FEBRUARY 15, 2019 | DRAFT

TECHNICAL MEMO #4
(ALTERNATIVES DEVELOPMENT AND EVALUATION)

Mn 220 N Corridor Study

Prepared for: Grand Forks - East Grand Forks Metropolitan Planning Organization

ALLIANT

1. Introduction

This memo is the fourth in a series of technical memos for the Mn 220 N (Mn 220) Corridor Study project.

2. Existing and Future Conditions

Refer to Technical Memorandum 1 for documentation of the existing and future conditions assessment.

3. Roadway Safety and Traffic Operation Analysis

Refer to Technical Memorandum 2 for documentation of the roadway safety and traffic operation characteristics.

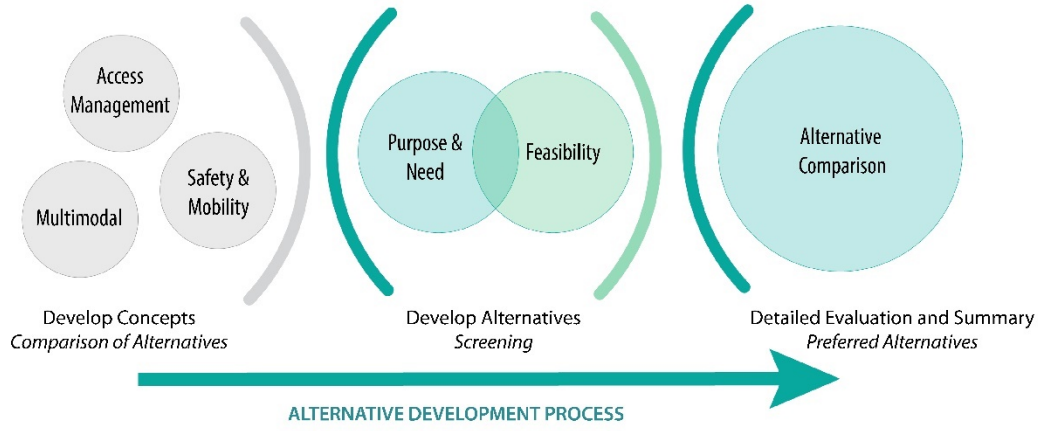
4. Purpose and Need

Refer to Technical Memorandum 3 for documentation of the corridor study purpose and needs.

5. Alternatives Analysis and Evaluation

The alternatives development identifies transportation ideas and concepts based upon input from stakeholders and a review of the purpose and needs. From this range of alternatives, a screening evaluation is completed to evaluate each idea against key objectives. This process identifies the alternatives that best meet the project goals and are carried forward for further evaluation. The goal is to arrive at the alternative that best balance and meet the primary objectives of the stakeholders and community.

Table 5- 1. Alternatives Analysis Process



5.1 Alternative Identification and Evaluation Considerations

To address identified deficiencies and the purpose and needs for the Mn 220 corridor numerous improvement alternatives were identified to address four primary objectives of the study:

- Improve access control
- Improve safety
- Improve mobility/capacity; and
- Improve pedestrian crossings of Mn 220

The evaluation of the identified alternatives consists of a layered approach that includes:

- Assessing and comparing high level considerations such as key pros/cons, trade-offs and design considerations or fatal flaws;
- Technical analysis of intersection capacity, safety benefits, right of way needs, construction costs and economic viability as applicable (benefit/cost ratio); and
- Qualitative evaluation scoring of key metrics identified in the planning process that are consistent with the Purpose and Need statement and 2045 Metropolitan Transportation Plan (MTP) objectives and performance goals.

The ultimate selection of the preferred alternative(s) or maintaining the no build is the alternative that best meets the corridor objectives; including the combination of assessment of all the considerations, technical analysis, comparison evaluation metrics and public/stakeholder engagement.

5.2 Access / Traffic Control Device Considerations

Three primary forms of traffic control were evaluated at each of the key intersections: through-stop control with access management or geometric improvements, traffic signal, and roundabout. The following sub-sections provide the high-level pros and cons of the preliminary access/traffic control alternatives, as well as an outline of the any necessary capacity/warrant analysis procedures.

5.2.1 Access Management

Access management in most cases would consist of limiting a full-access intersection to a three-quarter access intersection with stop signs on the cross-street. Prohibiting cross-street through and left-turning movements would improve safety by decreasing the number of conflict points and potential for right angle crashes. Intersection operations would be expected to improve as well. The Mn 220 corridor intersections (15th Street NE and 20th Street NW) are good candidates for access management modifications due to the presence of frontage roads and a well-connected supporting street system. Motorists attempting to cross or turn left onto Mn 220 could re-route to a nearby full-access intersection via the closest frontage road. ¾ access configuration at these two locations are being considered for two primary reasons:

- There may be advantage with this design to improving pedestrian crossing treatments and reducing exposure for pedestrians (i.e. improved refuge median design).
- Restricting eastbound/westbound left turn and through movements relocates these motorists to 23rd Street and 17th Street the primary east/west through streets, thereby helping support justification for improved access control at those locations.

5.2.2 Traffic Signal

The two existing traffic signal systems (14th Street NW and US 2) are nearing the end of their useful life and will require replacement. The traffic signal control alternative considers either the full replacement of existing traffic signals, upgraded to present day standards, or the installation

of a new signal system at currently stop controlled intersections. Installation of a traffic signal where one is not present may reduce overall crash frequency but may bear an increase in specific crash types such as rear-end and right angle. The benefit or impact of traffic signal installation takes into consideration the change in motor vehicle delays and change in safety performance derived from anticipated changes in crash characteristics. In some cases, the installation of a traffic signal system may provide improved peak hour traffic operation but could result in extra traffic delay during off peak periods. The true cost of a signal system involves a minimum of initial construction, Americans with Disability Act (ADA) pedestrian ramp improvements, ongoing maintenance, and electricity.

The intersections of Mn 220/US 2, 14th Street NW, 17th Street NW and 23rd Street NW are the four locations a traffic signal system may be a feasible alternative. The existing traffic signal systems at 14th Street NW and US 2 are warranted installations. For each intersection where a new traffic signal installation is considered (17th Street NW and 23rd Street NW), a warrant analysis was completed under existing 2018 volume and forecasted years 2030 and 2045 volumes. In addition, a warrant analysis was completed considering the potential for ¾ access configuration at 20th Street NW and 15th Street NE, where left turn and through motorists would be re-routed to these intersections. The warrant analysis was conducted in accordance with the *Minnesota Manual on Uniform Traffic Control Devices* (MnMUTCD)[1] and is summarized in **Table 5-2**.

Table 5- 2. Traffic Signal Warrant Analysis Summary

TH 220 and 17th Street

Scenario	Warrant 1 - Eight Hour Vehicle Volume				Warrant 2 - Four Hour Volume		Warrant 3 - Peak Hour Volume	
	1A (Hours)	1B (Hours)	1A&B (Hours)	Warrant Met / Not Met	Hours	Warrant Met / Not Met	3B (Hours)	Warrant Met / Not Met
Year 2018 Existing (Full Access)	0 Hour	0 Hour	0 Hour	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2018 Existing (3/4 Access at Adjacent Intersections)	0 Hour	0 Hour	1 Hour	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2030 Existing (Full Access)	0 Hour	0 Hour	0 Hour	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2030 Existing (3/4 Access at Adjacent Intersections)	1 Hour	7 Hours	4 Hours	Not Met	2 Hour	Not Met	0 Hour	Not Met
Year 2045 Existing (Full Access)	0 Hour	0 Hour	0 Hour	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2045 Existing (3/4 Access at Adjacent Intersections)	4 Hours	10 Hours	7 Hours	Met (1B)	6 Hours	Met	2 Hour	Met

Source: 2011 Minnesota Manual on Uniform Traffic Control Devices

Note: Warrant 2 (Four Hour Volume) expected to be met in year 2033 and Warrant 1B (Eight Hour Volume) is expected to be met in year 2038 with 3/4 access configuration at 20th Street

[1] Minnesota Manual on Uniform Traffic Control Devices, February 2015

TH 220 and 23rd Street

Scenario	Warrant 1 - Eight Hour Vehicle Volume				Warrant 2 - Four Hour Volume		Warrant 3 - Peak Hour Volume	
	1A (Hours)	1B (Hours)	1A&B (Hours)	Warrant Met / Not Met	Hours	Warrant Met / Not Met	3B (Hours)	Warrant Met / Not Met
Year 2018 Existing (Full Access)	0 Hour	0 Hour	2 Hours	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2018 Existing (3/4 Access at Adjacent Intersections)	0 Hour	0 Hour	2 Hours	Not Met	0 Hour	Not Met	0 Hour	Not Met
Year 2030 Existing (Full Access)	5 Hours	3 Hours	6 Hours	Not Met	2 Hours	Not Met	0 Hour	Not Met
Year 2030 Existing (3/4 Access at Adjacent Intersections)	6 Hours	2 Hours	5 Hours	Not met	3 Hours	Not Met	0 Hours	Not Met
Year 2045 Existing (Full Access)	8 Hours	9 Hours	11 Hours	Met (1A, B, C)	10 Hours	Met	4 Hours	Met
Year 2045 Existing (3/4 Access at Adjacent Intersections)	11 Hours	9 Hours	11 Hours	Met (1A, B, C)	10 Hours	Met	4 Hours	Met

Source: 2011 Minnesota Manual on Uniform Traffic Control Devices

The warrant analysis indicates that a traffic signal at Mn 220/17th Street NW does not meet warrants until year 2033 (Warrant 2) and year 2038 (Warrant 1) assuming the added left turn and through traffic using 17th Street as the result of the proposed ¾ access configurations at 20th Street NW and 15th Street. Without the proposed ¾ access configurations, a signal system is not expected to meet warrants at 17th Street NW. At 23rd Street, traffic signal warrants are also not satisfied until year 2045, regardless of access configuration at 20th Street.

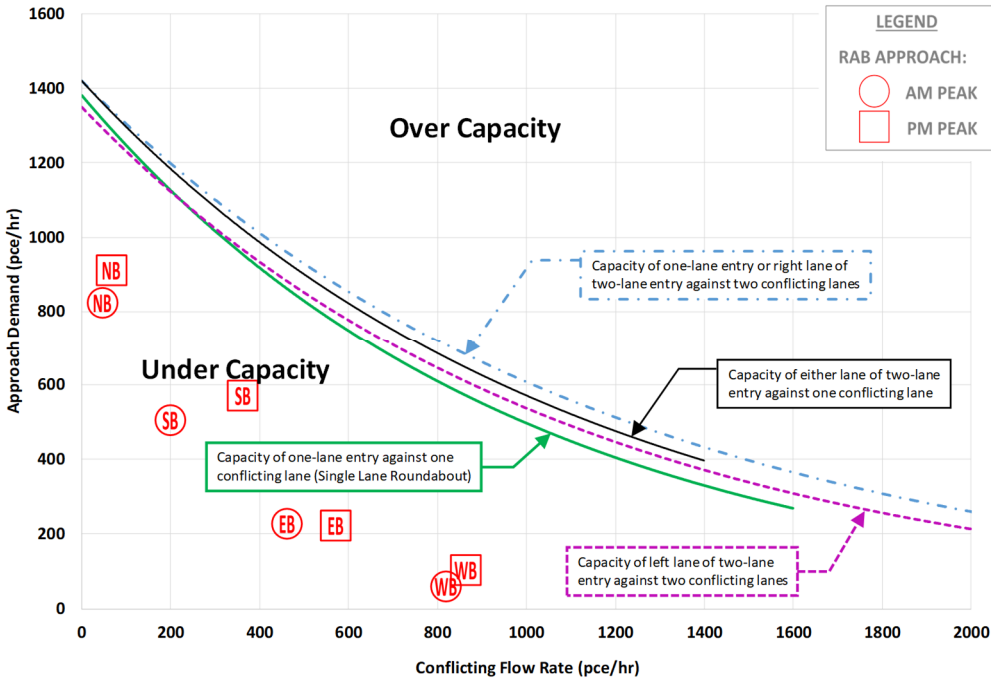
5.2.3 Roundabout

A roundabout would require full intersection reconstruction with a higher initial construction cost. Right of way acquisition may be necessary and may impact existing frontage roads. Overall, a roundabout is expected to provide high intersection safety performance (minimizes the potential for severe crashes) and with optimal lane configurations provides efficient traffic operations with low motorist delay during all time periods of the day.

For each intersection where a roundabout was considered, a planning-level roundabout capacity analysis was completed under forecasted year 2045 traffic volumes. The analysis was conducted in accordance with the *Highway Capacity Manual* (HCM)[2]. The purpose of the analysis was to determine whether a roundabout (multilane or single-lane) would be a suitable alternative for the intersection. The analysis indicated that a multilane roundabout is needed at US 2 and 14th Street NW, whereas a single lane roundabout is expected to provide sufficient capacity at 17th Street NW and 23rd Street NW. An example planning level roundabout capacity analysis is shown in **Table 5-3**.

[2] Highway Capacity Manual, 6th Edition, Transportation Research Board

Table 5- 3. Planning Level Roundabout Capacity



Note: Mn 220 at 17th Street – Forecast Year 2045

5.3 Pedestrian Improvement Strategies

To improve pedestrian crossing safety, comfort, and environment, the strategies could range from establishing connections and improving accessibility, improving visibility, reducing exposure, enhancing awareness or providing protection. The implementation of such strategies is dependent upon intersection characteristics but are typically considered in the hierarchy of least restrictive measures first to the most restrictive measures only when warranted. Although there are many treatments that fit into each strategy category, **Table 5-4** illustrates and discusses a few treatments that might be most beneficial to Mn 220. As appropriate, pedestrian crossing treatments are included as part of the intersection improvement alternatives analysis. Truck and agricultural equipment are additional considerations that need to be made in determining the most appropriate improvements by location.

Table 5- 4. Pedestrian Improvement Strategies

ADA Ramps

Description	Benefits	Considerations
When expanding/improving a pedestrian network, eliminating gaps in connectivity is recommended. If a sidewalk is added, a curb ramp will help provide an accessible route that people with disabilities can use to safely transition from a roadway to a curbed sidewalk and vice versa.	1. Will establish a connection for pedestrians between streets, schools, regional trails, and parks. 2. Improving pedestrian access to transit routes will improve a multimodal transportation environment.	1. There are currently 33 pedestrian ramps that are not compliant with ADA design standards. 2. It is often difficult or impossible for a person using a wheelchair, scooter, walker, or other mobility device to cross a street if the sidewalk on either side of the street ends without a curb ramp. If curb ramps are not provided, these individuals are forced to make a difficult choice. 3. Gaps in connectivity can be unsafe and reduce access for the elderly and disabled. 4. Follow Americans with Disabilities Act (ADA) design guidelines. 5. Texture patterns must be detectable to visually

High-Visibility Crosswalk Markings

Description	Benefits	Considerations
A marked crosswalk is a type of pavement marking that indicates to pedestrians the recommended location to cross the roadway and also alerts approaching motorists as to where pedestrians may be crossing the street.	1. Providing highly visible crosswalk locations can serve to bring greater attention to the motorist to expect pedestrian activity.	1. Pavement marking material type is important. 2. Design style (i.e., parallel bar, zebra, or other). 3. Note that at uncontrolled intersections without related enhancements, marked crosswalks are unlikely to statistically increase pedestrian safety, however awareness is improved. 4. Frequent maintenance required due to damage caused by snow plows.

Median Refuge Island

Description	Benefits	Considerations
Medians and crossing islands (also known as refuge islands or center islands) are raised areas that are constructed in the center portion of a roadway that can serve as a place of refuge for pedestrians who cross the road mid-block or at an intersection. After crossing to the center island, pedestrians wait for motorists to stop or for an adequate gap in traffic before crossing the second half of the street.	1. Provide a simplified crossing maneuver by allowing pedestrians to concentrate on only one direction of traffic at a time, creating the equivalent of two narrower one-way streets instead of one wide two-way street. 2. Crossing islands may also provide space for landscaping that can be used to change the visual cues of the roadway and reduce driver speeds.	1. Median islands along TH 220 generally exist at all intersections, but are of insufficient width to be considered a safe refuge. 2. Crossing islands may not be appropriate or physically possible at all locations. They may need to be weighed against other roadway features. 3. Crossing islands must be fully accessible by ramps or cut through, and should provide tactile cues for pedestrians with visual impairments to indicate the border between the pedestrian refuge area and the motorized vehicle roadway. 4. Winter maintenance should be considered to keep the pedestrian route clear of snow.

Curb Extensions

Description	Benefits	Considerations
Curb extensions narrow the roadway and reduce crossing distance/vehicle exposure for pedestrians.	1. Curb extensions can improve pedestrian safety by reducing the pedestrian crossing distance and reducing the time that pedestrians are in the street. 2. Drivers are encouraged to reduce speeds because of the restricted street width. 3. Tight curb radii result in slower running speeds. 4. The reduction in the street cross-section	1. The turning needs of larger vehicles such as trucks and school buses need to be considered in the design of curb extensions. 2. Applicable at most intersections along TH 220 since a wide shoulder space is currently provided. The curb extensions could fill in the existing shoulder space.

5.4 Alternatives Development

To address identified deficiencies and the purpose and needs for the Mn 220 corridor numerous improvement alternatives were identified for several key intersections and for key corridor segments. **Figure 5-1** illustrates the alternatives developed. Key categories include; sidewalk construction, pedestrian crossing, intersection improvements and control devices, and segment design alternatives. The improvement alternatives were identified to address four primary objectives of the study:

- Improve access control
- Improve safety
- Improve mobility/capacity; and
- Improve pedestrian crossings of Mn 220

For most intersection alternatives a technical analysis is completed to document the high-level design considerations, key pros/cons and trade-offs, mobility (LOS), estimated construction cost, safety (crash and severity rate) and economic viability (benefit/cost ratio). Further explanation of the benefit/cost analysis is provided in the following section.

5.4.1 Benefit / Cost Analysis

An economic benefit/cost analysis was completed in accordance with the MnDOT Office of Investment Management, Benefit/Cost Analysis for Transportation Projects procedures, and assumes a 20-year analysis period. The monetary benefit of the project is quantified in terms of reduced (or increased) vehicle hours traveled (VHT) or less delay (or added delay) at the intersection and the reduced number and/or severity of estimated crashes over the analysis period between the no build conditions and the proposed alternatives. The estimated 20-year monetary cost includes construction costs, expected operational and maintenance cost over this period (e.g., lighting, street signs), and contingency. Remaining capital values of the infrastructure features at the end of the 20-year analysis period are subtracted from the total cost of the alternative. The highest benefit/cost ratio represents the most economical solution. Benefit/cost ratios less than 1.0 might be considered less economically viable or be given less priority.

Estimated Safety Benefit

A safety analysis was completed for each alternative to help understand the anticipated level of improvement. The safety analysis includes investigating the change in crash types and computing a monetary annual crash cost for each preliminary alternative. Anticipated future roundabout crashes were estimated utilizing *A Study of the Traffic Safety at Single-Lane Roundabouts in Minnesota*[3] The study revealed significant reductions in severe crashes upon conversion of traditional intersections to roundabout control. Anticipated future traffic signal crashes were estimated utilizing the crash rates from the *MnDOT Intersection Green Sheets*[4]. The A 20-year, present value adjusted safety benefit is computed using the MnDOT fiscal year 2019 crash values listed below:

[3] A Study of the Traffic Safety at Single Lane Roundabouts in Minnesota, MnDOT, December 16, 2014.

[4] MnDOT Intersection Green Sheet. 2011 (Crash Severity Distribution) & 2015 (Crash Rates)

- Property Damage Only: $7,200
- Injury Type C: $87,000
- Injury Type B: $180,000
- Injury Type A: $600,000
- Fatal: $1,200,000 (two times Injury Type A).

Estimated Traffic Operation Benefit

The estimated traffic operation benefit is based on the total intersection vehicle delay for each intersection extrapolated over a 24-hour day compared to the no-build (either an increase or decrease in total VHT). The total vehicle delay, measured in hours, is converted to 20-year present worth monetary value based on MnDOT fiscal year 2019 value of time ($ per hour) for automobiles and trucks.

Estimated Construction Costs

Estimated construction costs are developed for key intersection alternatives. It should be noted that the cost estimates included a 30 percent contingency to account for risk or any unknowns that may not be identified without more detailed engineering. The cost estimates are also based on a high-level concept, without supporting base mapping engineering detail to accurately account for actual construction limits, grading, drainage or other design considerations. Therefore, are used for purpose of relative comparison within the study.

The following sub-sections discuss and evaluate the alternatives for each intersection and corridor segment.

5.4.2 Mn 220 at 23rd Street NW

The following alternatives were developed and evaluated:

- No build
- Alternative A: Install Traffic Signal System
- Alternative B: Install Single Lane Roundabout

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-6**. Concept sketches are provided for reference in Appendix A.

Traffic Operation Analysis

Results of the traffic operation analysis are detailed in **Table 5-5**. Although acceptable traffic operation is expected, the traffic operation analysis found that a traffic signal is expected to increase the overall intersection delay and would provide less efficient intersection operation during off-peak periods. The roundabout alternative, however, is expected to provide a continuous flow of traffic and improve efficiency – it would provide the most overall efficient 24-hour operation.

Table 5- 5. Intersection Delay and LOS Summary – Mn 220 at 23rd Street NW

	Alternatives	AM Peak Hour		PM Peak Hour	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	A / A	2.6 / 5.6	A / A	2.6 / 6.7
	ALT A	A / A	7.2 / 9.6	A / B	8.7 / 11.8
	ALT B	A / A	1.4 / 1.9	A / A	1.6 / 2.0
Year 2045	No Build	A / C	5.8 / 15.0	A / C	7.0 / 22.8
	ALT A	B / B	13.1 / 18.5	B / B	13.0 / 18.8
	ALT B	A / A	3.6 / 4.8	A / A	3.8 / 4.7

Overall Intersection LOS / Worst Approach LOS

Overall Intersection Delay / Worst Movement Delay

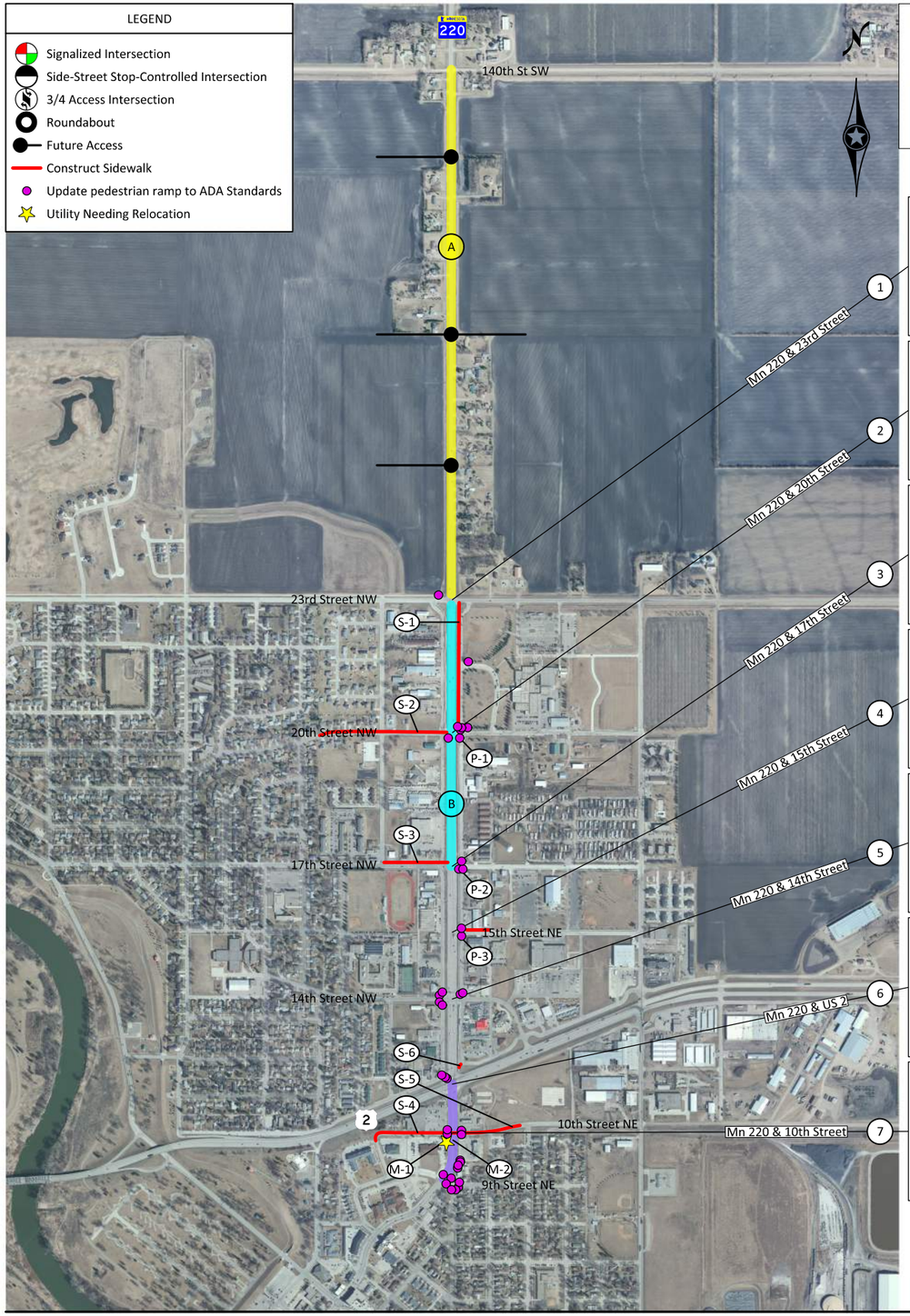
Safety Analysis

Table 5-7 summarizes the estimated change in intersection crash performance. Alternative A is expected to increase the overall intersection crash rate, and potentially increase crash severity. Alternative B is expected to reduce the overall intersection crash rate and crash severity.

