# SAFE ROUTES TO SCHOOL

## ST. PAUL ENGINEERING STUDY

April, 2021

SRF

DEPARTMENT OF TRANSPORTATION

MINNESOTA SAFE ROUTES TO SCHOOL

# ACKNOWLEDGEMENTS

The Study was made possible by funding from the Minnesota Department of Transportation (MnDOT). Special thanks to the individuals below who provided their expertise, time, and feedback for this Study to ensure it encompassed the needs of the children and broader community who will benefit when walking, rolling, or bicycling from these improvements.

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# TABLE OF CONTENTS


**Executive Summary ..... 1**

Existing Conditions ..... 1

Identified Needs ..... 3

Alternative Evaluation ..... 3

Potential Projects ..... 4

Next Steps ..... 4

**Engineering Study Framework ..... 6**

**Chapter 1: Introduction ..... 7**

Study Background ..... 7

What is Safe Routes to School? ..... 7

**Chapter 2: Existing Conditions Analysis ..... 9**

Study Location and Focus Schools ..... 9

Previous Plans and Other Studies ..... 20

Community Engagement ..... 22

Transportation Network ..... 26

Parking ..... 35

Access ..... 39

Safety Analysis ..... 41

**Chapter 3: Issue Identification And Needs Summary ..... 50**

Identified Transportation Issues ..... 50

Summary of Needs ..... 50

**Chapter 4: Alternative Evaluation ..... 52**

Roadway Configuration and Design ..... 53

Crossing Improvements ..... 63

Pedestrian-Realm Upgrades ..... 75

**Chapter 5: Potential Projects ..... 78**

Priority Crossings ..... 78

Quick Build Crossing Infrastructure ..... 80
Other Considerations ..... 81
**Chapter 6: Next Steps ..... 85**
Agency Coordination ..... 85
Identify Priorities ..... 85
Focused Timeline and Actionable Steps ..... 86
Celebrate Wins ..... 86

# LIST OF TABLES

Table 1. Focus Schools Overview ..... 12
Table 2. Arcade Street Alternative Evaluation Matrix ..... 54
Table 3. Hybrid Alternative Traffic Operations Comparison ..... 59
Table 4. Corridor Operations Comparison ..... 62
Table 5. Arcade Street Crossing Ranking by Criteria ..... 65
Table 6. Arcade Street Crossing Prioritization (all intersections) ..... 66
Table 7. Arcade Street Crossing Prioritization (uncontrolled crossings only) ..... 67
Table 8. Crossing Infrastructure Options at Signalized Intersections ..... 68
Table 9. Crossing Infrastructure Options at Uncontrolled Crossings ..... 71

# LIST OF FIGURES

Figure 1. Prioritized Safe Routes to School Crossings ..... 5
Figure 2. Project Area and Focus Schools ..... 10
Figure 3. Residential Density ..... 11
Figure 4. Student Population – All Schools ..... 14
Figure 5. Student Population – John A. Johnson Achievement Plus Elementary ..... 15
Figure 6. Student Population – Farnsworth Aerospace Lower Campus ..... 16
Figure 7. Student Population – Phalen Lake Hmong Studies Magnet ..... 17
Figure 8. Student Population – Farnsworth Aerospace Upper Campus ..... 18
Figure 9. Student Population – Johnson Senior High School ..... 19
Figure 10. Online Survey Results ..... 22
Figure 11. Existing Transportation Network ..... 27
Figure 12. StreetLight Pedestrian Activity Estimate ..... 28

Figure 13. StreetLight Bicycle Activity Estimate ..... 28
Figure 14. Existing Turning Movement Counts ..... 32
Figure 15. Existing Traffic Operations ..... 34
Figure 16. Existing Parking Regulations ..... 36
Figure 17. Maximum Parking Demand ..... 37
Figure 18. Existing Maximum Parking Utilization ..... 38
Figure 19. Number of Access Points per Block (total of both sides) ..... 39
Figure 20. Existing Access Points ..... 40
Figure 21. Pedestrian and Bicyclist Crashes by Intersection (2010-2019) ..... 42
Figure 22. Pedestrian and Bicyclist Crashes by Severity (2010-2019) ..... 42
Figure 23. All Intersection Crashes by Severity (2015-2019) ..... 44
Figure 24. Pedestrian and Bicycle Crashes by Severity (2010-2019) ..... 45
Figure 25. Pedestrian and Bicycle Crash Density (2010-2019) ..... 46
Figure 26. All Crashes by Severity (2015-2019) ..... 47
Figure 27. All Crashes Density (2015-2019) ..... 48
Figure 28. All Crashes by Manner of Collision (2015-2019) – Highlands Elementary ..... 49
Figure 29. Identified Issues ..... 51
Figure 30. Arcade Street Peak Hour Volume Profile ..... 56
Figure 31. Arcade Street 12-Hour Volume Profile (northbound and southbound) ..... 58
Figure 32. Traffic Condition Comparison: Existing and Hybrid Alternative ..... 61
Figure 33. Arcade Street PHB Warrant Analysis for Lower Speed Roadways (<35 mph) ..... 72
Figure 34. Arcade Street FHWA STEP Guidance Analysis ..... 73
Figure 35. Example of Sidewalk Pedestrian Clear Zones ..... 76
Figure 36. Saint Paul Street Design Manual ..... 76
Figure 37. Prioritized Safe Routes to School Crossings ..... 79
Figure 38. Stopping and Sight Distance ..... 81
Figure 39. Likelihood of Injury or Death by Traffic Speed ..... 82
Figure 40. Lighting Design Guidance for Pedestrians and Bicyclists ..... 83

# APPENDICES

Appendix A – Community Feedback Data
Appendix B – Crossing Prioritization Tool
Appendix C – Parking Utilization Data

# EXECUTIVE SUMMARY

The Saint Paul Safe Routes to School Engineering Study focused on Arcade Street (US 61) from Neid Lane to Wheelock Parkway which connects five adjacent or nearby schools along the 1.2-mile north-south corridor. The Study's objective was to complete a technical analysis of a potential four- to three-lane conversion and other multimodal improvements along, and across, the corridor as a part of a broader roadway rehabilitation project planned in 2024 and for consideration in the long-term. The desired multimodal elements include enhanced crossings at major intersections and uncontrolled locations, as well as better connectivity along Arcade Street (US 61). As a part of Safe Routes to School (SRTS), proposed infrastructure specifically focused upon improving the safety, comfort, and convenience for children walking, rolling, or bicycling to the schools. SRTS is a national program intended to improve safety for children to access school and encourage a more active lifestyle through physical activity.

The Saint Paul Safe Routes to School Engineering Study was led by the City of Saint Paul in partnership with Saint Paul Public Schools. The Study illustrates strategies and potential improvements reviewed in coordination with numerous area stakeholders, including City, County, School District, Metro Transit, and MnDOT staff. The Study organizes needs and justifies improvements by the City of Saint Paul to implement the potential projects identified in this Study, as well as for MnDOT's consideration as part of a concurrent project underway to design and implement improvements to the corridor in 2024.

## EXISTING CONDITIONS

### Project Location and Focus Schools

The Arcade Street (US 61) corridor is in the east side of Saint Paul and is a regional transportation corridor primarily surrounded by residential neighborhoods while serving as the main commercial corridor for the area. The study area includes five public schools, parks, and other destinations children may want to access such as the Phalen Recreation Center, Arlington Hills Community Center, Lockwood Park, and the Saint Paul Eastside YMCA. There are 518 students total among the five schools that live within one-half mile of the study corridor, accounting for over 15 percent of the total enrollment.

### Previous Plans and Other Studies

Other applicable studies were reviewed as a part of the planning process including:

- *Safe Routes to School – Farnsworth Aerospace Upper Campus (2017)*
- *Saint Paul Safe Routes to School Policy Plan (2017)*
- *Saint Paul For All – 2040 Comprehensive Plan (2019)*

- *Saint Paul Pedestrian Plan (2019)*
- *Saint Paul Street Design Manual (2016)*
- *Saint Paul Bicycle Plan (2015)*

The planning documents identified supportive planning elements and synergies with this study.

## Community Feedback

Online community engagement was facilitated as a part of this Study and was specifically tailored to student and parents of the five schools. The engagement occurred from September 22, 2020 through October 26, 2020 via an engagement website, online survey, and interactive mapping exercise. Approximately 125 survey responses were collected, as well as 38 open-ended comments, and 28 comments related to the interactive map. The survey included five questions to understand how the community uses and feels about Arcade Street (US 61). The top three issue areas identified by the community via the interactive map include the intersections of Cottage Avenue, Ivy Avenue, and Maryland Avenue.

## Transportation Network

The transportation network was reviewed along Arcade Street (US 61) to identify existing infrastructure for walking, rolling, bicycling, transit, and driving on, and adjacent to, the corridor. Arcade Street (US 61) varies in lane configurations with six distinct cross-sections; however, the corridor is primarily either a two-lane with no turn lanes and on-street parking, or a four-lane, undivided roadway with on-street parking in the outside lanes during select times. Sidewalk is present along both sides of the corridor and marked crossings exist at the six signalized intersections, as well as two uncontrolled locations with no additional enhancements.

Ten years of vehicle-to-bicycle and vehicle-to-pedestrian crashes were reviewed to identify potential areas of need. Due to the multimodal focus of this Study, an additional five years of data was reviewed to provide a larger sample size of data from which to analyze trends and identify “hot spots”. All crashes were also reviewed, including the manner of collision which details the way in which the crash occurred (e.g., rear end), over the last five years. The data was derived from MnDOT’s Minnesota Crash Mapping Analysis Tool (MnCMAT 2) and includes recorded crashes by law enforcement that provide crash details and approximate location. A total of 308 crashes were reported along Arcade Street (US 61) over the last five years (see Figure 26 and Figure 27). This equates to a crash frequency of 62 crashes per year and a crash density of 257 crashes per mile for the 1.2-mile corridor. A total of 43 crashes involving a pedestrian (35) or bicyclist (8) were recorded, of which a significant number along Arcade Street (US 61) involved children ranging in age from 12- to 18-years-old. A total of 16 crashes (40 percent of all recorded pedestrian or bicyclist crashes) involved a child, of which 11 occurred during the school day either in the afternoon or early evening.

Detailed analysis of multimodal elements, traffic volumes and operations, on-street parking regulations and utilization, access, and safety is covered for each school in Chapter 2.

# IDENTIFIED NEEDS

Broadly identified needs were recorded from the existing conditions analysis which detected potential issues. These include roadway design, crossing enhancements, and sidewalk infrastructure both along, and across, Arcade Street (US 61).

| | |
|---|---|
| **Roadway Design** | Reconstruct the roadway to improve the configuration of Arcade Street and create a corridor that is safe and accessible for users of all ages and abilities. |
| **Crossing Enhancements** | Enhance crossing infrastructure at high-volume, signalized intersections to improve connections across Arcade Street at these key locations while ensuring they are not barriers for children.<br>Implement crossing infrastructure at key uncontrolled locations along the 1.2-mile Arcade Street corridor to create a convenient and connected multimodal transportation network. |
| **Connectivity to Walk** | Reconstruct sidewalk infrastructure along Arcade Street to enhance the comfort, accessibility, and environment of walking or rolling along the corridor, as well as access to destinations (i.e., schools, parks, businesses, etc.). |

# ALTERNATIVE EVALUATION

Project alternatives are based upon evaluated opportunities proposed to improve or eliminate identified needs. Chapter 4 organizes potential improvements and project opportunities to address the high-level needs identified by the Study using the latest state and national guidance. Potential projects were vetted using engineering judgment and reviewed in coordination with numerous area stakeholders, including City, County, School District, Metro Transit, and MnDOT staff.

## Roadway Configuration and Design

Four alternatives were studied for Arcade Street (US 61) using an evaluation matrix to identify tradeoffs for future consideration regarding four alternatives from York Avenue to Wheelock Parkway:

- **No Build:** Maintain existing conditions.
- **Alternative 1:** Two-lane roadway (one travel lane in each direction) with no turn lanes at any intersection except Maryland Avenue; left-turn lanes are added along Arcade Street at Maryland Avenue.
- **Alternative 2:** Two-lane roadway (one travel lane in each direction) with left-turn lanes at all intersections.
- **Alternative 3:** Three-lane roadway with one travel lane in each direction and continuous two-way, left-turn lane and left-turn lanes at all intersections.

A hybrid alternative identified by the project team was evaluated further with respect to traffic volumes, operations, queueing, parking, and access. The hybrid configuration includes a two-lane roadway with turn lanes from York Avenue to Geranium Avenue, and then a three-lane roadway to Wheelock Parkway.

### Major, Uncontrolled, and Side-Street Crossings

Potential crossing improvements were studied along Arcade Street (US 61) at all 20 intersection in the study area including signalized intersections and uncontrolled locations. Infrastructure improvements could enhance each crossing and support a safer and more comfortable environment for children to cross. The crossings were prioritized quantitatively using a decision matrix to identify potential short-term and long-term upgrades. Those prioritized crossings are discussed further in Chapter 4 and Chapter 5.

### Sidewalk and Pedestrian-realm Upgrades

Upgrades to the sidewalk system and pedestrian-realm along Arcade Street (US 61) were identified as a priority by the community from the online survey. A brief overview of potential considerations for the concurrent rehabilitation project are highlighted including widening, street trees, and ADA-improvements.

## POTENTIAL PROJECTS

The potential crossings considered along Arcade Street (US 61) are organized by prioritized groups for short-, mid- and long-term consideration (see Figure 1).

## NEXT STEPS

This Study offers a range of potential infrastructure improvements along Arcade Street (US 61) from Neid Lane to Wheelock Parkway. Actionable next steps were organized to ensure this document is fully utilized and implemented to the best of the City of Saint Paul's ability in coordination with MnDOT. Key next steps include:

- Agency Coordination: Identify a champion and regularly coordinate within a small team that includes various agency and school district representatives as well as other key area stakeholders.
- Identify Priorities: Prioritize projects using the Study and small group discussion.
- Focused Timeline and Action Plan: Create a timeline and action plan that identifies planned improvements, responsible parties, the estimated cost, and associated schedule. The action plan will focus on implementation, identify synergies with other planned projects, and allow agencies to be prepared for funding opportunities.
- Celebrate wins!

Northern Segment

Southern Segment

61

Wheelock Parkway East

Arcade Street

Weide Street

Sherwood Avenue

Cottage Avenue East

Clear Avenue

Johnson Senior High School

Ivy Avenue East

Farnsworth Aerospace
Lower Campus

Hyacinth Avenue East

Orange Avenue East

Hawthorne Avenue East

Maryland Avenue East

Rose Avenue East

0 250 500 ft

Geranium Avenue East

Jessamine Avenue East

Phalen Lake Magnet School
900 ft.

