TH 47 and TH 65 Road Safety Audit: Technical Report - DRAFT

Anoka-Hennepin County Limit to TH 10

Minnesota Department of Transportation (MnDOT) Metro District

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Report Prepared By HDR (October 2018)

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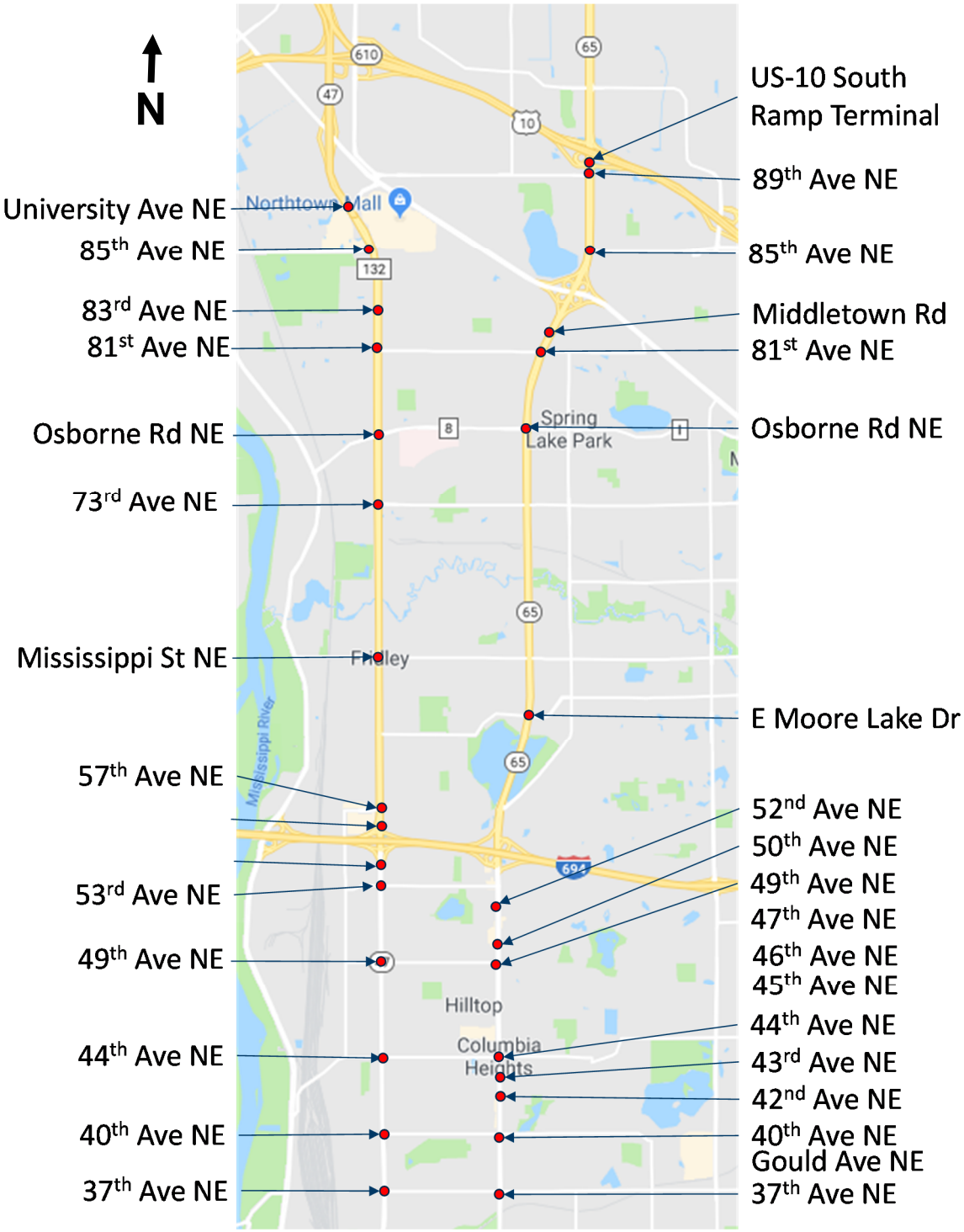
Executive Summary

This report discusses the findings of a road safety audit that took place on the two, parallel 7.5-mile-long corridors of Trunk Highway 47 (TH 47) and Trunk Highway 65 (TH 65), from the Anoka and Hennepin County line to south of the Trunk Highway 10 (TH 10) interchange in the northern Twin Cities metropolitan region. A road safety audit is a three-step study where a road is observed for unusual crash trends through data analysis. A field visit is conducted to identify deficiencies and other safety risks and then safety solutions and recommendations are provided to increase the safety of a corridor. The need for a road safety audit was triggered in response to a high number of crashes. Fatal and severe crashes (especially pedestrian-related) are a concern at many intersections along these corridors.

Table ES-1 summarizes the recommendations for safety solutions along the corridors. These recommendations were developed from the road safety audit review process. See Section 4.2 for descriptions of solutions for corridor-wide improvements, as well as improvements to specific locations. See Figure ES-1 for an overview of the key intersections evaluated along the corridors. Key intersections were determined based on historical crash data collected between January 1, 2013 and March 15, 2015; if a pedestrian crash occurred during this study period or if crash rates were determined to be a statistically significantly high compared to statewide averages, an intersection was considered to be a key intersection. See Section 2.4 for more background on the determination of key intersections.

This report consists of an evaluation of the corridor backgrounds, a summary of crash data trends, an overview of the field review process, suggested improvement strategies, and an overview of the road safety audit team recommendations. Appendix A provides a glossary of commonly referenced acronyms and abbreviations. In addition to this report, see *TH 47 and TH 65 Road Safety Audit Briefing Book (September 10 and 11, 2018)* for background information and crash data on the corridors.

Figure ES-1: Key Intersections along TH 47 and TH 65



Source: Google Maps™ mapping service. August 2018.

Table ES-1: Summary of Corridor-wide Recommended Solutions

Short-Term (0 to 5 years)

1. Create a Toward Zero Deaths Coalition and/or Corridor Coalition(s) to prioritize safety on TH 47 and TH 65.
    a) Identify an advocate to lead the coalition(s) and efforts

2. Implement active traffic law enforcement
    a) Strategize key enforcement locations and hours based off historical crash trends and risk factors.
        i. Prioritize non-compliance with traffic control devices, including non-motorized traffic. Prioritize enforcement to dissuade speeding and red light running for left turns.
    b) Consider red light running cameras and blue light enforcement at prioritized signals and actively enforce non-compliance with traffic control devices.
    c) Seek additional funding sources to support added enforcement.

3. Conduct education outreach
    a) Consider temporary signs (or changeable message signs), local papers, social media, etc. Consider ways to create an education campaign and use it with some expected frequency, for example, an issue or reminder of the month. Encourage local schools, enforcement, and transit agencies to promote safety education initiatives. Reference successful education campaigns by other coalitions such as the Highway 12 Safety Coalition, a coalition that was formed in 2014 in response to a high number of fatal crashes on Highway 12, just west of the Twin Cities Metropolitan region.

4. Implement the following recommendations for corridor lighting:
    a) Evaluate lighting levels at intersections with pedestrian crossings, including unsignalized intersections and marked and unmarked crossings. Install and upgrade lighting as needed. Prioritize locations with high number of non-daylight collisions (see Minnesota Department of Transportation's (MnDOT's) nighttime warrant analysis).
    b) Install pedestrian-grade lighting at prioritized bus stops along the corridors.
    c) Identify source of power and funding sources for lighting upgrades and additions.
    d) Implement active maintenance of street lights, have enforcement notify MnDOT when they see burnt out lights.

<u>Key TH 47 Intersections:</u>

- 49th Avenue NE (intersection and bus stop)
- 57th Avenue NE (at TH 47 and at 3rd Street)
- 81st Avenue NE (intersection and bus stop)
- 83rd Avenue NE (intersection)
- 85th Avenue NE (intersection)

<u>Key TH 65 Intersections:</u>

- 37th Avenue NE (intersection)
- Gould Avenue NE (intersection)
- 40th Avenue NE (intersection)
- 42nd Avenue NE (intersection)
- 43rd Avenue NE (intersection)
- 46th Avenue NE (intersection)
- 46 ½ Avenue NE (intersection; was noted during field review while evaluating 46th Avenue NE)
- Osborne Road NE (intersection)
- 81st Avenue NE (pedestrian bridge)

Short-Term (0 to 5 years)

5. Implement the following recommendations for crossing treatments:
    a) Use high visibility crosswalk markings and appropriately place markings to avoid car wheel paths, which can cause accelerated wear and tear on the markings.
    b) Consider installing advanced stop lines and/or R10-15a – "TURNING VEHICLES STOP FOR PEDESTRIANS" signs on prioritized signalized approaches. Consider using blank out signs at signals.
    c) Use MnDOT *Traffic Engineering Manual*, Chapter 13 (http://www.dot.state.mn.us/trafficeng/publ/tem/2015/chapter13.pdf) to evaluate whether a marked crosswalk should be installed at unsignalized intersections. Use guidance from Federal Highway Administration's (FHWA's) *Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations* (https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/pocket_version.pdf) to assess potential crossing enhancements.
        i. Consider installing Rectangular Rapid Flashing Beacon (RRFB) system at prioritized unsignalized crossings.
    d) Actively maintain markings (especially crosswalks) so that they maintain visibility for drivers and pedestrians.

Key TH 47 Intersections:

- 44th Avenue NE (add crosswalk on east leg, maintain striping)
- 49th Avenue NE (add marked crosswalk on east and west leg, maintain striping, install stop bar on east leg)
- 53rd Avenue NE (add crosswalk on east leg)
- 57th Avenue NE (add crosswalk on west leg at 3rd Street)
- Mississippi Street NE (restripe crosswalk)
- 81st Avenue NE (add crossing on north leg)
- 83rd Avenue NE (add crossing on south leg, consider RRFB)
- 85th Avenue NE (add crosswalk on channelized right turns)
- University Avenue NE (add marked crossings across TH 47)

Key TH 65 Intersections:

- Gould Avenue NE (add RRFB)
- 40th Avenue NE (upgrade to enhanced crosswalk markings)
- 42nd Avenue NE (add RRFB)
- 43rd Avenue NE (add RRFB)
- 46th Avenue NE (add RRFB or pedestrian pre-emption)
- 46 ½ Avenue NE (add RRFB or pedestrian pre-emption; was noted during field review while evaluating 46th Avenue NE)

6. Implement the following recommendations to reduce crossing distances where possible:
    a) Install curb bump outs where possible to reduce crossing distance.
    b) Evaluate if all lanes are necessary and evaluate road widths, use extra width for curb bump outs, bike lanes, etc.
    c) Restripe roadways with wider edge lines to help narrow lanes and minimize lane departure.
    d) Evaluate on-street parking needs and eliminate where feasible to allow for more bike lanes, wider sidewalks, curb bump outs, etc.
    e) Provide mid-crossing refuge for pedestrians as deemed appropriate.

Short-Term (0 to 5 years)

Key TH 47 Intersections:

- 37th Avenue NE (curb bump outs and lane reduction)
- 40th Avenue NE (curb bump outs and lane reduction)
- 44th Avenue NE (reduce side street pavement width)
- 49th Avenue NE (reduce side street pavement width)
- 53rd Avenue NE (reduce side street pavement width)
- 57th Avenue NE (remove northbound right-turn lane flare, lane reduction)
- Mississippi Street NE (reduce lanes)
- 73rd Avenue NE (reduce lanes)
- Osborne Road NE (lane reduction, mid-crossing refuge)
- 81st Avenue NE (lane reduction)
- 83rd Avenue NE (shorten crossing distance and mid-crossing refuge)
- 85th Avenue NE (lane reduction)
- University Avenue NE (lane reduction)

Key TH 65 Intersections:

- 37th Avenue NE (curb bump outs and mid-crossing refuge)
- Gould Avenue NE (curb bump outs)
- 40th Avenue NE (lane reduction, curb bump outs, and mid-crossing refuge)
- 42nd Avenue NE (curb bump outs)
- 43rd Avenue NE (curb bump outs)
- 44th Avenue NE (curb bump outs)
- 46th Avenue NE (curb bump outs, mid-crossing refuge, shorten left turn lanes)
- 46 ½ Avenue NE (curb bump outs, mid-crossing refuge, shorten left turn lanes; was noted during field review while evaluating 46th Avenue NE)
- 47th Avenue NE (curb bump outs and mid-crossing refuge)
- 50th Avenue NE (curb bump outs, reduce lanes)
- E Moore Lake Drive (lane reduction)
- Osborne Road NE (lane reduction)
- 81st Avenue NE (lane reduction)
- 85th Avenue NE (lane reduction)

7. Examine the length of corridor for more opportunities to make roads more pleasant and calm traffic.
    a) Identify and engage truck companies to determine which roads need to be designed for and accommodate large trucks. Through conversations with truck companies, identify opportunities and tradeoffs to balance large oversized vehicles with providing a safe, usable, and functional environment for small vehicles and pedestrians and bicyclists.
        i. Look at performance-based practical design (https://www.fhwa.dot.gov/design/pbpd/general_information/faqs.cfm) or design vehicles (frequent user) versus control vehicles (an infrequent large user) to achieve optimal intersection performance.
    b) Design intersection corners with tightened radii to slow down turns at intersections that do not have regular truck traffic. Consider adding truck apron if needed.
    c) Extend median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment).
    d) Improve look of unpleasant bus stops to be more inviting to commuters and to make more people want to choose public transit options.
    e) Evaluate corner sight distances for visibility of crosswalks from the perspective of turning vehicles and clear corners of visual barriers as appropriate.

Short-Term (0 to 5 years)

Key TH 47 Intersections:

- 37th Avenue NE (tighten corner radii)
- 44th Avenue NE (tighten corner radii, extend median noses, evaluate sightlines)
- 49th Avenue NE (tighten corner radii, extend median noses, evaluate sightlines)
- 53rd Avenue NE (tighten corner radii, extend median noses, evaluate sightlines)
- 57th Avenue NE (tighten corner radii)
- Mississippi Street NE (tighten corner radii, extend median noses)
- 73rd Avenue NE (tighten corner radii, extend median noses)
- Osborne Road NE (tighten corner radii, extend median noses)
- 83rd Avenue NE (tighten corner radii, extend median noses)
- 85th Avenue NE (add raised curb and gutter to northwest corner)
- University Avenue NE (evaluate sightlines)

Key TH 65 Intersections:

- 37th Avenue NE (extend median noses)
- Gould Avenue NE (extend median noses, increase sidewalk and boulevard width)
- 42nd Avenue NE (extend median noses, evaluate sightlines)
- 43rd Avenue NE (extend median noses)
- 44th Avenue NE (evaluate sightlines)
- 45th Avenue NE (extend median noses, evaluate sightlines)
- 46th Avenue NE (tighten corner radii, extend median noses)
- 49th Avenue NE (tighten corner radii)
- 50th Avenue NE (tighten corner radii, extend median noses)
- 52nd Avenue NE (tighten corner radii, extend median noses)
- E Moore Lake Drive (tighten corner radii, extend median noses)
- Osborne Road NE (tighten corner radii, extend median noses)
- 81st Avenue NE (tighten corner radii)
- 85th Avenue NE (tighten corner radii, extend median noses)
- 89th Avenue NE (tighten corner radii, extend median noses)

8. Implement the following recommendations for traffic signals:
    a) Evaluate extending crossing time for pedestrians at signalized intersections to allow time for pedestrians to pause for conflicts such as turning vehicles. Prioritize those that have regular use by limited mobility transit users or those that have a school nearby.
    b) Evaluate adjusting signal cycle length to reduce wait times for pedestrians.
    c) Evaluate placing signals on pedestrian recall for side street crossings. Consider doing this on mainline as well if the crossing has high pedestrian use and/or crash exposure risk.
    d) Evaluate signal phasing, which increases pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing especially at high-risk crash exposure locations.
    e) Evaluate locations to restrict right turns on red; implement and enforce. Prioritize intersections with low sightlines and intersections with LPI phasing. Consider using a blank out sign for time of day restriction.
    f) Consider changes in signal timing to encourage lower speeds, potentially along TH 47 north of 53rd Avenue NE and TH 65 south of 53rd Avenue NE.
    g) If appropriate, use “signal set for XX mph” signs to encourage motorists to avoid speeding up to slow/stop.
        i. Consider dynamic based on time of day

Short-Term (0 to 5 years)	
Key TH 47 Intersections: • 37th Avenue NE (LPI and/or POOFYA) • 44th Avenue NE (restrict right turn on red for westbound) • 49th Avenue NE (restrict right turn on red for westbound) • 53rd Avenue NE (restrict right turn on red for westbound) • 57th Avenue NE (LPI and/or POOFYA) • Mississippi Street NE (extend crossing times, restrict right turn on red for westbound) • 73rd Avenue NE (extend crossing times, pedestrian recall on side street, LPI and/or POOFYA) • Osborne Road NE (LPI and/or POOFYA) • 81st Avenue NE (LPI and/or POOFYA) • 85th Avenue NE (extend crossing times)	Key TH 65 Intersections: • 37th Avenue NE (extend crossing times, reduce pedestrian wait times, LPI and/or POOFYA) • 40th Avenue NE (extend crossing times, reduce pedestrian wait times, LPI and/or POOFYA) • 44th Avenue NE (LPI and/or POOFYA) • 45th Avenue NE (LPI and/or POOFYA) • 50th Avenue NE (LPI and/or POOFYA) • E Moore Lake Drive (LPI and/or POOFYA) • Osborne Road NE (LPI and/or POOFYA) • 81st Avenue NE (LPI and/or POOFYA, restrict right turn on red) • 85th Avenue NE (reduce pedestrian wait times, LPI and/or POOFYA)
9. Implement the following recommendations to provide accessible routes for all road users: a) Assess intersections for Americans with Disability Act (ADA) compliance for ramps and pedestrian signal equipment and update accordingly. b) Work with private property owners to pave existing dirt walking paths that indicate frequent pedestrian travel routes to and from surrounding land parcels. c) Where not already in place, provide ADA accessible routes to bus stops from the nearby intersection. i. Install curb at all bus stops that do not already have curb to provide separation from the roadway.	

Short-Term (0 to 5 years)

Key TH 47 Intersections:

- 44th Avenue NE (evaluate audible levels for pedestrian timers)
- 49th Avenue NE (provide ADA compliant crossing on east leg)
- 53rd Avenue NE (provide ADA compliant crossing on east leg, evaluate audible levels for pedestrian timers)
- Interstate 694 (I-694) South Ramp Terminal (provide ADA accessible route)
- I-694 North Ramp Terminal (provide ADA accessible route)
- 57th Avenue NE (provide more direct routes in southwest and northeast corners)
- Mississippi Street NE (provide connection to northwest parking lot)
- 73rd Avenue NE (provide connections in northeast corner and add curb to bus stop)
- Osborne Road NE (add ADA upgrades to curb ramps, provide connections and add curb to bus stops)
- 81st Avenue NE (define pedestrian space using raised curb, provide connections to bus stops)
- 85th Avenue NE (repair south pedestrian timer, provide connections to surrounding land uses)
- University Avenue NE (provide ADA accessible route through intersection)

Key TH 65 Intersections:

- 37th Avenue NE (add ADA upgrades to intersection, repair pavement)
- 43rd Avenue NE (add connection to northwest bus stop)
- 45th Avenue NE (remove structure in northwest corner)
- 46th Avenue NE (add ADA crossing over TH 65)
- 46 ½ Avenue NE (add ADA crossing over TH 65)
- 47th Avenue NE (add ADA crossing on north leg)
- 49th Avenue NE (add at-grade ADA crossing on north leg and south leg, provide connections to businesses)
- 85th Avenue NE (connect to northwest bus stop)
- 89th Avenue NE (connect to frontage road in south corners)

10. Where possible, use temporary methods to implement medium term-solutions on a faster timeline. Install more permanent solutions in the medium-term.

Medium-Term (5 to 10 years)

11. Consider the following for future projects:
    a) Implement safety edge treatment on sections without curb and gutter (include in future pavement projects).
    b) Add retro-reflective back plates to signal heads at intersections that are in low lighting segments of the corridors (increases visibility of signal indications). Install as signal upgrades are made.
    c) Consider adding a signal head over every through lane.

Medium-Term (5 to 10 years)	
Key TH 47 Intersections: • 85th Avenue NE (add retro-reflective back plates)	Key TH 65 Intersections: • 37th Avenue NE (add signal heads over each lane) • 40th Avenue NE (add signal heads over each lane) • 44th Avenue NE (add signal heads over each lane) • E Moore Lake Drive (add signal heads over each lane) • Osborne Road NE (add signal heads over each lane) • 89th Avenue NE (add retro-reflective back plates, signal heads over each lane) • TH 10 South Terminal (add retro-reflective back plates)

12. Develop an access management plan and start implementation of the plan.
    a) Use MnDOT *Access Management Manual (https://www.dot.state.mn.us/accessmanagement/resources.html)* for guidance.
    b) Assess driveway access density and consolidate as feasible to meet access guidelines. Prioritize regions near pedestrian crossings.
    c) Evaluate access of closely spaced frontage road intersections and parallel roads. Consider restricting access to right-in and right-out and/or modifying intersection geometry to provide more clarity of pedestrian and vehicle space.
        i. Tighten up corner radii
        ii. Provide pedestrian crossing between mainline and frontage road intersections and provide a raised median refuge. Consider raising the crossing.
        iii. Consider installing do not block the box striping to allow the frontage road intersection to remain clear.
    d) Consider restricting access to right-in and right-out only or ¾ intersections, especially at unsignalized intersections.
    e) At signalized intersections, consider signalized Reduced Conflict Intersections (RCIs).
    f) Consider pedestrians and bicyclists when developing this access management plan. Pedestrians and bicyclists should be included in all traffic impact assessments.

Medium-Term (5 to 10 years)	
Key TH 47 Intersections: • 44th Avenue NE (frontage road) • 49th Avenue NE (frontage road) • 53rd Avenue NE (frontage road) • 57th Avenue NE (3/4 access) • Mississippi Street NE (frontage road) • Osborne Road NE (frontage road) • 83rd Avenue NE (frontage road, median u-turn with HAWK signal)	Key TH 65 Intersections: • Gould Avenue NE (right-in and right-out or ¾ access) • 42nd Avenue NE (evaluate driveway access, right-in and right-out or ¾ access) • 43rd Avenue NE (evaluate driveway access, right-in and right-out or ¾ access) • 45th Avenue NE (3/4 access) • 46th Avenue NE (right-in and right-out or ¾ access or full closure) • 49th Avenue NE (right-in and right-out or ¾ access) • 50th Avenue NE (evaluate driveway access) • 52nd Avenue NE (3/4 access with u-turns) • Osborne Road NE (RCI) • 81st Avenue NE (evaluate Buchanan Street access) • 89th Avenue NE (right-in and right-out or ¾ access and u-turns)
13. Develop and implement a pedestrian and bicyclist network plan **a)** Evaluate gaps in the pedestrian and bicycle network. Prioritize communities that have higher percentages of households with no vehicles and areas with high transit use. **b)** Provide pedestrian connections that are convenient and have direct access to businesses, bus stops, and other key pedestrian origins and destinations.	

Medium-Term (5 to 10 years)

Key TH 47 Intersections:

- 37th Avenue NE (connect shared use path south to Minneapolis trail network)
- 40th Avenue NE (complete streets upgrades on 40th)
- 40th Avenue NE to I-694 (improve first and last mile connections to service road)
- 44th Avenue NE (connect to Mississippi River Trail (MRT) to the west of TH 47)
- 45th Avenue NE to north of I-694 (provide connections for pedestrians and bicyclists along the east frontage road and under interchange)
- 49th Avenue NE (provide sidewalk connections along 49th Avenue NE)
- 53rd Avenue NE (provide sidewalk connections along 53rd Avenue NE)
- Mississippi Street NE (connect to MRT to west of TH 47)
- Osborne Road NE (connect to MRT to west of TH 47)
- 83rd Avenue NE (add sidewalk connections along 83rd)
- University Avenue NE (add sidewalk connections along University Avenue NE)

Key TH 65 Intersections:

- 37th Avenue NE (shared use path)
- 40th Avenue NE (add bicycle route)
- Osborne Road NE (complete streets solutions on Osborne Road NE)
- 81st Avenue NE (trail connection to pedestrian bridge)
- 85th Avenue NE (connect sidewalk in northwest corner to frontage road)

14. Investigate a broader study of regional effects to understand travel patterns and the effects of lowering throughput of speed on any roads in the corridors. Develop a long-term plan to redesign the corridors to meet the needs of the changing context, communities, and multi-modal use.
    a) Conduct a thorough Corridor Study for both corridors and/or Planning and Environmental Linkages (PEL) Study (a PEL officially links the study with a federal National Environmental Policy Act (NEPA) process if federal funds are used for future projects).
    b) Consider functional priority of both corridors (that is, can one corridor prioritize throughput/speed/mobility for motorized vehicles while the other prioritizes non-motorized users, that is, complete streets and lower speeds).
        i. Consider whether there is a logical split where the functional change from one corridor to the other (that is, complete streets design on TH 47 north of 53rd Avenue NE and TH 65 south of 53rd Avenue NE and principal arterial design on TH 65 north of 53rd Avenue NE and TH 47 south of 53rd Avenue NE).
        ii. Evaluate the role of East River Road to support the movement of people and goods in conjunction with these studies.
    c) Collect input from local communities
    d) Use complete streets concepts and reference other corridors that have undergone road redesign.

Long-Term (10 years and longer)
15. Reconstruct both corridors based on recommendations from the Corridor Study and/or PEL Study.

Contents

Tables

Figures

Appendices

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1 Introduction

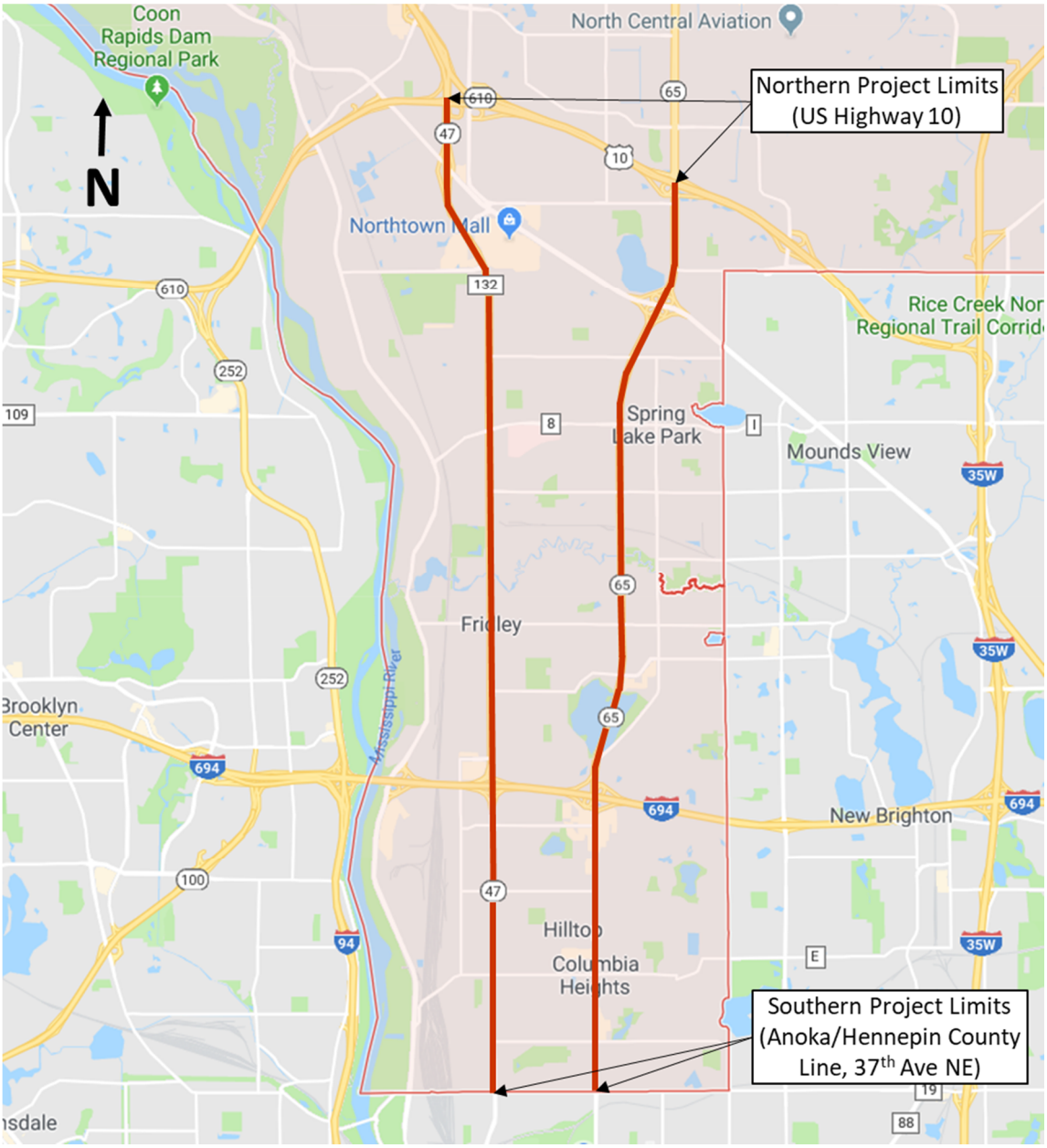
The corridors of Trunk Highway 47 (TH 47) and Trunk Highway 65 (TH 65), also known as University Avenue NE and Central Avenue NE, are bounded by the Anoka/Hennepin County line and Trunk Highway 10 (TH 10) in Anoka County, Minnesota. The 7.5-mile-long parallel corridors run through six different cities: Columbia Heights, Hilltop, Fridley, Spring Lake Park, Coon Rapids, and Blaine, Minnesota. These stretches of road are heavily used by drivers commuting to and from the Twin Cities metropolitan region. In addition, the corridors have seen an increase in pedestrian and bicycle use, likely a result of increasing housing and transit options in the area. Numerous concerns have been expressed about safety issues along the corridors, especially as it relates to recent pedestrian fatalities.

To further investigate issues along the corridors, Minnesota Department of Transportation (MnDOT) decided to conduct a road safety audit to determine if the number and severities of crashes is abnormal, to determine the primary factors for the crashes, and to propose long-, medium-, and short-term recommendations to improve the safety of both corridors. For more information on what a road safety audit process entails, please refer to Appendix B of this report.

1.1 Study Area

The 7.5-mile-long project corridors run along TH 47 and TH 65 from the Anoka/Hennepin County line at 37th Avenue NE to TH 10 in Anoka County. The project corridors run through six different cities: Columbia Heights, Hilltop, Fridley, Spring Lake Park, Coon Rapids, and Blaine. Figure 1-1 shows the study limits of the project.

Figure 1-1: Study Limits



Source: Google Maps™ mapping service. September 2018

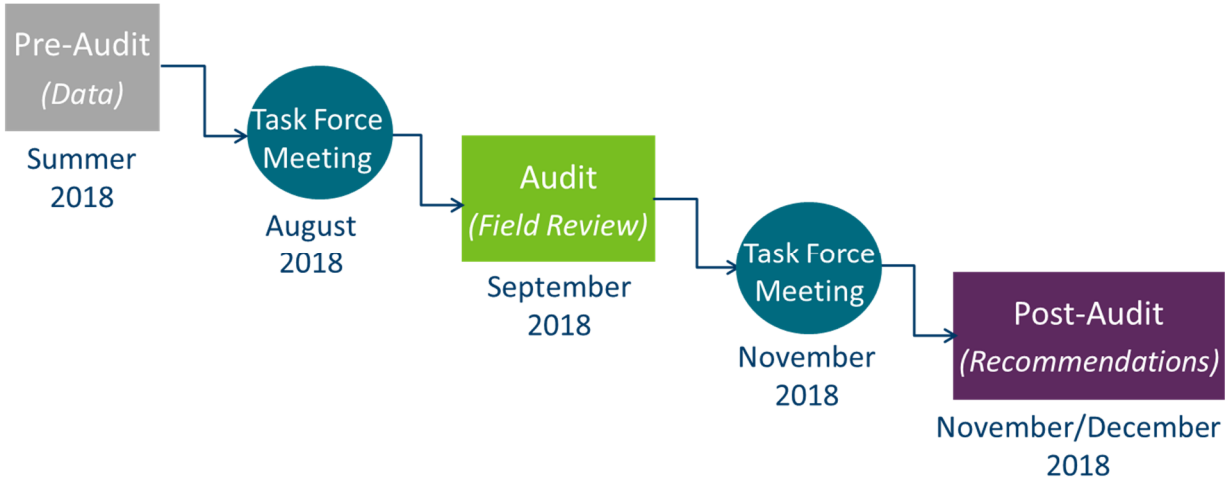
1.2 Key Dates

The road safety audit process includes pre-audit (collection of data and background information), audit (onsite corridor review), and post-audit (development of recommendations) stages, as well as interim phases to collect input from a task force group consisting of various stakeholders in the TH 47 and TH 65 corridors. The task force group included representatives from: State Patrol, Blaine PD, Fridley PD, Coon Rapids PD, City of Columbia Heights, City of Coon Rapids, City of Fridley, Anoka County, Metropolitan Council, Metro Transit, Barole Trucking, Columbia Heights Schools, Spring Lake Park Schools, the MN House, the MN Senate, and MnDOT.

The following dates show the development of the TH 47 and TH 65 road safety audit process and Figure 1-2 shows a summary of the road safety audit process.

- **June 28, 2018**: Kickoff meeting at MnDOT (Metro District).
- **August 13, 2018**: Task force meeting at Spring Lake Park High School.
- **September 10, 2018**: All day field review of the TH 65 project corridor.
- **September 11, 2018**: All day field review of the TH 47 project corridor.
- **October 2018**: Road safety audit team review of draft report.
- **November 2018**: Task Force meeting to discuss findings of the road safety audit process.

Figure 1-2: Road Safety Audit Process



2 Pre-Audit

The main goal of the pre-audit stage was to analyze crash data, obtain stakeholder safety concerns and identify key issue areas to focus on for the field reviews. In addition, a briefing book was developed that provided the field audit team this information for reference during the field reviews (see *TH 47 and TH 65 Road Safety Audit Briefing Book (September 10 and 11, 2018)*). Various factors were considered for the pre-audit stage, including: observations identified by the task force; past, present, and future improvement projects planned for the corridor; roadway characteristics (volumes, speeds, and average annual daily traffic [AADT]); and crash data.

2.1 Task Force Group Concerns

MnDOT formed a Task Force specifically for the efforts of the Road Safety Audit. MnDOT invited city staff representatives, county staff representatives, the area's city/county/state elected officials, school representatives, transit agency staff, and metropolitan council staff.

Various concerns and recommendations were raised at the August 13, 2018 initial task force meetings. The following sub-sections list the concerns and recommendations for TH 47 and TH 65. The road safety audit process evaluated the topics brought up during the task force meeting.

2.1.1 Crash Locations and Areas of Concern

The following lists crash locations and areas of concern for TH 47.

- An area of concern is at the 85th Avenue NE Metro Transit Park and Ride.
- An area of concern is near Interstate 694 (I-694) because no sidewalks exist, but pedestrians are present. This area of concern shows a need for connectivity.
- An area of concern is at the southern end of the TH 47 corridor because it is heavily travelled by semi-trucks.
- An area of concern is at 85th Avenue NE because two accidents involving fatalities have occurred there this year (2018). One fatality accident was a pedestrian crash (crossed on red while looking at phone) and the other fatality accident was a red-light runner (vehicle to vehicle). The accidents happened during the months of March and April.
- An area of concern is at 83rd Avenue NE because of recent suicide(s) occurring there.
- An area of concern is in Columbia Heights, north of 49th Avenue NE, because a fatality occurred in the summer (2018).
- Areas of concern are in Fridley by the plasma banks and north of Mississippi Street NE because vehicle speeds seem high.
- An area of concern is that there are too many speed limit changes in some areas, especially north of TH 610.

The following lists crash locations and areas of concern for TH 65.

- An area of concern is at the south end of I-694 because there are issues causing drivers to be stuck at the light.
- An area of concern is at 40th Avenue NE because the transit center is a major pedestrian attractor.

2.1.2 Current and Upcoming Efforts

The following lists current and upcoming efforts for TH 47.

- The City of Fridley is interested in adding landscaping on TH 47, especially in the center swales. This could potentially change the character of the roadway.
- A new interconnect system is being installed where signals will be able to communicate with each other and the timing will be controlled directly from MnDOT's office. In addition, video cameras on the signals will stream live footage.

The following lists current and upcoming efforts for TH 65.

- A restricted crossing u-turn (RCUT) intersection project is underway on TH 65 north of Bunker Lake Boulevard.

The following lists current and upcoming efforts for both corridors.

