rate				Fatal & Serious Injury Rate				Severity Rate
				Int. Rate	Statewide Average	Critical Rate	Crash Index	Int. Rate	Statewide Average	Critical Rate	Fatal and Serious Index	
Timberwood & TH 210	TWSC	0	9,200	0.00	0.18	0.48	0.00	0.00	0.33	5.09	0.00	0.00
Meredith & TH 210	TWSC	2	9,200	0.12	0.18	0.48	0.25	0.00	0.33	5.09	0.00	0.12
Memorywood & TH 210	TWSC	13	12,675	0.56	0.18	0.43	1.30	0.00	0.33	4.01	0.00	0.65
Highland Scenic Dr & TH 210	Signal	13	15,325	0.46	0.40	0.72	0.64	0.00	0.32	3.48	0.00	0.64
Knollwood Dr & TH 210	Signal	16	15,150	0.58	0.40	0.72	0.81	3.61	0.32	3.51	1.03	0.90
Inglewood Dr & TH 210	TWSC	15	15,050	0.55	0.16	0.37	1.49	10.92	0.17	2.99	3.65	1.06
Elder Dr & TH 210	TWSC	45	16,600	1.48	0.18	0.40	3.70	0.00	0.33	3.30	0.00	1.72
Fairview Rd & TH 210	TWSC	1	13,400	0.04	0.18	0.43	0.09	0.00	0.33	3.85	0.00	0.08
TH 371 & TH 210	Signal	263	45,750	3.15	0.45	0.65	4.85	0.00	0.48	2.04	0.00	3.81
Golf Course Dr & TH 210	TWSC	29	29,800	0.53	0.18	0.34	1.56	0.00	0.33	2.24	0.00	0.75
Cypress Dr & TH 210	Signal	5	26,600	0.10	0.70	1.02	0.10	0.00	0.76	3.40	0.00	0.10
Baxter & TH 210	Signal	27	24,400	0.61	0.70	1.03	0.59	0.00	0.76	3.56	0.00	0.74

Rate Exceeds Critical Rate (Critical Index > 1.0)

Intersection	Crash Type							
	Right Angle Crashes	Left Turn Crash	Rear End Crashes	Sideswipe Passing	Sideswipe Opposing	Run Off Road	Head On	Other
Timberwood & TH 210								
Meredith & TH 210			1					1
Memorywood & TH 210	1	3	4		1			4
Highland Scenic Dr & TH 210		1	10	1				1
Knollwood Dr & TH 210	2		10	1		3		
Inglewood Dr & TH 210	5	4	3			1	1	2
Elder Dr & TH 210	1	2	38	2		1		1
Fairview Rd & TH 210							1	
TH 371 & TH 210	11	1	239	8		2		2
Golf Course Dr & TH 210	5	1	17	3				3
Cypress Dr & TH 210			5					
Baxter & TH 210	4		20	3				

Appendix B

Warrant Analysis

2020 Volumes

Intersection	Hours Met/Hour Required				
	Warrant 1A	Warrant 1B	Warrant 2	Warrant 3	All-Stop
Timberwood Dr	0/8	0/8	0/4	0/1	0/8
Meredith Dr	0/8	1/8	0/4	0/1	0/8
Memorywood Dr	2/8	6/8	6/4	1/1	1/8
CR 48 (Highland Scenic Dr)	2/8	5/8	4/4	4/1	0/8
Knollwood Dr	5/8	14/8	7/4	5/1	9/8
Inglewood Dr	0/8	7/8	5/4	0/1	0/8
Elder Dr	11/8	13/8	12/4	11/1	11/8
TH 371	16/8	15/8	15/4	14/1	16/8
Golf Course Dr	3/8	10/8	9/4	8/1	1/8
Cypress Dr	14/8	16/8	14/4	13/1	14/8
Baxter Dr	10/8	14/8	12/4	12/1	12/8

2040 Volumes					
Intersection	Hours Met/Hour Required				
	Warrant 1A	Warrant 1B	Warrant 2	Warrant 3	All-Stop
Timberwood Dr	0/8	0/8	0/4	0/1	0/8
Meredith Dr	0/8	1/8	0/4	0/1	0/8
Memorywood Dr	2/8	6/8	6/4	1/1	1/8
CR 48 (Highland Scenic Dr)	4/8	5/8	4/4	4/1	0/8
Knollwood Dr	6/8	14/8	8/4	6/1	12/8
Inglewood Dr	0/8	9/9	7/4	3/1	0/8
Elder Dr	12/8	14/8	12/4	12/1	12/8
TH 371	16/8	15/8	16/4	15/1	18/8
Golf Course Dr	3/8	12/8	11/4	9/1	1/8
Cypress Dr	14/8	16/8	14/4	14/1	14/8
Baxter Dr	12/8	15/8	12/4	12/1	14/8

Appendix C

Traffic Operations Results

Project: TH 210 - Baxter
Scenario: Existing PM Peak

		TH 210 - Existing PM													
		Traffic Delay (sec/veh)				Traffic Queuing (feet)									
Intersection	Approach	Movement (Delay - LOS)			Approach (Delay - LOS)	Intersection (Delay - LOS)	Left Turn			Through			Right Turn		
		L	T	R			Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
TH 210 & Baxter Dr <i>Signalized Intersection</i>	EB	67 - E	15 - B	4 - A	21 - C	49 - D	375	75	300	-	75	475	625	0	50
	WB	153 - F	76 - E	63 - E	76 - E		350	25	75	825	75	775	200	25	75
	NB	57 - E	71 - E	10 - B	53 - D		100	50	250	-	25	75	100	0	50
	SB	60 - E	69 - E	27 - C	39 - D		150	50	300	125	25	100	125	50	325
TH 210 & Cypress Dr <i>Signalized Intersection</i>	EB	35 - D	3 - A	2 - A	4 - A	19 - B	500	25	75	-	25	150	225	0	25
	WB	23 - C	18 - B	5 - A	18 - B		525	25	50	2150	150	900	500	0	50
	NB	52 - D	70 - E	15 - B	41 - D		200	25	125	-	25	50	200	25	75
	SB	53 - D	47 - D	24 - C	51 - D		200	75	400	375	25	50	200	25	100
TH 210 & Golf Course Dr N <i>Stop Controlled</i>	EB	46 - E	1 - A	1 - A	5 - A	5 - A	200	25	150	-	0	0	200	0	0
	WB	12 - B	5 - A	7 - A	6 - A		250	25	75	-	25	125	350	0	25
	SB	-	-	20 - C	20 - C		-	-	-	-	-	-	100	25	175
TH 210 & TH 371 <i>Signalized Intersection</i>	EB	84 - F	54 - D	8 - A	66 - E	53 - D	625	125	500	1125	75	325	300	25	100
	WB	92 - F	61 - E	31 - C	57 - E		550	100	400	-	125	400	850	100	550
	NB	145 - F	41 - D	6 - A	53 - D		750	250	800	2600	125	675	800	25	150
	SB	74 - E	38 - D	6 - A	39 - D		425	100	350	860	75	475	350	25	225
TH 210 & Elder Dr S <i>Stop Controlled</i>	EB	11 - B	1 - A	2 - A	2 - A	8 - A	650	0	50	-	0	0	225	0	0
	WB	31 - D	3 - A	5 - A	13 - B		600	75	500	1125	0	0	275	0	0
	NB	-	-	5 - A	5 - A		-	-	-	-	-	-	250	25	200
	SB	-	-	10 - B	10 - B		-	-	-	-	-	-	125	25	125
TH 210 & Inglewood Dr <i>Stop Controlled</i>	EB	21 - C	2 - A	-	5 - A	10 - B	300	25	150	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	350	0	0
	SB	129 - F	-	22 - C	56 - F		-	75	400	-	-	-	125	25	200
TH 210 & Knollwood Dr <i>Signalized Intersection</i>	EB	52 - D	17 - B	5 - A	18 - B	19 - B	350	25	100	-	25	250	250	0	75
	WB	42 - D	13 - B	4 - A	16 - B		350	25	175	-	25	275	350	25	100
	NB	32 - C	31 - C	12 - B	28 - C		225	50	325	-	50	325	225	50	325
	SB	36 - D	30 - C	9 - A	31 - C		75	25	200	75	25	200	75	0	50
TH 210 & Highland Scenic Dr <i>Signalized Intersection</i>	EB	-	13 - B	5 - A	12 - B	26 - C	-	-	-	-	25	225	200	25	100
	WB	93 - F	7 - A	-	28 - C		350	125	450	-	25	200	-	-	-
	NB	80 - F	-	12 - B	56 - E		-	75	250	-	-	-	250	25	100
TH 210 & Memorywood Dr <i>Stop Controlled</i>	EB	8 - A	0 - A	-	1 - A	2 - A	375	0	50	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	200	0	0
	SB	32 - D	-	23 - C	31 - D		-	25	150	-	-	-	-	25	175
TH 210 & Meredith Dr <i>Stop Controlled</i>	EB	15 - C	1 - A	-	2 - A	1 - A	250	25	50	-	0	0	-	-	-
	WB	-	0 - A	1 - A	1 - A		-	-	-	-	0	0	225	0	0
	SB	19 - C	-	5 - A	15 - C		-	25	75	-	-	-	-	25	75
TH 210 & Timberwood Dr <i>Stop Controlled</i>	EB	-	0 - A	-	0 - A	2 - A	-	-	-	-	0	0	-	-	-
	WB	7 - A	1 - A	-	2 - A		475	0	50	-	0	0	-	-	-
	NB	44 - E	-	13 - B	16 - C		-	25	75	-	-	-	600	25	75

Project: TH 210 - Baxter
 Scenario: 2025 No Build - PM Peak

TH 210 - 2025 No Build															
Intersection	Approach	Traffic Delay (sec/veh)				Intersection (Delay - LOS)	Traffic Queuing (feet)								
		Movement (Delay - LOS)			Approach (Delay - LOS)		Left Turn			Through			Right Turn		
		L	T	R			Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
TH 210 & Baxter Dr <i>Signalized Intersection</i>	EB	71 - E	15 - B	4 - A	21 - C	50 - D	375	75	300	-	75	500	625	0	75
	WB	150 - F	78 - E	64 - E	78 - E		350	25	75	825	75	800	200	25	75
	NB	58 - E	71 - E	11 - B	54 - D		100	50	250	-	25	75	100	0	50
	SB	60 - E	69 - E	27 - C	39 - D		150	50	300	125	25	100	125	50	300
TH 210 & Cypress Dr <i>Signalized Intersection</i>	EB	38 - D	3 - A	2 - A	4 - A	19 - B	500	25	100	-	25	125	225	0	25
	WB	32 - C	18 - B	5 - A	18 - B		525	25	75	2150	150	925	500	0	50
	NB	52 - D	70 - E	16 - B	41 - D		200	25	125	-	25	50	200	25	75
	SB	54 - D	47 - D	26 - C	52 - D		200	100	400	375	25	50	200	25	75
TH 210 & Golf Course Dr N <i>Stop Controlled</i>	EB	44 - E	1 - A	1 - A	5 - A	5 - A	200	25	150	-	0	0	200	0	0
	WB	14 - B	5 - A	7 - A	6 - A		250	25	75	-	0	75	350	0	0
	SB	-	-	20 - C	20 - C		-	-	-	-	-	-	100	25	175
TH 210 & TH 371 <i>Signalized Intersection</i>	EB	90 - F	56 - E	7 - A	69 - E	55 - E	625	125	500	1125	75	325	300	25	100
	WB	92 - F	62 - E	33 - C	58 - E		550	100	400	-	125	425	850	125	575
	NB	158 - F	42 - D	7 - A	57 - E		750	275	800	2600	125	750	800	25	225
	SB	77 - E	38 - D	8 - A	40 - D		425	100	350	860	75	575	350	25	250
TH 210 & Elder Dr S <i>Stop Controlled</i>	EB	14 - B	1 - A	3 - A	2 - A	8 - A	650	0	50	-	0	0	225	0	25
	WB	30 - D	4 - A	5 - A	13 - B		600	75	450	1125	0	0	275	0	0
	NB	-	-	6 - A	6 - A		-	-	-	-	-	-	250	25	200
	SB	-	-	11 - B	11 - B		-	-	-	-	-	-	125	25	125
TH 210 & Inglewood Dr <i>Stop Controlled</i>	EB	21 - C	2 - A	-	4 - A	10 - B	300	25	125	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	350	0	0
	SB	140 - F	-	20 - C	58 - F		-	75	425	-	-	-	125	25	225
TH 210 & Knollwood Dr <i>Signalized Intersection</i>	EB	51 - D	18 - B	5 - A	19 - B	20 - C	350	25	100	-	25	275	250	0	75
	WB	44 - D	12 - B	4 - A	15 - B		350	25	200	-	25	250	350	25	75
	NB	34 - C	34 - C	10 - B	29 - C		225	50	275	-	50	275	225	50	275
	SB	43 - D	29 - C	10 - B	35 - D		75	25	225	75	25	225	75	0	50
TH 210 & Highland Scenic Dr <i>Signalized Intersection</i>	EB	-	13 - B	4 - A	12 - B	27 - C	-	-	-	-	25	200	200	25	100
	WB	98 - F	7 - A	-	29 - C		350	125	500	-	25	175	-	-	-
	NB	84 - F	-	10 - B	59 - E		-	75	275	-	-	-	250	25	100
TH 210 & Memorywood Dr <i>Stop Controlled</i>	EB	10 - B	0 - A	-	1 - A	3 - A	375	0	50	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	200	0	0
	SB	40 - E	-	25 - D	38 - E		-	25	175	-	-	-	-	25	200
TH 210 & Meredith Dr <i>Stop Controlled</i>	EB	7 - A	1 - A	-	2 - A	1 - A	250	0	25	-	0	0	-	-	-
	WB	-	0 - A	1 - A	1 - A		-	-	-	-	0	0	225	0	0
	SB	25 - D	-	5 - A	19 - C		-	25	75	-	-	-	-	25	100
TH 210 & Timberwood Dr <i>Stop Controlled</i>	EB	-	0 - A	-	0 - A	2 - A	-	-	-	-	0	0	-	-	-
	WB	5 - A	1 - A	-	2 - A		475	0	25	-	0	0	-	-	-
	NB	35 - E	-	13 - B	15 - C		-	25	75	-	-	-	600	25	75