Magnolia Avenue East

Cook Avenue East

Lawson Avenue East

Farnsworth Aerospace
Upper Campus

Jenks Avenue

Case Avenue

Sims Avenue

York Avenue

John A. Johnson
Achievement Plus
Elementary

Wells Street

Neid Lane

61

## Prioritized Safe Routes to School Crossing Improvements

St. Paul, MN

Figure 1

- Focus School
- Existing Sidewalk
- Existing Shared Lane (Sharrow)
- Existing Trail
- Existing Bikeable/Wide Shoulder

(#) Improvement ID

**Priority 1:** High-priority crossings for implementation as a part of the upcoming rehabilitation project or in the near-term.
**Priority 2:** Medium-priority crossings for implementation when warranted by the City/MnDOT.
**Priority 3:** Low-priority crossings for tracking purposes and potential implementation in the long-term if desired.

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# ENGINEERING STUDY FRAMEWORK

This engineering study is organized into six chapters outlined herein:

**Chapter 1: Introduction**

Study introduction and Safe Routes to School program background.

**Chapter 2: Existing Conditions Analysis**

Outlines the quantitative and qualitative approach undertaken for the Study and foundational elements to support the planning process.

**Chapter 3: Issue Identification and Needs Summary**

Identifies issues and summarizes needs from the existing conditions analysis. Issues could include an unsafe crossing or sidewalk gap for example.


**Chapter 4: Alternative Evaluation**

Analyzes potential infrastructure opportunities and evaluates opportunities to address known issue areas.

**Chapter 5: Potential Projects**

Summarizes the prioritized crossings and other considerations for when those improvements are potentially implemented.

**Chapter 6: Next Steps**

Actionable next steps to organize project champions and implement the Study's potential improvements.

# CHAPTER 1: INTRODUCTION

## STUDY BACKGROUND

The Saint Paul Safe Routes to School Engineering Study (herein known as "the Study") sought to improve access to schools near Arcade Street (US 61) for children to walk, roll, or bike safely, comfortably, and conveniently along or across the roadway. The Study focused on a 1.2-mile section of Arcade Street (US 61) from Neid Lane to Wheelock Parkway which connects five adjacent or nearby schools along the north-south corridor. The Study's objective was to complete a technical analysis of a potential lane configuration changes to the roadway, and multimodal improvements along, and across, the corridor as both a part of a broader roadway rehabilitation project planned in 2024 and for consideration in the long-term. The desired multimodal elements include enhanced crossings and better connectivity along Arcade Street (US 61).

The Study was led by the City of Saint Paul in partnership with Saint Paul Public Schools. The Study illustrates strategies and improvements reviewed in coordination with numerous area stakeholders, including City, County, School District, Metro Transit, and MnDOT staff. The Study organizes needs and justifies improvements by the City of Saint Paul to implement the potential projects identified in this Study, as well as for MnDOT's consideration as part of the upcoming project.

## WHAT IS SAFE ROUTES TO SCHOOL?

Safe Routes to School (SRTS) is a program that receives federal and state funding in Minnesota with the objective of increasing safety for children to walk, roll, or bike to school and in daily life to encourage more active lifestyles through physical activity. The program began in 2005 with federal funding and has continued to receive support from all levels of government. The Minnesota Department of Transportation (MnDOT) administers the SRTS program in Minnesota which includes technical and programmatic support as well as competitive grant funds for SRTS studies, programs, education, and infrastructure. The statewide program is guided by a five-year strategic plan that was completed in September 2020 with a vision for youth in Minnesota to safely, confidently, and conveniently walk, bike, and roll to school and in daily life.[1]

The *Minnesota Safe Routes to School Strategic Plan* was updated in the fall of 2020. It updates the 2015 Strategic Plan and establishes a five-year action plan for MnDOT, the Minnesota Department of Health, the Minnesota Department of Education, and other participating agencies and partners. There are six overarching goals that guide the Strategic Plan as well as a three-phase strategic planning process. Visit the Safe Routes to School webpage hosted by MnDOT for more information or to view the Strategic Plan.

[1] MnDOT. (n.d.). *About Safe Routes to School*. http://www.dot.state.mn.us/saferoutes/about.html

SRTS focuses on a multidisciplinary approach guided by the "6 E's":

- **Evaluation:** Understand the issues that need to be addressed and the projects and/or programs of each of the following 5 E's that could be most effective.
- **Education:** Classes and activities that teach children (and their parents or guardians) pedestrian, bicycle, and traffic safety skills, the benefits of walking, rolling, or bicycling to school, the best route to get to school, and the positive impacts on personal health and the environment.
- **Encouragement:** Events and activities that create interest in both students and parents to walk, roll, or bike to school.
- **Equity:** Ensure that SRTS initiatives benefit all, with specific attention toward addressing barriers and inclusivity for lower-income students, students of color, and others that face ongoing disparities.
- **Enforcement:** Strategies to deter unsafe behavior of drivers and other modes to encourage all road users to obey traffic laws and share the transportation network safely around schools.
- **Engineering:** Infrastructure improvements designed to enhance the safety of children (and more broadly benefit parents, guardians, and/or community members) walking, rolling, bicycling, and driving along school routes.

The Study focuses on the "engineering" component to enhance the built environment for children walking, rolling, or bicycling near schools along Arcade Street (US 61) in Saint Paul. It was funded and supported by MnDOT to complete planning and conceptual design for local agencies and school districts across Minnesota.

## SAFE ROUTES TO SCHOOL CAN:

**Reduce the risk of PEDESTRIAN INJURY BY 44 PERCENT**

Help build desirable communities by making it **EASIER AND SAFER FOR FAMILIES** and neighbors to walk and bike to school together.

**BRING MORE RESOURCES** to Greater Minnesota communities.

In 2015, **THREE OUT OF FOUR** Safe Routes to School state-funded **INFRASTRUCTURE GRANTS** were awarded to communities in Greater Minnesota.

**GET KIDS MORE ACTIVE**

Students who start walking or biking to school benefit from **47 MORE MINUTES OF PHYSICAL ACTIVITY PER WEEK.**

**Help reduce vehicle congestion & IMPROVE AIR QUALITY around schools.**

**Traffic-related air pollution INCREASES** a child's risk of developing **ASTHMA.**

*Source: Minnesota Department of Health*

# CHAPTER 2: EXISTING CONDITIONS ANALYSIS

Existing conditions data provides a foundation in which to identify issue areas, organize opportunities that attempt to resolve those issues, and summarize potential improvements. The following section outlines school-specific data and previous planning efforts, results from community outreach conducted for this Study, as well as data analyzed for the existing transportation system, operations, and safety along Arcade Street (US 61).

## STUDY LOCATION AND FOCUS SCHOOLS

### Location

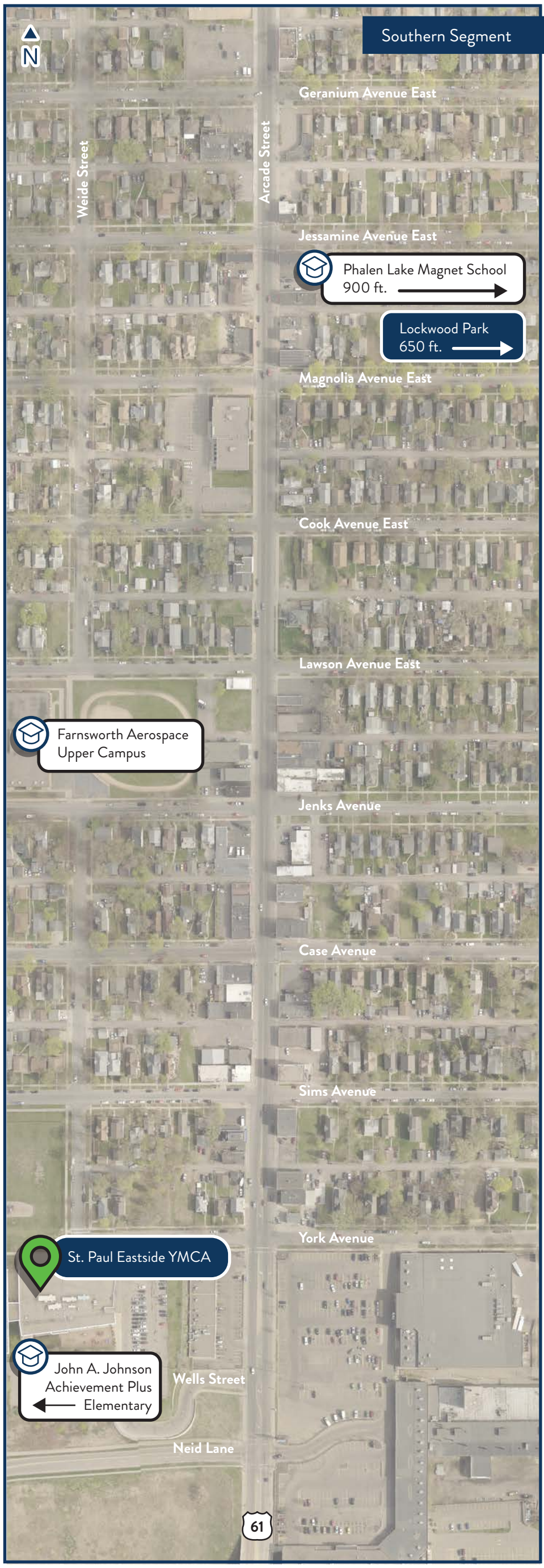
The City of Saint Paul is in Ramsey County and has an estimated population of approximately 305,000 as of 2019. The Arcade Street (US 61) study area is in the east side of the City and is primarily surrounded by residential neighborhoods while serving as the main commercial corridor for the area. The study area includes five public schools, parks, and other destinations children may want to access such as the Phalen Recreation Center, Arlington Hills Community Center, Lockwood Park, and Saint Paul Eastside YMCA (see Figure 2).

Most of the built environment along the study corridor includes low- to medium-density commercial and retail buildings with medium-density housing immediately adjacent (see Figure 3). An analysis of residential property density illustrated that most blocks near the corridor are consistently medium density with pockets of higher density two or more blocks away. Density can be the precursor for a higher propensity to walk or bike, as well as provide insight into where children may be living. This data is further organized using student enrollment data later in this chapter.


*Arcade Street looking north at Case Avenue. Source: SRF Consulting Group, 2020*

Northern Segment

Southern Segment


**Project Area and Focus Schools**

St. Paul, MN

Figure 2

Focus School

Destination

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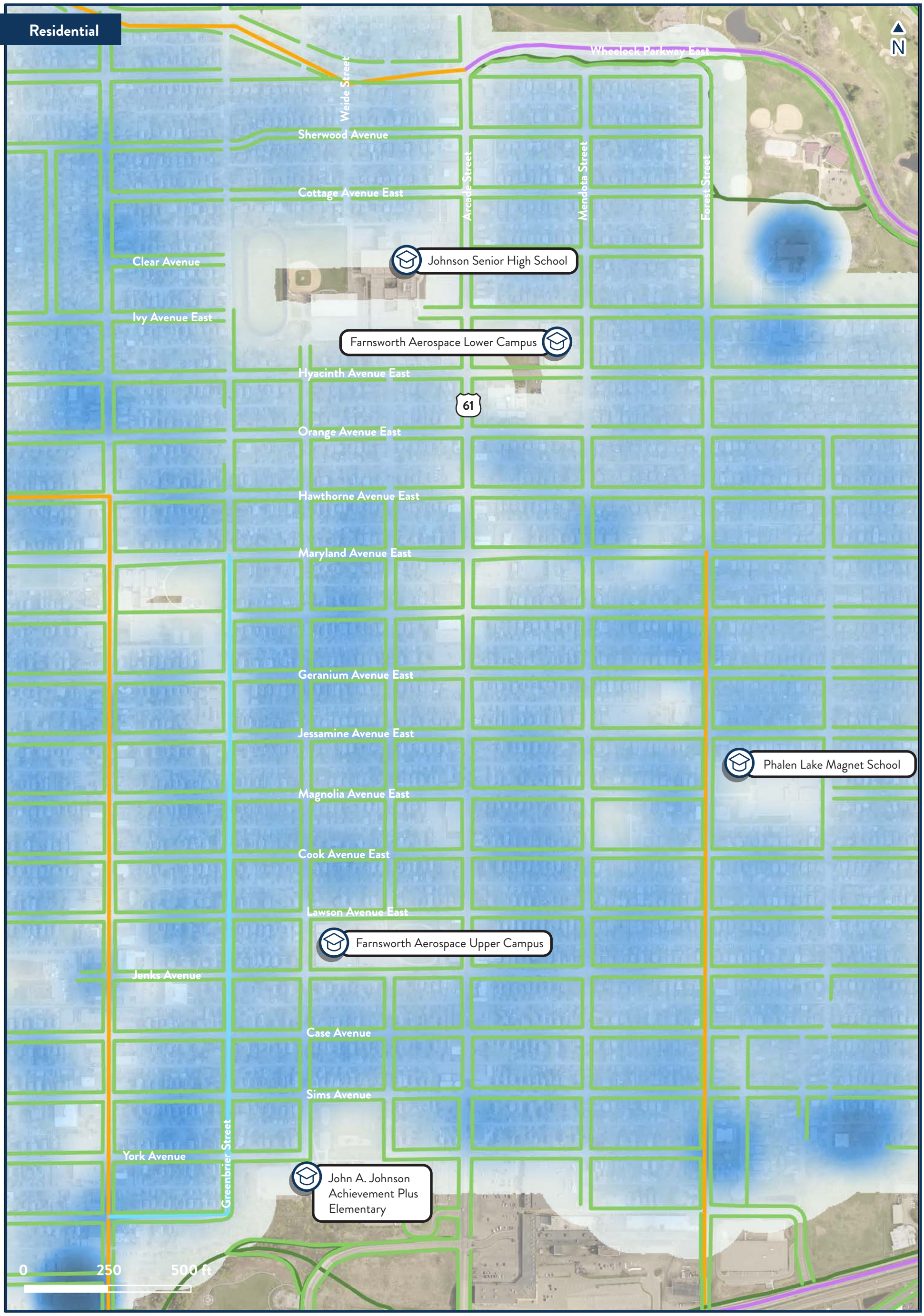
# Residential




**Residential Density**

St. Paul, MN

Figure 3

Focus School

Higher Residential Density

Lower Residential Density

Existing Sidewalk

Existing Bike Boulevard

Existing Shared Lane (Sharrow)

Existing Trail

Existing Bikeable/Wide Shoulder

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## Focus Schools

The Saint Paul Public Schools (District No. 625) serves the City of Saint Paul. As of 2020, the District had approximately 36,000 students which makes it the second largest in Minnesota. Approximately 3,328 students, or nearly ten percent of the district total, attend one of the five focus schools (see Table 1).