- A bus rapid transit (BRT) line is proposed on the TH 47 and TH 65 corridors. It will run on TH 65 south of 53rd Avenue NE and then will cut over to TH 47 north of 53rd Avenue NE.
- Turn lane extensions are underway on TH 65; there may be an option to do this on TH 47 as well.
- Enforcement for vehicles and pedestrians has been ongoing in the City of Fridley. Law enforcement officers have distributed educational cards to pedestrians they encounter; however, pedestrians in the area may be variable because of transit. Law enforcement officers would like to find a way to reach drivers with educational efforts.
- Law enforcement officers noted that Driving While Intoxicated (DWI) enforcement would be moved to earlier in the day (afternoon hours): with this change, law enforcement may also focus more on red light enforcement.
- Law enforcement officers noted that they have opportunities to use electronic billboards with businesses to display safety messages; they also have access to construction dynamic message signs.

2.1.3 Potential Strategies

The following lists potential strategies for TH 65.

- Change the ramp system so that looping would allow drivers to make it through the traffic signals and not be caught waiting for extended periods. TH 65 around County Highway 10 and US Highway 10 seems to be slower because of these cross roads. At TH 47, drivers do not have to stop around TH 610.
- Evaluate signal timing and consider providing longer crossing time for pedestrians to cross. Additionally, consider increasing green time for side streets because locals have noted side street delay as an issue. Consider the tradeoff of increasing travel time on TH 65.
- Consider providing wider median pedestrian refuges to allow for staged crossings on TH 65.

The following lists potential strategies for both corridors.

- Identify one of the corridors as the faster route and one as the slower route from I-694. Currently, University Avenue NE, south of I-694, appears to be the faster route between TH 47 and TH 65. Central Avenue NE, north of I-694, then becomes the faster route. Note that TH 65 currently functions as a principal arterial.
- Implement ways to encourage drivers to yield to pedestrians at crossings. In the City of St. Paul, three intersections have dynamic message signs posted, which indicate the percentage of vehicles who stop for pedestrians at the crossing. The idea is to encourage drivers think of stopping for pedestrians as a positive.
- Consider adding a connection to East River Road (ERR) to alleviate traffic on TH 47 and TH 65; currently, the railroad tracks inhibit most connections via crossroads.

Traffic volume would be added to ERR, but it should accommodate that traffic growth because of its wider cross section. ERR currently carries about half the amount of traffic that TH 47 and TH 65 carry.

- Involve city planners when developing recommendations.

2.1.4 Additional Insight

The following provides additional insight for TH 47.

- Lighting appears to be too dark north of 37th Avenue NE. Drivers noted that it is often difficult to see pedestrians in the area during the morning and evening hours.
- The swales in the center of TH 47 do not deter all bicyclists or pedestrians from crossing mid-block.
- Pedestrians cannot cross on the north side of 81st Avenue NE, but pedestrians can cross on other legs.
- Pedestrians often walk on the road shoulder, especially between 57th Avenue NE and Mississippi Street NE.
- New apartment buildings are under construction off of TH 47 and there are a lot of industrial areas along TH 47, mainly north of Osborne to 85th Avenue NE on the west side.

The following provides additional insight for TH 65.

- Pedestrians, especially pedestrians with disabilities, do not always have enough green time at signals. The longer pedestrians have to wait at signals the more likely they are to take risks such as crossing on red or using narrow medians as mid-crossing refuges.
- At 53rd Avenue NE, there is a rush, drivers appear impatient and often run red lights to avoid waiting for another stoplight cycle.
- Water tables are high on TH 65, which is why underpasses have not been constructed.

The following provides additional insight for both corridors.

- Transit stops along the corridors do not have comparable conditions in regard to ADA compliance. The Metropolitan Council has noted that the ADA conditions at the stops gets worse (or less compliant) toward the northern end of the corridors.
- Data from crashes may be available sooner than the approximate 6 months that it takes to complete the crash reconstructions if detectives who investigated the case are contacted. Detectives are called to the scene for fatal crashes and sometimes serious injury crashes.
- During the road safety audit, dilemma zones, stopping sight distances, and presence of countdown timers should be considered for the corridors. Additionally, the location of transit stops at the intersection should be considered (that is, if the stop is on the near side versus the far side of the intersection), as well as the directionality of a.m. and p.m. traffic.
- Met Council predicts that the City of Fridley's character will change from Urban Fringe to Urban Core.

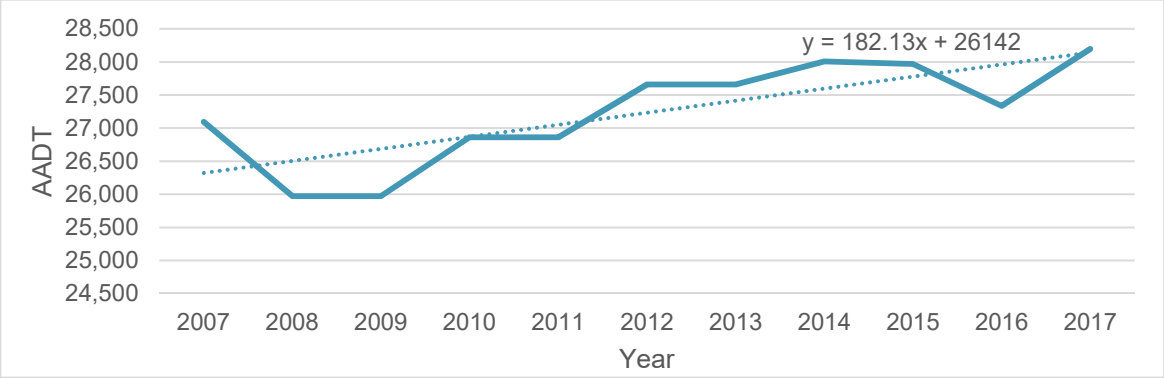
2.2 Corridor Characteristics

2.2.1 Annual Average Daily Traffic

The 2017 AADT values on TH 47 range between 20,500 vehicles per day (vpd) at the southern project limits, 39,500 vpd just north of I-694, and 25,000 vpd at the northern project limits. On TH 65, the 2017 AADT values range between 19,400 vpd at the southern project limits, 37,000 vpd just north of I-694, and 37,000 vpd at the northern project limits.

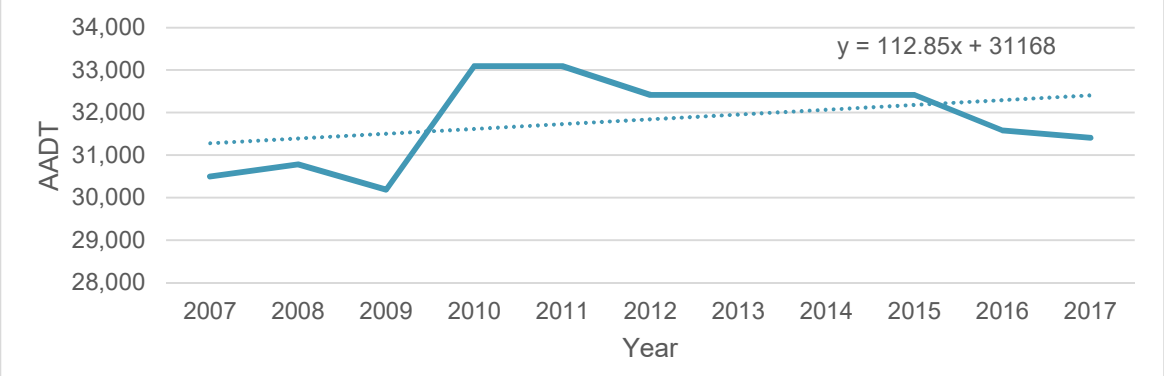
As shown in Figure 2-1 and Figure 2-2, both corridors have generally experienced traffic volume growth since 2007; however, recently, TH 65 has been gradually decreasing in volume while TH 47 has continued to increase. It is possible that more drivers are choosing to use TH 47 instead of TH 65.

Figure 2-1: TH 47 Corridor AADT (2007-2017, Weighted Average from 37th Avenue NE to US 10)



Source: Data derived from MnDOT AADT Twin City Metro Maps

Figure 2-2: TH 65 Corridor AADT (2007-2017, Weighted Average from 37th Avenue NE to US 10)



Source: Data derived from MnDOT AADT Twin City Metro Maps

See *TH 47 and TH 65 Road Safety Audit Briefing Book (September 10 and 11, 2018))*, pages A-9 and A-10, for 2017 AADT maps of the corridors. AADT values for 2013 to 2017 are summarized in Appendix F of this document, in Table F-1 and Table F-2.

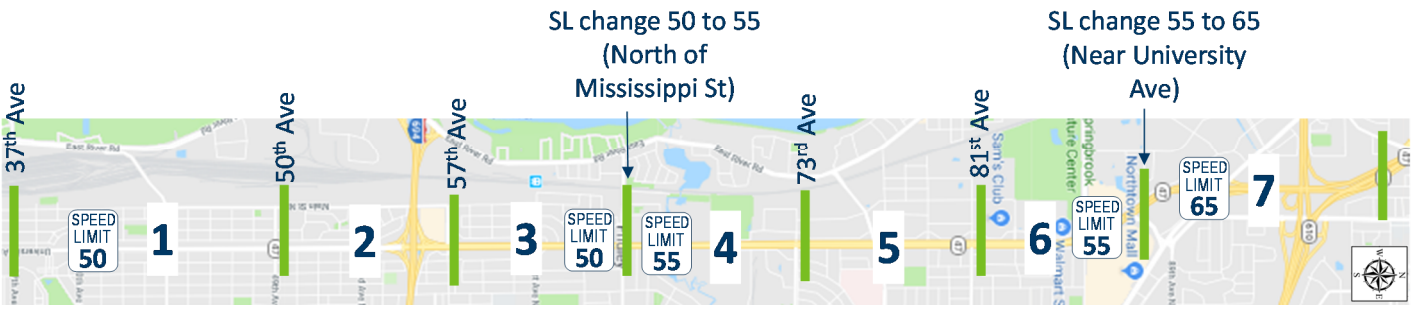
2.2.2 Speeds

Posted Speed Limits

Speed limits on the corridors generally increase when travelling from south to north. In addition, characteristics of the corridors transition from more urban at the Anoka and Hennepin County limits to expressway approaching TH 10.

TH 47 generally has higher posted speed limits and its characteristics are less urban than TH 65. At the south limits of TH 47, the posted speed limit is 50 miles per hour (mph). Just north of Mississippi Street, the speed limit increases to 55 mph. Just north of University Avenue NE (near Northtown Mall), the speed limit increases to 65 mph (see Figure 2-3).

Figure 2-3: TH 47 Posted Speed Limits (South to North)



Source: Google Maps™ mapping service. August 2018.

TH 65 has a statutory speed limit of 30 mph on its south limits. The speed limit increases to 40 mph near 45th Avenue NE, increases to 50 mph near Medtronic Parkway, and increases to 55 mph near 67th Avenue NE (see Figure 2-4).

Figure 2-4: TH 65 Posted Speed Limits (South to North)

Source: Data derived from MnDOT AADT Twin City Metro Maps

Travel Speeds

To assess corridor speeds, vehicle speed analytic data gathered by StreetLight Data, Inc., was evaluated for 2017. Overall, the vehicle speed data collected showed that on average, drivers travelled below the posted speed limit on both corridors. When this data was presented to the task force group on August 13, 2018, group members were surprised by the results, because from their personal experiences on the road, the drivers generally travelled over the posted speed limit.

The following provides possible explanations for why the speed data collected did not match the personal experiences of the task force.

- A delay caused by traffic signals may have increased travel time, thereby decreasing average speed through the corridors
- StreetLight Data, Inc., speeds may have been based on a limited number of data points.
- The average speed values collected would not have represented the drivers travelling at higher speeds.

A speed study was conducted on TH 47 in 2016 between 40th Avenue NE and TH 10. North of Mississippi Street, 85th percentile speeds determined in this study generally align with today's posted speed limits. South of Mississippi Street, 85th percentile speeds were around 55 mph, while the posted speed in that area is 50 mph.

See *TH 47 and TH 65 Road Safety Audit Briefing Book (September 10 and 11, 2018)*, pages A-11 through A-14 for StreetLight Data, Inc., summary charts of average weekday vehicle speeds as well as a summary of speed samples from the 2016 speed study.

2.2.3 Transit

Transit use on both the corridors is heavy, especially on TH 65. Most intersections on both corridors have northbound and southbound bus stops. Most bus stops have an average weekday ridership of more than 30 boardings (on or off) per day.

Major transit hubs on the corridors include the following.

- The Northtown Mall, TH 47 between 85th Avenue NE and University Avenue NE
- Talecris Plasma Resources, TH 47 and Mississippi Street NE
- Commercial businesses, TH 47 and 57th Avenue NE
- Columbia Heights Transit Center and Bay C, near TH 65 and 40th Avenue NE
- Most stops south of I-694, on TH 65, which are located within communities that have approximately 5.4 percent of households with no vehicles.[1]

Presence of bus stop shelters are variable across the corridors. According to Metro Transit's website,[2] bus stops that have an average of 30 or more daily passenger boardings are considered for having shelters added. Because labor and funding resources are limited, Metro Transit prioritizes stops that serve those with disabilities, older adults, hospitals, healthcare clinics, or social service providers, or stops that are major transfer points or in areas where more households do not have personal vehicles. See *TH 47 and TH 65 Road Safety Audit Briefing Book (September 10 and 11, 2018)*, page B-6, for a visual of current bus stop shelter availability along the corridors. See Figure 2-5 for an example of a bus stop with a shelter, see Figure 2-6 for an example of a bus stop without a shelter, and is not Americans with Disabilities Act (ADA) accessible.

[1] *Access to zero vehicle data from American Community Survey, Table S0801.*

[2] *Web link: https://www.metrotransit.org/shelter-guidelines*

Figure 2-5: Bus Stop with Shelter at TH 47 and 73rd Avenue NE

Source: Image taken on September 11, 2018 by Natalie Sager

Figure 2-6: Bus Stop without Shelter at TH 47 and 81st Avenue NE

Source: Image taken on September 11, 2018 by Natalie Sager

2.3 Historic and Planned Road Construction Projects

The following sections and Table 2-1 and Table 2-2 summarize past, programmed, and planned projects for each corridor.

2.3.1 TH 47

Overall, the pavement surface on TH 47 within the study area is 9 years old or newer. The most recent project on TH 47 was a bituminous reclaim, which occurred between 37th Avenue and 44th Avenue NE in 2018. In 2015, a mill and fill project took place between County State Aid Highway 10 (CSAH 10) and TH 10. Between 44th Avenue NE and CSAH 10, the most recent mill and overlay was in 2009 (which makes the surface 9 years old).

The next programmed and planned project on the TH 47 corridor is a fence replacement project that will take place in 2020 and will include landscaping upgrades.

Table 2-1: TH 47 Past, Programmed, and Planned Projects

Year Built	Location	Description
Past		
2004	Hennepin/Anoka Co. Line to CSAH 2	Mill and bituminous overlay
2009	CSAH 2 to TH 10	Mill and bituminous overlay
2015	North of CSAH 10 (Coon Rapids Boulevard) to TH 10	Mill and fill, ultra-thin bounded wearing course
2018	37th Avenue NE to 44th Avenue NE	Bituminous Reclaim
Programmed		
2020	37th Avenue NE to 69th Avenue NE	Remove and replace existing fence, landscaping
2021	JCT 10/169 to Industry Avenue/Bunker Lake Road (north of road safety audit limits)	Bituminous mill and overlay, drainage, ADA
Planned		
2023	MN 65 to 27th Avenue (south of road safety audit limits)	Medium mill and overlay
2025	Bunker Lake Boulevard to Anoka/Isanti County line (north of road safety audit limits)	Concrete pavement repair/medium mill and overlay

Sources: http://www.dot.state.mn.us/roadway/data/const-projlog-bydistrict.html and http://www.dot.state.mn.us/planning/10yearplan/pdf/2019/metro.pdf

2.3.2 TH 65

Overall, the pavement surface on TH 65 within the study area is 11 years old or newer. The most recent project on TH 65 was a 0.084-mile-long grading and bituminous surfacing just north of I-694 in 2016. In 2014, approximately half of the corridor, between 53rd Avenue NE and CSAH 10, underwent an unbonded concrete overlay. South of 53rd Avenue NE, the most recent pavement project was in 2012. North of CSAH 10, the most recent pavement project was in 2007 (which makes the surface 11 years old).

In 2013, a pedestrian bridge was constructed just north of 79th Avenue NE, which connects to Spring Lake Park High School.

Programmed projects within the study area (within the next 5 years) include the following:

- In 2019, a sign replacement project between 37th Avenue NE and TH 10.
- In 2019, a signal system replacement at the intersection with 41st Avenue NE.
- In 2019, turn lane extensions north of 85th Avenue NE, all in 2019.
- In 2022, a mill and overlay project is planned to take place from CSAH 10 to 153rd Avenue.

Planned projects within the study area (in 5 to 10 years) include the following:

- In 2023, bridge repairs on CSAH 10 over TH 65 (2023).
- In 2028, a mill and overlay from 53rd Avenue NE to reference point 7 (near 47th Avenue NE).

Other projects programed or planned on TH 65, outside of the study area, include the following:

- A multi-year bridge rehabilitation project in Minneapolis at 3rd Avenue, which is approximately 3.7 miles south of the project corridor.
- A RCUT in East Bethel, Minnesota, which is approximately 14 miles north of the project corridor.
- Bridge repairs over Coon Creek, which is approximately 7 miles north of the project corridor

Table 2-2: TH 65 Past, Programmed, and Planned Projects

Year Built	Location	Description
Past		
2007	CSAH 10 to US 10	Micro-surfacing
2012	Hennepin/Anoka Co. line to 53rd Ave	Mill and bituminous overlay
2013	Just north of 79th Ave	Grading and added pedestrian bridge
2014	53rd Avenue to CSAH 10	Grading/aggregate base, bituminous surfacing, un-bonded concrete overlay
2016	North of I-694 (0.084 mile segment)	Grading and bituminous surfacing
Programmed		
2019	Hennepin/Anoka Co. line to US 10	Sign replacement
2019	41st Avenue NE	Signal system replacement, ADA improvements
2019	85th Avenue NE to Sims Road	Extending 14 left turn lanes, adding left turn lane, repair culverts, add curb and gutter.
2020	3rd Avenue S (Bridge #2240)	Bridge rehab over Mississippi River
2021	MSAS 103/Klondike Drive in East Bethel	Construct Reduced Conflict U-Turn (RCUT) intersection
2022	Bridge under CSAH 10 in Spring Lake Park to 153rd Avenue in Ham Lake	Mill and overlay, drainage repairs, ADA improvements
Planned		
2023	CSAH 10 over TH 65	Bridge repairs
2024	153rd Avenue to 217th Avenue	Reclaim/white topping
2024	Bridge #6817 and #9417 over Coon Creek	Bridge repairs/replacement
2026	217th Avenue to CSAH 5	Concrete pavement repair/medium mill and overlay
2027	3rd Avenue Bridge to 37th Avenue NE	Medium bituminous mill and overlay
2027	Bridge #27015 over railroad	Re-overlay bridge
2028	53rd Avenue NE to reference point 7	Medium mill and overlay

Sources: http://www.dot.state.mn.us/roadway/data/const-projlog-bydistrict.html and http://www.dot.state.mn.us/planning/10yearplan/pdf/2019/metro.pdf

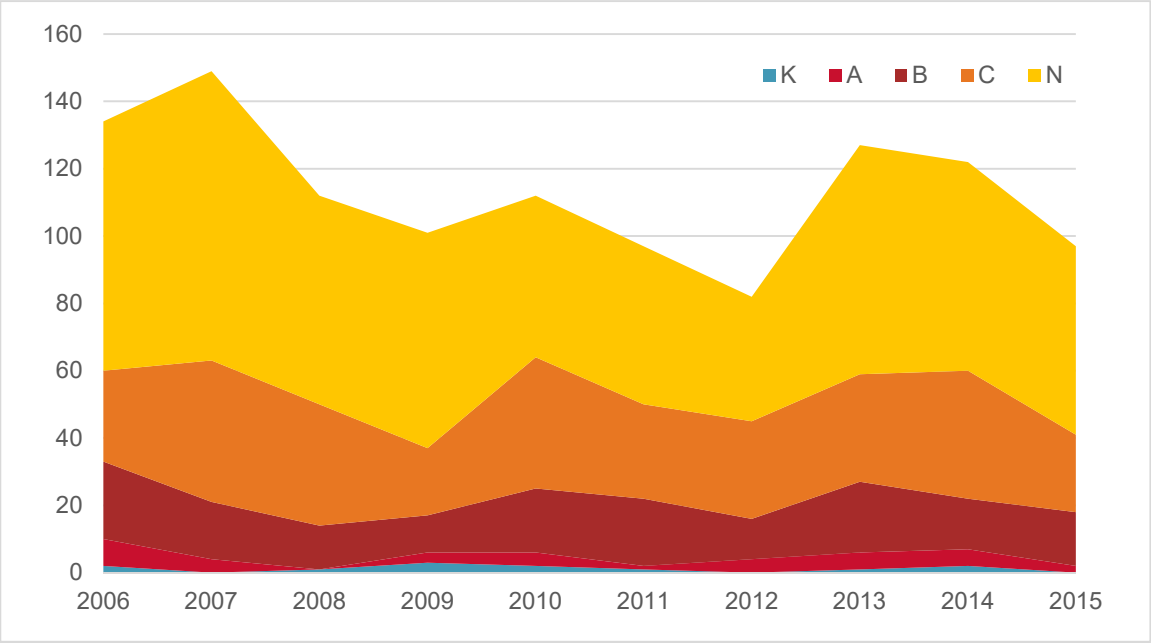
2.4 Crash Data

Crash data was collected from MnDOT and the Minnesota Department of Public Safety (MNDPS) database and was evaluated to identify trends. The corridor history since 1984 was first evaluated on a large scale. Corridor-wide trends from the years 2013 to 2017 were next assessed in terms of crash severity, crash type, surface conditions, diagram, relation to junction, crash location, and time of crash.

2.4.1 Historical Trends (2006 to 2015)

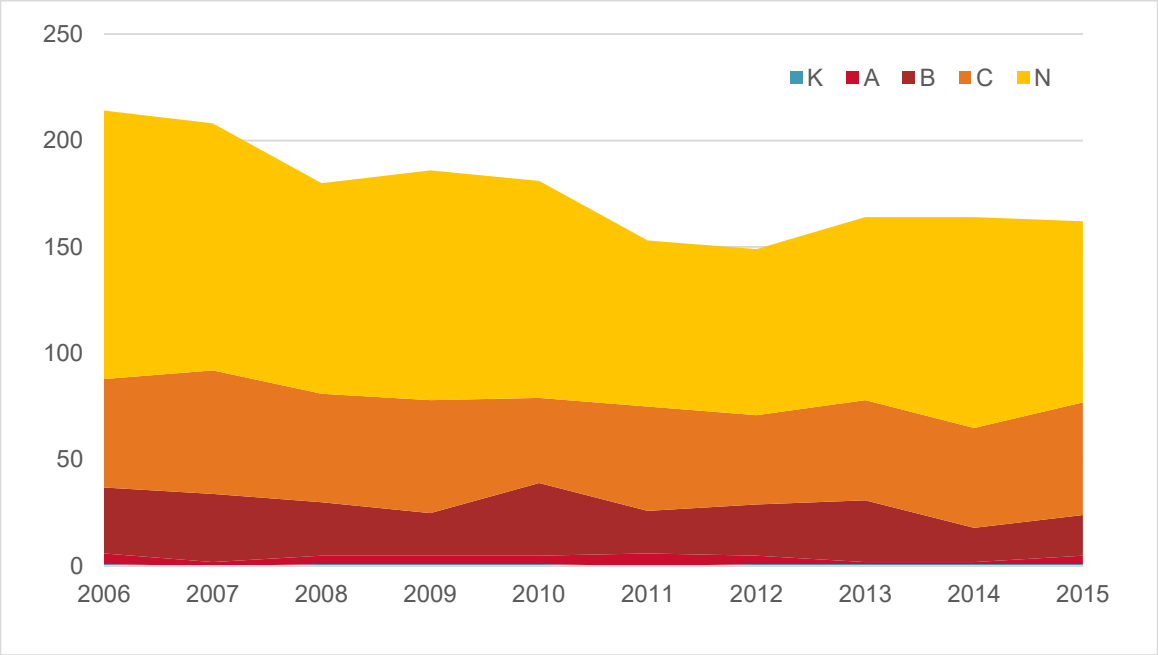
Historical crash data was gathered from the years 2006 to 2015. From the years 2006 to 2015, the total amount of crashes that have occurred along the corridors have generally decreased. As seen in Figure 2-7 and Figure 2-8, the peak number of crashes within this period occurred around 2006 or earlier. It should be noted that the boundaries used for this data pull were slightly different from the project boundaries; however, the trends shown still give a general representation of the corridors' historical trends.

Figure 2-7: TH 47 Total Crashes, by Severity (2006 to 2015)



Source: Crash Data from Minnesota Crash Mapping Analysis Tool (MnCMAT) 2006–2015. Crash severities are classified using the following scale: K (Fatal), A (Serious Injury), B (Minor Injury), C (Suspected Injury), N (Property Damage Only).

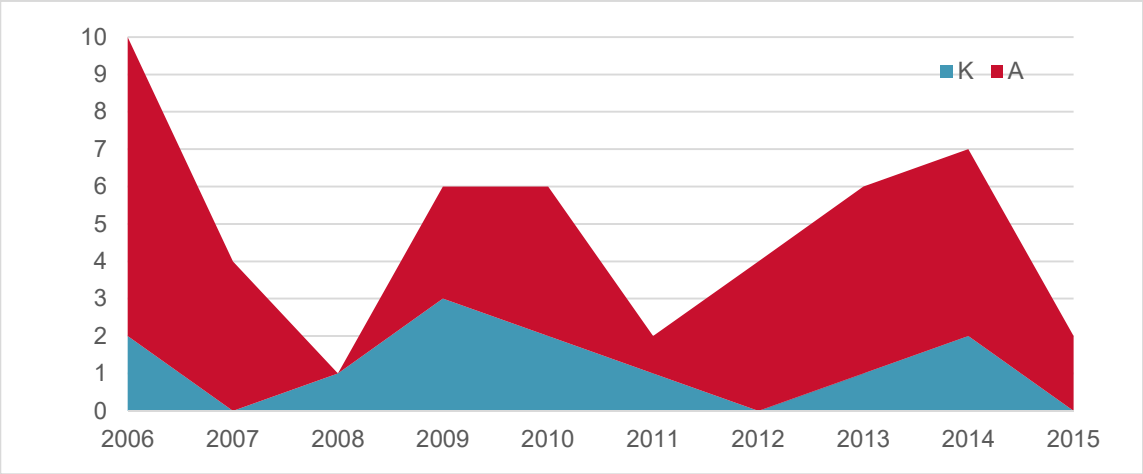
Figure 2-8: TH 65 Total Crashes, by Severity (2006 to 2015)



Source: Crash Data from Minnesota Crash Mapping Analysis Tool (MnCMAT) 2006–2015. Crash severities are classified using the following scale: K (Fatal), A (Serious Injury), B (Minor Injury), C (Suspected Injury), N (Property Damage Only).

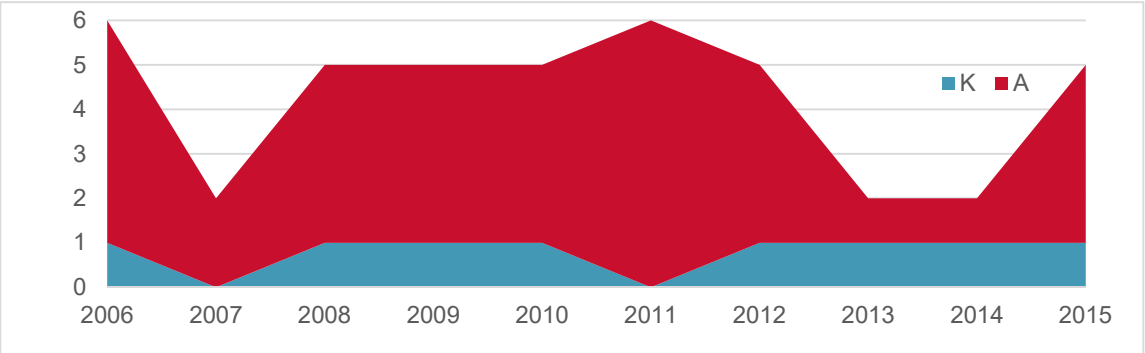
Throughout the 2006 to 2015 period, the distribution of crash severities remained approximately the same, with property damage only (type N) crashes being the most common, and fatal (type K) crashes being the least frequent. TH 65 has generally had more crashes than TH 47; however, TH 47 has generally experienced a larger percentage of severe injury crashes than TH 65. Figure 2-9 and Figure 2-10 show fatal and severe injury (K and A respectively) crash trends from 2006 to 2015.

Figure 2-9: TH 47 Fatal and Severe (K and A respectively) Crashes (2006 to 2015)



Source: Crash Data from Minnesota Crash Mapping Analysis Tool (MnCMAT) 2006–2015. Crash severities are classified using the following scale: K (Fatal) and A (Serious Injury).

Figure 2-10: TH 65 Fatal and Severe (K and A respectively) Crashes (2006 to 2015)



Source: Crash Data from Minnesota Crash Mapping Analysis Tool (MnCMAT) 2006–2015. Crash severities are classified using the following scale: K (Fatal) and A (Serious Injury).

2.4.2 Corridor-Wide Trends (2013 to 2017)

The study period chosen for the crash data review was from 2013 to 2017. In addition, partial year data was available for year 2018 (through March 15). This 5-year study period provides data that is recent, yet long enough in duration to more accurately show trends.

From January 1, 2013 to March 15, 2018, there were a total of 678 crashes on TH 47, with 31 crashes being fatal and serious injury (K+A). On TH 65, there were a total of 1,077 crashes, with 29 crashes being K+A.

One considerable trend observed for the corridors during this study period was the high percentage of pedestrian-related collisions, especially fatal and severe injury collisions on TH 47. Based on this trend, the road safety audit team noted the importance of implementing safety features to reduce pedestrian-related crashes.

A graphical crash assessment summary, which shows pedestrian and bicycle crash locations by mode and severity, and also shows which intersections have crash rates above the critical rate[3], is provided in Appendix E: Crash Assessment Figures.

The following list provides the general trends observed along the corridors. See *TH 47 and TH 65 Road Safety Audit Briefing Book (September 10 and 11, 2018)*, Section D, for data figures and charts.

- Crash severity:
    - TH 47: 56 percent of all crashes were property damage only. 4.6 percent of crashes were fatal or incapacitating (K+A).
    - TH 65: 60 percent of all crashes were property damage only. 2.4 percent of crashes were K+A.
- Pedestrian and bicycle collisions:
    - TH 47: 5 percent of all crashes involved pedestrians or bicyclists (2.9 percent pedestrians, 2.2 percent bicyclists). However, 45 percent

[3] *Crash rates are the number of crashes per million entering vehicles. Critical crash rates are computed based on system-wide averages and account for the design of the facility, type of intersection control, amount of exposure, and the random nature of crashes. If an intersection's crash rate is above the critical crash rate, it indicates the crash rate is statistically significantly higher than at similar facilities. Intersection crash rates are further discussed in Section 3.4.4.*

of K+A crashes involved pedestrians or bicyclists (35.5 percent pedestrians, 9.7 percent bicyclists).

- TH 65: 4 percent of all crashes involved pedestrians or bicyclists (2.9 percent pedestrians, 1.0 percent bicyclists). However, 25 percent of K+A crashes involved pedestrians or bicyclists (20.7 percent pedestrians, 3.4 percent bicyclists).

- Relation to junction:
  - TH 47: 82 percent of all crashes and 71 percent of K+A crashes were at intersections. 95 percent of pedestrian-related and 93 percent of bicycle-related collisions were at intersections.
  - TH 65: 64 percent of all crashes and 90 percent of K+A crashes were at intersections. 100 percent of pedestrian-related and bicycle-related collisions were at intersections.
- Manner of collision (MOC):
  - TH 47: Most crashes were rear end collisions (49 percent of all crashes and 17 percent of K+A crashes). The second most frequent MOC was angle (23 percent of all crashes and 17 percent of K+A crashes). The third most frequent MOC was head on (5 percent of all crashes and 12 percent of K+A crashes). The remaining crashes fall in the “other” category.
  - TH 65: Most crashes were rear end collisions (52 percent of all crashes and 30 percent of K+A crashes). The second most frequent MOC was angle (23 percent of all crashes and 27 percent of K+A crashes). The third most frequent MOC was head on (4 percent of all crashes and 3 percent of K+A crashes). The remaining crashes fall in the “other” category.
- Surface conditions:
  - Both corridors: 70 percent of all crashes and 82 percent of K+A crashes occurred in dry conditions; these percentages are higher than state averages[4] (64 percent of all crashes and 77 percent of K+A crashes). 16 percent of all crashes and 13 percent of K+A crashes occurred in wet conditions. 13 percent of all crashes and 5 percent of K+A crashes occurred in snow conditions.
- Lighting conditions (pedestrian crashes):
  - Both corridors: 45 percent of all crashes involving pedestrians occurred in daylight, the remaining crashes occurred during dark/twilight. This is less than the state average of 56 percent,[5] indicating that light conditions may be a contributing factor for pedestrian crashes.
- Chemical impairment (pedestrian crashes):

[4] MN average from MnCMAT crash data (2011-2015, Statewide)

[5] MN average from MnCMAT crash data (2011-2015, Statewide, Collisions with Pedestrian Crashes)

  - TH 47: 10 percent of pedestrians were noted as being under the influence. This is less than the state average of 25 percent.[6]
  - TH 65: 22 percent of pedestrians were noted as being under the influence. This is slightly less than the state average of 25 percent.
  - Both corridors: No drivers were reported as being under the influence in all pedestrian-related crashes. In all cases, pedestrians were the ones under the influence.
- Contributing factors (pedestrian crashes, both corridors):
  - Top Contributing Factors for Drivers: failure to yield right of way, distraction.
  - Top Contributing Factors for Pedestrians: in roadway improperly (standing, lying, working, playing) or impeding traffic, failure to yield right of way or disregarding traffic control devices, impaired, not visible.
- Time of day (pedestrian crashes):
  - TH 47: 25 percent of pedestrian crashes occurred between 6:00 a.m. and 9:00 a,m. 20 percent occurred between 3:00 p.m. and 6:00 p.m. 20 percent of pedestrian crashes occurred between 9:00 p.m. and midnight.
  - TH 65: Majority of pedestrian crashes were in the evening, with more than one-third of crashes occurring between 6:00 p.m. and 9:00 p.m. Nearly 20 percent of pedestrian crashes occurred between 9:00 p.m. and midnight, just over 15 percent occurred between 3:00 p.m. and 6:00 p.m.
- Weekend versus weekday:
  - TH 47: 81 percent of all crashes and 90 percent of crashes involving pedestrians occurred on a weekday.
  - TH 65: 80 percent of all crashes and 68 percent of crashes involving pedestrians occurred on a weekday.
- Time of year:
  - TH 47: Of all crashes, 29 percent occurred in fall (September to November), 29 percent in occurred in winter (December to February), 22 percent in summer (June to August), and 20 percent in spring (March to May). Of all pedestrian crashes, 32 percent in winter, 26 percent in fall, 26 percent in summer, and 16 percent in spring.
  - TH 65: Of all crashes, 28 percent occurred in fall, 26 percent occurred in winter, 23 percent occurred in spring, and 23 percent occurred in summer. Of all pedestrian crashes, 37 percent occurred in spring, 27 percent occurred in winter, 23 percent occurred in fall, and 13 percent occurred in summer.
- Age (pedestrian crashes):

[6] *MN Average from MnDOT SHSP (2014-2019)*

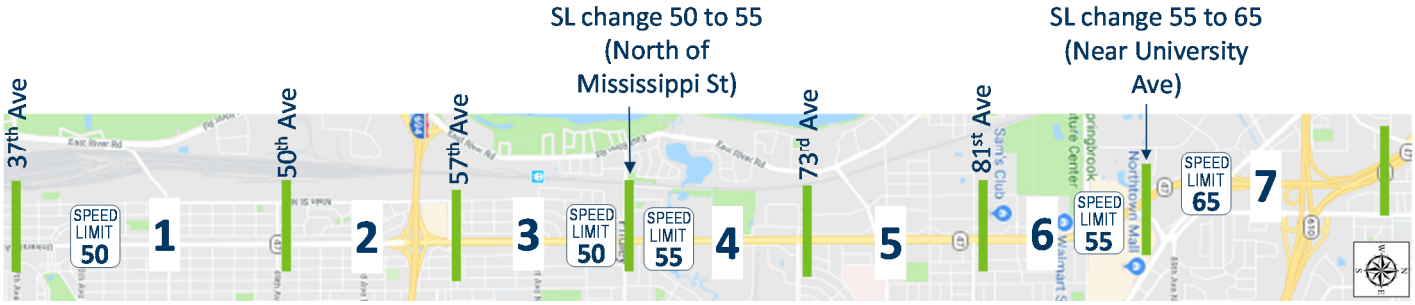
- TH 47: 25 percent of pedestrians involved in crashes were between the ages of 46 and 55. 15 percent were above the age of 66. All other age ranges were below state averages.[7]
- TH 65: Nearly one-third of pedestrians involved in crashes were between the ages of 56 and 65. Just less than 20 percent were between the ages of 46 and 55. Just over 15 percent were between the ages of 15 and 20. All other age ranges were below state averages.