Table 5- 6. Intersection Safety Summary – Mn 220 at 23rd Street NW

	No Build	Alternative A Signal Installation	Alternative B Single-lane Roundabout
Observed/Estimated Crash Rate (Crashes/MEV)	0.54	0.59	0.32
Observed/Estimated Injury Crashes (Percent of Total Crashes)	33.3%	37.7%	24.7%
Observed/Estimated Crash Severity Rate (Crashes/MEV)	0.80	0.89	0.42
2045 Estimated Crash Cost (2018 Dollars)*	$135,715	$149,471	$56,250

* Crash cost is in dollar unit based on MnDOT OIM Fiscal Year 2019 Values

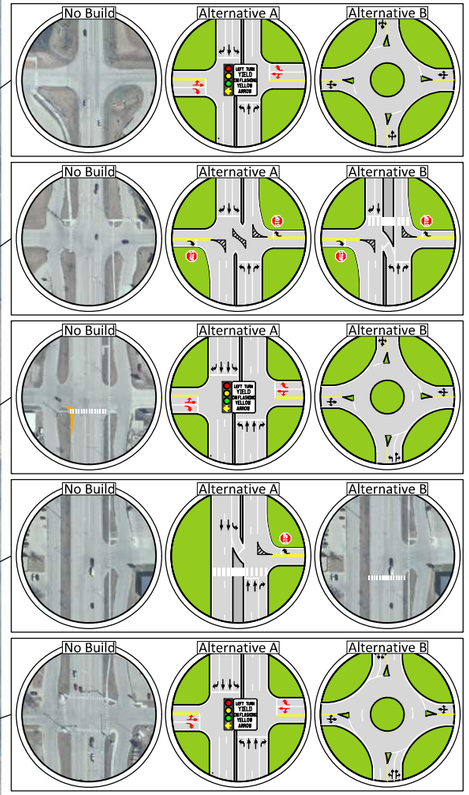


A 23rd Street - 140th Street Segment Alternatives

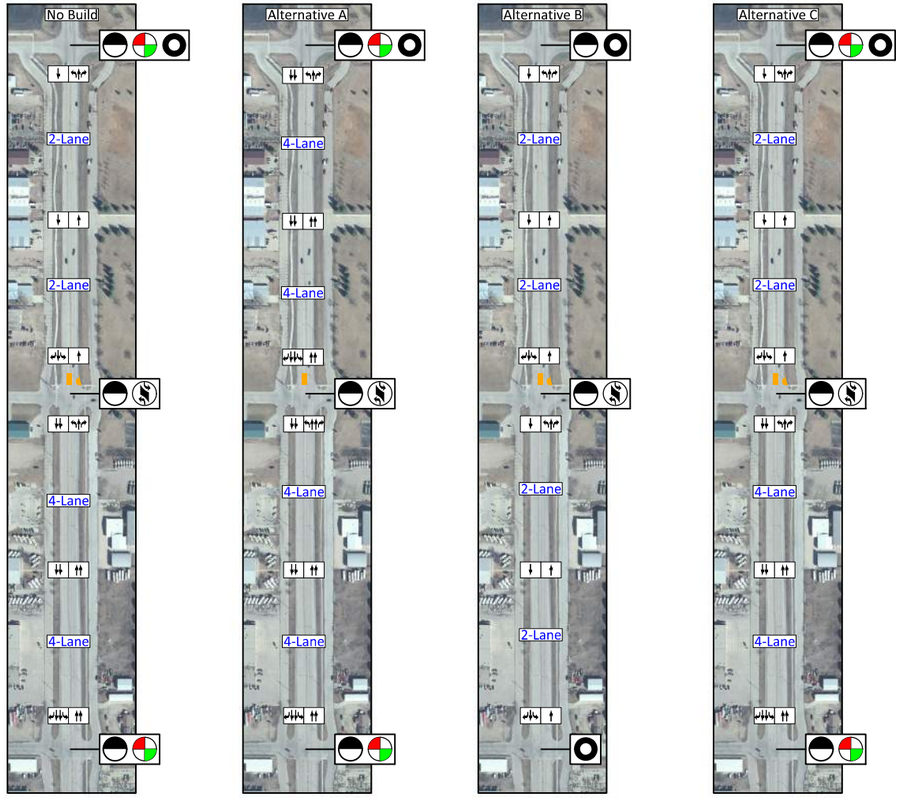
No Build

Alternative A 2-Lane with Left Turn Lanes

Alternative B 3-Lane with Two-Way Center Left Turn Lane



B 17th Street - 23rd Street Segment Alternatives



Sidewalks

- S-1 Mn 220 - E Side (20th St to 23rd St)
- S-2 20th Street NW - Both Sides (5th Ave NW to Mn 220)
- S-3 17th Street NW - North Side (3rd Ave NW to Mn 220)
- S-4 10th Street NW - Both Sides (Terrace Dr to Mn 220)
- S-5 10th Street NE - Both Sides (Mn 220 to 2nd Ave NE)
- S-6 Mn 220 & US 2 - NW Corner (to Frontage Road

Pedestrian Cossing Improvements

- P-1 Improve Pedestrian Crossing
  (see Intersection 2 Alternatives A and B)
- P-2 Improve Pedestrian Corssing
  - Add curb extension
  - Upgrade ped pamps with ADA compliant directional ramps
- P-3 Improve Pedestrian Crossing
  (see Intersection 4 Alternatives A and B)

Miscellaneous

- M-1 Relocate utilities to improve sightlines
- M-2 Restripe lane drop and turn lane between 10th Street and 9th Street

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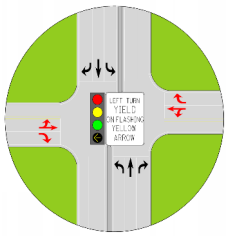
Figure 5-1
Intersection and Segment Alternatives Overview

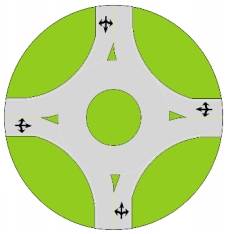
Table 5- 7. Alternatives Comparison Matrix – Mn 220 at 23rd Street NW

Alternative A: Install Traffic Signal System



Description	Options and Considerations	Pros and Cons	Comparison Summary
Install traffic signal system	• Install FYA on all approaches o During AM and PM peak periods, operate westbound, northbound and southbound prot/perm (operate eastbound permissive only) o Outside of peak periods, both eastbound/westbound operate permissive only • Provide pedestrian crossing countdown timers, crosswalks and intersection lighting •Install lane eastbound/westbound lane designation and pavement markings (1-TH/LT, 1-RT)	Pros 1. Can be designed with minor impact to street width and curbs 2. Improves left turn access onto Mn 220 3. FYA can improve motorist safety and flexibility for intersection operation, including FYA omit funcationality with pedestrian actuation 4. Familiarity 5. Compatible with long term needs of TH 220 north of 23rd Street NW 6. Compatible with current 2045 MTP Cons 1. Ongoing operation, maintenance, and electricity costs 2. Signal warrants not met until 2045 3. Expected to increase the overall intersection delay and increase the overall intersecton crash rate. Statewide average severity rate indicates a potential increase in crash severity 4. Inefficient intersection operation during off peak periods	**Cost:** Approximately $500,000 with ADA Improvements **Mobility**: LOS B (2045) **Safety:** 10% Increase in crash and severity rate **R/W:** None **20-year Traffic Operation Benefit:** (-$3,050,616) **20-year Safety Benefit:** (-$171,503) **Benefit/Cost:** <0

Alternative B: Install Single Lane Roundabout



Description	Options and Considerations	Pros and Cons	Comparison Summary
Construct single lane roundabout	• Single lane is expected to operate acceptably through 2045 forecast • Special attention would be required in design for trucks and agricultural vehicles • Spacing to adjacent frontage roads may present design and/or operation challenges • Existing ditches, drainage design and storm sewer system needs	Pros 1. Greatly improves access to Mn 220 2. Provides continuous flow of traffic and improves efficiency 3. Provides traffic calming 4. Improves pedestrian crossing (reduced exposure, improved sightline) 5. Reduces overall intersection crash rate and intersection crash severity 6. Aesthetics 7. Compatible with long term needs of TH 220 north of 23rd Street NW 8. Intersection operations and delays are expectd to improve and provides the most overall efficient 24 hour operation. Cons 1. More expensive to install than a traffic signal (but may be less in long run) 2. Requires more space at intersection (but less space along road) 3. Familiarity	**Cost:** Approximately $2,950,000 **Mobility**: LOS A (2045) **Safety:** 41% reduction in crash rate. 48% reduction in severity rate **R/W:** None **20-year Traffic Operation Benefit:** $1,026,765 **20-year Safety Benefit:** $990,747 **Benefit/Cost:** 0.98

5.4.3 Mn 220 & 20th Street NW

The intersection of Mn 220 at 20th Street NW is located near Northland Community and Technical College. Currently it is at the 4-lane to 2-lane transition area and there is a pedestrian crosswalk, crossing the north leg of the intersection.

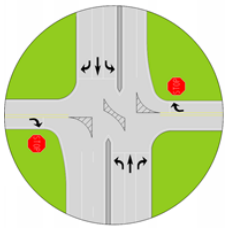
The following alternatives were identified to improve the pedestrian crossing and to improve quality of access at the adjacent intersections of 23rd Street NW and 17th Street NW:

- No build
- Alternative A: Convert to ¾ Access
- Alternative B: Convert to ¾ Access and Remove Southbound Left Turns

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-8.** Concept sketches are provided for reference in Appendix A. It should be noted that a benefit/cost ratio was not computed for the 20th Street NW intersection, as the change in mobility and the benefit of improved pedestrian access associated with the proposed alternatives are mostly qualitative and not reliably quantifiable.

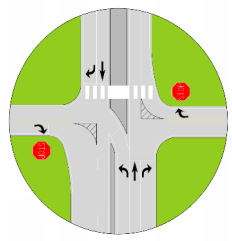
Table 5- 8. Alternatives Comparison Matrix – Mn 220 at 20th Street NW

Alternative A: Convert to 3/4 Access



Description	Options and Considerations	Pros and Cons	Comparison Summary
Reconstruct to a 3/4 access configuration. Three-quarter intersections are an access management technique that limits cross street movements through an intersection. A median is installed in the middle of the intersection that permits all mainline through and turning movements but prevents cross-traffic through and left turn movements. **Options: Improve crosswalk on north side of intersection with markings and signing; or remove crosswalk with construction of sidewalk on east side of Mn 220 between 20th and 23rd**	• Minimal impact/inconvenience to travel routes/destinations due to connectedness of the urban network and the presence of frontage roads. • Consider curb extensions to minimize pedestrian crosswalk distance on the north leg • Consider installation of a sidewalk on the east side of Mn 220 to reduce need for pedestrians to cross at this intersection to continue north/south (could remove north leg crosswalk) • Redistributed left/through movements help satisfy traffic signal warrants at 23rd Street NW and 17th Street NW	Pros 1. Will improve safety by decreasing conflict points and removing right angle type crash occurrences currently being experienced 2. All work can be done within the existing ROW 3. Minimal ongoing maintenance 4. Improves overall quality of access along Mn 220 5. Expected to provide LOS A operation through forecast 2045 conditions Cons 1. Will increase the utilization of the frontage road system and could unnecessarily increase traffic volumes and turning movements on other minor roads 2. Public/business perception of reduced access	**Cost:** Approximately $350,000 **Mobility**: LOS A **Safety**: Reduced Crash Rate (Reduces Right Angle Crashes) **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns



Description	Options and Considerations	Pros and Cons	Comparison Summary
3/4 access configuration, but also prevents the southbound left turning movement to provide for a wide pedestrian refuge median. **Improve crosswalk on north side of intersection with markings and signing.**	• Minimal impact/inconvenience to travel routes/destinations due to connectedness of the urban network and the presence of frontage roads. • Consider curb extensions to minimize pedestrian crosswalk distance on the north leg • Removing the southbound left turn allows for a wide median refuge island for pedestrians. Greatly reducing crossing exposure and potential conflicts. • Reduces need for the installation of a sidewalk on the east side of Mn 220 to reduce need for pedestrians to cross at this intersection to continue north/south. • Redistributed left/through movements help satisfy traffic signal warrants at 23rd Street NW and 17th Street NW • Best compatibility with 2-lane segment to the north of 20th Street, 2-lane or 4-lane (right turn lane drop) to the south	Pros 1. Will improve safety by decreasing conflict points and removing right angle type crash occurrences currently being experienced 2. All work can be done within the existing ROW 3. Greatly improves the pedestrian crossing 4. Minimal ongoing maintenance 5. Improves overall quality of access along Mn 220 6. Expected to operate at a LOS A through forecast 2045 conditions Cons 1. Expected ton increase utilization of the frontage roads and could unnecessarily increase traffic volumes and turning movements on other minor roads 2. Public/business perception of reduced access	**Cost:** Approximately $600,000 **Mobility**: LOS A **Safety**: Reduced Crash Rate (Reduces Right Angle Crashes) **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

5.4.4 Mn 220 at 17th Street NW

The intersection of Mn 220 and 17th Street NW is located near the East Grand Forks Senior High School and is the preferred crossing point for school-related pedestrians. The following alternatives were developed to improve intersection mobility, safety and pedestrian of Mn 220:

- No build: Pedestrian Crosswalk Improvement
- Alternative A: Install Traffic Signal System
- Alternative B: Install Single Lane Roundabout

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-10**. Concept sketches are provided for reference in Appendix A. The No build (existing stop control) alternative highlights a potential short-term pedestrian crosswalk improvement strategy that includes constructing a small curb extension on the southwest corner to narrow the crossing distance, construct ADA compliant directional pedestrian ramps, reconstruct the median nose to provide refuge, and installing high visibility crosswalk markings and signing.

Traffic Operation Analysis

Results of the traffic operation analysis are detailed in **Table 5-9**. Although acceptable traffic operation is expected, the traffic operation analysis found that a traffic signal is expected to increase the overall intersection delay and would provide less efficient intersection operation during off-peak periods under existing conditions. Under future condition traffic volumes an operational benefit is expected. The roundabout alternative is expected to provide the most efficient intersection operations. However, longer PM peak hour northbound vehicle queues entering the roundabout are expected under the forecast year 2045 traffic demand.

Table 5- 9. Intersection Delay and LOS Summary – Mn 220 at 17th Street NW

	Alternatives	AM Peak Hour		PM Peak Hour	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	A / B	2.6 / 12.2	A / B	2.8 / 13.6
	ALT A	A / D	6.3 / 44.7	A / C	7.4 / 33.3
	ALT B	A / A	2.0 / 3.9	A / A	2.4 / 3.2
Year 2045	No Build	A / D	4.2 / 34.8	B / F	11.7 / 127.8
	ALT A	A / D	6.8 / 43.8	B / D	11.1 / 41.1
	ALT B	A / A	3.9 / 7.3	A / A	6.3 / 6.8

Overall Intersection LOS / Worst Approach LOS

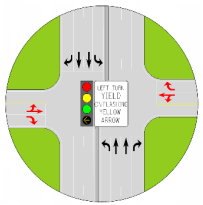
Overall Intersection Delay / Worst Movement Delay

Table 5- 10. Alternatives Comparison Matrix – Mn 220 at 17th Street NW

No Build: Improve Pedestrian Crossing

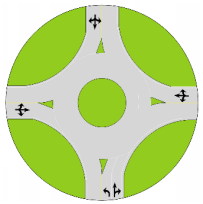
Description	Options and Considerations	Pros and Cons	Comparison Summary
Maintain existing through stop control and improve the existing pedestrian crosswalk on the south leg of intersection	•Construct curb extension on the southwest corner to narrow crosswalk exposure •Construct ADA compliant directional pedestrian ramps on both the southwest and southeast corners of the intersection •Reconstruct median nose to provide pedestrian crosswalk pass-through •Install high visibility continental pedestrian crosswalk markings and pedestrian crossing signs	Pros 1. Low cost 2. Improves pedestrian crosswalk, visibility and pedestrian exposure 3. Establishes and ADA compliant crossing of Mn 220 Cons 1. Short term intersection solution 2. Does not address long term intersection mobility or existing intersection safety concerns	**Cost:** Approximately $50,000 **Mobility**: LOS F (2045) **Safety:** No Change **R/W:** None **20-year Traffic Operation Benefit:** No Change **20-year Safety Benefit:** No Change **Benefit/Cost:** 0

Alternative A: Install Traffic Signal System



Description	Options and Considerations	Pros and Cons	Comparison Summary
Install traffic signal system	• Install FYA on all approaches o During AM and PM peak periods, operate westbound, northbound and southbound prot/perm (operate eastbound permissive only) o Outside of peak periods, both eastbound/westbound operate permissive only • Provide pedestrian crossing countdown timers, crosswalks and intersection lighting • Provide signal communication and operate coordinated with 14th Street • Install lane eastbound/westbound lane designation and pavement markings (1-TH/LT, 1-RT)	Pros 1. Can be designed with minor impact to street width and curbs 2. Improves left turn access onto Mn 220 3. FYA can improve motorist safety and flexibility for intersection operation, including FYA omit funcationality with pedestrian actuation 4. Familiarity 5. Compatible with long term needs of TH 220 north of 23rd Street NW 6. Efficient off peak traffic operations (low delays) 7. Compatible with current 2045 MTP 8. Expected to result in a reduction in total number of intersection crashes (reduced crash rate) and crash severity. Cons 1. Ongoing operation, maintenance, and electricity costs 2. Signal warrants not met until 2033 (warrant2) and 2038 (warrant 1) with 3/4 access configuration at 20th Street NW) 3. Expected to increase the overall intersection delay under existing conditions and provide slightly improved delays under 2045 conditions. 4. Inefficient intersection operation during off peak periods	**Cost:** Approximately $500,000 with ADA Improvements and Signal Communication **Mobility**: LOS B (2045) **Safety:** 18% reduction in crash rate and severity rate **R/W:** None **20-year Traffic Operation Benefit:** (-$1,777,272) **20-year Safety Benefit:** $219,027 **Benefit/Cost:** <0

Alternative B: Install Single Lane Roundabout



Description	Options and Considerations	Pros and Cons	Comparison Summary
Construct single lane roundabout	• Single lane is expected to operate acceptably through 2045 forecast • Special attention would be required in design for trucks and agricultural vehicles • Spacing to adjacent frontage roads requires careful attention to design for trucks. Evaluation indicates the design should be feasible. • Will eliminate the need to expand Mn 220 roadway width to the north and provides for more effective right turn lane design at 20th • Could consider R/W acquisition on the east side of the east frontage road to increase frontage road spacing with Mn 220 • North/South pedestrian accommodations are difficult due to narrow spacing between Mn 220 and Frontage Road. May require median closure of the frontage road on the east side, or routing pedestrian crossings on the far east and far west sides of the frontage roads resulting in less direct travel path.	Pros 1. Greatly improves access to Mn 220 2. Provides continuous flow of traffic and improves efficiency 3. Provides traffic calming 4. Improves pedestrian crossing (reduced exposure, improved sightline) 5. Reduces overall intersection crash rate and intersection crash severity 6. Aesthetics 7. Compatible with long term needs of TH 220 north of 23rd Street NW 8. Intersection operations and delays are expectd to improve and provides the most overall efficient 24 hour operation. Cons 1. More expensive to install than a traffic signal (but may be less in long run) 2. Requires more space at intersection (but less space along road) 3. Familiarity 4. To accommodate the two northbound lanes on Mn 220 and to not introduce a lane drop, the ideal northbound lane configuration is a 2-lane approach (1-left turn, 1-through/right). All other approaches would be 1 lane entry.	**Cost:** Approximately $2,600,000 **Mobility**: LOS A (2045) **Safety:** 55% reduction in crash rate and severity rate. **R/W:** None **20-year Traffic Operation Benefit:** $1,487,692 **20-year Safety Benefit:** $647,421 **Benefit/Cost:** 1.18

Safety Analysis

A safety analysis was completed for each alternative to help understand the anticipated level of improvement. The safety analysis includes investigating the change in crash types and/or the elimination in certain types of crashes and computing a monetary annual crash cost for each preliminary alternative. **Table 5-11** summarizes the estimated change in intersection crash performance. Both Alternative A and Alternative B is expected to reduce the overall intersection crash rate and crash severity rate.

Table 5- 11. Intersection Safety Summary – Mn 220 at 17th Street NW

	No Build	Alternative A Signal Installation	Alternative B Single-lane Roundabout
Observed/Estimated Crash Rate (Crashes/MEV)	0.71	0.58	0.32
Observed/Estimated Injury Crashes (Percent of Total Crashes)*	15.4%	15.4%	15.4%
Observed/Estimated Crash Severity Rate (Crashes/MEV)	0.81	0.66	0.37
2045 Estimated Crash Cost (2018 Dollars)**	$83,145	$67,769	$37,694

* Severity proportions are assumed to be unchanged across No Build and alternatives due to the existing crash characteristics and high concentration of PDO crashes.

** Crash cost is in dollar unit based on MnDOT OIM Fiscal Year 2019 Values

5.4.5 Mn 220 at 15th Street NE

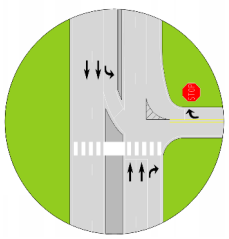
The intersection of Mn 220 at 15th Street NE is located near the East Grand Forks Senior High School. The following alternative was identified to improve the pedestrian crossing and to improve quality of access at the adjacent intersection of 17th Street NW:

- No build
- Alternative A: Convert to ¾ Access and Provide Pedestrian Crosswalk
- Alternative B: Maintain Full Access and Provide Pedestrian Crosswalk with Reconstructed Pedestrian Refuge Median

The intersection improvement options, design considerations, pros and cons, and estimated cost for this alternative is summarized in **Table 5-12.** Concept sketches are provided for reference in Appendix A. It should be noted that a benefit/cost ratio was not computed for the 15th Street NE intersection, as the change in mobility and the benefit of improved pedestrian access associated with the proposed alternatives are mostly qualitative and not reliably quantifiable.

Table 5- 12. Alternatives Comparison Matrix – Mn 220 at 15th Street NE

Alternative A: Convert to 3/4 Access



Description	Options and Considerations	Pros and Cons	Comparison Summary
Reconstruct intersection to a 3/4 access configuration. Three-quarter intersections are an access management technique that limits cross street movements through an intersection. A median is installed in the middle of the intersection that permits all mainline through and turning movements but prevents cross-traffic through and left turn movements. **Option: Establish crosswalk on south side of the intersection.**	• Minimal impact/inconvenience to travel routes/destinations due to connectedness of the urban network and the presence of frontage roads. • Consider curb extension on the west side (fill in shoulder) to minimize pedestrian crosswalk distance on the south leg • Reconstruct the median to provide for a wide median refuge island for pedestrians. Greatly reducing crossing exposure and potential conflicts. • Redistributed left movements help satisfy traffic signal warrants at 17th Street NW	Pros 1. Will improve safety by decreasing conflict points and removing right angle type crash occurrences currently being experienced 2. All work can be done within the existing ROW 3. Greatly improves the pedestrian crossing whether marked or unmarked 4. Minimal ongoing maintenance 5. Improves overall quality of access along Mn 220 Cons 1. Will increase the utilization of the frontage road and could unnecessarily increase traffic volumes and turning movements on other minor roads 2. Public/business perception of reduced access	**Cost:** Approximately $490,000 **Mobility**: LOS A (2045) **Safety**: Reduced Right Angle Crashes **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Alternative B: Establish Crosswalk with Pedestrian Refuge

Description	Options and Considerations	Pros and Cons	Comparison Summary
Maintain full access intersection and add crosswalk with wide pedestrian median on south leg.	• Provide high visibility crosswalk markings and pedestrian crosswalk signing • Maintain full access if median closure of frontage road is necessary for the roundabout alternative at 17th Street to provide best network circulation • Consider curb extension on the west side (fill in shoulder) to minimize pedestrian crosswalk distance on the south leg • Reconstruct the median to provide for a wide median refuge island for pedestrians. Greatly reducing crossing exposure and potential conflicts.	Pros 1. All work can be done within the existing ROW 2. Establihes pedestrian crosswalk and improves the pedestrian crossing distance and reduces exposure 3. Minimal ongoing maintenance Cons 1. Does not meet 1/4 mile full access spacing guidelines	**Cost:** Approximately $350,000 **Mobility:** LOS C (2045) **Safety:** No Change **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

5.4.6 Mn 220 at 14th Street NW

The intersection of Mn 220 at 14th Street NW is located less than ¼ of a mile north of US 2. It is currently signalized and serves as a primary intersection along the Mn 220 corridor. The following alternatives are developed to improve mobility and intersection safety:

- No build
- Alternative A: Rebuild Signal System and Signal Coordination with US 2
- Alternative B: Construct Multi-Lane Roundabout (2 Mainline Entry Lanes x 1 Cross-Street Entry Lane)

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-14**.

Traffic Operation Analysis

Results of the traffic operation analysis are detailed in **Table 5-13.** The traffic operation analysis found that an improved traffic signal system is expected to improve intersection delay. A multilane roundabout is expected to provide the most efficient intersection operations.

Table 5- 13. Intersection Delay and LOS Summary – Mn 220 at 14th Street NW

	Alternatives	AM Peak Hour		PM Peak Hour	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	B / B	10.3 / 15.5	B / B	11.3 / 15.4
	ALT A	A / C	9.7 / 32.8	B / C	11.6 / 33.6
	ALT B	A / A	1.7 / 3.2	A / A	1.9 / 3.6
Year 2045	No Build	A / B	9.2 / 17.3	B / B	11.6 / 19.5
	ALT A	A / C	8.3 / 32.4	B / C	10.9 / 34.9
	ALT B	A / A	2.1 / 4.4	A / A	2.4 / 5.6

Overall Intersection LOS / Worst Approach LOS

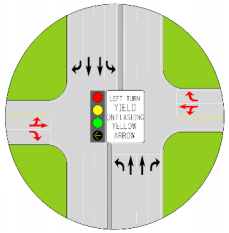
Overall Intersection Delay / Worst Movement Delay

Safety Analysis

A safety analysis was completed for each alternative to help understand the anticipated level of improvement. The safety analysis includes investigating the change in crash types and/or the elimination in certain types of crashes and computing a monetary annual crash cost for each preliminary alternative. **Table 5-15** summarizes the estimated change in intersection crash performance. The installation of flashing yellow arrow (FYA), a westbound left turn arrow and signal coordination is expected to reduce intersection crashes by approximately 28 percent. It should be noted that multilane roundabouts typically experience higher crash rates than single lane entries. In other words, the total number of crashes at a multilane roundabout is expected to increase compared to traffic signal control. However, the percentage of injury related crashes (specifically Type A and Type B) is typically reduced as illustrated for Alternative B.

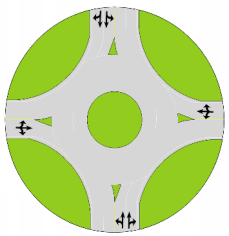
Table 5- 14. Alternatives Comparison Matrix – Mn 220 at 14th Street NW

Alternative A: Rebuild Signal System



Description	Options and Considerations	Pros and Cons	Comparison Summary
Rebuild the existing traffic signal system to current design standards	• Install FYA on all approaches ○ During AM and PM peak periods, operate westbound, northbound and southbound protected/permissive (operate eastbound permissive only) ○ Outside of peak periods, operate both eastbound/westbound permissive only • Install signal communication and coordinated signal timing with US 2 • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals • Install eastbound/westbound lane designation signs and pavement markings (1-TH/LT, 1-RT)	Pros 1. Can be designed with minor to no impact to street width and curbs 2. The addition of FYA and the westbound left turn arrow Improves left turn access onto Mn 220 and separates the conflicts which is expected to result in a reduction of intersection crashes 3. Signal coordination is expected to greatly reduce the potential for rear end crashes and improve overall corridor operation 3. FYA can improve motorist safety and intersection operation and provides flexibility to change left turn operation to improve safety 4. Pedestrian countdown timers can provide pedestrian safety 5. Familiarity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Overall is not the most efficient intersection operation over a full 24-hour day (higher off peak delays)	**Cost:** Approximately $300,000 with Traffic Signal Interconnection to US 2 **Mobility**: LOS B (2045) **Safety:** 29% reduction in crash rate and 33% reduction in crash severity rate. **R/W:** None **20-year Traffic Operation Benefit:** $371,482 **20-year Safety Benefit:** $1,955,479 **Benefit/Cost:** 9.50

Alternative B: Install Multilane (2 x 1) Roundabout



Description	Options and Considerations	Pros and Cons	Comparison Summary
Construct a Multilane (hybrid 2 mainline by 1 cross-street entry) roundabout	• Multilane roundabout is expected necessary to accommodate existing and forecast 2045 traffic demands • Special attention would be required in design for trucks and agricultural vehicles • Spacing to adjacent frontage roads will likely be problematic with a multilane roundabout footprint	Pros 1. Provides continuous flow of traffic and improves efficiency 2. Provides traffic calming 3. Improves pedestrian crossing (reduced exposure, improved sightline) 4. Reduces intersection crash severity 5. Aesthetics 6. Overall most efficient intersection operations during both the AM and PM peak periods and off peak traffic operations (low delays) Cons 1. Overall crash rate is expected to increase and will be much higher than compared to the rebuilt traffic signal system. However, the crash severity is expected to be less making the safety consideration fairly comparable. 2. More expensive to install than rebuilding the traffic signal 3. Requires more space at intersection (but less space along road) 4. Familiarity 5. May not be feasible due to the spacing of the frontage roads and desitination access of motorists needing to make a U-turn onto the frontage roads.	**Cost:** Approximately $3,000,000 **Mobility**: LOS A (2045) **Safety:** 9% increase in crash rate. 1% reduction in crash severity rate (large reduction in Type A, Type B) **R/W:** None **20-year Traffic Operation Benefit:** $8,805,855 **20-year Safety Benefit:** $1,803,378 **Benefit/Cost:** 5.20

Table 5- 15. Intersection Safety Summary – Mn 220 at 14th Street NW

	No Build	Alternative A Signal Improvements	Alternative B 2x1 Roundabout
Observed/Estimated Crash Rate (Crashes/MEV)	0.70	0.50	0.76
Observed/Estimated Injury Crashes (Percent of Total Crashes)	22.2%	19.7%	18.5%
Observed/Estimated Crash Severity Rate (Crashes/MEV)	0.94	0.63	0.93
2045 Estimated Crash Cost (2018 Dollars)	$239,070	$117,745	$127,210

* Crash cost is in dollar unit based on MnDOT OIM Fiscal Year 2019 Values

5.4.7 Mn 220 at US 2

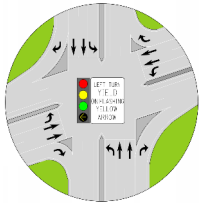
The intersection of Mn 220 and US 2 is an existing signalized intersection of two major arterial roadways. The intersection crash rate and severity rate are above critical rates and the intersection mobility is expected to reach unacceptable LOS by 2045. The following alternatives are developed to address intersection deficiencies, improve mobility and improve safety for all modes:

- No build
- Alternative A: Rebuild Signal System
  - Alternative A-0: Rebuild Signal System with Offset Eastbound/Westbound Left Turn Lanes
  - Alternative A-1: Rebuild Signal System with Dual Eastbound Left Turn Lanes
  - Alternative A-2: Rebuild Signal System with Right Turn Channelization Improvements
  - Alternative A-3: Rebuild Signal System with Offset Eastbound/Westbound Left Turn Lanes and Right Turn Channelization Improvements
- Alternative B: Install Multi-Lane Roundabout
- Alternative C: Construct a Displaced Eastbound Left Turn
- Alternative D: Grade Separated Tight Diamond Interchange
- Alternative E: System Improvements - 5th Avenue NW Access

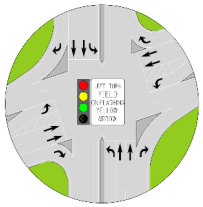
The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-16**. Concept sketches are provided for reference in Appendix A.