**Table 1. Focus Schools Overview**

| Focus School | Grades | Location | Student Population | School Day | Arrival and Dismissal Times |
|---|---|---|---|---|---|
| John A. Johnson Achievement Plus Elementary | EC to 5th | Immediately west of Arcade Street and south of York Avenue. | 299 | 7:30 a.m. to 2:00 p.m. | 7:05 to 7:30 a.m.<br>2:00 to 2:20 p.m. |
| Farnsworth Aerospace Lower Campus | EC to 4th | Adjacent east of Arcade Street, between Ivy and Hyacinth Avenues. | 508 | 9:30 a.m. to 4:00 p.m. | 9:05 to 9:30 a.m.<br>4:00 to 4:20 p.m. |
| Farnsworth Aerospace Upper Campus | 5th to 8th | Immediately west of Arcade Street, between Lawson and Jenks Avenues. | 599 | 9:30 a.m. to 4:00 p.m. | 9:05 to 9:30 a.m.<br>4:00 to 4:20 p.m. |
| Phalen Lake Hmong Studies Magnet | EC to 5th | Approximately 0.25 miles east of Arcade Street and Magnolia Avenue. | 679 | 7:30 a.m. to 2:00 p.m. | 7:05 to 7:30 a.m.<br>2:00 to 2:20 p.m. |
| Johnson Senior High School | 9th to 12th | Adjacent west of Arcade Street, at Ivy Avenue. | 1,243 | 8:30 a.m. to 3:00 p.m. | 8:00 to 8:30 a.m.<br>3:00 to 3:30 p.m. |

*Source: Saint Paul Public Schools, 2020*

Student household location data identifies the potential SRTS benefit from enhanced multimodal infrastructure to/from the schools and is helpful toward understanding routes that students could use to access their respective school. Potential improvements for those key areas such as a busy intersection are important to ensure a location is not a barrier for children to access their school safely, comfortably, and conveniently. The location of where students live who are enrolled at one of the focus schools was analyzed using data shared by the school district for the purposes of the Study.

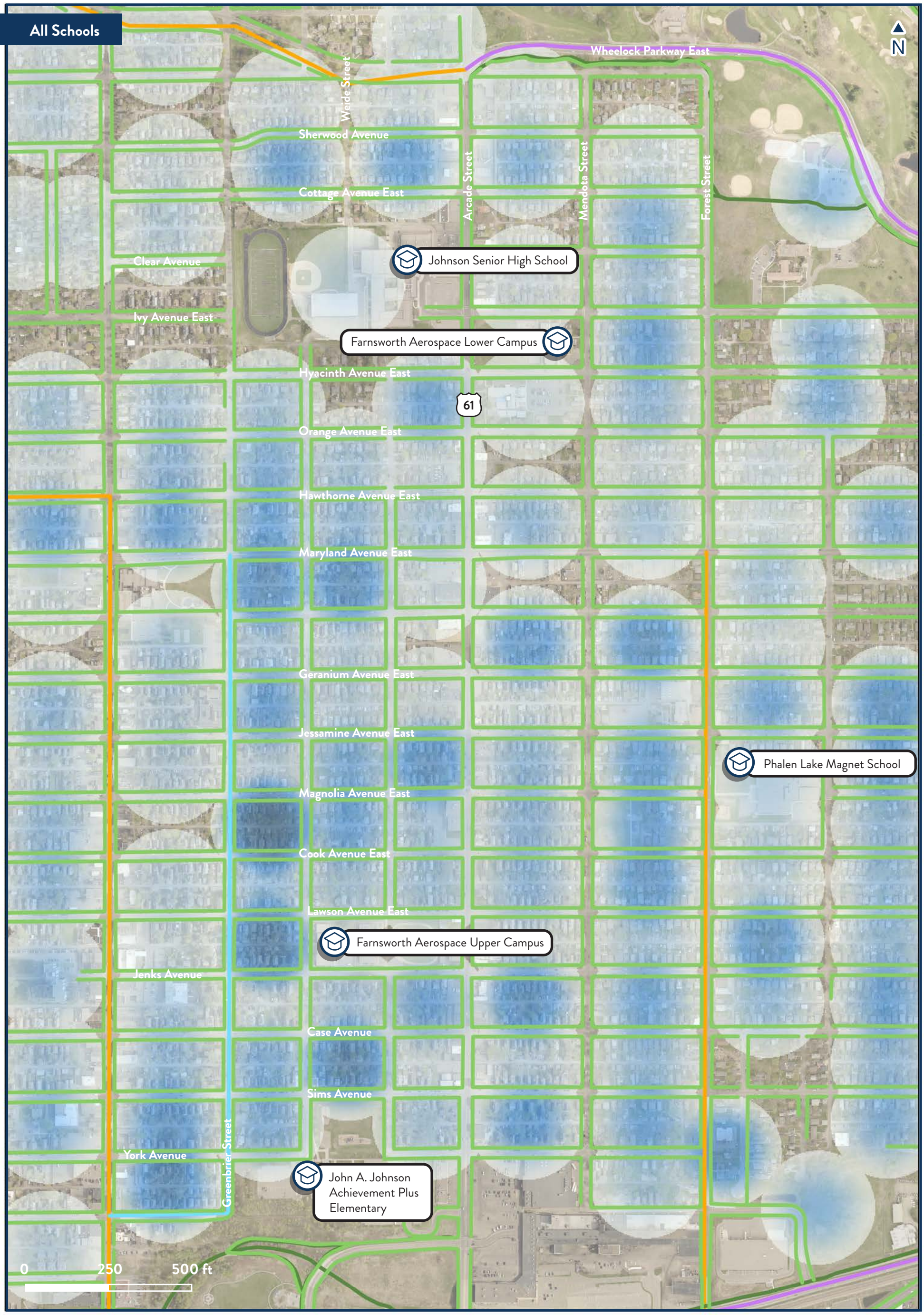
There are 518 students total among the five schools that live within one-half mile of the study corridor, accounting for over 15 percent of enrollment (see Figure 4). The school district uses both community and magnet schools as options to provide children and their parents the opportunity to prioritize the schools they wish to attend. This model can limit a child's ability to access their school by walking, rolling, or bicycling as they could live outside of a reasonable distance to do so because of citywide school attendance opportunities. The school district provides a methodology for their choice program, of which priority is given to students who live within a "community school zone" to promote attendance of schools within a child's neighborhood.

The following information from 2020 provides student locational data findings per focus school:

- **John A. Johnson Achievement Plus Elementary:** Approximately 28 percent of students (i.e., 84 students) live within one-half mile of the school and north of Phalen Boulevard which was considered a barrier for elementary children to access the school from neighborhoods to the south. Of them, 66 students live within one-half mile of Arcade Street (US 61), mainly west of the corridor. A total of seven students live within one-half mile of the school east of Arcade Street (US 61), primarily between York Avenue and Cook Avenue (see Figure 5).
- **Farnsworth Aerospace Lower Campus:** Nearly seven percent of students (i.e., 34 students) live within both one-half mile of the school and Arcade Street (US 61), mainly east of the corridor. A total of 14 students live within one-half mile of the school west of Arcade Street (US 61), primarily between Maryland Avenue and Sherwood Avenue (see Figure 6).
- **Farnsworth Aerospace Upper Campus:** About eight percent of students (i.e., 48 students) live within both one-half mile of the school and Arcade Street (US 61), mainly west of the corridor. A total of 15 students live within one-half mile of the school east of Arcade Street (US 61), primarily between York Avenue and Lawson Avenue (see Figure 7).
- **Phalen Lake Hmong Studies Magnet:** Over 12 percent of students (i.e., 83 students) live within one-half mile of the school. Of them, 48 students live within one-half mile of Arcade Street (US 61), mainly east of the corridor. A total of seven students live within one-half mile of the school west of Arcade Street (US 61), primarily between Jenks Avenue and Magnolia Avenue (see Figure 8).
- **Johnson Senior High School:** Nearly 30 percent of students (i.e., 364 students) live within one mile of the school. The one-mile threshold was used as high school students can walk, roll, or bike a longer distance than younger children and it is the threshold used by Saint Paul Public Schools. Of them, 217 students live within one-half mile of the Arcade Street (US 61) study area and are distributed almost equally between east and west sides. A total of 124 students live east of Arcade Street (US 61), primarily between York Avenue and Rose Avenue (see Figure 9).


*Johnson Senior High School. Source: Saint Paul Public Schools*

All Schools




**Student Population, All Schools**

St. Paul, MN

Figure 4

Focus School

Higher Density Student Population

Lower Density Student Population

Existing Sidewalk

Existing Bike Boulevard

Existing Shared Lane (Sharrow)

Existing Trail

Existing Bikeable/Wide Shoulder

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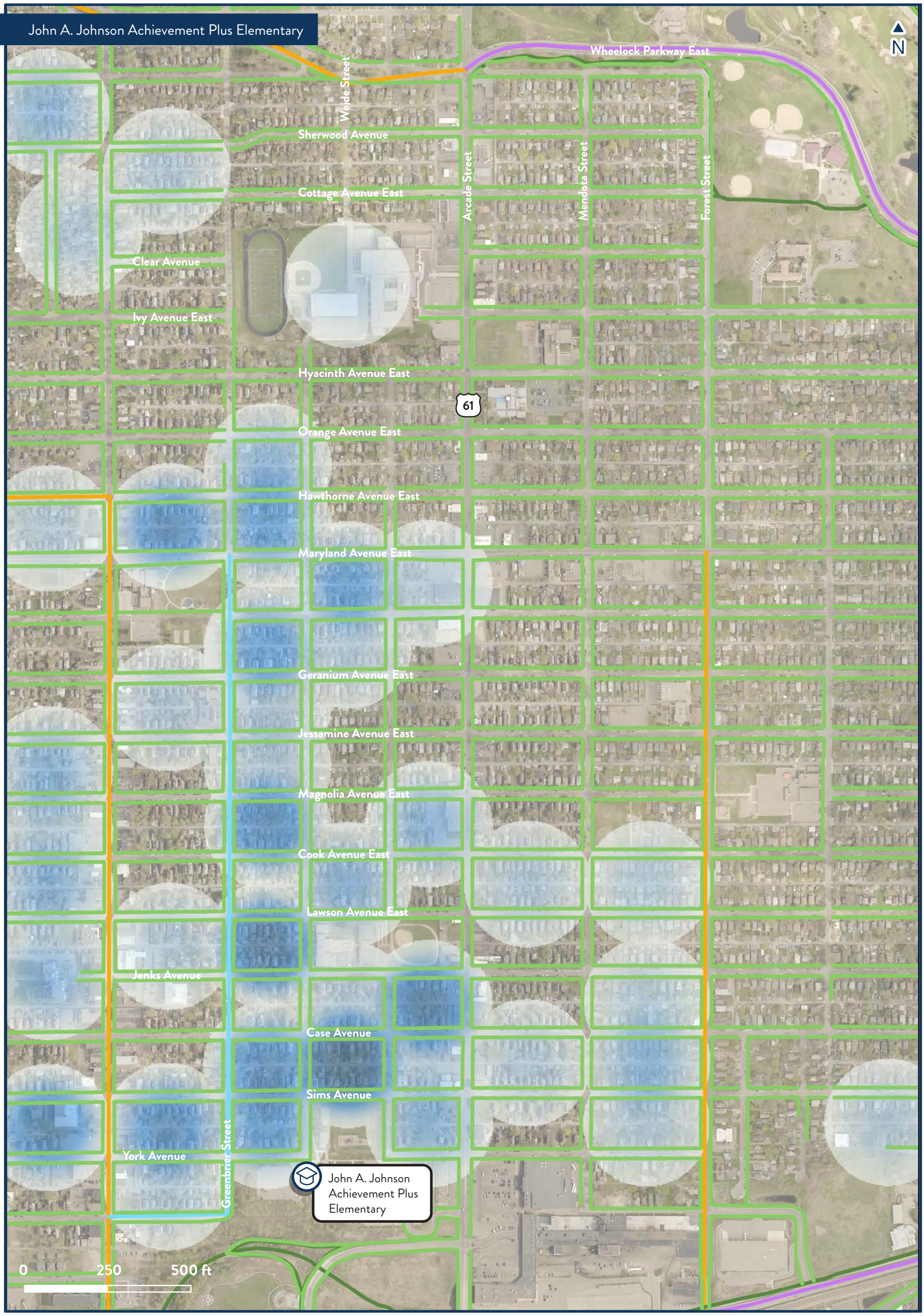
John A. Johnson Achievement Plus Elementary




**Student Population, John A. Johnson Achievement Plus Elementary**
St. Paul, MN

Figure 5

Focus School

Higher Density Student Population

Lower Density Student Population

Existing Sidewalk

Existing Bike Boulevard

Existing Shared Lane (Sharrow)

Existing Trail

Existing Bikeable/Wide Shoulder

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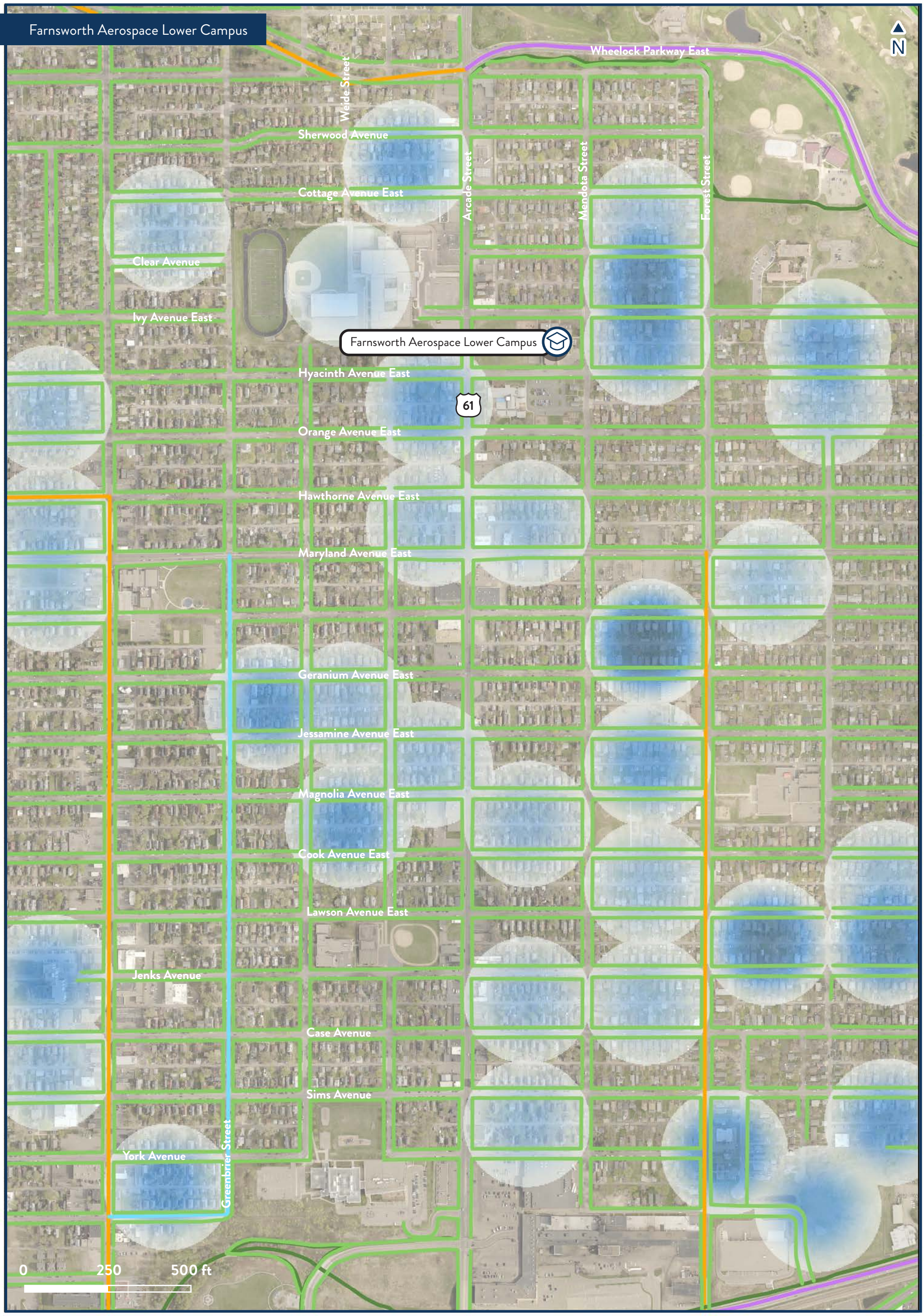
Farnsworth Aerospace Lower Campus