- Local versus non-local (pedestrian crashes, both corridors)[8]:
  - Drivers: 67 percent of drivers involved in pedestrian crashes were local based on their home zip code.
  - Pedestrians: 76 percent of pedestrians involved in crashes were local based on their home zip code.

2.4.3 Segment Trends (2013 to 2017)

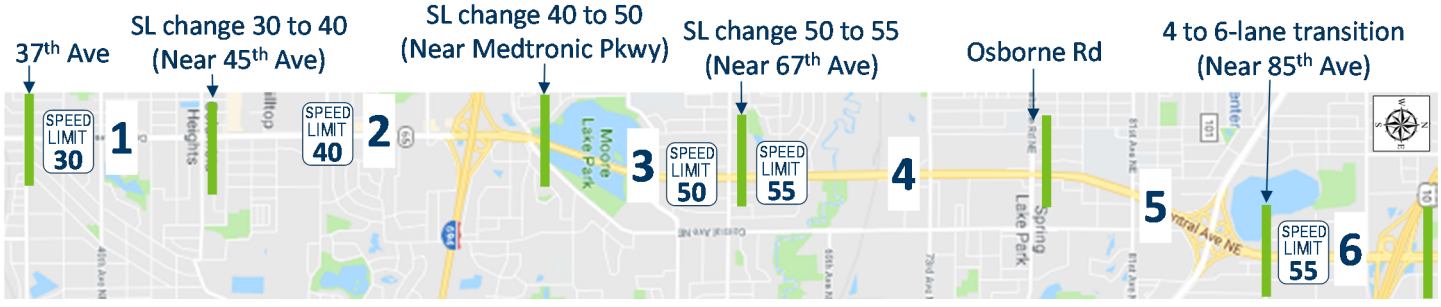
Each of the segments shown in Figure 2-11 and Figure 2-12 were analyzed as part of the crash study. Segments are approximately one mile in length and start/end at locations where the roadway changes in speed limit or geometry, or at mile markers.

Figure 2-11: TH 47 Segments (South to North)



Source: Google Maps™ mapping service. August 2018.

Figure 2-12: TH 65 Segments (South to North)



Source: Google Maps™ mapping service. August 2018.

[7] *MN averages from MnCMAT (2011-2015, statewide, pedestrian vehicle types only)*

[8] *Zip codes considered local include: 55112, 55412, 55413, 55418, 55421, 55430, 55432, 55434, 55443, 55444, 55448, and 55449.*

For each segment, crash rates and fatal and severe injury crash rates (FARs) were computed and were compared to critical crash rates and critical FARs. Crash rates are the number of total crashes which occurred per million entering vehicles during the study period. FARs are crash rates computed using only fatal and severe injury crashes. Critical crash rates are a statistical computation based on system-wide (statewide) averages and account for the design of the facility, type of intersection control, amount of exposure, and the random nature of crashes. If an intersection's crash rate is above the critical crash rate, it indicates the crash rate is statistically significantly higher than at similar facilities. Refer to MnDOT's 2015 *Traffic Safety and Fundamentals Handbook*[9] for crash rate formulas.

Crash rates are summarized in Table 2-3 and Table 2-4. Note that bolded and underlined values indicate that the critical crash rate index is over one (that is, that the TH 47 or TH 65 segment crash rate is over the critical rate). In most cases, the FARs were identified as a problem. This signified that fatal and serious injury crashes play a large role in the corridor safety. On both corridors, segment crash rates were highest at the north and south ends and lowest in the middle.

Table 2-3: TH 47 Segment Crash Rates (2013 to 2017)

Segment	Beginning Point	End Point	ADT (2013-2017 avg) (vpd)	Length (mi)	Speed Limit (mph)	Comparison Group	Crash Totals - By Severity			Critical Crash Rate Index	Critical FAR Index
							K	A	Total		
1	37th Ave NE	626 ft North of 49th Ave NE	19670	1.6	50	Urban 4-Lane Divided	2	4	109	0.61	**1.41**
2	626 ft North of 49th Ave NE	590 ft North of 57th Ave NE	31630	1	50	Urban 4-Lane Divided	2	6	161	0.89	**1.87**
3	590 ft North of 57th Ave NE	.31 Miles North of Mississippi St NE	36130	1.2	50	Urban 4-Lane Divided	0	0	62	0.25	0.00
4	.31 Miles North of Mississippi St NE	660 ft North of 73rd Ave NE	33500	0.8	55	Urban 4-Lane Divided	0	2	49	0.32	0.52
5	660 ft North of 73rd Ave NE	625 ft North of 81st Ave NE	31780	1	55	Urban 4-Lane Divided	2	1	99	0.55	0.70
6	625 ft North of 81st Ave NE	900 ft North of University Ave NE	26950	1.07	55	Urban 4-Lane Divided	3	2	78	0.47	**1.25**
7	900 ft North of University Ave NE	TH 10	24020	1.05	65	Urban Expressway	1	5	85	0.94	**2.21**

Note: Critical crash rates indexes were computed via formulas from the MnDOT's 2015 *Traffic Safety Fundamentals Handbook* (http://www.dot.state.mn.us/trafficeng/publ/fundamentals/2015-mndot-safety-handbook-reduced.pdf). Statewide Averages came from the MnDOT 2015 Section Toolkit (http://www.dot.state.mn.us/stateaid/trafficsafety.html). Segments include intersection crashes. A 95 percent confidence interval was used to compute the critical crash rate. A 90 percent confidence interval was used to compute the FAR.

[9] *http://www.dot.state.mn.us/trafficeng/publ/fundamentals/2015-mndot-safety-handbook-reduced.pdf*

Table 2-4: TH 65 Segment Crash Rates (2013 to 2017)

Segment	Beginning Point	End Point	ADT (2013-2017 avg) (vpd)	Length (mi)	Speed Limit (mph)	Comparison Group	Crash Totals - By Severity			Critical Crash Rate Index	Critical FAR Index
							K	A	Total		
1	37th Ave NE	280 ft North of 45th Ave NE	21200	1.07	30	Urban 4-Lane Divided	1	6	237	**1.33**	**2.04**
2	280 ft North of 45th Ave NE	340 ft North of Medtronic Pkwy NE	27140	1.51	40	Urban 4-Lane Divided	0	3	314	**1.00**	0.59
3	340 ft North of Medtronic Pkwy NE	50 ft South of 67th Ave NE	34600	1.1	50	Urban 4-Lane Divided	1	2	30	0.10	0.62
4	50 ft South of 67th Ave NE	.18 Miles South of Osborne Rd NE	31170	1.2	55	Urban 4-Lane Divided	0	1	39	0.14	0.21
5	.18 Miles South of Osborne Rd NE	85th Ave NE	35660	1.43	55	Urban 4-Lane Divided	1	8	238	0.62	**1.51**
6	85th Ave NE	TH 10	38000	0.57	55	5-Lane Undivided	1	4	162	**1.36**	**1.54**

Note: Critical crash rates indexes were computed via formulas from the MnDOT's 2015 *Traffic Safety Fundamentals Handbook* (http://www.dot.state.mn.us/trafficeng/publ/fundamentals/2015-mndot-safety-handbook-reduced.pdf). Statewide Averages came from the MnDOT 2015 Section Toolkit (http://www.dot.state.mn.us/stateaid/trafficsafety.html). Segments include intersection crashes. A 95 percent confidence interval was used to compute the critical crash rate. A 90 percent confidence interval was used to compute the FAR.

2.4.4 Intersection Trends (2013 to 2017)

Majority of crashes on both corridors are intersection-related or occurred close to an intersection. Because of this, a higher emphasis was put on intersection-specific trends as opposed to segment trends. A similar approach was taken for computing and comparing crash rates at intersections. See *TH 47 and TH 65 Road Safety Audit Briefing Book (September 10 and 11, 2018)*, Section D, for more information on intersection severities and crash rates.

If crash rates or FARs exceeded state averages or critical rates for an intersection, the intersection was further evaluated for crash trends or abnormalities in the field. To ensure that nothing was overlooked, any intersections that had any pedestrian crashes during the 5-year study period were observed. Table 2-5 identifies all of the intersections that were flagged as being a higher risk intersection.

Crash type summaries were developed for each of the key intersections to determine trends in crash severity, year, light condition, collision type, collision diagram, vehicle type, contributing factors, alcohol/chemical use, time of day, day of week, road surface condition, weather condition, and driver age. Crash frequency and percentages were compared to expected crash data (that is, Minnesota Statewide Averages) from MnDOT Oracle Business Intelligence (BI) and the MnDOT 2015 Crash Data Toolkit. Sections E and F contain crash type summaries for each of the key intersections. A summary of intersection data sheets is provided in Appendix D.

Table 2-5: TH 47 Key Intersections

Intersection	Above Critical Crash Rate Index	Above Critical FAR Crash Rate Index	Pedestrian Crashes
University Avenue NE			1
85th Avenue NE		x	1 severe

Intersection	Above Critical Crash Rate Index	Above Critical FAR Crash Rate Index	Pedestrian Crashes
83rd Avenue NE	x	x	2 fatal
81st Avenue NE	x		1 fatal
Osborne Road NE	x	x	1
73rd Avenue NE		x	1 fatal
Mississippi Street NE			1
57th Avenue NE		x	3 (1 fatal, 1 severe)
I-694 North Ramp Terminal	x		
I-694 South Ramp Terminal	x		
53rd Avenue NE	x	x	1
49th Avenue NE			1
44th Avenue NE	x	x	1
40th Avenue NE			1 fatal
37th Avenue NE	x		4 (1 was severe)

Table 2-6: TH 65 Key Intersections

Intersection	Above Critical Crash Rate Index	Above Critical FAR Index	Pedestrian Crashes
US-10 South Terminal	x		
89th Avenue NE		x	
85th Avenue NE			2
Middletown Road	x	x	
81st Avenue NE	x		2
Osborne Road NE	x	x	1 severe
E Moore Lake Drive			1
52nd Avenue NE			1
50th Avenue NE			3
49th Avenue NE	x		2
47th Avenue NE			4 (1 was severe)
46th Avenue NE	x		2 (1 was severe)
45th Avenue NE			4 (1 was severe)
44th Avenue NE		x	3 (1 was severe)
43rd Avenue NE	x		1
42nd Avenue NE			1 severe
40th Avenue NE			2
Gould Avenue NE			1
37th Avenue NE	x		

3 Audit

On Monday, September 10, 2018, and Tuesday, September 11, 2018, 8-hour field reviews were conducted by the road safety audit team for each corridor. In addition, a small group did an evening field visit on September 10, 2018. The road safety audit team consisted of team members from various disciplines and backgrounds. Table 3-1 lists the road safety audit team members as well as their agency, role, and days present for the field visit. Figure 3-1 shows members of the road safety audit team at TH 65 and 40th Avenue NE on September 10, 2018. Figure 3-2 shows members of the road safety audit team at TH 47 and Osborne Road NE on September 11, 2018.

Table 3-1: Road Safety Audit Team

Name	Agency	Role	Days Present
Melissa Barnes	MnDOT	MnDOT Project Manager	Both, also evening of September 10th
Derek Leuer	MnDOT	Traffic Safety Engineer	Day 2
Brad Estochen	MnDOT	Traffic Safety Engineer	Day 1
Jamal Love	MnDOT	Geometrics Design	Both
Todd Grugel	MnDOT	ADA Program Engineer	Day 1
Elizabeth Walton	MnDOT	Pedestrian and Bicycle Planner	Both
Will Stein	FHWA	Traffic Safety Engineer	Both
Perry Jones	City of Fridley	Detective/Law Enforcement	Both
Sonja Burseth	Metro Transit	Transit Planner	Both
Heidi Shallberg	Metropolitan Council	Transportation Planner	Both
Joe Gustafson	Washington County	Traffic Engineer	Day 1
David Sheen	Hennepin County	Traffic Safety Engineer	Day 2
Brandi Popenhagen	HDR	Road Safety Audit Project Manager	Both, also evening of September 10th
Rick Plenge	HDR	Multi-Modal Expert	Both, also evening of September 10th
Natalie Sager	HDR	Road Safety Audit Project Engineer	Both

Team members drove the entire project corridor and looked for different risk factors that could be used to diagnose the contributing factors of problems identified in the pre-audit review. The road safety audit team focused on the intersections that were deemed higher risk in the pre-audit review. Additionally, the team took note of any potential risk factors that could lead to future safety risks. Detective Perry Jones from the City of Fridley provided insight from his experiences along the corridors.

Figure 3-1: Road Safety Audit Team Members at TH 65 and 40th Avenue NE

Source: Image taken on September 10, 2018 by Natalie Sager

Figure 3-2: Road Safety Audit Team Members at TH 47 and Osborne Road NE

Source: Image taken on September 11, 2018 by Natalie Sager

4 Post-Audit

4.1 Improvement Strategies

Strategies were divided into three main categories: short-term, medium-term and long-term. Short-term strategies tend to be simple and low cost changes that can be implemented in

zero to five years. Medium-term strategies may have a larger implementation cost, but don't require a lot of planning to complete and could fit within MnDOT's current funding program; these strategies fall within the five- to ten-year timeframe. Long-term strategies may require substantial planning to implement and may not fit within the funding constraints within MnDOT's transportation improvement program; therefore these improvements may take for ten or more years to implement.

A general strategy is to establish low-cost/high benefit solutions that can be used as a system-wide approach to corridor wide issues. Where issues are unique, special attention is given on a case-by-case basis.

There are several advantages of using lower cost, higher benefit strategies. Doing so can allow changes to be made on a faster timeline and can be used to spread funding so that the entire system can be fixed strategically.

4.2 Short-, Medium-, and Long-Term Strategies

The following sections provide explanation of the strategies listed in Table ES-1. For the purpose of easier cross-referencing, each corridor-wide strategy is denoted with a code, C-W, followed by the bulleted list number. For example, C-W, 8b refers to corridor-wide strategy 8 (traffic signal recommendations), bullet b (evaluate signal cycle length) in Table ES-1.

4.2.1 Corridor-Wide Short-Term Strategies

The following paragraphs provide discussion of short-term (less than 5 years) safety recommendations given for both the TH 47 and TH 65 corridors. See Table ES-1 for a summary of these recommendations.

C-W, 1. Coalition(s)

The likelihood of implementing corridor recommendations developed from the road safety audit process increases if supported and promoted by local advocates, especially if they form a group, or coalition. Ideally, coalitions consist of a diverse group working together for a common goal and include representatives from local police, emergency services, education, politicians, government agencies, and communities. While a task force group was identified during the road safety audit process, a coalition has not been formally established. It is recommended that the task force group continue to meet after the completion of the road safety audit and use findings and recommendations presented in this report as a resource for promoting safety improvements on the TH 47 and TH 65 corridors on behalf of the local community. Ann advocate will need to be identified to lead the coalition and its efforts, ideally this advocate will be a local representative with a strong network in the project area.

Minnesota's Toward Zero Deaths (TZD) program supports coalitions and can provide resources for forming a coalition, can help coalitions identify funding sources, and can provide resources for education and outreach. Additional information, including how to form a coalition, can be found on Minnesota's TZD website http://www.minnesotatzd.org.

An example of an existing coalition within Minnesota is the Highway 12 Safety Coalition. This coalition was formed in 2014 in response to a high number of fatal crashes on the Highway 12 corridor, just west of the Twin Cities metropolitan region. Through efforts from this coalition, some recommendations from a MnDOT road safety audit, which took place in 2015, have been implemented. The coalition meets regularly, maintains an active Facebook page, and continues to push for safety improvements on the corridors.

Another example of an established coalition is the North TH 65 Corridor Coalition, which extends from Spring Lake Park to the Aitkin County Line. The coalition meets every other month, has successfully helped implement several projects, and is currently pushing for other prioritized safety and congestion changes. More information about this coalition can be found on their website: http://www.th65cc.com/home.html.

C-W, 2. Enforcement

In regions where disregarding traffic control devices and failure to yield right of way is identified as an issue, targeted enforcement of traffic laws is an option to modify drivers' behavior. Having law enforcement officers present on the road may motivate drivers, pedestrians, and bicyclists to obey traffic laws and traffic control devices, especially in regions where they expect to see officers present. The presence of officers can increase road users' awareness and can decrease the amount of distraction-related crashes. According to a study by Cohen Children's Medical center "drivers are 23 times more likely to be in a crash if they are texting while driving."[10]

a) **Key Enforcement Locations and Hours:** Enforcement locations and hours should be based off historical crash trends and risk factors. Crash trends showed that a large number of pedestrian or bicycle crashes were related to drivers, pedestrians, and bicyclists not obeying traffic control devices or failing to yield right of way. Safety risks that should be prioritized include the following: red-light running (especially for left-turning vehicles), speeding, and jaywalking. See Appendix D for a summary of intersection crash trends.

b) **Red-Light Cameras and Blue Light Enforcement at Signals:** Cameras to catch vehicles running red lights and blue lights to enforce traffic laws are two strategies used to decrease the amount of vehicles that run red lights.

   Red-light cameras are connected directly to traffic signals and take high-resolution pictures or video of vehicles that drive through the intersection during a red light. By watching live video footage, a law enforcement officer downstream of the intersection can watch for red-light running vehicles and pull drivers over on the other side of the intersection. The photographs and video captured by these cameras can assist in providing evidence for issuing a ticket. Red-light cameras have been installed in St Cloud, Minnesota. According to research presented on the Crash Modification Factor (CMF) Clearinghouse,[11] intersections that have red-light cameras can reduce red-light running related crashes by approximately 20 percent. This same study stated that there was not any increase in rear-end collisions when cameras were installed.

   Blue lights are tools that can aid in traffic law enforcement and are becoming increasingly popular in Minnesota. There are blue lights in place at two intersections on TH 65: one at the TH 10 north ramp and the other at 105th Avenue NE. Blue lights are installed on the back side of a signal and turn on only when the signal indication behind it is showing red. If the blue light is on when a driver crosses the intersection, officers located downstream can tell that the driver ran a red light and the officers can be on the optimal side of the

[10] *Source:* http://safety.trw.com/texting-while-driving-now-leading-cause-of-us-teen-deaths/0710/

[11] *Source:* http://www.cmfclearinghouse.org. *CMF ID #2426.*

intersection to pull the driver over. Blue lights can be installed relatively quickly; however, it should be noted that blue lights should only be installed at intersections that have adequate downstream parking space with visibility to the blue light for officers, which can be difficult in more urban areas. Local law enforcement agencies and MnDOT will have to agree on installation, maintenance, and placement of blue enforcement lights.

Figure 4-1: Example of Blue Light Enforcement Installed on Traffic Light

Source: https://minnesota.cbslocal.com/2014/11/06/good-question-what-are-those-blue-traffic-lights/

c) **Funding for Additional Enforcement:** The enforcement methods mentioned in a) and b) will only remain effective if enforcement can be maintained. Using the red-light cameras and/or blue lights will require more labor hours and availability of law enforcement officers. Therefore, it is recommended to seek grants that provide funding for added enforcement.

C-W, 3. Education Outreach

In addition to enforcement of traffic laws, education outreach can be used to teach drivers about different road safety topics, such as the dangers of distracted driving, pedestrian awareness, the risk of aggressive driving, the dangers of drinking while driving, and knowing how to use different traffic control devices at intersections.

It is recommended that multiple outlets be pursued for sharing safety messages, including the following.

- Temporary signs (or changeable message signs)
- Local papers
- Social media
- Handouts

Ideally, an education campaign is developed to share messages with relative frequency, for example, in the form of a reminder or issue of the month. It is strongly encouraged that local schools, law enforcement officers, and local transit agencies be involved in education efforts

to help get messages out to adolescents, drivers, pedestrians, bicyclists, and local transit users.

Various outreach campaigns are available, including through Minnesota's TZD program and can be researched. In addition, the Highway 12 Safety Coalition's Facebook page[12] is a good example to reference for sharing messages via social media. The Highway 12 Safety Coalition share's coalition updates and meeting minutes, news articles, safety messages, construction updates, and more on its Facebook page. In November 2015, crash reduction signs (see Figure 4-2) were installed on Highway 12 to raise awareness of the crash issues occurring.

Figure 4-2: Highway 12 Crash Reduction Sign

Source: Highway 12 Safety Coalition Facebook Webpage, Posted November 18, 2015.

The United States Department of Transportation (USDOT)[13], the Minnesota Department of Public Safety, and Minnesota State Patrol provide many great tips and resources about how to start conversations with children and youth, as well as how to use the integrated four-E approach (Engineering, Enforcement, Education, and Emergency Services) to accomplish

[12] *Web link:* https://www.facebook.com/Hwy-12-Safety-Coalition-1315243138753 02/

[13] *USDOT Education/Outreach Web Link:* http://safety.fhwa.dot.gov/ped_bike/education/

safety improvements. Different grants, such as the Minnesota TZD Safe Roads Grant,14 may be available to help fund action on education outreach and other safety initiatives along the corridors.

Informing drivers, pedestrians, and bicyclists of different safety risks may not eliminate distraction-related crashes, but it will allow road users to make more informed decisions when driving, walking, or riding bicycles along the corridor.

C-W, 4. Corridor Lighting Recommendations

a) **Corridor Lighting Assessment:** An overall assessment of corridor lighting should take place on both TH 47 and TH 65. Corridor lighting, especially at intersections and pedestrian facilities on and near the roadway, can improve safety for all road users. Having a well-lit corridor can increase driver response time because it allows drivers to see obstacles and road geometry changes ahead. A corridor lighting plan should be developed to acknowledge light-deficient regions. The corridor lighting plan should consider the following items b) through d).

b) **Bus Stop Lighting:** Many bus stops along the corridors are not lit at night. Unlit bus stops result in pedestrians' reduced visibility while walking to and from the stop or while waiting at bus stops. When bus stops are located on the same grade as the roadway, pedestrians are put at greater risk of being hit by traffic because of the reduced visibility. To install lights at bus stops along the corridors, additions of electrical connections will need to be considered.

c) **Source of Power and Funding:** When introducing new lights into a system, funding for the installation, the maintenance, and the power for lights will need to be identified. Intersections with a crash history of three or more non-daylight crashes in a year may meet a nighttime crash warrant and be eligible for MnDOT funding.

d) **Maintenance:** Streetlights should be actively maintained to prevent lighting deficiencies such as burnt out bulbs or loss of light caused by dirt or filming. An agreement should be made among MnDOT, law enforcement officers, and Metro Transit to set up a procedure for notifying MnDOT about burnt out lights and other lighting deficiencies reported.

C-W, 5. Crossing Treatment Recommendations

Crosswalk markings help delineate crossings for pedestrians, bicyclists, and help alert vehicles of the crossing. The following items a) through d) discuss recommendations and considerations at pedestrian crossings along the corridors.

a) **High Visibility Crosswalk Markings:** Consider high visibility crosswalk markings at marked crosswalks to increase awareness of the crossing. High visibility crosswalk markings (often referred to as zebra crosswalk markings) use wide bars, which are easier to see than standard parallel-line crosswalk markings. Crosswalk blocks should be placed such that they avoid car wheel paths to reduce wear caused by vehicles.

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[14] *TZD Safe Roads Grant Program Web Link:* https://dps.mn.gov/divisions/ots/tzd-safe-roads/Pages/default.aspx

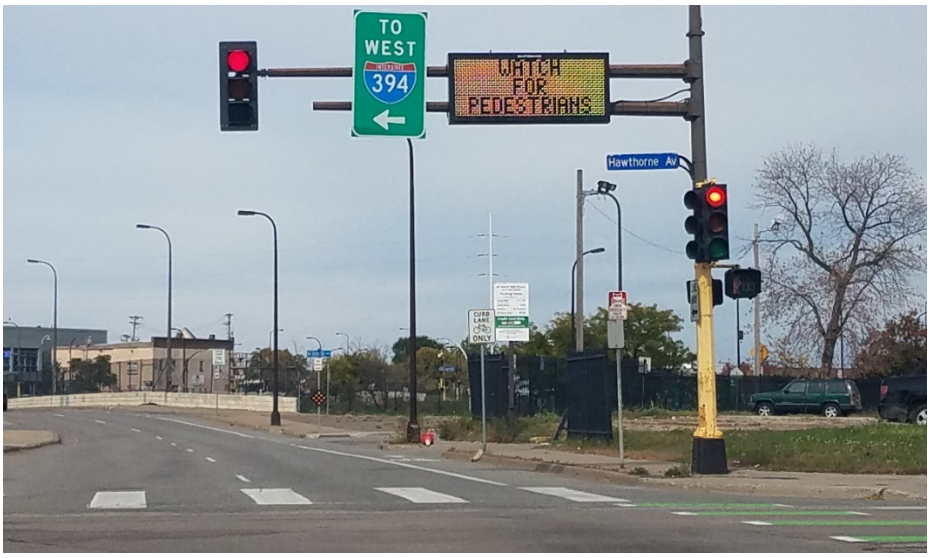
b) Advanced Stop Lines and Stop for Pedestrians Signage:

Advanced Stop Lines: At most signalized intersections on the two corridors, stop bars are not used, nor are they required in accordance with the MnDOT's *Manual on Uniform Traffic Control Devices* (MUTCD),[15] due to the presence of crosswalk markings. However, as suggested in the FHWA *Signalized Intersections: Informational Guide,*[16] right-turning drivers are more likely to come to a complete stop on red in advance of the crosswalk when an advanced stop line is present, especially if placed more than the standard 4 feet in advance of the crosswalk (15 to 30 feet recommended). This results in a reduction of right-turn-on-red vehicle and pedestrian collisions. When combined with a R10-15a sign[17] (Turning Vehicles Stop for Pedestrians), this strategy is even more effective.

R10-15a – "TURNING VEHICLES STOP FOR PEDESTRIANS" Signs: At intersections with frequent pedestrian crossing and turning vehicles, a "turning vehicles stop for pedestrians" sign should be considered. These signs can be implemented quickly to help remind drivers to check for crossing pedestrians, increasing drivers' awareness. This would be ideally used only as a short-term solution; it is preferable to implement intersection changes that make pedestrians more visible to drivers, for example, decreasing corner radii or installing curb bump outs.

Blank out signs: To draw more attention to pedestrians, blank out signs can be installed on signals to display changeable messages. The City of Minneapolis has recently installed these types of signs at various signals, see Figure 4-3 and Figure 4-4.

Figure 4-3: Blank out sign example, phase one of two



Source: Image taken on October 12, 2018 on Hawthorne Avenue in Minneapolis, MN by Natalie Sager.

[15] http://www.dot.state.mn.us/trafficeng/publ/mutcd/mnmutcd2018/mnmutcd_entiredoc.pdf.

[16] *Web link:* https://www.fhwa.dot.gov/publications/research/safety/04091/04091.pdf

[17] http://www.dot.state.mn.us/trafficeng/publ/mutcd/mnmutcd2018/mnmutcd_entiredoc.pdf.

Figure 4-4: Blank out sign example, phase two of two

Source: Image taken on October 12, 2018 on Hawthorne Avenue in Minneapolis, MN by Natalie Sager.

c) **Uncontrolled Crossings:** Chapter 13 of the *Minnesota Traffic Engineering Manual*[18] discusses locations where "crosswalk markings or additional crossing enhancement should be considered'. Intersections and potential mid-block crossings should be evaluated for enhanced crossing treatments according to the guidelines outlined in this manual.

Another resource that should be referenced for uncontrolled crossings is FHWA's *Field Guide for Selecting Countermeasures at Uncontrolled Pedestrian Crossing Locations.*[19] Table 1 of the guide identifies suggested countermeasures at crossings based on speed limit, road configuration, and AADT. For example, in a segment with speeds greater than 40 mph, an AADT over 15,000, and four or more lanes with a raised median, the following are recommended: high visibility crosswalk markings, parking restriction on crosswalk approach, adequate nighttime lighting levels, advance stop here for pedestrian sign and stop line, curb extension, and pedestrian Rectangular Rapid Flashing Beacon (RRFB).

Rectangular Rapid Flashing Beacons: TH 47 and TH 65 both have high vehicle volumes, high pedestrian activity, and long crossing distances that can make crossings difficult for pedestrians; especially at unsignalized crossings. The use of a pedestrian-activated flasher system, such as an RRFB, can help direct a driver's attention when pedestrians are crossing.

RRFBs can be installed at a low cost and on a short schedule. Figure 4-5 shows what an RRFB looks like. RRFBs are much more visually apparent than traditional flashers and only flash when triggered by a pedestrian. RRFBs are installed at unsignalized intersections and mid-block pedestrian crossings to increase driver awareness. Pedestrians push a button installed on the crossing to trigger a flashing pattern similar to emergency flashers on police vehicles. Solar panels can be used to provide electricity to the devices.

[18] http://www.dot.state.mn.us/trafficeng/publ/tem/2015/chapter13.pdf

[19] *Web link:* https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/pocket_version.pdf

Traditionally, local units of government have funded these kinds of safety improvements.

Figure 4-5: Rectangular Rapid Flashing Beacon

Source: https://www.gshpinc.com/rectangular-rapid-flash-beacon/

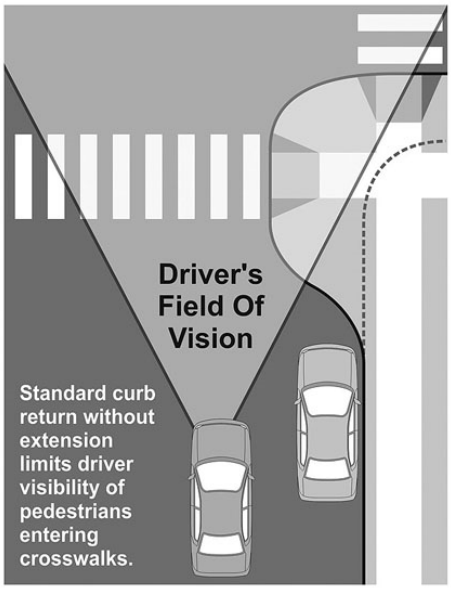
d) **Active Pavement Marking Maintenance:** Active maintenance of pavement markings is essential to ensuring the markings' effectiveness. During the road safety audit, it was noted at multiple intersections that crosswalk markings were worn and faded, which resulted in the markings being not very visible. It is recommended that crosswalks be regularly monitored to maintain crossing visibility year-round. Other pavement markings (stop bars, edge lines, etc.) should be maintained to ensure they remain in adequate conditions.

C-W, 6. Crossing Distance

Pedestrian crossing distances directly correlate with the amount of time a pedestrian is exposed to traffic within an intersection. Increased exposure results in increased risk, especially for those with low mobility. At signalized intersections, crossing distance influences signal timing, the longer the crossing distance, the longer a pedestrian phase needs to be, which can result in increased delay for vehicular traffic. Opportunities to decrease crossing distance should be evaluated along both corridors. Possible countermeasures include installing curb extensions (also referred to as curb bump outs), minimizing the number of and width of lanes, restricting on-street parking/minimizing shoulder widths at intersections, and providing mid-crossing refuges.

a) **Curb Bump Outs/Extensions:** At pedestrian crossings in wide road sections, curb bump outs (also referred to as curb extensions) are recommended. Curb bump outs are installed to narrow the crossing distance over a street and improve pedestrian safety see Figure 4-6. Curb bump outs allow pedestrians to enter the driver's field of vision before entering the crossing.

Figure 4-6: Curb Bump Outs



Source: https://www.pinterest.com/pin/350295677237259425/?lp=true

Because installation of curb bump outs can be completed on a short schedule, curb bump outs should be added in the short-term. It is much more effective to install permanent curb extensions; however, if it is not possible to install immediately, temporary curb bump outs can be created using bollards and pavement markings, as shown in Figure 4-7. Bollards can become a maintenance burden because they get hit easily and do not create as much physical protection for pedestrians. It will be important to consider truck-turning movements when designing curb bump outs.

Figure 4-7: Temporary Bump Outs

Source: http://sf.streetsblog.org/category/san-francisco-neighborhoods/district-6/.

b) **Minimize Number of/Widths of Lanes:** Pedestrian crossing distances are heavily dictated by the number of and width of lanes on a roadway. By removing just one lane, crossing distance is reduced by at least 10 to 12 feet. Based on a walking speed of 3.5 feet per second (the speed typically assumed for signal timing), removal of one lane results in a reduction of approximately 3 seconds (or more) of exposure for pedestrians and increases with each lane removed.

   Turn lanes: The need for turn lanes should first be evaluated, especially on lower speed roadways and/or in cases where dual turn lanes are provided. Things to consider when assessing the need for a turn lane include turning movement volumes, road speed, and number of through lanes. A traffic analysis is recommended to assess the effect of removing turn lanes on traffic operations. An increase in rear-end collisions is often correlated with removal of turn lanes; however, on lower speed corridors these crashes tend to be low injury and do not outweigh the pedestrian safety benefits.

   Number of through lanes: Another consideration is the number of through lanes. During the road safety audit, some lower volume cross streets that had four through lanes were noted as potential candidates for a reduction to three lanes (two through lanes with a shared center left-turn lane).

   Mainline through lanes should be evaluated. On northbound TH 47, a third lane is added just south of 85th Avenue NE and drops into dual right-turn lanes at University Avenue NE. A traffic analysis is recommended to assess the effects of removing this additional lane. On TH 65, north of 85th Avenue NE, the road section transitions from 4 to 6 lanes, the location of this transition should be evaluated; one consideration is to not add the third northbound lane until north of the intersection (after the crossing).

   Minimize lane widths: Minimum lane width criteria should be evaluated for all through lanes and turn lanes and be uniformly applied throughout each corridor. Coordination with local jurisdictions will be important for implementing these types of changes at cross streets. In most locations, lane widths of 12 feet or larger appear to be typical; however, lane widths as low as 10 feet may be possible depending on lane type and road speeds. Lane widths ranges based on road type, safety impacts, and traffic impacts are further discussed on FHWA's mitigation strategies for design exceptions website.[20]

c) **Wide Edge Lines:** Increasing the width of existing edge lines should be considered along both corridors. Increased edge lines widths improve drivers' visibility of lane lines, which helps keep drivers in their lanes, especially in fog, wet, and low-lighting conditions. It would also help keep drivers further away from pedestrian walking spaces. Pavement marking upgrades can be implemented quickly and at relatively low cost.

d) **On Street Parking Lanes:** On street parking lanes widen the roadway and tend to widen pedestrian crossings. It is recommended that on-street parking needs be evaluated along the corridors and on cross streets. It is recommended that parking lanes be eliminated where possible to provide more space for non-motorized facilities such as bicycle lanes, wider

[20] *Web link:* https://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/chapter3/3_lanewidth.cfm

sidewalks, and wider boulevards. Involvement of local businesses on decisions to remove parking will be important. If retained, parking lanes should end in advance of an intersection and curb extensions should be added so that pedestrian crossing distance is decreased at the intersection.

e) **Mid-Crossing Pedestrian Refuges:** Pedestrian refuges provide a space for pedestrians to stop mid-crossing and allow for a two-stage crossing. Pedestrian refuges can be especially beneficial at signalized intersections for those who are elderly or have low mobility and cannot cross the intersection. Another benefit of the mid-crossing refuge is that pedestrians can focus on crossing one direction of traffic at a time. The desired width for a refuge is 8 to 10 feet, but can be as low as 6 feet (the typical width needed to fit a bicycle or large strollers). Additional information on pedestrian refuges can be found in National Association of City Transportation Officials' (NACTO) *Urban Street Design Guide*.[21] Median nose extensions should be considered when evaluating pedestrian refuges, see C-W, 7c.

C-W, 7. Traffic Calming/Aesthetic Improvement

In various locations along the corridors and on some cross streets, the road safety audit team recognized that the road sections were wide. The shoulder widths resulted in a feel of a higher speed section, rather than a low speed urban street. In various locations on TH 65 and TH 47, and on various cross streets, repurposing the cross sectional width should be considered to change the character of the road.

Different methods could be used to change the character of the roadway so that drivers naturally slow down, i.e. making the roadway feel more urban. This can be done through: the use of landscaping or plant boxes, addition of bike lanes[22], narrowing of travel lanes, addition of curb bump outs, addition of pedestrian refuges, strategic use of pavement materials and/or colors, adjustment of coordinated system signal timing, etc. Many of these traffic calming measures can be implemented at a fairly low cost and on a fairly fast timeline.

a) **Truck Route Considerations:** Geometric changes to the roadway will be influenced by the needs of trucking agencies to navigate routes. It is recommended that truck companies in the area be identified and engaged regarding suggested changes. Key intersections/traffic movements that need to remain open to trucks should be identified as well as frequency of truck use. Potential tradeoffs should be discussed as well to address the needs of all road users; consider alternative truck routes or identify ways to get traffic through an intersection while also providing tighter geometry (i.e. truck aprons or corrugated surfaces).