Project: TH 210 - Baxter
 Scenario: 2040 No Build - PM Peak

TH 210 - 2040 No Build															
Intersection	Approach	Traffic Delay (sec/veh)				Intersection (Delay - LOS)	Traffic Queuing (feet)								
		Movement (Delay - LOS)			Approach (Delay - LOS)		Left Turn			Through			Right Turn		
		L	T	R			Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
TH 210 & Baxter Dr <i>Signalized Intersection</i>	EB	72 - E	16 - B	3 - A	22 - C	60 - E	375	75	325	-	75	500	625	0	75
	WB	151 - F	97 - F	81 - F	97 - F		350	25	100	825	175	1250	200	25	100
	NB	58 - E	61 - E	13 - B	54 - D		100	50	250	-	25	100	100	25	75
	SB	63 - E	76 - E	45 - D	52 - D		150	50	350	125	25	175	125	100	425
TH 210 & Cypress Dr <i>Signalized Intersection</i>	EB	37 - D	3 - A	1 - A	4 - A	21 - C	500	25	75	-	25	175	225	0	50
	WB	34 - C	20 - C	6 - A	20 - C		525	25	75	2150	200	1000	500	0	50
	NB	48 - D	70 - E	18 - B	39 - D		200	25	125	-	25	50	200	25	75
	SB	57 - E	57 - E	30 - C	55 - E		200	100	500	375	25	50	200	25	75
TH 210 & Golf Course Dr N <i>Stop Controlled</i>	EB	49 - E	1 - A	1 - A	6 - A	6 - A	200	25	150	-	0	0	200	0	0
	WB	15 - C	6 - A	7 - A	7 - A		250	25	75	-	25	225	350	0	50
	SB	-	-	24 - C	24 - C		-	-	-	-	-	-	100	25	200
TH 210 & TH 371 <i>Signalized Intersection</i>	EB	88 - F	54 - D	7 - A	67 - E	62 - E	625	150	475	1125	75	350	300	25	100
	WB	121 - F	62 - E	36 - D	65 - E		550	150	475	-	125	425	850	150	675
	NB	210 - F	52 - D	15 - B	74 - E		750	425	1175	2600	150	825	800	25	250
	SB	76 - E	40 - D	9 - A	41 - D		425	100	350	860	75	625	350	25	250
TH 210 & Elder Dr S <i>Stop Controlled</i>	EB	15 - C	1 - A	4 - A	2 - A	13 - B	650	0	50	-	0	0	225	0	0
	WB	55 - F	5 - A	7 - A	22 - C		600	175	725	1125	0	0	275	0	0
	NB	-	-	7 - A	7 - A		-	-	-	-	-	-	250	25	300
	SB	-	-	11 - B	11 - B		-	-	-	-	-	-	125	25	125
TH 210 & Inglewood Dr <i>Stop Controlled</i>	EB	21 - C	2 - A	-	4 - A	16 - C	300	25	125	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	350	0	0
	SB	219 - F	-	47 - E	102 - F		-	150	525	-	-	-	125	50	425
TH 210 & Knollwood Dr <i>Signalized Intersection</i>	EB	59 - E	18 - B	5 - A	19 - B	22 - C	350	25	75	-	25	250	250	0	50
	WB	46 - D	14 - B	4 - A	17 - B		350	50	175	-	50	275	350	25	75
	NB	38 - D	40 - D	13 - B	33 - C		225	75	375	-	75	375	225	75	375
	SB	74 - E	39 - D	16 - B	56 - E		75	50	300	75	50	300	75	0	50
TH 210 & Highland Scenic Dr <i>Signalized Intersection</i>	EB	-	14 - B	6 - A	13 - B	28 - C	-	-	-	-	25	200	200	25	100
	WB	103 - F	8 - A	-	32 - C		350	150	675	-	25	200	-	-	-
	NB	87 - F	-	11 - B	59 - E		-	75	275	-	-	-	250	25	100
TH 210 & Memorywood Dr <i>Stop Controlled</i>	EB	10 - B	0 - A	-	1 - A	5 - A	375	0	50	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	200	0	0
	SB	66 - F	-	43 - E	64 - F		-	50	225	-	-	-	-	50	250
TH 210 & Meredith Dr <i>Stop Controlled</i>	EB	14 - B	1 - A	-	2 - A	1 - A	250	25	75	-	0	0	-	-	-
	WB	-	0 - A	1 - A	1 - A		-	-	-	-	0	0	225	0	0
	SB	26 - D	-	4 - A	20 - C		-	25	75	-	-	-	-	25	75
TH 210 & Timberwood Dr <i>Stop Controlled</i>	EB	-	0 - A	-	0 - A	2 - A	-	-	-	-	0	0	-	-	-
	WB	4 - A	1 - A	-	2 - A		475	0	25	-	0	0	-	-	-
	NB	34 - D	-	14 - B	16 - C		-	25	75	-	-	-	600	25	75

Project: TH 210
Scenario: Summer Volumes
Analysis: PM Peak

TH 210 - Existing PM (With Train) Summer_Node Results.att															
Intersection	Approach	Traffic Delay (sec/veh)				Intersection (Delay - LOS)	Traffic Queuing (feet)								
		Movement (Delay - LOS)			Approach (Delay - LOS)		Left Turn			Through			Right Turn		
		L	T	R			Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
Baxter Dr & TH 210 <i>Signalized Intersection</i>	EB	70 - E	17 - B	4 - A	22 - C	64 - E	375	75	275	-	75	650	625	25	75
	WB	168 - F	106 - F	91 - F	106 - F		350	25	100	-	100	1000	200	25	75
	NB	58 - E	71 - E	11 - B	54 - D		100	50	250	-	25	75	100	25	50
	SB	60 - E	69 - E	33 - C	43 - D		150	50	300	-	25	100	125	50	325
TH 210 & Cypress Dr <i>Signalized Intersection</i>	EB	54 - D	2 - A	2 - A	3 - A	20 - C	500	25	75	-	25	150	225	0	50
	WB	29 - C	21 - C	7 - A	21 - C		525	25	75	-	200	975	500	0	50
	NB	52 - D	70 - E	18 - B	42 - D		200	25	125	-	25	50	200	25	75
	SB	54 - D	47 - D	30 - C	52 - D		200	100	425	-	25	50	200	25	100
TH 210 & Golf Course Dr N <i>Stop Controlled</i>	EB	47 - E	1 - A	2 - A	5 - A	6 - A	200	25	150	-	0	0	200	0	0
	WB	16 - C	5 - A	7 - A	6 - A		250	25	50	-	25	175	350	0	0
	SB	-	-	28 - D	28 - D		-	-	-	-	-	-	-	25	200
TH 210 & TH 371 <i>Signalized Intersection</i>	EB	87 - F	54 - D	7 - A	65 - E	59 - E	625	125	450	-	100	425	300	25	75
	WB	106 - F	73 - E	39 - D	68 - E		550	125	400	-	175	525	850	125	625
	NB	168 - F	49 - D	11 - B	61 - E		750	300	900	-	200	1125	800	25	225
	SB	74 - E	40 - D	12 - B	41 - D		425	100	300	860	100	850	350	25	250
TH 210 & Elder Dr S <i>Stop Controlled</i>	EB	12 - B	1 - A	3 - A	2 - A	8 - A	650	0	25	-	0	0	225	0	0
	WB	33 - D	5 - A	6 - A	14 - B		600	75	450	-	0	0	275	0	0
	NB	-	-	6 - A	6 - A		-	-	-	-	-	-	-	25	225
	SB	-	-	12 - B	12 - B		-	-	-	-	-	-	-	25	125
TH 210 & Inglewood Dr <i>Stop Controlled</i>	EB	25 - D	2 - A	-	4 - A	10 - B	300	25	100	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	350	0	0
	SB	154 - F	-	26 - D	66 - F		-	100	425	-	-	-	125	25	275
TH 210 & Knollwood Dr <i>Signalized Intersection</i>	EB	62 - E	17 - B	4 - A	18 - B	19 - B	350	25	100	-	25	250	250	0	75
	WB	48 - D	12 - B	4 - A	15 - B		350	25	200	-	25	300	350	25	100
	NB	38 - D	32 - C	12 - B	31 - C		225	50	325	-	50	325	-	50	325
	SB	51 - D	38 - D	11 - B	42 - D		-	25	225	-	25	225	75	0	50
TH 210 & Highland Scenic Dr <i>Signalized Intersection</i>	EB	-	14 - B	6 - A	13 - B	24 - C	-	-	-	-	25	225	200	25	75
	WB	96 - F	7 - A	-	26 - C		350	125	450	-	25	225	-	-	-
	NB	81 - F	-	12 - B	56 - E		-	75	250	-	-	-	250	25	100
TH 210 & Memorywood Dr <i>Stop Controlled</i>	EB	15 - C	0 - A	-	1 - A	3 - A	375	0	50	-	0	0	-	-	-
	WB	-	1 - A	2 - A	2 - A		-	-	-	-	0	0	200	0	0
	SB	51 - F	-	36 - E	49 - E		-	25	150	-	-	-	-	25	175
TH 210 & Meredith Dr <i>Stop Controlled</i>	EB	15 - C	1 - A	-	2 - A	1 - A	250	25	50	-	0	0	-	-	-
	WB	-	0 - A	1 - A	1 - A		-	-	-	-	0	0	225	0	0
	SB	26 - D	-	7 - A	20 - C		-	25	75	-	-	-	-	25	100
TH 210 & Timberwood Dr <i>Stop Controlled</i>	EB	-	0 - A	-	0 - A	2 - A	-	-	-	-	0	0	425	-	-
	WB	7 - A	2 - A	-	3 - A		475	0	25	-	0	0	-	-	-
	NB	50 - F	-	16 - C	19 - C		-	25	75	-	-	-	600	25	75

Project: TH 210

Scenario: 2040 PM Peak - Preferred Alternative

		2040 PM Peak																	
		Traffic Delay (sec/veh)					Traffic Queuing (feet)												
Intersection	Approach	Movement (Delay - LOS)				Approach (Delay - LOS)	Intersection (Delay - LOS)	U Turn			Left Turn			Through			Right Turn		
		U	L	T	R			Storage	Avg	Max	Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
TH 210 & Baxter Dr <i>Signalized Intersection</i>	EB	-	70 - E	15 - B	4 - A	21 - C	61 - E	-	-	-	375	75	300	-	75	500	625	25	75
	WB	-	162 - F	99 - F	80 - F	99 - F		-	-	-	350	25	75	825	150	1200	200	25	75
	NB	-	56 - E	61 - E	14 - B	52 - D		-	-	-	100	50	275	-	25	100	100	0	50
	SB	-	61 - E	79 - E	45 - D	52 - D		-	-	-	150	50	300	125	25	150	125	100	425
TH 210 & Cypress Dr <i>Signalized Intersection</i>	EB	-	50 - D	3 - A	2 - A	4 - A	21 - C	-	-	-	500	25	100	-	25	175	225	0	50
	WB	-	31 - C	21 - C	7 - A	21 - C		-	-	-	525	25	75	2150	200	1025	500	0	75
	NB	-	49 - D	67 - E	14 - B	38 - D		-	-	-	200	25	125	-	25	75	200	25	75
	SB	-	56 - E	53 - D	30 - C	54 - D		-	-	-	200	100	475	375	25	75	200	25	100
TH 210 & Golf Course Dr N <i>Stop Controlled</i>	EB	-	54 - F	1 - A	1 - A	6 - A	6 - A	-	-	-	200	50	175	-	0	0	200	0	0
	WB	-	14 - B	5 - A	7 - A	6 - A		-	-	-	250	25	50	-	25	200	350	0	25
	SB	-	-	-	27 - D	27 - D		-	-	-	-	-	-	-	-	-	100	25	225
TH 210 & TH 371 <i>Signalized Intersection</i>	EB	-	90 - F	52 - D	7 - A	67 - E	61 - E	-	-	-	625	150	500	1125	75	350	300	25	100
	WB	-	108 - F	62 - E	37 - D	63 - E		-	-	-	550	125	450	-	125	450	850	150	650
	NB	-	214 - F	49 - D	13 - B	73 - E		-	-	-	750	425	1250	2600	150	750	800	25	250
	SB	-	74 - E	41 - D	10 - B	41 - D		-	-	-	425	100	350	860	75	700	350	25	300
TH 210 & Elder Dr S <i>Partially Signalized</i>	EB	-	14 - B	9 - A	7 - A	9 - A	9 - A	-	-	-	650	0	50	-	25	250	225	0	0
	WB	-	25 - D	4 - A	5 - A	11 - B		-	-	-	600	50	425	1125	0	0	275	0	0
	NB	-	-	-	6 - A	6 - A		-	-	-	-	-	-	-	-	-	250	25	200
	SB	-	-	-	12 - B	12 - B		-	-	-	-	-	-	-	-	-	125	25	100
TH 210 & Inglewood Dr <i>Signalized Intersection</i>	EB	-	91 - F	14 - B	3 - A	26 - C	30 - C	-	-	-	300	50	250	-	25	275	300	0	50
	WB	-	85 - F	20 - C	4 - A	24 - C		-	-	-	300	50	175	-	50	400	350	25	100
	NB	-	67 - E	72 - E	10 - B	58 - E		-	-	-	200	50	250	200	25	200	200	25	75
	SB	-	67 - E	74 - E	13 - B	36 - D		-	-	-	150	50	200	150	25	125	150	25	175
TH 210 & Knollwood Dr N <i>RCI with 3/4 access</i>	EB	-	20 - C	0 - A	-	1 - A	2 - A	-	-	-	350	25	75	-	0	0	-	-	-
	WB	-	-	2 - A	3 - A	3 - A		-	-	-	-	-	-	-	0	0	325	0	25
	SB	-	-	-	17 - C	17 - C		-	-	-	-	-	-	-	-	-	100	25	150
TH 210 & Highland Scenic Dr <i>Signalized Intersection</i>	EB	-	-	23 - C	9 - A	21 - C	33 - C	-	-	-	-	-	-	-	50	275	200	25	100
	WB	-	74 - E	12 - B	-	33 - C		-	-	-	650	150	650	-	50	525	-	-	-
	NB	-	70 - E	-	12 - B	54 - D		-	-	-	-	100	450	-	-	-	250	25	100
TH 210 & Memorywood Dr <i>Stop Controlled- Green T</i>	EB	-	13 - B	0 - A	-	1 - A	4 - A	-	-	-	375	25	50	-	0	0	-	-	-
	WB	-	-	2 - A	3 - A	3 - A		-	-	-	-	-	-	-	0	0	200	0	0
	SB	-	47 - E	-	17 - C	43 - E		-	-	-	25	175	-	-	-	-	-	25	75
TH 210 & Meredith Drive <i>Stop Controlled</i>	EB	-	13 - B	1 - A	-	2 - A	2 - A	-	-	-	250	25	50	-	0	0	-	-	-
	WB	-	-	1 - A	1 - A	1 - A		-	-	-	-	-	-	-	0	0	225	0	0
	SB	-	30 - D	-	15 - C	26 - D		-	-	-	25	75	-	-	-	-	-	25	100
TH 210 & Timberwood <i>Stop Controlled</i>	EB	-	-	0 - A	-	0 - A	2 - A	-	-	-	-	-	-	-	0	0	-	-	-
	WB	-	6 - A	1 - A	-	2 - A		-	-	-	475	0	50	-	0	0	-	-	-
	NB	-	64 - F	-	14 - B	18 - C		-	-	-	25	100	-	-	-	-	-	25	100
Knollwood U-Turn	EB	-	-	2 - A	-	2 - A	1 - A	-	-	-	-	-	-	-	0	0	-	-	-
	WB	10 - B	-	0 - A	-	1 - A		-	25	125	-	-	-	-	0	0	-	-	-