**Student Population, Farnsworth Aerospace Lower Campus**
St. Paul, MN

Figure 6

Focus School

Higher Density Student Population

Lower Density Student Population

Existing Sidewalk

Existing Bike Boulevard

Existing Shared Lane (Sharrow)

Existing Trail

Existing Bikeable/Wide Shoulder

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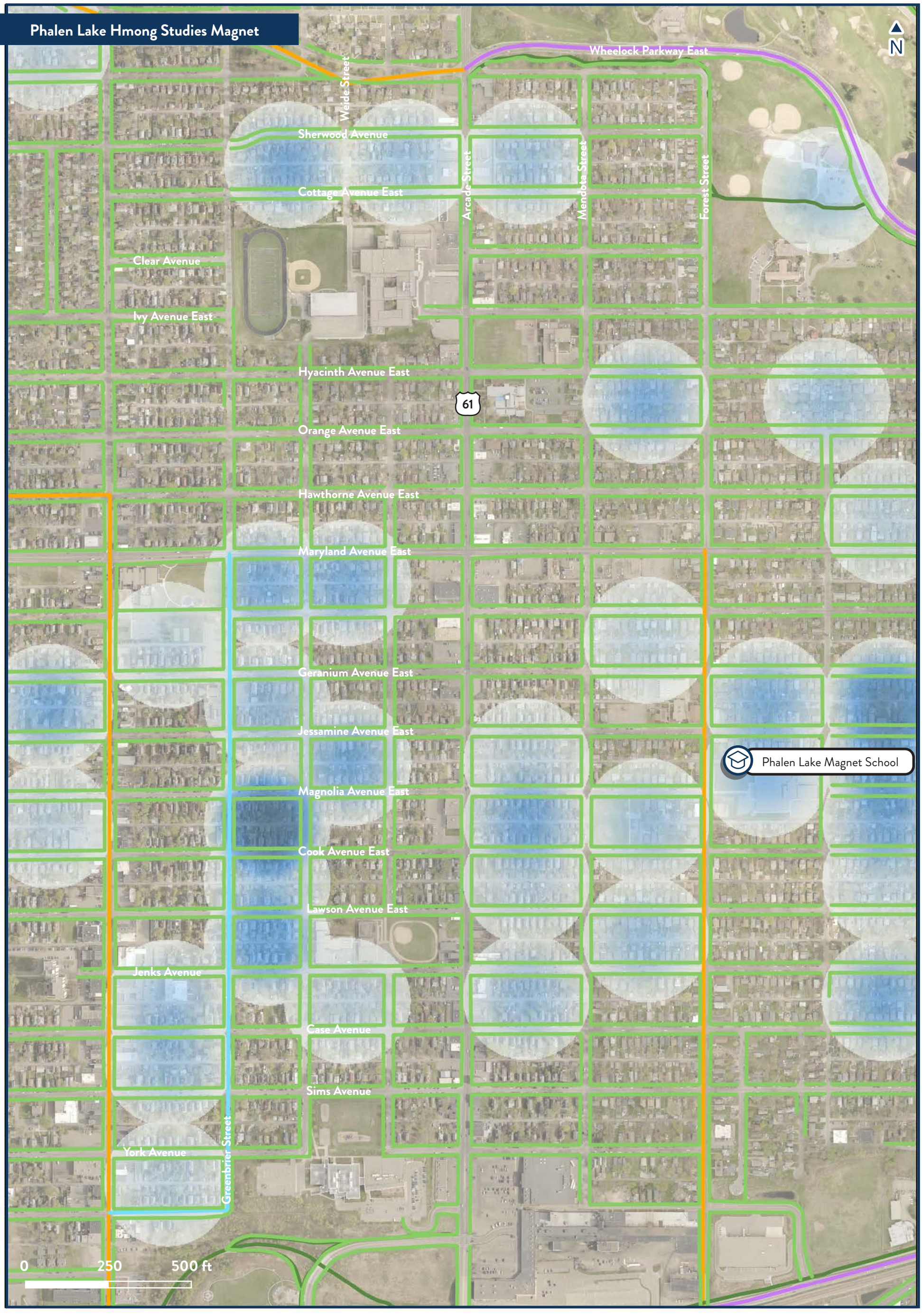
DEPARTMENT OF TRANSPORTATION

MINNESOTA SAFE ROUTES TO SCHOOL

# Phalen Lake Hmong Studies Magnet




**Student Population, Phalen Lake Hmong Studies Magnet**
St. Paul, MN

Figure 7

Focus School

Higher Density Student Population

Lower Density Student Population

Existing Sidewalk

Existing Bike Boulevard

Existing Shared Lane (Sharrow)

Existing Trail

Existing Bikeable/Wide Shoulder

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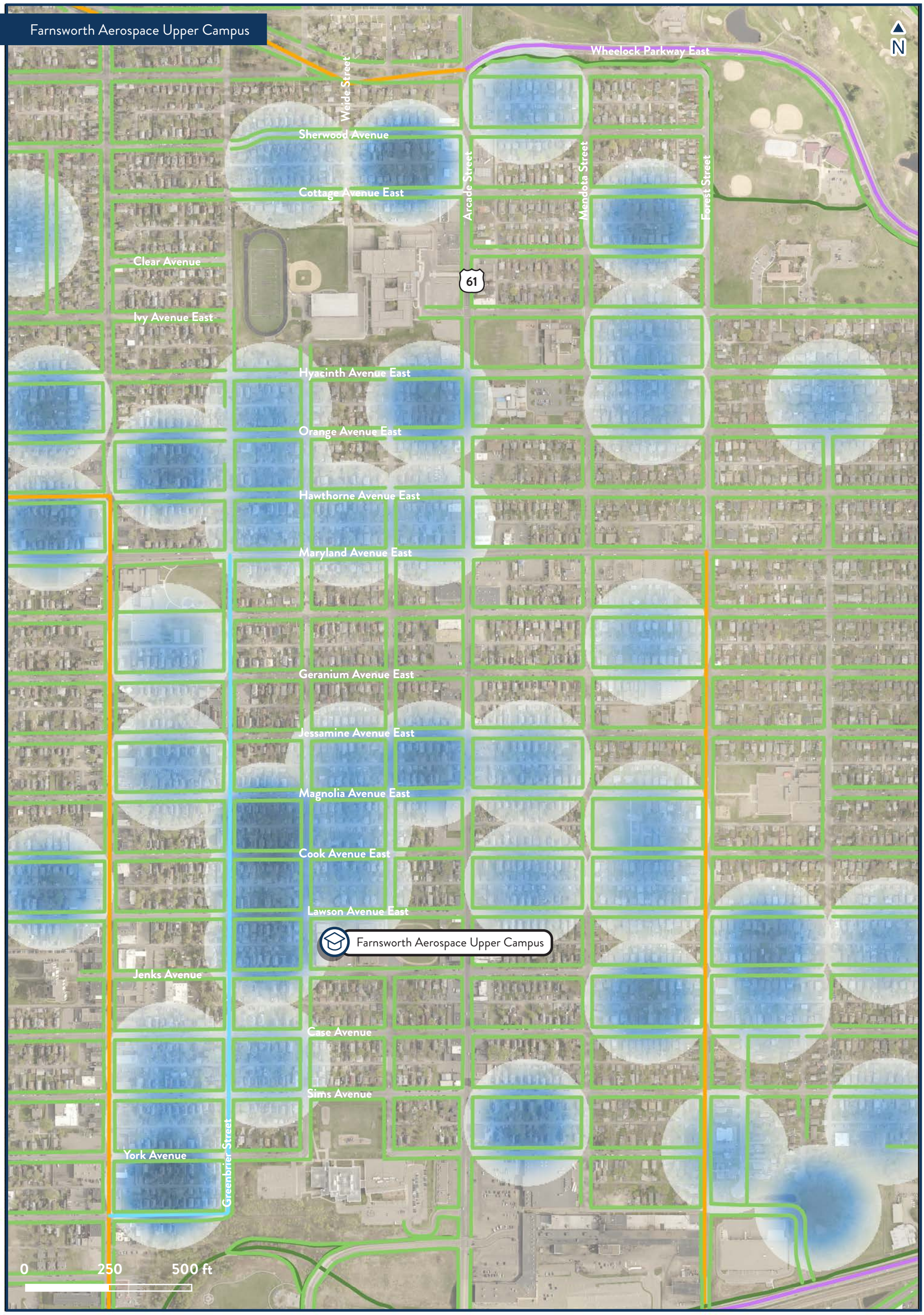
MINNESOTA SAFE ROUTES TO SCHOOL

Farnsworth Aerospace Upper Campus




**Student Population, Farnsworth Aerospace Upper Campus**
St. Paul, MN

Figure 8

Focus School

Higher Density Student Population

Lower Density Student Population

Existing Sidewalk

Existing Bike Boulevard

Existing Shared Lane (Sharrow)

Existing Trail

Existing Bikeable/Wide Shoulder

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MINNESOTA SAFE ROUTES TO SCHOOL

Johnson High School

Wheelock Parkway East
Weide Street
Sherwood Avenue
Arcade Street
Mendota Street
Forest Street
Cottage Avenue East
Clear Avenue
Johnson Senior High School
Ivy Avenue East
Hyacinth Avenue East
61
Orange Avenue East
Hawthorne Avenue East
Maryland Avenue East
Geranium Avenue East
Jessamine Avenue East
Magnolia Avenue East
Cook Avenue East
Lawson Avenue East
Jenks Avenue
Case Avenue
Sims Avenue
York Avenue
Greenbrier Street
0 250 500 ft
N

**Student Population, Johnson High School**

St. Paul, MN

Figure 9

Focus School

Higher Density Student Population

Lower Density Student Population

Existing Sidewalk

Existing Bike Boulevard

Existing Shared Lane (Sharrow)

Existing Trail

Existing Bikeable/Wide Shoulder

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DEPARTMENT OF TRANSPORTATION

MINNESOTA SAFE ROUTES TO SCHOOL

# PREVIOUS PLANS AND OTHER STUDIES

A review of previous plans and other studies was completed to identify supportive planning elements and synergies with the Study.

**Safe Routes to School – Farnsworth Aerospace Upper Campus (2017)**

- Upgrade crossings at Arcade Street and Maryland Avenue, expand sidewalk approaches, and complete signal timing modifications for a leading pedestrian interval. Identified as a high priority.
- Implement crossing enhancements at Arcade Street and Jenks Avenue and align north leg crossing where there is a skew today. Identified as a high priority.
- Reduce Arcade Street from four-lanes to three-lanes and construct widened sidewalks along with increased buffer space. Identified as medium priority.
- Implement crossing enhancements at Arcade Street and Lawson Avenue. Identified as a low priority.

**Saint Paul Safe Routes to School Policy Plan (2017)**

- Recommended policy guidance for crossings at signalized intersections within one-half mile of a school, which include high visibility crosswalk markings at all legs, curb extensions when applicable, shortened traffic signal cycle length, protected left-turns at intersections near schools, and leading pedestrian intervals.

**Saint Paul For All – 2040 Comprehensive Plan (2019)**

This plan provides background, local policies, and direction for review as a part of the planning process. Applicable demographic considerations by Census Block Group:

- Up to 24 percent of nearby residents along Arcade Street do not own a car.
- Between 20 and 51 percent of the population are children under the age of 18 along Arcade Street.
- Between 25 and 35 percent of a families live in poverty, and the area is included in Saint Paul's "Area of Concentrated Poverty with over 50 Percent People of Color".

Applicable transportation policies for consideration as a part of this Study:

- Policy T-3: Design rights-of-way using the modal hierarchy of 1) pedestrians (safety focus), 2) bicyclists (safety focus), 3) transit, and 4) other vehicles.
- Policy T-6: Implement "road diets' for undivided four-lane roads to convert them to two or three lanes, where feasible, to prioritize pedestrian safety.
- Policy T-7: Implement intersection safety improvements.
- Policy T-9: Design the rights-of-way for all users, including older people, children, and those with mobility constraints as guided by the Street Design Manual and Safe Routes to School Plans.

- Policy T-34: Promote safe walking and bicycling to school by supporting Safe Routes to School efforts and investing in sidewalk connectivity and crossing enhancements near schools.

**Saint Paul Pedestrian Plan (2019)**

- The Arcade Street corridor is identified as a high-priority area for walking investments.
- Use funding sources such as Safe Routes to School and the Metropolitan Council's Regional Solicitation to leverage infrastructure improvements. The City also has an annual $125,000 program for Safe Routes to School projects which began in 2017.

**Saint Paul Street Design Manual (2016)**

- Arcade Street is identified as a mixed-use corridor with upgraded and expanded pedestrian realm.

**Saint Paul Bicycle Plan (2015)**

- No planned bikeway along Arcade Street due to parallel north-south facilities along adjacent streets including Forest Street (two blocks east) and Greenbrier Street (three blocks west).
- Two existing bikeways cross Arcade Street within the study area today including at Neid Lane where a connection exists to the Bruce Vento Regional Trail and Wheelock Parkway which will be a part of the future Grand Rounds trail system in Saint Paul.
- Three planned bikeways across Arcade Street within the study area are at Case Avenue (enhanced shared lane), Jessamine Avenue (bike boulevard), and Hyacinth Avenue (bike boulevard).