   Performance-Based Practical Design (PBPD): To achieve optimal intersection performance, a practical design approach should be used to provide facilities that are designed for frequent users (i.e. the design vehicle) but can still accommodate infrequent large users (i.e. the control vehicle). In other words, if large trucks infrequently use the intersection but have no alternative routes,

[21] *Web link:* https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/crosswalks-and-crossings/pedestrian-safety-islands/

[22] *FHWA provides guidance on Incorporating On-Road Bicycle Networks in Resurfacing Projects:* https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/resurfacing/resurfacing_workbook.pdf

the geometry should still be designed such that they are able to navigate the intersection, but should be considered the control vehicle instead of the design vehicle. Further background on PBPD approaches can be found on FHWA's design webpage.[23]

b) **Corner Radii:** Corner radii size influences the speed that a vehicle is able to complete a turn at. By tightening up a corner, turning speeds are reduced. In addition, tightened corners allow for pedestrian crossings to be located closer to the intersection, which puts pedestrians in a higher visibility location. National Association of City Transportation Officials' (NACTO) Urban Street Design Guide presents more background[24] on the benefits of small corner radii. In general, it is recommended that corner radii be modified to be less than or equal to 15-feet where possible.

c) **Median Nose Extensions:** The extent that medians extend into an intersection can impact how vehicles make turning movements. If a median extends further into an intersection, turning speeds can be reduced because there is less room for turning maneuvers and corner cutting. This results in a positive safety benefit for pedestrians crossing the roadway because drivers must be more attentive to make their turning maneuvers and have more reaction time due to their slower travel speeds. Furthermore, if there is a pedestrian cut-through in the median (as opposed to the crossing being located in front of the median), the raised median nose provides some separation and protection for pedestrians in mid-crossing.

   Before installing median nose extensions, it will be important to evaluate local truck routes and assess what the design vehicles are and how much traversable space is necessary to maintain to accommodate large turning vehicles. Through conversations with local businesses, it may be possible to strategize truck routes and minimize the number of intersections carrying heavy vehicle turning traffic. Another option may be to use a treatment such as the corrugated concrete median nose design which has been used by Illinois Department of Transportation.

   IDOT Corrugated Concrete Median Nose Treatment: Illinois Department of Transportation (IDOT) has developed a standard detail[25] for a corrugated concrete median nose treatment which allows for a tighter intersection geometry for turning passenger vehicles while still accommodating larger design vehicles. When traveled on, the corrugated surface provide auditory and vibratory feedback which alerts drivers that they are leaving the traveled way. Because they are not raised like traditional raised median noses, corrugated concrete median noses are likely to reduce the potential for equipment damage resulting from snow plows striking them. An alternative use for this design is to use it for locations where left turn access restrictions are desired, but emergency vehicle access needs to be maintained.

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[23] *Web link:* https://www.fhwa.dot.gov/design/pbpd/general_information/faqs.cfm

[24] *Web link:* https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/corner-radii/

[25] *Web link:* http://idot.illinois.gov/Assets/uploads/files/Doing-Business/Standards/Highway-Standards/PDF/216-606306-03_corrugatedpccmedians.pdf

d) **Improve Bus Stop Aesthetics:** Consider upgrades to bus stops that look unwelcoming. Dirt or damaged bus stops could deter people from choosing public transportation. An increased appearance of the bus stops would make them move inviting to anyone who might normal drive instead of taking the bus. An increase in local transit ridership could help decrease the amount of vehicles on the corridors.

e) **Improve/Maintain Sightlines:** The ability for drivers to see pedestrians and for pedestrians to see vehicles before entering an intersection is important for having enough decision and reaction time to respond to potential conflicts. Presence of obstacles such as signs, buildings, tall landscaping, retaining walls, and other structures can reduce sightlines at corners of intersections, which results in higher risk of turning vehicles not seeing pedestrians before turning. During the road safety audit, intersection sight distance was a concern at some intersections. Intersection sight distance should be evaluated at intersection corners using criteria presented in Chapter 5 of the MnDOT Road Design Manual. Where possible, measures should be taken to clear corners to maintain proper sight distances.

C-W, 8. Traffic Signals

a) **Pedestrian Crossing Times:** During the road safety audit, it was observed the pedestrian crossing times were not long enough at several intersections. Without adequate crossing time, pedestrians may not be clear of the intersection before conflicting traffic gets a green indication. Pedestrian interval guidelines are presented in the MN MUTCD, Section 4E.6. Compliance with these guidelines should be checked at signalized intersections.

   At intersections located near schools and/or lower mobility communities, more conservative pedestrian clearance times should be used, it is recommended that a walking speed slower than 3.5 feet per second be assumed. At intersections with high turning movements, there is a risk of drivers not yielding to pedestrians in crossing which results in added delay for pedestrians because they have to wait for a gap in traffic. At these intersections, additional buffer time should be considered to provide adequate time for a pedestrian to clear the intersection.

b) **Signal Cycle Length:** With long cycle lengths, pedestrians may need to wait a long time before the walk signal turns on. This wait time can be especially long if they don’t trigger the push button in time for the current cycle. With longer wait times, pedestrians are more likely to jaywalk, especially if they need to get to a bus stop on another corner and are at risk of missing their bus while waiting for the signal to change. By shortening signal cycle length, frequency of pedestrian indications can increase and wait time shortened.

c) **Pedestrian Recall:** Placing pedestrian indications on recall is an option and can be done all day or just during specific time periods. Pedestrian recall means that the pedestrian indication turns on with each signal cycle, regardless of whether a pedestrian push button was triggered. This option is ideal for side streets that are lower in traffic volumes or at locations that have consistently high number of pedestrian crossings. By putting signals on

pedestrian recall, the risk of pedestrians not pushing the push button in time is removed, which decreases the risk of jaywalking.

d) **Leading Pedestrian Intervals (LPIs):** LPIs increase pedestrian conspicuity at signalized intersections by providing pedestrians with a 3-7 second head start from the corresponding green signal in the same direction of travel when entering an intersection. By having a head start, visibility of pedestrians is improved and pedestrians are able to reinforce their right-of-way over turning vehicles. According to NACTO's online Urban Street Design Guide,[26] "LPIs have been shown to reduce pedestrian-vehicle collisions as much as 60% at treated intersections". LPIs are relatively easy to implement because they only require signal re-timing.

e) **Pedestrian Omit on Flashing Yellow Arrow (POOFYA) Phasing:** Flashing yellow arrows are used to control left turn movements using either protected or permissive phasing. When showing a green arrow, left turn movements are allowed to go and don't have to yield to other traffic movements. When a flashing yellow arrow indication is shown, vehicles are allowed to turn left, however, they must yield to oncoming traffic and pedestrians. When showing a red arrow, left turns are prohibited. When flashing yellow arrows are installed, it is recommended that the arrow show red during a walk indication to prevent left turn conflicts with pedestrians. When done, this is often referred to as Pedestrian Omit on Flashing Yellow Arrow, or POOFYA phasing.

   Research shows that protected left turn phasing overall tends to result in an increase in crashes... <<CONTINUE DISCUSSION ON THIS, DEREK TO FOLLOW UP WITH FRANK GROSS FOR MORE INFORMATION ON THE STUDY>>

f) **Restrict Right Turns on Red:** Unless restricted, drivers in Minnesota are permitted to make a right turning movement during red light cycles; this creates a potential conflict when the pedestrian walk phase is on. Although drivers legally must come to a complete stop before turning, many drivers do not comply with this and tend to primarily focus on yielding to traffic on their left instead of looking for pedestrians on their right. It is recommended that right turns at each signalized intersection on the corridors be evaluated for right turn on red restrictions, especially at intersections that have leading pedestrian interval (LPI) phasing intended to provide pedestrians with a conflict-free head start. By doing so, drivers are forced to come to a complete stop on red and it's possible to provide a fully protected pedestrian phase. Because right turn restrictions are not yet the norm in Minnesota, this may go against driver expectation. If applied consistently across the corridors, probability of drivers obeying the restrictions will increase.

g) **Signal Timing Operational Speeds:** Timing of signals along mainline corridors is often coordinated to maximize traffic flow and reduce delay during peak hours. The coordination between signals is based on a chosen speed, typically the 85th percentile or posted speed limit. By adjusting the target speed that signal progression is designed for, operational speeds on a

[26] *Web link: https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/traffic-signals/leading-pedestrian-interval/*

roadway can be influenced. Consider signal progression based on a speed lower than the 85th percentile speed in order to reduce operational speeds on the corridors. National Association of City Transportation Officials' (NACTO) Urban Street Design Guide presents more background[27] and recommendations on coordinated signal timing.

"Signals Set for XX mph" signs: To help drivers know how to best navigate a low signal progression speed corridor without getting stuck at red lights, signs such as the ones shown in Figure 4-8 can be posted along the corridor. These signs could either have changeable speeds (like the one shown in the example) or could be static signs (i.e. standard signs).

Figure 4-8: Example Signals Set for XX mph sign

Source: https://store.hallsigns.com/I1-1-Signals-Set-for-XX-MPH_p_5044.html

C-W, 9. ADA Accessibility

Sidewalks, pedestrian crossings, and other existing/desired pedestrian connections should be designed to serve all users, including those who have low mobility due to age, abilities, or other assistive devices such as wheelchairs or strollers. ADA standards have been developed

[27] *Web link:* https://nacto.org/publication/urban-street-design-guide/intersection-design-elements/traffic-signals/coordinated-signal-timing/

for sidewalks and street crossings. Considerations for ADA accessibility include: steepness of grade, curb ramp shape/size, sidewalk and crossing width, location of obstructions, pavement surface (texture, material, wear), location of pedestrian pushbuttons, visibility of pedestrian indications, availability of accessible connections, presence of detectible edges, length of crossing, accessibility during winter or wet conditions, maintenance of accessible facilities, and convenience of access.

a) **Assess Intersections for ADA Compliance:** Facilities that do not meet current ADA standards should be evaluated and upgraded. The US Access Board's Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG) should be followed for accessibility standards. The MUTCD provides standards regarding Accessible Pedestrian Signals (APS) which should be used as design minimums. Additional ADA guidance can be found on MnDOT's Accessibility webpage.[28]

b) **Paving Existing Dirt Walking Paths:** During the road safety audit, dirt walking paths were observed at several intersections, indicating routes which are unpaved, but heavily traveled by pedestrians. Consider working with property owners to pave these routes and also improve the overall accessibility and better serve the needs of pedestrians along the corridor.

c) **ADA Accessibility of Bus Stops:** During the field visit, it was observed that several bus stops were not ADA accessible from the nearby intersection. It is recommended that bus stops, especially those with limited mobility ridership, be evaluated for ADA compliance and be upgraded accordingly. The United States Access Board's Americans with Disability Acts Accessibility Guidelines (ADAAG) Section 10.2 provides guidance on ADA accessibility requirements at bus stops and terminals for both new construction as well as alterations for existing facilities.

   Curb Installation at Bus Stops: Several bus stops on the corridors (especially on TH 47) are located directly on the roadway and are at grade with pavement. When sitting at some of the bus stop benches, road safety audit team members felt uncomfortable due to the proximity to live traffic. To provide some vertical separation for pedestrians at bus stops, it is recommended that curb be added in front of bus stops and connect from the intersection corner.

C-W, 10. Temporary Methods for Longer-Term Strategies

Where feasible, temporary methods should be used to implement longer-term strategies on a faster timeline. For example, pavement markings and bollards can be temporarily used in place of raised curb to implement access management strategies or construct curb bump outs (see C-W, 6a, Figure 4-7 for further discussion on temporary curb bump outs). Longer-term, these temporary improvements can be replaced with more permanent strategies.

4.2.2 Corridor-Wide Medium to Long-Term Strategies

The following paragraphs provide discussion of medium-term (five to ten years) and long-term (ten years or more) safety recommendations given for both the TH 47 and TH 65 corridors. Please refer to Source: Google Maps™ mapping service. August 2018.

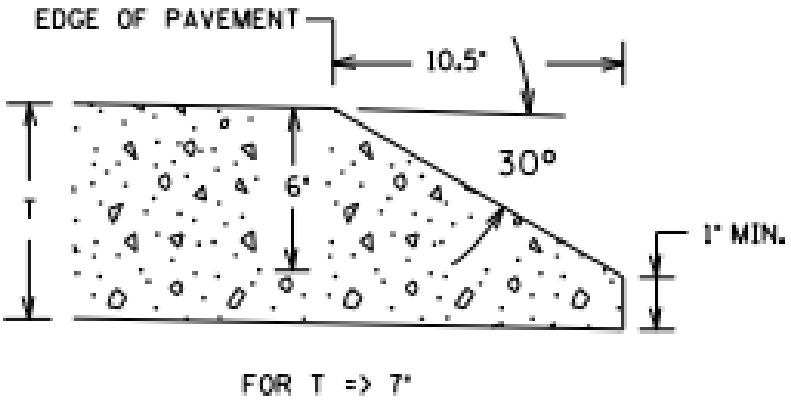
[28] *Web link:* http://www.dot.state.mn.us/ada/design.html

Table for a summary of these recommendations.

C-W, 11. Considerations for future projects

a) **Safety Edge Treatment:** In sections of the corridor without curb and gutter, it is recommended that safety edge treatments be implemented. This can be done as part of future paving projects. With safety edge treatments, edges of road ways slope down at a slope of 30 degrees with no more than a 1 inch drop shown in Figure 4-9 according to MNDOT's Technical Memorandum No 16-01-T-01. This makes it possible for drivers who have driven too far off the road to make a smooth transition back onto the road instead of having a sudden drop off. This will help decrease the risk of overturn and rollovers.

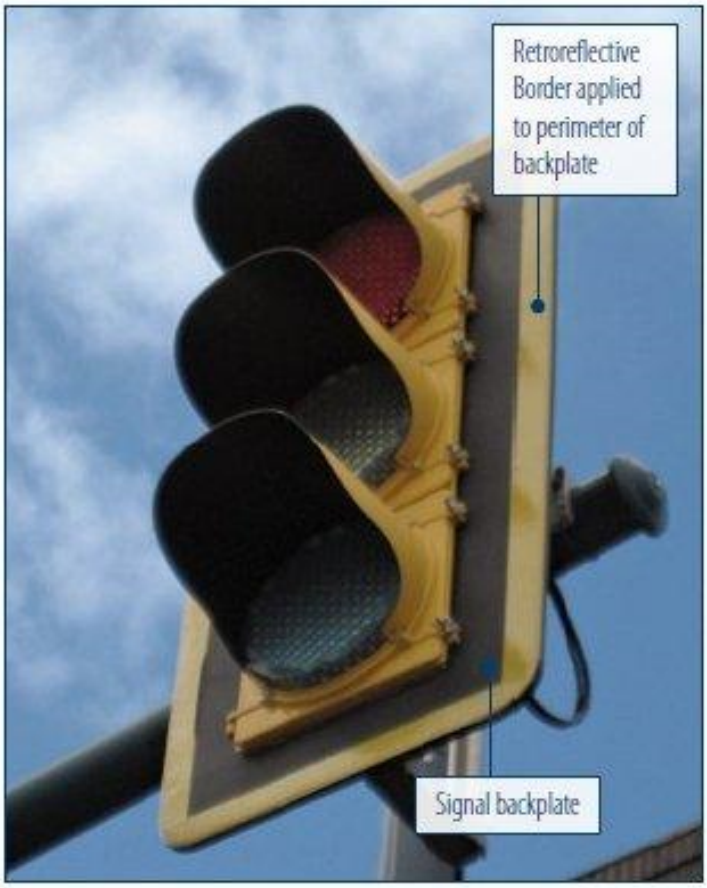
Figure 4-9: Safety Edge Treatment Example Typical Section



Source: https://www.dot.state.mn.us/stateaid/trafficsafety/reference/edge/16-01-t-01.pdf

b) **Retro-Reflective Back Plates:** Consider installing retro-reflective back plates on signal heads at intersections along both corridors to improve visibility of signal indications. This should be done when signal upgrades are being made. When hit by the light of a vehicle's headlights, these back plates become illuminated and essentially frame the signal head with light. This makes it much easier to see from a distance. **Error! Reference source not found.** shows what a retro-reflective back plate looks like.

Figure 4-10: Retro-Reflective Back Plate for Signal Heads



Source: http://safety.fhwa.dot.gov/provencountermeasures/fhwa_sa_12_007.htm

c) **Signal Head Placement:** At multiple intersections, it was noted that two lanes shared a signal head instead of having one signal head centered over each lane. Consider changing this to one signal head per lane of travel. This improvement can be done during future intersection improvement projects. Section D4.11 of the MUTCD provides guidance on the recommended number of primary signal faces based on number of through lanes. For approaches with two through lanes, one overhead-mounted signal face is required at minimum for the movement (see Table 4D-1 of the MUTCD), however, it is recommended that one be used per lane (see Figure 4D-3 of the MUTCD). Having one signal head per lane improves visibility for drivers and also helps with navigating through the intersection because drivers have a target to aim for as they enter the receiving lane.

C-W, 12. Access Management Plans

Consider developing an access management plan for both corridors. According to a publication written by the Federal Highway Administration (FHWA) and the Institute of Transportation Engineers (ITE) in 2004, access management plans are intended to ensure that a roadway “serving a community or region will operate safely and efficiently while adequately meeting the access needs of the abutting land uses of the roadway. The use of

access management techniques is designed to increase roadway capacity, manage congestion and reduce crashes."[29]

Access management plans map out current access points in a region and consider how drivers enter or exit each side street or driveway. Factors that are observed include: access density, presence of turn lanes, use of service and frontage roads, and presence of raised medians.

a) **Access Guidance:** The FHWA provides an overview of key concepts for access management in their "Benefits of Access Management Brochure".[30] Another resource that can be referenced is the MnDOT Access Management Manual.[31] Pedestrians and bicyclists should be considered when developing this plan and should be included in all traffic impact assessments.

Some key concepts associated with access management plans are explained in the bullets below:

b) **Access Density:** The more access points (roads or driveways intersecting a corridor) within a given stretch of roadway, the higher the access density. Having high access density can greatly increase the probability of crashes. Limiting access reduces the number of possible conflict zones and can increase capacity. Spacing of access points should also be considered so that drivers have sufficient space to make turns and merges with minimal conflict.

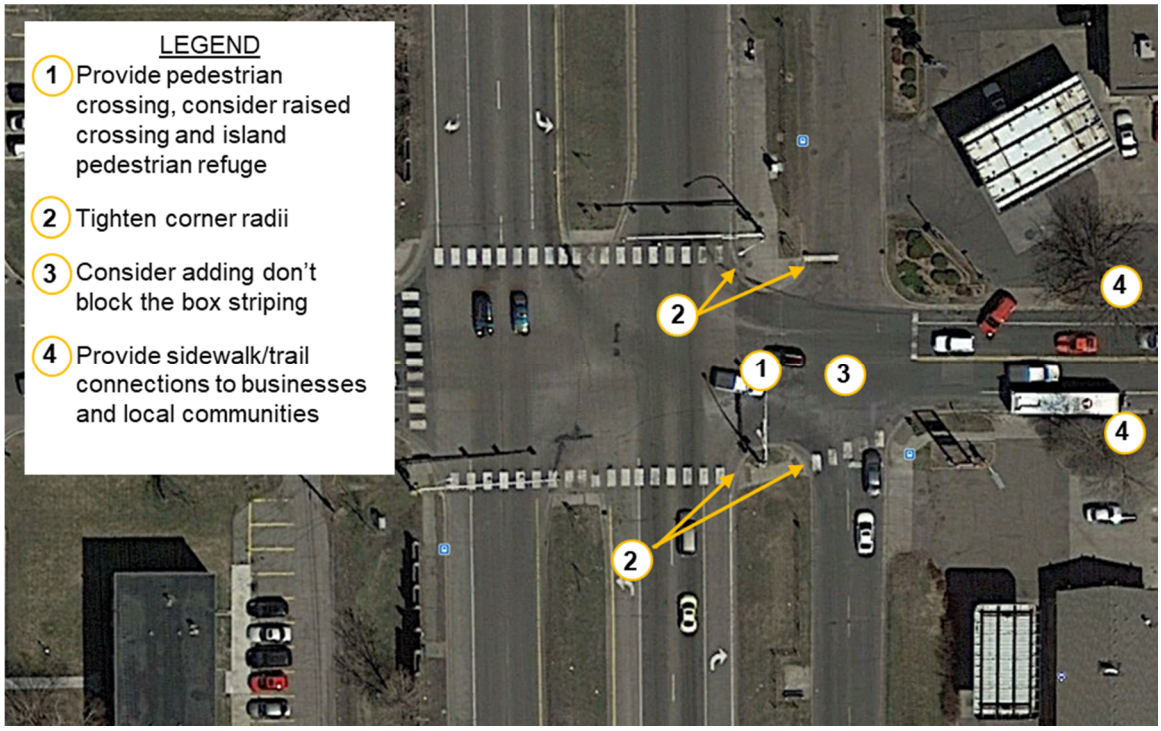
c) **Closely spaced frontage road intersections:** Several intersections on the project corridors have parallel frontage road intersections nearby. These intersections tend to be confusing to navigate for vehicles and non-motorized users. It is recommended that access at these intersections be evaluated and solutions be implemented to provide more navigable space for pedestrians and vehicles. Restricting the frontage road intersection by adding/extending a median on the east/west cross street is recommended where feasible. Where not feasible, an approach, such as the one shown in Figure 4-11 may be used to clarify space within the intersection for non-motorized users and motorized vehicles:

[29] *Source:* http://library.ite.org/pub/e26c5400-2354-d714-51b2-432d8f3da94d

[30] *Source:* http://ops.fhwa.dot.gov/access_mgmt/docs/benefits_am_trifold.htm

[31] *Source:* http://www.dot.state.mn.us/accessmanagement/pdf/manualchapters/chapter3.pdf

Figure 4-11: Example Intersection Treatments with Closely Spaced Frontage Road (TH 47 and 53rd Avenue NE Shown)

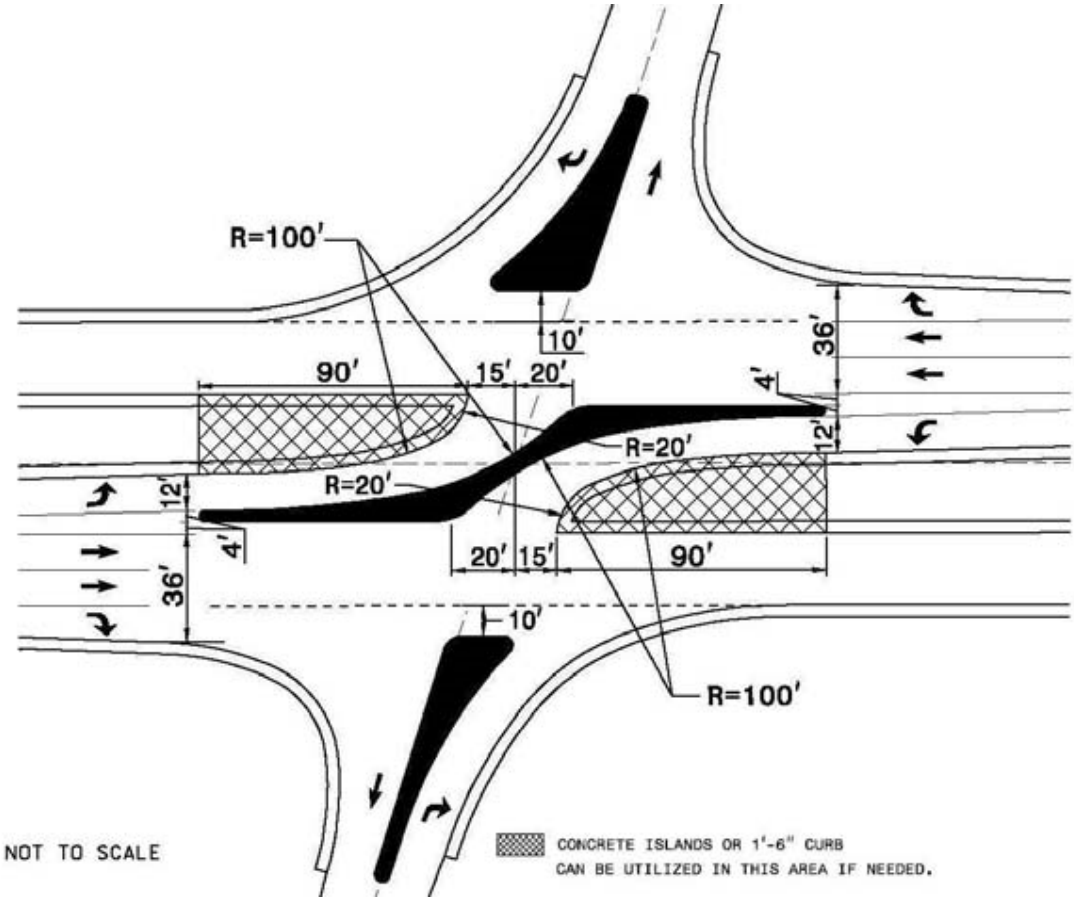


d) **Right-in/Right-out or ¾ Access:** Most unsignalized intersections on the corridors have full access, meaning drivers are allowed to turn left or go through on side streets. At prioritized intersections, consider reducing access to right-in/right-out or ¾ access to reduce the number of potential conflict points for vehicles and to provide opportunities for enhanced pedestrian crossings.

Right-in/right-out intersections restrict left-turn and through access, typically for the minor street. This is commonly done by extending a median fully (without a break) through the intersection along the main road. Right-in/right out intersections provide an opportunity for staged pedestrian crossings through providing a pedestrian refuge in the center median. In addition, because left turns are eliminated, crossing distance can be reduced with the removal of left turn lanes.

¾ intersections are similar to right-in/right-out intersections, except left-in movements are allowed, which may be necessary to provide at some locations based on volume/access reasons. This is typically using concrete center islands that channelize the left turn movements. See Figure 4-12 for an example of a ¾ intersection. In this example, the road running left and right would be the main road and the road running up and down would be the minor road.

Figure 4-12: 3/4 Intersection Example



Source: https://www.fhwa.dot.gov/publications/research/safety/09060/004.cfm

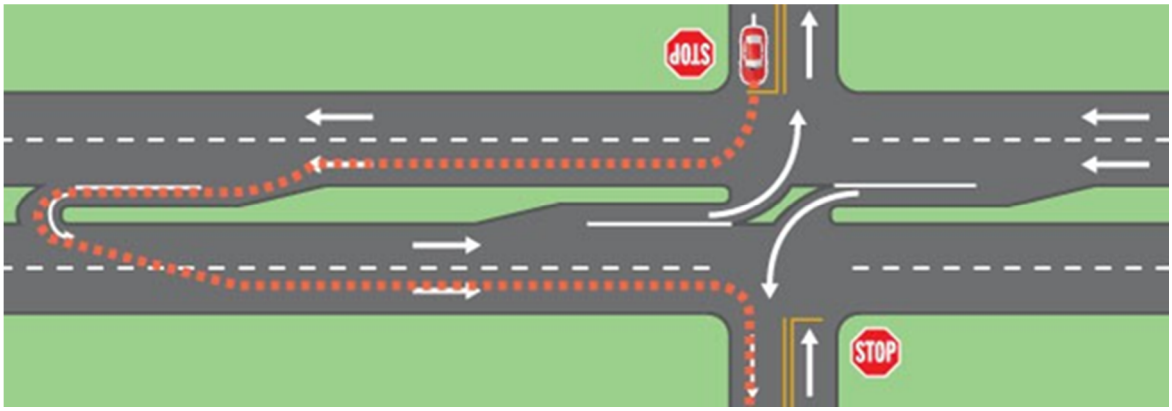
Due to the presence of left turn lanes, ¾ intersections are not ideal for pedestrians compared to the right-in/right-out configuration. Crossing locations should minimize conflicts with vehicles and be based on turning volumes, lane geometrics, and median width. One potential option is to cross pedestrians in three stages and provide a refuge on either side of the left turn lane. The benefit is that the route is more direct, however, the challenge is additional width is needed to provide adequate space for refuge islands and left turn conflicts are still present. Another option is to provide one central crossing which runs diagonally through the intersection through the center island, this option reduces conflict with left turning vehicles, but may not provide a direct route. Because of this, fencing may need to be installed to prevent pedestrians from crossing the median at other locations. A third option is to eliminate one of the left turns in, and select one side of the intersection for a two-stage pedestrian crossing. Challenging pedestrian crossing locations should be assessed.

e) **Reduced Conflict Intersection:** Reduced conflict intersections are a possible long term solution for intersections with a high volume of left turns or with a history of frequent right-angle crashes. They also may be effective for

providing reduced traffic delay at signalized intersections because only two signal phases are needed.

The main goal of an RCI is to reduce the number of conflict zones present in an intersection. RCIs usually entail restricting turn movements to be right-in-right-out so that through and turning vehicles don't cross opposing traffic. Pre-specified locations are installed for drivers who need to make U-turn maneuvers. See Figure 4-13 for a visual of a RCI.

Figure 4-13: Reduced Conflict Intersection Example



Source: http://www.mikeontraffic.com/restricted-crossing-u-turn-rcut-intersections/

Unlike roundabouts or standard signals, RCIs do not impede or stop mainline through traffic. RCI intersections allow all the same directional options as a typical signalized intersections, but have shown a major decrease in crashes. According to a preliminary crash data from a study performed by MnDOT's Office of Traffic, Safety, and Technology in May 2017,[32] RCIs in Minnesota have shown a 100 percent reduction of fatal and serious injury right-angle crashes, a 77 percent reduction of all severity right-angle crashes, and a 50 percent reduction of injury crashes. Since this corridor has a high pedestrian activity, consider exclusive pedestrian signal phases with signalized RCI intersections.

RCIs are being installed on the TH 65 corridor to improve safety and manage congestion in the region north of Bunker Lake Boulevard and south of 245th Avenue N. A signalized RCI will be installed at Viking Boulevard and non-signalized RCIs will be installed at 143rd Avenue, 153rd Avenue, 157th Avenue, 181st Avenue, and 187th Avenue. Please refer to the project website for more information: http://www.dot.state.mn.us/metro/projects/hwy65rci/.

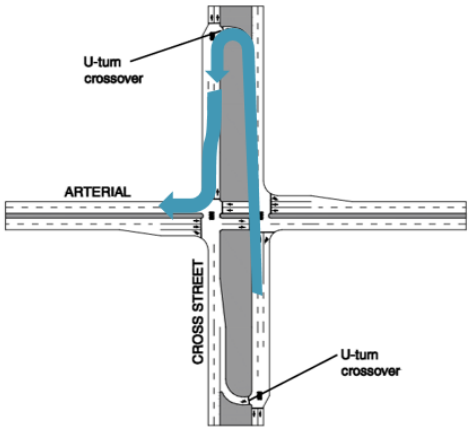
Median U-turn Intersections: The Median U-turn (MUT) intersection is a type of reduced conflict intersection that eliminates all left turns. Figure 4-14 and Figure 4-15 show two different configurations of this intersection type. Use of traffic signals is optional at the U-turn locations depending on traffic volumes. Because of wide medians and restriction of left turn conflicts, MUT intersections can be ideal for pedestrian crossings. **Error! Reference source**

[32] *Web link:* http://www.dot.state.mn.us/roadwork/rci/docs/trafficsafetyatrcistudy.pdf

not found. shows an example of what a pedestrian crossing might look like at a MUT intersection.

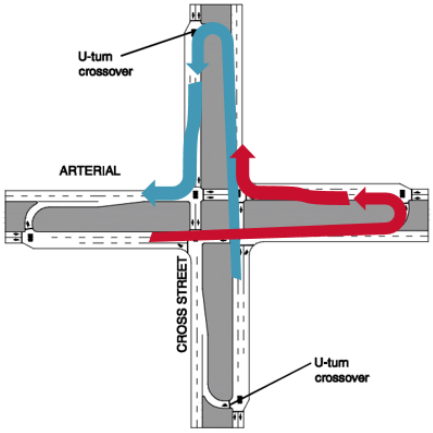
MUT intersections reduce injury related intersection related crashes by 30 percent according to the FHWA Median U-turn Intersection Informational Guide from 2014.[33] The same report also states that all corridor-related crashes were reduced by 14 percent. MUT intersections would be long term solutions and would require many signs including "No Left Turn" (R3-2) and "Do Not Enter" (R5-1). They would also require outreach so that drivers understand why these intersections are safer and to make sure they understand how to properly drive them. For a visual of MUT intersections, please refer to FHWA's video, "Alternative Intersections: Median U-Turns".

Figure 4-14: U-turn on minor street



Source: https://safety.fhwa.dot.gov/intersection/alter_design/pdf/fhwasa14069_mut_infoguide.pdf

Figure 4-15: U-turn on both streets



Source: https://safety.fhwa.dot.gov/intersection/alter_design/pdf/fhwasa14069_mut_infoguide.pdf

f) **Pedestrian and Bicycle Considerations:** When assessing access changes, impacts to bicycles and pedestrians should be considered. Improvements should not provide barriers to connectivity or accessibility. Crossing locations should be strategized to maximize safety. Pedestrians and bikers should be included in all traffic impact assessments.

C-W, 13. Pedestrian and Bicycle Network

The existing pedestrian and bicycle network should be evaluated along and around both corridors to identify gaps and desired connections. Key pedestrian and bicyclists origins and destinations should be identified during this process as well as existing barriers to non-motorized traffic. Connections to and from communities that have a high percentage of households with no vehicles should be prioritized for network improvements. Connections to bus stops and retail should also be considered. ADA accessibility of in place infrastructure should also be evaluated to ensure that existing connections are accessible to those with any ability. Some existing corridor features were evaluated prior to the road safety audit; see the figures in Appendix E (Crash Assessment Figures) for a graphic which shows the existing

[33] *Source: Exhibit 4-4* https://safety.fhwa.dot.gov/intersection/alter_design/pdf/fhwasa14069_mut_infoguide.pdf

pedestrian network, some key pedestrian destinations, transit stops on the corridors, and percentage of households with no vehicles.

FHWA's Bicycle and Pedestrian Program offers guidance on finding funding opportunities, provides ideas for developing bike network mapping, and provides other resources: https://www.fhwa.dot.gov/environment/bicycle_pedestrian/

C-W, 14. Develop a Long-Term Corridor Plan

With new developments being continually added, the character, context, and use of the TH 47 and TH 65 corridors have evolved. With these changes, high-speed urban expressways may no longer fit within the context, communities, and multi-modal use. A corridor study and/or Planning and Environmental Linkages (PEL) Study is recommended for both corridors in the study area to establish and implement a long-term vision for the corridors, which balances the needs of all road users.

a) **Planning and Environmental Linkages (PEL) Study:** According to Colorado Department of Transportation (CDOT),[34] "PEL studies can be used to make planning decisions and for planning analysis. These decisions and analyses, for example, can be used to identify and prioritize future projects, develop the purpose and need for a project, determine project size or length, and/or develop and refine a range of alternatives." These types of planning studies often allow for projects to happen in a faster timeline because they link planning information directly or by reference into the National Environmental Policy Act (NEPA) process. PEL studies should be considered in case if federal funds are used for future projects.

b) **Functional Priority of the Corridors:** Long-term, consider re-designing parts or the extents of the two corridors such that regional mobility is maintained but with much lower vehicle speeds and safer conditions for other modes and the communities that they pass through. Consider the following:
    - Intersections are usually what cause capacity problems; some innovative solutions may be necessary to move traffic while also dramatically improving conditions for pedestrians. For example, consider reduced conflict intersections.
    - Consider functional priority of both corridors and consider the location of a logical split between the corridors, for example, vehicle throughput could be prioritized on TH 65 north of 53rd and on TH 47 south of 53rd Avenue NE. Complete streets involving slower travel speeds could be prioritized on TH 65 south of 53rd and on TH 47 north of 53rd Avenue NE.
    - With changes to roadway function and connections, the use and impact to surrounding roads, such as the parallel East River Road, will need to be considered.

c) **Stakeholder involvement** in corridor planning is important to ensure recommendations are a result of a collaborative process and that input is gathered on potential project impacts and benefits to the local community.

d) **Complete Streets (Road Diet):** Complete Streets are streets which are designed to accommodate various road users. There is no set way to develop

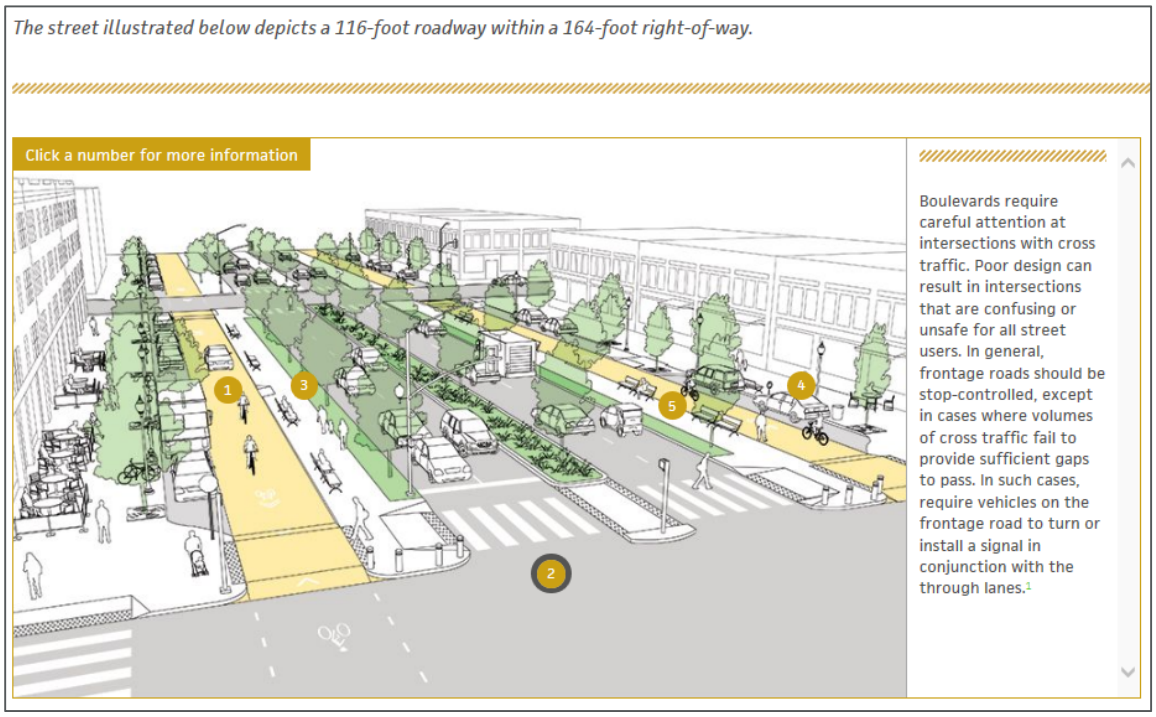
[34] *Source:* https://www.codot.gov/library/studies/study-archives/us6cliftonstudy/what-is-pel.html

a Complete Street layout but designs are most successful when created for specific community needs. Space availability should be considered as well.