Project: TH 210

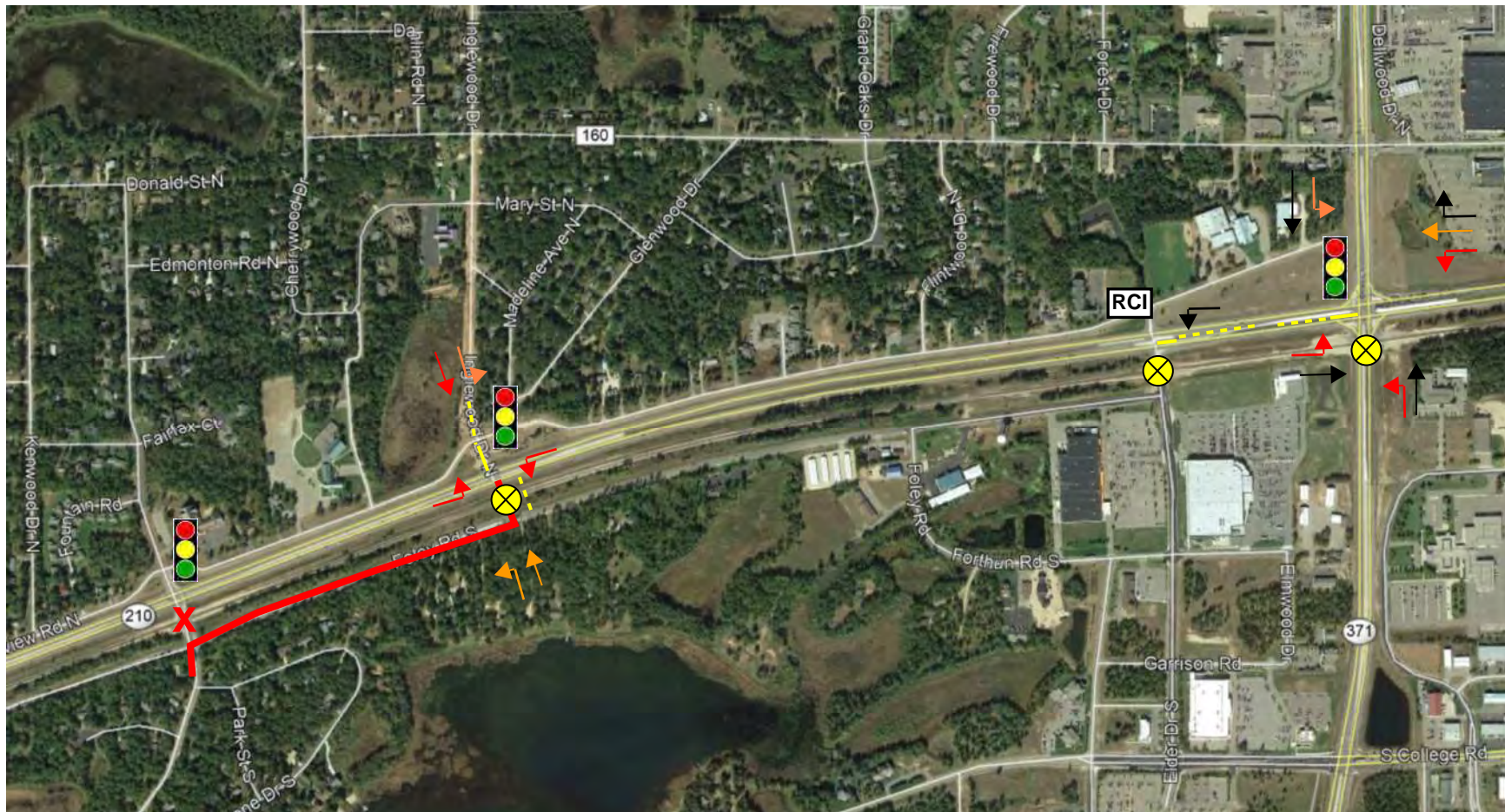
Scenario: 2040 Summer PM Peak - Preferred Alternative

		2040 PM Peak (Summer)																	
		Traffic Delay (sec/veh)					Traffic Queuing (feet)												
Intersection	Approach	Movement (Delay - LOS)				Approach (Delay - LOS)	Intersection (Delay - LOS)	U Turn			Left Turn			Through			Right Turn		
		U	L	T	R			Storage	Avg	Max	Storage	Avg	Max	Link Length	Avg	Max	Storage	Avg	Max
TH 210 & Baxter Dr <i>Signalized Intersection</i>	EB	-	71 - E	18 - B	4 - A	24 - C	69 - E	-	-	-	375	75	275	-	100	675	625	25	75
	WB	-	154 - F	112 - F	98 - F	112 - F		-	-	-	350	25	75	825	300	1450	200	25	100
	NB	-	56 - E	60 - E	14 - B	52 - D		-	-	-	100	50	275	-	25	100	100	0	50
	SB	-	67 - E	88 - F	59 - E	64 - E		-	-	-	150	50	325	125	25	200	125	125	525
TH 210 & Cypress Dr <i>Signalized Intersection</i>	EB	-	59 - E	3 - A	2 - A	4 - A	23 - C	-	-	-	500	25	100	-	25	200	225	0	25
	WB	-	41 - D	25 - C	10 - B	25 - C		-	-	-	525	25	75	2150	300	1175	500	25	75
	NB	-	50 - D	67 - E	17 - B	40 - D		-	-	-	200	25	125	-	25	75	200	25	75
	SB	-	57 - E	54 - D	37 - D	56 - E		-	-	-	200	100	475	375	25	75	200	25	100
TH 210 & Golf Course Dr N <i>Stop Controlled</i>	EB	-	79 - F	1 - A	2 - A	7 - A	12 - B	-	-	-	200	75	275	-	0	0	200	0	0
	WB	-	20 - C	12 - B	9 - A	12 - B		-	-	-	250	25	50	-	50	625	350	0	25
	SB	-	-	-	76 - F	76 - F		-	-	-	-	-	-	-	-	-	100	75	425
TH 210 & TH 371 <i>Signalized Intersection</i>	EB	-	92 - F	52 - D	9 - A	66 - E	78 - E	-	-	-	625	150	525	1125	100	450	300	25	75
	WB	-	132 - F	137 - F	44 - D	105 - F		-	-	-	550	125	450	-	475	1200	850	175	700
	NB	-	287 - F	62 - E	22 - C	89 - F		-	-	-	750	600	1600	2600	250	1150	800	25	250
	SB	-	76 - E	42 - D	14 - B	43 - D		-	-	-	425	100	325	860	100	900	350	25	375
TH 210 & Elder Dr S <i>Stop Controlled</i>	EB	-	19 - C	10 - B	7 - A	10 - B	10 - B	-	-	-	650	0	50	-	25	350	225	0	0
	WB	-	26 - D	5 - A	6 - A	11 - B		-	-	-	600	50	400	1125	0	0	275	0	0
	NB	-	-	-	7 - A	7 - A		-	-	-	-	-	-	-	-	-	250	25	175
	SB	-	-	-	13 - B	13 - B		-	-	-	-	-	-	-	-	-	125	25	100
TH 210 & Inglewood Dr <i>Signalized Intersection</i>	EB	-	92 - F	15 - B	4 - A	25 - C	29 - C	-	-	-	300	50	250	-	50	325	300	0	50
	WB	-	90 - F	21 - C	5 - A	25 - C		-	-	-	300	50	200	-	75	450	350	25	100
	NB	-	70 - E	73 - E	11 - B	60 - E		-	-	-	200	50	275	200	25	150	200	25	75
	SB	-	68 - E	76 - E	16 - B	38 - D		-	-	-	150	50	225	150	25	125	150	25	175
TH 210 & Knollwood Dr N <i>RCI with 3/4 access</i>	EB	-	26 - D	0 - A	-	1 - A	3 - A	-	-	-	350	25	75	-	0	0	-	-	-
	WB	-	-	2 - A	3 - A	3 - A		-	-	-	-	-	-	-	0	0	325	0	0
	SB	-	-	-	22 - C	22 - C		-	-	-	-	-	-	-	-	-	100	25	175
TH 210 & Highland Scenic Dr <i>Signalized Intersection</i>	EB	-	-	23 - C	9 - A	21 - C	31 - C	-	-	-	-	-	-	50	325	200	25	100	
	WB	-	72 - E	14 - B	-	30 - C		-	-	-	650	125	525	-	75	900	-	-	-
	NB	-	70 - E	-	14 - B	54 - D		-	-	-	-	100	450	-	-	-	250	25	125
TH 210 & Memorywood Dr <i>Stop Controlled- Green T</i>	EB	-	18 - C	0 - A	-	1 - A	6 - A	-	-	-	375	25	50	-	0	0	-	-	-
	WB	-	-	2 - A	3 - A	3 - A		-	-	-	-	-	-	-	0	0	200	0	0
	SB	-	84 - F	-	24 - C	76 - F		-	-	-	50	250	-	-	-	-	-	25	75
TH 210 & Meredith Drive <i>Stop Controlled</i>	EB	-	16 - C	1 - A	-	2 - A	2 - A	-	-	-	250	25	50	-	0	0	-	-	-
	WB	-	-	1 - A	1 - A	1 - A		-	-	-	-	-	-	-	0	0	225	0	0
	SB	-	41 - E	-	20 - C	36 - E		-	-	-	25	100	-	-	-	-	-	25	100
TH 210 & Timberwood <i>Stop Controlled</i>	EB	-	-	0 - A	-	0 - A	2 - A	-	-	-	-	-	-	0	0	-	-	-	
	WB	-	7 - A	1 - A	-	2 - A		-	-	-	475	0	25	-	0	0	-	-	-
	NB	-	68 - F	-	17 - C	21 - C		-	-	-	25	100	-	-	-	-	-	25	100
Knollwood U-Turn	EB	-	-	2 - A	-	2 - A	2 - A	-	-	-	-	-	-	0	0	-	-	-	
	WB	11 - B	-	1 - A	-	2 - A		-	25	125	-	-	-	-	0	0	-	-	-

Appendix D

Concept Evaluations

	Option	Intersection			
		Knollwood	Inglewood	Elder	TH 371
Intersection Control	1A	Signal (3-leg)	Signal (4-leg)	Existing RCI	Signal
Overall LOS		A	C	A	E
MnDOT LOS		A	C	A	E
City LOS		C	E	B	E
City Queuing Issues?		Yes - 3 veh	Yes - 4 veh	Yes - 1 veh	N/A
Vehicle Safety		+	+	++	
Pedestrian Safety		++	++	+	



What works:

- Signalized pedestrian crossings provided at Inglewood, Knollwood
- Improved vehicle safety at Inglewood with signalization
- TH 210 operations maintained
- Average queues do not block frontage roads

Drawbacks:

- Access spacing between signals substandard
- Elder Dr spacing to TH 371 substandard
- EBL may spill into thru lane at TH 371
- Inglewood operations marginally improved
- Max. sidestreet queues may extend past frontage roads

	Option	Intersection			
		Knollwood	Inglewood	Elder	TH 371
Intersection Control	1B	Signal (3-leg)	Signal (4-leg)	Relocated RCI	Signal
Overall LOS		A	C	A	E
MnDOT LOS		A	C	A	E
City LOS		C	E	B	E
City Queuing Issues?		No	Yes - 6 veh	Yes - 6 veh	N/A
Vehicle Safety		+	+	++	
Pedestrian Safety		++	++	+	



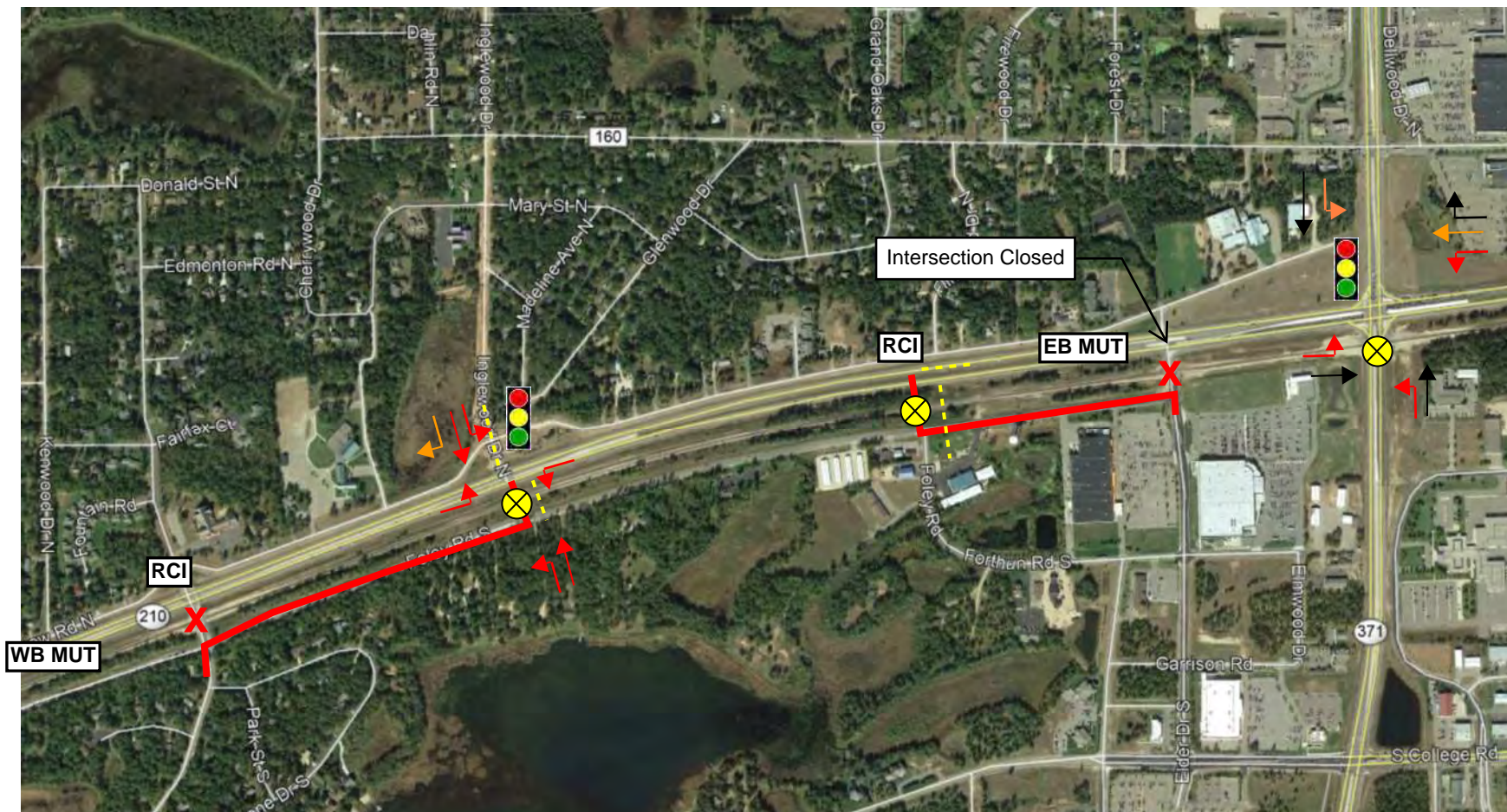
What works:

- Signalized pedestrian crossings provided at Inglewood, Knollwood
- Improved vehicle safety at Inglewood with signalization
- Improved EB queuing at TH 371, WB at Elder
- Access spacing corrected between Inglewood and TH 371, setting up for TH 371 Interchange
- Average queues do not block frontage roads

Drawbacks:

- Access spacing between signals substandard
- Inglewood operations marginally improved
- EBL may spill into thru lane at TH 371
- Max. sidestreet queues may extend past frontage roads

	Option	Intersection			
		Knollwood	Inglewood	Elder	TH 371
Intersection Control	1C	RCI w/ 3/4 Access (3-leg)	Signal (4-leg)	Relocated RCI	Signal
Overall LOS		A	D	A	E
MnDOT LOS		A	D	A	E
City LOS		C	F	B	E
City Queuing Issues?		Yes - 1 veh	Yes - 6 veh	Yes - 6 veh	N/A
Vehicle Safety		++	+	++	
Pedestrian Safety		+	++	+	