*Arcade Street looking south at Magnolia Avenue. Source: SRF Consulting Gorup, 2020*

# COMMUNITY ENGAGEMENT

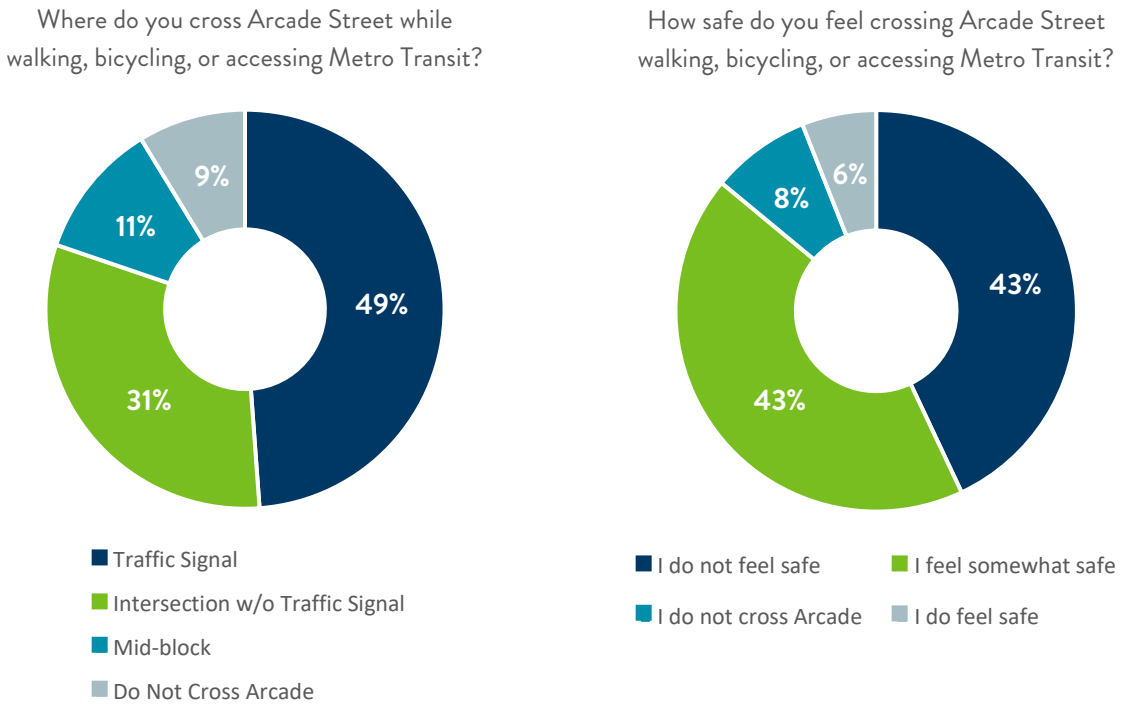
Online community engagement was facilitated as a part of this Study and was specifically tailored to students and parents of the five schools. The broader public engagement campaign was organized to align with a concurrent project effort underway during the Study's process to plan and design for the rehabilitation of Arcade Street (US 61) from Roselawn Avenue to East 7th Street (TH 5) which includes the study area.

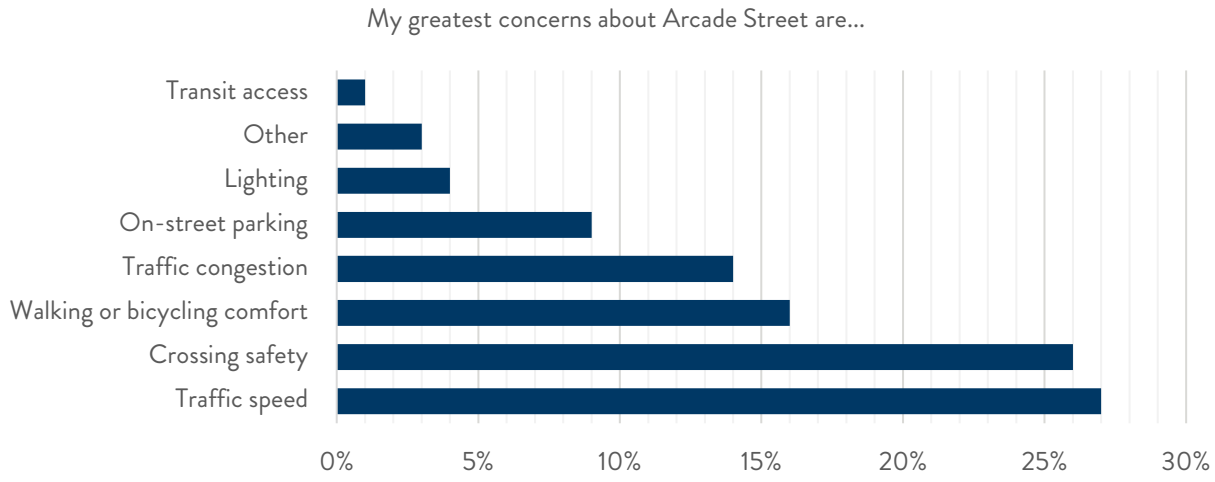
The engagement occurred from September 22, 2020 through October 26, 2020 via an engagement website, online survey, and interactive map. Approximately 125 survey responses were collected, as well as 38 open-ended comments, and 28 comments related to the interactive map (see Appendix A for raw data). Of the total survey responses, over one-third were from parents or students of the five focus schools. Additionally, over two-thirds of respondents lived on, or near (i.e., within four city blocks of) Arcade Street (US 61). Ten percent of respondents owned or worked at a business along the corridor and the remainder commuted to work or school via Arcade Street (US 61).

## Online Survey

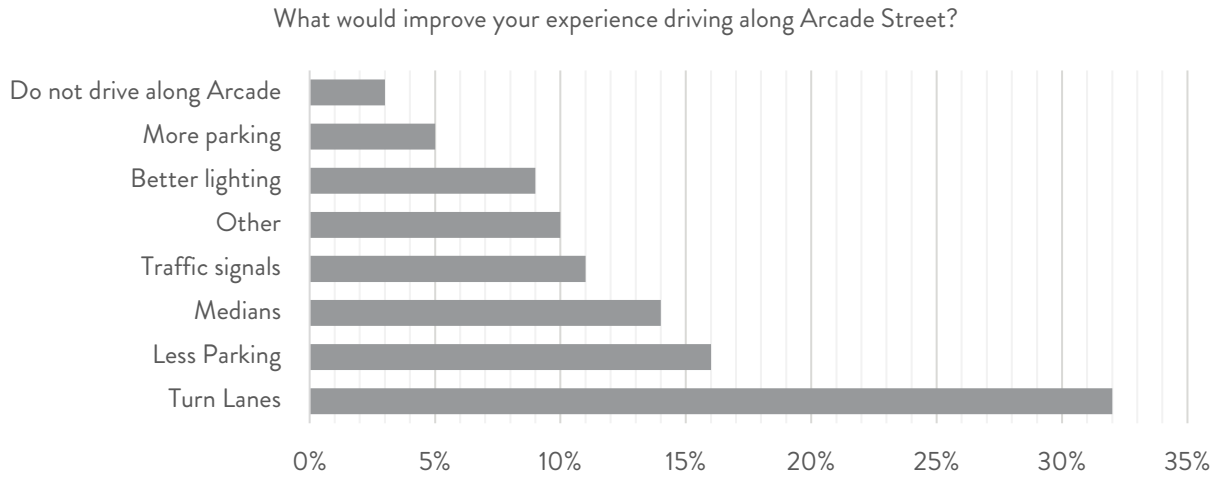
The survey included five questions to understand how the community uses and feels about Arcade Street (US 61). The following figures illustrate the results for each question (see Figure 10). A total of 42 comments were received via the survey questions that provided such responses by choosing "other".

**Figure 10. Online Survey Results**










*Source: SRF Consulting Group, 2020*

*Of note, the three questions on this page required respondents to choose their top two choices only.*

## Interactive Map

The community identified issue areas by using points on an interactive online map. The issues could be identified by type including, walking, bicycling, transit, driving, overall safety, and other issues. A total of 28 comments were recorded of which some pertained to locations for the concurrent MnDOT project along Arcade Street (US 61) and outside the study area (see Appendix A for raw data). The top three issue areas identified by the community include the intersections of Cottage Avenue, Ivy Avenue, and Maryland Avenue.

**Cottage Avenue**[2]

- ”Many students get food from the gas station before and during school hours, but they have to cross without a crosswalk or signal and cars do not stop.”
- “Vehicles are going way too fast. They do not stop for people walking or bicycling.”
- ”I would like to see traffic calming such as what was implemented along Maryland Avenue. I would like to see [traffic calming] at least from Maryland Avenue to Larpentuer Avenue, if not Parkway Avenue/Frost Avenue.”

**Ivy Avenue**

- “Students use Metro Transit to commute to/from Johnson Senior High School…More than once a student has been hit by a car while crossing the intersection in front of a bus.”
- “Many Johnson Senior High School students, and a few staff, commute to school by bike. Please make sure to prioritize the safety of bicyclists – it is the greenest way to travel besides walking!”
- “Improved bike lanes and safety awareness for staff and students who choose to bike to school [is desired]. Total pedal power!”
- “There are not any bus shelters here. I know it would be a tight fit next to the elementary school playground, but it can still get pretty windy and cold.”
- ”Please add a left-turn signal here. Traffic gets really congested turning into Johnson [Senior High School].”

**Maryland Avenue**

- “Many students cross here, and it can be very dangerous since many motorists speed along Arcade Street. This could also be a better lighted intersection for everyone’s safety.”
- “This is a major intersection for transit. Make sure to prioritize Metro Transit buses through here and crossings to transfer in the redesign process.”
- “It is really hard to turn here because of the on-street parking and merging cars.”

[2] Quotes are edited for grammar and clarity.

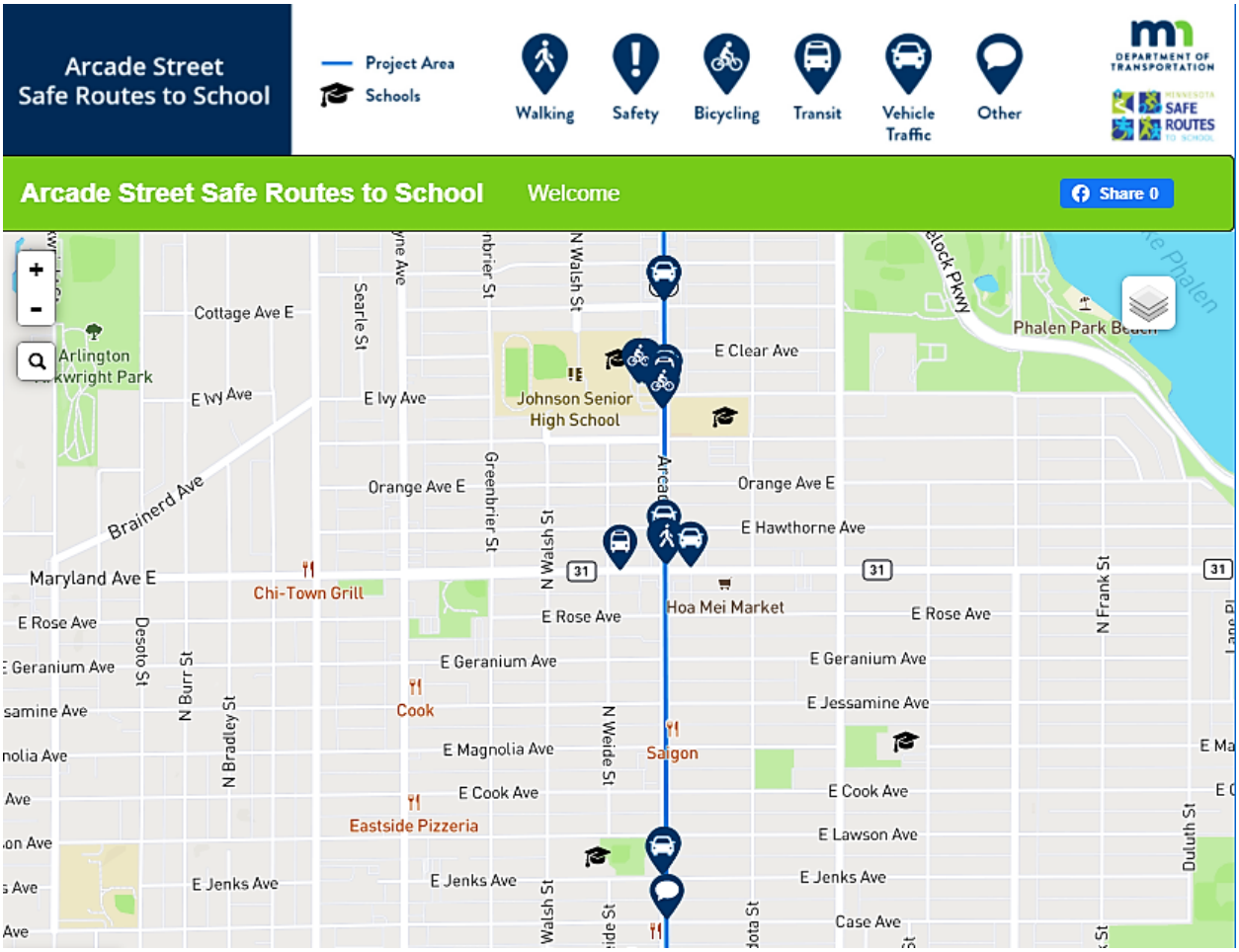
- "This intersection can be nuts. There needs to be [left turn] arrows for Arcade Street traffic. If you are heading southbound and trying to turn left onto Maryland Avenue, you are taking your life into your hands [due to the sight distance and cars passing on the right]. The parked cars mess things up for southbound right turning vehicles. This is a dangerous intersection for everyone."

**Jenks Avenue**

- "A lot of students from Farnsworth [Aerospace Upper Campus] or Johnson [Senior High School] cross here and it can be dangerous to [both] pedestrians and motorists…"
- "It is nearly impossible to turn left [from the east] onto Arcade Street. I worked at Farnsworth [Aerospace Upper Campus] for nine years and started using a different way since it could take forever to turn left here and often were backing cars up also trying to turn right."

**Case Avenue**

- "Many Johnson Senior High School students use this bus stop year-round. Even in the winter. There is only one small bench and no shelter to cover them from the rain and snow."




*Screenshot of feedback received via the interactive map. Source: SRF Consulting Group, 2020*

# TRANSPORTATION NETWORK

The transportation network was reviewed to identify existing infrastructure for walking, rolling, or bicycling, transit, and driving along Arcade Street (US 61). The following sections summarize each transportation mode as it exists today (see Figure 11).