There are several resources available for developing Complete Streets solutions. One useful resource is the National Association of City Transportation Officials (NACTO) Urban Street Design Guide.[35] This tool gives a brief overview of the benefits of Complete Streets, provides guidance for designing 21st century streets, provides different case studies from actual projects that have been constructed, and offers trainings and workshops, and more. Recommendations can be found for various intersection and street types.

Various elements that can be incorporated into complete streets designs include, but are not limited to: boulevards, bicycle lanes, separation of pedestrians and vehicular traffic, benches, greenery, parking spaces, bus stops, storm water management upgrades, and different traffic calming elements. Figure 4-16 provides a visual of an info-graphic tool which can be found on NACTO's website.

Figure 4-16: National Association of City Transportation Officials (NACTO) Urban Streets Design Guide Info-Graphic Tool on Boulevards



Road Re-Design Examples: An example of a roadway which has undergone dramatic re-design is the Sheridan Expressway in the Bronx, which has been un-designated as an interstate and re-designated to accommodate a variety of modes. See Figure 4-17 for a visual of the project.

[35] *NACTO's Urban Street Design Guide Web Link:* http://nacto.org/publication/urban-street-design-guide/

Figure 4-17: Sheridan Expressway Project

Source: https://www.amny.com/news/sheridan-expressway-bike-path-1.21134764

Another example is a Safe Infrastructure Project in Asheville, North Carolina, which reduced 7 lanes of traffic into a single lane roundabout to reduce speeds, shorten queues, and enable pedestrians to cross just one lane at a time. Please see Figure 4-18 for photos of the intersection before (left) and after (right).

Figure 4-18: Asheville, NC, Safe Infrastructure Project (Before and After)

Photographs taken by Anthony Butzek (Project Manager)

C-W, 15. Corridor Reconstruction

It is anticipated that changes proposed in the long-term corridor plan (see C-W, 14) may take time to implement due to cost, design, political, and construction constraints. It will be important to utilize strategic planning methods and to create a shared vision to minimize delays for implentation. Given that corridor reconstruction will take time, shorter-term strategies should be used to improve safety in the interim.

4.2.3 TH 47 Intersection Strategies

The following paragraphs provide discussion of safety recommendations given for TH 47 intersections. Please refer to Sections 4.2.1 and 4.2.2 for more background information on corridor-wide strategies (denoted by ***C-W, #***).

37th Avenue NE

Figure 4-19: Aerial Image of 37th Avenue NE and TH 47

Source: Google Earth™ mapping service. August 2018.

37th Avenue NE (shown in Figure 4-19) is the southern-most intersection on the TH 47 project corridor. Hennepin County is on the south side of the intersection and Anoka County is on the north side. The intersection is signalized and has four legs. Northbound/southbound lefts run on protected phasing and eastbound/westbound lefts run on permissive phasing. TH 47 has an ADT (from year 2017) of 13,700 vpd on the north and south legs and 37th Avenue has an ADT of 1,600 vpd on the west leg and 6,400 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs. Sidewalk connections exist to the east and west and a trail runs north along the east side of TH 47 but ends at Naegele Avenue. There are no bike lanes. The intersection was recently upgraded as part of a mill and overlay project on TH 47. This intersection was flagged because four pedestrian crashes occurred during the study period (2013-March 2018) and the critical crash rate index (1.11) exceeds one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider adjusting curb geometry on northeast corner to remove bump in and shorten crossing distance on east leg of intersection (***C-W, 6***).
- Consider tightening corner radii on all corners and consider curb bump outs on east and west side in shoulder areas. (***C-W, 6 and 7***).

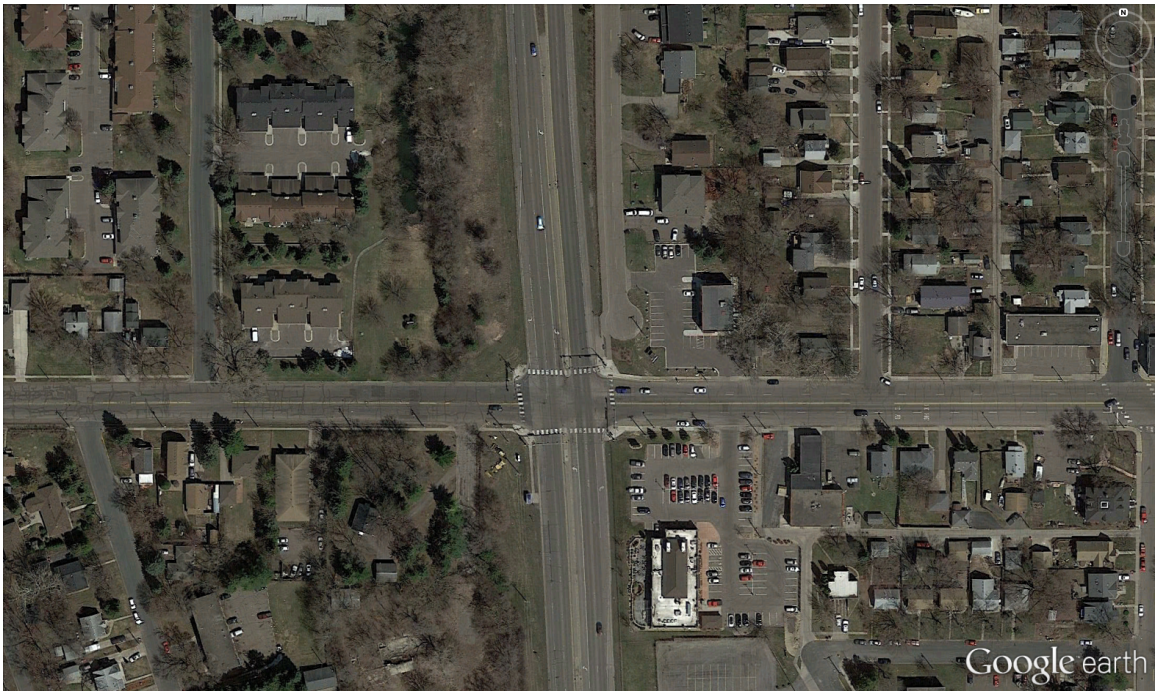
- Evaluate signal phasing which increases pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing. **(*C-W, 8d*)**.
- Consider removing fire hydrants and bollards.

Medium-Term (5-10 years)

- Consider speed and/or lane reduction south of 40th Avenue NE. **(*C-W, 6b*)**.
- Look for ways to connect the shared use path at 37th Avenue NE to the south to St. Anthony Pkwy and/or Columbia Pkwy paths (which will then connect the area to the extensive Minneapolis network) and to the north to at least 53rd Avenue NE (assuming the service road can function as a bike/walk facility). **(*C-W, 13*)**.

40th Avenue NE

Figure 4-20: Aerial Image of 40th Avenue NE and TH 47



Source: Google Earth™ mapping service. August 2018.

40th Avenue NE (shown in Figure 4-20), also known as CSAH 2, is located north of 37th Avenue NE on the TH 47 project corridor. The intersection is signalized and has four legs. Flashing yellow arrow systems are installed for left turns on all four approaches. TH 47 has an ADT (from year 2017) of 13,700 vpd on the south leg and 20,500 vpd on the north leg and 40th Avenue has an ADT of 2,200 vpd on the west leg and 5,500 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs. Sidewalk connections exist to the east and west, and there is trail to the north along the frontage road on the east side of TH 47. There are no bike lanes. The intersection was recently upgraded as part of a mill and overlay project on TH 47 and it was noted that radii were tightened, especially in the NE corner. This intersection was flagged because a pedestrian crash occurred in November 2015.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider installing curb bump outs for the west crossing. **(*C-W, 6a*)**.
- Push east crossing closer to TH 65 to improve visibility of the crossing.
- Reattach WB 40th Avenue NE signal head to prevent swaying (was noted as being loose during road safety audit).

Medium-Term (5-10 years)

- Consider speed and/or lane reduction south of 40th Avenue NE. **(*C-W, 6b*)**.
- Improve first and last mile connections to bus service on the service road at least until Interstate 694 to make transit more accessible to surrounding communities. **(*C-W, 13*)**.
- Implement Complete Streets solution on 40th Avenue NE. **(*C-W, 6 and 13*)**.
    - Reduce number of lanes.
    - Utilize existing right of way fully to provide facilities and connections for pedestrians, bicyclists and transit. Work with new development(s) to make sure future connections are made.

44th Avenue NE

Figure 4-21: Aerial Image of 44th Avenue NE and TH 47

Source: Google Earth™ mapping service. August 2018.

44th Avenue NE (shown in Figure 4-21) is located north of 40th Avenue NE on the TH 47 project corridor. 44th Avenue NE is the only road on the project corridor south of I-694 that connect to East River Road to the west, and resultantly, is heavily used by large trucks to access industrial land uses. The intersection is signalized and has four legs.

Northbound/southbound lefts run on protected phasing and eastbound/westbound lefts run on permissive phasing. A frontage road runs parallel to TH 47 on the east side and intersects 44th Avenue NE close to the intersection. TH 47 has an ADT (from year 2017) of 20,500 vpd on the south leg and 21,500 vpd on the north leg, and 44th Avenue NE has an ADT of 5,500 vpd on the west leg and 6,400 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs. Trail connections run parallel along TH 47 on the east side between 40th Avenue NE and 45th Avenue NE. Trail connections are also present behind the fence on the west side of TH 47 between 44th Avenue NE and 45th Avenue NE. No sidewalk is present on 44th Avenue NE. This intersection was flagged because a pedestrian crash occurred in April 2014. In addition, both the critical crash rate index (1.10) and the FAR index (2.89) are above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider installing crosswalk markings on the west leg. (***C-W, 5***).
- Restripe worn pavement markings, especially crosswalks on the east leg. Consider raising east crosswalk and/or including pedestrian refuge island. See Figure 4-11. (***C-W, 5d and 6e***).
- Consider restriping the east and west legs to provide dedicated right turn lane to avoid drivers trying to squeeze by on existing shoulder or consider a curb bump out to control movements. Flexible bollards could also be installed to prevent this movement. Alternatively, consider re-purposing the shoulders for bike lanes. (***C-W, 6 and 13***).
- Evaluate intersection corner radii geometry to identify opportunities to tighten radii, shorten crossing distance and make curb ramps more pronounced. Also extend curbs on frontage road to prevent cutting turns. (***C-W, 6 and 7b***).
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). (***C-W, 7c***).
- Look for opportunities to improve sight distance between vehicles and pedestrians on northwest quadrant around sound wall. Review noise walls for end terminals. Consider a blank out sign that is push button activated. (***C-W, 7e***).
- Consider prohibiting westbound right turns on red. (***C-W, 8e***).
- Evaluate audible levels of accessible pedestrian signals at the northwest corner. (***C-W, 9a***)

Medium-Term (5-10 years)

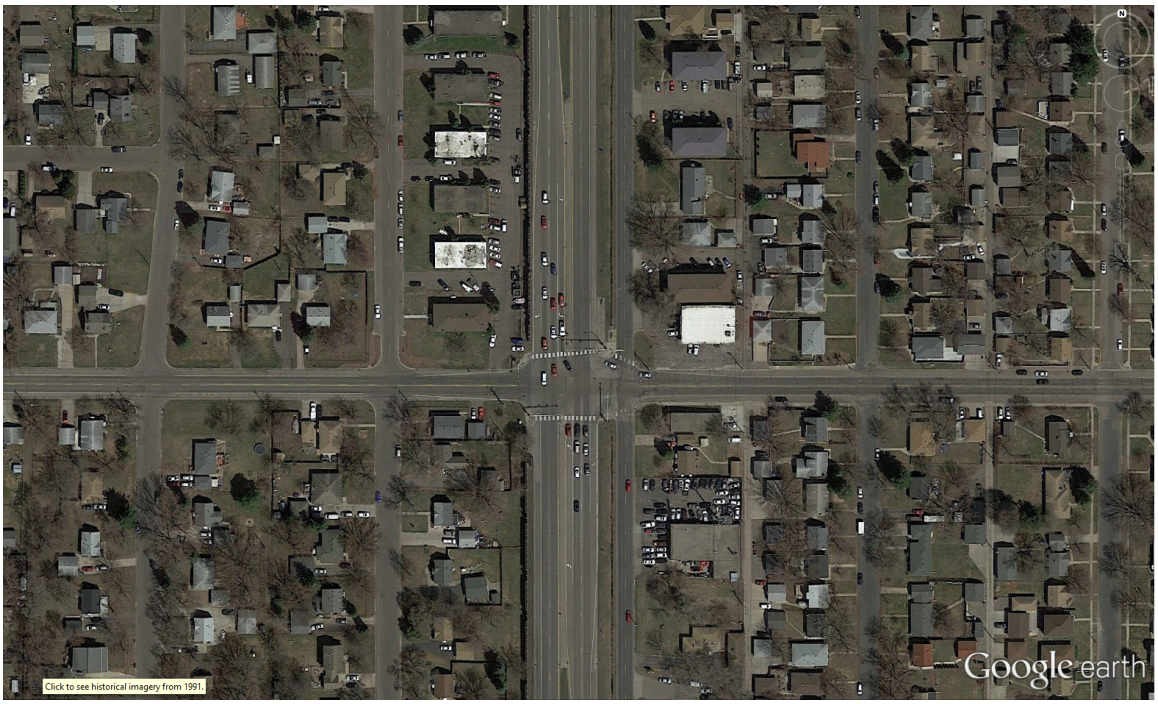
- Evaluate access of closely spaced frontage road intersection. Consider restricting access to right-in/right-out and/or modifying intersection geometry to provide more clarity of pedestrian and vehicle space. (***C-W, 12c***).
- Consider adding connections to U.S. Bicycle Route 45/MRT, which is west of TH 47. (***C-W, 13***).
- Evaluate how to serve bicyclists/pedestrians on the service road; including providing a connection across Interstate 694. (***C-W, 13***).

- Discuss the short and long term options for a pedestrian/bicycle connection parallel to TH 47 as well as opportunities for shopping/jobs along the corridor.

Treatments at this intersection should be consistent with those applied at 49th Avenue NE and 53rd Avenue NE due to similar intersection control/geometry.

49th Avenue NE

Figure 4-22: Aerial Image of 49th Avenue NE and TH 47



Source: Google Earth™ mapping service. August 2018.

49th Avenue NE (shown in Figure 4-22), also known as CSAH 4, is located less than a mile south of I-694 on the TH 47 project corridor. The intersection is signalized and has four legs. Northbound/southbound lefts run on protected phasing and eastbound/westbound lefts run on permissive phasing. A frontage road runs parallel to TH 47 on the east side and intersects 49th Avenue NE close to the intersection. TH 47 has an ADT (from year 2017) of 21,500 vpd on the south leg and 23,200 vpd on the north leg, and 49th Avenue NE has an ADT of 3,500 vpd on the west leg and 5,250 vpd on the east leg. There are bus stops in the northeast and southwest corners and also in the northeast corner off of the frontage road. There are crossings on all legs except the east leg. Sidewalk connections exist along 49th Avenue NE to the east. This intersection was flagged because a pedestrian crash occurred in January 2014.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate lighting levels and improve lighting as appropriate, especially at bus shelter. (***C-W, 4***).
- Consider a stop bar on the east leg of the intersection with the frontage road, similar to how it is at 53rd Avenue NE. (***C-W, 5b***).
- Consider installing crosswalk markings on the west leg. (***C-W, 5***).
- Restripe worn pavement markings, especially crosswalks. (***C-W, 5d***).

- Consider removing no pedestrian crossing signs on east leg of intersection and provide directional ADA ramps, crosswalks, and pedestrian signals. Consider raising crosswalk and/or including pedestrian refuge island. See Figure 4-11. (***C-W, 5, 6e, and 9***).
- Consider restriping the east and west legs to provide dedicated right turn lane to avoid drivers trying to squeeze by on existing shoulder or consider a curb bump out to control movements. Flexible bollards could also be installed to prevent this movement. Alternatively, consider re-purposing the shoulders for bike lanes. (***C-W, 6 and 13***).
- Evaluate intersection corner radii geometry to identify opportunities to tighten radii and make curb ramps more pronounced. Also extend curbs on frontage road to prevent cutting turns. (***C-W, 6 and 7b***).
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). (***C-W, 7c***).
- Look for opportunities to improve sight distance between vehicles and pedestrians on northwest quadrant around sound wall. Review noise walls for end terminals. Consider a blank out sign that is push button activated. (***C-W, 7e***).
- Consider prohibiting westbound right turns on red. (***C-W, 8e***).
- Fix leaning of the northwest signal pole.

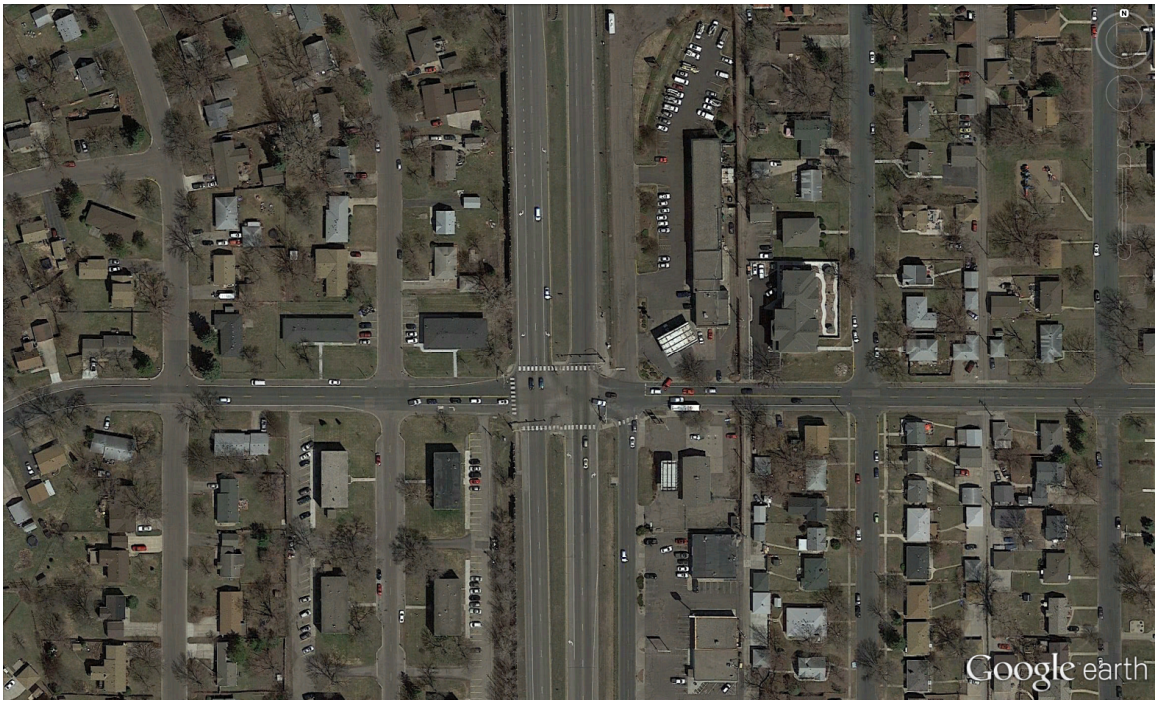
Medium-Term (5-10 years)

- Evaluate access of closely spaced frontage road intersection. Consider restricting access to right-in/right-out and/or modifying intersection geometry to provide more clarity of pedestrian and vehicle space. (***C-W, 12c***).
- Consider adding sidewalk connections on the west leg and also on the northeast corner to connect between frontage road intersection and existing sidewalk on north side of 49th Avenue NE. (***C-W, 13***).
- Evaluate how to serve bicyclists/pedestrians on the service road; including providing a connection across Interstate 694. (***C-W, 13***).
    - Discuss the short and long term options for a pedestrian/bicycle connection parallel to TH 47 as well as opportunities for shopping/jobs along the corridor.

Treatments at this intersection should be consistent with those applied at 44th Avenue NE and 53rd Avenue NE due to similar intersection control/geometry.

53rd Avenue NE

Figure 4-23: Aerial Image of 53rd Avenue NE and TH 47



Source: Google Earth™ mapping service. August 2018.

53rd Avenue NE (shown in Figure 4-23) is located just south of I-694 on the TH 47 project corridor. The intersection is signalized and has four legs. Northbound/southbound lefts run on protected phasing and eastbound/westbound lefts run on permissive phasing. A frontage road runs parallel to TH 47 on the east side and intersects 53rd Avenue NE close to the intersection. TH 47 has an ADT (from year 2017) of 23,200 vpd on the south leg and 29,500 vpd on the north leg, and 49th Avenue NE has an ADT of 4,750 vpd on the west leg and 6,400 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs except the east leg. Few sidewalk or trail connections are present. 53rd Avenue NE is the proposed cutover location between TH 47 and TH 65 for future BRT. This intersection was flagged because a pedestrian crash occurred in August 2014. In addition both the critical crash rate index (1.12) and the FAR index (2.01) are above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider removing no pedestrian crossing signs on east leg of intersection and provide directional ADA ramps, crosswalks, and pedestrian signals. Consider raising crosswalk and/or including pedestrian refuge island. See Figure 4-11. (***C-W, 5, 6e, and 9***).
- Consider restriping the east leg to provide dedicated right turn lane to avoid drivers trying to squeeze by on existing shoulder or consider a curb bump out to control movements. Flexible bollards could also be installed to prevent this movement. Alternatively, consider re-purposing the shoulders for bike lanes. (***C-W, 6 and 13***).
- Evaluate intersection corner radii geometry to identify opportunities to tighten radii, shorten crossing distance and make curb ramps more

pronounced. Also extend curbs on frontage road to prevent cutting turns. (***C-W, 6 and 7b***).

- Look for opportunities to improve sight distance between vehicles and pedestrians on northwest quadrant around sound wall. Review noise walls for end terminals. Consider a blank out sign that is push button activated. (***C-W, 7e***).
- Consider prohibiting westbound right turns on red. (***C-W, 8e***).
- Evaluate audible levels of accessible pedestrian signals at the west leg of the intersection. (***C-W, 9a***)

Medium-Term (5-10 years)

- Evaluate access of closely spaced frontage road intersection. Consider restricting access to right-in/right-out and/or modifying intersection geometry to provide more clarity of pedestrian and vehicle space. (***C-W, 12c***).
- Consider adding sidewalk connections along the east and west legs on 53rd Avenue NE. (***C-W, 13***).
- Evaluate how to serve bicyclists/pedestrians on the service road; including providing a connection across Interstate 694. (***C-W, 13***).
    - Discuss the short and long term options for a pedestrian/bicycle connection parallel to TH 47 as well as opportunities for shopping/jobs along the corridor.

Treatments at this intersection should be consistent with those applied at 44th Avenue NE and 49th Avenue NE due to similar intersection control/geometry.

I-694 South Ramp Terminal

Figure 4-24: Aerial Image of I-694 South Ramp Terminal and TH 47

Source: Google Earth™ mapping service. August 2018.

I-694 eastbound ramps (see Figure 4-24) intersect TH 47 in a traditional diamond configuration. Right turns from the I-694 off ramp split off and merge onto TH 47 south of the ramp terminal. Northbound traffic on TH 47 destined to eastbound I-694 exits right via a ramp south of the signalized ramp terminal. The ramp terminal intersection is signalized and has four legs, with the east and west legs being one-way in the eastbound direction. TH 47 has an ADT (from year 2017) of 29,500 vpd on the south and north legs. Based on daily volumes from October 10, 2017 obtained from MnDOT detector data, the east leg is estimated to have an ADT around 15,000 vpd. There are no bus stops, curb ramps, or sidewalk connections present, however, unmarked crossings are located on the east and west legs. Rear end and sideswipe same direction crashes are above state average at this intersection. This intersection was flagged because the critical crash rate index (1.18) is above one.

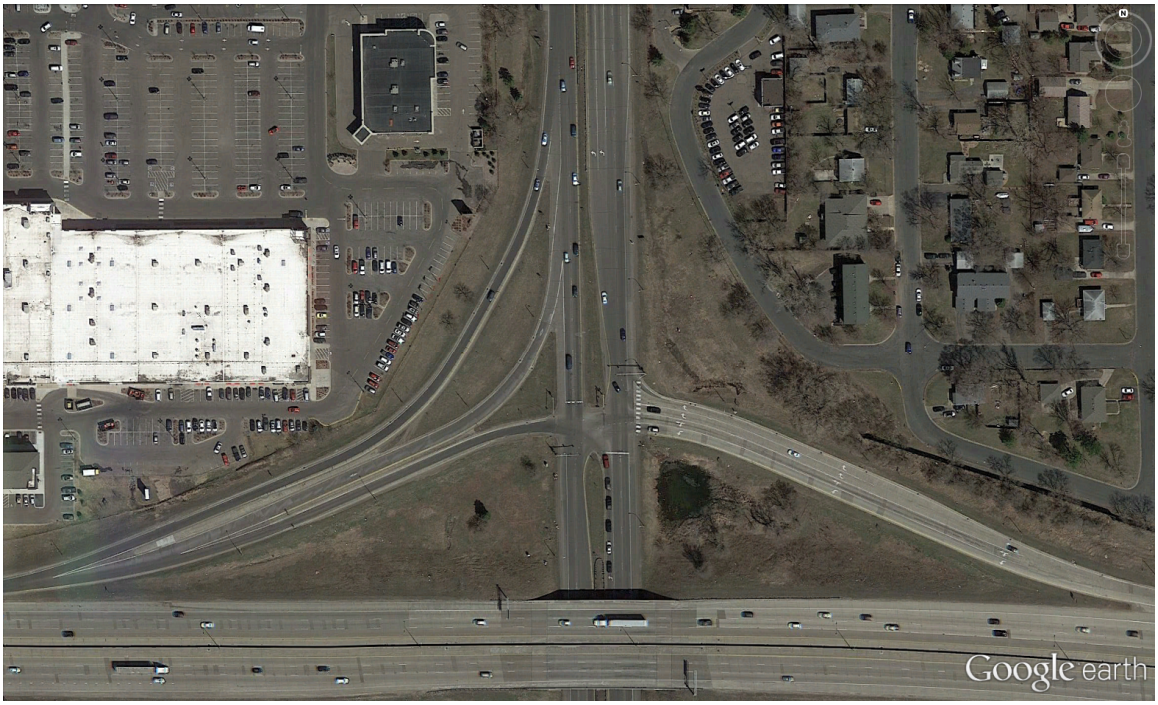
During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Medium-Term (5-10 years)

- Consider installing accessible route through the interchange including sidewalks, ADA ramps, pedestrian countdown signals, etc. (***C-W, 9 and 13***).
- Consider revising the ramp geometry by pulling the EB ramp and NB ramp into the intersection.

I-694 North Ramp Terminal

Figure 4-25: Aerial Image of I-694 North Ramp Terminal and TH 47



Source: Google Earth™ mapping service. August 2018.

I-694 westbound ramps (see Figure 4-25) intersect TH 47 in a traditional diamond configuration. Southbound traffic on TH 47 destined to westbound I-694 exits right via a ramp north of the signalized ramp terminal. The ramp terminal intersection is signalized and has four legs, with the east and west legs being one-way in the westbound direction. TH 47 has an ADT (from year 2017) of 29,500 vpd on the south leg and 39500 vpd on the north leg.

Based on daily volumes from October 10, 2017 obtained from MnDOT detector data, the west leg is estimated to have an ADT around 33,500 vpd. There are no bus stops, curb ramps, or sidewalk connections present, however, crossings are located on the east (marked) and west (unmarked) legs. Rear end and sideswipe same direction crashes are above state average at this intersection. This intersection was flagged because the critical crash rate index (1.07) is above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Medium-Term (5-10 years)

- Consider installing accessible route through the interchange including sidewalks, ADA ramps, pedestrian countdown signals, etc. (***C-W, 9 and 13***).
- Look for opportunities to simplify ramp terminal in NW quadrant to remove multiple WB on-ramp configurations. Remove the north ramp to provide more separation from 57th Avenue NE and reduce the likelihood of drivers to increase speeds in anticipation of this free flow ramp condition.

57th Avenue NE

Figure 4-26: Aerial Image of 57th Avenue NE and TH 47

Source: Google Earth™ mapping service. August 2018.

57th Avenue NE (shown in Figure 4-26) is located just north of I-694 on the TH 47 project corridor. The intersection is signalized and has four legs. TH 47 has an ADT (from year 2017) of 39,500 vpd on the south leg and 32,500 vpd on the north leg, and 57th Avenue NE has an ADT of 11,200 vpd on the west leg and 5,100 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs. Sidewalk connections are present to the west and to the north, on the east side of the eastern fence. This intersection was

flagged because three pedestrian crashes occurred during the study period (2013-March 2018) and the FAR index (1.51) is above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate lighting levels and improve intersection lighting as appropriate. (***C-W, 4***).
- Investigate opportunities to provide improved lighting at intersection directly to west of TH 47 at 3rd Street. (***C-W, 4***).
- Consider adding crosswalk and accessible route on west leg crossing at 3rd Street. (***C-W, 5***).
- Consider removing northbound right turn lane flare. (***C-W, 6***).
- Evaluate lane configuration to determine opportunities to reduce number of eastbound/westbound approach lanes. (***C-W, 6b***).
    - Consider removing split phase signal operation.
    - Remove second left turn lane, if high left turn volumes, make the through lane be a shared through-left.
- Consider tightening curb radii on SE corner. (***C-W, 7b***).
- Evaluate signal phasing which increases pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA). (***C-W, 8d***).
- Consider providing a more direct pedestrian connection to the southwest bus stop from the sidewalk on the south side of 57th Avenue NE where there is currently a dirt path. Alternatively, fence in this area to block access and instead encourage use of existing sidewalk route. (***C-W, 9***).
- Consider realigning sidewalk in the northeast corner to provide a more direct pedestrian path to the crossing. Remove branch of sidewalk that leads into westbound turn lanes on 57th Avenue NE. (***C-W, 9***).
- Consider removing old guardrail and the old base from the south median (no clear use for this).

Medium-Term (5-10 years)

- Consider restricting left turns onto 57th Avenue NE by converting intersection to ¾ access. (***C-W, 12d***).
- Consider relocating the southwest bus stop to the near side (northwest corner) so it is further from entrance ramp. Alternatively, reduce ramp taper/north ramp location for I-694.
- Consider eliminating left turns on mainline to allow for median bus stops with pedestrian refuge space, install median u-turns north of the intersection.

Mississippi Street NE

Figure 4-27: Aerial Image of Mississippi Street NE and TH 47

Source: Google Earth™ mapping service. August 2018.

Mississippi Street NE (shown in Figure 4-27), also known as CSAH 6, is located 1.2 miles north of I-694 on the TH 47 project corridor. The intersection is signalized and has four legs. TH 47 has an ADT (from year 2017) of 32,500 vpd on the south leg and 34,000 vpd on the north leg, and Mississippi Street NE has an ADT of 6,900 vpd on the west leg and 7,200 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs. Sidewalk/trail connections are present on along all approaches. Along TH 47, trail runs along the east side of the eastern fence. The nearby City of Fridley public works facilities are in the process of being relocated to another location, as a result, there may not be a strong need for the eastern frontage road. There is a strip mall in the northwest corner that is a known pedestrian destination, specifically the plasma center. This intersection was flagged because a pedestrian crash occurred in March 2017.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Restripe worn pavement markings, especially crosswalks. (***C-W, 5d***).
- Consider reducing number of lanes on the cross street. (***C-W, 6b***).
- Consider tightening curb radii and raise curb ramps to better define pedestrian facilities and prevent vehicles from tracking over sidewalk ramps (***C-W, 6 and 7***).
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). (***C-W, 7c***).
- Consider removing fence to improve sightline for WB to NB turns. (***C-W, 7e***).

- Evaluate signal timing and increase crossing times as appropriate, especially on the north and south legs. **(*C-W, 8a*)**.
- Consider restricting right turns on red for westbound traffic turning north. **(*C-W, 8e*)**.
- Consider providing a pedestrian connection to the parking lot on the northwest corner, where there is currently a dirt walking path. **(*C-W, 9*)**.

Medium-Term (5-10 years)

- Consider closing frontage road connection (currently emergency access between frontage road and NB TH 47 with relocation of fire department to new location). **(*C-W, 12*)**.
- Consider closing frontage road access on the southeast quadrant with relocation of public works facilities. **(*C-W, 12*)**.
- Consider adding a connection to U.S. Bicycle Route 45/MRT, which is west of TH 47. **(*C-W, 13*)**.

73rd Avenue NE

Figure 4-28: Aerial Image of 73rd Avenue NE and TH 47

Source: Google Earth™ mapping service. August 2018.

73rd Avenue NE (shown in Figure 4-28), is located one mile north of Mississippi Street NE/CSAH 6 on the TH 47 project corridor. The intersection is signalized and has four legs. TH 47 has an ADT (from year 2017) of 34,000 vpd on the south and north legs, and 73rd Avenue NE has an ADT of 6,000 vpd on the west leg and 8,800 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs. Trail connections are present on along TH 47 on the west side and along 73rd Avenue to the east. This intersection was flagged because a pedestrian crash occurred in September 2014 and the FAR index (1.18) is above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate need for turn lanes (especially dual southbound lefts) and remove as permitted to reduce crossing distances. **(*C-W, 6b*)**.
- Consider tightening curb radii and raise curb ramps to better define pedestrian facilities and prevent vehicles from tracking over sidewalk ramps. **(*C-W, 7b*)**.
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). **(*C-W, 7c*)**.
- Evaluate extending crossing time for pedestrians to allow time for pedestrians to pause for conflicts such as turning vehicles, especially on the south leg. **(*C-W, 8a*)**.
- Consider providing pedestrian recall phasing on side streets. **(*C-W, 8c*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing. **(*C-W, 8d*)**.
- Consider adding a pedestrian connection in the NE corner to the city street and bus stop. **(*C-W, 9*)**.
- Consider installing curb at NE bus stop to provide separation from the roadway. **(*C-W, 9c*)**.

Osborne Road NE

Figure 4-29: Aerial Image of Osborne Road NE and TH 47

Source: Google Earth™ mapping service. August 2018.

Osborne Road NE (shown in Figure 4-29), also known as CSAH 8, is located approximately halfway between I-694 and TH 10 on the TH 47 project corridor. The intersection is signalized and has four legs. Northbound/southbound left turns run on protected phasing and

eastbound/westbound left turns run on protected/permissive phasing (left turn yield on green ball). TH 47 has an ADT (from year 2017) of 34,000 vpd on the south leg and 31,000 vpd on the north leg, and Osborne Road NE has an ADT of 7,800 vpd on the west leg and 8,800 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs. Trail/sidewalk connections are present along TH 47 on the west side and also along Osborne Road NE to both east and west. The western frontage road intersection with Osborne Road NE has been observed to get busy during weekday lunch hours and making turning maneuvers is difficult. This intersection was flagged because a pedestrian crash occurred in June 2017. In addition, both the critical crash rate index (1.02) and the FAR index (1.18) are above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider reducing the number of lanes on Osborne Road NE to reduce crossing distance. **(*C-W, 6b*)**.
- Consider tightening curb radii and raise curb ramps to better define pedestrian facilities and prevent vehicles from tracking over sidewalk ramps. **(*C-W, 7b*)**.
- Consider extending median noses to slow left turning vehicles and widen to provide center pedestrian refuge. **(*C-W, 6e and 7c*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing. **(*C-W, 8d*)**.
- Consider extending sidewalk access to bus stop on NE corner and provide accessible route to land use on NE corner as well. **(*C-W, 9*)**.
- Evaluate ramps for ADA compliance and upgrade accordingly, especially the SE corner. **(*C-W, 9a*)**.
- Consider connecting bus stop on SW corner to the trail where an existing dirt path is. **(*C-W, 9c*)**.
- Consider installing curb at bus stops to provide separation from the roadway. **(*C-W, 9c*)**.