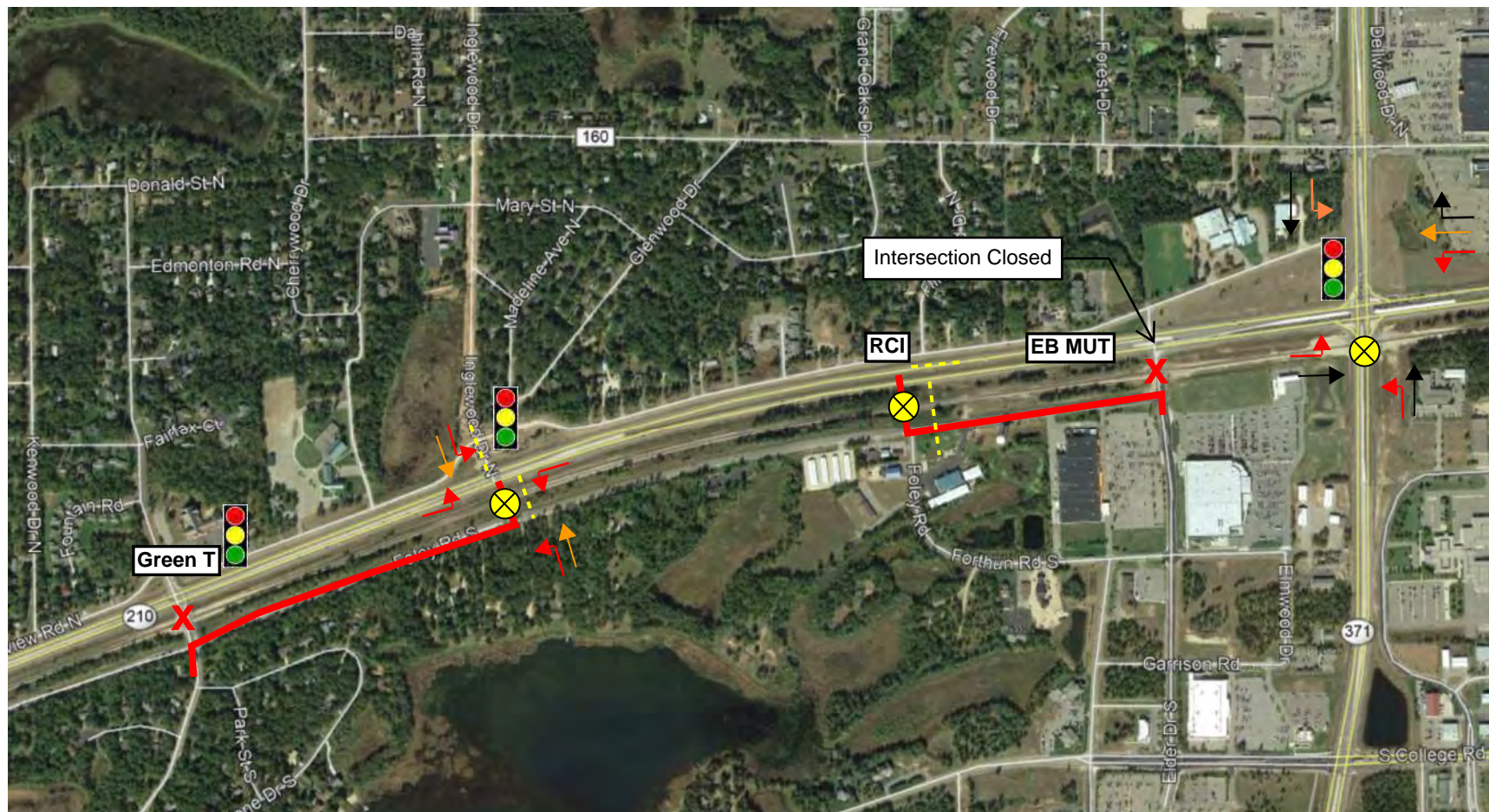
What works:

- Access spacing corrected between Knollwood and TH 371, setting up for TH 371 Interchange
- Improved EB queuing at TH 371, WB at Elder
- Improved safety, operations at 3-leg Knollwood
- Improved vehicle safety at Inglewood with signalization
- Average queues do not block frontage roads

Drawbacks:

- Inglewood operations poor, especially on NB approach
- Pedestrian crossing at Knollwood reconfigured
- Max. sidestreet queues may extend past frontage roads
- EBL may spill into thru lane at TH 371

	Option	Intersection			
		Knollwood	Inglewood	Elder	TH 371
Intersection Control	1D	Green-T (3-leg)	Signal (4-leg)	Relocated RCI	Signal
Overall LOS		A	C	A	E
MnDOT LOS		A	C	A	E
City LOS		C	F	B	E
City Queuing Issues?		Yes - 2 veh	Yes - 2 veh	Yes - 6 veh	N/A
Vehicle Safety		++	+	++	
Pedestrian Safety	-	++	+		



What works:

- Access spacing corrected between Inglewood and TH 371, setting up for TH 371 Interchange
- Improved EB queuing at TH 371, WB at Elder
- Improved safety, operations at 3-leg Knollwood
- Improved vehicle safety at Inglewood with signalization
- Average queues do not block frontage roads

Drawbacks:

- Inglewood options poor, especially on NB approach
- Pedestrian crossing at Knollwood **removed**
- EBL may spill into thru lane at TH 371
- Max. sidestreet queues may extend past frontage roads

	Option	Intersection			
		Knollwood	Inglewood	Elder	TH 371
Intersection Control	1E	3-Leg RCI w/o 3/4 Access	Signal (4-leg)	Relocated RCI	Signal
Overall LOS		A	D	A	E
MnDOT LOS		A	D	A	E
City LOS		B	F	B	E
City Queuing Issues?		No	Yes - 6 veh	Yes - 6 veh	N/A
Vehicle Safety		++	+	++	
Pedestrian Safety		+	++	+	



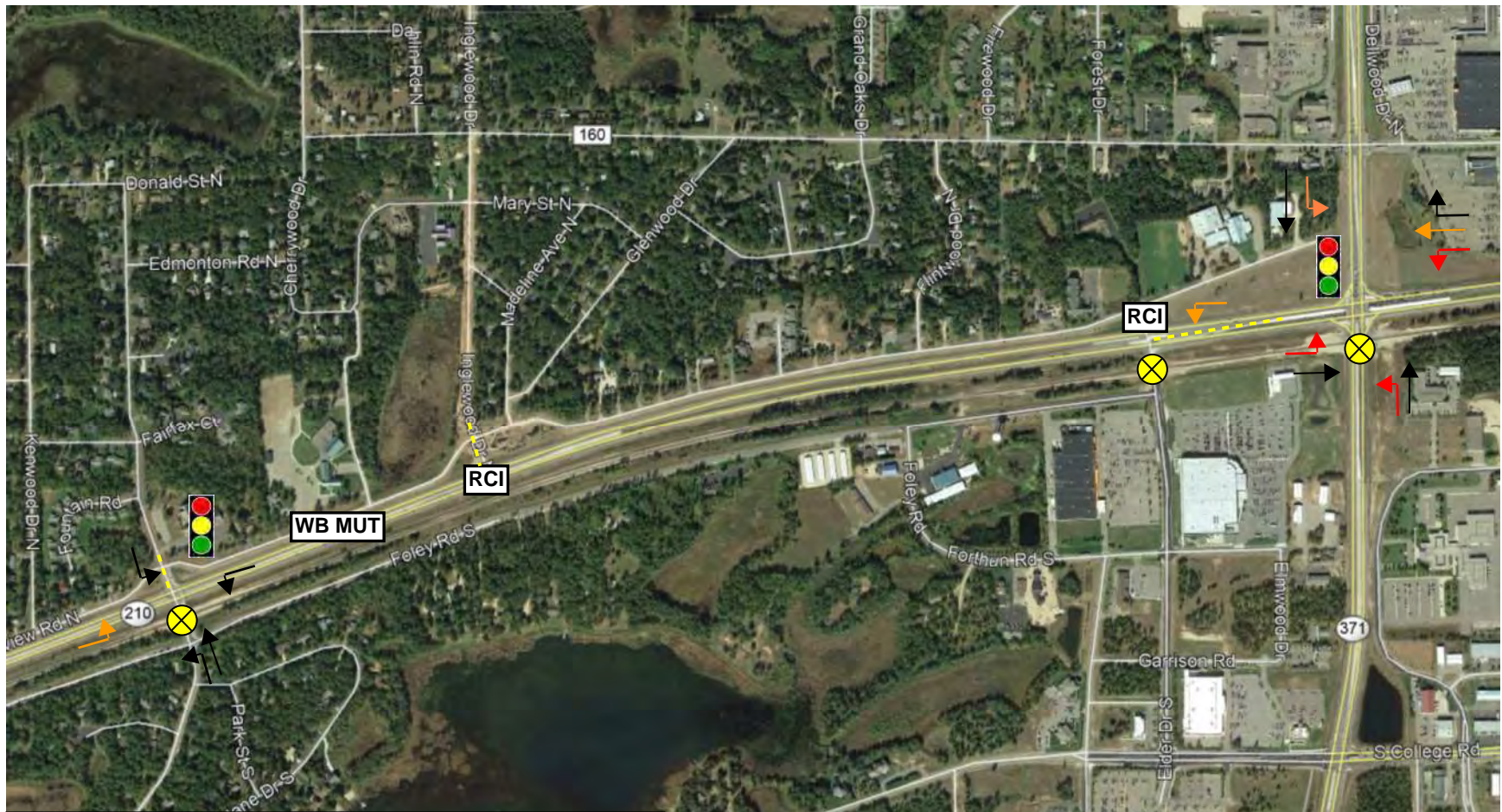
What works:

- Access spacing corrected between Knollwood and TH 371, setting up for TH 371 Interchange
- Improved EB queuing at TH 371, WB at Elder
- Improved safety, operations at 3-leg Knollwood, MUT's operate well
- Improved vehicle safety at Inglewood with signalization
- Average queues do not block frontage roads

Drawbacks:

- Inglewood options poor, especially on NB approach
- Pedestrian crossing at Knollwood reconfigured
- EBL may spill into thru lane at TH 371
- Max. sidestreet queues may extend past frontage roads

	Option	Intersection			
		Knollwood	Inglewood	Elder	TH 371
Intersection Control	2A	Signal (4-leg)	RCI w/ 3/4 Access (3-leg)	Existing RCI	Signal
Overall LOS		C	A	B	E
MnDOT LOS		B	A	C	E
City LOS		D	C	B	E
City Queuing Issues?		Yes - 8 veh	Yes - 3 veh	Yes - 2 veh	N/A
Vehicle Safety		+	++	++	
Pedestrian Safety		++	+	+	



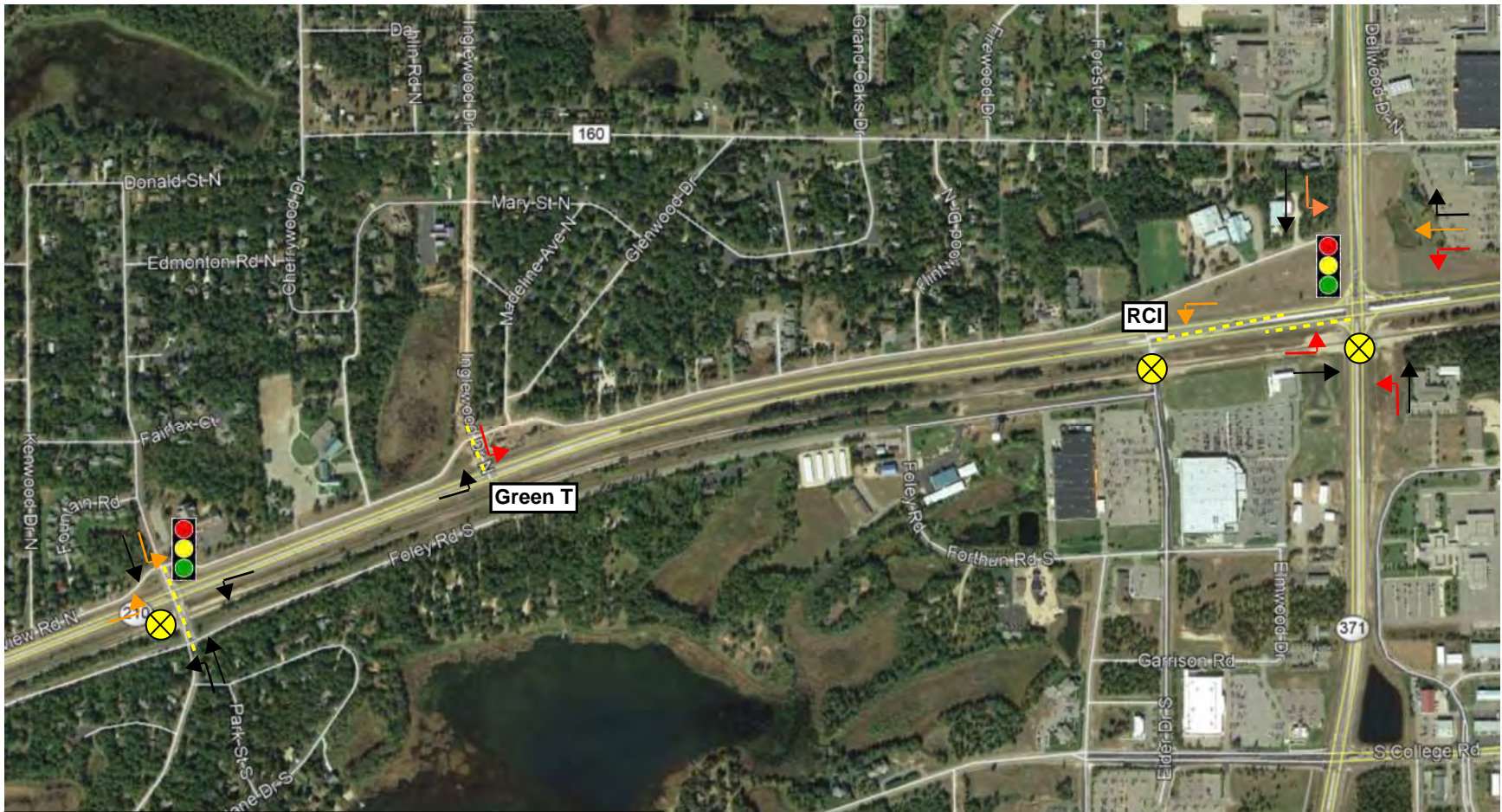
What works:

- Access spacing corrected between Knollwood and Elder
- Improved safety, operations at 3-leg Inglewood, MUT operates well
- All Knollwood movements LOS D or better
- Average queues do not block frontage roads

Drawbacks:

- Does not support City-planned closure of Knollwood
- Difficult pedestrian crossing at Inglewood
- Does not improve operations, safety in Elder-TH 371 area
- EBL may spill into thru lane at TH 371
- Max. sidestreet queues may extend past frontage roads

	Option	Intersection			
		Knollwood	Inglewood	Elder	TH 371
Intersection Control	2B	Signal (4-leg)	Green-T (3-leg)	Existing RCI	Signal
Overall LOS		C	A	B	E
MnDOT LOS		C	A	C	E
City LOS		D	E	B	E
City Queuing Issues?		Yes - 4 veh	Yes - 3 veh	Yes - 2 veh	N/A
Vehicle Safety		+	++	++	
Pedestrian Safety		++	+	+	



What works:

- Access spacing corrected between Knollwood and TH 371, setting up for TH 371 Interchange
- Improved safety, operations at 3-leg Inglewood
- All Knollwood movements LOS D or better
- Average queues do not block frontage roads

Drawbacks:

- Does not support City-planned closure of Knollwood
- Does not support pedestrian crossing at Inglewood
- SBL at Inglewood operates as LOS F
- Does not improve operations, safety in Elder-TH 371 area
- EBL may spill into thru lane at TH 371
- Max. sidestreet queues may extend past frontage roads