## Walking, Rolling, and Bicycling

The corridor is primarily auto-focused with nearly 75 percent of the total right-of-way devoted to vehicular uses including travel lanes and on-street parking. Existing multimodal infrastructure includes approximately eight-foot sidewalks along both sides of the street with a typical clear zone of six feet or less. There are no street trees or other landscaping present, and other amenities such as benches or trash receptables are very limited. Vehicular-focused street lighting is present along the corridor with approximately four light poles spaced along each city block. There is no pedestrian-scale lighting.

Marked crossings exist at eight locations within the 1.2-mile study corridor. Of those, six are at existing signalized intersections including: Neid Lane, Case Avenue, Magnolia Avenue, Maryland Avenue, Ivy Avenue, and Wheelock Parkway. Two uncontrolled marked crossings (i.e., crosswalks) are located at York Avenue and Jessamine Avenue. No crossing enhancements (e.g., curb extension, etc.) exist in the study area.

There are no existing or planned bicycle facilities along Arcade Street (US 61). Two off-street bicycle facilities either cross or connect to Arcade Street (US 61) at Wheelock Parkway and Neid Lane, respectively. The connection at Wheelock Parkway is a part of the future Grand Rounds network of off-street paths while a link to the Bruce Vento Regional Trail is located at Neid Lane.

*Arcade Street looking south at York Avenue. Source: Google Streetview, 2019*

Northern Segment

Southern Segment

N

STOP

61

SPEED LIMIT 30

Wheelock Parkway East

Arcade Street

Weide Street

Sherwood Avenue

Cottage Avenue East

Clear Avenue

Johnson Senior High School

Ivy Avenue East

Farnsworth Aerospace Lower Campus

Hyacinth Avenue East

Orange Avenue East

Hawthorne Avenue East

Maryland Avenue East

Rose Avenue East

0 250 500 ft

Geranium Avenue East

Jessamine Avenue East

Phalen Lake Magnet School
900 ft.

Magnolia Avenue East

Cook Avenue East

Lawson Avenue East

Farnsworth Aerospace Upper Campus

Jenks Avenue

Case Avenue

Sims Avenue

York Avenue

John A. Johnson Achievement Plus Elementary

Wells Street

Neid Lane

## Existing Transportation Network

St. Paul, MN

Figure 11

- Focus School
- Side-Street Stop-Controlled Intersection
- Marked Crosswalk
- School Crossing Sign
- Traffic Signal
- Existing Sidewalk
- Existing Shared Lane (Sharrow)
- Existing Bikeable/Wide Shoulder
- Bus Route
- Bus Stop

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DEPARTMENT OF TRANSPORTATION

MINNESOTA SAFE ROUTES TO SCHOOL

## Multimodal Activity

Multimodal activity was studied using StreetLight to estimate the frequency for pedestrians and bicyclists to cross at each intersection, instead of traditional pedestrian and bicyclist counts due to the COVID-19 pandemic that disrupted school operations. The 2019 data included daily estimates during the months when school was in session and only during Monday through Thursday. The data does not provide raw counts but rather an estimated level of use that can identify areas of higher activity. The data is organized using app-based locational cell phone data that is anonymized and organized by StreetLight using proprietary algorithms. Activity is estimated using this data and normalized using sample trip counts and Census Block population. StreetLight data can assist in identifying locations with higher usage, which can aid in the prioritization of improvements (see Figure 12 and Figure 13).

**Figure 12. StreetLight Pedestrian Activity Estimate**

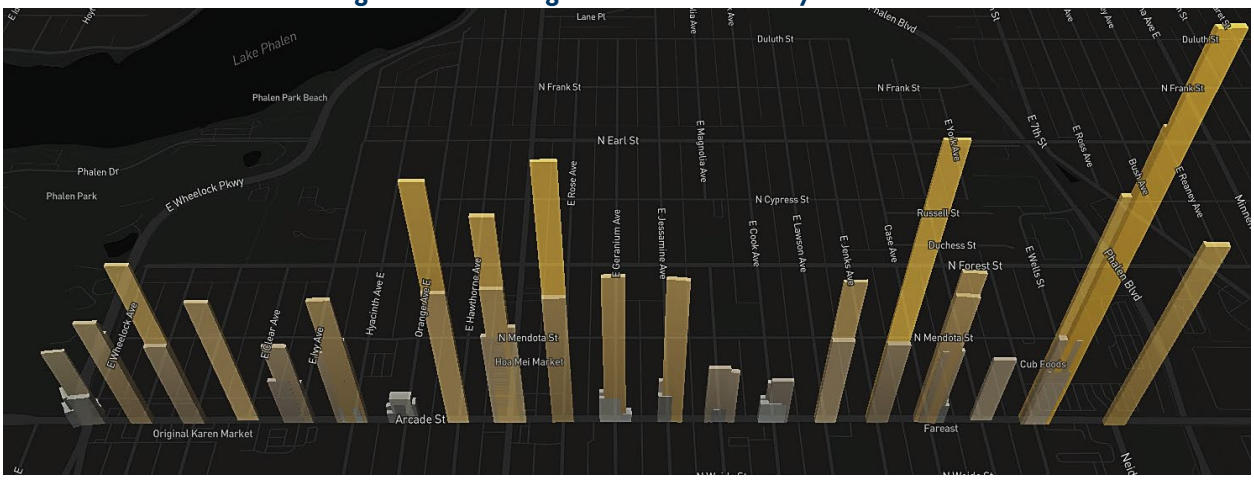
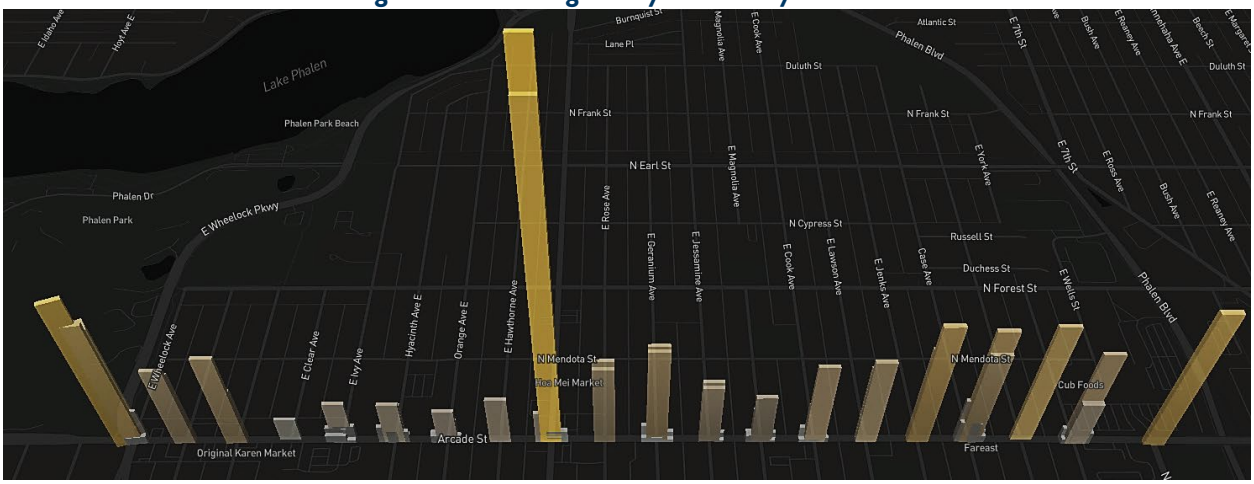



**Figure 13. StreetLight Bicycle Activity Estimate**




*Source: StreetLight, 2020; SRF Consulting Group, 2020*

## Transit

Metro Transit buses are a critical connector for Johnson Senior High School students who receive metro transit passes from Saint Paul Public Schools for $50 per year if they live within one-mile of the school or are free if greater than one-mile. Some students cannot (or choose not to) walk, bike, drive, or carpool, so they must rely upon frequent and reliable transit service to access school. Metro Transit has four existing routes along all, or portions of, Arcade Street (US 61) from Neid Lane to Wheelock Parkway (see Figure 11).

- Route 61: East-west connector between downtown Minneapolis and Saint Paul via East Hennepin/ Larpenteur Avenue. It runs along Arcade Street (US 61) from Larpenteur Avenue to East 7th Street.
- Route 54: Connector between the Mall of America, Minneapolis-Saint Paul International Airport, downtown Saint Paul, and the Maplewood Mall. It runs along Arcade Street (US 61) from Maryland Avenue to East 7th Street.
- Route 64: One of Metro Transit's high-frequency routes operating between downtown Saint Paul and locations to the northeast via several different branches. It runs along Arcade Street (US 61) only for select trips serving Johnson Senior High School.
- Route 74: East-west connector between the Blue Line's 46th Street Station, downtown Saint Paul, and several locations to the east via a number of different branches. It runs along Arcade Street (US 61) only for select trips serving Johnson Senior High School.

As of 2019, over 1,500 boarding's and alighting's were recorded per day for the local bus routes in the study area. The top three bus stops by ridership, of which two serve the high school, are all affiliated with Route 61:

- Ivy Avenue (southbound / northbound): 187 / 142
- Maryland Avenue (southbound): 101

The Arcade Street (US 61) and Maryland Avenue intersection is a key connection for area transit riders via three bus routes serving that location, including high-frequency service. On average, almost 650 daily transit riders board or alight at the intersection, which accounts for over 40 percent of all ridership in the study area.


*Students waiting for a Metro Transit bus. Source: Star Tribune, 2012*

## Roadway Network

Arcade Street (US 61) is a MnDOT functionally classified minor arterial roadway running north-south approximately one-mile east of Interstate 35E. Functional classification is the grouping of roadways into classes that define how the roadway serves vehicular travel within the broader roadway network. Local roadways service short, localized trips, while collector roadways provide key connections between local streets and the regional arterial network. As a minor arterial, the roadway operates as both a key connector and support route for regional north-south travel between downtown Saint Paul, as well as and suburban locations to the north. In addition to regional travel, the road is important to the local community by providing access to shopping, recreation, schools, and other neighborhood destinations.

The 1.2-mile study area has six different lane configurations, including:

- **Wheelock Parkway to Rose Avenue**: Four-lane, undivided with no turn lanes and on-street parking (outside lanes during certain times).
- **Rose Avenue to Jessamine Avenue**: Three-lane (two southbound lanes and one northbound lane), undivided with no turn lanes and on-street parking (east side only).
- **Jessamine Avenue to Case Avenue**: Two-lane, undivided with no turn lanes and on-street parking (both sides).
- **Case Avenue to Sims Avenue**: Two-lane, undivided with no turn lanes and on-street parking (east side only).
- **Sims Avenue to York Avenue**: Two-lane, undivided with a southbound turn lane and on-street parking (both sides).
- **York Avenue to Neid Lane**: Four-lane, divided with turn lanes and no on-street parking.

Though there are several lane configurations, the corridor maintains a relatively consistent cross-section of 60-feet from the back of sidewalk and approximately 44-feet-wide curb to curb. The only variation is from Neid Lane to Sims Avenue which has an estimated cross-section of 74-feet, and approximately 58-feet-wide curb to curb. Arcade Street (US 61) is urban in context (i.e., curb and gutter).

## Traffic Volume

Vehicular activity was analyzed using average annual daily traffic (AADT) volumes along Arcade Street (US 61) from MnDOT's publicly available data (see Figure 14). The corridor volumes from 2018, along with 20 years of AADT volumes from 1998 to 2018, were reviewed to understand growth or fluctuations in traffic along Arcade Street (US 61). Based on this data, overall AADT volumes have decreased along most of the corridor, with minor increases or fluctuations between Case Avenue and Maryland Avenue. The limited or declining growth coincides with the surrounding context of established neighborhoods.

- **Wheelock Parkway to Maryland Avenue**: 11,800 (decreased 15 percent and fluctuated within a few hundred vehicles of the current volume since 2006)
- **Maryland Avenue to Case Avenue**: 13,000 (increased 12 percent and fluctuated between 12,000 and 13,000 since 2006)
- **Case Avenue to Neid Lane**: 12,000 (decreased 15 percent and fluctuated between 12,000 and 14,000)

The AADT volumes of state-aid cross-streets at major intersections were also reviewed where data was available. These locations included:

- Wheelock Parkway: 5,200 west (year 2016)
- Maryland Avenue: 19,400 west (year 2018); 18,600 east (year 2016)
- Case Avenue: 3,000 west (year 2017), 4,050 east (year 2016)
- Neid Lane: 4,450 (year 2017)

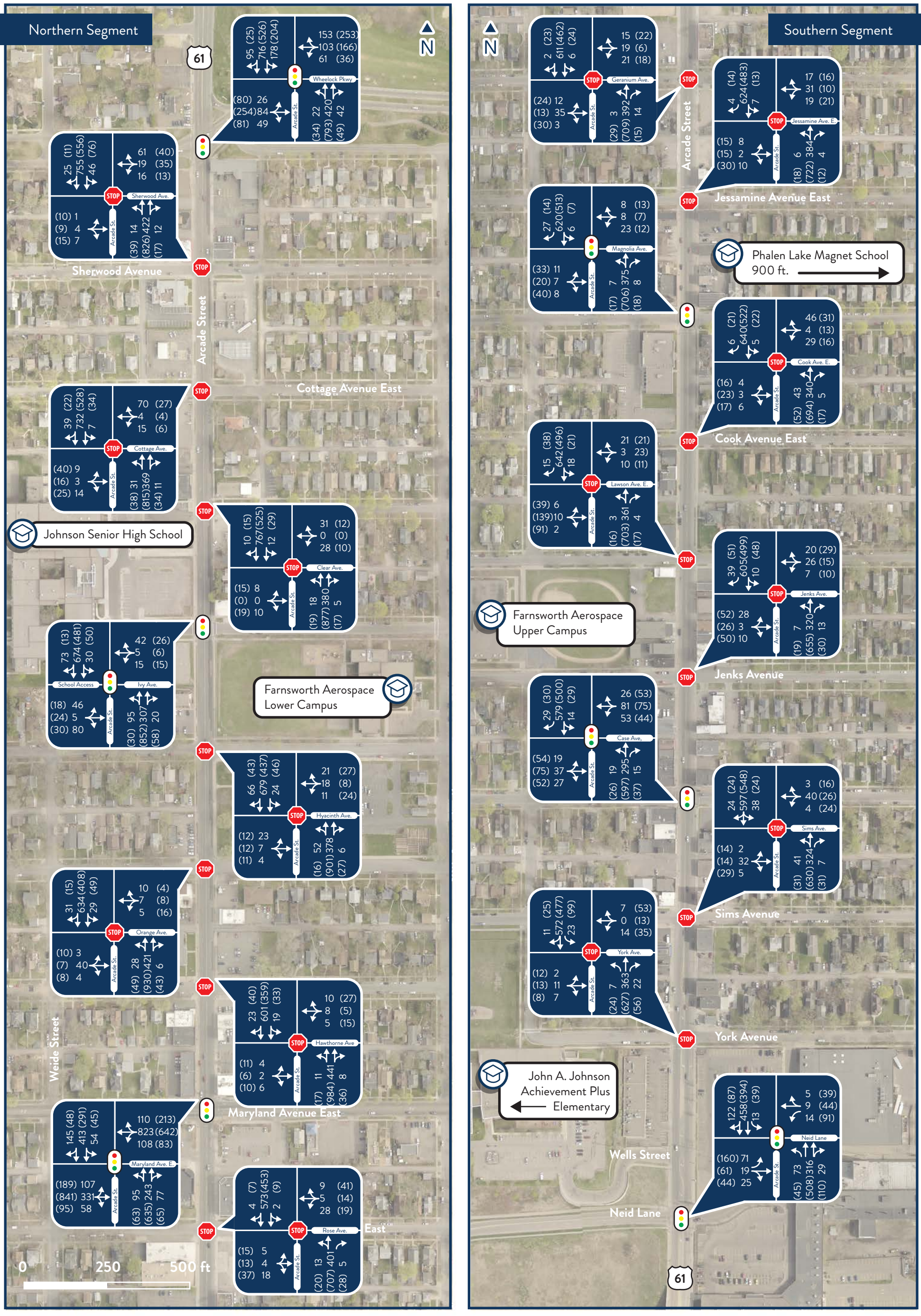
Intersection turning movement counts (TMCs) were studied using Synchro/SimTraffic at the 20 intersections within the study area to understand existing traffic operations. Data was available at the six signalized intersections from 2018 which formed the basis for the TMCs along the remainder of the corridor. All other intersections were organized using StreetLight traffic volume data due to the COVID-19 pandemic that significantly impacted traffic volumes and travel patterns in 2020. The volumes were balanced along the corridor using engineering judgment between both data sources.