Medium-Term (5-10 years)

- Evaluate intersection treatments at the intersection with the west frontage road on Osborne Road NE to improve safety and operations for turning maneuvers. **(*C-W, 12*)**.
- Consider adding a connection to U.S. Bicycle Route 45/MRT, which is west of TH 47. Improve convenient, safe, and inviting connections to, from, and across TH 47 for bikes. **(*C-W, 13*)**.

81st Avenue NE

Figure 4-30: Aerial Image of 81st Avenue NE and TH 47

Source: Google Earth™ mapping service. August 2018.

81st Avenue NE (shown in Figure 4-30) is located approximately half a mile north of Osborne Road NE on the TH 47 project corridor. The intersection is signalized and has four legs. TH 47 has an ADT (from year 2017) of 31,000 vpd on the south and north legs, and 81st Avenue NE has an ADT of 9,800 vpd on the west leg and 6,400 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs except the north leg. Trail/sidewalk connections are present along TH 47 on the west side and also along 81st Avenue NE to the east. This intersection was flagged because a pedestrian crash occurred in October 2016 and the critical crash rate index (1.10) is above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate lighting levels and improve lighting as appropriate, especially near the transit stop and at pedestrian crossings. **(*C-W, 4*)**.
- Consider adding a pedestrian crossing on the north leg to reduce pedestrian delay and improve accessibility. **(*C-W, 5 and 9*)**.
- Evaluate lane configuration to determine opportunities to reduce number of lanes. **(*C-W, 6b*)**.
    - Consider removing split phase signal operation for eastbound and westbound
    - Consider exclusive left with shared through/rights for eastbound and westbound
    - Consider removing westbound receiving right turn lane or bump out at intersection
    - Consider removing one of the northbound left turn lanes

- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing. **(*C-W, 8d*)**.
- Consider reconfiguring pedestrian ramps on the southeast, southwest, and northwest corners to raise up and make more defined. **(*C-W, 9*)**.
- Extend sidewalk on NE quadrant to provide accessible route to NB bus stop. **(*C-W, 9c*)**.
- Consider shifting the far side southbound bus stop closer to 81st Avenue NE and extending sidewalk to provide an accessible route. **(*C-W, 9c*)**.
- Consider installing curb at bus stops to provide separation from the roadway. **(*C-W, 9c*)**.
- Consider installing a new signal pedestal pole on the southwest corner to improve pedestrian signal head visibility on south leg of intersection (westbound direction).

83rd Avenue NE

Figure 4-31: Aerial Image of 83rd Avenue NE and TH 47

Source: Google Earth™ mapping service. August 2018.

81st Avenue NE (shown in Figure 4-30) is located approximately half a mile north of Osborne Road NE on the TH 47 project corridor. The intersection is signalized and has four legs. There is a parallel frontage road nearby on the east side of TH 47. TH 47 has an ADT (from year 2017) of 31,000 vpd on the south and north legs, and 83rd Avenue NE has an ADT of 1,400 vpd on the west leg and 1,350 vpd on the east leg. There are bus stops in the northeast and southwest corners and crossings on all legs except the north leg. Trail/sidewalk connections are present along TH 47 on the west side and also along 81st Avenue NE to the east. High density housing (apartments and senior housing) is present on the west side of the intersection and multiple restaurants and a bar are located on the east side of the intersection. A nature center is located just west of TH 47 in this area. This intersection was

flagged because two pedestrian crashes occurred during the study period (2013-March 2018). In addition, both the critical crash rate index (1.33) and FAR index (1.53) are above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider adding LED street lights to all four corners of intersection. (***C-W, 4).***
- Consider providing accessible route with marked crossings across south leg of TH 47. (***C-W, 5***).
    - Position to not conflict with SB left turn movement
    - Do not mark crosswalk without an enhancement such as a rectangular rapid flashing beacon (RRFB)
- Consider extending the south median to receive pedestrian crossing and extending the north median to move frontage road stop up near minor road on east leg of intersection. (***C-W, 6e and 7c***).
- Consider narrowing 83rd Avenue NE roadway width on west leg of intersection. Reduce shoulder to 6 feet and extend median nose. (***C-W, 6c and 7c***).
- Consider tightening intersection geometry on west leg of 83rd Avenue NE, especially due to the trail crossing. (***C-W, 7b***).
- Consider extending the raised island on west leg of 83rd to include a portion of the southbound shoulder (consider impacts to shoulder running bus/BRT).

Medium-Term (5-10 years)

- Consider converting intersection to a median U-turn (MUT) with a HAWK signal. (***C-W, 12).***
- Consider reducing the frontage road access to right-in/right-out. (***C-W, 12c).***
- Consider adding sidewalk connections to the east and west residential and commercial areas along 83rd Avenue NE. (***C-W, 13).***

85th Avenue NE

Figure 4-32: Aerial Image of 85th Avenue NE and TH 47

Source: Google Earth™ mapping service. August 2018.

85th Avenue NE (shown in Figure 4-32) is located south of Coon Rapids Boulevard/CSAH 10 on the TH 47 project corridor at the southwest corner of the Northtown Mall. The intersection is signalized and has four legs. Based on the location of the intersection, all four corners are under different jurisdictions. TH 47 has an ADT (from year 2017) of 31,000 vpd on the south and north legs, and 85th Avenue NE has an ADT of 16,100 vpd on the west leg and 6,500 vpd on the east leg. There are no bus stops at the intersection, however, there are transit stops nearby at the Northtown Mall Transit Center and at the intersection of 85th Avenue NE and W University Service Drive. There are pedestrian crossings on all four legs. There are no paved sidewalk/trail connections to/from the intersection and the Mall, however, there are worn foot trails/paths on the northwest, northeast, and southeast corners to the surrounding land uses. Trail is present along TH 47 on the west side to the south, and on 85th Avenue to the west. This intersection was flagged because a pedestrian crash occurred in December 2016 and the FAR index (1.12) is above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate lighting levels and improve lighting as appropriate. Consider upgrading luminaires to LED and adding fixtures to the northwest and southeast corners. **(*C-W, 4*)**.
- Consider adding crosswalk markings across channelized right turn lanes on SE and SW corners of the intersection. **(*C-W, 5*)**.
    - Consider raised crosswalks across channelized right turn lanes on SE/SW corners or remove the free rights.
- Evaluate lane configuration to determine opportunities to reduce number of EB and WB approach lanes. **(*C-W, 6b*)**.

    - Consider removing split phase signal operation for EB and WB
    - Consider removing shared through/left lanes for EB and WB
    - Remove second EB and WB receiving lanes to allow for shorter pedestrian crossings
- Consider removing the third lane for northbound through movements on the south leg of the intersection and don't introduce until north of the intersection (shortens crossing distance on north and south crossings). (***C-W, 6b***).
- Consider adding raised curb and gutter on NW corner to slow turning vehicles. (***C-W, 7***).
- Evaluate extending crossing time for pedestrians to allow time for pedestrians to pause for conflicts such as turning vehicles, especially on the west side. (***C-W, 8a***).
- Repair/replace pedestrian countdown on south leg of intersection. (***C-W, 9***).
- Investigate opportunities to provide accessible routes to surrounding land uses on all four corners. (***C-W, 9***).

Medium-Term (5-10 years)

- Consider installing retro-reflective back plates on signal heads. (***C-W, 11***).

University Avenue NE

Figure 4-33: Aerial Image of University Avenue NE and TH 47

Source: Google Earth™ mapping service. August 2018.

University Avenue NE (shown in Figure 4-33) is located south of Coon Rapids Boulevard/CSAH 10 on the TH 47 project corridor at the northwest corner of the Northtown Mall. The intersection is signalized and has three legs. Left turns are restricted for southbound traffic and all right turns are channelized. TH 47 has an ADT (from year 2017) of 31,000 vpd

on the south leg and 22,400 vpd on the north leg, and University Avenue NE has an ADT of 15,500 vpd on the east leg. There are no bus stops at the intersection, however, there are transit stops nearby at the Northtown Mall Transit Center. There are no paved sidewalk/trail connections or pedestrian crossings at this intersection, however, a foot path is evident between TH 47 and the western frontage road and it has been observed that solicitors often stand in the right turn islands. This intersection was flagged because a pedestrian crash occurred in December 2017.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider providing a marked crossing and accessible route across TH 47 (through median and to frontage road on west side). (***C-W, 5 and 9***).
- Evaluate capacity needed for north-east bound right turn movement. Reduce to a single lane and bring the turn into the intersection. (***C-W, 6b***).
- Consider removing free right turns to allow for installation of safer pedestrian crossings.

Medium-Term (5-10 years)

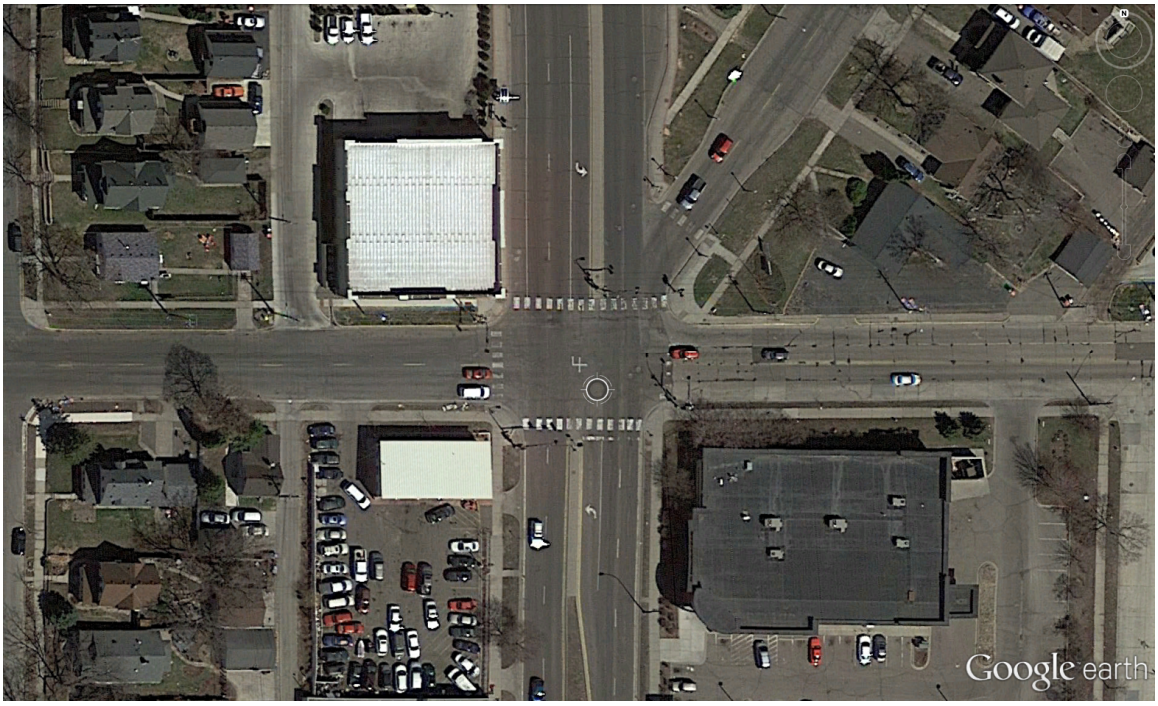
- Provide accessible sidewalk along north side of University Avenue NE approach leg. (***C-W, 13***).
    - Need to verify pedestrian routing to mall area and if sidewalk should be provided on both sides of University Avenue NE. Slope of embankment on north side of University Avenue NE may be challenging.
    - If crossings are provided, analyze sight distances for turning vehicles. (***C-W, 7e***).

4.2.4 TH 65 Intersection Strategies

The following paragraphs provide discussion of safety recommendations given for TH 65 intersections. Please refer to Sections 4.2.1 and 4.2.2 for more background information on corridor-wide strategies (denoted by ***C-W, #***).

37th Avenue NE

Figure 4-34: Aerial Image of 37th Avenue NE and TH 65



Source: Google Earth™ mapping service. August 2018.

37th Avenue NE (shown in Figure 4-34) is the southern-most intersection on the TH 65 project corridor. Hennepin County is on the south side of the intersection and Anoka County is on the north side. The intersection is signalized and has complex geometry due to Reservoir Boulevard in the northeast corner acting as a fifth leg. Northbound, southbound, and westbound movements have protected/permissive left turn phasing. Right turns on red are restricted for all approaches. TH 65 has an ADT (from year 2017) of 13,200 vpd on the south leg and 19,400 on the north leg, and 37th Avenue NE has an ADT of 5,700 vpd on the west leg and 8,300 vpd on the east leg. Reservoir Boulevard has an ADT of 1,400 vpd. There are bus stops approximately 120 to 180 feet north of the intersection in the northeast and northwest corners. There are crossings on all legs and sidewalk connections exist on all approaches. There are no bike lanes. There were no pedestrian crashes at this intersection during the study period (2013-March 2018). Head-on collisions and sideswipe opposing crashes are above state average. This intersection was flagged because the critical crash rate index (1.02) exceeds one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate intersection lighting and upgrade to improve pedestrian lighting. (***C-W, 4a***).
- Consider ways to clarify the SB bus stop lane, which currently acts as a defacto right turn lane.
    - Consider adding curb bump out to NW corner to shorten crossing distance on TH 65. (***C-W, 6a***).
    - Consider relocating the bus stop closer to the intersection to encourage crossing at intersection as opposed to mid-block.

- Consider ways to clarify the wide EB and WB intersection approaches.
    - Consider adding curb bump outs and eliminating right turn lanes or space that acts as defacto right turn lanes. **(*C-W, 6a*)**.
    - Consider adding minor-street left turn lanes (currently double bypass configuration).
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). Also include pedestrian refuge. **(*C-W, 6e and 7c*)**.
- Evaluate extending crossing time for pedestrians to allow time for pedestrians to pause for conflicts such as turning vehicles. **(*C-W, 8a*)**.
- Evaluate adjusting signal cycle length to reduce wait times for pedestrians. **(*C-W, 8b*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing especially and high risk crash exposure locations. **(*C-W, 8d*)**.
- Upgrade intersection to be ADA compliant for ramps and pedestrian signal equipment. **(*C-W, 9a*)**.
- Evaluate visibility of pedestrian indications and upgrade appropriately.
- Evaluate uneven pavement surfaces and consider fixing, especially at pedestrian crossings. **(*C-W, 9*)**.

Medium-Term (5-10 years)

- Consider adding a signal head over every through lane. **(*C-W, 11c*)**.
- Evaluate if lane widths/turn lanes can be altered to someday create a shared use path to further extend biking infrastructure. **(*C-W, 6b and 13*)**.
- Consider converting Reservoir Boulevard to be one-way access to allow rights in only at the intersection. Narrow up the roadway to shorten crossing distances across Reservoir Boulevard as well as across the north leg of TH 65. Alternatively, consider cul-de-sac'ing Reservoir Boulevard.

Gould Avenue NE

Figure 4-35: Aerial Image of Gould Avenue NE and TH 65

Source: Google Earth™ mapping service. August 2018.

Gould Avenue NE (shown in Figure 4-35) is located north of 37th Avenue NE on the TH 65 project corridor. The intersection is unsignalized (side street stop control) and has a T-configuration with Gould Avenue NE being the base of the "T" to the east. TH 65 has an ADT (from year 2017) of 19,400 vpd on the south and north legs, and Gould Avenue NE is assumed to have an ADT less than 1,000 vpd. There are no bus stops and no marked cross walks at the intersection. Sidewalk connections exist on all approaches. There are no bike lanes. There is a Dairy Queen in the southeast corner, which is likely a pedestrian destination. This intersection was flagged because there was a crash involving a two-year old pedestrian in September 2017.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

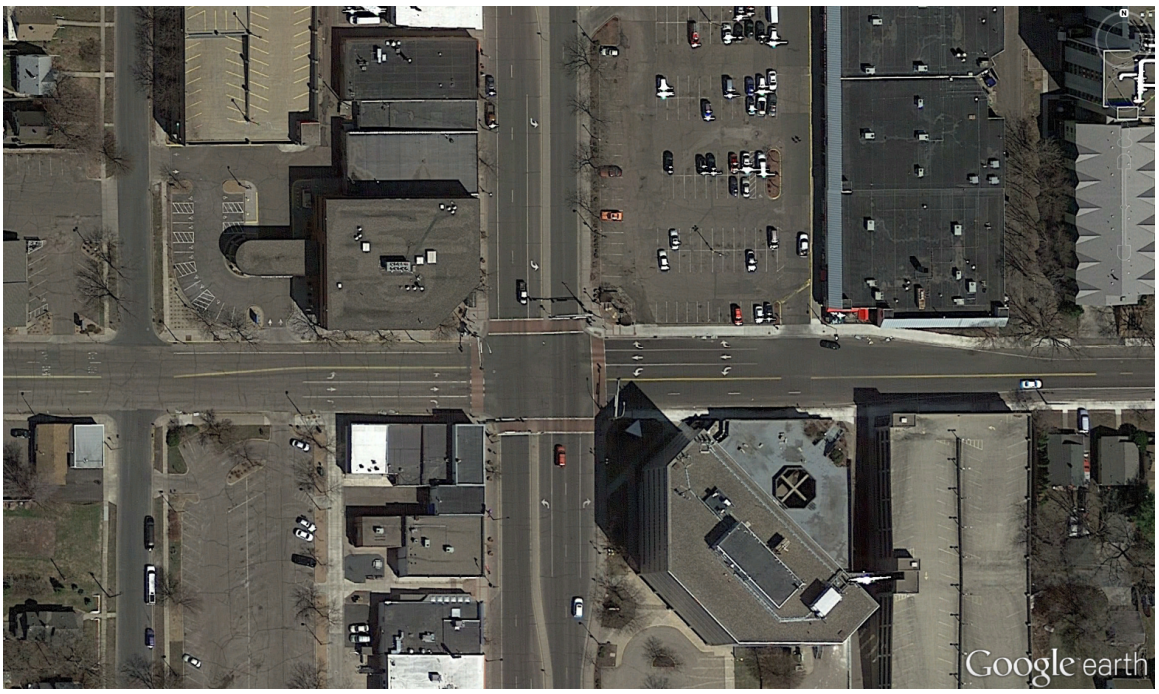
- Consider adding LED street lights to all four corners of intersection. (***C-W, 4***).
- Consider providing an accessible crossing with rectangular rapid flashing beacon (RRFB) to facilitate pedestrian crossing on TH 65. (***C-W, 5c***).
- Consider installing a curb bump out in the SB parking lane at the intersection and also provide a pedestrian refuge mid-block. Restrict parking within the intersection. (***C-W, 6***).
- Consider adding curb bump outs on Gould Avenue NE to physically narrow the roadway and shorten crossing distance. (***C-W, 6a***).
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). (***C-W, 7c***).
- Consider increasing sidewalk and/or boulevard widths. (***C-W, 7***).

Medium-Term (5-10 years)

- Consider restricting intersection to ¾ or right-in/right-out and consider modifying the median to create a pedestrian refuge area or close intersection for vehicles. (***C-W, 12d***).

40th Avenue NE

Figure 4-36: Aerial Image of 40th Avenue NE and TH 65



Source: Google Earth™ mapping service. August 2018.

40th Avenue NE (shown in Figure 4-36), also known as CSAH 2, is located north of Gould Avenue NE on the TH 65 project corridor. The intersection is signalized and has four legs. All four approaches run on protected/permissive left turn phasing. TH 65 has an ADT (from year 2017) of 19,400 vpd on the south leg and 23,000 on the north leg, and 40th Avenue NE has an ADT of 5,600 vpd on the west leg and 4,050 vpd on the east leg. There is a southbound bus stops in the northwest corner and a transit center is located nearby on the east side between 40th Avenue NE and 41st Avenue NE. This intersection is a heavy transit stop. There are pedestrian crossings on all legs and sidewalk connections exist on all approaches. There are no bike lanes. This intersection was flagged because there were two pedestrian crashes during the study period (2013-March 2018), one in April of 2015 and another in September of 2016.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate lighting and upgrade as appropriate, especially for the north and south crossings. (***C-W, 4***).
- Consider adding high visibility crosswalk markings. (***C-W, 5a***).
- Consider decreasing lane widths on all approaches and removing turn lanes. (***C-W, 6b***).
- Consider removing the eastbound receiving lane. (***C-W, 6b***).

- Consider installing curb bump outs to narrow all crossings and adding parking to shadow curb bump outs and/or adding bus bulbs where appropriate. **(*C-W, 6a*)**.
- Consider adding center median pedestrian refuges. **(*C-W, 6e*)**.
- Evaluate signal timing and consider providing more time to the side street. Also evaluate north versus south crossing times. **(*C-W, 8a*)**.
- Evaluate signal timing to reduce pedestrian wait times. **(*C-W, 8b*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing especially and high risk crash exposure locations. **(*C-W, 8d*)**.
- Consider adding a no parking sign at the SB bus stop.
- Investigate if a NB bus stop can/should be installed at this intersection.

Medium-Term (5-10 years)

- Consider adding a signal head over every through lane. **(*C-W, 11c*)**.
- Develop and implement a bicycle plan for the area. **(*C-W, 13*)**.
    - If add bike lanes, consider paving shoulder and bike lanes concrete and making driving lanes asphalt.

42nd Avenue NE

Figure 4-37: Aerial Image of 42nd Avenue NE and TH 65

Source: Google Earth™ mapping service. August 2018.

42nd Avenue NE (shown in Figure 4-37) is located north of 40th Avenue NE on the TH 65 project corridor. The intersection is unsignalized (side street stop control) and has four legs. TH 65 has an ADT (from year 2017) of 23,000 vpd on the south and north legs, and 42nd Avenue is assumed to have an ADT less than 1,000 vpd. There are bus stops in the northwest and southeast corners and no marked pedestrian crossings. Sidewalk connections

exist on all approaches. There are no bike lanes. There is assisted living in the southwest corner. This intersection was flagged because there was a crash involving a pedestrian in a motorized wheelchair in October 2015.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider adding LED street lights to all four corners of intersection. (***C-W, 4***).
- Consider adding an accessible crossing with a rectangular rapid flashing beacon (RRFB) to facilitate pedestrian crossing of TH 65. Prioritize crossings from the southwest corner due to nearby assisted living housing. (***C-W, 5***).
- Consider adding curb bump outs on 42nd Avenue NE to physically narrow the roadway and shorten crossing distance. (***C-W, 6a***).
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). (***C-W, 7c***).
- Investigate ways to improve sight distances on SE corner to aid in driver visibility of pedestrians on sidewalk at driveway on SE corner. Consider trimming vegetation, coordinating with property owner to relocate delivery vans/restrict parking in corner of the lot, and/or evaluating if the wall can be modified to improve sight distances. (***C-W, 7e***).

Medium-Term (5-10 years)

- Consider relocating nearby driveways on the block. (***C-W, 12b***).
- Consider restricting the intersection to ¾ or right-in/right-out access. (***C-W, 12d***).

43rd Avenue NE

Figure 4-38: Aerial Image of 43rd Avenue NE and TH 65

Source: Google Earth™ mapping service. August 2018.

43rd Avenue NE (shown in Figure 4-38) is located north of 42nd Avenue NE on the TH 65 project corridor. The intersection is unsignalized (side street stop control) and has four legs. TH 65 has an ADT (from year 2017) of 23,000 vpd on the south and north legs, and 43rd Avenue NE is assumed to have an ADT less than 1,000 vpd. There are bus stops in the northwest and southeast corners and no shoulders in front of the stops. There are no marked pedestrian crossings. Sidewalk connections exist on all approaches. There are no bike lanes. This intersection was flagged because there was a crash involving a pedestrian in May 2017 and the critical crash rate index (2.38) exceeds one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

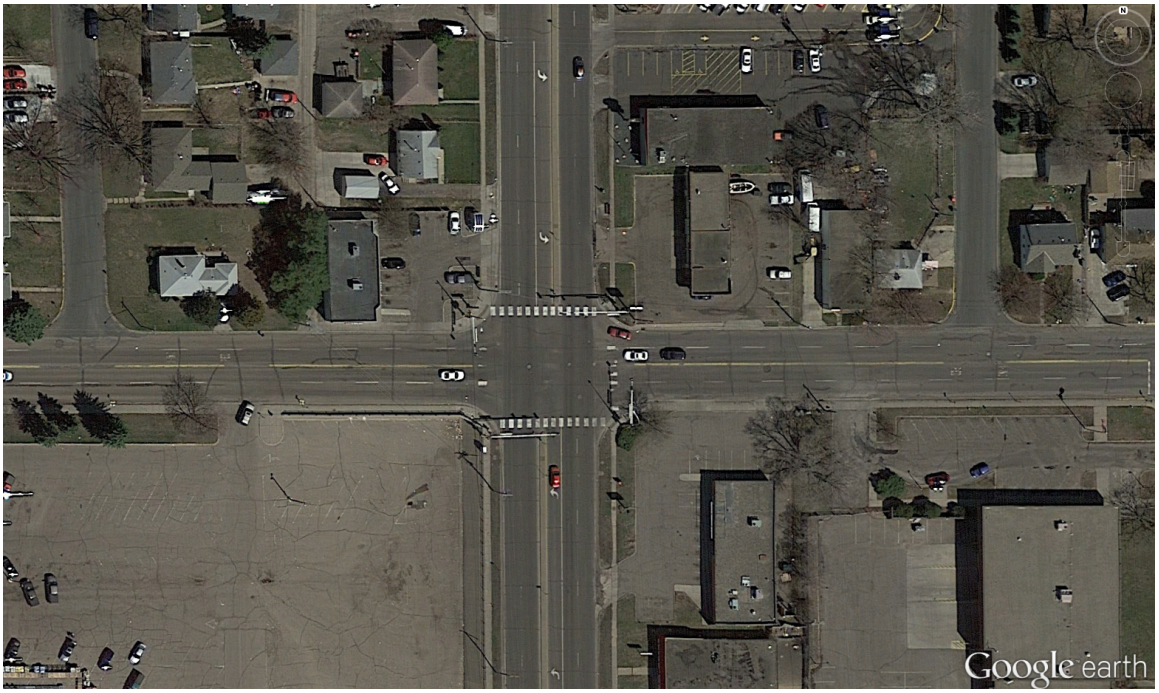
- Evaluate intersection lighting and upgrade as needed to illuminate pedestrian crossings. (***C-W, 4***).
- Consider providing an accessible crossing with rectangular rapid flashing beacon (RRFB) to facilitate pedestrian crossing of TH 65. (***C-W, 5***).
- Consider installing curb bump outs to narrow up cross street at the intersection. (***C-W, 6a***).
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). (***C-W, 7c***).
- Consider installing a concrete landing pad on the NW bus stop to make ADA accessible. (***C-W, 9c***).

Medium-Term (5-10 years)

- Implement access management on the surrounding blocks. (***C-W, 12b***).
- Consider restricting intersection to ¾ or right-in/right-out access. (***C-W, 12d***).

44th Avenue NE

Figure 4-39: Aerial Image of 44th Avenue NE and TH 65



Source: Google Earth™ mapping service. August 2018.

44th Avenue NE (shown in Figure 4-39) is located north of 43rd Avenue NE on the TH 65 project corridor. The intersection is signalized and has four legs. TH 65 has an ADT (from year 2017) of 23,000 vpd on the south leg and 25,500 on the north leg, and 44th Avenue NE has an ADT of 6,200 vpd on the west leg and 5,250 vpd on the east leg. There are bus stops in the northwest and northeast corners and pedestrian crossings on all four legs. Sidewalk connections exist on all approaches. There are no bike lanes. This intersection was flagged because there were three pedestrian crashes during the study period (2013-March 2018) and the FAR index (1.15) exceeds one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

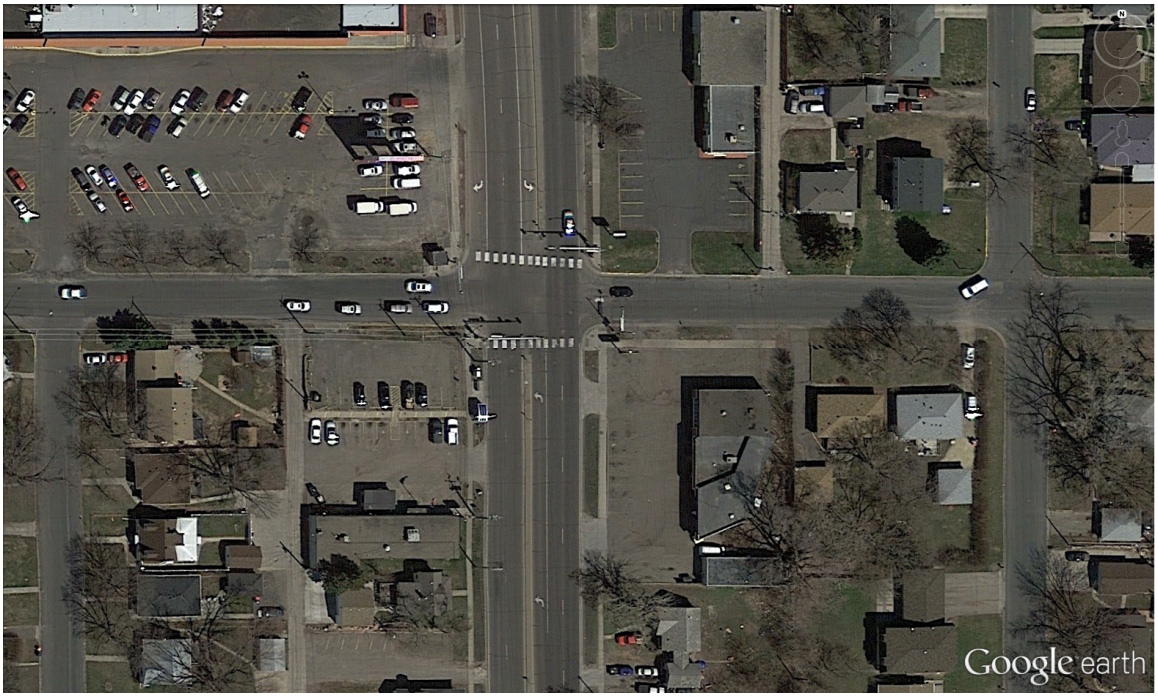
- Evaluate intersection sightlines. **(*C-W, 7e*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing especially and high risk crash exposure locations. **(*C-W, 8d*)**.

Medium-Term (5-10 years)

- Consider converting 44th Avenue NE to a 3-lane section and consider cross section transition as it relates to the nearby 44th Avenue NE crossings to the east and west. **(*C-W, 6*)**.
    - Also add medians on the minor to provide delineation and pedestrian refuge.
    - Install curb bump outs to narrow up the cross street at the intersection.
- Consider adding a signal head over every through lane. **(*C-W, 11c*)**.

45th Avenue NE

Figure 4-40: Aerial Image of 45th Avenue NE and TH 65



Source: Google Earth™ mapping service. August 2018.

45th Avenue NE (shown in Figure 4-40) is located north of 44th Avenue NE on the TH 65 project corridor. The intersection is signalized and has four legs. TH 65 has an ADT (from year 2017) of 25,500 vpd on the south and north legs, and 45th Avenue NE is assumed to have an AADT around 1,250 vpd. There are bus stops in the southwest and northeast corners and pedestrian crossings on all four legs. Sidewalk connections exist along both sides of TH 65 to the north and south. The only east-west sidewalk connection is in the southeast corner of the intersection to the corner property. There are no bike lanes. The Central Plaza in the northwest corner is likely a pedestrian destination. This intersection was flagged because there were four pedestrian crashes during the study period (2013-March 2018).

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). (***C-W, 7c***).
- Consider relocating the structure in the northwest quadrant to provide more room for pedestrians and improve sight distances. (***C-W, 7e and 9***).
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing. (***C-W, 8d***).

Medium-Term (5-10 years)

- Consider removing the signal and converting to a ¾ intersection. Continue to provide pedestrian crossing(s) and consider installing an RRFB. (***C-W, 5 and 12d***).

46th Avenue NE

Figure 4-41: Aerial Image of 46th Avenue NE and TH 65

Source: Google Earth™ mapping service. August 2018.

46th Avenue NE (shown in Figure 4-41) is located north of 45th Avenue NE on the TH 65 project corridor, adjacent to the City of Hilltop. The intersection is unsignalized (side street stop control) and has four legs, with the west leg being an access to a storage facility which is currently being constructed. TH 65 has an ADT (from year 2017) of 25,500 vpd on the south and north legs, and 46th Avenue NE is assumed to have an ADT less than 1,000 vpd. There are bus stops in the southwest and northeast corners and "end shoulder authorized bus only" signage located approximately 200 feet south of the intersection in the southbound direction. There are no marked pedestrian crossings. Sidewalk connections exist along both sides of TH 65 to the north and south. There are no east-west sidewalk connections or bike lanes. This intersection was flagged because there were two pedestrian crashes during the study period (2013-March 2018) and the critical crash rate index (1.32) is above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider adding LED street lights to all four corners of intersection. (***C-W, 4***).
- Consider adding an accessible crossing with rectangular rapid flashing beacon (RRFB) to facilitate pedestrian crossing of TH 65 or pedestrian pre-emption. (***C-W, 5c***).
- Shorten the northbound left turn bay for 46 ½ Avenue NE to provide space for a wider pedestrian refuge. Do this as well at 46 ½ Avenue NE for the SB left turn bay leading to 46th Avenue NE. (***C-W, 6***).
- Evaluate intersection corner radii geometry to identify opportunities to tighten radii and make curb ramps more pronounced. Consider adding curb bump outs for minor street crossings. (***C-W, 6a and 7b***).

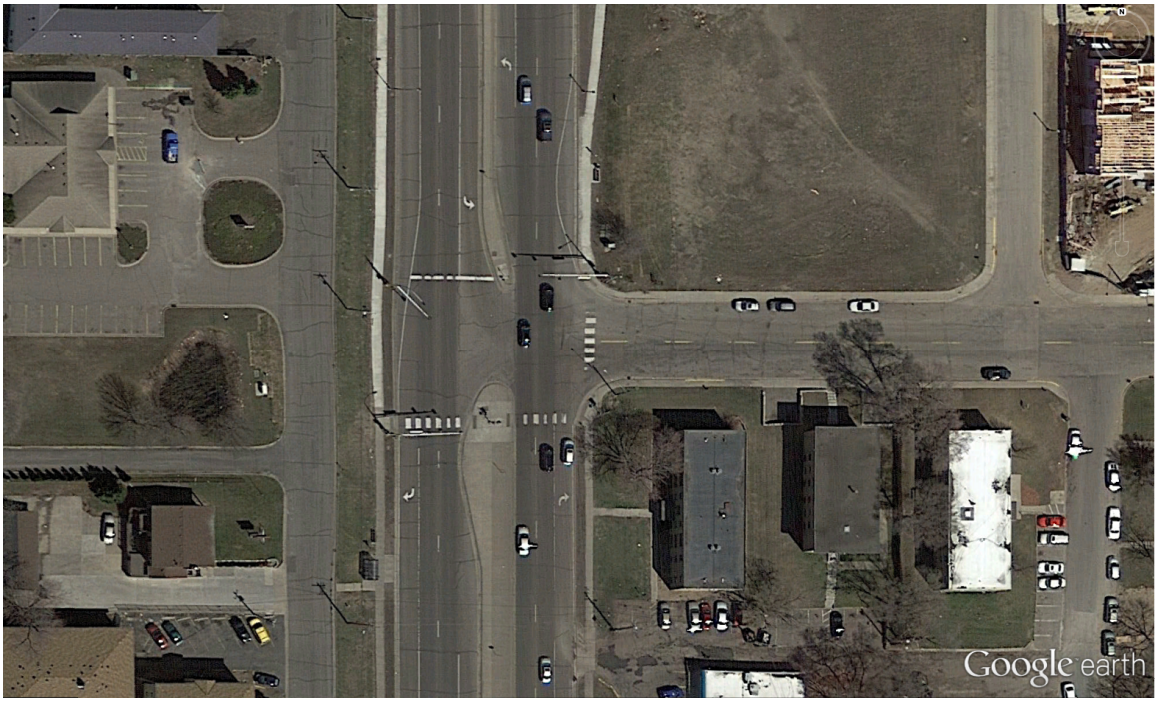
- Consider using corrugated median nose to slow left turning traffic. **(*C-W, 7c*)**.
- Upgrade accessible pedestrian route with ADA ramps, median island cut throughs, etc. **(C-W, 9).**
- Implement these same treatments at 46 ½ Avenue NE.

Medium-Term (5-10 years)

- Consider restricting intersection to ¾ access, right-in/right-out only, or full closure. **(*C-W, 12d*)**.

47th Avenue NE

Figure 4-42: Aerial Image of 47th Avenue NE and TH 65



Source: Google Earth™ mapping service. August 2018.