Appendix E

MetroQuest Survey #2 Comments Received

Item	Comment
Elder Drive	westbound turn lane backs up onto hwy 210 attimes. move farther from hwy 371 for more turn lane
Elder Drive	That is a lot of signals between Hwy 210 andthe new one on Inglewood.
Elder Drive	You need to enforce the yield sign, make itlarger with blinking lights, and additional signs instructing traffic they must yield to oncoming traffic. Clearly define the right turn lane, get rid of the dashed white lines. Look at adding an additional lane for people wanting to go South on 371 from Elder road, and still allow 210 traffic tohave their own lane to turn. This is probably the busiest area of all. Perhaps connect Forthum Rdto 371, to provide a right only access.
Elder Drive	So long as it's sequenced with the lights atthe 371 interchange.
Elder Drive	Access to 210 here should be right turn onlywith no westbound traffict crossing the lanes. Too many cars come off 371 then shoot across the lanes to turn left to elder dr.
Elder Drive	Needs to a FULL traffic signal so that people would walk and bicycle can safely cross, MN 371 is NOT a safe place to cross even with the trafficsignal because of high speed right turn no stop and no sidewalk/path south of 210 on 371.
Elder Drive	Would not be necessary if EB traffic actually kept to 45 mph. Radar signs showing people their speed?
Elder Drive	Currently this is a terrible design. Anything you do to make it better will help
Elder Drive	I frequently use this intersection to accessCostco. There is no problem with delay or finding gaps to turn left. A signal is not necessary anda low-ROI expense. Spend the money instead to connect the crosswalk at the SW corner of 210/371 to the commercial shopping district along Elder Drive. It is impossible to safely walk or bike to this major shopping area from the north or east.
Elder Drive	Under the proposed change, it is too close to the 371 intersection. Putting a light there will cause traffic to back up thru the 371 intersection.
Elder Drive	Can you at least allow/install a right greenarrow to signal people to go east? (There are a lot of dumb drivers in this area in my opinion)
Elder Drive	Elder Drive gets pretty busy. Moving the intersection to the west further could help. Need to do something on Elder because it is way too congested now.
Elder Drive	I have never had a problem entering with this traffic and have not seen a large enough volume of traffic to have it cause an issue. so i am unsure of this issue.
Elder Drive	That is so close to another signal! I already dread driving that way but this would be a ridiculous solution. Why wasnt better planning done when that business development was happening??
Elder Drive	No more stop lights.
Elder Drive	I can see many traffic back ups between elder and 371
Fairview Road Access	Very difficult to get out of Speedway and turn left to return to Brainerd/Baxter. With increased traffic at the school, it will only increase.Baxter Post Office is now located at Speedway so traffic has increased as a result.
Fairview Road Access	This would alleviate the bottleneck we get right at the gast station entrance.
Fairview Road Access	Definitely a great improvement.
Fairview Road Access	Just CLOSE the inappropriate access.
Fairview Road Access	This still does not seem safe because the frontage road is closely spaced with the highway. It's the same safety issue with the 3/4 intersections near Fleet Farm.
Fairview Road Access	I support this change.
Fairview Road Access	People would still be confused and stop whencoming off the highway
Knollwood Drive	Like the concept but please allow pedestrians to cross at Knollwood - dont want to walk to Inglewood/County 48 to cross
Knollwood Drive	It doesn't really improve the situation of trying to get turned around. Traffic volumes at certain times requires you to sit waiting to get outwhen you're in the crossover. If you have a trailer, etc., you end up being an obstacle in a lanebecause there's not enough room for the vehicle and what is attached (boat, trailer, etc.).
Knollwood Drive	Only concern here is, pedestrian traffic...need a bridge or tunnel. Also radar signs and better speed enforcement. Should be 45mph until afterthe school.
Knollwood Drive	I often come up Knollwood drive from Forestview Middle school to go east on 210. It would not be difficult to jog over to Inglewood instead
Knollwood Drive	Eh. Are you eliminating access to 210 for northbound Knollwood?
Knollwood Drive	Will this remove pedestrian access at this point? I would hope that would be considered.
Knollwood Drive	This would eliminate a pedestrian crossing that is BADLY NEEDED DAMMIT!!!! There needs to more safe places to walk and bike across 210 NOT FEWER DAMMIT!!!!
Knollwood Drive	This proposal is unacceptable for bike-walkconnectivity and permeability across the highway. There is currently a trail crossing of the RR andhighway at this location, and removal would add miles (a half hour of walking or more) to many trips. This would invite people crossing at the location anyways, at which point they would be blamed fornot crossing at a crosswalk if they are injured or killed. This is unacceptable hostile infrastructure.
Knollwood Drive	A concern with the RCI is the speed of traffic moving thru on 210. I think the light works there. Also where would the traffic from Elder Dr to210W get in? There? That's a lot of traffic at times.
Knollwood Drive	I feel this would create other traffic issues. My family lives on Jepson Rd just North kf the 48/Knollwood intersection. Traffic is already horrible on Knollwood due to Forestview and Baxter schools. While we appreciate the schools ans their location, it has heavily increased traffic for families traveling to those schools to pick up and dropoff children.
Knollwood Drive	The 210 freeway will sure be nice for bypassing and dividing Baxter.
Knollwood Drive	If the plan is to send all traffic now downto Inglewood, this will work.
Knollwood Drive	I support the reduced traffic option.

Item	Comment
Knollwood Drive	Removing this stoplight would make it much more difficult and much less efficient for getting across 210 and over to the Baxter Elementary and Middle Schools. Traffic already backs up around the middle school, so having cars coming from only two directions instead of three is not going to help the situation. Due to the location of my home, I would be extremely disappointed if this stoplight was removed.
Knollwood Drive	It is not possible to comment on this option. You haven't included the plans to change Knollwood and move the light to Inglewood. This is misleading.
Knollwood Drive	As long as you put a stop light at an intersection in Baxter to cross 210 other than 371 because having to deal with 371 during tourist season sucks and this is how I get to the stores in Baxter and back without going into brainerd
Knollwood Drive	I do not understand what an RCI is? You don't explain it.
Knollwood Drive	How much will traffic increase on Foley? Knollwood has become a race tract
Memorywood Drive	This is another signal system close to CR 48, I see no feedback for this intersection.
Memorywood Drive	As a Memorywood Dr commuter I love this idea. I may have misunderstood on one of my previous commitments. I thought you were stopping westbound traffic.
Memorywood Drive	Keep 210 four lanes!
Memorywood Drive	Really, how can this be justified? Turning a 4 lane highway into a 2 lane so local access can be every block or so? These accesses don't meet spacing requirement - close the extra accesses and maintain the highway as a highway or let the local city (Baxter) pay for it as a local road.
Memorywood Drive	Nice improvement. The narrow median there today with no signal light makes getting on the highway a scary experience.
Memorywood Drive	While this could improve traffic it could also slow down traffic from the direction its coming from. I would recommend using the new intersections 169 is using where you pull in and loop around further down as this cuts down on traffic trying to cross.
Memorywood Drive	Need to keep 2 lanes headed east/west
Meredith Drive	Why not do something similar to the proposed Memorywood interchange? Maybe not a continuous green scenario but how about through lanes with an acceleration lane for people entering 210 eastbound? This would improve Memorywood too without stopping westbound traffic in the afternoon. The morning flow is Eastbound with more people entering from Memorywood. Evening traffic is Westbound with more people exiting at Memorywood. Not much need to stop westbound traffic.
Meredith Drive	Why decrease the amount of 210 that is four lanes? Often I am behind it slow traffic all the way from Motley, with no dedicated passing lanes that whole section.
Meredith Drive	I prefer to get up to speed limit asap
Meredith Drive	If Meredith access isn't simply closed it should be converted to a right-in / right-out only (close the median)
Meredith Drive	Widen the median to provide space.
General Comment	A significant amount of education would need to be done on how this works. People have trouble with roundabouts in Brainerd. ELDER DRIVE IS A VERY DANGEROUS SITUATION. There are near miss situations here on a daily basis.
Meredith Drive	Why? A low volume road that services only a few people?
Meredith Drive	Reducing the number of lanes would make turning across the intersection safer, though a half-RCI would be even safer for conflict management.
Meredith Drive	The 2 lanes should be further back.
Meredith Drive	I think going to two lane only exacerbates the congestion problem.
Meredith Drive	Not busy enough for this. Maybe a rci here?
Meredith Drive	I think this option will work better than what is there now.
Meredith Drive	I support the restriping of this intersection for improved safety.
Meredith Drive	Cannot comment as I do not use this area.





Appendix F

Intersection Capacity Analysis (CAP-X) at TH 210/371

Capacity Analysis for Planning of Junctions

Summary Report - Page 1 of 2

Project Name:	TH 210 Baxter Access Study
Project Number:	T49.M00120
Location:	TH 371
Date:	2040 AM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	180	525	265	6.00%	0.00%
Westbound	0	195	305	300	6.00%	0.00%
Southbound	0	410	720	315	6.00%	0.00%
Northbound	0	90	440	150	6.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone		C3C-Suburban Commercial				
Critical Lane Volume Threshold			2-phase signal		Suggested = 1800	1800
			3-phase signal		Suggested = 1750	1750
			4-phase signal		Suggested = 1700	1700

Capacity Analysis for Planning of Junctions





Summary Report - Page 2 of 2

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Partial Cloverleaf B E-W	0.38	1	3.0	Poor	Poor	Good
Displaced Left Turn	0.44	2	4.8	Fair	Fair	Good
Partial Cloverleaf A E-W	0.46	3	3.0	Poor	Poor	Good
Diverging Diamond Interchange E-W	0.46	3	6.7	Good	Good	Good
Quadrant Roadway N-W	0.50	5	4.4	Fair	Fair	Fair
Quadrant Roadway N-E	0.52	6	4.4	Fair	Fair	Fair
Partial Displaced Left Turn N-S	0.55	7	4.8	Fair	Fair	Good
Quadrant Roadway S-E	0.56	8	4.4	Fair	Fair	Fair
Single Point E-W	0.56	8	4.8	Fair	Fair	Good
Traffic Signal	0.58	10	4.8	Fair	Fair	Good

Capacity Analysis for Planning of Junctions

Summary Report - Page 1 of 2

Project Name:	TH 210 Baxter Access Study
Project Number:	T49.M00120
Location:	TH 371
Date:	2040 PM
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	435	435	60	6.00%	0.00%
Westbound	0	315	615	575	6.00%	0.00%
Southbound	0	330	440	365	6.00%	0.00%
Northbound	0	250	835	225	6.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone		C3C-Suburban Commercial				
Critical Lane Volume Threshold		2-phase signal		Suggested = 1800	1800	
		3-phase signal		Suggested = 1750	1750	
		4-phase signal		Suggested = 1700	1700	

Capacity Analysis for Planning of Junctions





Summary Report - Page 2 of 2

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Partial Cloverleaf A E-W	0.46	1	3.0	Poor	Poor	Good
Diverging Diamond Interchange E-W	0.51	2	6.7	Good	Good	Good
Displaced Left Turn	0.58	3	4.8	Fair	Fair	Good
Partial Cloverleaf B E-W	0.58	3	3.0	Poor	Poor	Good
Quadrant Roadway S-W	0.65	5	4.4	Fair	Fair	Fair
Quadrant Roadway S-E	0.66	6	4.4	Fair	Fair	Fair
Single Point E-W	0.69	7	4.8	Fair	Fair	Good
Diamond E-W	0.71	8	4.8	Fair	Fair	Good
Quadrant Roadway N-W	0.72	9	4.4	Fair	Fair	Fair
Partial Displaced Left Turn N-S	0.73	10	4.8	Fair	Fair	Good

Capacity Analysis for Planning of Junctions

Summary Report - Page 1 of 2

Project Name:	TH 210 Baxter Access Study
Project Number:	T49.M00120
Location:	TH 371
Date:	2040 AM - Summer Volumes
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	235	680	345	6.00%	0.00%
Westbound	0	255	400	390	6.00%	0.00%
Southbound	0	535	935	410	6.00%	0.00%
Northbound	0	115	570	195	6.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone			C3C-Suburban Commercial			
Critical Lane Volume Threshold			2-phase signal		Suggested = 1800	1800
			3-phase signal		Suggested = 1750	1750
			4-phase signal		Suggested = 1700	1700

Capacity Analysis for Planning of Junctions





Summary Report - Page 2 of 2

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Single Point E-W	0.49	1	4.8	Fair	Fair	Good
Partial Cloverleaf B E-W	0.50	2	3.0	Poor	Poor	Good
Displaced Left Turn	0.52	3	4.8	Fair	Fair	Good
Displaced Left Turn (Interchange) E-W	0.56	4	4.8	Fair	Fair	Good
Partial Cloverleaf A E-W	0.60	5	3.0	Poor	Poor	Good
Diverging Diamond Interchange E-W	0.60	5	6.7	Good	Good	Good
Quadrant Roadway N-W	0.65	7	4.4	Fair	Fair	Fair
Diamond E-W	0.66	8	4.8	Fair	Fair	Good
Traffic Signal	0.67	9	4.8	Fair	Fair	Good
Quadrant Roadway N-E	0.68	10	4.4	Fair	Fair	Fair

Capacity Analysis for Planning of Junctions

Summary Report - Page 1 of 2

Project Name:	TH 210 Baxter Access Study
Project Number:	T49.M00120
Location:	TH 371
Date:	2040 PM - Summer Volumes
Number of Intersection Legs:	4
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn 	Left 	Thru 	Right 	Heavy Vehicles	Volume Growth
Eastbound	0	565	565	80	6.00%	0.00%
Westbound	0	410	800	745	6.00%	0.00%
Southbound	0	430	570	475	6.00%	0.00%
Northbound	0	325	1085	290	6.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	0.80	0.95		0.85		
Truck to PCE Factor				Suggested = 2.00	2.00	
FDOT Context Zone			C3C-Suburban Commercial			
Critical Lane Volume Threshold			2-phase signal		Suggested = 1800	1800
			3-phase signal		Suggested = 1750	1750
			4-phase signal		Suggested = 1700	1700

Capacity Analysis for Planning of Junctions

Summary Report - Page 2 of 2

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Multimodal Score	Pedestrian Accommodations	Bicycle Accommodations	Transit Accommodations
Partial Cloverleaf A E-W	0.47	1	3.0	Poor	Poor	Good
Partial Cloverleaf B E-W	0.63	2	3.0	Poor	Poor	Good
Diverging Diamond Interchange E-W	0.66	3	6.7	Good	Good	Good
Single Point E-W	0.66	3	4.8	Fair	Fair	Good
Displaced Left Turn	0.70	5	4.8	Fair	Fair	Good
Displaced Left Turn (Interchange) E-W	0.71	6	4.8	Fair	Fair	Good
Diamond E-W	0.82	7	4.8	Fair	Fair	Good
Partial Displaced Left Turn N-S	0.95	8	4.8	Fair	Fair	Good
Quadrant Roadway N-W	0.96	9	4.4	Fair	Fair	Fair
Quadrant Roadway N-E	1.00	10	4.4	Fair	Fair	Fair

Attachment 2 – 2022 Inglewood Drive
Railway Crossing and Associated Roadway
Improvements – Project History and
Purpose Memorandum – April 2021



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& MENK**

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MEMORANDUM

Date: April 29, 2021
To: City of Baxter Council/City of Baxter Utility Commission
From: Derek Arens/Pete Lemke *pml*
Subject: 2022 Inglewood Drive Railway Crossing and Associated Roadway Improvements

Project History and Purpose

City of Baxter
Municipal Project No.: 4121
BMI Project No. T42.120675

Background

On April 6, 2021, Bolton & Menk presented the proposed layout of the 2022 Inglewood Drive Railway Crossing and Associated Roadway Improvements project. The purpose of the presentation was to receive input from the council and consensus to proceed with amending the feasibility report and public input process. During the discussion, project need, intent, and reasoning were re-evaluated. This memo's intent is to provide the project area history and background that will justify the need and purpose of this project.