The StreetLight data used for this Study includes hourly traffic volumes and daily estimates using 2019 data during the months when school was in session and only during Tuesday through Thursday. The data is organized using app-based locational cell phone data that is anonymized and organized by StreetLight using proprietary algorithms to determine vehicular counts.

Traffic volumes also play a key role in determining appropriate multimodal infrastructure such as a bike lane versus a multiuse trail or the type of pedestrian and bicycle crossing treatments (e.g., the threshold for a rectangular rapid flashing beacon). This is detailed further in Chapter 4.

## Northern Segment

## Southern Segment




**Existing Turning Movement Counts**

St. Paul, MN

Figure 14

- Focus School
- # Morning Peak Hour Volume
- (#) Evening Peak Hour Volume
- STOP Side-Street Stop-Controlled Intersection
- Traffic Signal

SRF · Minnesota Department of Transportation · Minnesota Safe Routes to School

## Traffic Speed

Arcade Street (US 61) has a 30 mile per hour (mph) speed limit and no school speed zones present in the study area. Vehicular speed data was not collected by traditional methods (i.e., road tubes) due to the COVID-19 pandemic. Various methods were used to determine average northbound and southbound speeds along Arcade Street (US 61) including SimTraffic (average peak hour speeds), Iteris (average peak hour speeds), StreetLight (all day average speeds), and Google (all day average speeds). All four sources were within one to three miles per hour of one another and averaged to display an overall directional speed of 23 mph (northbound) and 22 mph (southbound). The calculated average speeds are similar to those observed by the City of Saint Paul in 2007.

The 85$^{th}$ percentile speed is the industry standard measurement for setting roadway speeds; however, that was not studied due to the comparative data available that used average speeds. Moreover, the average speed is also considered by the Institute of Transportation Engineers (ITE), the National Association of City Transportation Officials (NACTO), and other multimodal-focused jurisdictions as an alternative threshold when focusing on safety and multimodal comfort as it relates to speed and roadway design.

## Traffic Operations

Existing traffic operations were studied using turning movement counts at 20 intersection from Neid Lane to Wheelock Parkway (see Figure 15). The typical threshold of acceptable traffic operations for most jurisdictions is an LOS D. Due to the objective of this Study, other considerations beyond traffic operations were reviewed to ensure prioritization of children walking, rolling, and bicycling, over vehicular movement along, or across, Arcade Street (US 61), a neighborhood mixed-use corridor.

Arcade Street (US 61) experiences some congestion during the morning (7:00 a.m. to 8:00 a.m.) and evening (5:00 p.m. to 6:00 p.m.) peak periods of travel, which is generally concentrated at the Maryland Avenue intersection (though operating at an LOS D overall during both periods). During the evening peak period, the eastbound side-street approach at Lawson Avenue operates at a LOS F while Jenks Avenue, an adjacent intersection, operates at a LOS D during the same period. All other intersections operate better than a LOS D during both peak periods which indicates the traffic volume, lane configuration, and/or traffic controls provide adequate capacity for the corridor.

Northern Segment

Southern Segment

N

61

Wheelock Parkway East

5,200

17,300

Sherwood Avenue

Arcade Street

Cottage Avenue East

Clear Avenue

Johnson Senior High School

11,800

Ivy Avenue East

Farnsworth Aerospace
Lower Campus

Hyacinth Avenue East

Orange Avenue East

Hawthorne Avenue East

Weide Street

19,400

Maryland Avenue East

18,600

13,000

Rose Avenue East

0 250 500 ft

Geranium Avenue East

Jessamine Avenue East

Phalen Lake Magnet School
900 ft.

Magnolia Avenue East

13,000

Cook Avenue East

Lawson Avenue East

Farnsworth Aerospace
Upper Campus

Jenks Avenue

3,000

Case Avenue

4,050

Sims Avenue

York Avenue

John A. Johnson
Achievement Plus
Elementary

12,000

Wells Street

Neid Lane

4,450

61

**Existing Traffic Conditions**

St. Paul, MN

Figure 15

Focus School

Morning

Evening

Overall Intersection

Worst Movement

Level of Service

- A or B
- C
- D
- E or F

# AADT

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MINNESOTA SAFE ROUTES TO SCHOOL

# PARKING

On-street parking is allowed during most of the day between York Avenue and Wheelock Parkway. Existing parking restrictions and utilization per block were studied to understand how future improvements may impact existing parking. Parking is an opportunity to balance supply with demand to manage modal priorities and incentivize walking, rolling, bicycling, or taking transit in lieu of making it easier to drive.

## Parking Regulations

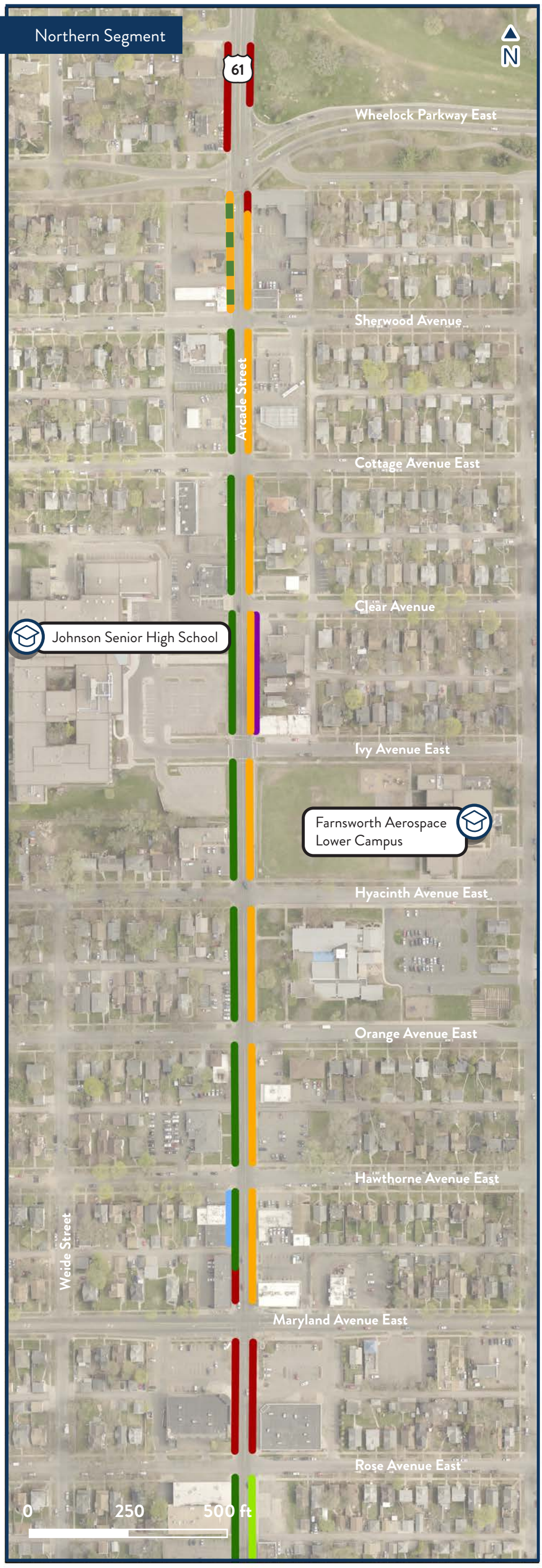
Of the 38 block faces studied from Neid Lane to Wheelock Parkway, a total of nine different parking regulations exist (Figure 16).

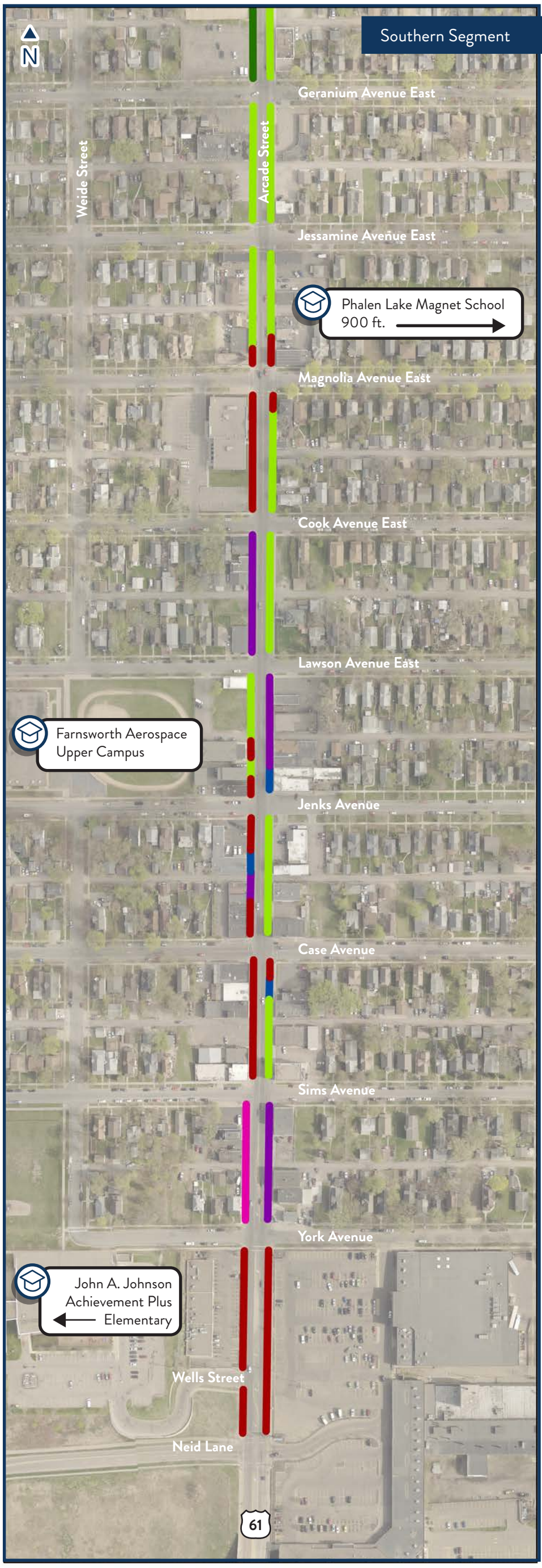
- **Corridor-wide Overnight Restriction**: No parking restriction from 2:00 a.m. to 7:00 a.m. exists along all blocks within the study area.
- **Peak Hour Restriction**: No parking or stopping from 7:00 a.m. to 9:00 a.m. or 4:00 p.m. to 7:00 p.m. from Geranium Avenue to Wheelock Parkway in the southbound and northbound directions, respectively. This restriction exists to ensure all travel lanes of the three- or four-lane undivided roadway sections are open during peak travel periods and limit the chance of parked cars narrowing the roadway to one travel lane in each direction which could exacerbate congestion.
- **Time Limit**: 15-minute, 30-minute, 1-hour, and 2-hour parking time limitations along certain sections of blocks.
- **No Parking Anytime**: Exists along all, or portions of, eight city blocks, as well as all bus stops.
- **No Limit**: Exists along all, or portions of, eight city blocks.

Existing parking restrictions are inconsistent and could be reviewed as a part of future studies or the upcoming rehabilitation project. Updates to parking regulations along Arcade Street (US 61) could produce more consistency than what exists today while better aligning with existing land uses, businesses, and demand that may have changed since the existing regulations were implemented. Furthermore, signage is either damaged or missing in some locations.