47th Avenue NE (shown in Figure 4-42) is located north of 46th Avenue NE on the TH 65 project corridor. The intersection is signalized and has three legs, with the east leg forming the base of the "T". TH 65 has an ADT (from year 2017) of 25,500 vpd on the south and north legs, and 47th Avenue NE has an ADT of 11,500 vpd on the east leg. There are bus stops in the southwest and northeast corners and pedestrian crossings on the south and east legs. Sidewalk connections exist along both sides of TH 65 to the north and south and to the east on 47th Avenue NE. A gas station is planned to be constructed in the northeast corner and a new senior housing complex was recently built behind that, off of Grand Avenue NE. This intersection was flagged because there were four pedestrian crashes during the study period (2013-March 2018).

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider adding curb bump outs in conjunction with tightening curb geometry on east leg of 47th Avenue NE. **(*C-W, 6a*)**.

- Consider adding curb bump outs to NW, NE, and SW corners to shorten crossing distance on TH 65. (***C-W, 6a***).
- Consider providing a pedestrian median cut through on south median. (***C-W, 6e***).
- Consider adding a marked crosswalk and an accessible route on north leg of TH 65. (***C-W, 9***).

49th Avenue NE

Figure 4-43: Aerial Image of 49th Avenue NE and TH 65

Source: Google Earth™ mapping service. August 2018.

49th Avenue NE (shown in Figure 4-43) is located north of 47th Avenue NE on the TH 65 project corridor. The intersection is signalized and has four legs. All approaches utilize flashing yellow arrows for left turns. TH 65 has an ADT (from year 2017) of 25,500 vpd on the south leg and 28,500 on the north leg, and 49th Avenue NE has an ADT of 5,150 vpd on the west leg and 5,700 vpd on the east leg. There are bus stops in the southwest and northeast corners and at-grade pedestrian crossings on the east and west legs. There are no at-grade crossings on the north or south legs, however, a pedestrian bridge is present on the south leg of the intersection. During the field visit on September 10, 2018 around 1:00 PM, no pedestrians were observed to use the bridge but nine pedestrians crossed TH 65 at grade within a 14-minute period. Field timing showed that it takes more than three minutes to cross the roadway via the pedestrian bridge. Sidewalk connections exist along all legs of the intersection. Valley View Elementary School and Columbia Academy are both located near the southwest corner of the intersection. This intersection was flagged because there were two pedestrian crashes during the study period (2013-March 2018) and the critical crash rate index (1.10) is above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider designing intersection corners with tightened radii to slow down turns. (***C-W, 7b***).
- Consider installing at grade crossings on the north and south legs of the intersection. (***C-W, 9***).
- Consider providing pedestrian connections which are convenient and direct access to businesses, bus stops, and other pedestrian destinations. (***C-W, 9***).

Medium-Term (5-10 years)

- Consider restricting access to ¾ or right-in/right-out only at 48th Avenue NE. (***C-W, 12d***).

50th Avenue NE

Figure 4-44: Aerial Image of 50th Avenue NE and TH 65

Source: Google Earth™ mapping service. August 2018.

50th Avenue NE (shown in Figure 4-44) is located north of 49th Avenue NE on the TH 65 project corridor. The intersection is signalized and has four legs. TH 65 has an ADT (from year 2017) of 28,500 vpd on the south and north legs, and 50th Avenue NE is assumed to have an ADT less than 1,000 vpd. There are bus stops in the northwest and southeast corners and pedestrian crossings on all legs. There are sidewalk connections on both sides of TH 65 to the north and south. The only east-west sidewalk connection is in the northeast corner of the intersection to the corner parcels. There is retail on all four corners of the intersection. This intersection was flagged because there were three pedestrian crashes during the study period (2013-March 2018).

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

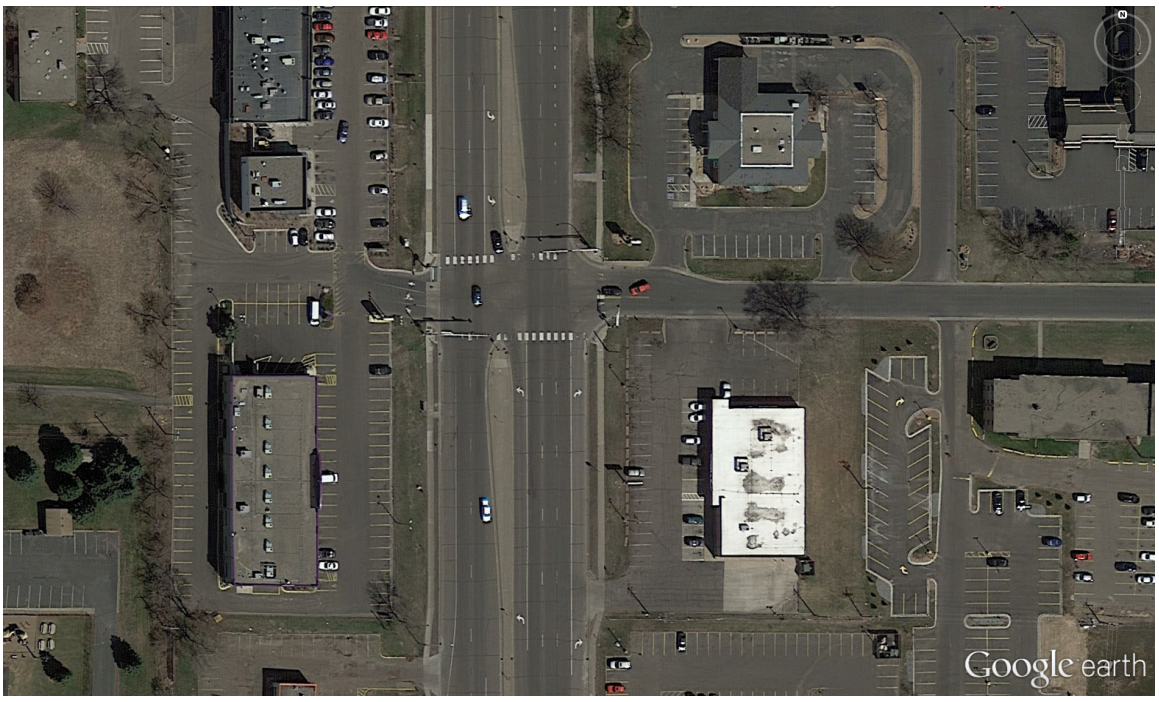
- Consider installing curb bump outs where there is currently shoulder on TH 65. **(*C-W, 6a*)**.
- Consider changing lane configuration to exclusive left and shared through/right on side streets to shorten width of side street crossings. **(*C-W, 6*)**.
- Evaluate intersection corner radii geometry to identify opportunities to tighten radii and make curb ramps more pronounced. **(*C-W, 7b*)**.
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). **(*C-W, 7c*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing. **(*C-W, 8d*)**.

Medium-Term (5-10 years)

- Consider restricting or closing access for driveways close to the intersection. **(*C-W, 12b*)**.

52nd Avenue NE

Figure 4-45: Aerial Image of 52nd Avenue NE and TH 65



Source: Google Earth™ mapping service. August 2018.

52nd Avenue NE (shown in Figure 4-45) is located north of 50th Avenue NE on the TH 65 project corridor. The intersection is signalized and has four legs, with the west leg providing access to retail. Left turns all run on permissive (left turn yield on green ball) phasing. TH 65 has an ADT (from year 2017) of 28,500 vpd on the south and north legs, and 52nd Avenue NE is assumed to have an ADT less than 1,000 vpd. There are bus stops in the southwest and northeast corners and pedestrian crossings on all legs. There are sidewalk connections on both sides of TH 65 to the north and south. The only east-west sidewalk connection is in the northeast corner of the intersection to the corner parcel. This intersection was flagged because there was a pedestrian crash in August 2013.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate intersection corner radii geometry to identify opportunities to tighten radii and make curb ramps more pronounced. **(*C-W, 7b*)**.
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). **(*C-W, 7c*)**.
- Consider changing the driveway apron to make it more abrupt (2-3' ramp, 2-3' accessible sidewalk).

Medium-Term (5-10 years)

- Consider waiting to introduce the third northbound through lane until north of the intersection (verify traffic first). **(*C-W, 6*)**.
- Consider removing the signal and converting intersection to ¾ access and allowing u-turns at 53rd Avenue NE. **(*C-W, 12d*)**.

E Moore Lake Drive

Figure 4-46: Aerial Image of E Moore Lake Drive and TH 65

Source: Google Earth™ mapping service. August 2018.

E Moore Lake Drive (shown in Figure 4-46) is located north of E Moore Lake and I-694 on the TH 65 project corridor. The intersection is signalized and has four legs. TH 65 has an ADT (from year 2017) of 30,500 on the south and north legs, and E Moore Lake Drive has an ADT of 2,950 vpd on the west leg and 7,600 vpd on the east leg. There are bus stops in the southwest and northeast corners and pedestrian crossings on all legs. There are east-west sidewalk connections on both legs of E Moore Lake Drive but no north-south connections. This intersection was flagged because there was a pedestrian crash in March 2016.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider reducing the number of lanes on the side street, including removing one of the eastbound receiving lanes. **(*C-W, 6b*)**.
- Evaluate intersection corner radii geometry to identify opportunities to tighten radii and make curb ramps more pronounced. **(*C-W, 7b*)**.
- Consider extending median noses to slow turning vehicles (consider Illinois DOT corrugated median nose). **(*C-W, 7c*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing. It may be necessary to install a longer mast arm on the side street to accommodate flashing yellow arrow signal heads. **(*C-W, 8d*)**.
- Consider adding accessible connection between NE corner of intersection and land use parcel on same corner. **(*C-W, 9*)**.

Medium-Term (5-10 years)

- Consider adding retro-reflective back plates to signal heads. **(*C-W, 11b*)**.
- Consider centering signal heads over each lane on the side street. **(*C-W, 11c*)**.

Osborne Road NE

Figure 4-47: Aerial Image of Osborne Road NE and TH 65

Source: Google Earth™ mapping service. August 2018.

Osborne Road NE (shown in Figure 4-47), also known as CSAH 8, is approximately a mile south of CSAH 10 on the TH 65 project corridor. The intersection is signalized and has four legs. Northbound/southbound lefts run on protected phasing and eastbound/westbound lefts run on protected/permissive phasing (left turn yield on green ball). TH 65 has an ADT (from year 2017) of 30,500 vpd on the south and north legs, and Osborne Road NE has an ADT of 8,800 vpd on the west leg and 5,100 vpd on the east leg. There are bus stops in the

southwest and northeast corners and pedestrian crossings on all legs. There are east-west trail/sidewalk connections on both legs of Osborne Road NE but no north-south connections. This intersection was flagged because there was a pedestrian crash in November 2015. In addition, the critical crash rate index (1.12) and FAR index (2.97) are above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider installing LED lighting on the southeast corner of the intersection. **(*C-W, 4*)**.
- Consider removing extra receiving lanes on side streets. **(*C-W, 6b*)**.
- Evaluate intersection corner radii geometry to identify opportunities to tighten radii, make curb ramps more pronounced, and push crossings closer into the intersection. **(*C-W, 7b*)**.
- Consider extending median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). **(*C-W, 7c*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing. **(*C-W, 8d*)**.
- Fix countdown timers and burnt out red arrow for NB lefts.

Medium-Term (5-10 years)

- Consider offsetting the left turn lanes to improve visibility.
- Consider adding a signal head over every through lane. **(*C-W, 11c*)**.
- Consider changing to reduced conflict intersection (RCI) and include in a series as part of the high-speed section of TH 65. Provide enhanced mid-block pedestrian crossings. **(*C-W, 5 and 12e*)**.
- Implement Complete Streets solution on Osborne Road NE. **(*C-W, 6, 7, and 13*)**.

81st Avenue NE

Figure 4-48: Aerial Image of 81st Avenue NE and TH 65

Source: Google Earth™ mapping service. August 2018.

81st Avenue NE (shown in Figure 4-48), is just south of CSAH 10 on the TH 65 project corridor. The intersection is signalized and has four legs. TH 65 has an ADT (from year 2017) of 30,500 vpd on the south leg and 37,000 on the north leg, and 81st Avenue NE has an ADT of 7,800 vpd on the west leg and 6,100 vpd on the east leg. There are bus stops in the southwest and northeast corners and pedestrian crossings on all legs. There are east-west trail/sidewalk connections on both legs of 81st Avenue NE but no north-south connections. There is an east-west pedestrian bridge over TH 65 approximately 900 feet south of the intersection and Spring Lake Park High School is in the southwest corner. A new HyVee is under construction in the northeast corner and the 81st Avenue NE / TH 65 intersection will be upgraded due to this new development. It is anticipated that HyVee will be a pedestrian/bicyclist destination. This intersection was flagged because there were two pedestrian crashes in the study period (2013-March 2018) and the critical crash rate index (1.09) is above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider adding lights to the pedestrian bridge south of the intersection. (***C-W, 4***).
- Reconsider proposed WB double right on 81st Avenue NE. (***C-W, 6***).
    - If double rights are maintained, restrict right turns on red and consider protected right turn movement to eliminate multiple threat.
    - May want to consider channelized right turn to mitigate pedestrian conflict.
- Consider modifying 81st Avenue NE to a 3-lane section. (***C-W, 6b***).

- Evaluate intersection corner radii geometry to identify opportunities to tighten radii, especially for westbound right turns (NW corner). **(*C-W, 7b*)**.
- Evaluate adjusting signal cycle length to reduce wait times for pedestrians. **(*C-W, 8b*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA). **(*C-W, 8d*)**.
    - Restrict right turns on red during LPI using a blank out sign. **(*C-W, 8e*)**.

Medium-Term (5-10 years)

- Consider extending the median on the east leg to restrict access at Buchanan Street to right-in/right-out only. **(*C-W, 12*)**.
- Consider adding a trail to provide a connection to the pedestrian bridge. **(*C-W, 13*)**.

Middletown Road NE

Figure 4-49: Aerial Image of Middletown Road NE and TH 65

Source: Google Earth™ mapping service. August 2018.

Middletown Road NE (shown in Figure 4-49), is just south of CSAH 10 on the TH 65 project corridor. The intersection is unsignalized and has three legs with the west leg forming base of the “T” and only having right-in/right-out access. TH 65 has an ADT (from year 2017) of 37,000 vpd on the south and north legs, and Middletown Road NE is assumed to have an ADT less than 1,000 vpd. There are no bus stops, pedestrian crossings, or sidewalk connections. No pedestrian or bicycle-related collisions occurred during the study period (2013-March 2018). This intersection was flagged because both the critical crash rate index (1.08) and FAR index (1.45) are above one. It is likely that most crashes at this intersection are related to the signal at 81st Avenue NE just south of Middletown Road NE. Both of the severe injury collisions that occurred during the study period involved southbound vehicles.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Consider adding a right turn lane or removing access to/from SB TH 65.
- Consider installing a pork chop island to slow down drivers turning on and off TH 65.

85th Avenue NE

Figure 4-50: Aerial Image of 85th Avenue NE and TH 65

Source: Google Earth™ mapping service. August 2018.

85th Avenue NE (shown in Figure 4-50), is just north of CSAH 10 on the TH 65 project corridor. The intersection is signalized and has four legs. TH 65 has an ADT (from year 2017) of 41,000 vpd on the south leg and 35,000 on the north leg, and 85th Avenue NE has an ADT of 8,100 vpd on the east leg and is assumed to have an ADT less than 1,000 on the west leg. There are bus stops in the northwest and northeast corners and pedestrian crossings on the north and east legs. There are east-west trail/sidewalk connections to the east on 85th Avenue NE and to the corner parcel on the northwest corner, but no north-south connections. This intersection was flagged because there were two pedestrian crashes in the study period (2013-March 2018).

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate lane configuration on 85th Avenue NE to remove split phase operation and reduce lanes. **(*C-W, 6*)**.
- Evaluate intersection corner radii geometry to identify opportunities to tighten radii and make curb ramps more pronounced. **(*C-W, 7b*)**.

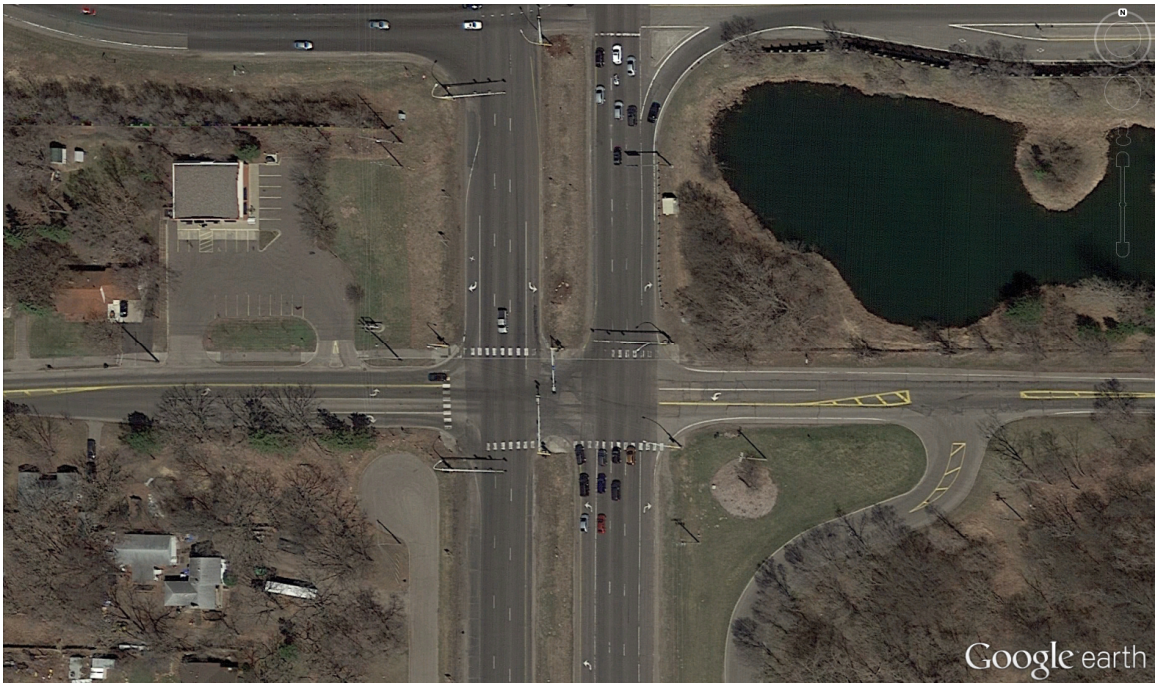
- Extend median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). **(*C-W, 7c*)**.
- Evaluate adjusting signal cycle length to reduce wait times for pedestrians. **(*C-W, 8b*)**.
- Evaluate signal phasing which increase pedestrian conspicuity, such as Lead Pedestrian Interval (LPI) and Pedestrian Omit on Flashing Yellow Arrow (POOFYA) phasing. **(*C-W, 8d*)**.
- Consider adding crosswalk and accessible ramps on south and west legs of intersection and relocate SB bus stop to the south side (far side stop). **(*C-W, 9*)**.
- Consider providing a connection from the northwest bus stop to sidewalk and provide a landing pad to make ADA accessible. **(*C-W, 9*)**.
- Fix pedestrian countdown timer on east leg.
- Consider removing out of place truncated domes mid-way on sidewalk connection to Kwik Trip.

Medium-Term (5-10 years)

- Connect sidewalk in the NW corner to the frontage road, run north parallel to TH 65. **(*C-W, 13*)**.

89th Avenue NE

Figure 4-51: Aerial Image of 89th Avenue NE and TH 65



Source: Google Earth™ mapping service. August 2018.

89th Avenue NE (shown in Figure 4-51), is closely spaced to TH 10 just to the south on the TH 65 project corridor. The intersection is signalized and has four legs. Northbound/southbound left turn movements run on protected phasing and eastbound/westbound left turn movements run on protected/permissive phasing. TH 65 has an ADT (from year 2017) of 35,000 vpd on the south and north legs, and 89th Avenue NE has an ADT of 5,000 vpd on the west leg and is assumed to have and ADT less than 1,000 on the east leg. There are no bus stops at the

intersection. Pedestrian crossings are present on all legs. There are trail connections to the west on 89th Avenue NE, but no connections in any other directions. No pedestrian or bicycle-related collisions occurred during the study period (2013-March 2018). This intersection was flagged because the FAR critical index (1.76) was above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Evaluate intersection corner radii geometry to identify opportunities to tighten radii and make curb ramps more pronounced. **(*C-W, 7b*)**.
- Extend median noses to slow turning vehicles (consider using Illinois DOT corrugated concrete median nose treatment). **(*C-W, 7c*)**.
- Consider providing a pedestrian connection to the frontage roads in the southwest and south east corners. **(*C-W, 9*)**.
- Based on closely spaced signalized intersections consider using optically programmed signal heads to reduce potential safety issues resulting from drivers viewing downstream signal and not paying attention to upstream signal.

Medium-Term (5-10 years)

- Consider adding retro-reflective back plates to signal heads. **(*C-W, 11b*)**.
- Consider adding signal heads over each through lane. **(*C-W, 11c*)**.
- Consider restricting intersection to ¾ or right-in/right-out access and providing space for U-turns to the south; could re-route some traffic to 85th Avenue NE. **(*C-W, 12d*)**.

TH 10 South Terminal

Figure 4-52: Aerial Image of TH 10 South Terminal and TH 65

Source: Google Earth™ mapping service. August 2018.

TH 10 eastbound ramps (see Figure 4-52) intersect TH 65 in a partial cloverleaf configuration. The ramp terminal intersection is signalized and has four legs, with the east and west legs being one-way in the eastbound direction. TH 65 has an ADT (from year 2017) of 35,000 vpd on the south leg and 58,000 on the north leg. There are no bus stops, curb ramps, or sidewalk connections present. Rear end crashes are above state average at this intersection. This intersection was flagged because the critical crash rate index (1.06) is above one.

During the road safety audit, the following improvements were suggested for this intersection to improve safety for all modes of travel:

Short-Term (0-5 years)

- Based on closely spaced signalized intersections consider using optically programmed signal heads to reduce potential safety issues resulting from drivers viewing downstream signal and not paying attention to upstream signal.

Medium-Term (5-10 years)

- Consider adding retro-reflective back plates to signal heads. (***C-W, 11b***).

5 Conclusion

The goal of a road safety audit process is to determine if the number and severities of crashes is abnormal, to determine the primary factors for the crashes, and to propose short-, medium-, and long-term recommendations to improve the safety of the corridor. A focus is given to eliminating severe and fatal crashes and to reducing the total number of crashes along the corridor. All aspects of road safety are considered and opportunities to reduce crash risk are sought out.

This report is intended as a tool to provide guidance and recommendations as corridor improvements are made. A hierarchy of priorities should be continually evaluated to make the greatest effect given available time and resources. Short-term solutions are usually low-cost, high benefit, and can often be applied corridor wide and system wide.

Overall, the amount of crashes on the corridors have continually decreased since 2006. This is likely a cause of safety improvements that have been implemented over the years.

Some improvement projects are programmed to occur within the next year or two. On TH 65 in 2019, this includes turn lane extensions on the north end of TH 65, sign replacement on the entire corridor, and a signal system replacement at 41st Avenue NE. The next programmed project on TH 47 is a fence replacement from 37th Avenue NE to 69th Avenue NE and landscaping project in year 2020. Opportunities should be sought out to include some of the road safety audit recommended safety improvements in these projects.

Along both corridors, the percentage of crashes that are pedestrian-related (especially for fatal and severe injury collisions) is higher than statewide averages. In addition, majority of crashes on these corridors occur at intersections. Intersections that had crash rates above a computed critical crash rate based on statewide averages, fatal and incapacitating crash rates (FARs) above the critical rate, or having any pedestrian crashes between January 1, 2013, and March 15, 2018, were flagged as needing further evaluation. On TH 47, 15 intersections were evaluated and on TH 65, 19 intersections were evaluated. Safety recommendations were made for these intersections on a case-by-case basis. Some low-cost solutions should be applied to all intersections to maintain corridor-wide consistency.

Key recommendations along the corridors include:

Short-Term (0–5 years)

1. Form a coalition(s) to prioritize safety on the TH 47 and TH 65 corridors.
2. Implement active enforcement to increase compliance with traffic control devices for both motorized and non-motorized road users, reduce speeding, and reduce red-light running.
3. Conduct education outreach to promote safety initiatives.
4. Evaluate and improve corridor lighting as appropriate.
5. Enhance/install crossing treatments as appropriate.
6. Reduce crossing distances where feasible.
7. Examine the length of the corridors for opportunities to make roads more pleasant and calm traffic.
8. Evaluate traffic signal timing, phasing, and operation to improve pedestrian safety, slow traffic speeds, and reduce wait times for pedestrians.
9. Provide accessible routes for all road users.
10. Where possible, use temporary methods to implement longer-term solutions on a faster time line.

Medium-Term (5–10 years)

1. Incorporate best practice improvements in future projects.
2. Develop and implement an access management plan.
3. Develop and implement a pedestrian/bicyclist network plan.
4. Investigate a broader study of regional effects to understand travel patterns and the effects of lowering throughput of speed on any roads in the corridors. Develop a long-term plan to redesign the corridors to meet the needs of the changing context, communities, and multi-modal use.

Long-Term (10 years and longer)

1. Reconstruct both corridors based on recommendations from the corridor study.

Engineering, Education, Enforcement, and Emergency Services (the four E’s) should be considered to create a multi-disciplinary approach to safety solutions.

Appendix A. Glossary of Acronyms

Table A-1: Glossary of Acronyms

Acronym	Meaning	Definition
AADT	Annual Average Daily Traffic	Wikipedia Definition (September 2018): "Annual average daily traffic, abbreviated AADT, is a measure used primarily in transportation planning and transportation engineering. Traditionally, it is the total volume of vehicle traffic of a highway or road for a year divided by 365 days. AADT is a useful and simple measurement of how busy the road is. Newer advances from traffic data providers are now providing AADT by side of the road, by day of week and by time of day."
CGT	Continuous Green T	Continuous Green T's, also referred to as CGT's, are a type of intersection control installed at T-intersections. They are constructed to allow continuous movement for through traffic on the "top" of the T intersection and provide safer turn movements through channelization.
CMF	Crash Modification Factor	From the CMF Clearinghouse Website (October 2018): "A crash modification factor (CMF) is used to compute the expected number of crashes after implementing a countermeasure on a road or intersection."
CSAH	County State Aid Highway	Wikipedia Definition (September 2018): "County roads in Minnesota are roads locally maintained by county highway departments in Minnesota. County roads span a wide variety of road types, varying from A-minor arterials that carry large volumes of traffic to an improved road. Most county roads in Minnesota are designated with numbers that are unique only within a county." "Some county routes are designated as County State Aid Highways (CSAH). These routes are constructed and maintained by counties, but they are eligible for funding from the County State Aid Highway Fund."
BUILD	Better Utilizing Investments to Leverage Development	From US DOT's website (September 2018): "BUILD Transportation grants replace the pre-existing Transportation Investment Generating Economic Recovery (TIGER) grant program. As the Administration looks to enhance America's infrastructure, FY 2018 BUILD Transportation grants are for investments in surface transportation infrastructure and are to be awarded on a competitive basis for projects that will have a significant local or regional impact. BUILD funding can support roads, bridges, transit, rail, ports or intermodal transportation."
FAR	Fatal and Incapacitating Crash Rate	A type of crash rate which computes crash frequency of fatal and severe injury crashes per some measure of exposure. This rate allows for road segments of different traffic volumes, lengths, and number of study years to be compared with one another.

Acronym	Meaning	Definition
FHWA	Federal Highway Administration	From FHWA's website (September 2018): "The Federal Highway Administration (FHWA) provides stewardship over the construction, maintenance and preservation of the Nation's highways, bridges and tunnels. FHWA also conducts research and provides technical assistance to state and local agencies in an effort to improve safety, mobility, and livability, and to encourage innovation."
GIS	Geographic Information System	Wikipedia Definition (September 2018): "A system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data."
HAWK	High-Intensity Activated Crosswalk beacon	Wikipedia Definition (September 2018): "A HAWK beacon (High-Intensity Activated crossWalK beacon) is a traffic control device used to stop road traffic and allow pedestrians to cross safely. It is officially known as a Pedestrian Hybrid Beacon (PHB). The purpose of a HAWK beacon is to allow protected pedestrian crossings, stopping road traffic only as needed. Where standard traffic signal 'warrants' prevent the installation of standard three-color traffic signals, the HAWK beacon provides an alternative. A HAWK beacon is used only for marked crosswalks. Similar hybrid beacons are allowed at driveways of emergency service buildings such as fire houses."
ICE	Intersection Control Evaluation	From MnDOT's Traffic Engineering Page (September 2018): "The goal of Intersection Control Evaluation is to select the optimal traffic control for an intersection based on an objective analysis."
ITS	Intelligent Transportation System	Wikipedia Definition (September 2018): "A Intelligent transportation system (ITS) is an advanced application which, without embodying intelligence as such, aims to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks."
K+A	Fatal (K) and Incapacitating (A) crashes	The sum of crashes which result in fatality or serious injuries.
LED	Light Emitting Diode	A type of light source which can provide several advantages, such as: high-efficiency, high levels of brightness, low voltage and current requirements, low radiated heat, long life, and can be easily controlled and programmed.

Acronym	Meaning	Definition
MnDOT	Minnesota Department of Transportation	Wikipedia Definition (September 2018): "The Minnesota Department of Transportation (Mn/DOT, pronounced "min-dot") oversees transportation by all modes including land, water, and air in the U.S. state of Minnesota. The cabinet-level agency is responsible for maintaining the state's trunk highway system (including state highways, U.S. highways, and interstate highways), funding municipal airports and maintaining radio navigation aids, and other activities."
NEPA	National Environmental Policy Act	Wikipedia Definition (October 2018): "The National Environmental Policy Act (NEPA) is a United States environmental law that promotes the enhancement of the environment and established the President's Council on Environmental Quality (CEQ)".
PEL	Planning and Environmental Linkages	From CDOT's Website (October 2018): "PEL studies can be used to make planning decisions and for planning analysis. These decisions and analyses, for example, can be used to identify and prioritize future projects, develop the purpose and need for a project, determine project size or length, and/or develop and refine a range of alternatives". "PEL studies should be able to link planning to environmental issues and result in useful information that can be carried forward into the National Environmental Policy Act (NEPA) process."
RCI	Reduced Conflict Intersection	From MnDOT's Website (September 2018): "Reduced Conflict Intersections are intersections that decrease fatalities and injuries caused by broadside crashes on four-lane divided highways. In some parts of the country, RCIs are sometimes referred to as J-turns or RCUTs."" In an RCI, drivers always make a right turn, followed by a U-turn."
RRFB	Rectangular Rapid Flash Beacon (RRFB)	From FHWA's Safety Website (May 2009): "RRFBs are user-actuated amber LEDs that supplement warning signs at un-signalized intersections or mid-block crosswalks. They can be activated by pedestrians manually by a push button or passively by a pedestrian detection system."
TDA	Transportation Data and Analysis	Analysis and data collection for the development of cartographic maps, GIS data, traffic monitoring programs, and TIS database maintenance for transportation systems.
TH	Trunk Highway	Wikipedia Definition (September 2018): "A trunk road, trunk highway, or strategic road is a major road, usually connecting two or more cities, ports, airports and other places, which is the recommended route for long-distance and freight traffic. Many trunk roads have segregated lanes in a dual carriageway, or are of motorway standard."

Acronym	Meaning	Definition
TIS	Transportation Information System	From MnDOT's website (September 2018): "integrated database system that stores roadway related traffic information such as AADT and HCAADT, and roadway physical characteristics such as number of lanes, presence of medians, etc."
USDOT	United States Department of Transportation	Wikipedia Definition (September 2018): "The United States Department of Transportation (USDOT or DOT) is a federal Cabinet department of the U.S. government concerned with transportation."
VPD	Vehicles Per Day	Units for Annual Average Daily Traffic (AADT) volumes.

Appendix B. What is a Road Safety Audit?

What is a Road Safety Audit?

In the FHWA's (Federal Highway Safety Administration) *Road Safety Audit Guidelines* 2006 publication, the following definition is provided:

> *A Road Safety Audit is a formal safety performance examination of an existing or future road or intersection by an independent audit team.*
>
> *The road safety audit team considers the safety of all road users, qualitatively estimates and reports on road safety issues and opportunities for safety improvement.*

A road safety audit usually is in response to an abnormal frequency or severity of crashes in a region. Road safety audits can also be used to assess potential risk factors as well.

Goals of a Road Safety Audit

The primary goal of a road safety audit is to find ways to make a road safer by identifying potential road safety issues and developing short-, medium-, and long-term solutions. The following fundamental focus areas were identified to help achieve this goal:

Focus #1: Eliminate fatal and serious injuries

Focus #2: Reduce the number and severity of all crashes

Focus #3: Take a multi-dimensional approach

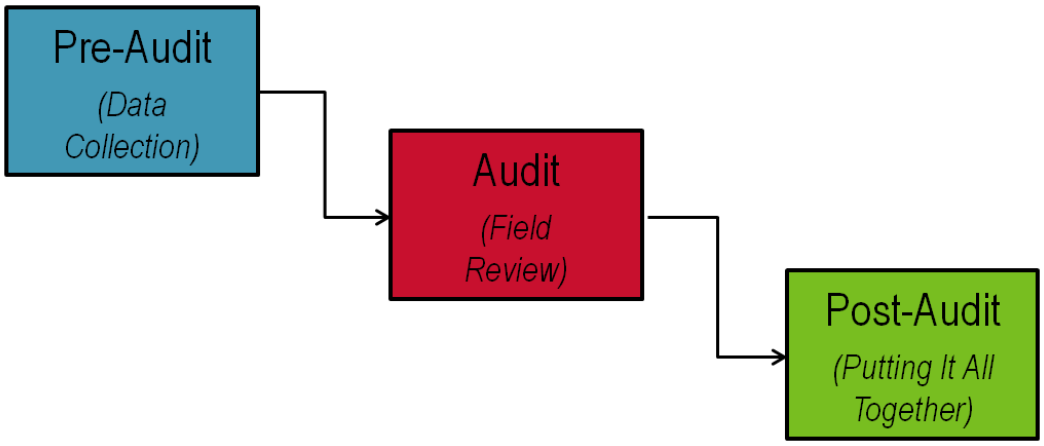
Fatal and incapacitating crashes hold the highest importance. By focusing on fatal and incapacitating crashes, more lives can be saved. This well aligns with Minnesota's "Toward Zero Deaths" (TZD) goal. By next focusing on reducing the total number and severity of crashes, risk factors can be reduced to improve the overall safety of the corridor.

The safety of all road users is important. Semi-trucks, students, daily commuters, pedestrians, bicyclists, road maintenance staff, and emergency vehicles use the road and put their lives at risk. There are many types of road users and different considerations that need to be made to account for them.

Road Safety Audit Review Process

There are three main stages for the road safety audit review process: Pre-audit, audit, and post audit.

Figure B- 1: Road Safety Audit Process



Pre-Audit

The pre-audit stage involves collecting data and background information on the corridor. This includes identifying the roadway characteristics, corridor history, and crash data and trends. Using this information, key focus areas can be determined for the corridor.

Audit

The audit is an onsite corridor review performed by a multi-disciplinary road safety audit team. While in the field, the road safety audit team investigates the project corridor and records observations, takes inventory of existing conditions, and discusses potential strategies and applications that can be used.

Post-Audit

Following the field review, the road safety audit team develops and recommends short-, medium-, and long-term solutions to safety concerns identified in the pre-audit and audit steps. All findings are presented to stakeholders.

Appendix C. Star Tribune Article

Spike in pedestrian deaths spurs state action

By HANNAH COVINGTON hannah.covington@startribune.com

Tom Freund often watches pedestrians dash across busy University Avenue NE. in Fridley, tearing through the intersection near BoB's Produce Ranch during breaks in traffic.

"I see it every night going home," said Freund, who has worked at BoB's for more than 30 years. "They think they've got a gap, and they don't."

Local and state officials say a recent spike in fatalities is spurring them to take a closer look at safety issues along Anoka County sections of University and Central avenues NE. — also known respectively as Hwys. 47 and 65 — where at least eight pedestrians and cyclists have died since 2013 and 13 others have been seriously injured. Most of the pedestrian fatalities happened at intersections.

One of the most recent occurred in March, when a 28-year-old man died near BoB's after he was struck by a motorist while trying to cross University Avenue near Osborne Road .

A $70,000 safety audit will focus on problems along the two north metro highways between the Hennepin-Anoka county line in Columbia Heights and Hwy. 10 in Coon Rapids. Officials say they may dig into lighting issues, timing of pedestrian signals, lane widths and medians as part of potential short-term fixes.

"This is a start to a larger and broader initiative to increase safety on this corridor," said Melissa Barnes , north area engineer with the Minnesota Department of Transportation . "We want to make sure that we can get in there and do something soon and then have a plan for the future."

State officials expect to start making recommendations in November, Barnes said.

"Pedestrians are very vulnerable, and so are bicycles," she said. "Any fatality is an issue."