Table 5- 16. Alternatives Comparison Matrix – Mn 220 at US 2

Alternative A: Rebuild Signal System

Description	Options and Considerations	Pros and Cons	Comparison Summary
 Rebuild the traffic signal system to current standards. Alternative assumes no changes to the intersection geometric design. All safety and capacity improvements are operational or signal system related.	• Install FYA on all approaches o Operate eastbound/westbound protected only 11 am to 6 pm and northbound protected/permissive all day o Implement FYA Omit logic for pedestrian actuations • Install communication and coordinate signal timing with 14th Street NW and 5th Avenue NE • Implement a southbound right turn overlap (concurrent with the eastbound left turn) • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals to current standards • Add an additional overhead signal indication for each approach to improve visibility and provide yellow backplate for FYA left turn indications	Pros 1. Can be designed with no impact to street width and curbs 2. Improves left turn access onto Mn 220 3. FYA provides operational flexibility and is expected to improve motorist safety and intersection operation 4. Low cost 5. Familiarity 6. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Operational improvement is minimal. LOS D is expected in 2045 3. Does not address the right turn related crashes or pedestrian comfort of crossing the intersection.	**Cost:** Approximately $350,000 including communication to US 2/5th Avenue NE **Mobility**: LOS D (2045) **Safety:** 25% decrease in crash rate. 23% decrease in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** (-$1,922,257) **20-year Safety Benefit:** $2,111,426 **Benefit/Cost:** 0.66

Alternative A-0: Rebuild Signal System with Offset EB/WB Left Turn Lanes

Description	Options and Considerations	Pros and Cons	Comparison Summary
 In addition to rebuilding the signal system as described in Alternative A, Alternative A-0 involves the realignment of left turn lanes on US 2 to provide a positive lateral offset for improved motorist sight lines and visibility.	• Turn lanes may be tapered or parallel • Can be achieved with striping a buffer if no new median is desired • A pedestrian refuge could be provided if roadway is widened significantly • Implement a southbound right turn overlap (concurrent with the eastbound left turn) • Install FYA on all approaches o Operate eastbound/westbound protected only 11 am to 6 pm and northbound prot/perm all day o Implement FYA Omit logic for pedestrian actuations • Install communication and coordinate signal timing with 14th Street NW and 5th Avenue NE • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals to current standards • Add an additional overhead signal indication for each approach to improve visibility and provide yellow backplate for FYA left turn indications	Pros 1. Can be designed with minor impact to street width and curbs 2. Improves left turn access onto Mn 220 3. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 4. Low cost 5. Familiarity 6. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Operational improvement is minimal. LOS D is expected in 2045 3. Does not address the right turn related crashes or pedestrian comfort of crossing the intersection.	**Cost:** Approximately $2,350,000 **Mobility**: LOS D (2045) **Safety:** 31% decrease in crash rate. 28% decrease in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** (-$1,922,257) **20-year Safety Benefit**: $2,721,822 **Benefit/Cost:** 0.48

Alternative A-1: Rebuild Signal System with Dual EB Left Turn Lanes

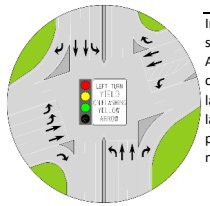
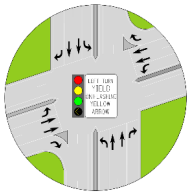
Description	Options and Considerations	Pros and Cons	Comparison Summary
 In addition to rebuilding the signal system as described in Alternative A, Alternative A-1 involves the construction of dual eastbound left turn lanes on US 2. The westbound left turn lane would be offset to provide a positive lateral offset for improved motorist sight lines and visibility.	• A pedestrian refuge could be provided if roadway is widened significantly • Install FYA on all approaches o Operate eastbound/westbound protected only 6 am to 10 pm and northbound prot/perm all day o Implement FYA Omit logic for pedestrian actuations • Install communication and coordinate signal timing with 14th Street NW and 5th Avenue NE • Implement a southbound right turn overlap (concurrent with the eastbound left turn) • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals to current standards • Add an additional overhead signal indication for each approach to improve visibility and provide yellow backplate for FYA left turn indications	Pros 1. Expected to operate at a LOS C in year 2045. Provides the greatest operational benefit while maintaining the signalized intersection control 2. Expected to provide sufficient capacity to minimize the need for the 5th Avenue NW full access intersection with US 2 3. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 4. Familiarity 5. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Vehicles may not evenly distribute between lanes 2. Requires additional roadway width 3. Dual lanes tend to result in increased crashes as the intersection becomes wider 4. Does not address the right turn related crashes or pedestrian comfort of crossing the intersection.	**Cost:** Approximately $2,350,000 **Mobility**: LOS C (2045) or LOS D if No Connection at 5th Ave **Safety:** 27% decrease in crash rate. 25% decrease in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** $5,095,230 **20-year Safety Benefit:** $2,363,174 **Benefit/Cost:** 4.47

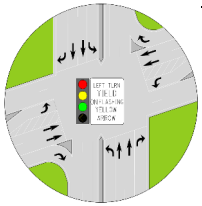
Table 5- 16. Alternatives Comparison Matrix – Mn 220 at US 2 Continued

Alternative A-2: Rebuild Signal System with Right Turn Channelization Improvements



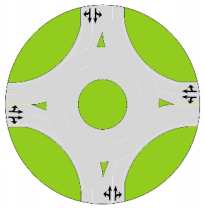
Description	Options and Considerations	Pros and Cons	Comparison Summary
In addition to rebuilding the signal system as described in Alternative A, Alternative A-2 involves the reconstruction of the northwest and southeast corners to remove the channelized right turn pork chop islands. Providing traditional right turn lane design will improve the intersection skew and vehicle angle of approach to the intersection resulting in better visibility.	• Install FYA on all approaches o Operate eastbound/westbound protected only 11 am to 6 pm and northbound prot/perm all day o Implement FYA Omit logic for pedestrian actuations • Implement a southbound right turn overlap (concurrent with the eastbound left turn) • Install communication and coordinate signal timing with 14th Street NW and 5th Avenue NE • Install pedestrian countdown timers • Update the pedestrian and vehicle clearance intervals to current standards • Add an additional overhead signal indication for each approach to improve visibility and provide yellow backplate for FYA left turn indications	Pros 1. Can be designed with overall minor impact to street width and curbs 2. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 3. Moderate cost 4. Improved right turn sightlines is expected to improve the intersection safety and pedestrian crossing safety 5. Familiarity 6. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Operational improvement is minimal. LOS D is expected in 2045	**Cost:** Approximately $875,000 **Mobility**: LOS D (2045) **Safety:** 26% decrease in crash rate. 23% reduction in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** (-$2,038,918) **20-year Safety Benefit:** $2,085,539 **Benefit/Cost:** 0.07

Alternative A-3: Rebuild Signal System with Offset Eastbound/Westbound Left Turn Lanes and Right Turn Channelization Improvements



Description	Options and Considerations	Pros and Cons	Comparison Summary
This alternative involves the combination of previously mentioned strategies: • Rebuild Signal System, with Offset Left Turn Lanes - Alternative A-0 • Rebuild Signal System, with Right Turn Channelization Improvements - Alternative A-2	Refer to previously mentioned strategies	Pros 1. Can be designed with overall minor impact to street width and curbs 2. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 3. Moderate/High cost 4. Improved right turn sightlines is expected to improve the intersection safety and pedestrian crossing safety 5. Familiarity 6. Expected to reduce the overall intersection crash rate and provide an improvement to the overall intersection crash severity Cons 1. Ongoing operation, maintenance, and electricity costs 2. Operational improvement is minimal. LOS C/D is expected in 2045	**Cost:** Approximately $2,650,000 **Mobility**: LOS D (2045) or LOS E if No Connection at 5th Ave **Safety:** 32% decrease in crash rate. 29% reduction in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** (-$2,038,918) **20-year Safety Benefit:** $2,746,728 **Benefit/Cost:** 0.38

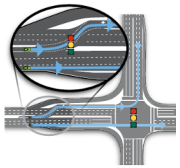
Alternative B: Install Roundabout



Description	Options and Considerations	Pros and Cons	Comparison Summary
Construct full multilane roundabout with two-lane entry on all four approaches	• Multilane roundabout is expected necessary to accommodate existing and forecast 2045 traffic demands • Special attention would be required in design for trucks and agricultural vehicles	Pros 1. Provides continuous flow of traffic and improves efficiency 2. Provides traffic calming 3. Improves pedestrian crossing (reduced exposure, improved sightline) 4. Greatly reduces crash severity 5. Aesthetics 6. Most efficient traffic operations during both AM and PM peak periods, and the off peak periods (low delays) 7. Overall intersection size is not expected to increase due to size of current pavement area. Fits within R/W and current intersection footprint Cons 1. Multilane roundabouts have high crash rates (3 times that of a traditional signalized intersection control) and severity rate. Increased crashes are expected; however the percentage of injury crashes is expected to be significantly reduced resulting in an overall best expected safety benefit. 2. More expensive to install than rebuilding the traffic signal as all four approaches will require full reconstruction. 3. Requires more space at intersection (but less space along road) 4. Familiarity	**Cost:** Approximately $3,600,000 **Mobility**: LOS A (2045) or LOS C if No Connection at 5th Ave **Safety:** 71% increase in crash rate. 35% increase in severity rate. **R/W:** None **20-year Traffic Operation Benefit:** $38,510,513 **20-year Safety Benefit:** $4,255,888 **Benefit/Cost:** 17.34

Table 5- 16. Alternatives Comparison Matrix – Mn 220 at US 2 Continued

Alternative C: Displaced EB Left Turn



Description	Options and Considerations	Pros and Cons	Comparison Summary
A displaced left turn (DLT) will move the eastbound left-turn movement from US 2/Mn 220 to an upstream signalized location. Traffic that would turn left at Mn 220 in a conventional design now has to cross opposing through lanes at a signal-controlled intersection several hundred feet upstream and then travel on a new roadway parallel to the opposing lanes. This traffic is now able to execute the left turn simultaneously with the westbound through traffic at the US 2/Mn 220 intersection.	• Overall roadway typical section width is expected to impact the frontage road. • An additional traffic signal system located approximately mid way between Mn 220 and 5th Avenue is needed to facilitate the displaced left turn cross over. The traffic signal systems will need to be coordinated • Eastbound left turn storage length needs to balanced to ensure compatibility for a potential future 5th Avenue 3/4 or full access intersection • The southbound right turn lane would need to be designed as a free operating movement to avoid conflicting at the intersection with the displaced left turn.	Pros 1. Improves intersection capacity by removing a high volume conflicting movement at the US 2/Mn 220 intersection 2. FYA provides operational flexibility and with the offset left turn lanes is expected to improve motorist safety and intersection operation 3. Expected to improve intersection safety by improving sightlines and providing an improved level of left turn control. Anticipated the crash performance will be similar to Alternative A-0. Cons 1. Ongoing operation, maintenance, and electricity costs. Snow removal will be much more difficult 2. High construction cost 3. Adds an additional traffic signal system to the network 4. Requires substantial cross-sectional roadway space, adds effectively 1 more travel lane and 2 more raised median islands. Expected to have R/W and frontage road impacts 5. Familiarity. Likely result in motorist confusion	**Cost:** Approximately $2,900,000 **Mobility:** LOS C (2045) **Safety:** 25% decrease in crash rate. 23% reduction in severity rate. **R/W:** Frontage Road Impact **20-year Traffic Operation Benefit:** $9,010,428 **20-year Safety Benefit:** $2,111,426 **Benefit/Cost:** 5.41

Alternative D: Grade Separated Tight Diamond Interchange

Description	Options and Considerations	Pros and Cons	Comparison Summary
A compressed diamond interchange with either US 2 or Mn 220 grade separated over the top	• Traffic signals would be provided at the ramp terminal intersections • Traffic signal coordination will be required • Tight diamond interchanges require significant retaining wall construction to reduce space and R/W acquisition footprint. This however, greatly increases the construction cost	Pros: 1. Effectively separates volumes from conflicting movements 2. Provide long term efficient traffic operation 3. Reduces vehicle conflicts and is expected to improve overall intersection safety Cons: 1. Significant cost and Right of Way acquisition 2. Will impact businesses and local resident properties 3. Will disrupt the frontage road connections 4. May require closure or reroute of neighboring roads 5. Significant cost and impacts for comparable benefit to other alternatives 6. A grade separated interchange will significantly impact the visibility and presence of remaining businesses near this intersection.	**Cost:** High. > $15,000,000 to 20M excluding R/W and property acquisition costs **Mobility:** NA **Safety:** NA **R/W:** Significant Impact **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Alternative D2: Grade Separated Partial Interchange

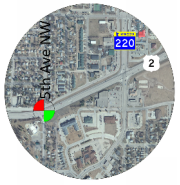
Description	Options and Considerations	Pros and Cons	Comparison Summary
A non-traditional interchange with US 2 overpass with ramps in the southeast corner and combined frontage road/ramp access on the north side of US 2	• Traffic signals would be necessary at Mn 220/10th Street NE intersection. May require signalized control at the new Mn 220/North Frontage Road intersection • Traffic signal coordination between 10th Street NE and 14th Street NW should be provided • The existing access via the frontage road system is preserved while additional traffic are routed through select frontage roads • The overpass would require significant retaining wall construction to reduce space and R/W acquisition footprint. This however, greatly increases the construction cost	Pros: 1. Effectively separates volumes from conflicting movements 2. Provide long term efficient traffic operation 3. Reduces vehicle conflicts and is expected to improve overall intersection safety Cons: 1. Significant cost and Right of Way acquisition 2. Will impact businesses on the southeast side of the interchange 3. Additional traffic on frontage roads and combined business access may introduce additional conflicts and design issues 4. Significant cost and impacts for comparable benefit to other alternatives 5. A grade separated interchange will significantly impact the visibility and presence of remaining businesses near this intersection.	**Cost:** High. > $15,000,000 to 20M excluding R/W and property acquisition costs **Mobility:** NA **Safety:** NA **R/W:** Significant Impact **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Table 5- 16. Alternatives Comparison Matrix – Mn 220 at US 2 Continued

Alternative D3: Grade Separated Westbound Overpass

	Description	Options and Considerations	Pros and Cons	Comparison Summary
	A westbound US 2 overpass with ramp access via the existing MN220/14th St intersection	• Traffic signals would be maintained at the MN220/14th St and Mn 220/US 2 intersection • Traffic signal coordination should be provided • The existing frontage road system is preserved while additional traffic are routed along 14th Street NE • Overpass require significant retaining wall construction to reduce space and R/W acquisition footprint. This however, greatly increases the construction cost • The southbound right turn movement may alternatively need to be located under the overpass and access westbound US 2 via a left side merge	Pros: 1. Effectively separates volumes from some conflicting movements 2. Provide more efficient traffic operation than existing 3. Reduces vehicle conflicts and is expected to improve overall intersection safety 4. Maintains the existing frontage road system and significantly reduces property impacts Cons: 1. Does not separates all existing conflicting movements - existing traffic signal at MN220/US2 must be preserved and modified 2. Significant cost 3. Additional traffic on neighboring roads 4. Significant cost and impacts for comparable benefit to other alternatives 5. A grade separated interchange will significantly impact the visibility and presence of remaining businesses near this intersection.	**Cost:** High. > $15,000,000 to 20M **Mobility:** NA **Safety:** NA **R/W:** Significant Impact **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

Alternative E: System Improvements - 5th Avenue NW Access

	Description	Options and Considerations	Pros and Cons	Comparison Summary
	The current 2045 MTP identifies a full access signalized intersection at the US 2/5th Avenue NW intersection (Currently RI/RO on the south side). Full access will provide additional connectivity to the neighborhood reducing traffic demand at the US 2/Mn 220 intersection. Alternative E-1: Couple with Alt A-1 Alternative E-2: Couple with Alt A-3 Alternative E-3: Couple with Alt B	• Provide full access intersection with traffic signal system operating in coordination with the US 2/Mn 220 intersection • Maintaining the existing 5th Avenue NW intersection configuration results in an approximate 1,900 ADT increase to Mn 220 • Streetlight Origin-Destination analysis found the existing eastbound left turn at the US 2/Mn 220 intersection would decrease by 95 (33%) and 50 (18%) vehicles during the AM and PM peak hours, respectively • North of 14th Street, a marginal change in overall ADT on Mn 220 is expected.	Pros: 1. Provides improved access to the neighborhood 2. Reduces vehicle demand at the US 2/Mn 220 intersection 3. Can be designed to provide acceptable safety and traffic operations into forecast year 2045 Cons: 1. High cost 2. Will impact businesses and local resident properties and will increase traffic circulating on neighborhood streets that currently experience low traffic volumes 3. May not be funded or approved for construction **Key Conclusion:** 1. 3/4 Access or full access signalized intersection overall provides a positive benefit to the transportation system and should be considered a viable long term alternative 2. Without the 5th Avenue NW access, the single eastbound left turn lane alternatives at US 2/Mn 220 may not be feasible alternatives due to intersection capacity constraint	NA

Traffic Operation Analysis

Results of the traffic operation analysis are detailed in **Table 5-17.** All alternatives were evaluated with consideration of the 2045 MTP illustrative project to provide signalized full access at the 5th Avenue NW intersection with US 2. Under this assumption, the traffic operation analysis found that the roundabout alternative is expected to provide the most overall efficient 24-hour operation and Alternative A-1 (dual left turn) is expected to operate at a LOS C. The analysis indicates that additional capacity is needed for the eastbound left turn movement (dual left). Alternative C (displaced left turn) is expected to operate very similar to Alternative A-1. Three alternatives were evaluated with consideration that the 5th Avenue NW full access is not constructed (Alternative E-1, E-2 and E-3). Further discussion of Alternative E is provided in a following section.

Table 5- 17. Intersection Delay and LOS Summary – Mn 220 at US 2

	Alternatives	AM Peak Hour		PM Peak Hour	
Year	Scenario	LOS	Delay (s)	LOS	Delay (s)
Year 2018	No Build	B / C	19.3 / 25.4	C / C	20.2 / 23.6
	ALT A	C / D	24.7 / 41.5	C / D	25.9 / 40.9
	ALT A-0	C / D	24.7 / 41.5	C / D	25.9 / 40.9
	ALT A-1	C / D	24.4 / 40.7	C / D	25.8 / 39.3
	ALT A-2	C / D	24.9 / 41.6	C / D	26.8 / 41.6
	ALT A-3	C / D	24.9 / 41.6	C / D	26.8 / 41.6
	ALT B	A / A	2.5 / 4.6	A / A	3.0 / 4.8
	ALT C	C / C	21.2 / 24.6	C / C	21.8 / 28.6
Year 2045	No Build	D / D	37.9 / 48.4	D / E	44.8 / 66.2
	ALT A	D / D	38.6 / 54.3	D / E	39.7 / 58.2
	ALT A-0	D / D	38.6 / 54.3	D / E	39.7 / 58.2
	ALT A-1	C / D	29.4 / 45.9	C / D	31.1 / 45.4
	ALT E-1	C / D	33.9 / 46.7	D / D	35.9 / 44.7
	ALT A-2	D / D	39.6 / 54.8	D / D	38.4 / 53.8
	ALT A-3	D / D	39.6 / 54.8	D / D	38.4 / 53.8
	ALT E-2	D / D	41.3 / 52.5	E / F	68.2 / 177.6
	ALT B	A / B	8.2 / 13.9	A / C	8.9 / 16.9
	ALT E-3	B / D	13.0 / 28.3	C / E	15.4 / 39.8
	ALT C	C / C	27.0 / 29.9	C / C	30.1 / 34.7

Overall Intersection LOS / Worst Approach LOS
Overall Intersection Delay / Worst Movement Delay

Safety Analysis

A safety analysis was completed for each alternative to help understand the anticipated level of improvement. The safety analysis includes investigating the change in crash types and/or the elimination in certain types of crashes and computing a monetary annual crash cost for each preliminary alternative. For each alternative, Crash Modification Factors (CMF) were developed

and applied to specific correctable crashes based on the various safety improvement measures. Key safety improvements include FYA operation with protected only arrows by time of day, improved visibility of traffic signal indications, improved sight lines with offset left turn lanes, improved right turn lane geometrics and traffic signal coordination. It should be noted that multilane roundabouts typically experience higher crash rates than single lane entries. In other words, the total number of crashes at a multilane roundabout is expected to increase compared to traffic signal control. However, the percentage of injury related crashes (specifically Type A and Type B) is typically reduced, even though the severity rate is increased (skewed high due to significant increase of PDO crashes) as illustrated for Alternative B. **Table 5-18** summarizes the estimated change in intersection crash performance.

Table 5- 18. Intersection Safety Summary – Mn 220 at US 2

	No Build	Alternative A Signal Improvements	Alternative A-0 Alternative A + Offset EB/WB LT Lanes	Alternative A-1 Alternative A + Dual EB LT Lanes	Alternative A-2 Alternative A + RT Channelization Improvements	Alternative A-3 Alternative A + Offset EB/WB LT Lanes + RT Channelization	Alternative B 2-lane Roundabout	Alternative C Displaced EB LT
Observed/Estimated Crash Rate (Crashes/MEV)	1.27	0.95	0.88	0.93	0.94	0.87	2.18	0.95
Observed/Estimated Injury Crashes (Percent of Total Crashes)	28.6%	30.1%	29.9%	29.7%	30.5%	30.2%	14.4%	30.1%
Observed/Estimated Crash Severity Rate (Crashes/MEV)	1.90	1.47	1.36	1.43	1.46	1.35	2.56	1.47
2045 Estimated Crash Cost (2018 Dollars)*	$895,801	$746,416	$706,534	$729,992	$751,386	$703,712	$596,976	$746,416

* Crash cost is in dollar unit based on MnDOT OIM Fiscal Year 2019 Values

US 2 & 5th Avenue NW Intersection Impact

An illustrative project identified in the 2045 MTP involves constructing a full access intersection (with a traffic signal) at the US 2/5th Avenue NW intersection. This intersection, which currently is right-in right-out on the south leg only, is located about ¼ of a mile to the west of the Mn 220 corridor. Due to the proximity of this intersection and the large volume of eastbound left turns at the Mn 220/US 2 study intersection, this project would be expected to have a minor impact on the southern half of the Mn 220 study corridor. The Regional Travel Demand model indicates that the ADT on Mn 220, north of US, without the 5th Avenue NW access increases by approximately 1,900 vehicles (i.e., approximately 190 total vehicles during the PM peak hour). Observations were made to understand how many of the current eastbound left turns at Mn 220/US 2 access the neighborhood via 14th Street and 17th Street. It is these motorists that are likely to use the future 5th Avenue NW connection. **Figure 5-2** illustrates the estimated origin/destination. It should also be noted that a similar project was identified in the 2045 MTP at US 2 & 2nd Avenue NE, less than ¼ of a mile to the east of the study corridor. This project was also taken into consideration but is expected to have a negligible effect on Mn 220 or the Mn 220/US 2 intersection demand.

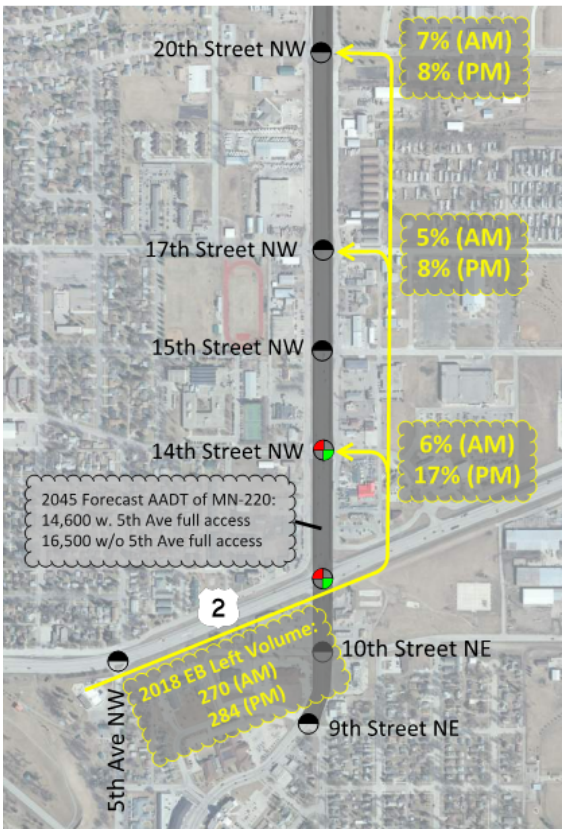


Figure 5- 2. 5th Avenue NW Intersection Origin-Destination Demand

The analysis indicates there is operational value of the 5th Avenue NW intersection and it should continue to be considered a viable future project (specifically as it relates to providing an eastbound left turn off of US 2 onto northbound 5th Avenue NW). Whether or not there is a future access to neighborhood at 5th Avenue NW may have implications on potential intersection alternatives at Mn 220/US 2. Without the future 5th Avenue NW access, the analysis indicates that the single eastbound left turn lane concepts at the US 2/Mn 220 intersection may still have capacity concern during the peak hours under forecast year 2045 traffic volumes.

5.4.8 DeMers Avenue at 10th Street NE

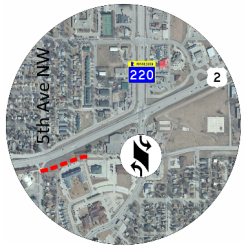
The intersection of DeMers Avenue & 10th Street is located less than 1/8 of a mile south of US 2 and the location where DeMers Avenue transitions from a four-lane roadway to a three-lane roadway. One potential intersection improvement alternative was developed to address future stop control motorist delay and intersection safety.

- No build
- Alternative A: Convert to ¾ Access

The intersection improvement options, design considerations, pros and cons, and estimated cost for each alternative are summarized in **Table 5-19**. In review of the supporting street network and business accesses, the feasibility of a ¾ access configuration at this location may require alternative access to US 2, via extension of 10th Street NW to 5th Avenue NW.

Table 5- 19. Alternatives Comparison Matrix – Mn 220 at 10th Street NE

Convert to 3/4 Access



Description	Options and Considerations	Pros and Cons	Comparison Summary
Reconstruct to a 3/4 access configuration. Three-quarter intersections are an access management technique that limits cross street movements through an intersection. A median is installed in the middle of the intersection that permits all mainline through and turning movements but prevents cross-traffic through and left turn movements.	• Business access will potentially be significantly impacted. • Would likely necessitate the extension of 10th St NW to 5th Ave NW to provide reasonable service to all movements.	Pros 1. Will improve safety by decreasing conflict points 2. All work can be done within the existing ROW 3. Minimal ongoing maintenance 4. Will improve the overall intersection operation (reduce delays) Cons 1. Could unnecessarily increase traffic volumes and turning movements on other minor roads 2. Potential for increased U-turn related crashes 3. Public/business perception of reduced access	**Cost:** NA **Mobility:** LOS A **Safety:** Reduced Right Angle Crashes **R/W:** None **20-year Traffic Operation Benefit:** NA **20-year Safety Benefit:** NA **Benefit/Cost:** NA

5.5 Identification of Segment Alternatives

To address identified deficiencies, the purpose and needs for the Mn 220 corridor, and planning for future growth north of 23rd Street NW, alternatives for two key roadway segments were developed:

- Segment A: 23rd Street NW to 140th Street SW
- Segment B: 17th Street NW to 23rd Street NW

5.5.1 Segment A: 23rd Street NW to 140th Street SW

The following alternatives are proposed to add long term roadway capacity and safety at future development access along the corridor:

- Alternative A: Two-Lane Roadway with Left Turn Lanes
- Alternative B: Convert to Three-Lane Cross-Section with Two Way Center Left Turn Lane

Figure 5-3 illustrates the anticipated roadway typical section under existing conditions and widening to accommodate left turn and/or right turn lanes at future accesses. As shown, the future pavement width need is approximately 53 feet (Alternative A or Alternative B) or 57 feet if a right turn lane is also provided. In any of the alternatives, the existing 150 feet right of way is expected to be enough in accommodating the future roadway width and rural roadway design.

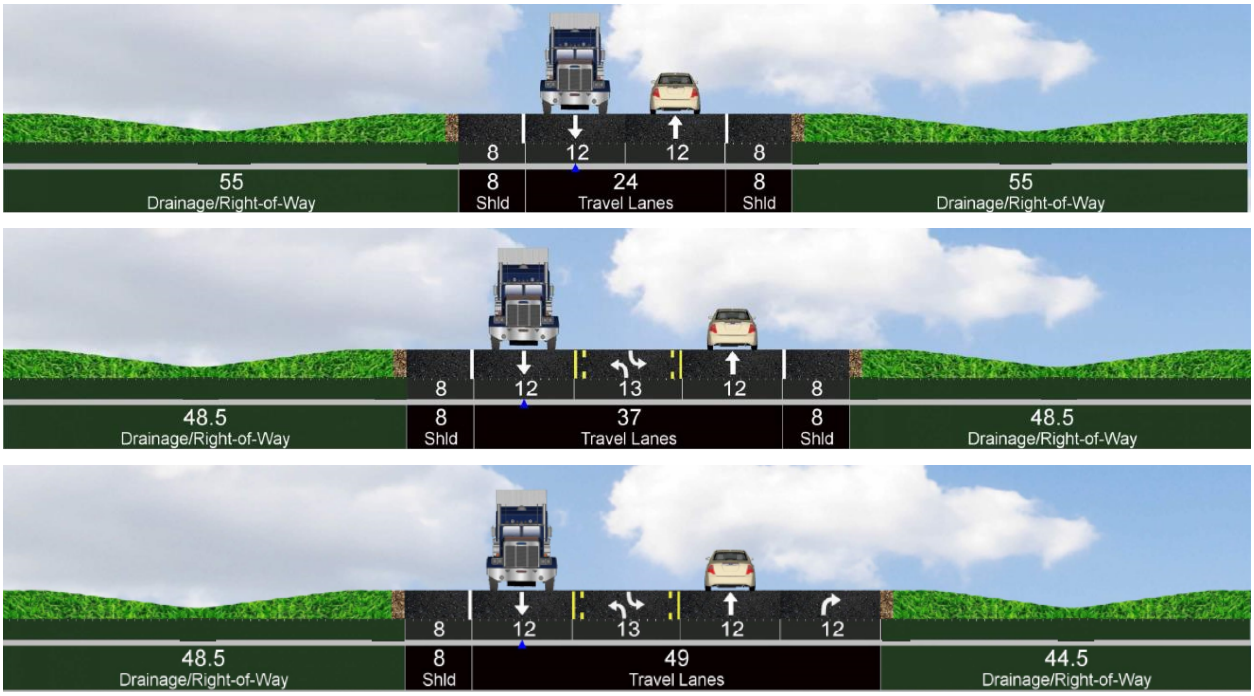


Figure 5- 3. Roadway Typical Section Comparison – 23rd Street NW to 140th Street SW

The considerations, pros and cons for each segment alternative are summarized in **Table 5-20.**

5.5.2 Segment B: 17th Street NW to 23rd Street NW

The 2045 MTP identified an illustrative project to extend the existing four lane roadway (currently transitions to two lanes at 17th Street NW) to 23rd Street NW. The various traffic control device, intersection improvement options, and pedestrian crossing considerations may influence the potential typical section alternatives for this segment of Mn 220. The following alternatives were developed:

- Alternative A: Extend 4-Lane Roadway Segment to 23rd Street NW
- Alternative B: Convert 17th Street NW to 23rd Street NW Segment to 2-Lane Roadway
- Alternative C: Extend 4-Lane Roadway Segment to 20th Street NW

Figure 5-4 shows each of these alternatives and details the compatibility with applicable intersection control alternatives. The pros and cons for each segment alternative are summarized in **Table 5-21**.