HISTORY

A. General

The City of Baxter is unique as it contains two of the major interregional corridors within the State of Minnesota. Trunk Highway 371 is a superhighway that runs north and south while Trunk Highway 210 runs east and west making a connection between Fargo and Duluth. Maintaining and sustaining these major arterials through the heart of the City of Baxter is critical for the longevity of the city. The corridor's constant thru traffic provides exposure to businesses and yields accessibility and transportation convenience for all city residents.

With these Trunk Highway corridors continuing to trend towards increased Average Daily Traffic (ADT) volumes, it becomes crucial that local traffic have alternative routes on the local system. With increased traffic volumes comes increased travel times which leads to MnDOT seeking for solutions to improve their roadway system.

A certain technique MnDOT tends to use first is Access Management. Access Management can consist of limiting access points by combining multiple driveways or city/county streets into one focused area. Other approaches are installing $\frac{3}{4}$ intersections, auxiliary lanes, or alternative intersection types. If all Access Management techniques have been exhausted, the final solution is for grade separation which can have the impact of limiting access and on-and-off capabilities of the free-flowing roadway making it crucial that the local system is adaptable and effective.

In certain examples throughout the state, if a corridor becomes too congested and MnDOT is looking to grade separate or expand the roadway, some municipalities frown upon the idea of

limiting access and/or major impacts to their local businesses by full acquisitions or redirecting traffic elsewhere. When discussions between MnDOT and the local entity come to a halt, the alternative can be a devastating realignment (bypass) of the entire Trunk Highway around them, removing that frequent passer-by traffic that businesses rely on. Avoidance of this situation has and should continue to be a goal for the City of Baxter.

It is imminent this situation will happen in 20 years plus. MnDOT will eventually want grade separations and make TH 371 a free-flowing roadway. Today MnDOT has already implemented Access Management techniques with focused entry areas and $\frac{3}{4}$ intersections. We are currently seeing it on TH 210 with MnDOT's active corridor study. This study is pushing for alternative intersection types throughout the corridor. If the City continues to prepare for this in the coming years, infrastructure and the local circulation will already be in-place to adapt to any changes of the adjacent Trunk Highway systems.

B. Reliever Roadway Planning

The solution to adapt to any possible changes of the Trunk Highway system is to provide parallel routes on each side of these principal arterials of TH 210 and TH 371. This provides local traffic the ability to move in a majority of directions without needing to utilize the Trunk Highway to get to their destinations. Having roadway connections for the minor direction of traffic to develop circulation is another key aspect. In the City of Baxter, having that ability to circulate around the commercial business district should be a major focus.

The City has designated the east of TH 371 reliever route as Cypress Drive. Recent improvements and two planned future projects will connect CSAH 48 (Highland Scenic Road) with Woida Road via Cypress Drive will allow that roadway to function as an eastside reliever in response to situations that may happen on TH 371. The west of TH 371 reliever route is a little less conventional with Perch Lake being a natural barrier to work around. Per the Isle Drive/Elder Drive Transportation Study (2013), the west reliever roadway was defined as Inglewood Drive and Isle Drive. See **Appendix 1** for more information of the parallel reliever routes and assumed circulatory patterns that have been assumed to date within the City of Baxter.

C. Planning Study History

Previous transportation studies have been completed and incorporated into the City of Baxter's long range planning efforts. These studies developed the idea of local roadway circulation and recommended improving the local roadway system around these two interregional corridors which includes installment of parallel reliever routes. A summary of sequential list of these studies is below:

- City of Baxter Long Range Transportation Plan (2000) (City Comprehensive Plan)
- Benshoof & Associates, Inc. – MnDOT HAC & RAC – TH 210 Corridor Management Plan (2002) (MnDOT)
- Traffic Study for Excelsior Rd, Knollwood Drive, and Inglewood Drive (2010) (Wenck) (City of Baxter)
- Isle Drive/Elder Drive Transportation Study (2013) (WSB) (City of Baxter)
- City Railroad Crossing Assessment Analysis (2015) (SEH) (City of Baxter)
- Excelsior Road Area Transportation Study (2015) (WSB) (City of Baxter)

- Inglewood Drive Railway Crossing & Associated Roadway Improvements Feasibility Report (2018) (WSN) (City of Baxter)
- Highway 371 Bike/Pedestrian Crossing Study (2019) (SRF/Toole Design Group) (City of Baxter)
- (In Progress) - MnDOT District 3 TH 210 Corridor Study (2021) (Bolton and Menk) (MnDOT/City of Baxter/Crow Wing County)

D. Project History

With the recommendations of the traffic studies, the city has invested significant time and funding, slowly implementing this idea of reliever roadways and circulatory patterns. The following is a timeline of projects that have happened within the project area in the last 20+ years. **Appendix 2** displays them visually in a plan view.

1. Forthun Rd Construction and Utilities (1999) (WSN) (City of Baxter)
2. TH 210 City Street, Sanitary and Watermain Construction on Local Roads (2000) (WSN) (City of Baxter)
3. Knollwood and Parkwood Area Improvements (2001) (WSN) (City of Baxter)
4. TH 210 Expansion and Frontage Road System (2001) (MnDOT)
5. Isle Drive Extension Project (2004) (WSN) (City of Baxter)
6. The View at Rush Lake (2004) (Westwood) (City of Baxter)
7. Forthun Rd Construction and Utilities Extension (2005) (WSN) (City of Baxter)
8. Fairview Trail and Crossing Improvements Project (2007) (WSN) (City of Baxter)
9. Inglewood Drive Reconstruction (2016) (WSN) (City of Baxter/MnDOT)
10. Fairview Road Improvements (2016) (SEH) (City of Baxter)
11. Lift Station No. 3 Sanitary Re-Route [No Roadway Improvements] (2017) (Bolton and Menk) (City of Baxter)
12. Cypress Drive Improvements (East Side Reliever) (2018) (SEH) (City of Baxter)
13. Excelsior Road/Edgewood Dr Roundabout Project (2018) (WSB) (City of Baxter)

II. ADDITIONAL PURPOSES OF THE 2022 INGLEWOOD DRIVE PROJECT

A. Planning and Maintenance Reasons

- **Crossing and full access to TH 210 located closer to Commercial Development -** MnDOT has closed the northbound egress to westbound TH 210 traffic flow at Elder Drive. The closing of that intersection forced exiting traffic attempting to head west on TH 210, to either backtrack southerly to the Glory Road / TH 371 intersection, or head west on Foley Road (south frontage road) for 1.2 miles to the Knollwood Drive intersection and access to TH 210.
- **Improves pedestrian safety and routing –** Inglewood Drive has been designated as a regional corridor for pedestrians and bicyclists. A recent project installed a bituminous ped/bike trail along the west side of Inglewood Drive, north of TH 210.

That trail currently runs into TH 210 with the only way for pedestrians to cross TH 210 is at Knollwood Drive. This forces pedestrians and bicyclists to back track on the frontage road of Fairview Road that does not have any roadway separated facilities. In addition, the commercial development to the east tends to be the destination of these pedestrians and bicyclist so locating the TH 210 crossing at Inglewood aligns their traveled way to be more favorable toward a linear path. The relocation of the intersection will allow for better spacing for pedestrian trail crossings of TH 210. Currently there are no crossings between Knollwood Drive and Cypress Drive.

- **Foley Road has hit its life expectancy** – Foley Road was constructed in 2001, 20 years ago, which is a typical design life for a roadway. Today the pavement condition is fair to bad and visually needs repair. In addition, the existing trail located immediately behind the back of curb is substandard for today's bituminous trail standards. The MNDOT Bike Manual recommends at least a 5-foot-wide buffer from the roadway curb for signs, lighting, safety, etc. In addition, driveway crossings of this existing trail do not meet today's American with Disabilities Act (ADA) standards.
- **Better intersection spacing for TH 210** - The spacing of the existing signalized intersections do not meet MnDOT recommended distances and are not equally spaced to promote uniform traffic flow. The Knollwood Drive intersection is located approximately 1.4 miles west of TH 371 and the CSAH 48 intersection is located approximately 0.7 miles west of the Knollwood Drive intersection. This project would split the difference of that spacing in equal portions.

B. Establishing the West Reliever Roadway for TH 371

Midway through this idea of developing reliever and circulatory patterns, the city completed a planning study called Isle Drive/Elder Drive Transportation Study (2013). This study ultimately initiated the alignment of this west reliever roadway of TH 371. See **Appendix 3** for a visual. The City of Baxter has used this as a guide to formulate and establish the reliever roadway. Projects such as the Excelsior Road/Edgewood Dr Roundabout Project (2018) have begun the implementation process of this plan.

Most recently, the city composed the Inglewood Drive Railway Crossing & Associated Roadway Improvements Feasibility Report (2018) that recommended the design and construction of the 2022 Inglewood Drive project. See **Appendix 4** for those figures. It again built off the idea of the west reliever route alignment and analyzes how this project would be beneficial to all residents.

III. SUMMARY

Pending some probable additional implementations such as improvements to the Isle Drive/Glory Road intersection as described in a supporting memo by Bolton and Menk, going through and constructing the 2022 Inglewood Drive project would be the last puzzle piece to the west reliever road of TH 371. This project will not only support the needs of the City of Baxter for 20+ years on the local system, but it will also provide capacity and accommodations if MnDOT proceeds with any major changes of the interregional corridors of TH 210 and TH 371.

Name: 2022 Inglewood Drive Project History and Purpose

Date: 4/29/2021

Page: 5

BOLTON & MENK RECOMMENDATIONS

We recommend the City Council proceed with the proposed layout of the 2022 Inglewood Drive Project. Next steps will be public involvement and completion of the project feasibility report.

COUNCIL ACTION REQUESTED

Consensus of City Council to proceed with the proposed layout of the 2022 Inglewood Drive Project.

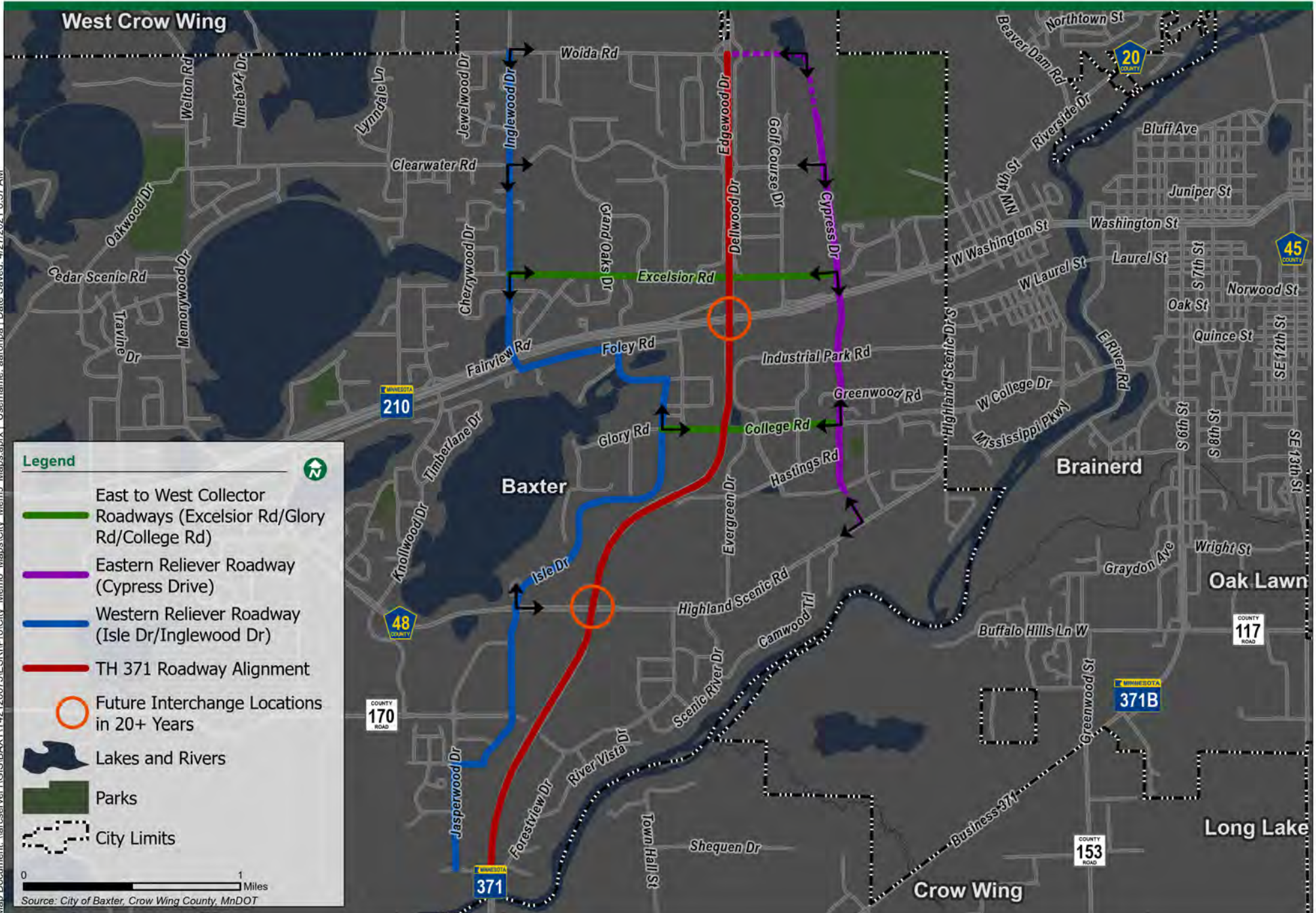
Appendices

Appendix 1– Reliver Routes for Trunk Highway 371

Appendix 2 – Area Project History and Timeline

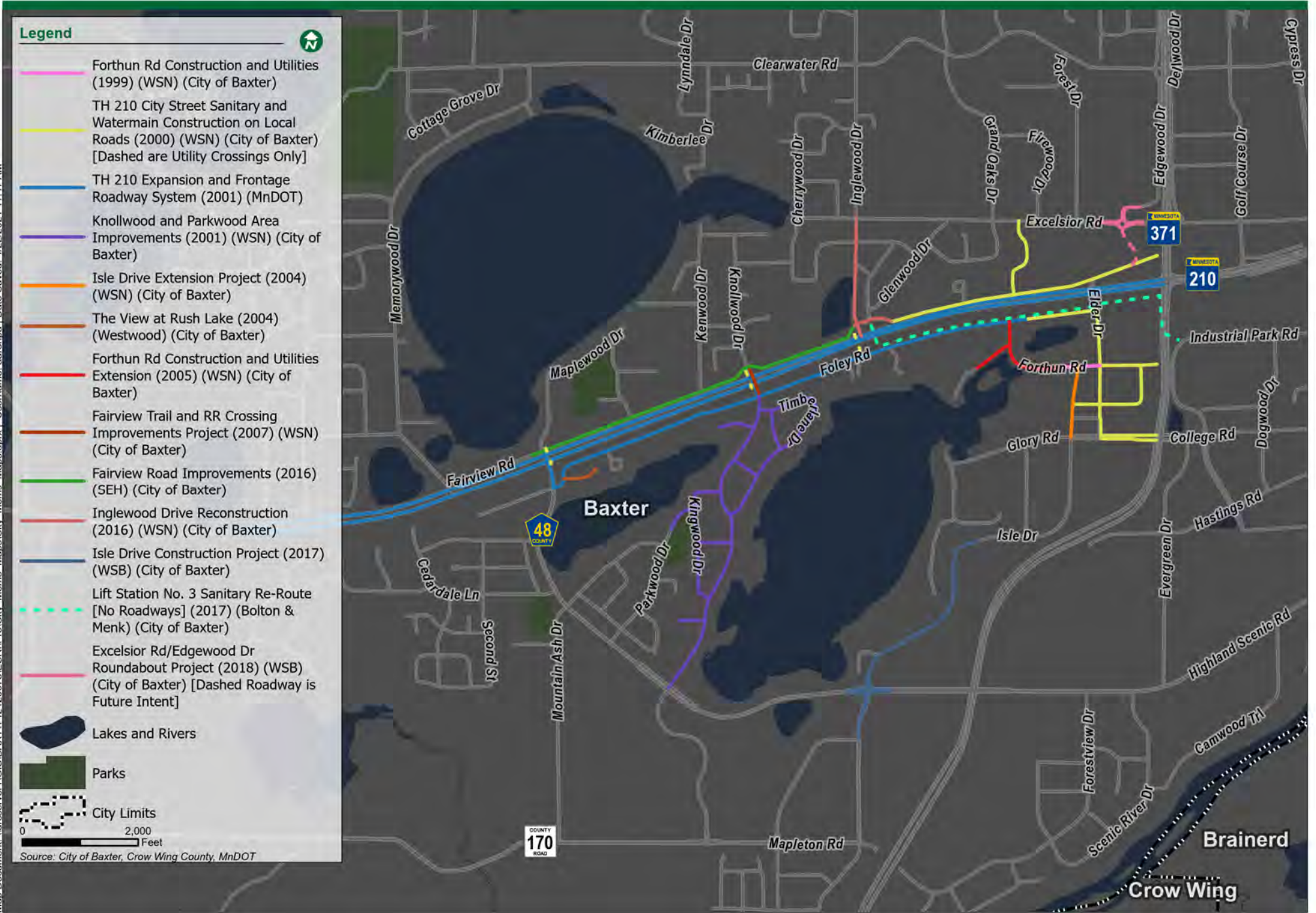
Appendix 3 – Isle and Elder Drive Transportation Study Reliver Road Layout