More walking and biking

According to MnDOT, crash reports show a mix of mistakes and bad judgment contributing to collisions. Examples include drivers failing to yield the right of way or being distracted and pedestrians disregarding traffic signals or not being visible.

Seven of the eight fatalities in the corridor in the past five years took place on Hwy. 47. Commuters like Freund say they've seen Hwy. 47 grow busier over the years, with drivers often running lights in their rush to get home.

Fridley officials say they suspect the recent jump in pedestrian deaths may be partly linked to increased foot traffic on Hwy. 47 as more housing and transit options sprout up along the corridor.

That includes a new apartment complex near 61st Avenue NE., where progress on a 256-unit project called Cielo is humming along. The market-rate apartment project marks the first of its kind in Fridley since 1988.

Speed limits shift from 30 to 55 mph northbound on Hwy. 65 and rise from 50 to 65 mph on Hwy. 47 as drivers move north.

That stretch of University Avenue "was designed as a suburban highway with frontage roads," said Fridley City Engineer Jim Kosluchar . "Everybody drove, and nobody walked or cycled anywhere."

Leaders in the old railroad town on the banks of the Mississippi River say Fridley is becoming more urban, with new residents bringing with them a bigger appetite for walking and biking.

"Now we do have a notable portion of the community that doesn't have vehicles," Kosluchar said. "We see that change being something we need to consider with the future of University Avenue."

Hannah Covington • 612-673-4751

Appendix D. Summary of Intersection Crash Data Sheets

The following trends were observed for the flagged intersections (*observations that apply to fatal crashes are noted with a star). See *TH 47 and TH 65 Road Safety Audit Briefing Book (September 10 and 11, 2018)*, Sections E and F, to review data sheets for these intersections:

TH 47

- **University Avenue NE:** Crashes above state averages for: crashes occurring in 2014 and 2017, crashes occurring in dark (street lights on), crashes involving pedestrians, sideswipe-same direction collisions, illegal/unsafe speed, driver impairment, improper lane use, crashes occurring on Mondays/Thursdays/ Saturdays, wet surface, driver ages between 21 and 49. Intersection flagged due to a pedestrian crash in 2017.
- **85th Avenue NE:** Crashes above state averages for: fatal and serious injury crashes, crashes occurring in 2017, dark lighting, crashes involving pedestrians, sideswipe-same direction collisions, driver impairment, improper lane use, improper maneuver, crashes occurring on Wednesdays/Fridays/Saturdays, wet surface, driver ages in 30s/50s/70s. Intersection flagged due to fatal and severe injury crash rate being above critical and a pedestrian crash in 2016.
- **83rd Avenue NE:** Crashes above state averages for: fatal crashes, crashes occurring in 2013 and 2015, crashes occurring at sunset and dark (street lights on), crashes involving pedestrians, angle collisions, sideswipe opposing collisions, head on collisions, driver impairment, collisions occurring between noon and midnight, crashes occurring on Wednesdays/Fridays/Saturdays, wet surface, winter weather conditions, driver ages between 21 and 69. Intersection flagged due to crash rate being above critical, fatal and severe injury crash rate being above critical, and two pedestrian crashes in years 2016/2017.
- **81st Avenue NE:** Crashes above state averages for: fatal crashes, crashes occurring in 2013, 2014, and 2017, dark lighting, crashes involving pedestrians, angle collisions, driver impairment, alcohol/chemical use, crashes occurring Friday-Sunday and on Wednesdays, wet surface, snow/slush surface, rain, winter weather conditions, driver ages in 30s/40s/70s. Intersection flagged due to crash rate being above critical and one pedestrian crash in 2016.
- **Osborne Road NE:** Crashes above state averages for: fatal crashes, crashes occurring in 2014 and 2015, crashes occurring at sunrise and dark (street lights on), crashes involving pedestrians and bicyclists, angle collisions, sideswipe opposing collisions, rear-end collisions, driver impairment, alcohol/chemical use, collisions occurring between 3:00PM and midnight, crashes occurring on Mondays and Tuesdays, wet surface, rain, blowing sand/winds, driver ages between 50 and 89 and also in 30s. Intersection flagged due to crash rate being above critical, fatal and severe injury crash rate being above critical, and a pedestrian crash in 2017.
- **73rd Avenue NE:** Crashes above state averages for: serious injury crashes, crashes occurring in 2014 and 2017, crashes occurring at sunrise/sunset/dark (streetlights on), crashes involving pedestrians, fixed object collisions, overturn/rollover collisions, angle collisions, head on collisions, collisions occurring between 6:00AM and 9:00AM and between 6:00PM and midnight, Crashes occurring on Tuesdays, Thursdays, and Sundays, winter weather conditions, blowing sands/winds, driver ages in 30s/70s/90s. Intersection flagged due to fatal and severe injury rate being above critical as well as a pedestrian crash in 2014.

- **Mississippi Street NE:** Crashes above state averages for: crashes occurring in 2013/2014/2017, crashes occurring at sunrise/sunset/dark (streetlights on), crashes involving pedestrians, fixed object collisions, sideswipe same direction collisions, head on collisions, illegal/unsafe speed, driver impairment, collisions occurring on Fridays/Saturdays/Sundays, wet surface, ice/packed snow, rain, driver ages between 40 and 69 and in 80s. Intersection flagged for a pedestrian crash in 2017.
- **57th Avenue NE:** Crashes above state averages for: fatal and severe injury crashes, crashes occurring in 2016 and 2017, crashes occurring at sunrise/sunset/dark, crashes involving pedestrians and bicyclists, fixed object collisions, head on collisions, improper maneuver, collisions occurring on Mondays/Thursdays/Saturdays, wet surface conditions, snow/slush surface conditions, winter weather conditions, driver ages in 20s/30s/50s/70s. Intersection flagged due to fatal and severe injury rate being above critical as well as three pedestrian crashes in years 2013/2016/2017.
- **I-694 North Ramp Terminal:** Crashes above state averages for: crashes occurring in 2016 and 2017, crashes occurring at sunrise and dark (street lights on), fixed object collisions, sideswipe-same direction collisions, rear end collisions, illegal/unsafe speed, driver inattention, driver impairment, improper maneuver, collisions occurring on Mondays/Tuesdays/Fridays, ice/packed snow surface, winter weather conditions, driver ages ins 20s/30s/40s/60s. Intersection flagged due to crash rate being above critical.
- **I-694 South Ramp Terminal:** Crashes above state averages for: severe injury crashes, crashes occurring in 2013/2016/2017, crashes occurring at sunrise/dark (street lights on), fixed object collisions, overturn/rollover collisions, sideswipe same direction collisions, rear end collisions, driver impairment, crashes occurring between midnight and 9:00AM and between noon and 3:00PM, wet surface conditions, rain, blowing sand/winds, driver ages in 20s/30s/90s. Intersection flagged due to crash rate being above critical.
- **53rd Avenue NE:** Crashes above state averages for: severe injury crashes, crashes occurring in 2014 and 2015, crashes occurring at sunrise/sunset, crashes involving pedestrians/bicyclists, sideswipe opposing collisions, rear end collisions, head on collisions, illegal/unsafe speed, driver impairment, collisions occurring on Tuesdays/Thursdays/Fridays, cloudy weather conditions, driver ages from 21 to 39. Intersection flagged due to crash rate being above critical, fatal and severe injury crash rate being above critical, and a pedestrian crash in 2014.
- **49th Avenue NE:** Crashes above state averages for: crashes occurring in 2013/2014/2015, crashes occurring at sunset and dark (streetlights on), crashes involving pedestrians, fixed object collisions, sideswipe opposing collisions, head on collisions, driver impairment, alcohol/chemical use, crashes occurring between 6:00AM and 3:00PM, crashes occurring between Thursday and Sunday, snow/slush surface conditions, blowing sand/winds, driver ages in 30s and 50s. Intersection flagged for a pedestrian crash that occurred in 2014.
- **44th Avenue NE:** Crashes above state averages for: fatal and severe injury crashes, crashes occurring in 2013, crashes occurring at sunrise/sunset/dark, crashes involving pedestrians or bicyclists, fixed object collisions, angle collisions, sideswipe opposing collisions, head on collisions, driver impairment, improper maneuver, collisions occurring on Wednesdays/Thursdays/Fridays, ice/packed snow surface conditions, cloudy weather conditions, winter weather conditions, driver ages in 30s and 70s. Intersection flagged due to crash rate being above critical, fatal and severe injury crash rate being above critical, and a pedestrian crash that occurred in 2014.

- **40th Avenue NE:** Crashes above state averages for: crashes occurring in 2016, crashes occurring at sunset and dark, collisions involving pedestrians, angle collisions, improper maneuver, crashes occurring on Mondays and Thursdays, wet surface conditions, winter weather conditions, blowing sand/winds, driver ages in 20s/30s/60s. Intersection flagged for a pedestrian crash that occurred in 2015.
- **37th Avenue NE:** Crashes above state averages for: severe injury collisions, crashes occurring in 2016 and 2017, crashes occurring in dark, crashes involving pedestrians and bicyclists, fixed object collisions, sideswipe same direction collisions, head on collisions, improper maneuver, crashes occurring between 3:00PM and 6:00PM, crashes occurring on Tuesdays/Wednesdays/Thursdays, wet surface conditions, snow/slush surface conditions, cloudy weather conditions, rain, blowing sand/winds, driver ages under 15, driver ages in 20s/30s/60s/70s. Intersection flagged due to crash rate being above critical, and four pedestrian crashes in years 2013/2014/2015/2016.

TH 65

- **US-10 South Ramp Terminal:** Crashes above state averages for: severe injury collisions, crashes occurring in 2014 and 2017, crashes occurring at sunrise/dark, fixed object collisions, overturn/rollover collisions, rear end collisions, driver impairment, time of day and day of week distributions close to state average, wet road surface, rain, blowing sand/winds, driver ages in 20s/30s/50s/60s. Intersection flagged due to crash rate being above critical.
- **89th Avenue NE:** Crashes above state averages for: fatal and severe injury collisions, crashes occurring in 2014 and 2017, crashes occurring at sunrise/dark, angle collisions, sideswipe collisions (same direction and opposing), driver inattention, crashes occurring between 3:00PM and 9:00PM and between 9:00AM and noon, crashes occurring on Mondays and Wednesdays, snow/slush surface conditions, winter weather conditions, blowing sand/winds, driver ages 16 to 18, driver ages in 40s and 60s. Intersection flagged due to fatal and severe injury crash rate being above critical.
- **85th Avenue NE:** Crashes above state averages for: crashes occurring in 2013/2015/2017, crashes occurring at sunrise and dark, collisions involving pedestrians, sideswipe (same direction and opposing) collisions, rear end collisions, illegal/unsafe speed, driver impairment, crashes occurring between 3:00AM and 9:00AM and between 9:00PM and midnight, crashes occurring on Thursdays and Saturdays, wet surface conditions, snow/slush surface conditions, rain, winter weather conditions, blowing sand/winds, driver ages in 30s and 50s. Intersection flagged for two pedestrian crashes in 2013/2014.
- **Middletown Road:** Crashes above state averages for: crashes occurring in 2015 and 2017, crashes occurring at sunrise, sideswipe same direction collisions, rear end collisions, illegal/unsafe speed, driver inattention, crashes occurring between 6:00AM and 9:00AM, crashes occurring on Tuesdays and Fridays, wet surface conditions, cloudy weather conditions, driver ages 16 to 18, driver ages in 20s/30s/60s. Intersection flagged due to crash rate being above critical and fatal and severe injury crash rate being above critical.
- **81st Avenue NE:** Crashes above state averages for: crashes occurring in 2013 and 2014, collisions involving pedestrians and bicyclists, fixed object collisions, rear end collisions, driver impairment, crashes occurring between 6:00AM and noon, crashes occurring on Tuesdays and Wednesdays, wet surface conditions, ice/packed snow conditions, rain, winter weather conditions, blowing sand/winds, driver ages 16 to 18, driver ages in 30s/50s/70s. Intersection flagged due to crash rate being above critical and two pedestrian crashes in years 2014/2016.

- **Osborne Road NE:** Crashes above state averages for: fatal and severe injury collisions, crashes occurring in 2014 and 2016, crashes occurring at sunrise and dark, overturn/rollovers, angle collisions, head on collisions, driver impairment, crashes occurring from noon-3:00PM/ 6:00PM-midnight/ 3:00AM-6:00AM, crashes occurring on Mondays/Tuesdays/Sundays, snow/slush surface conditions, rain, winter weather conditions, blowing sand/winds, driver ages in 20s/60s/70s. Intersection flagged due to crash rate being above critical, fatal and severe injury crash rate being above critical, and a pedestrian crash in 2015.
- **E Moore Lake Drive:** Crashes above state averages for: crashes occurring in 2013 and 2014, crashes occurring at sunset and dark (street lights on), collisions involving pedestrians, illegal/unsafe speed, crashes occurring from midnight to 6:00AM/ 9:00AM-3:00PM/ 9:00PM to midnight, crashes occurring on Mondays/Tuesdays/Thursdays, ice/slush surface conditions, winter weather conditions, driver ages 19 to 39 and in 80s. Intersection flagged due to a pedestrian crash in 2016.
- **52nd Avenue NE:** Crashes above state averages for: crashes occurring in 2013/2014/2017, crashes occurring in dark, collisions involving pedestrians, rear end collisions, driver impairment, crashes occurring from midnight-3:00AM/ 9:00AM-noon/ 3:00PM-midnight, crashes occurring on Wednesdays/ Thursdays/Saturdays, driver ages in 30s and 50s. Intersection flagged due to a pedestrian crash in 2013.
- **50th Avenue NE:** Crashes above state averages for: crashes occurring in 2014 and 2015, crashes occurring at sunrise/sunset, collisions involving pedestrians or bicycles, fixed object collisions, illegals/unsafe speed, driver inattention, driver impairment, crashes occurring from noon-3:00PM and 6:00PM-9:00PM, wet surface conditions, snow/slush surface conditions, driver ages in 360s/60s/70s. Intersection flagged due to three pedestrian crashes, all in 2015.
- **49th Avenue NE:** Crashes above state averages for: crashes occurring in 2013/ 2015/2016, crashes occurring at sunset/dark, collisions involving pedestrians, fixed object collisions, sideswipe opposing collisions, driver impairment, crashes occurring between 6:00PM and 6:00AM, crashes occurring on Wednesdays and Fridays, snow/slush surface conditions, rain, driver ages in 30s and 80s. Intersection flagged due to crash rate being above critical and two pedestrian crashes in years 2013/2017.
- **47th Avenue NE:** Crashes above state averages for: crashes occurring in 2016, crashes occurring in dark (street lights on), collisions involving pedestrians, rear end collisions, driver inattention, driver impairment, crashes occurring on Thursdays and Saturdays, wet surface conditions, rain, winter weather conditions, driver ages in 50s/60s/70s. Intersection flagged due to four pedestrian crashes in years 2016 (2)/2013/2017.
- **46th Avenue NE:** Crashes above state averages for: severe injury collisions, crashes occurring in 2013 and 2014, crashes occurring in dark (street lights on), collisions involving pedestrians, fixed object collisions, angle collisions, head on collisions, driver impairment, improper maneuver, crashes occurring from 3:00PM-6:00PM, 9:00PM-midnight, 3:00AM to 6:00AM, crashes occurring on Tuesdays/ Fridays/Sundays, cloudy weather conditions, winter weather conditions, blowing sands/winds, driver ages in 20s and 70s. Intersection flagged due to crash rate being above critical and two pedestrian crashes in years 2013/2017.
- **45th Avenue NE:** Crashes above state averages for: severe injury collisions, crashes occurring in 2017, crashes occurring at sunset/dark (street lights on), collisions involving

pedestrians, fixed object collisions, sideswipe same direction collisions, driver impairment, improper maneuver, alcohol/chemical use, crashes occurring between noon and midnight, crashes occurring on Thursdays/Saturdays/ Sundays, driver ages in 30/50s/70s/90s. Intersection flagged due to four pedestrian crashes in years 2013 (1)/2017 (3).

- **44th Avenue NE:** Crashes above state averages for: fatal and severe injury collisions, crashes occurring in 2016 and 2017, crashes occurring at sunset, collisions involving pedestrians, sideswipe opposing collisions, head on collisions, improper maneuver, crashes occurring between 9:00AM and 6:00PM, wet surface conditions, snow/slush surface conditions, driver ages in 70s and 80s. Intersection flagged due to fatal and severe injury crash rate being above critical and three pedestrian crashes in years 2015/2016/2017.
- **43rd Avenue NE:** Crashes above state averages for: severe injury collisions, crashes occurring in 2013/2015/2017, crashes occurring at sunset/dark (street lights on), collisions involving pedestrians, fixed object collisions, angle collisions, sideswipe same direction collisions, driver impairment, snow/slush surface conditions, winter weather conditions, driver ages 19 to 29 and in 50s. Intersection flagged due to crash rate being above critical and a pedestrian crash in 2017.
- **42nd Avenue NE:** Crashes above state averages for: severe injury collisions, crashes occurring in 2015 and 2016, crashes occurring at dark (street lights on), collisions involving pedestrians or bicyclists, fixed object collisions, sideswipe opposing collisions, illegal/unsafe speed, crashes occurring from 3:00PM to 9:00PM, crashes occurring on Wednesdays/Saturdays/Sundays, wet surface conditions, rain, winter weather conditions, driver ages in 30s/50s/60s. Intersection flagged due to a pedestrian crash in 2015.
- **40th Avenue NE:** Crashes above state averages for: crashes occurring in 2015 and 2017, crashes occurring in dark (street lights on), collisions involving pedestrians or bicycles, fixed object collisions, angle collisions, sideswipe opposing collisions, driver inattention, crashes occurring from 6:00AM-noon and 3:00PM-6:00PM, crashes occurring on Thursdays and Fridays, snow/slush surface conditions, cloudy weather conditions, driver ages 19 to 29 and in 70s. Intersection flagged due to two pedestrian crashes in years 2015/2016.
- **Gould Avenue NE:** Crashes above state averages for: crashes occurring in 2016/2017, collisions involving pedestrians, fixed object collisions, angle collisions, sideswipe same direction collisions, driver inattention, improper lane use, crashes occurring from 3:00PM-midnight and 6:00AM-9:00AM, crashes occurring on Mondays/Thursdays/Sundays, snow/slush surface conditions, winter weather conditions, driver ages 15 or younger/30s/40s/60s. Intersection flagged for a pedestrian crash in 2017.
- **37th Avenue NE:** Crashes above state averages for: severe injury collisions, crashes occurring in 2016 and 2017, crashes occurring at sunset/dark (street lights on), fixed object collisions, sideswipe opposing collisions, head on collisions, driver impairment, alcohol/chemical use, crashes occurring between 3:00PM and 3:00AM. Wet surface conditions, snow/slush surface conditions, rain, winter weather conditions, blowing sand/winds, driver ages in 20s and 40s. Intersection flagged due to crash rate being above critical.

Appendix E. Crash Assessment Figures

*Crash Data from MnDOT TIS (1.1.2013 to 3.15.2018)
*Access to 0 Vehicles Data from American Community Survey, Table S0801

TH 47 AND TH 65 ROAD SAFETY AUDIT

CRASH ASSESSMENT

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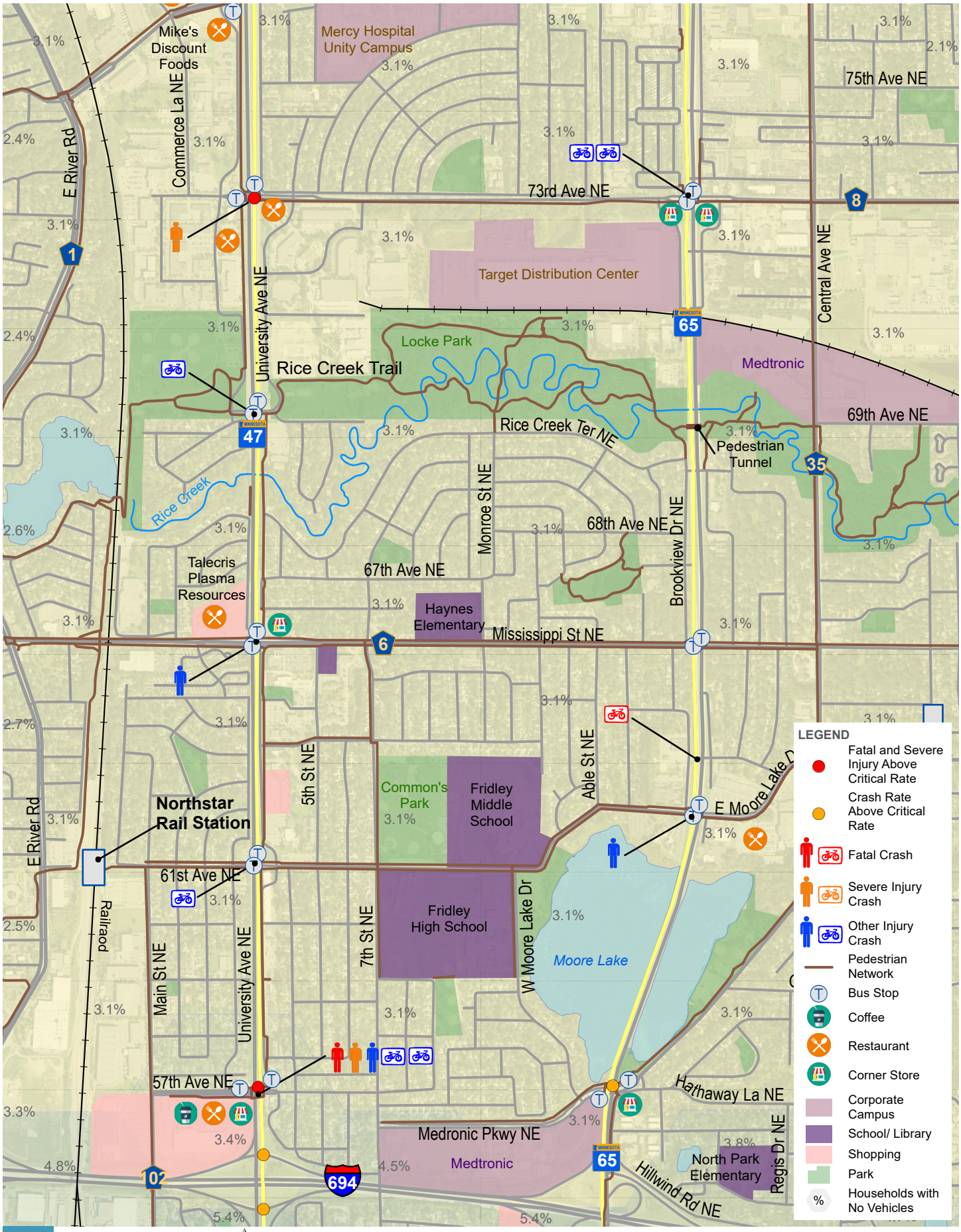

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*Crash Data from MnDOT TIS (1.1.2013 to 3.15.2018)
*Access to 0 Vehicles Data from American Community Survey, Table S0801

TH 47 AND TH 65 ROAD SAFETY AUDIT

CRASH ASSESSMENT

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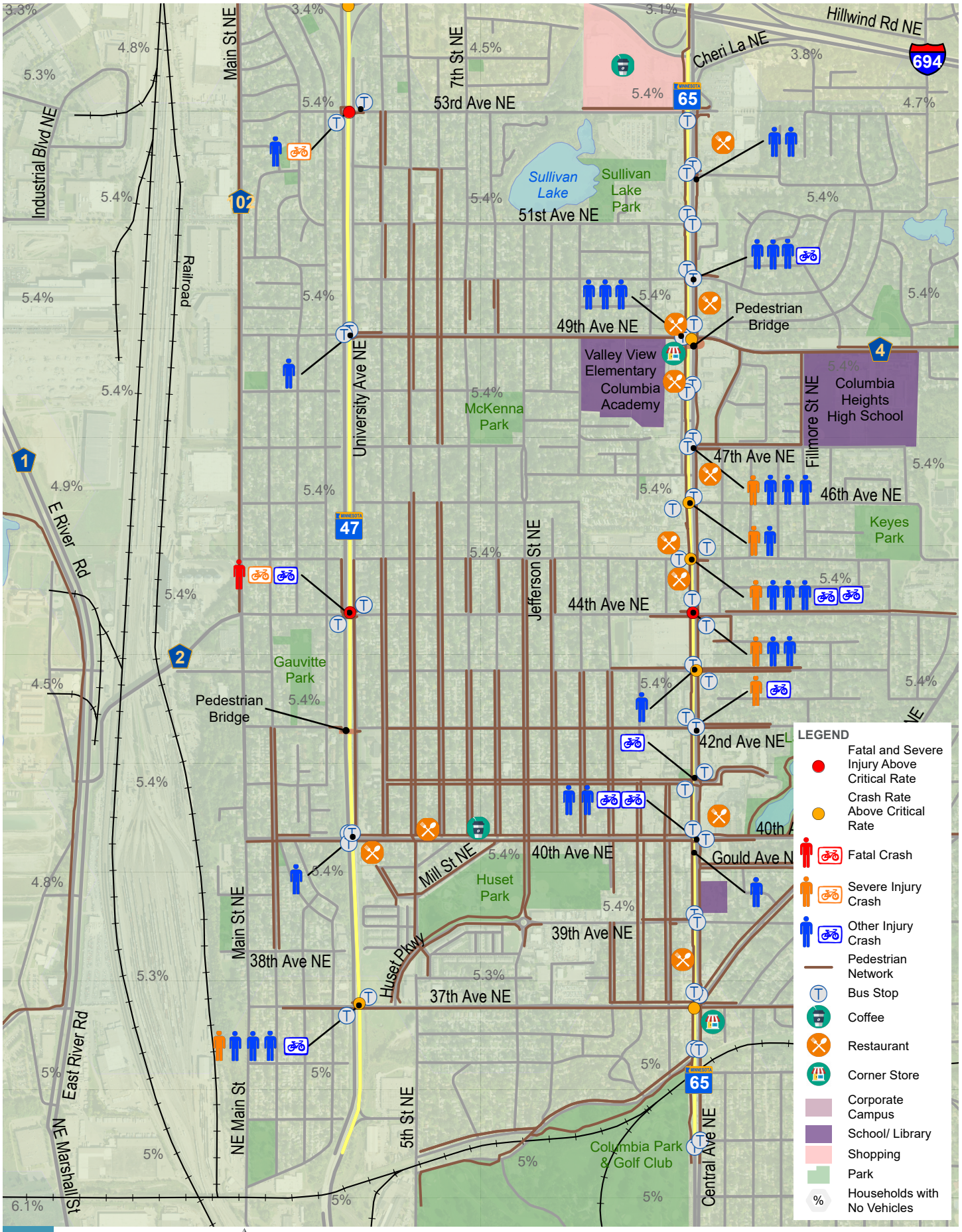

0 Feet 1,500

*Crash Data from MnDOT TIS (1.1.2013 to 3.15.2018)
*Access to 0 Vehicles Data from American Community Survey, Table S0801

TH 47 AND TH 65 ROAD SAFETY AUDIT

CRASH ASSESSMENT

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Appendix F. Annual Average Daily Traffic (AADT) Data

Table F-1: TH 47 AADT Summary (2013-2017)[36]

Start	End	2013	2014	2015	2016	2017	Average	Length (miles)
37th Ave NE	40th Ave NE	14,600	*	*	*	13,700	14,150	0.38
40th Ave NE	44th Ave NE/CSAH 2	18,200	*	*	18,500	20,500	19,070	0.50
44th Ave NE/CSAH 2	49th Ave/CSAH 4	19,400	19,900	*	19,800	21,500	20,150	0.63
49th Ave/CSAH 4	53rd Ave NE	*	*	*	22,400	23,200	22,800	0.50
53rd Ave NE	57th Ave NE	24,700	26,500	28,000	*	29,500	27,180	0.31
57th Ave NE	61ST AVE NE	39,000	41,500	*	37,500	39,500	39,380	0.70
61ST AVE NE	Mississippi Street/CSAH 6	33,500	*	34,000	*	32,500	33,330	0.50
Mississippi Street/CSAH 6	OSBORNE Road/CSAH 8	34,000	*	*	32,500	34,000	33,500	1.45
Osborne Road/CSAH 8	University Ave	31,000	*	31,000	*	31,000	31,000	1.24
University Ave	CSAH 10	22,500	*	*	21,100	22,400	22,000	0.81
CSAH 10	US 10	25,500	24,800	23,500	25,000	25,000	24,760	1.01

Table F-2: TH 65 AADT Summary (2013-2017)

Start	End	2013	2014	2015	2016	2017	Average	Length (miles)
37th Ave NE	40th Ave NE/CSAH 2	17,400	*	*	18,200	19,400	18,330	0.37
40th Ave NE/CSAH 2	44th Ave NE	20,900	*	*	21,600	23,000	21,830	0.50
44th Ave NE	49th Ave NE/CSAH 4	25,500	*	*	25,000	25,500	25,330	0.62
49th Ave NE/CSAH 4	53rd Ave NE	27,000	*	*	27,500	28,500	27,670	0.49
53rd Ave NE	E Moore Lake Drive	39,000	*	*	38,500	37,000	38,170	1.15
E Moore Lake Drive	Mississippi Street/CSAH 6	30,500	*	*	31,500	30,500	30,830	0.37
Mississippi Street/CSAH 6	81st Ave NE	33,000	*	*	30,000	30,500	31,170	2.02
81st Ave NE	Middletown Road NE	37,500	*	*	36,500	37,000	37,000	0.14
Middletown Road NE	85th Ave NE	*	*	*	40,000	41,000	40,500	0.61
85th Ave NE	US 10	40,500	*	*	38,500	35,000	38,000	0.79

[36] *Data Source: MnDOT AADT Twin City Metro Maps.*

No data were available for 2013 so used 2012 data.

** = No data for that year.*

Appendix G. Fridley Pedestrian Counts

Table G-1: TH 47 and 57th Ave NE Pedestrian and Bike Count Data

Latitude: 45 degrees, 04' 17.74" N, longitude: 93 degree, 15' 48.37"W **Location: City of Fridley Minnesota, Intersection of University Ave. and 57th Ave.**													
Date: 9/11/18		**Bicyclists**				**Pedestrians**							
						Unassisted				Assisted (skaters, wheelchairs, etc.)			
Time		Male		Female		Male		Female		Male		Female	
Hour	Minutes	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child
3 p.m.	:00-:15	2	0	0	0	0	1	0	0	0	0	0	0
	:15-:30	1	0	0	0	5	2	3	1	0	1	0	0
	:30-:45	2	0	0	0	5	0	4	1	0	0	0	0
	:45-:00	1	0	0	0	5	0	4	0	0	0	0	0
Hour 1 Subtotal		6	0	0	0	15	3	11	2	0	1	0	0
4 p.m.	:00-:15	1	0	0	0	8	1	4	3	0	0	0	0
	:15-:30	0	0	0	0	3	0	1	0	0	0	0	0
	:30-:45	0	0	0	0	4	0	3	0	0	0	0	0
	:45-:00	3	0	0	0	1	1	1	0	0	0	0	0
Hour 2 Subtotal		4	0	0	0	16	2	9	3	0	0	0	0
5 p.m.	:00-:15	0	0	0	0	4	0	5	0	0	0	0	0
	:15-:30	0	0	0	0	1	2	2	2	0	0	0	0
	:30-:45	1	0	0	0	1	0	0	0	0	0	0	0
	:45-:00	1	0	0	0	2	0	0	0	1	0	0	0
Hour 3 Subtotal		2	0	0	0	8	2	7	2	1	0	0	0
Three Hour Total – All Attributes 3-6 p.m.		12				82							

Comments from 9/11/18:
Highest count day from 9/11/18 through 9/13/18
11 person walked across University on red; 1 bike crossed University on red
5 walked over 57th Ave not at corner

Comments from 9/12/18:
10 bicyclists and 71 pedestrians during the 3 hour count (3-6pm).
6 people cross against light (2 bikers, 4 walkers
University Median is overgrown with weeds, no place for walkers to wait if they can't make it across

Comments from 9/13/18:
11 bicyclists and 42 pedestrians during the 3 hour count (3-6pm).
Primarily commuters from the bus

Table G-2: TH 47 and 61st Ave NE Pedestrian and Bike Count Data

Latitude: 45 degrees 04' 44.18" N, longitude: 93 degrees 15' 48.60" W

Location: City of Fridley Minnesota, Intersection of University Ave. and 61st Ave.

Date: 9/12/18		**Bicyclists**				**Pedestrians**							
						Unassisted				Assisted (skaters, wheelchairs, etc.)			
Time		Male		Female		Male		Female		Male		Female	
Hour	Minutes	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child
3 p.m.	:00-:15	1	4	0	0	1	2	0	0	0	0	0	0
	:15-:30	0	1	0	0	1	11	0	10	0	0	0	0
	:30-:45	0	0	0	0	1	0	1	1	0	1	0	0
	:45-:00	0	2	0	0	0	0	0	0	0	0	0	0
Hour 1 Subtotal		1	7	0	0	3	13	1	11	0	1	0	0
4 p.m.	:00-:15	0	6	0	0	0	0	1	0	0	0	0	0
	:15-:30	1	3	0	0	1	0	1	0	0	0	0	0
	:30-:45	1	0	0	0	1	1	1	0	0	1	0	0
	:45-:00	0	0	0	0	5	1	3	0	0	0	0	0
Hour 2 Subtotal		2	9	0	0	7	2	6	0	0	1	0	0
5 p.m.	:00-:15	0	0	0	0	0	0	2	1	0	0	0	0
	:15-:30	2	5	0	0	3	2	0	1	0	0	0	0
	:30-:45	0	0	0	0	1	3	2	0	0	0	0	0
	:45-:00	0	0	0	0	0	0	0	0	0	0	0	0
Hour 3 Subtotal		2	5	0	0	4	5	4	2	0	0	0	0
Three Hour Total – All Attributes 3-6 p.m.		26				60							

Comments from 9/12/18:
Highest count day from 9/11/18 through 9/13/18
No child wore a helmet
University Median is overgrown with weeds, no place for walkers to wait if they can't make it across

Comments from 9/11/18:
19 bicyclists and 43 pedestrians during the 3 hour count (3-6pm).
Most people getting off public bus do not cross University, they go east along 61st
A majority of people crossing University between 3-430 were middle and high school students
425 to 440, time period never changed for person to cross. Boy on bike water five minute, evidently need to push button to cross
Middle school girl crossed on red

Comments from 9/13/18:
23 bicyclists and 57 pedestrians during the 3 hour count (3-6pm).
No child wore a helmet
Adult male wearing baby crossed 61st 100' east of intersection
Adult wearing headphones wouldn't have been able to hear crossing signals

Table G-3: TH 47 and Mississippi Street NE Pedestrian and Bike Count Data

Latitude: 45 degrees 05' 10.17" N , longitude: 93 degrees 15' 48.76" W **Location: City of Fridley Minnesota, Intersection of University Ave. and Mississippi St.**													
Date: 9/13/18		**Bicyclists**				**Pedestrians**							
						Unassisted				Assisted (skaters, wheelchairs, etc.)			
Time		Male		Female		Male		Female		Male		Female	
Hour	Minutes	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child	Adult	Child
3 p.m.	:00-:15	0	0	0	0	3	0	2	0	0	0	0	0
	:15-:30	1	1	0	0	4	1	0	0	0	0	0	0
	:30-:45	2	0	1	0	0	0	2	0	0	0	0	0
	:45-:00	0	1	0	0	1	1	1	0	0	0	0	0
Hour 1 Subtotal		3	2	1	0	8	2	5	0	0	0	0	0
4 p.m.	:00-:15	1	0	0	0	1	0	2	0	0	0	0	0
	:15-:30	0	0	0	0	1	0	1	0	0	0	0	0
	:30-:45	1	0	0	0	1	0	1	0	0	0	0	0
	:45-:00	1	0	0	0	5	0	6	0	0	0	0	0
Hour 2 Subtotal		3	0	0	0	8	0	10	0	0	0	0	0
5 p.m.	:00-:15	0	0	0	0	5	0	4	0	0	0	0	0
	:15-:30	0	0	0	0	3	0	2	0	0	0	0	0
	:30-:45	0	0	0	0	3	0	3	0	0	0	0	0
	:45-:00	0	0	0	0	1	0	3	0	0	0	1	1
Hour 3 Subtotal		0	0	0	0	12	0	12	0	0	0	1	1
Three Hour Total – All Attributes 3-6 p.m.		9				59							

Comments from 9/13/18:
Highest count day from 9/11/18 through 9/13/18
Car pulled ahed in white cross walk while pedestrian was crssoing
6 bikes did not wait for light
Guy Standing up on motion bike zipped down Mississippi on road

Comments from 9/11/18:
11 bicyclists and 25 pedestrians during the 3 hour count (3-6pm).
Many people cut through the Holly Center Parking lot
Most southbound cars stopped in the crosswalk at redlight
6 people jaywalked and stopped in the median
A lot of traffic to the Walgreens

Comments from 9/12/18:
6 bicyclists and 30 pedestrians during the two hour count (3-5pm).
Volunteer left at 5