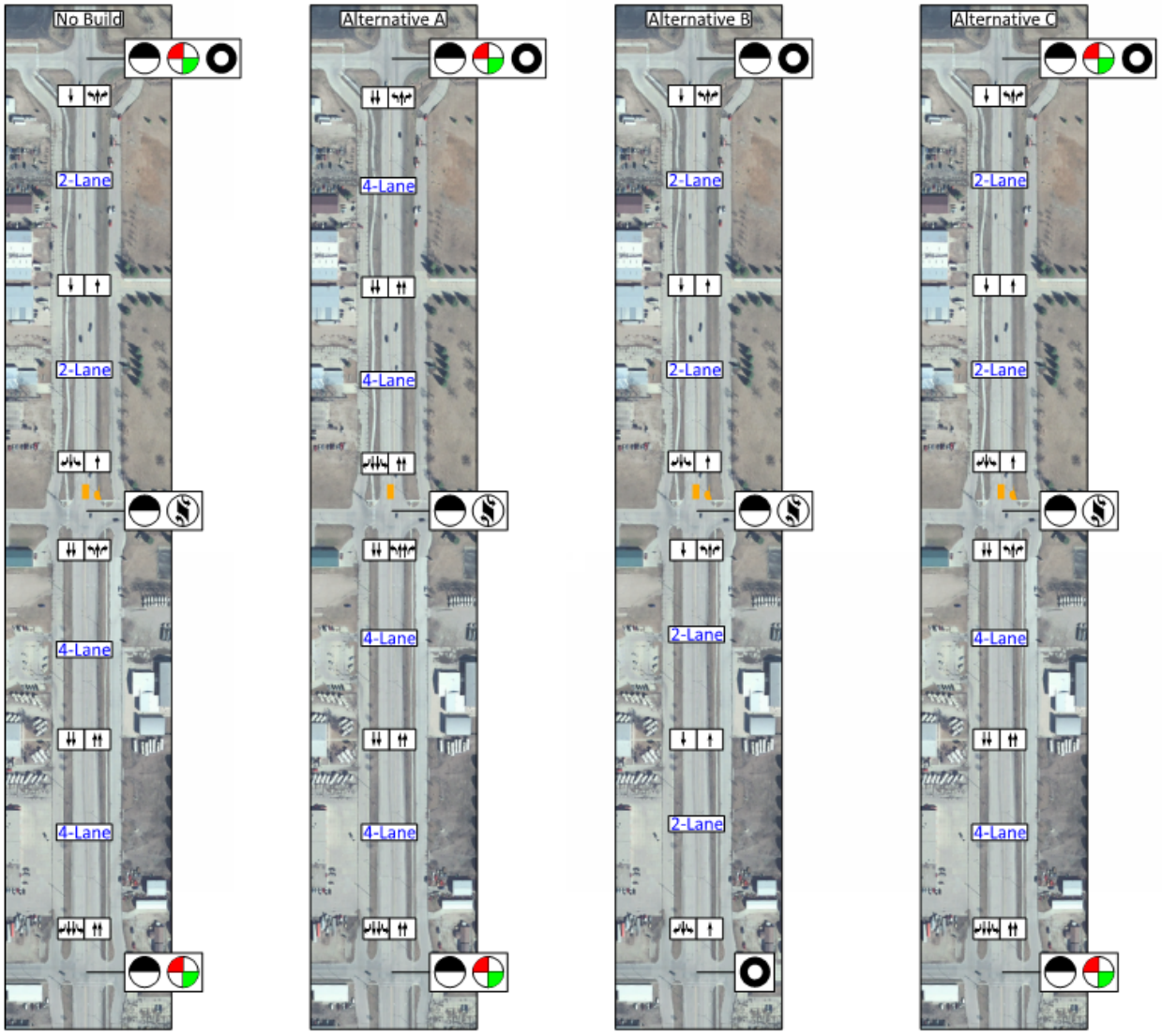


Figure 5- 4. 17th Street to 23rd Street Segment Alternatives Traffic Control Compatibility Comparison

Table 5- 20. Alternatives Comparison Matrix – Segment A - 23rd Street NW to 140th Street SW

No Build

Description	Compatibility	Pros and Cons
Maintain 2-lane roadway between 23rd Street NW and 140th Street SW. No turn lanes into driveways or at future intersections.	Compatible with any proposed intersection alternatives.	Pros 1. Does not have property, drainage or residential driveway impacts 2. Does not require roadway widening 3. Maintains LOS C or better through forecast year 2045 projection 4. Consistent corridor typical section and treatment of residential driveways. Cons 1. Left turn movements at future development access intersections may degrade traffic operation and safety of the corridor

Alternative A: Two-Lane Roadway with Left Turn Pockets

Description	Compatibility	Pros and Cons
Maintain 2-lane roadway, and add left turn pockets at future intersections.	Compatible with any proposed intersection alternatives.	Pros 1. Expected to provide more efficient traffic operations along segment and at future development access intersections 2. Left turn lanes will improve the corridor safety with the introduction of increased left turning vehicles 3. Provides opportunity for residents accessing private driveways to move out of traffic lane. 4. Can easily be constructed one access at a time as development occurs. Does not depend upon a full segment reconstruction to develop the roadway typical section 5. Overall, would only require about 50% of the segment between 23rd Street NW and 140th Street SW to be reconstructed. 6. Estimated to fit within the existing R/W Cons 1. Requires roadway widening on both sides of access with left turn lanes. Corridor would be widened to transition in and out of left turn bays 2. May provide inconsistent message for motorists accessing private driveways. In some cases turns can be made from turn lane, but other driveways not the case. Could cause confusion. 3. Widening for left turn lanes will impact residential driveways and drainage ditches. Approximately 7-9 feet of additional widening on each side of the road

Alternative B: Convert to 3-Lane Cross-Section

Description	Compatibility	Pros and Cons
Widen roadway between 23rd Street NW and 140th Street SW to 3-lane cross-section (2-lane with two-way center left turn lane along entire segment).	Compatible with any proposed intersection alternatives.	Pros 1. Expected to provide most efficient traffic operations along segment and at future development access intersections 2. Left turn lanes will improve the corridor safety with the introduction of increased left turning vehicles 3. Most consistent design to accommodate private residential driveways and future development access. 4. Estimated to fit within the existing R/W Cons 1. Requires roadway reconstruction and widening the full length of the corridor. High Cost for low residential driveway left turn movements. 2. Widening for left turn lanes will impact residential driveways and drainage ditches. Approximately 7-9 feet of additional widening on each side of the road 3. Not as easily implemented with stage construction that may be necessary with varying timeline for new land development access

Table 5- 21. Alternatives Comparison Matrix – Segment B - 17th Street NW to 23rd Street NW

No Build

Description	Compatibility	Pros and Cons
Maintain existing Mn 220 roadway cross-section and existing lane transition point. Make intersection improvements only.	• At 23rd Street NW ○ No Build ○ Alternative A: Install Signal System • At 20th Street NW ○ No Build ○ Alternative A: Convert to 3/4 Access ○ Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns • At 17th Street NW ○ No Build ○ Alternative A: Install Signal System	Pros 1. Compatibility with a variety of intersection alternatives 2. Low cost. Minimal to no roadway reconstruction 3. Maintains existing and projected future segment LOS C or better. Added capacity is not necessary Cons 1. Does not address lane utilization and motorists driving in the shoulder north of 17th Street NE to make right turn at 20th Street NE 2. Wide roadway and higher roadway speeds reduce pedestrian comfort and make pedestrian crossings more difficult

Alternative A: Extend 4-Lane Roadway Segment to 23rd Street NW

Description	Compatibility	Pros and Cons
Extend 4-lane roadway segment to 23rd Street NW. Northbound right lane would terminate as right turn only lane at 23rd Street NW	• At 23rd Street NW ○ No Build ○ Alternative A: Install Signal System • At 20th Street NW ○ No Build ○ Alternative A: Convert to 3/4 Access ○ Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns • At 17th Street NW ○ No Build ○ Alternative A: Install Signal System	Pros 1. Currently an illustrative project identified in the 2045 MTP 2. Most compatible with the long term consideration of traffic signal installations at 17th Street NW and 23rd Street NW Cons 1. Requires substantial roadway widening. High Cost 2. Wide roadway and higher roadway speeds reduce pedestrian comfort and make pedestrian crossings more difficult, specifically at the 20th Street NW pedestrian crossing. 3. Adds roadway capacity that isn't needed.

Alternative B: Convert 17th Street NW to 23rd Street NW Segment to 2-Lane Roadway

Description	Compatibility	Pros and Cons
Convert the entire segment to a 2-lane roadway between 17th Street NW and 23rd Street NW. Maintain right and left turn lanes at non-roundabout intersections	• At 23rd Street NW ○ No Build ○ Alternative A: Install Traffic Signal ○ Alternative B: Install Single-Lane Roundabout • At 20th Street NW ○ No Build ○ Alternative A: Convert to 3/4 Access ○ Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns • At 17th Street NW ○ Alternative A: Install Traffic Signal ○ Alternative B: Install Single-Lane Roundabout	Pros 1. Best compatibility with roundabout alternative at 17th Street NW and 23rd Street NW. However, could also be compatible with traffic signal installations at both locations. 2. Improves pedestrian comfort, reduces intersection pedestrian crossing distances. Provides best opportunity to improve the pedestrian crosswalk at 20th Street NW 3. Could increase distance between Mn 220 and the frontage roads 4. Reduces feel of wide roadway and likely could result in reduced vehicle travel speeds, supporting a future speed zone reduction between 17th Street NW and 23rd Street NW 5. Addresses the northbound motorist lane utilization and driving within the existing shoulder issue. If traffic signal installed at 17th Street NW, the northeast corner could be curb extended to reduce pedestrian crossing distance, improving pedestrian safety. Cons 1. Low to Moderate reconstruction cost. Require some curb and pavement work north of 17th Street NW to be most effective 2. Reducing travel lanes may not be perceived acceptable by area businesses.

Alternative C: Extend 4-Lane Roadway Segment to 20th Street NW

Description	Compatibility	Pros and Cons
Extend the 4-lane roadway to 20th Street NW. Northbound right lane would terminate as right turn only lane 20th Street NW. Maintain the existing 2-lane roadway segment between 20th Street NW and 23rd Street NW.	• At 23rd Street NW ○ No Build ○ Alternative A: Install Traffic Signal ○ Alternative B: Install Single-Lane Roundabout • At 20th Street NW ○ No Build ○ Alternative A: Convert to 3/4 Access ○ Alternative B: Convert to 3/4 Access and also Prohibit Southbound Left Turns • At 17th Street NW ○ Alternative A: Install Traffic Signal	Pros 1. Currently an illustrative project identified in the 2045 MTP involves shifting 4-lane to 2-lane transition north 2. Improves pedestrian comfort, reduces intersection pedestrian crossing distances, and provides opportunity to improve the pedestrian crosswalk at 20th Street NW 3. Compatibility with a variety of intersection alternatives 4. Low reconstruction cost. Minimal curb work and widening is needed in the northbound direction between 17th Street NW and 20th Street NW 5. Addresses the northbound motorist lane utilization and driving within the existing shoulder issue Cons 1. Requires roadway widening on one block 2. Maintains wide intersection at 17th Street NW conducive to only the existing stop or potential traffic signal control.

5.6 Identification of Other Improvement Alternatives

In addition to the intersection and segment alternatives, several additional improvements have been identified, as previously illustrated on **Figure 5-1**. These include:

- **Establishing sidewalk connections.** Six potential sidewalk connections were identified to address system gaps and to make connection between Mn 220 and adjoining businesses and neighborhoods.
- **Relocation of above ground utility boxes**. One location on the southwest corner of DeMers Avenue/10th Street NE was identified as being problematic in obstructing stopped motorist sight lines of approaching traffic.
- **10th Street NE to 9th Street NE lane transition**. One potential option to improve the lane drop and southbound left turn lane alignment at 9th Street NE, as illustrated in **Figure 5-5** below.

Figure 5- 5. Lane Drop and Left Turn Lane Striping Improvement – 10th Street NE to 9th Street NE

5.7 Evaluation of Intersection Alternatives

Nine qualitative and quantitative evaluation metric categories were reviewed as part of the screening process, as summarized in **Table 5-22**. The key evaluation metrics used to compare each alternative are consistent with the 2045 MTP objectives and performance targets.

Table 5- 22. Mn 220 Corridor Evaluation Metrics

Purpose and Need
- Compatible with project purpose and needs

Intersection Capacity
- Intersection level of service
- Worst approach level of service
- Delay Benefit

Transportation Demand/System Linkage
- Side-street accessibility
- Connectivity within the study area
- Connectivity to the greater region
- Dependence on 5th Ave NW or 2nd St NE connections
- Ability to accommodate future corridor volumes

Social or Economic Demand
- Compatibility with future land development
- Existing business impact
- Ability to accommodate harvest season heavy commercial traffic volumes and movements
- Ability to accommodate year-round heavy commercial traffic movements
- Farmland impact
- Corridor visual quality impact
- Environmental impacts

Modal Interrelationships
- Pedestrian network compatibility
- Ease of pedestrian crossing
- Bicycle network compatibility
- Transit service impacts

Safety
- Crash rate
- Injury Crash Percentage
- Crash Reduction or Impact

Roadway Deficiencies
- Infrastructure lifetime
- Public street and driveway spacing

Roadway Design and Complexity
- Addresses known roadway deficiencies
- Easiness to navigate / driver familiarity
- Coordination with planned project
- Favorable construction timeline
- Right-of-way impact area
- Number of potential property acquisitions

Cost
- Estimated design & construction cost
- Cost/benefit ratio

The evaluation criteria are intended to provide for a quantitative and qualitative evaluation of each of the alternatives, supplementing the selection and refinement of intersection recommendations. For each evaluation criteria, the alternative is subjectively scored based on how well it meets the objective; ranging from, 1 – does not meet objective (impact), to 3-neutral (no change), to 5- meets the objective well (improvement).

The evaluation criteria categories were evaluated in two ways: 1) given equal weight to each of the nine evaluation categories, and 2) weighted categories based on priorities heard through the stakeholder engagement process and consistency with other MPO studies completed in the area. The prioritized categories are (weight denoted in parenthesis):

- Purpose and Need (1)
- Safety (1.5)
- Intersection Capacity (1.25)
- Cost / Economical (1.25)

- Social or Economic Demand (1.1)
- Roadway Design and Complexity (1.1)
- Modal Interrelationships (1.1)
- Transportation Demand/System Linkage (1.05)
- Roadway Deficiencies (Access Spacing) (1)

Table 5-23 and **Table 5-24** detail the evaluation of the intersection alternatives developed with equal category weight. **Table 5-25** and **Table 5-26** detail the evaluation of the intersection alternatives developed with prioritized categories.

Table 5- 23. Preliminary Alternatives Evaluation Matrix – Mn 220 at US 2

MN-220 Preliminary Alternatives Evaluation Matrix		Mn 220 at US 2																	
		No Build		**Alternative A** Signal Improvements *(Intersection-level analysis)*		**Alternative A-0** Alternative A + Offset EB/WB LT Lanes		**Alternative A-1** Alternative A + Dual EB LT Lanes		**Alternative A-2** Alternative A + RT Channelization Improvements		**Alternative A-3** Alternative A + Offset EB/WB LT Lanes + RT Channelization		**Alternative B** 2-lane Roundabout		**Alternative C** Displaced EB LT		**Alternative D** Grade Separation (Tight Diamond)	
		Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score
Purpose and Need			1.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0
1	Compatible with project purpose and needs	--	1	--	4	--	4	--	4	--	4	--	4	--	4	--	4	--	4
Intersection Capacity			2.3		2.0		2.0		3.0		2.0		2.0		4.7		3.3		4.7
1	Intersection level of service (2045 AM/PM)	D/D	2	D/D	2	D/D	2	C/C	3	D/D	2	D/D	2	A/A	5	C/C	3	NA	5
2	Worst approach level of service (2045 AM/PM)	D/E	2	D/E	2	D/E	2	D/D	2	D/D	2	D/D	2	B/C	4	C/C	3	NA	4
3	Delay Benefit (Million $; 20 Years Present Value)	$ -	3	$ (1.92)	2	$ (1.92)	2	$ 5.10	4	$ (2.04)	2	$ (2.04)	2	$ 38.51	5	$ 9.01	4	Large	5
Transportation Demand/System Linkage			2.4		2.6		2.6		3.2		2.6		2.6		3.6		3.2		3.6
1	Side-street accessibility	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
2	Connectivity within the study area	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
3	Connectivity to the greater region	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
4	Dependence on 5th Ave NW or 2nd St NE connections	NA	1	NA	1	NA	1	C/D	3	NA	1	D/E	1	B/C	4	A-1	3	NA	4
5	Ability to accommodate future corridor volumes	--	2	--	3	--	3	--	4	--	3	--	3	--	5	--	4	--	5
Social or Economic Demand			3.0		3.0		3.0		2.9		3.1		2.9		3.4		2.7		2.1
1	Compatibility with future land development	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
2	Existing business impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	1
3	Ability to accommodate harvest season heavy commercial traffic volumes and movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
4	Ability to accommodate year-round heavy commercial traffic movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
5	Farmland impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
6	Corridor visual quality impact	--	3	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	1
7	Environmental impacts	--	3	--	3	--	3	--	2	--	4	--	2	--	4	--	2	--	1
Modal Interrelationships			2.8		3.3		3.3		3.3		3.3		3.3		2.5		2.8		1.8
1	Pedestrian network compatibility	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	1
2	Ease of pedestrian crossing	--	2	--	4	--	4	--	4	--	4	--	4	--	2	--	2	--	2
3	Bicycle network compatibility	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	3	--	1
4	Transit service impacts	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
Safety			3.0		3.7		4.0		3.7		3.7		4.0		3.7		3.7		3.7
1	Crash rate (crashes / million entering vehicles)	1.27	3	0.95	4	0.88	5	0.93	4	0.94	4	0.87	5	2.18	1	0.95	4	NA	4
2	Injury Crash Percentage	29%	3	30%	3	30%	3	30%	3	31%	3	30%	3	14%	5	30%	3	NA	3
3	Crash benefit (Million $; 20 Years Present Value)	$ -	3	$ 2.11	4	$ 2.72	4	$ 2.36	4	$ 2.09	4	$ 2.75	4	$ 4.26	5	$ 2.11	4	NA	4
Roadway Deficiencies			2.0		3.0		3.0		3.0		3.0		3.0		4.0		2.5		3.0
1	Infrastructure lifetime	--	1	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	4
2	Public street and driveway spacing	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	2
Roadway Design and Complexity			3.8		4.3		4.2		4.2		4.3		4.2		3.7		2.2		2.5
1	Addresses known roadway deficiencies	None	1	Signal	4	Signal	4	Signal	4	Signal	4	Signal	4	gnal/Paveme	5	Signal	4	gnal/Paveme	5
2	Easiness to navigate / driver familiarity	Comfort	5	Familiar	4	Familiar	4	Familiar	4	Familiar	4	Familiar	4	Unfamiliar	2	ery Unfamili	1	Comfort	5
3	Coordination with planned project	--	2	--	5	--	4	--	4	--	5	--	4	--	3	--	2	--	2
4	Favorable construction timeline	--	5	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	1
5	Right-of-way impact area	0	5	0	5	0	5	0	5	0	5	0	5	0	5	Some	2	Large	1
6	Number of potential property acquisitions	0	5	0	5	0	5	0	5	0	5	0	5	0	5	Some	2	Large	1
Cost			4.0		3.0		2.0		3.0		3.0		2.0		3.5		3.0		1.0
1	Estimated construction cost (Million $)	$ -	5	$ 0.35	4	$ 2.35	2	$ 2.35	2	$ 0.88	4	$ 2.65	2	$ 3.60	2	$ 2.90	2	>$15m	1
2	Benefit/cost ratio	NA	3	0.66	2	0.48	2	4.47	4	0.07	2	0.38	2	17.34	5	5.41	4	NA	1
	TOTAL (Sum of Individual Scores)	96.0		106.0		104.0		110.0		107.0		103.0		118.0		95.0		92.0	

Table 5- 24. Preliminary Alternatives Evaluation Matrix – All Other Intersections

MN-220 Preliminary Alternatives Evaluation Matrix		Mn 220 at 10th				Mn 220 at 14th						Mn 220 at 15th						Mn 220 at 17th						Mn 220 at 20th						Mn 220 at 23rd					
		No Build		**Alternative A** 3/4 Access		**No Build**		**Alternative A** Signal Improvements *(Intersection-level analysis)*		**Alternative B** 2x1 Roundabout		**No Build**		**Alternative A** 3/4 Access		**Alternative B** Establish Crosswalk with Pedestrian Refuge		**No Build**		**Alternative A** Signal Installation *(Intersection-level analysis)*		**Alternative B** Single-lane Roundabout		**No Build**		**Alternative A** 3/4 Access		**Alternative B** 3/4 Access + no SB LT		**No Build**		**Alternative A** Signal Installation *(Intersection-level analysis)*		**Alternative B** Single-lane Roundabout	
		Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score
Purpose and Need			2.0		4.0		2.0		4.0		4.0		1.0		3.0		3.0		2.0		4.0		4.0		1.0		3.0		3.0		2.0		4.0		4.0
1	Compatible with project purpose and needs	--	2	--	4	--	2	--	4	--	4	--	1	--	3	--	3	--	2	--	4	--	4	--	1	--	3	--	3	--	2	--	4	--	4
Intersection Capacity			3.7		4.3		4.0		3.7		4.7		4.3		4.3		4.3		3.0		3.0		4.7		4.0		4.3		4.3		3.7		3.0		4.7
1	Intersection level of service (2045 AM/PM)	A/A	5	NA	5	A/B	5	A/B	5	A/A	5	A/A	5	NA	5	NA	5	A/B	5	A/B	5	A/A	5	A/A	5	NA	5	NA	5	A/A	5	B/B	4	A/A	5
2	Worst approach level of service (2045 AM/PM)	C/D	3	NA	5	B/B	4	C/C	3	A/A	5	A/A	5	NA	5	NA	5	D/F	1	D/D	2	A/A	5	B/C	4	NA	5	NA	5	C/C	3	B/B	4	A/A	5
3	Delay Benefit (Million $; 20 Years Present Value)	$ -	3	$ -	3	$ -	3	$ 0.37	3	$ 8.81	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (1.78)	2	$ 1.49	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (3.05)	1	$ 1.03	4
Transportation Demand/System Linkage			3.2		2.6		3.4		3.6		3.2		3.4		3.2		3.4		3.0		3.6		3.2		3.4		3.2		3.2		3.2		3.6		3.8
1	Side-street accessibility	--	3	--	2	--	3	--	4	--	2	--	3	--	2	--	3	--	3	--	4	--	2	--	3	--	2	--	2	--	3	--	4	--	5
2	Connectivity within the study area	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
3	Connectivity to the greater region	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
4	Dependence on 5th Ave NW or 2nd St NE connections	OK	3	needed	1	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3
5	Ability to accommodate future corridor volumes	--	4	--	4	--	5	--	5	--	5	--	5	--	5	--	5	--	3	--	5	--	5	--	5	--	5	--	5	--	4	--	5	--	5
Social or Economic Demand			3.3		2.7		3.0		3.0		3.4		3.0		2.9		3.0		3.0		3.0		3.4		3.0		2.9		2.9		3.0		3.1		3.6
1	Compatibility with future land development	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	4	--	4
2	Existing business impact	--	5	--	1	--	3	--	3	--	3	--	3	--	2	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	3	--	3	--	3
3	Ability to accommodate harvest season heavy commercial traffic volumes and movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
4	Ability to accommodate year-round heavy commercial traffic movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
5	Farmland impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
6	Corridor visual quality impact	--	3	--	3	--	3	--	3	--	5	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	3	--	3	--	3	--	3	--	5
7	Environmental impacts	--	3	--	3	--	3	--	3	--	4	--	3	--	3	--	3	--	3	--	3	--	4	--	3	--	3	--	3	--	3	--	3	--	4
Modal Interrelationships			2.3		2.3		2.8		2.8		2.5		2.3		3.5		3.5		2.0		3.5		2.8		2.3		2.5		3.8		3.0		3.3		3.0
1	Pedestrian network compatibility	--	2	--	2	--	2	--	2	--	2	--	1	--	4	--	4	--	1	--	4	--	3	--	2	--	3	--	5	--	3	--	3	--	3
2	Ease of pedestrian crossing	--	2	--	2	--	3	--	3	--	3	--	2	--	4	--	4	--	1	--	4	--	3	--	2	--	3	--	5	--	3	--	4	--	4
3	Bicycle network compatibility	--	2	--	2	--	3	--	3	--	2	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	2	--	3	--	3	--	3	--	2
4	Transit service impacts	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	3	--	3	--	3
Safety			3.0		4.0		3.0		4.0		3.3		3.0		3.7		3.7		3.0		3.3		4.0		3.0		3.7		3.7		3.0		2.3		4.0
1	Crash rate (crashes / million entering vehicles)	0.34	3	Reduced	4	0.70	3	0.50	4	0.76	2	0.11	3	reduced	4	reduced	4	0.71	3	0.58	4	0.32	5	0.15	3	reduced	4	reduced	4	0.54	3	0.59	3	0.32	4
2	Injury Crash Percentage	0%	3	Reduced	4	22%	3	20%	4	19%	4	0%	3	reduced	4	reduced	4	15%	3	15%	3	15%	3	0%	3	reduced	4	reduced	4	33%	3	38%	2	25%	4
3	Crash benefit (Million $; 20 Years Present Value)	$ -	3	$ -	4	$ -	3	$ 1.96	4	$ 1.80	4	$ -	3	$ -	3	$ -	3	$ -	3	$ 0.22	3	$ 0.65	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (0.17)	2	$ 0.99	4
Roadway Deficiencies			2.5		3.5		2.0		3.0		3.5		3.0		3.0		3.0		2.5		3.0		4.0		3.0		3.0		3.0		2.5		3.0		4.0
1	Infrastructure lifetime	--	3	--	3	--	1	--	3	--	5	--	3	--	3	--	3	--	2	--	3	--	5	--	3	--	3	--	3	--	2	--	3	--	5
2	Public street and driveway spacing	--	2	--	4	--	3	--	3	--	2	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
Roadway Design and Complexity			4.0		3.7		3.8		4.2		3.7		4.2		4.2		4.2		4.0		4.3		3.8		4.2		4.2		4.2		3.8		4.5		3.5
1	Addresses known roadway deficiencies	none	1	me paveme	3	None	1	Signal	3	gnal/Paveme	5	none	3	ccess spacin	4	none	3	None	1	me paveme	4	gnal/Paveme	5	none	3	me paveme	3	me paveme	3	None	1	me paveme	4	gnal/Paveme	5
2	Easiness to navigate / driver familiarity	Comfort	5	Familiar	4	Comfort	5	Comfort	5	Unfamiliar	2	Comfort	4	Familiar	4	familiar	4	Comfort	5	Comfort	5	Unfamiliar	2	Comfort	5	Familiar	4	Familiar	4	Comfort	5	Comfort	5	Unfamiliar	2
3	Coordination with planned project	--	3	--	2	--	2	--	3	--	3	--	3	--	3	--	3	--	3	--	4	--	4	--	2	--	5	--	5	--	2	--	5	--	2
4	Favorable construction timeline	--	5	--	3	--	5	--	4	--	2	--	5	--	4	--	5	--	5	--	3	--	2	--	5	--	3	--	3	--	5	--	3	--	2
5	Right-of-way impact area	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
6	Number of potential property acquisitions	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
Cost			4.0		2.5		4.0		4.0		3.0		4.0		3.5		3.5		3.5		2.5		2.5		4.0		3.5		3.5		5.0		2.5		2.0
1	Estimated construction cost (Million $)	$ -	5	NA	2	$ -	5	$ 0.30	4	$ 3.00	2	$ -	5	$ 0.49	4	$ 0.35	4	$ 0.05	4	$ 0.50	4	$ 2.60	2	$ -	5	$ 0.35	4	$ 0.60	4	$ -	5	$ 0.50	4	$ 2.95	2
2	Benefit/cost ratio	NA	3	NA	3	NA	3	9.50	4	5.20	4	NA	3	NA	3	NA	3	NA	3	<0	1	1.18	3	NA	3	NA	3	NA	3	NA	3	<0	1	0.98	2
TOTAL (Sum of Individual Scores)		107.0		104.0		107.0		116.0		113.0		109.0		115.0		117.0		100.0		113.0		117.0		108.0		111.0		116.0		107.0		111.0		119.0	