Appendix 4 - Feasibility Study Layout of Foley Road and Inglewood Drive



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APPENDIX 3

Date Printed: 3/14/2013
 WSB Filename: K:\02037-020\Cad\Exhibits\fig-08 - Isle Drive Concept 1(500 Scale).dgn

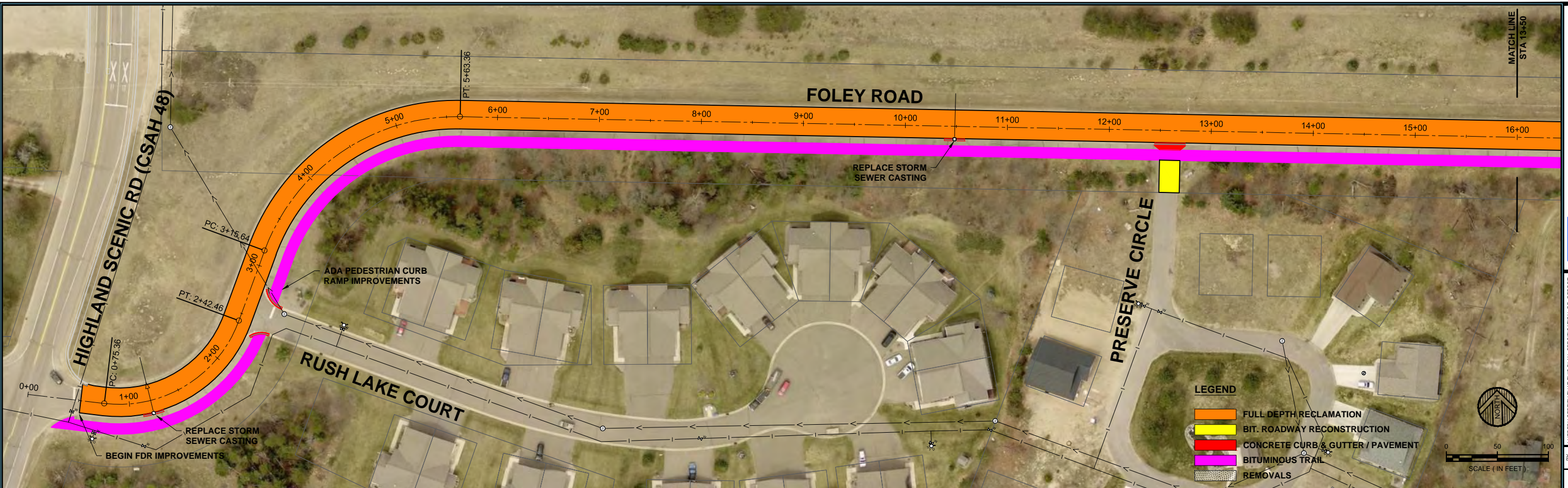


Elder Drive / Isle Drive Alternative Study City of Baxter, Minnesota

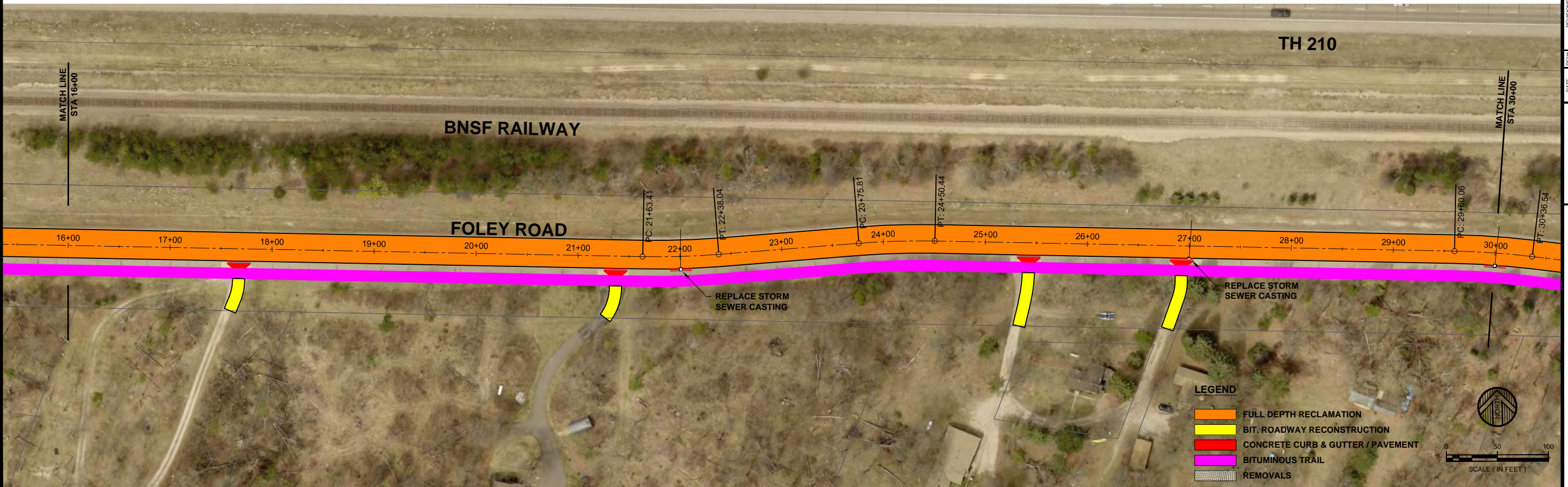
Alignment Concept 1

Figure 9

March 14, 2013



FOLEY ROAD STA 0+00 - 16+00



FOLEY ROAD STA 16+00 - 30+00

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 Engineering | Architecture | Surveying | Environmental

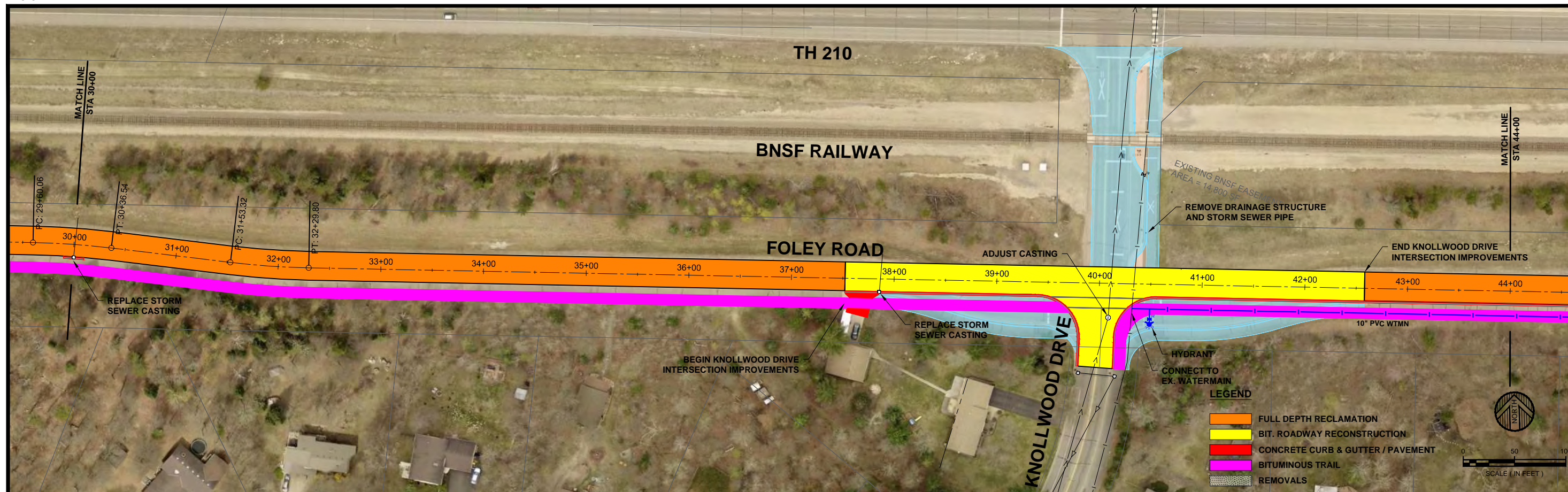


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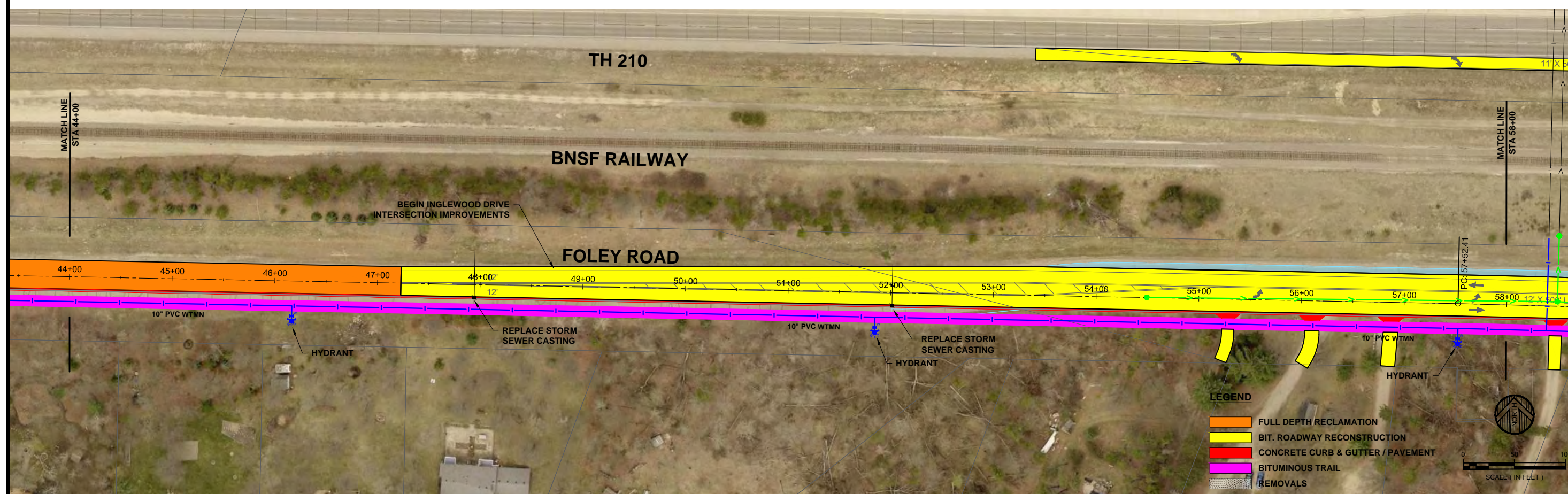
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INGLEWOOD DR RAILWAY CROSSING & FOLEY RD IMPROVEMENTS
 CITY OF BAXTER
 BAXTER, MINNESOTA
FIGURE 8 - PROPOSED IMPROVEMENTS - FOLEY ROAD



FOLEY ROAD STA 30+00 - 44+00



FOLEY ROAD STA 44+00 - 58+00



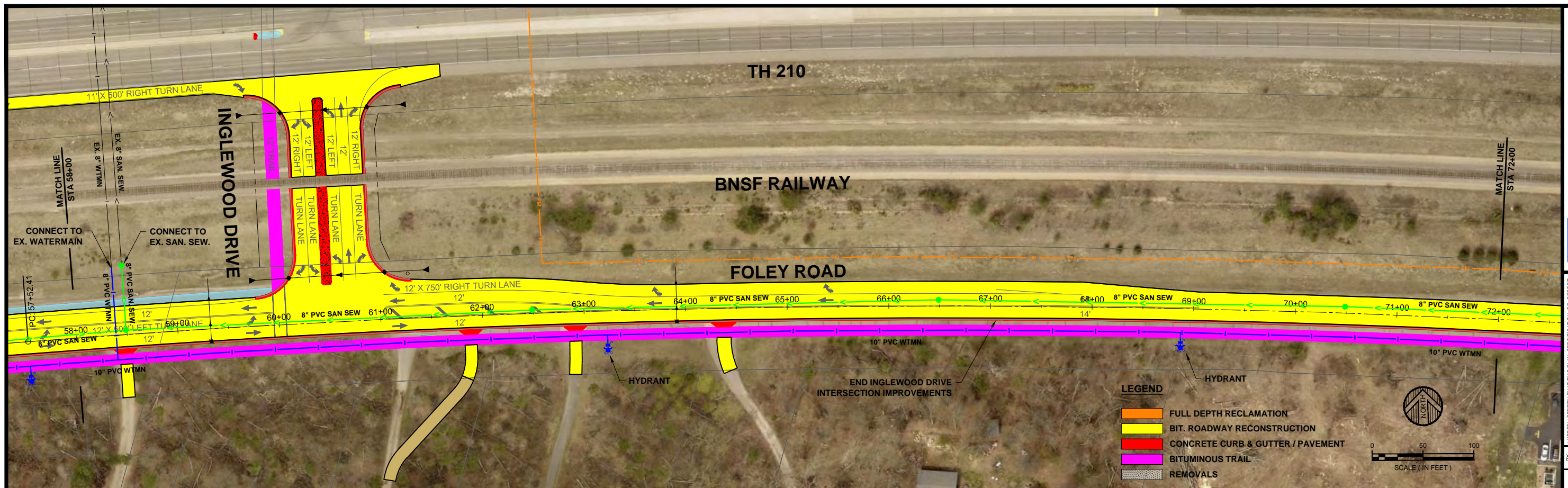
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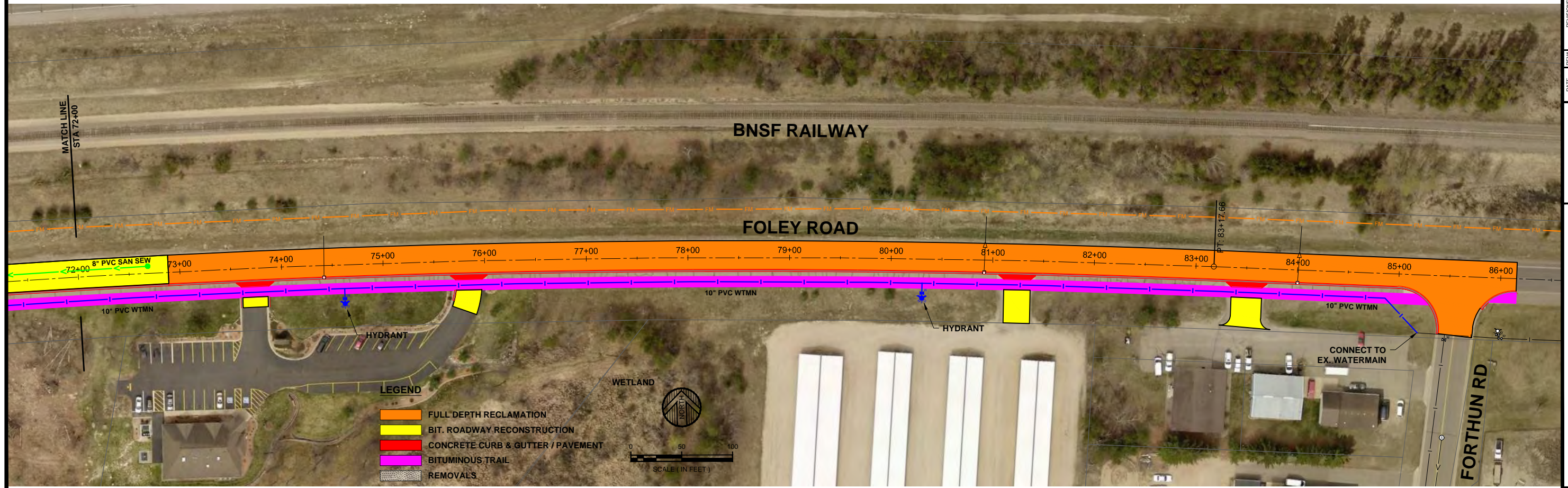
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MARCH 2018	AS SHOWN		