Table 5- 25. Prioritized Preliminary Alternatives Evaluation Matrix – Mn 220 at US 2

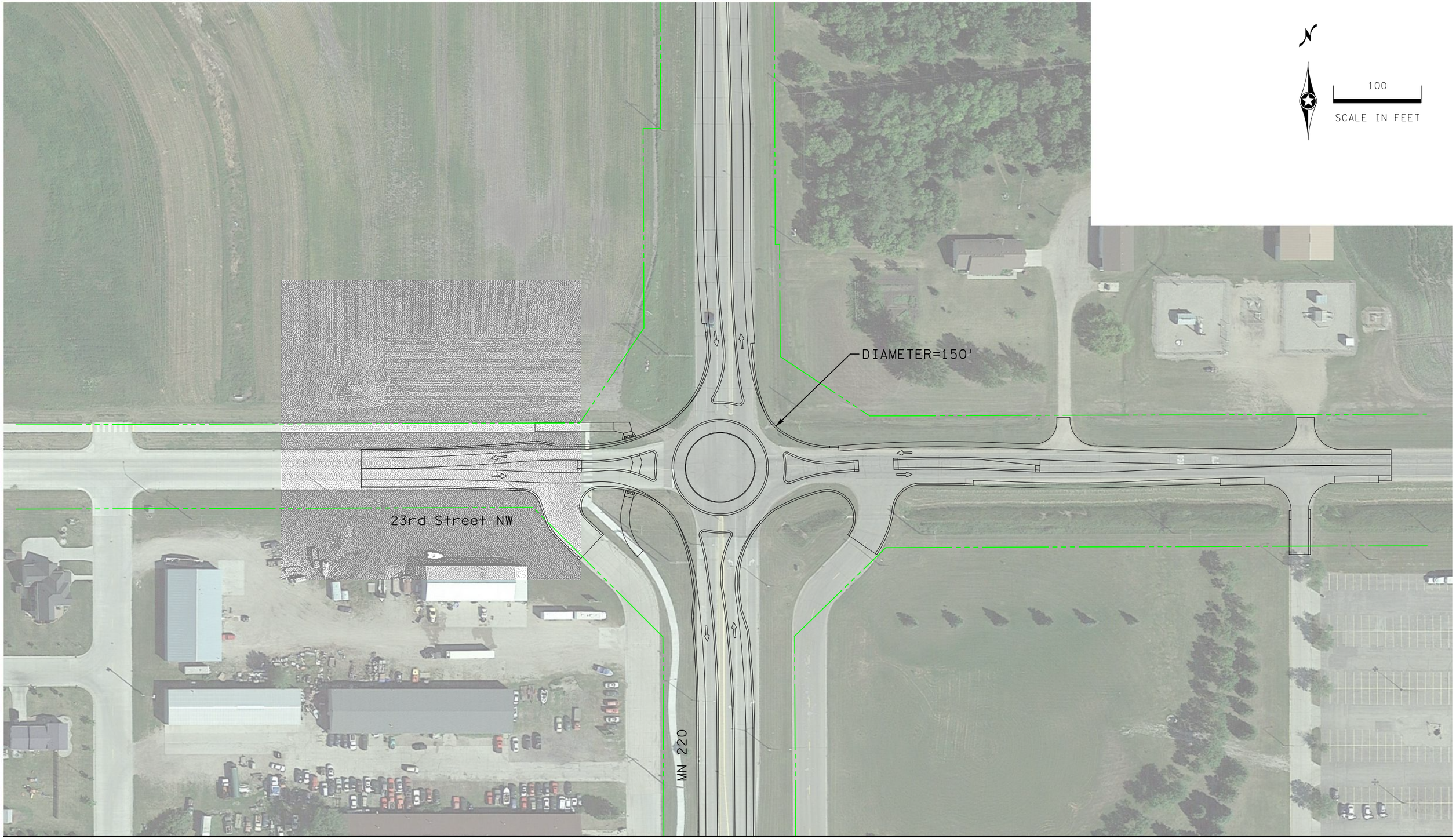
MN-220 Preliminary Alternatives Evaluation Matrix		Mn 220 at US 2																	
		No Build		**Alternative A** Signal Improvements *(Intersection-level analysis)*		**Alternative A-0** Alternative A + Offset EB/WB LT Lanes		**Alternative A-1** Alternative A + Dual EB LT Lanes		**Alternative A-2** Alternative A + RT Channelization Improvements		**Alternative A-3** Alternative A + Offset EB/WB LT Lanes + RT Channelization		**Alternative B** 2-lane Roundabout		**Alternative C** Displaced EB LT		**Alternative D** Grade Separation (Tight Diamond)	
		Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score
Purpose and Need			1.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0
1	Compatible with project purpose and needs	--	1	--	4	--	4	--	4	--	4	--	4	--	4	--	4	--	4
Intersection Capacity			2.3		2.0		2.0		3.0		2.0		2.0		4.7		3.3		4.7
1	Intersection level of service (2045 AM/PM)	D/D	2	D/D	2	D/D	2	C/C	3	D/D	2	D/D	2	A/A	5	C/C	3	NA	5
2	Worst approach level of service (2045 AM/PM)	D/E	2	D/E	2	D/E	2	D/D	2	D/D	2	D/D	2	B/C	4	C/C	3	NA	4
3	Delay Benefit (Million $; 20 Years Present Value)	$ -	3	$ (1.92)	2	$ (1.92)	2	$ 5.10	4	$ (2.04)	2	$ (2.04)	2	$ 38.51	5	$ 9.01	4	Large	5
Transportation Demand/System Linkage			2.4		2.6		2.6		3.2		2.6		2.6		3.6		3.2		3.6
1	Side-street accessibility	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
2	Connectivity within the study area	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
3	Connectivity to the greater region	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
4	Dependence on 5th Ave NW or 2nd St NE connections	NA	1	NA	1	NA	1	C/D	3	NA	1	D/E	1	B/C	4	A-1	3	NA	4
5	Ability to accommodate future corridor volumes	--	2	--	3	--	3	--	4	--	3	--	3	--	5	--	4	--	5
Social or Economic Demand			3.0		3.0		3.0		2.9		3.1		2.9		3.4		2.7		2.1
1	Compatibility with future land development	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
2	Existing business impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	1
3	Ability to accommodate harvest season heavy commercial traffic volumes and movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
4	Ability to accommodate year-round heavy commercial traffic movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
5	Farmland impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
6	Corridor visual quality impact	--	3	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	1
7	Environmental impacts	--	3	--	3	--	3	--	2	--	4	--	2	--	4	--	2	--	1
Modal Interrelationships			2.8		3.3		3.3		3.3		3.3		3.3		2.5		2.8		1.8
1	Pedestrian network compatibility	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	1
2	Ease of pedestrian crossing	--	2	--	4	--	4	--	4	--	4	--	4	--	2	--	2	--	2
3	Bicycle network compatibility	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	3	--	1
4	Transit service impacts	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
Safety			3.0		3.7		4.0		3.7		3.7		4.0		3.7		3.7		3.7
1	Crash rate (crashes / million entering vehicles)	1.27	3	0.95	4	0.88	5	0.93	4	0.94	4	0.87	5	2.18	1	0.95	4	NA	4
2	Injury Crash Percentage	29%	3	30%	3	30%	3	30%	3	31%	3	30%	3	14%	5	30%	3	NA	3
3	Crash benefit (Million $; 20 Years Present Value)	$ -	3	$ 2.11	4	$ 2.72	4	$ 2.36	4	$ 2.09	4	$ 2.75	4	$ 4.26	5	$ 2.11	4	NA	4
Roadway Deficiencies			2.0		3.0		3.0		3.0		3.0		3.0		4.0		2.5		3.0
1	Infrastructure lifetime	--	1	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	4
2	Public street and driveway spacing	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	2
Roadway Design and Complexity			3.8		4.3		4.2		4.2		4.3		4.2		3.7		2.2		2.5
1	Addresses known roadway deficiencies	None	1	Signal	4	Signal	4	Signal	4	Signal	4	Signal	4	gnal/Paveme	5	Signal	4	gnal/Paveme	5
2	Easiness to navigate / driver familiarity	Comfort	5	Familiar	4	Familiar	4	Familiar	4	Familiar	4	Familiar	4	Unfamiliar	2	ery Unfamili	1	Comfort	5
3	Coordination with planned project	--	2	--	5	--	4	--	4	--	5	--	4	--	3	--	2	--	2
4	Favorable construction timeline	--	5	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	1
5	Right-of-way impact area	0	5	0	5	0	5	0	5	0	5	0	5	0	5	Some	2	Large	1
6	Number of potential property acquisitions	0	5	0	5	0	5	0	5	0	5	0	5	0	5	Some	2	Large	1
Cost			4.0		3.0		2.0		3.0		3.0		2.0		3.5		3.0		1.0
1	Estimated construction cost (Million $)	$ -	5	$ 0.35	4	$ 2.35	2	$ 2.35	2	$ 0.88	4	$ 2.65	2	$ 3.60	2	$ 2.90	2	>$15m	1
2	Benefit/cost ratio	NA	3	0.66	2	0.48	2	4.47	4	0.07	2	0.38	2	17.34	5	5.41	4	NA	1
TOTAL (Weighted Sum of Individual Scores)			110.4		121.2		119.1		125.9		122.3		118.0		135.3		109.6		106.1

Table 5- 26. Prioritized Preliminary Alternatives Evaluation Matrix – All Other Intersections

MN-220 Preliminary Alternatives Evaluation Matrix		Mn 220 at 10th				Mn 220 at 14th						Mn 220 at 15th						Mn 220 at 17th						Mn 220 at 20th						Mn 220 at 23rd					
		No Build		**Alternative A** 3/4 Access		**No Build**		**Alternative A** Signal Improvements *(Intersection-level analysis)*		**Alternative B** 2x1 Roundabout		**No Build**		**Alternative A** 3/4 Access		**Alternative B** Establish Crosswalk with Pedestrian Refuge		**No Build**		**Alternative A** Signal Installation *(Intersection-level analysis)*		**Alternative B** Single-lane Roundabout		**No Build**		**Alternative A** 3/4 Access		**Alternative B** 3/4 Access + no SB LT		**No Build**		**Alternative A** Signal Installation *(Intersection-level analysis)*		**Alternative B** Single-lane Roundabout	
		Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score	Analysis	Score
Purpose and Need			2.0		4.0		2.0		4.0		4.0		1.0		3.0		3.0		2.0		4.0		4.0		1.0		3.0		3.0		2.0		4.0		4.0
1	Compatible with project purpose and needs	--	2	--	4	--	2	--	4	--	4	--	1	--	3	--	3	--	2	--	4	--	4	--	1	--	3	--	3	--	2	--	4	--	4
Intersection Capacity			3.7		4.3		4.0		3.7		4.7		4.3		4.3		4.3		3.0		3.0		4.7		4.0		4.3		4.3		3.7		3.0		4.7
1	Intersection level of service (2045 AM/PM)	A/A	5	NA	5	A/B	5	A/B	5	A/A	5	A/A	5	NA	5	NA	5	A/B	5	A/B	5	A/A	5	A/A	5	NA	5	NA	5	A/A	5	B/B	4	A/A	5
2	Worst approach level of service (2045 AM/PM)	C/D	3	NA	5	B/B	4	C/C	3	A/A	5	A/A	5	NA	5	NA	5	D/F	1	D/D	2	A/A	5	B/C	4	NA	5	NA	5	C/C	3	B/B	4	A/A	5
3	Delay Benefit (Million $; 20 Years Present Value)	$ -	3	$ -	3	$ -	3	$ 0.37	3	$ 8.81	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (1.78)	2	$ 1.49	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (3.05)	1	$ 1.03	4
Transportation Demand/System Linkage			3.2		2.6		3.4		3.6		3.2		3.4		3.2		3.4		3.0		3.6		3.2		3.4		3.2		3.2		3.2		3.6		3.8
1	Side-street accessibility	--	3	--	2	--	3	--	4	--	2	--	3	--	2	--	3	--	3	--	4	--	2	--	3	--	2	--	2	--	3	--	4	--	5
2	Connectivity within the study area	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
3	Connectivity to the greater region	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3	OK	3
4	Dependence on 5th Ave NW or 2nd St NE connections	OK	3	needed	1	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3	NA	3
5	Ability to accommodate future corridor volumes	--	4	--	4	--	5	--	5	--	5	--	5	--	5	--	5	--	3	--	5	--	5	--	5	--	5	--	5	--	4	--	5	--	5
Social or Economic Demand			3.3		2.7		3.0		3.0		3.4		3.0		2.9		3.0		3.0		3.0		3.4		3.0		2.9		2.9		3.0		3.1		3.6
1	Compatibility with future land development	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	4
2	Existing business impact	--	5	--	1	--	3	--	3	--	3	--	3	--	2	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	3	--	3	--	3
3	Ability to accommodate harvest season heavy commercial traffic volumes and movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
4	Ability to accommodate year-round heavy commercial traffic movements	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
5	Farmland impact	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
6	Corridor visual quality impact	--	3	--	3	--	3	--	3	--	5	--	3	--	3	--	3	--	3	--	3	--	5	--	3	--	3	--	3	--	3	--	3	--	5
7	Environmental impacts	--	3	--	3	--	3	--	3	--	4	--	3	--	3	--	3	--	3	--	3	--	4	--	3	--	3	--	3	--	3	--	3	--	4
Modal Interrelationships			2.3		2.3		2.8		2.8		2.5		2.3		3.5		3.5		2.0		3.5		2.8		2.3		2.5		3.8		3.0		3.3		3.0
1	Pedestrian network compatibility	--	2	--	2	--	2	--	2	--	2	--	1	--	4	--	4	--	1	--	4	--	3	--	2	--	3	--	5	--	3	--	3	--	3
2	Ease of pedestrian crossing	--	2	--	2	--	3	--	3	--	3	--	2	--	4	--	4	--	1	--	4	--	3	--	2	--	3	--	5	--	4	--	4	--	4
3	Bicycle network compatibility	--	2	--	2	--	3	--	3	--	2	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	2	--	3	--	2	--	3	--	2
4	Transit service impacts	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	2	--	2	--	3	--	3	--	3
Safety			3.0		4.0		3.0		4.0		3.3		3.0		3.7		3.7		3.0		3.3		4.0		3.0		3.7		3.7		3.0		2.3		4.0
1	Crash rate (crashes / million entering vehicles)	0.34	3	Reduced	4	0.70	3	0.50	4	0.76	2	0.11	3	reduced	4	reduced	4	0.71	3	0.58	4	0.32	5	0.15	3	reduced	4	reduced	4	0.54	3	0.59	3	0.32	4
2	Injury Crash Percentage	0%	3	Reduced	4	22%	3	20%	4	19%	4	0%	3	reduced	4	reduced	4	15%	3	15%	3	15%	3	0%	3	reduced	4	reduced	4	33%	3	38%	2	25%	4
3	Crash benefit (Million $; 20 Years Present Value)	$ -	3	$ -	4	$ -	3	$ 1.96	4	$ 1.80	4	$ -	3	$ -	3	$ -	3	$ -	3	$ 0.22	3	$ 0.65	4	$ -	3	$ -	3	$ -	3	$ -	3	$ (0.17)	2	$ 0.99	4
Roadway Deficiencies			2.5		3.5		2.0		3.0		3.5		3.0		3.0		3.0		2.5		3.0		4.0		3.0		3.0		3.0		2.5		3.0		4.0
1	Infrastructure lifetime	--	3	--	3	--	1	--	3	--	5	--	3	--	3	--	3	--	2	--	3	--	5	--	3	--	3	--	3	--	2	--	3	--	5
2	Public street and driveway spacing	--	2	--	4	--	3	--	3	--	2	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3	--	3
Roadway Design and Complexity			4.2		3.7		3.8		4.2		3.7		4.2		4.2		4.2		4.0		4.3		3.8		4.2		4.2		4.2		3.8		4.5		3.5
1	Addresses known roadway deficiencies	none	2	me paveme	3	None	1	Signal	3	nal/Paveme	5	none	3	ccess spacin	4	none	3	None	1	me paveme	4	nal/Paveme	5	none	3	me paveme	3	me paveme	3	None	1	me paveme	4	nal/Paveme	5
2	Easiness to navigate / driver familiarity	Comfort	5	Familiar	4	Comfort	5	Comfort	5	Unfamiliar	2	Comfort	4	Familiar	4	familiar	4	Comfort	5	Comfort	5	Unfamiliar	2	Comfort	5	Familiar	4	Familiar	4	Comfort	5	Comfort	5	Unfamiliar	2
3	Coordination with planned project	--	3	--	2	--	2	--	3	--	3	--	3	--	3	--	3	--	3	--	4	--	4	--	2	--	5	--	5	--	2	--	5	--	2
4	Favorable construction timeline	--	5	--	3	--	5	--	4	--	2	--	5	--	4	--	5	--	5	--	3	--	2	--	5	--	3	--	3	--	5	--	3	--	2
5	Right-of-way impact area	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
6	Number of potential property acquisitions	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5	0	5
Cost			4.0		2.5		4.0		4.0		3.0		4.0		3.5		3.5		3.5		2.5		2.5		4.0		3.5		3.5		4.0		2.5		2.0
1	Estimated construction cost (Million $)	$ -	5	NA	2	$ -	5	$ 0.30	4	$ 3.00	2	$ -	5	$ 0.49	4	$ 0.35	4	$ 0.05	4	$ 0.50	4	$ 2.60	2	$ -	5	$ 0.35	4	$ 0.60	4	$ -	5	$ 0.50	4	$ 2.95	2
2	Benefit/cost ratio	NA	3	NA	3	NA	3	9.50	4	5.20	4	NA	3	NA	3	NA	3	NA	3	<0	1	1.18	3	NA	3	NA	3	NA	3	NA	3	<0	1	0.98	2
	TOTAL (Weighted Sum of Individual Scores)		123.8		120.2		122.9		133.4		129.4		125.1		132.2		134.4		114.6		128.5		134.4		123.9		127.8		133.3		122.7		125.1		136.3

Appendix A:

Concept Sketches



MN 220 Corridor Study

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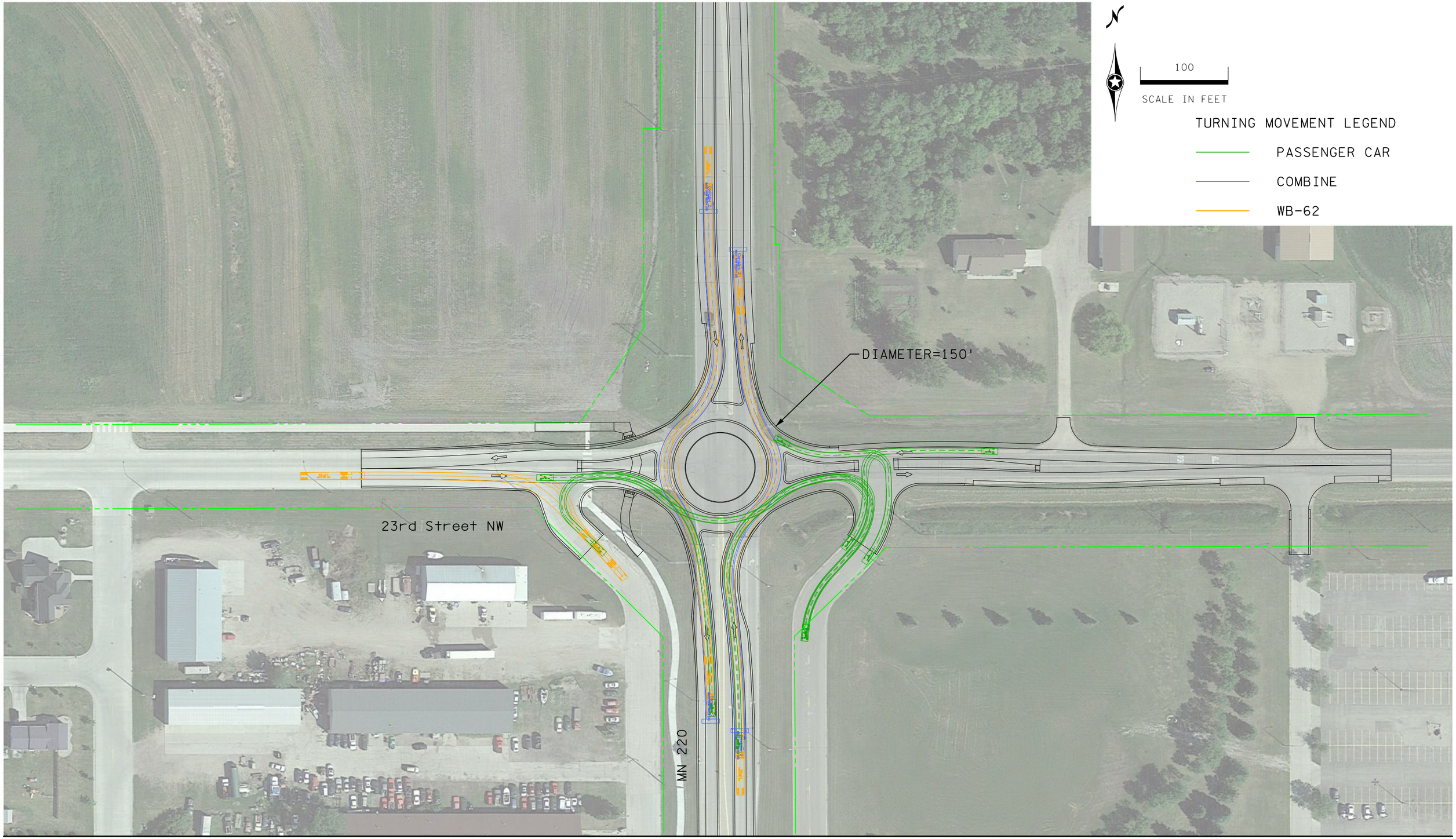
MN 220/23rd Street NW
Alternative B - Single Lane Roundabout



MN 220 Corridor Study

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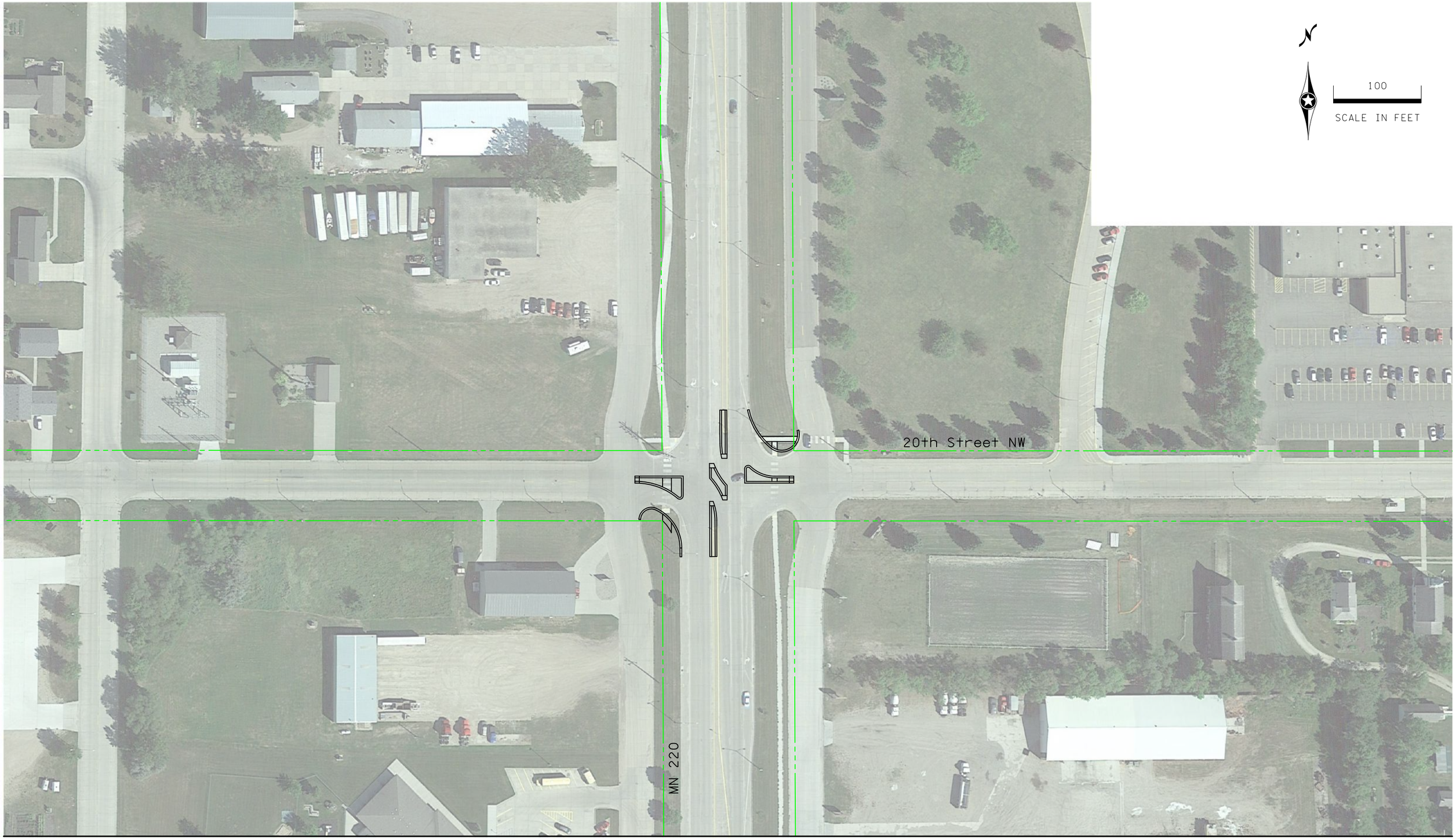
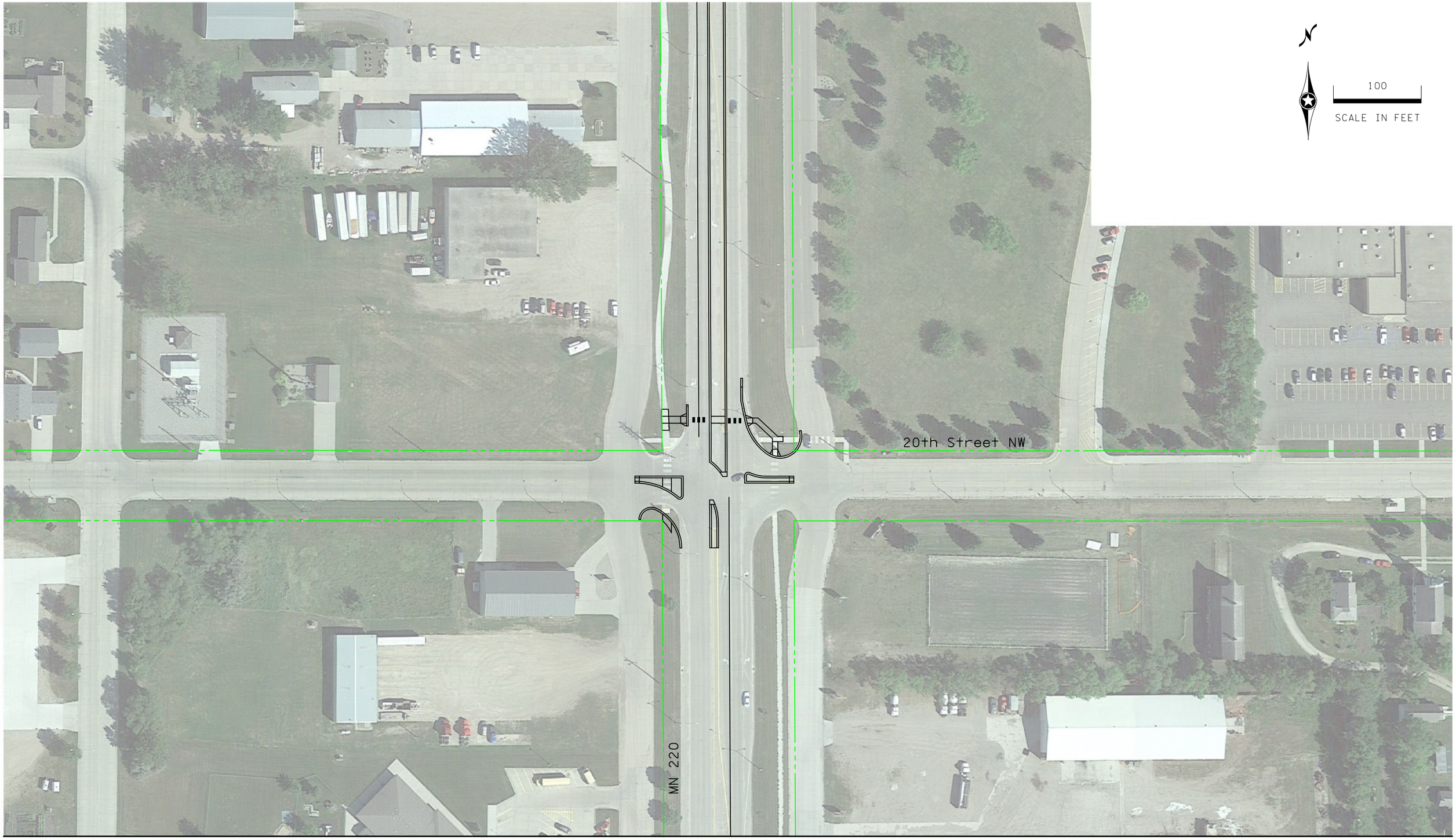
MN 220/23rd Street NW
Alternative B - Single Lane Roundabout
Turning Movements