INGLEWOOD DR RAILWAY CROSSING & FOLEY RD IMPROVEMENTS
CITY OF BAXTER
BAXTER, MINNESOTA



FOLEY ROAD STA 58+00 - 72+00



FOLEY ROAD STA 72+00 - END

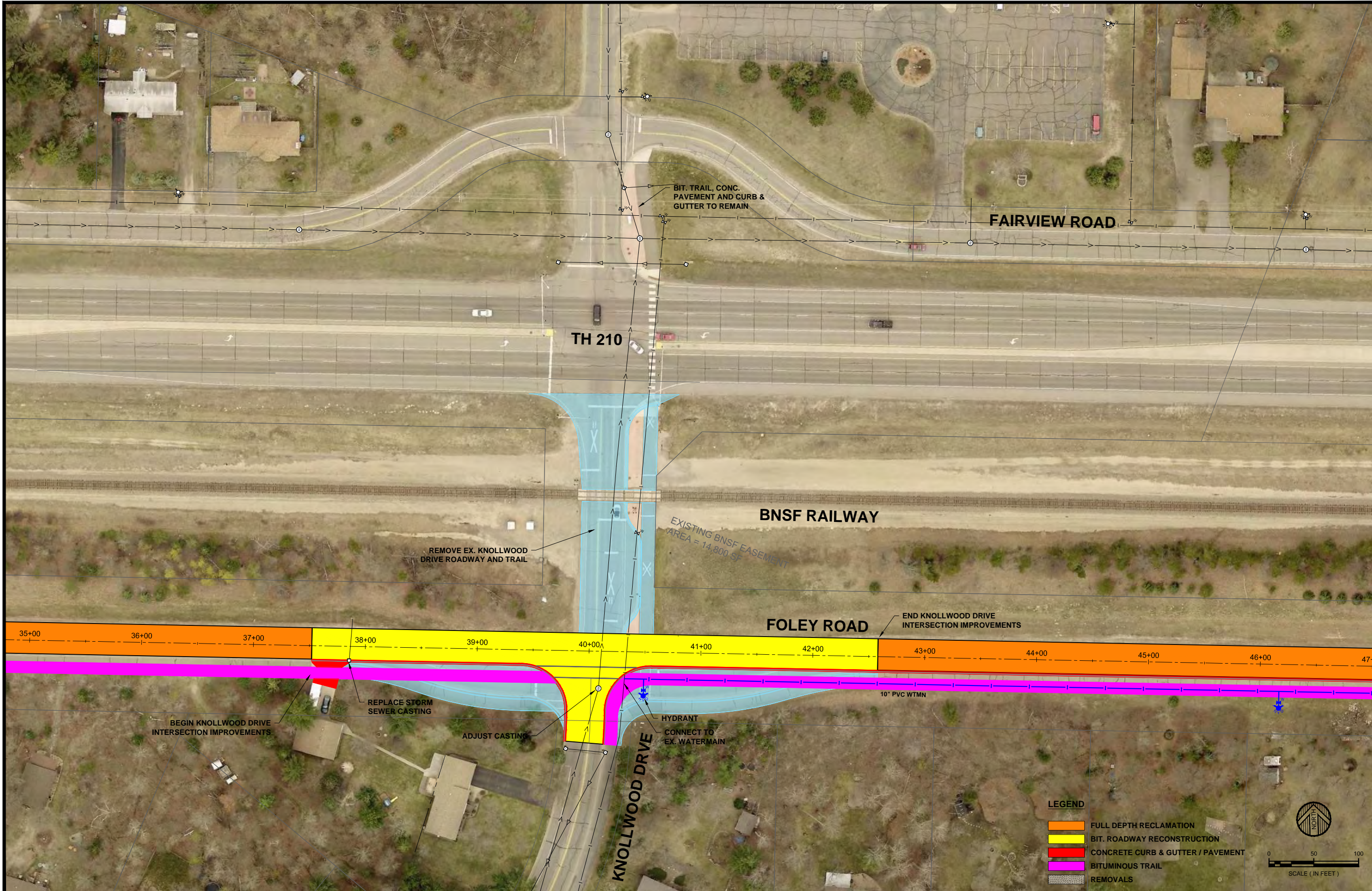


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INGLEWOOD DR RAILWAY CROSSING & FOLEY RD IMPROVEMENTS
 CITY OF BAXTER
 BAXTER, MINNESOTA
FIGURE 10 - PROPOSED IMPROVEMENTS - FOLEY ROAD



KNOLLWOOD DRIVE INTERSECTION DETAIL

WIDSETH SMITH NOLTING
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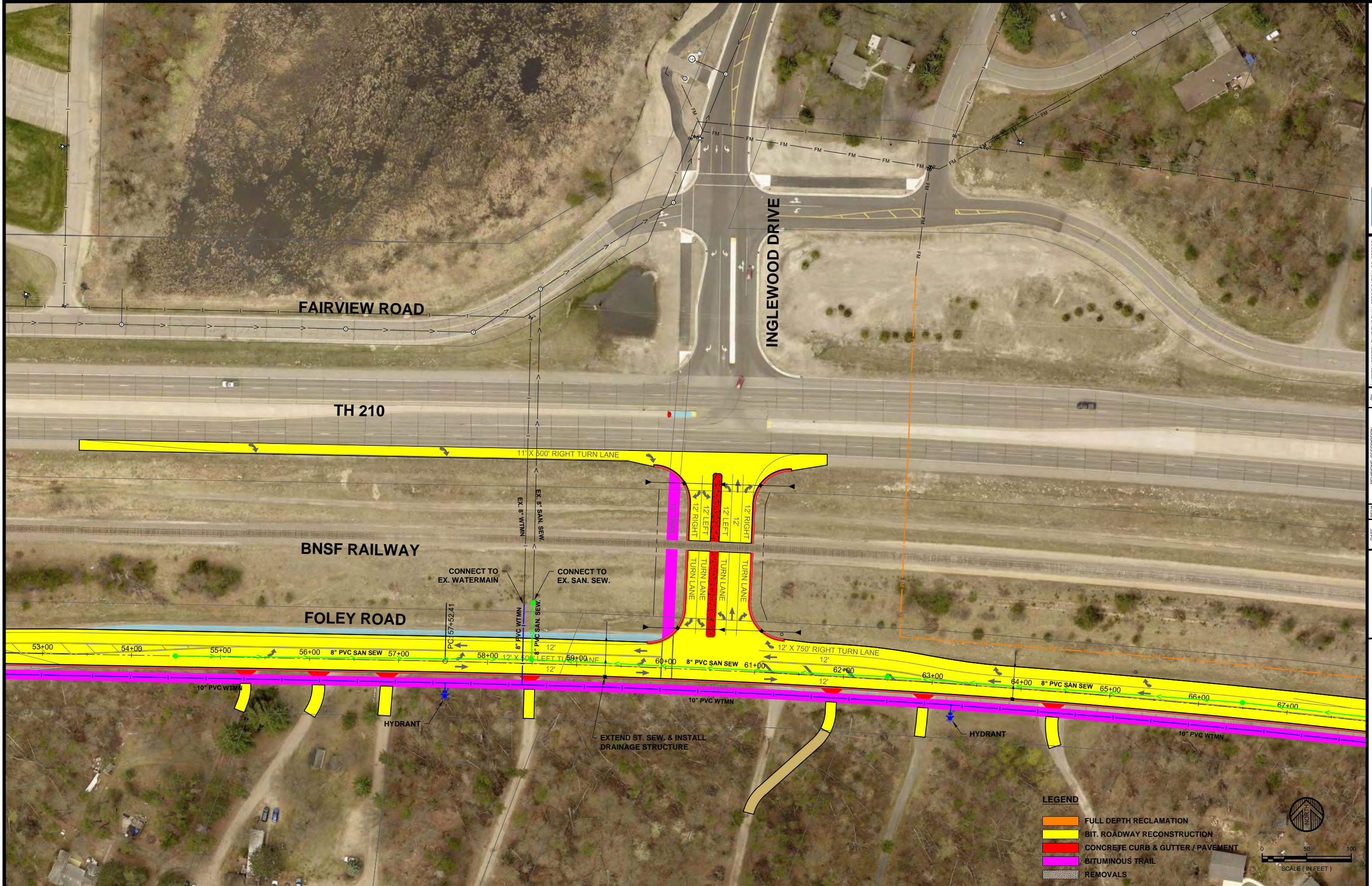


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MARCH 2018				

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 CITY OF BAXTER
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FIGURE 11 - PROPOSED IMPROVEMENTS - KNOLLWOOD DRIVE



LEGEND

- FULL DEPTH RECLAMATION
- BIT. ROADWAY RECONSTRUCTION
- CONCRETE CURB & GUTTER / PAVEMENT
- BITUMINOUS TRAIL
- REMOVALS



INGLEWOOD DRIVE INTERSECTION DETAIL

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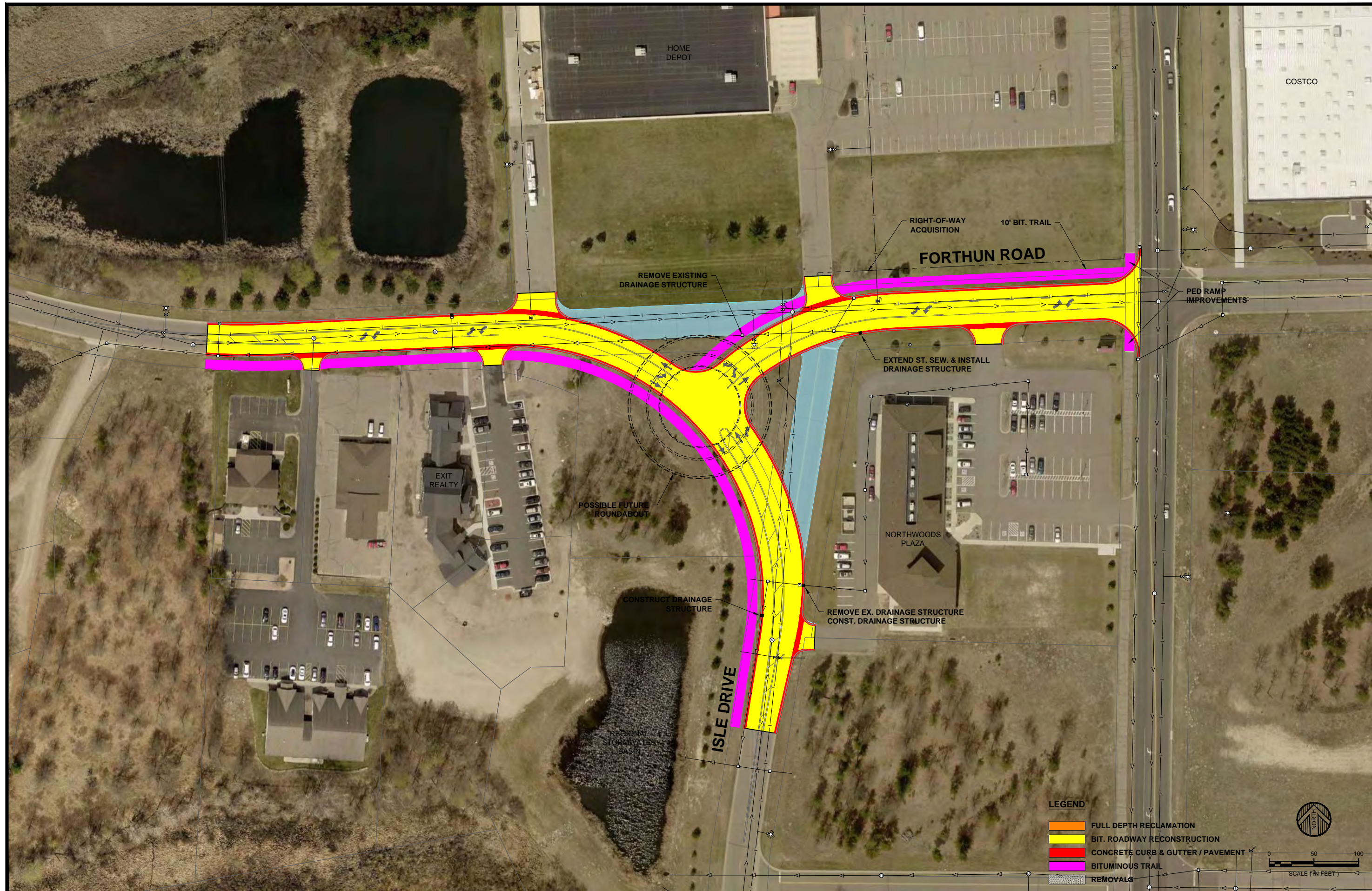
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INGLEWOOD DR RAILWAY CROSSING & FOLEY RD IMPROVEMENTS
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BAXTER, MINNESOTA

FIGURE 12 - PROPOSED IMPROVEMENTS - INGLEWOOD DRIVE

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FORTHUN ROAD AND ISLE DRIVE INTERSECTION IMPROVEMENTS

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INGLEWOOD DR RAILWAY CROSSING & FOLEY RD IMPROVEMENTS
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FIGURE 13 - PROPOSED IMPROVEMENTS - ISLE DRIVE

SHEET NO. **13**