MN 220 Corridor Study

ALLIANT ENGINEERING

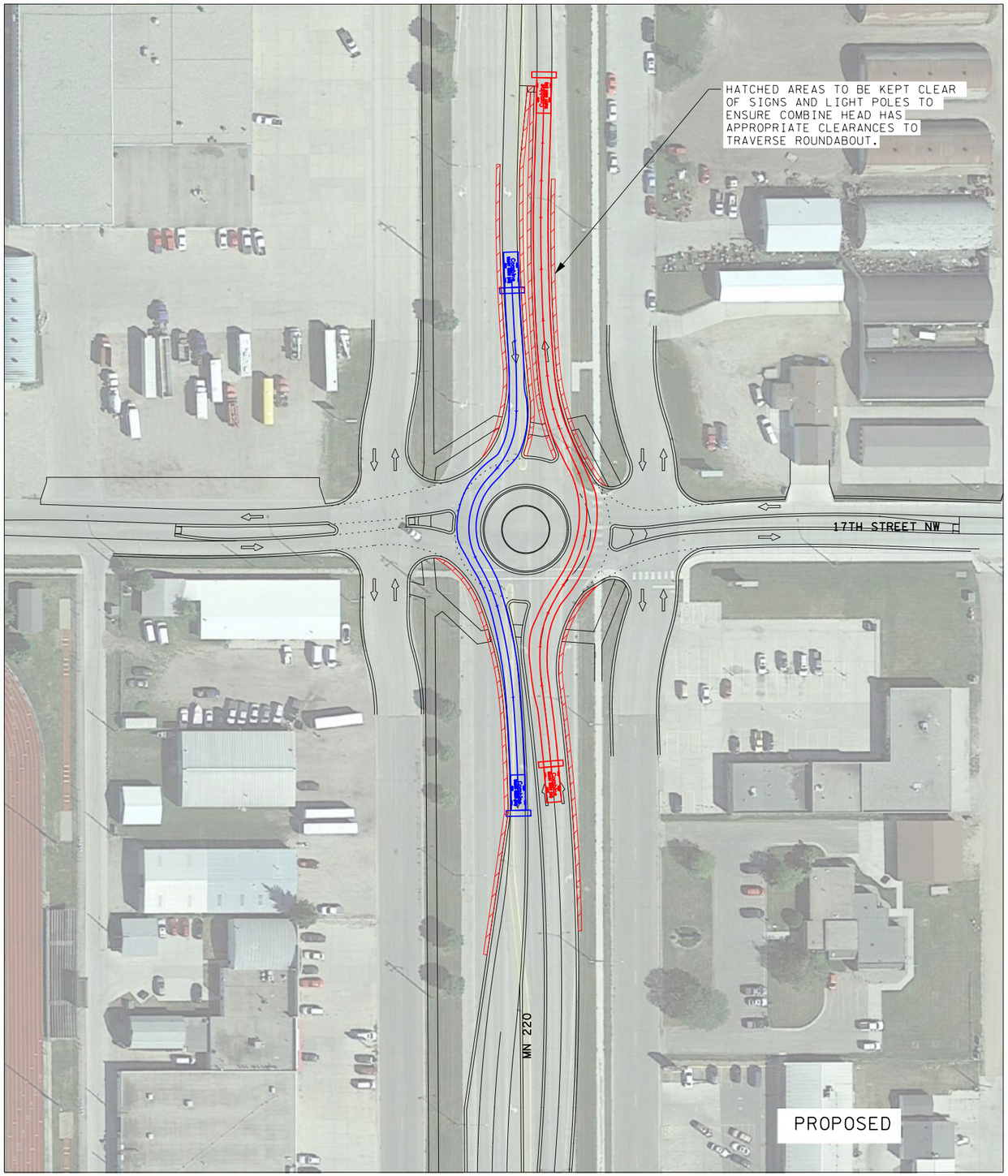
MN 220/20th Street NW
Alternative A - 3 / 4 Access with SB & NB Left Turn

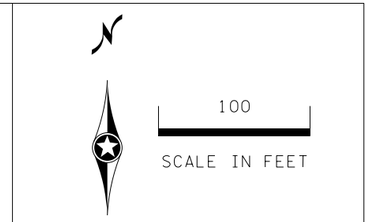


MN 220 Corridor Study

ALLIANT ENGINEERING

MN 220/20th Street NW
Alternative B - 3 / 4 Access with NB Left Turn

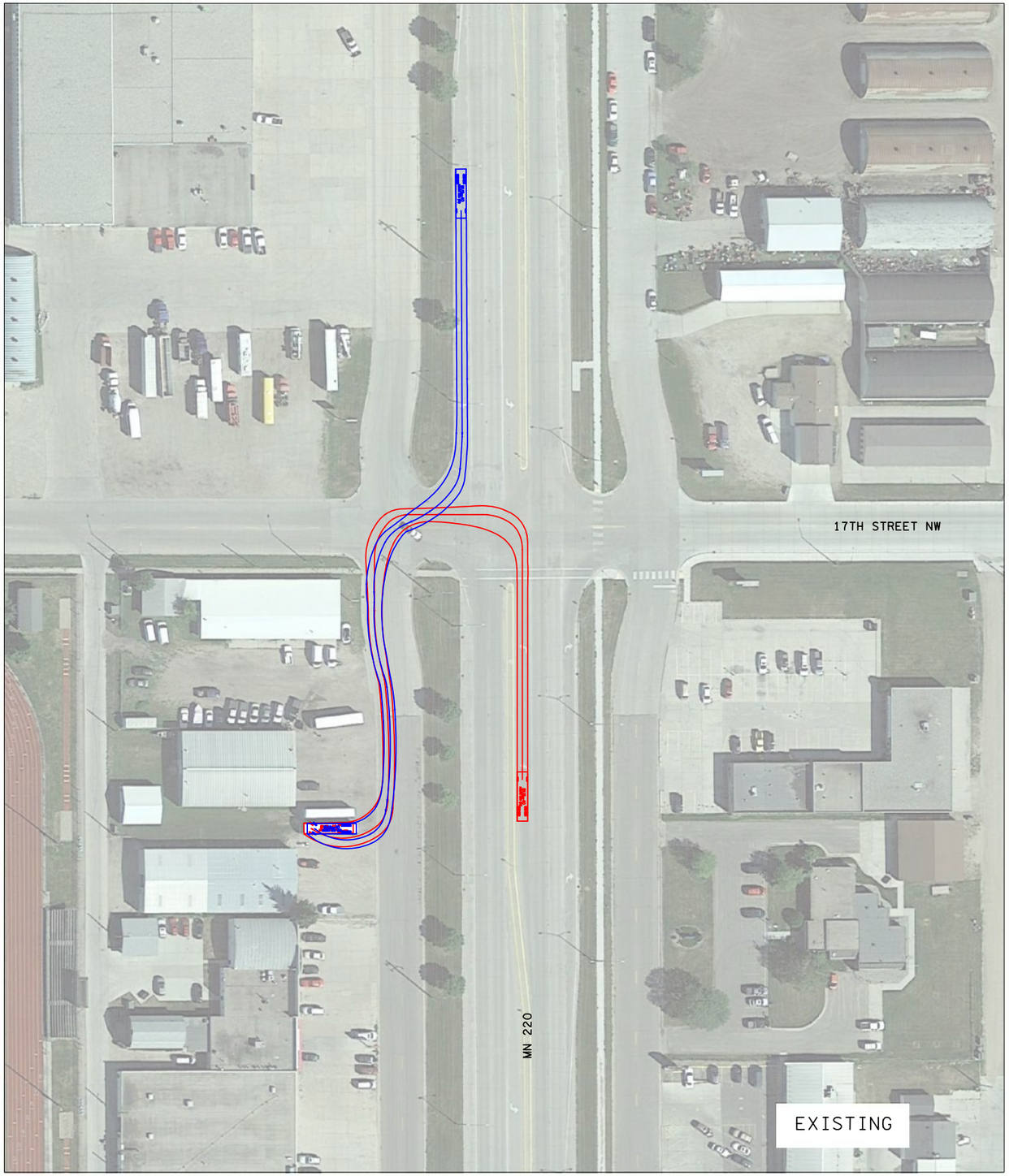


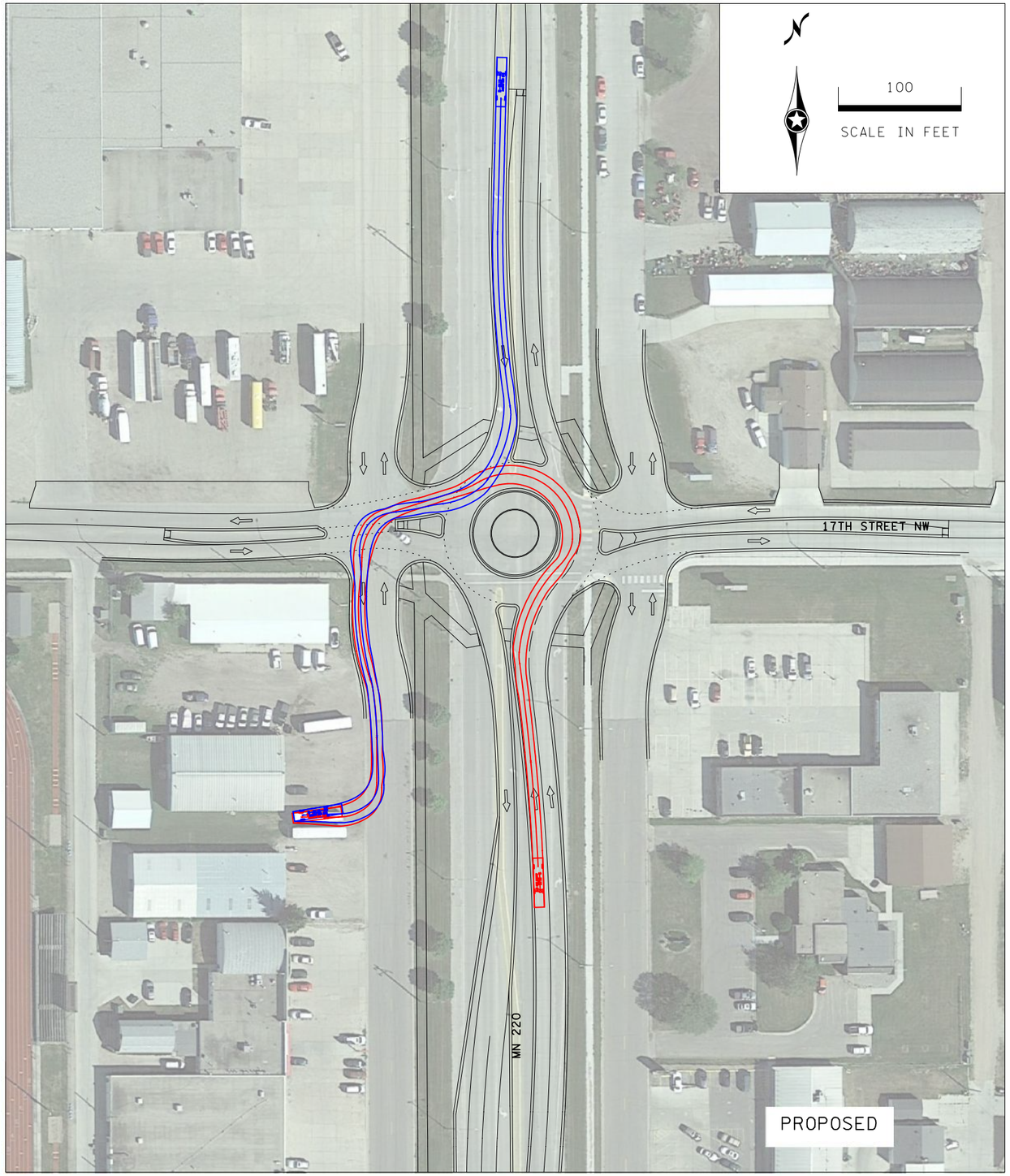


MN 220 Corridor Study

ALLIANT ENGINEERING

MN 220/17th Street NW
Combine Through Movements

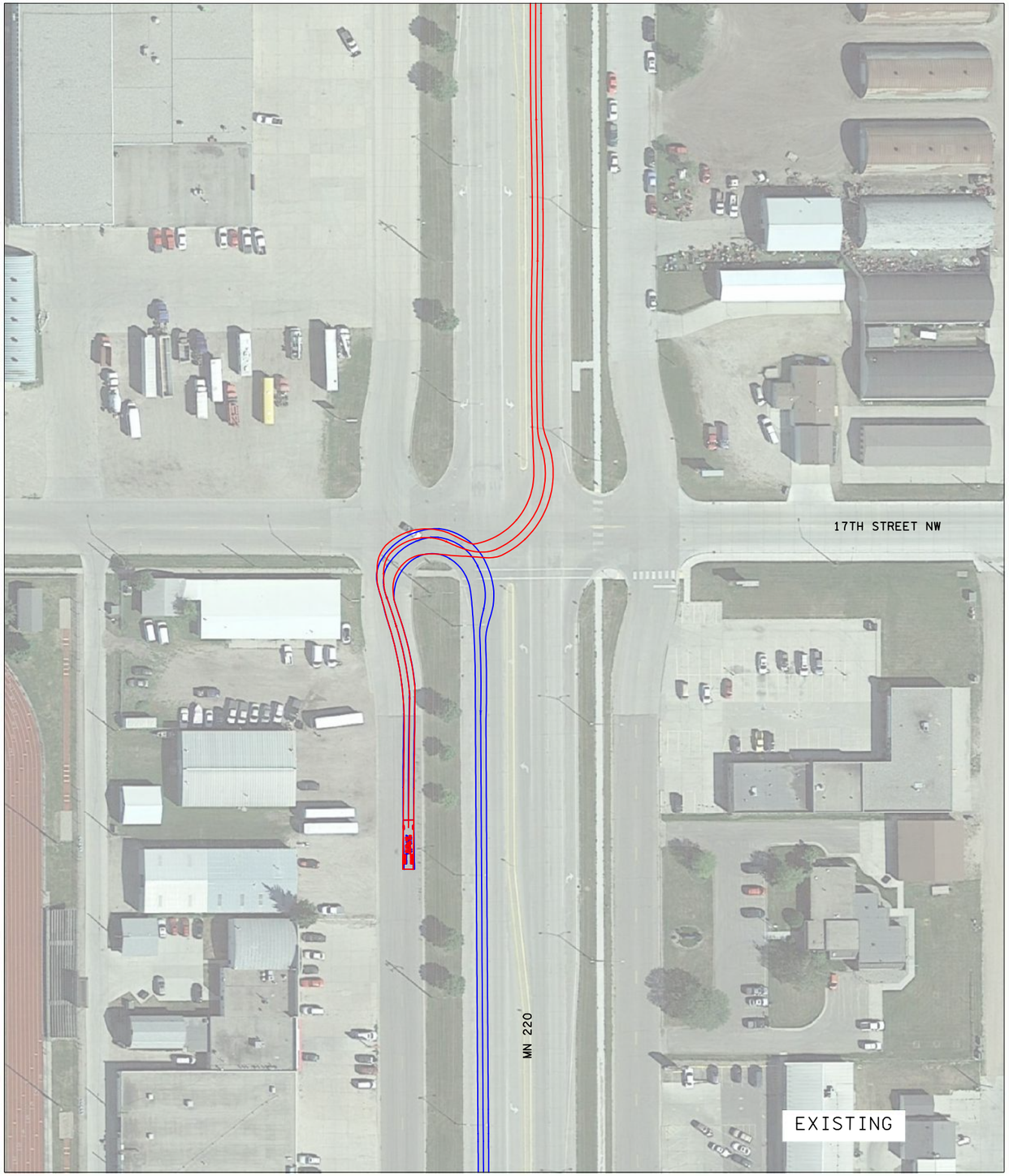


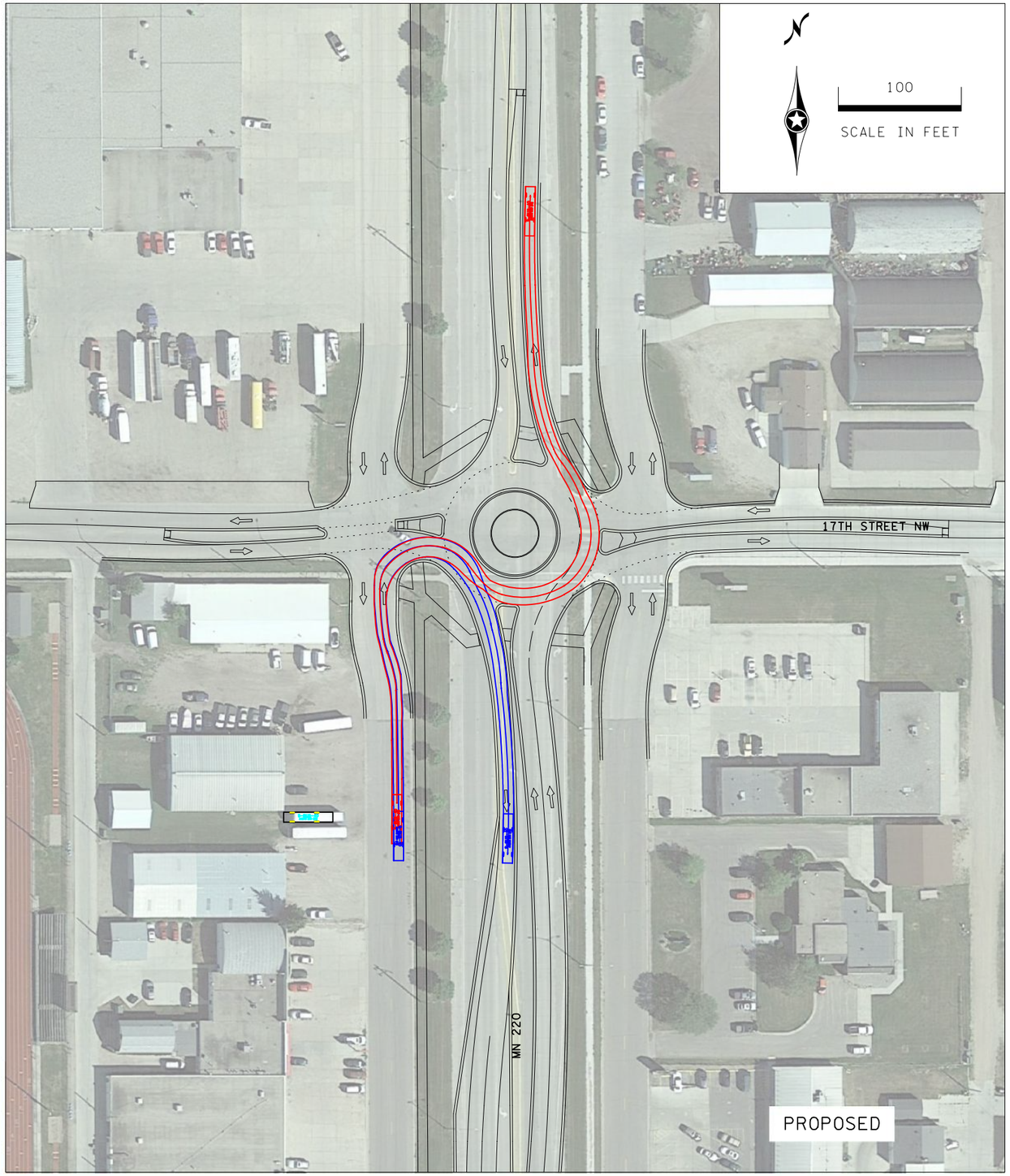


MN 220 Corridor Study

ALLIANT ENGINEERING

MN 220/17th Street NW
40' Bus Turn Movements Into Triangle Bus

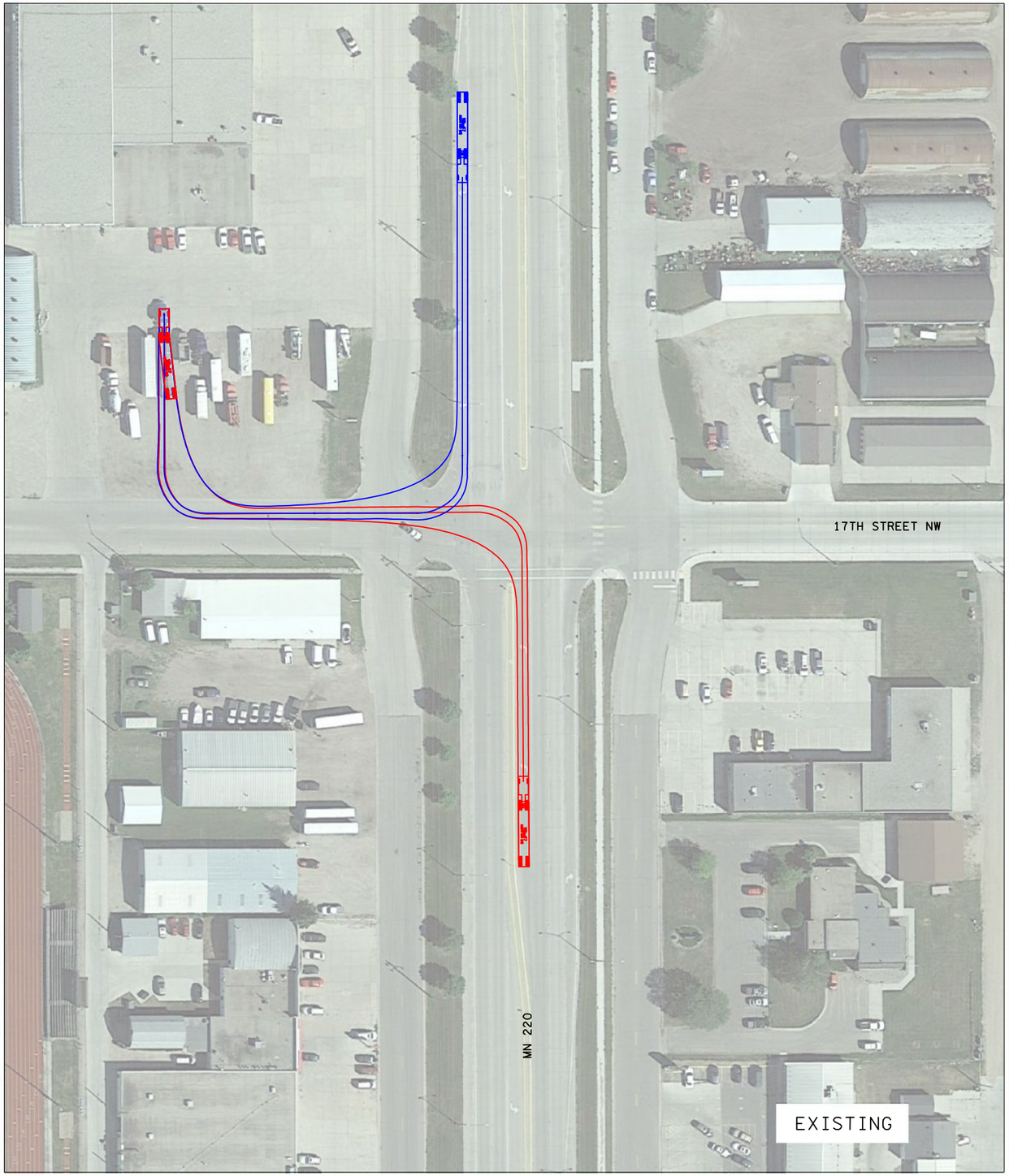


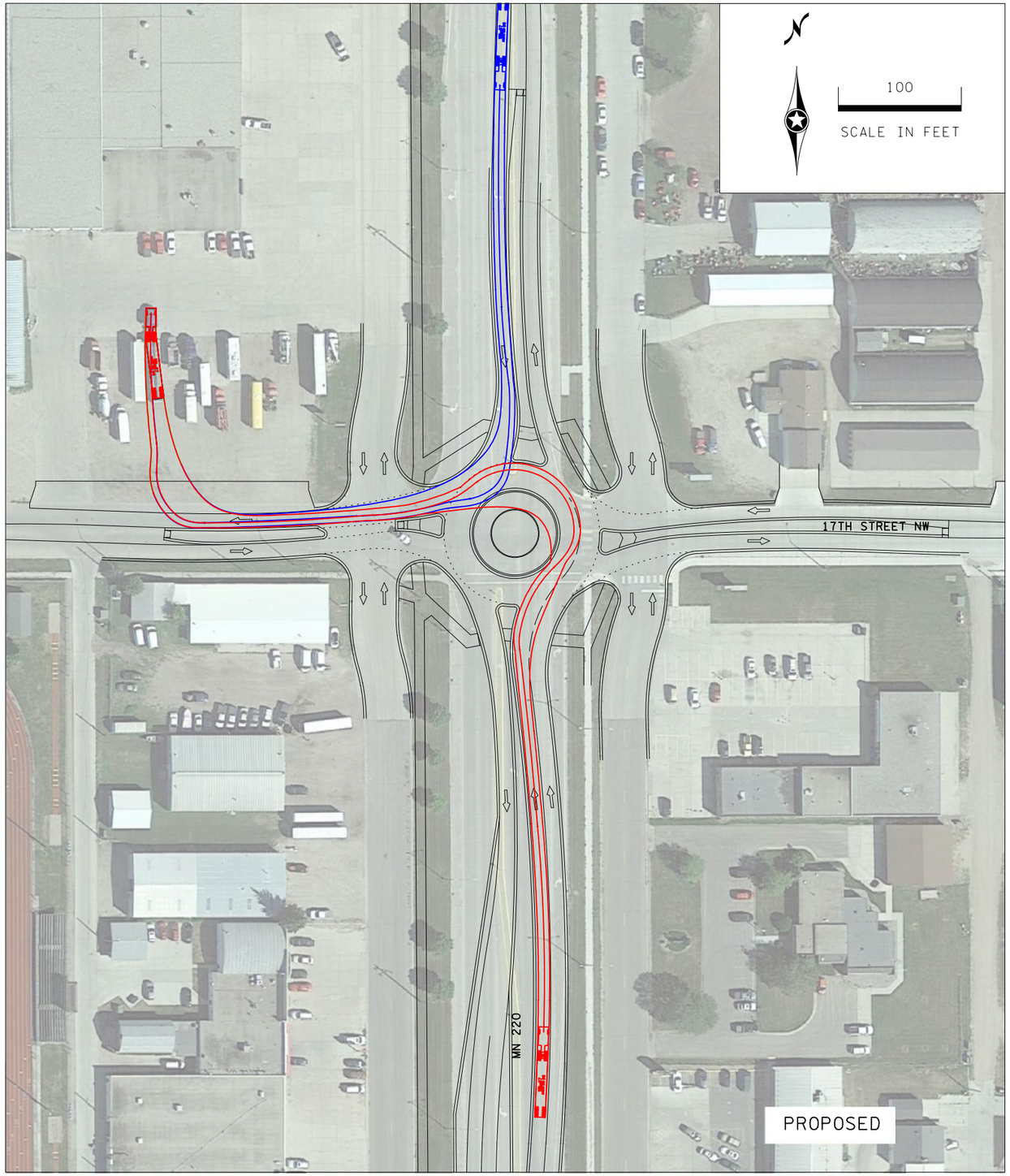


MN 220 Corridor Study

ALLIANT ENGINEERING

MN 220/17th Street NW
40' Bus Turn Movements Out of Triangle Bus

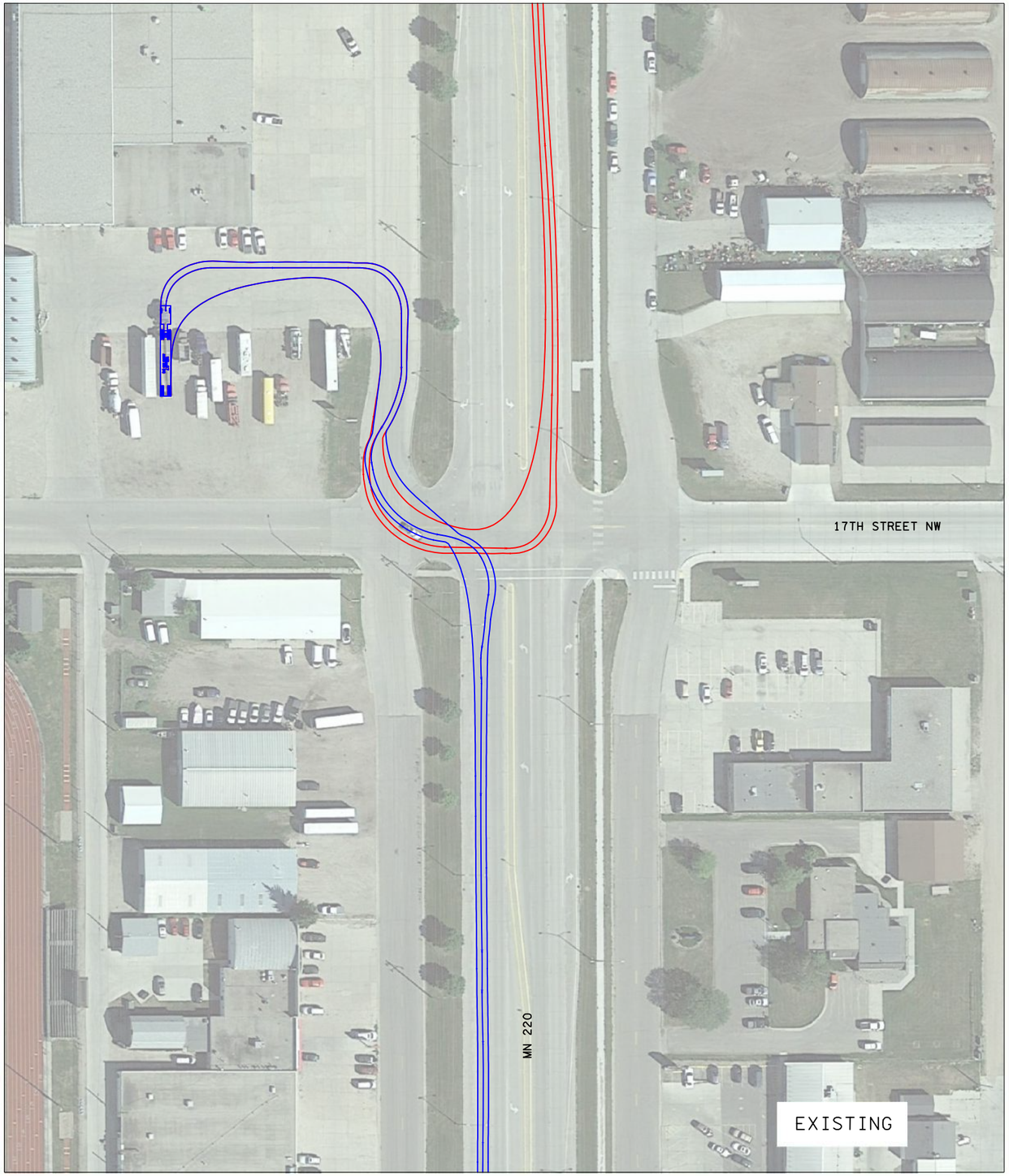


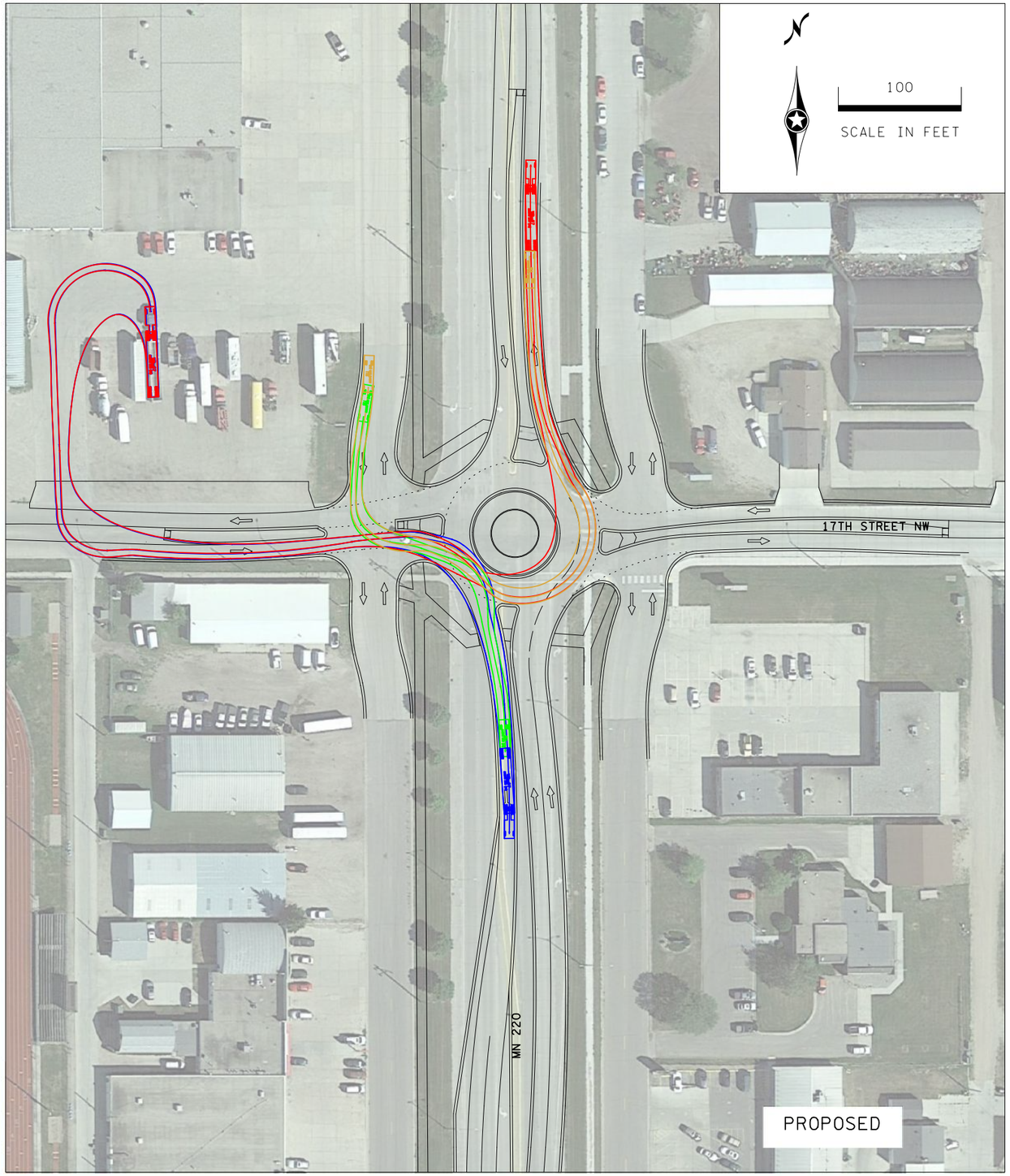


MN 220 Corridor Study

ALLIANT ENGINEERING

MN 220/17th Street NW
WB 67 Turn Movements Into Valley Truck

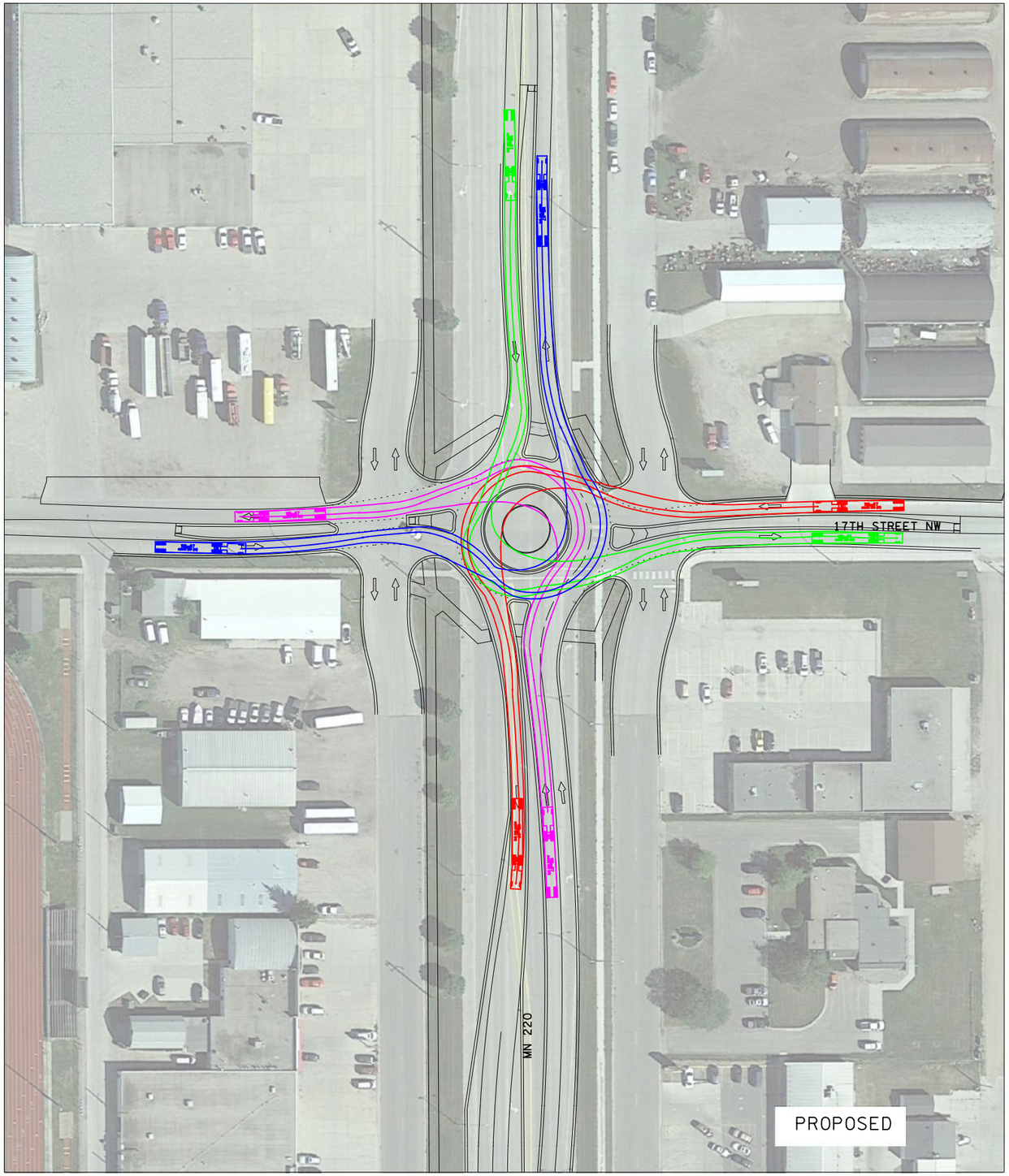


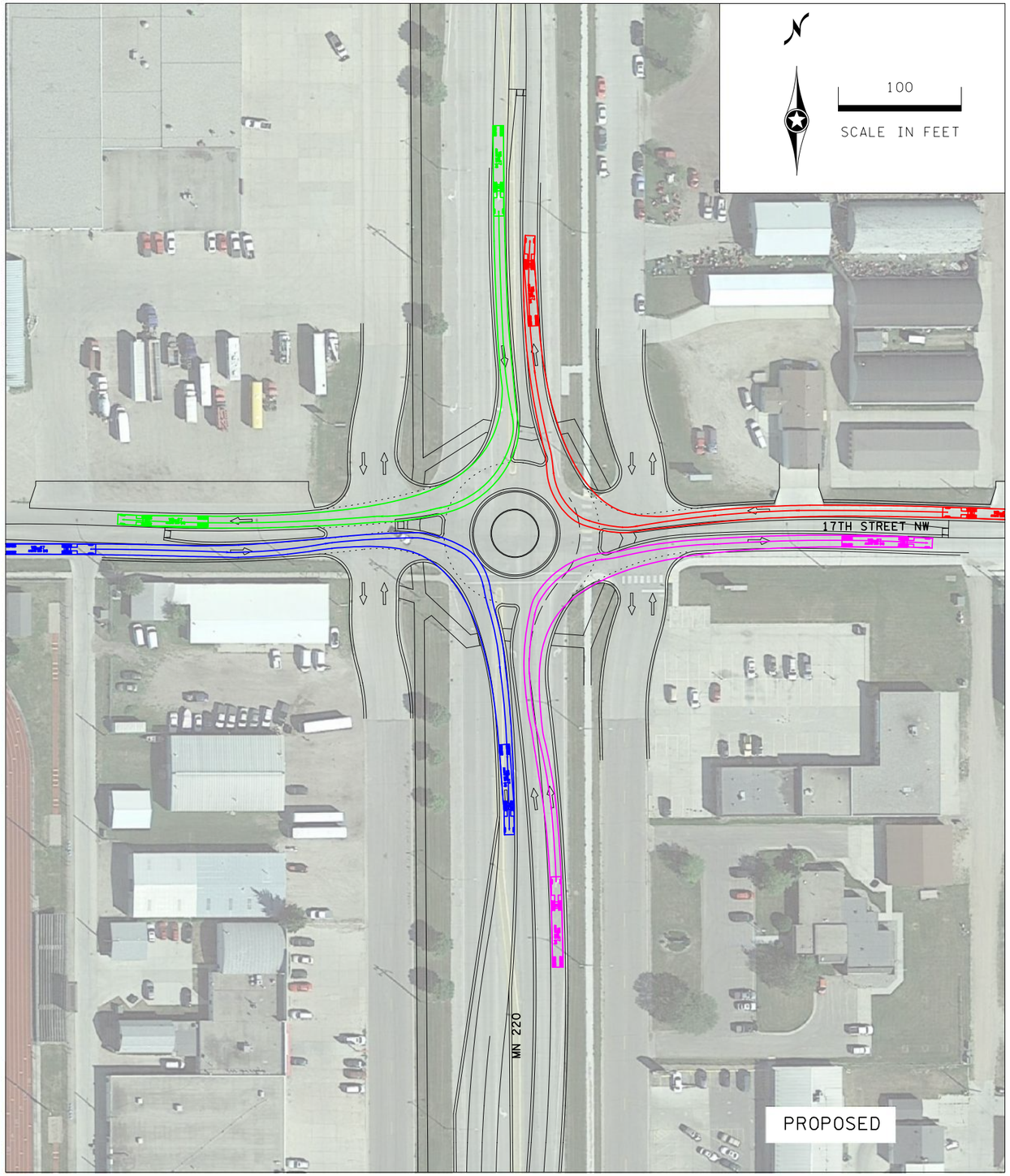


MN 220 Corridor Study

ALLIANT ENGINEERING

MN 220/17th Street NW
WB 67 Turn Movements Out of Valley Truck





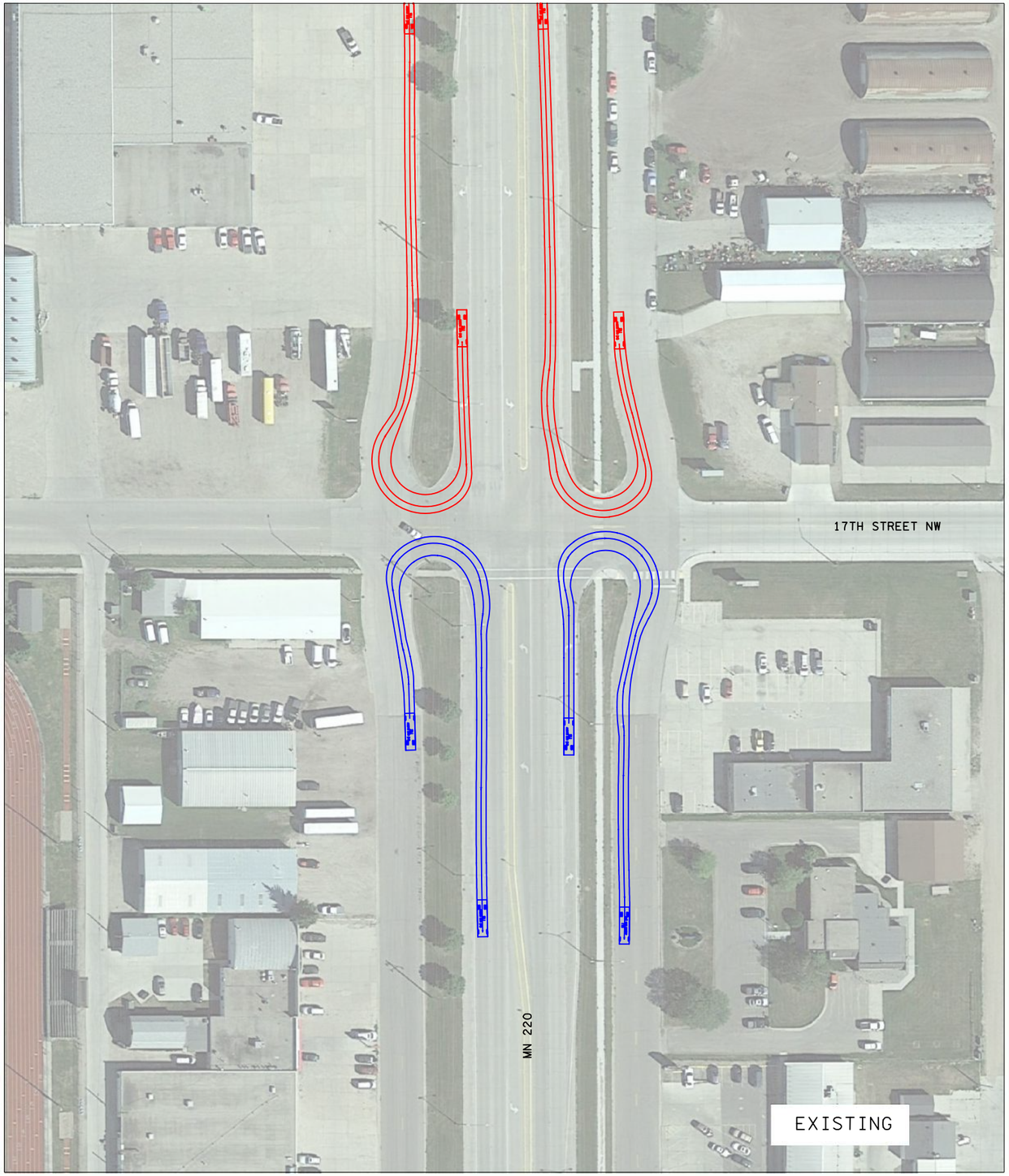
MN 220 Corridor Study

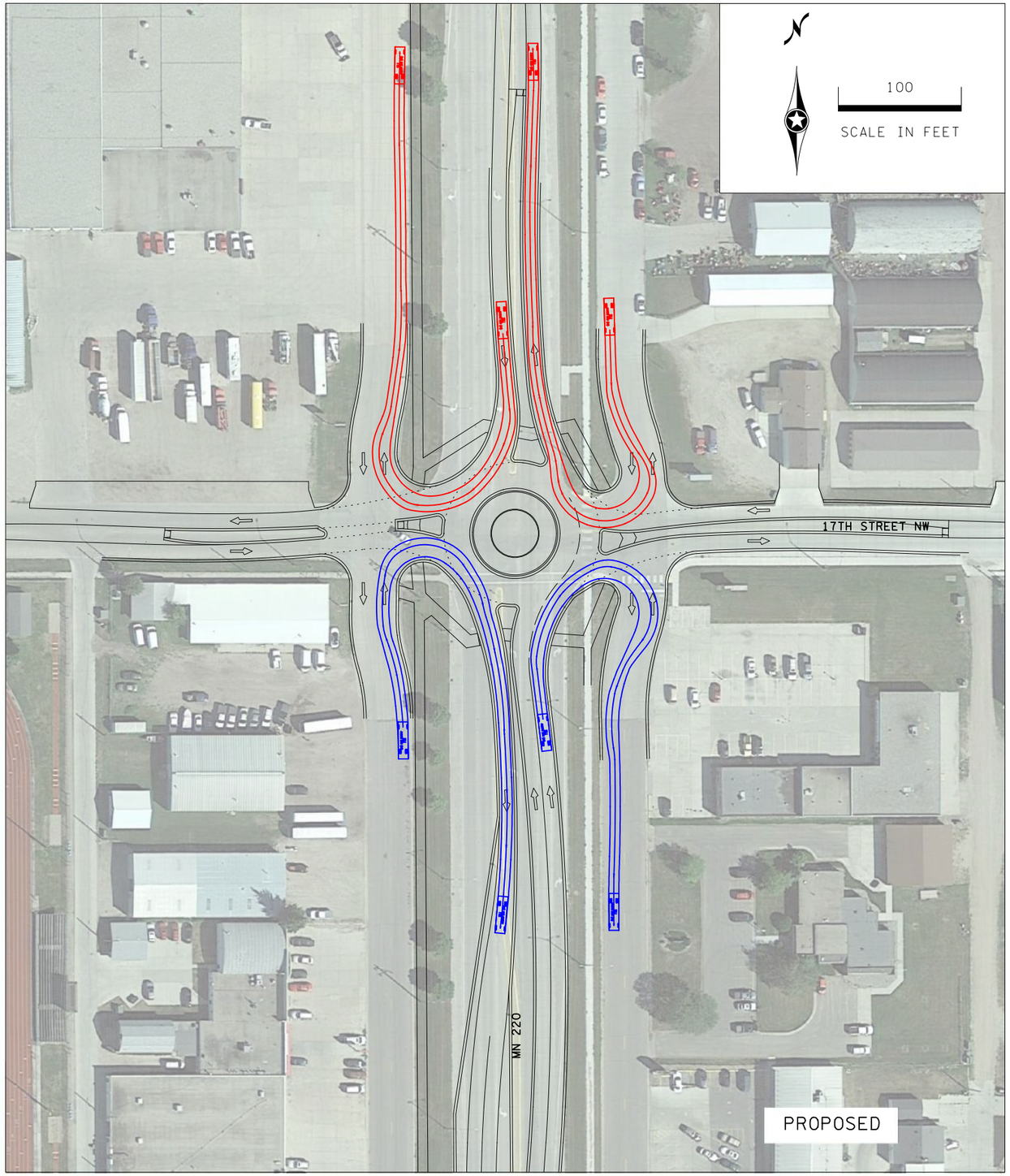
ALLIANT ENGINEERING

WB 67 Left Turn Movements

WB 67 Right Turn Movements

MN 220/17th Street NW
WB 67 Turn Movements





MN 220 Corridor Study

ALLIANT ENGINEERING

MN 220/17th Street NW
SU Double Right Turn Movements

MN 220 Corridor Study

ALLIANT ENGINEERING

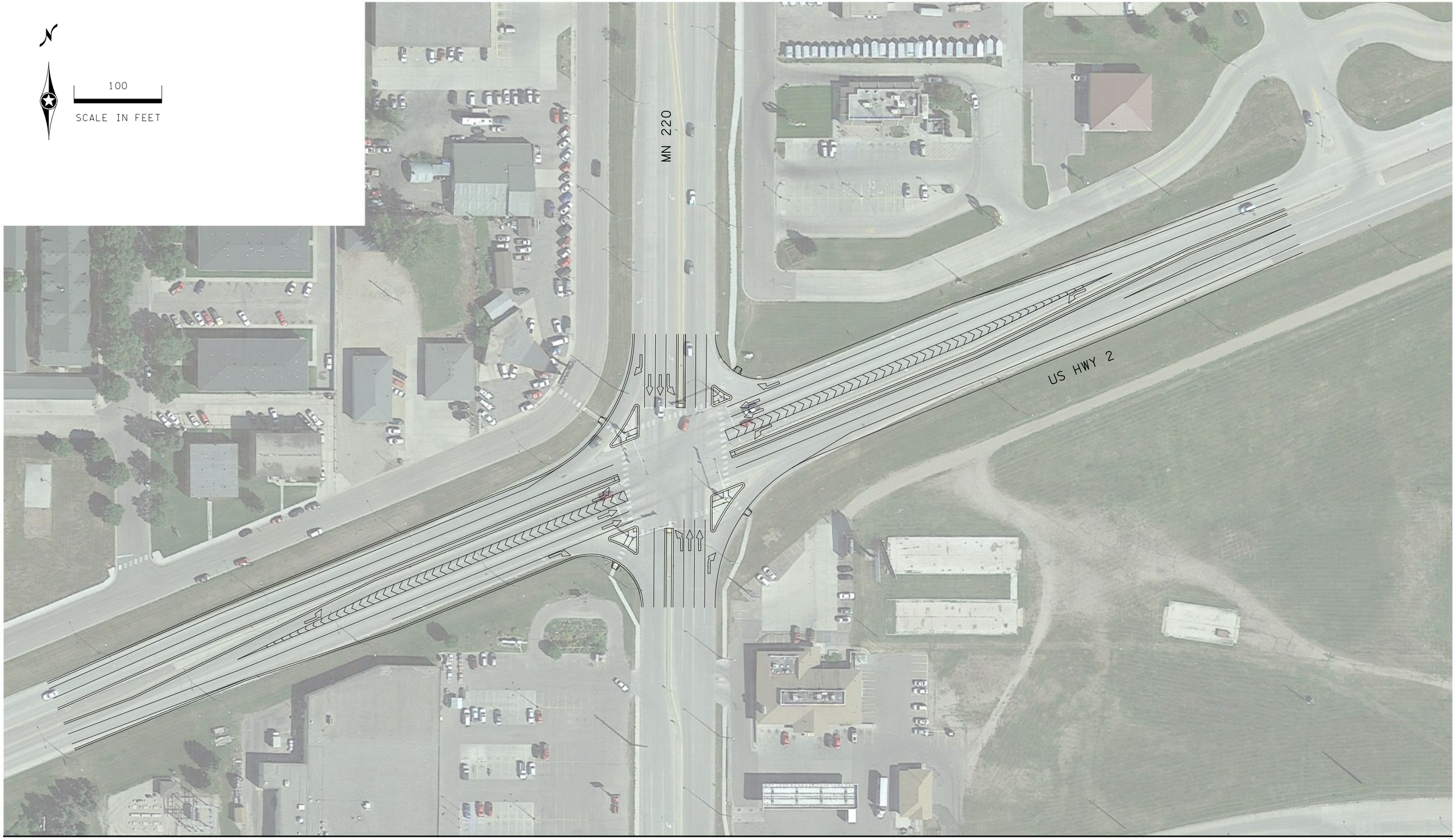
MN 220/15th Street NE

Alternative A - 3 / 4 Access Configuration with Pedestrian Crossing

N

100

SCALE IN FEET



MN 220 Corridor Study

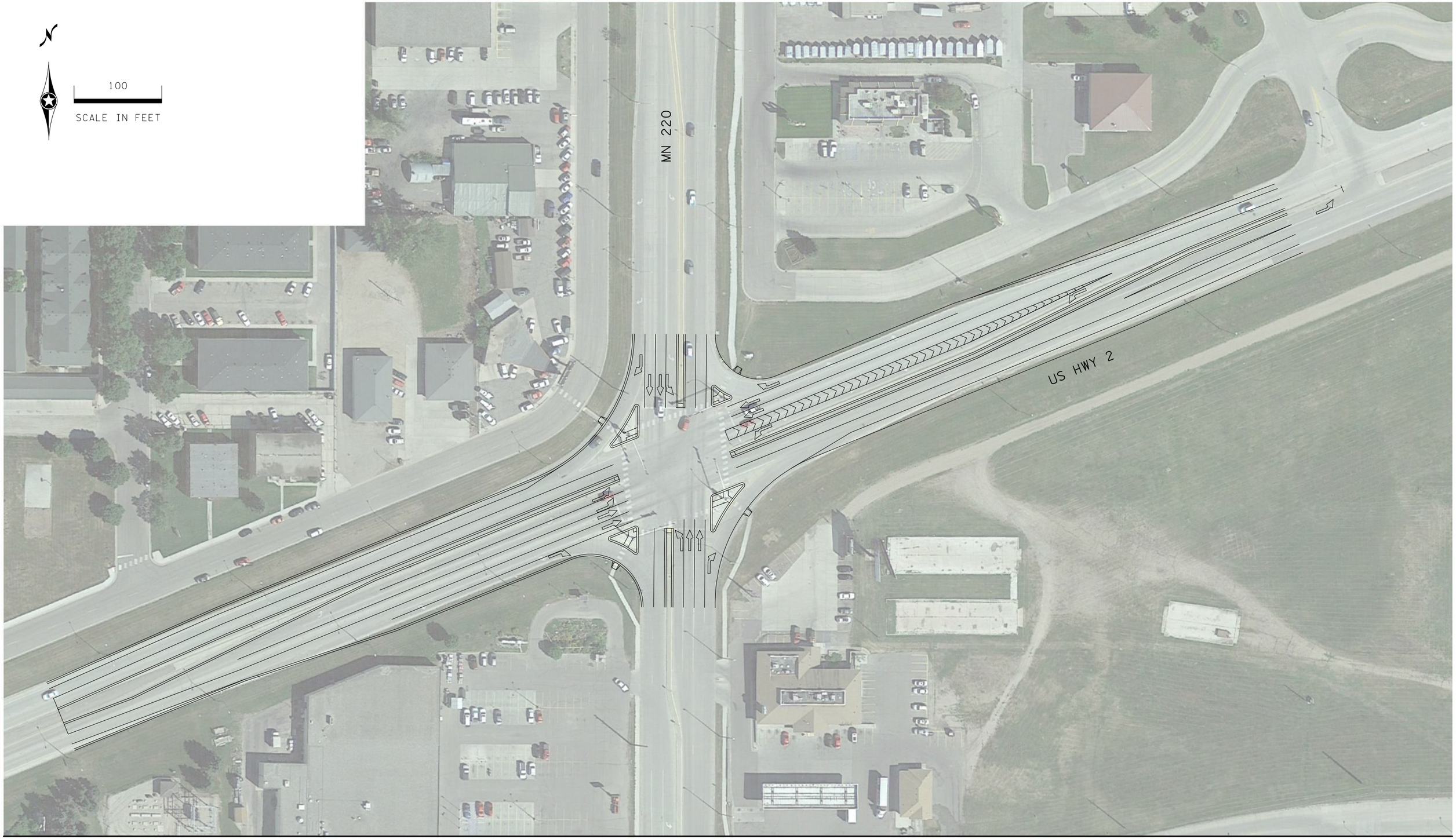
ALLIANT ENGINEERING

MN 220/US HWY 2
Alternative A-0 - Offset Left Turn Lanes

N

100

SCALE IN FEET



MN 220 Corridor Study

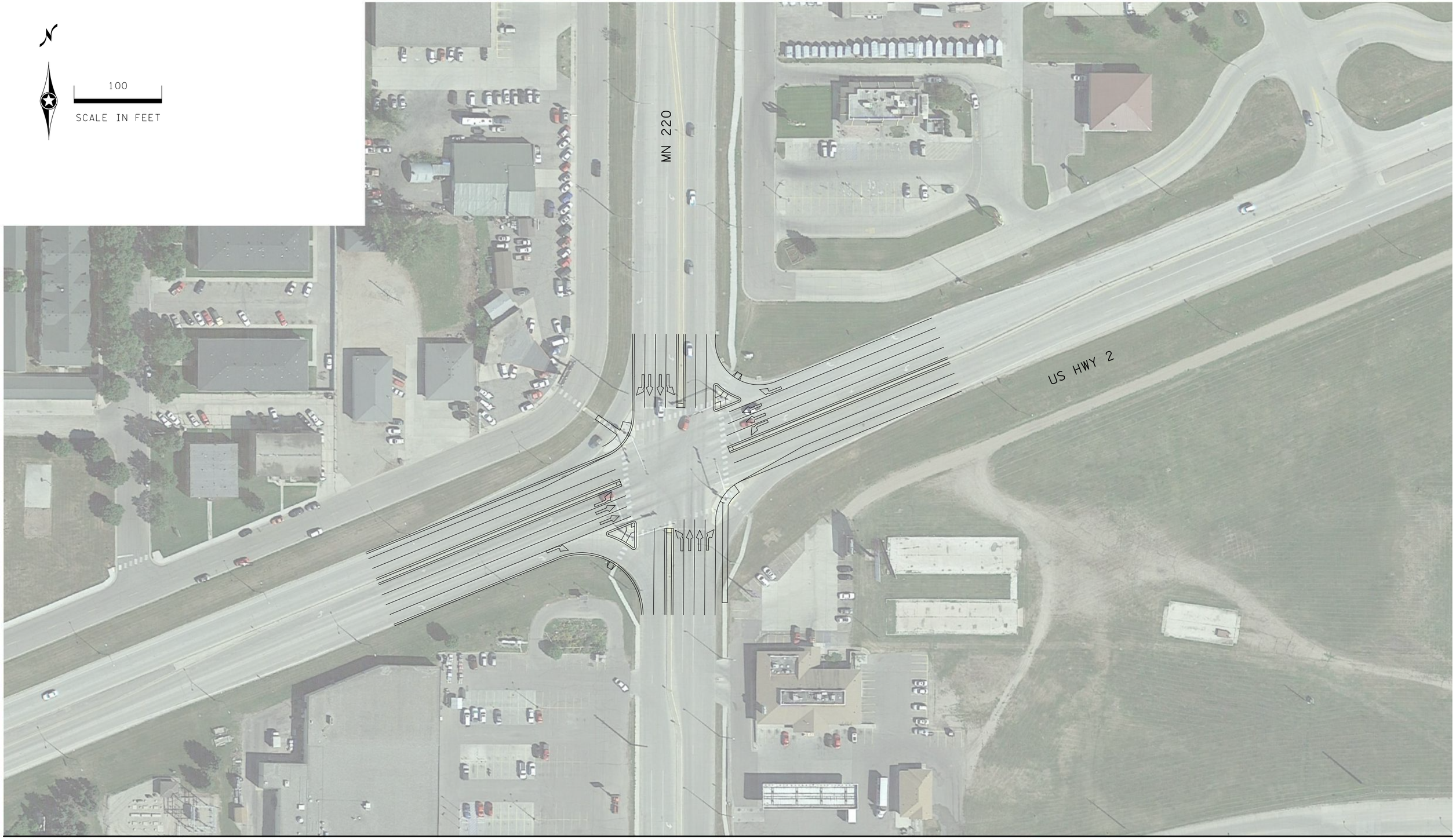
ALLIANT ENGINEERING

MN 220/US HWY 2
Alternative A-1 - Dual EB Left Turn Lanes

N

100

SCALE IN FEET



MN 220 Corridor Study

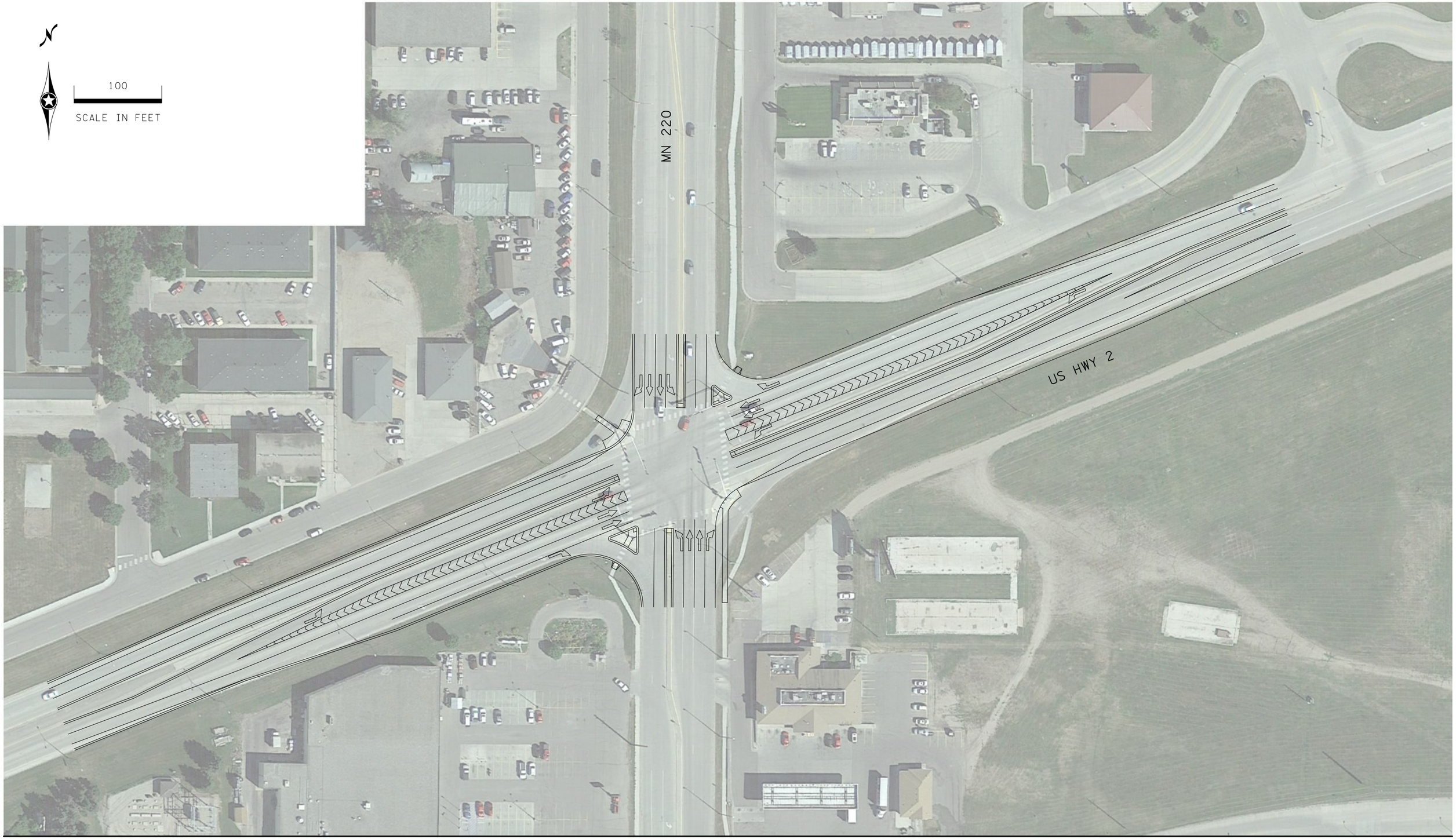
ALLIANT ENGINEERING

MN 220/US HWY 2
Alternative A-2 - Right Turn Lane Improvements

N

100

SCALE IN FEET



MN 220 Corridor Study

ALLIANT ENGINEERING

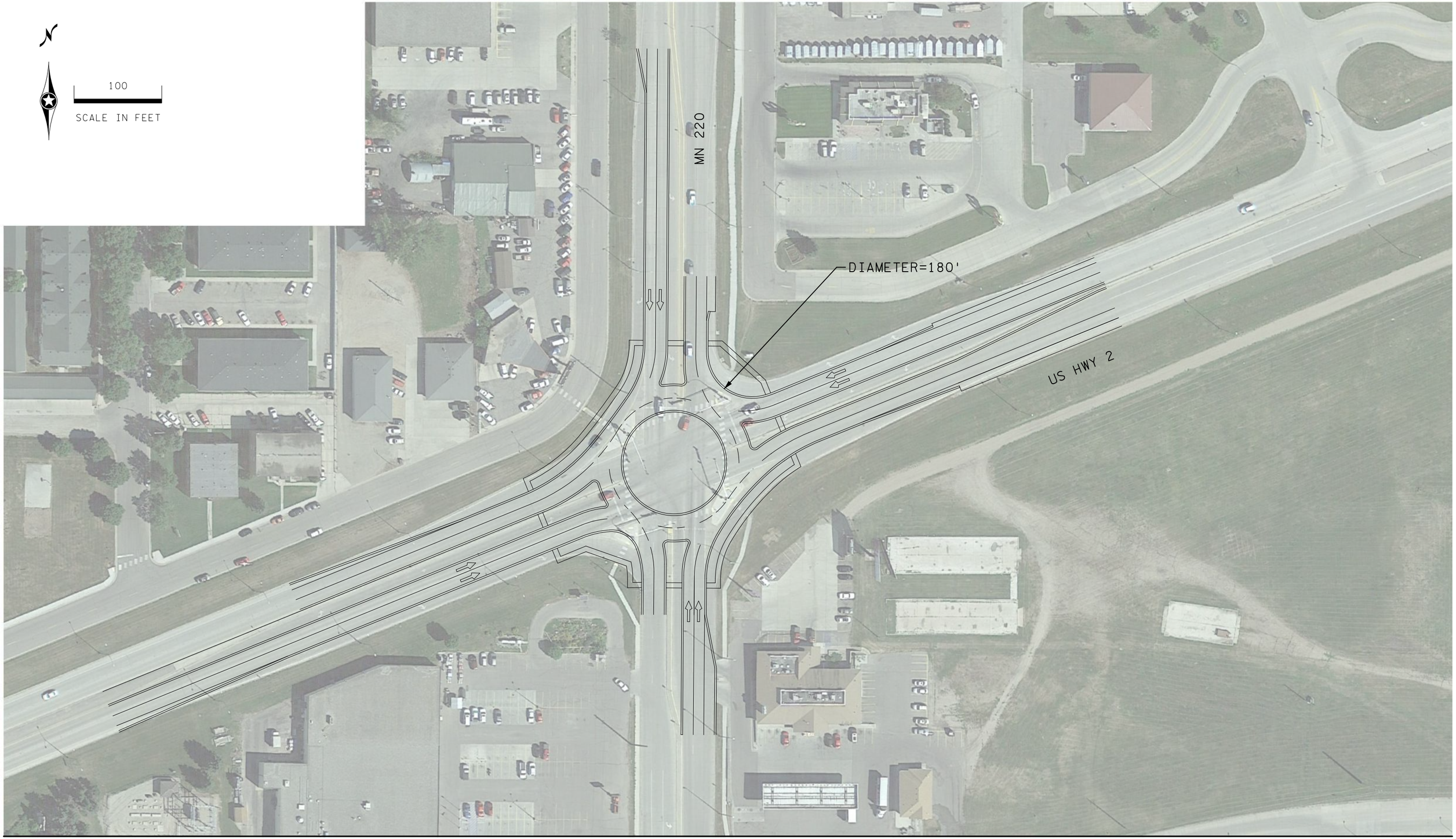
MN 220/US HWY 2

Alternative A-3 Offset Left Turn Lanes & Right Turn Lane Improvements

N

100

SCALE IN FEET



MN 220 Corridor Study

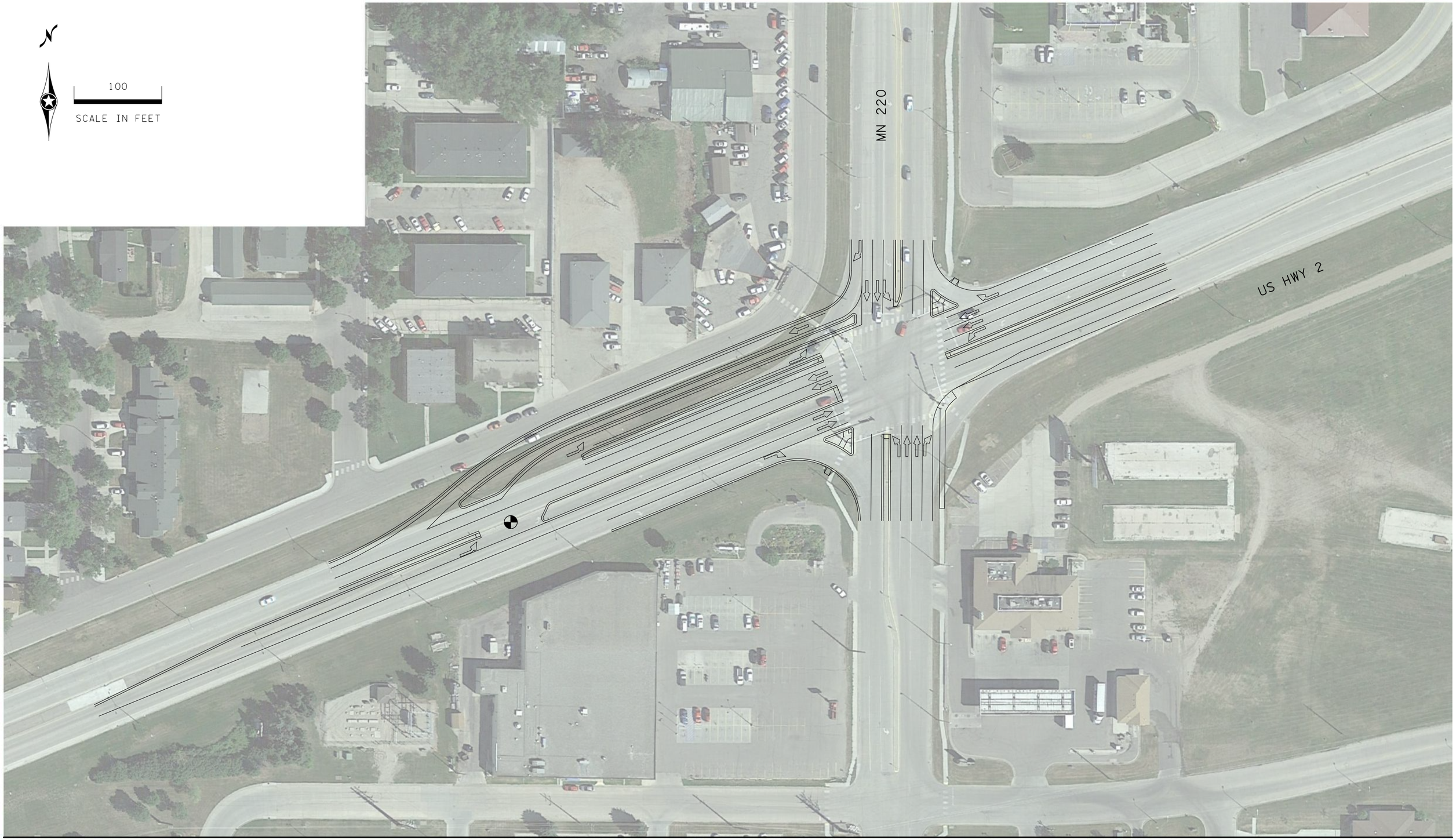
ALLIANT ENGINEERING

MN 220/US HWY 2
Alternative B - Multilane Roundabout

N

100

SCALE IN FEET



MN 220 Corridor Study

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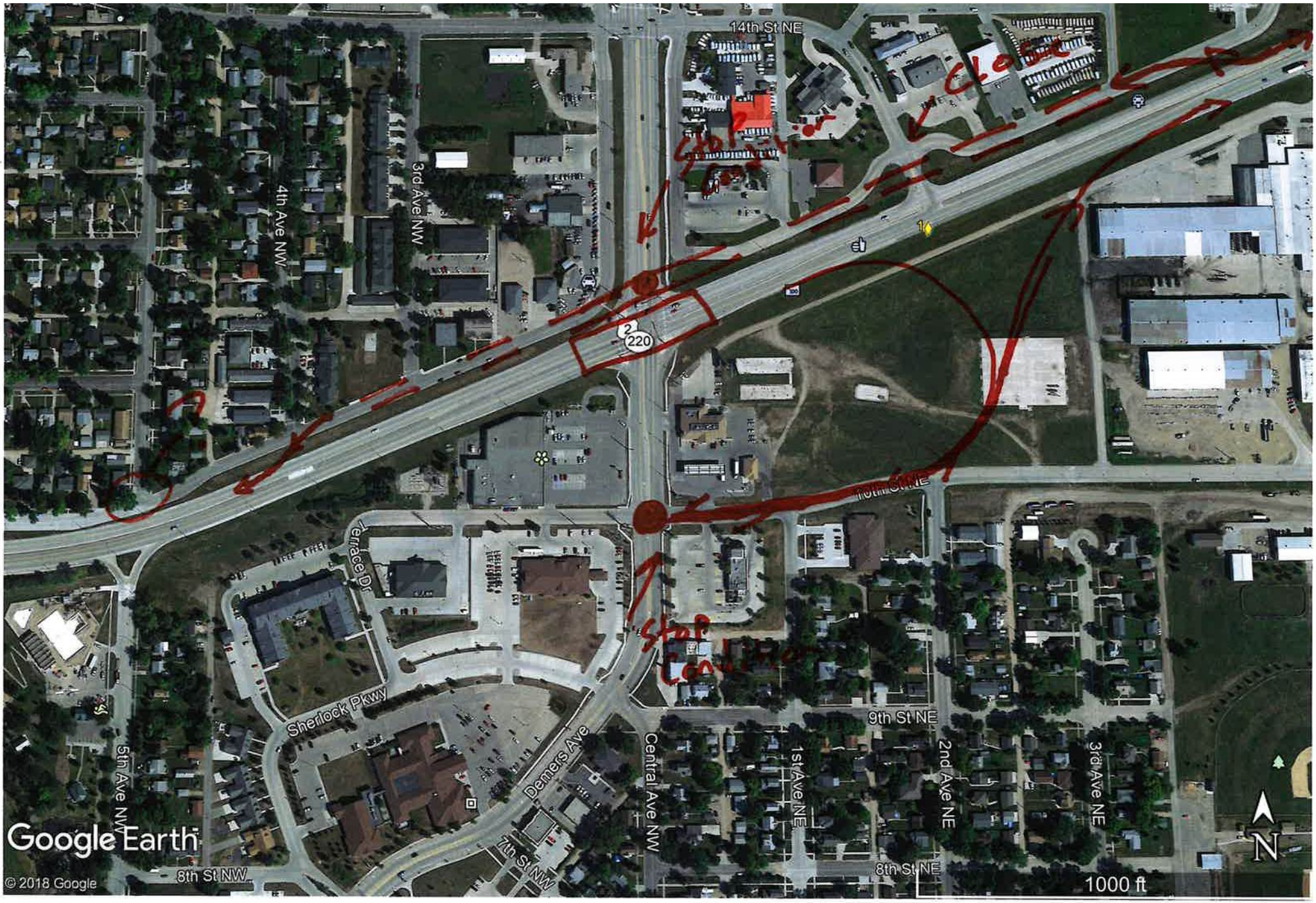
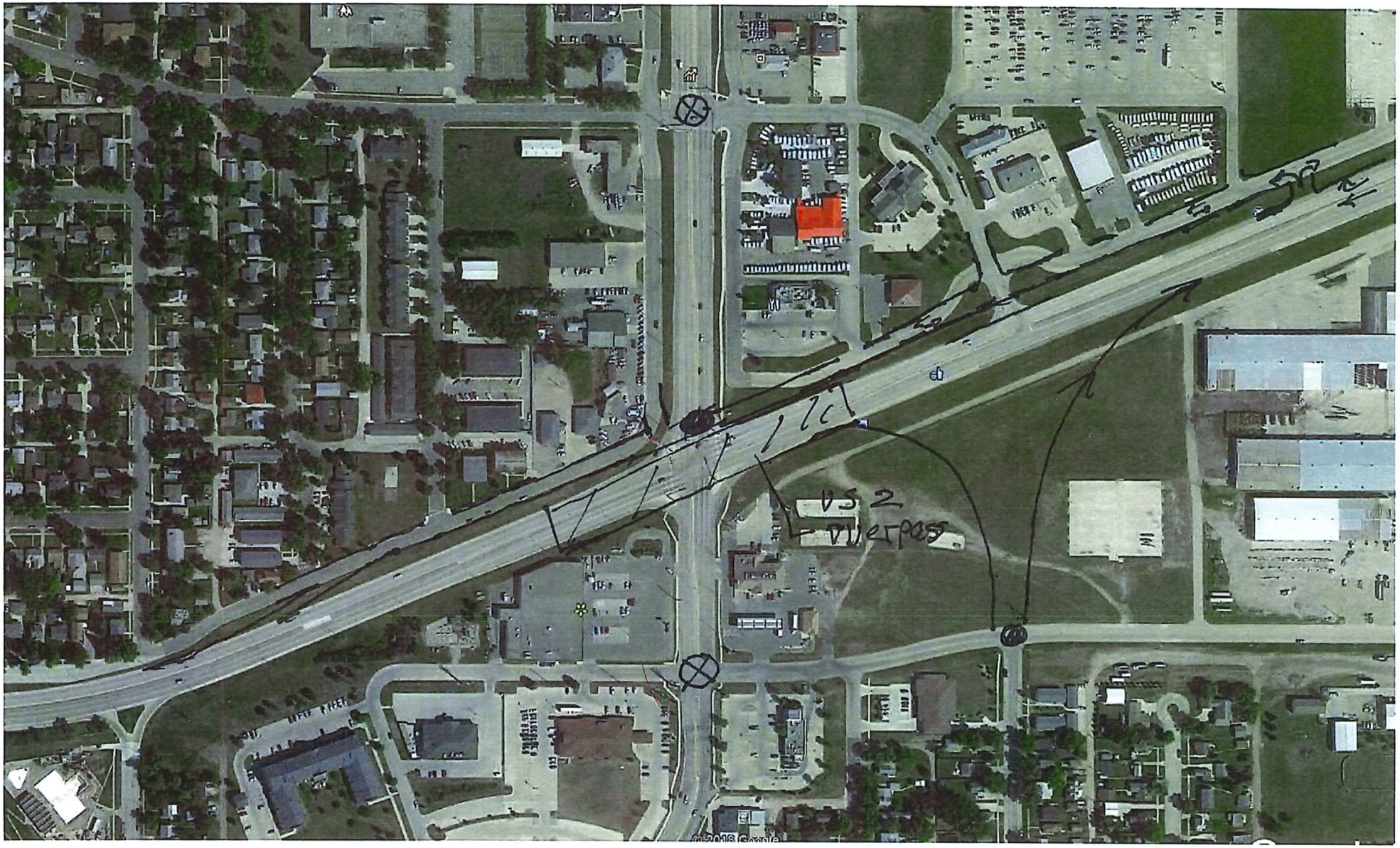
MN 220/US HWY 2
Alternative C - Displaced Left Turn lane



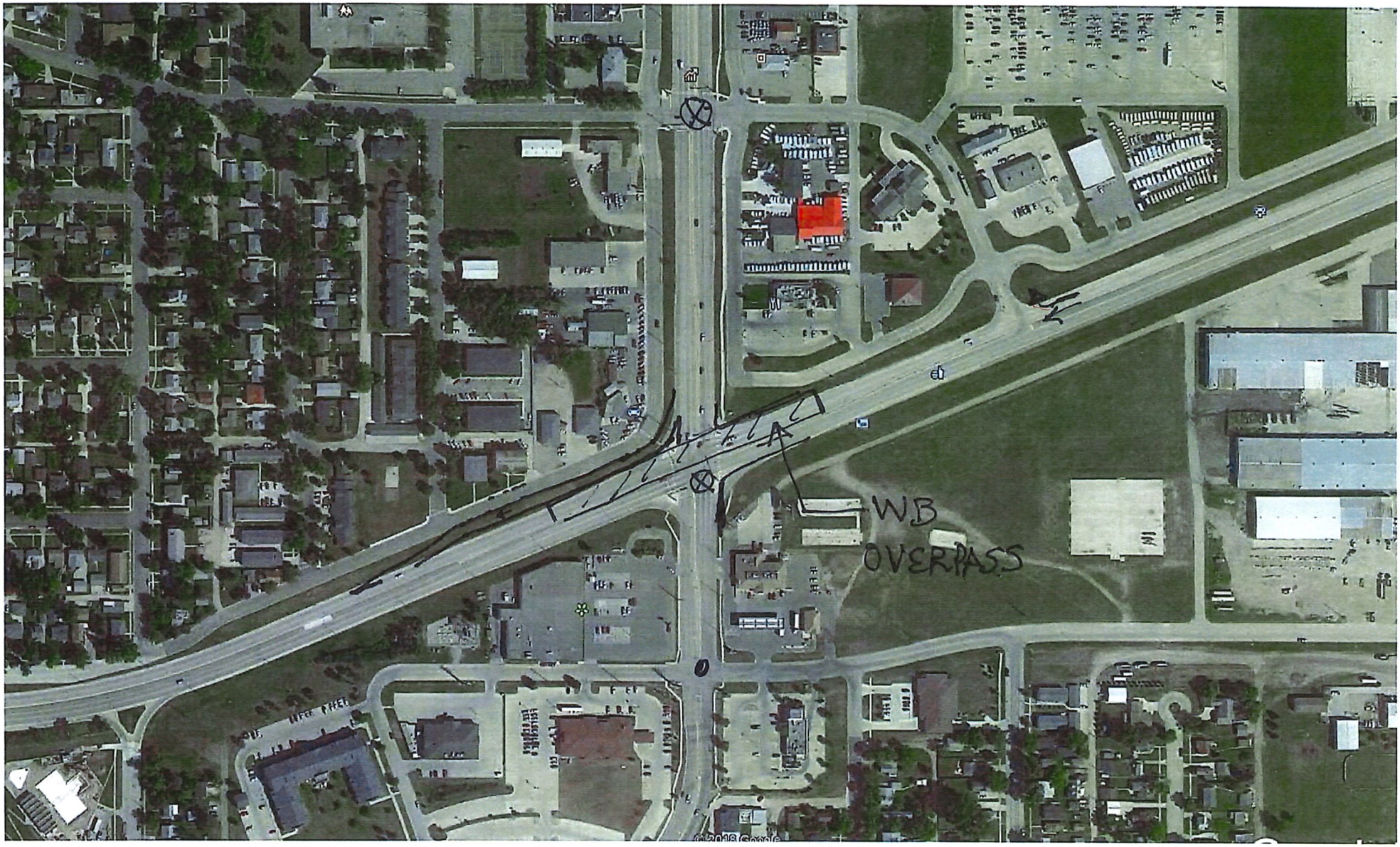
MN 220/US HWY 2
Alternative D - Grade Separation
(Tight Diamond)



⊗ Signal

◎ Thru-Stop

MN 220/US HWY 2
Alternative D-2 - Grade Separation
(Partial Ramps)



⊗ Traffic Signal
◎ Thru - Stop

MN 220/US HWY 2
Alternative D-3 - Grade Separation
(Westbound Overpass)

MN 220 Corridor Study

ALLIANT ENGINEERING

9th Street NE/10th Street NE
Alternative 1 - Restriping