Northern Segment

Southern Segment




## Existing Parking Regulations

St. Paul, MN

Figure 16

Focus School

No Parking Anytime
No Parking or Stopping 4-6 PM M-F
No Parking or Stopping 7-9 AM & 4-6 PM M-F
No Parking or Stopping 7-9 AM M-F

15-Minute Parking
30-Minute Parking
1-Hour Parking
2-Hour Parking
No Limit

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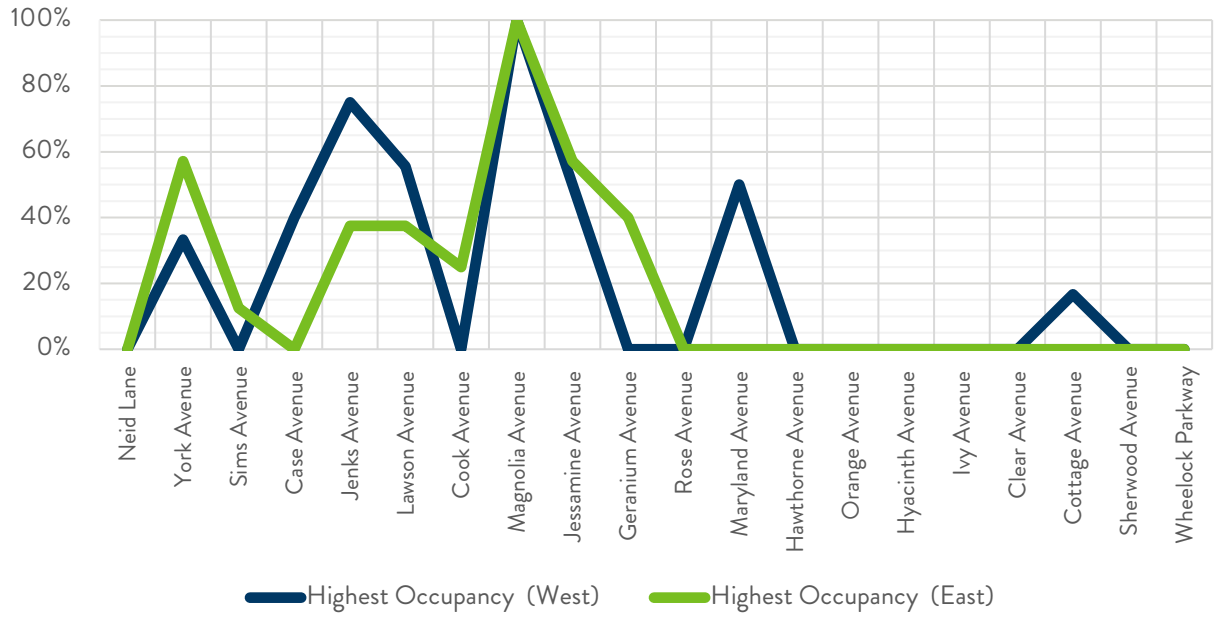
MINNESOTA SAFE ROUTES TO SCHOOL

## On-Street Parking Utilization

Review of on-street parking utilization was performed with Nearmap, an online aerial imagery tool that has high-quality aerial images of urbanized areas with the exact date each image. The sun's shadow was used to estimate the time of day within a two-hour range. Four time periods were studied during the 2018 and 2019 school year, and on weekdays (Wednesday through Friday). All four analysis periods occurred at different estimated times of the day including 10:00 a.m. to 12:00 p.m., 11:00 a.m. to 1:00 p.m., 2:00 p.m. to 4:00 p.m., and 4:00 p.m. to 6:00 p.m. This provided varied peak and off-peak weekday periods for consideration. Two overnight time periods were also collected via recorded video at 1:00 a.m. on Thursday, June 25, 2020 and Saturday, June 27, 2020. Though this was collected during the COVID-19 pandemic, it was determined that review of overnight parking utilization was important to consider and potentially not as impacted by the pandemic because of the mixture of residential uses along Arcade Street (see Appendix C for raw data).

Parking supply per city block was estimated using the length of the block and divided by the average length of a parallel parking space (about 25 feet). An estimated 216 on-street parking spaces exist in the study area, excluding locations with no parking restrictions. The maximum demand represents the highest recorded total across all data collection periods and equated to 25 percent of all available spaces (i.e., 26 west side and 21 east side) (see Figure 17 and Figure 18). The industry standard 85 percent occupancy threshold, which means one space is expected to be available per block, is only met from Magnolia Avenue to Jessamine Avenue.[3]

**Figure 17. Maximum Parking Demand**




*Graph depicts totals by block reading from left to right (i.e., Neid Lane to York Avenue is the first section, etc.). Source: SRF Consulting Group, 2020*

[3] Kaufman, Matthew, et al. (2012). *Contemporary Approaches to Parking Pricing: A Primer*. FHWA-HOP-12-026, 11, Office of Operations, Federal Highway Administration.

Northern Segment

Southern Segment

Wheelock Parkway East
Sherwood Avenue
Cottage Avenue East
Clear Avenue
Ivy Avenue East
Hyacinth Avenue East
Orange Avenue East
Hawthorne Avenue East
Maryland Avenue East
Rose Avenue East
Arcade Street
Weide Street
Johnson Senior High School
Farnsworth Aerospace Lower Campus
Geranium Avenue East
Jessamine Avenue East
Phalen Lake Magnet School 900 ft.
Magnolia Avenue East
Cook Avenue East
Lawson Avenue East
Farnsworth Aerospace Upper Campus
Jenks Avenue
Case Avenue
Sims Avenue
York Avenue
John A. Johnson Achievement Plus Elementary
Wells Street
Neid Lane
61
0 250 500 ft

## Existing Maximum Parking Utilization

St. Paul, MN

Figure 18

Focus School

Parking Utilization (% Full)

- 0%
- 25%
- 50%
- 75%
- 100%

# Number of Parking Spots

Blocks lacking utilization lines (e.g., Rose Avenue to Maryland Avenue) have a no parking restriction.

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The analysis shows that on-street parking is not well utilized within the four-lane, undivided section of Arcade Street (US 61) per the maximum recorded demand. This could be due to a variety of factors such as:

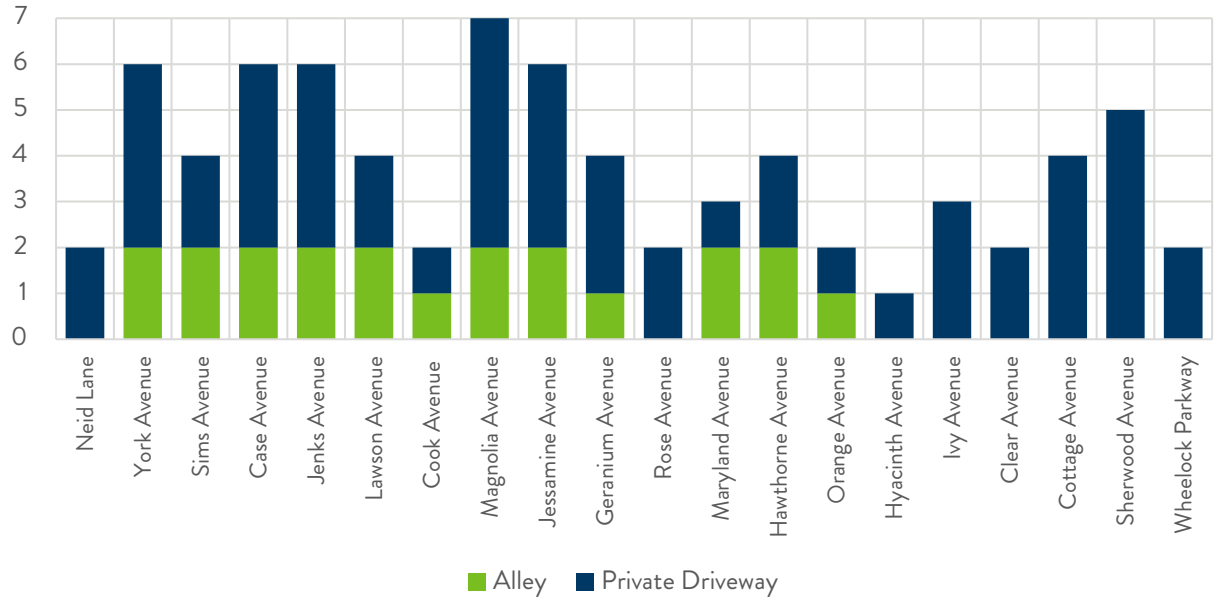
- Existing lane configurations, traffic volumes, and free flow vehicular speeds are not comfortable for someone to consider parking their car on-street.
- Land use context changes in this section of Arcade Street, with businesses primarily having off-street parking and set-back from the corridor.
- On-street parking supply along adjacent side-streets can accommodate the area's demand.

The two-lane section is more highly parked due to denser land uses and a lack of off-street parking, though many blocks remain below 50 percent occupied, illustrating generally low demand.

# ACCESS

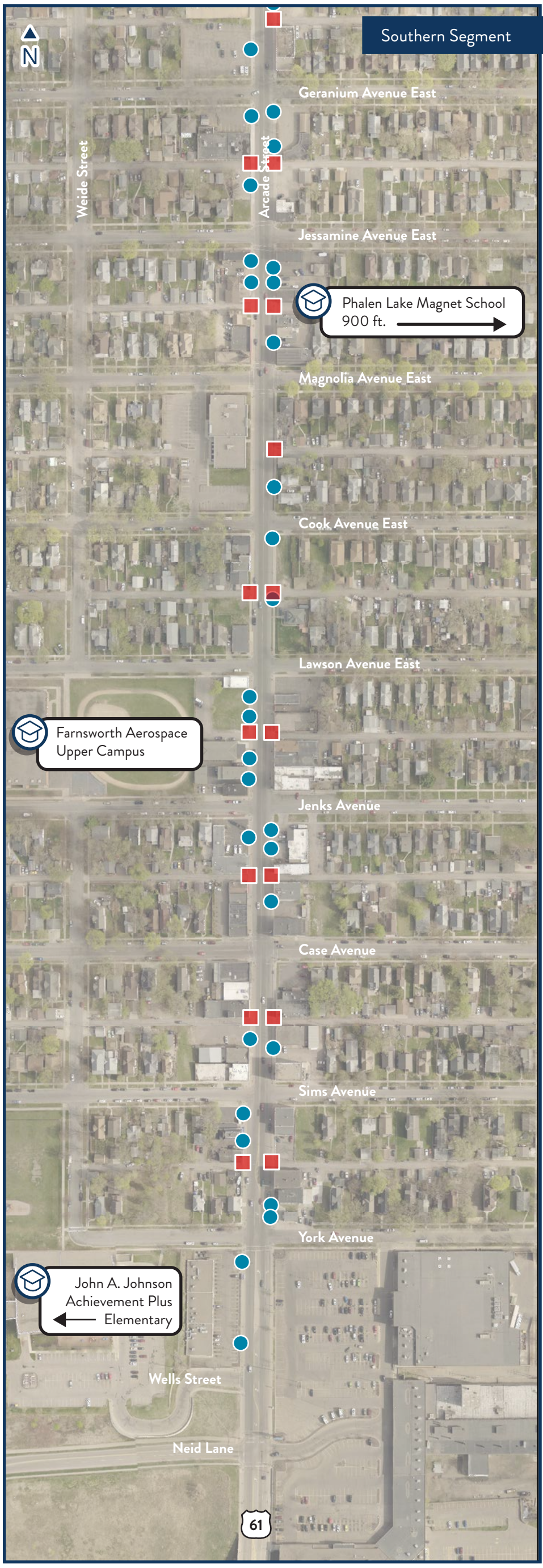
Access points were studied along the corridor which include alleyways and private driveways for businesses or residences (see Figure 19 and Figure 20). Due to the change in built context (i.e., urban versus suburban), the mixture of access changes from south to north along Arcade Street (US 61). In total, 75 access points exist along the 1.2-mile study area which equates to approximately 45 access points per mile. This exceeds MnDOT guidance which can negatively affect the safety and mobility of all users traveling along the corridor.[4] A balance of urban connectivity and access management could be considered during design development.

**Figure 19. Number of Access Points per Block (total of both sides)**




*Graph depicts totals by block reading from left to right (i.e., Neid Lane to York Avenue is the first section, etc.). Source: SRF Consulting Group, 2020*

[4] Minnesota Department of Transportation. (2012). *Access Management Manual, Chapter 3.*


**Existing Access Points**

St. Paul, MN

Figure 20

Focus School

Access Type

Private Driveway

Alley

# SAFETY ANALYSIS

Crash analysis is a critical piece of the existing conditions data review process. Analyzed crashes include ten years of vehicle-to-bicycle and vehicle-to-pedestrian crashes, as well as all crashes over the last five years. The manner of collision was also studied over the last five years which details the way in which the crash occurred (e.g., rear end). That data was derived from MnDOT's Minnesota Crash Mapping Analysis Tool (MnCMAT 2) and includes recorded crashes by law enforcement that provide crash details and approximate location. The following sections describe crashes along Arcade Street (US 61), or immediately adjacent to an intersection.

*Source: streets.mn*

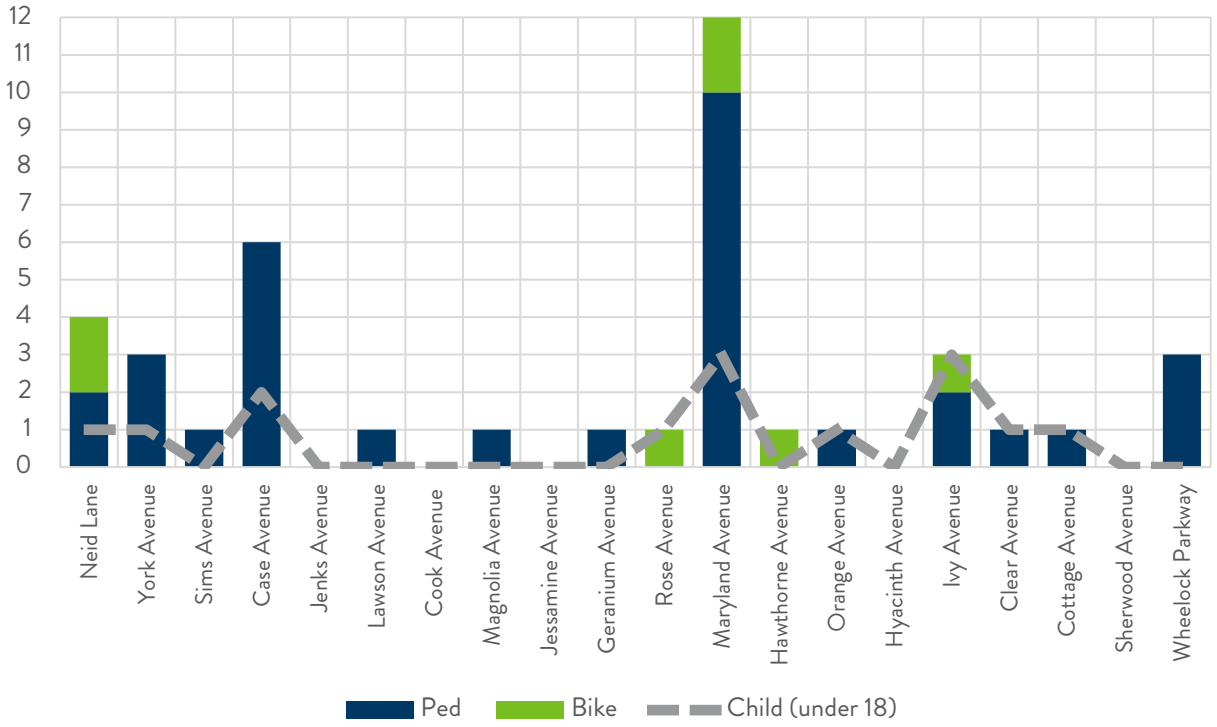
## Pedestrian and Bicycle Crashes (2010-2019)

A total of 43 crashes involving a pedestrian (35) or bicyclist (8) were recorded in the last ten years (see Figure 24 and Figure 25). Due to the multimodal focus of this Study, ten years of data was used to provide a larger sample size of data from which to analyze trends and identify "hot spots". Of the 43 crashes, 40 occurred at intersections along Arcade Street (US 61) (see Figure 21).

Three crashes involving pedestrians resulted in serious injuries, which occurred at York Avenue, Case Avenue, and Clear Avenue (see Figure 22). The crashes at York Avenue and Clear Avenue involved children. The serious injury crash at Clear Avenue occurred during the school day and involved a 17-year-old who likely was trying to access the nearby gas station, which school staff confirmed is a popular destination for the high school students.

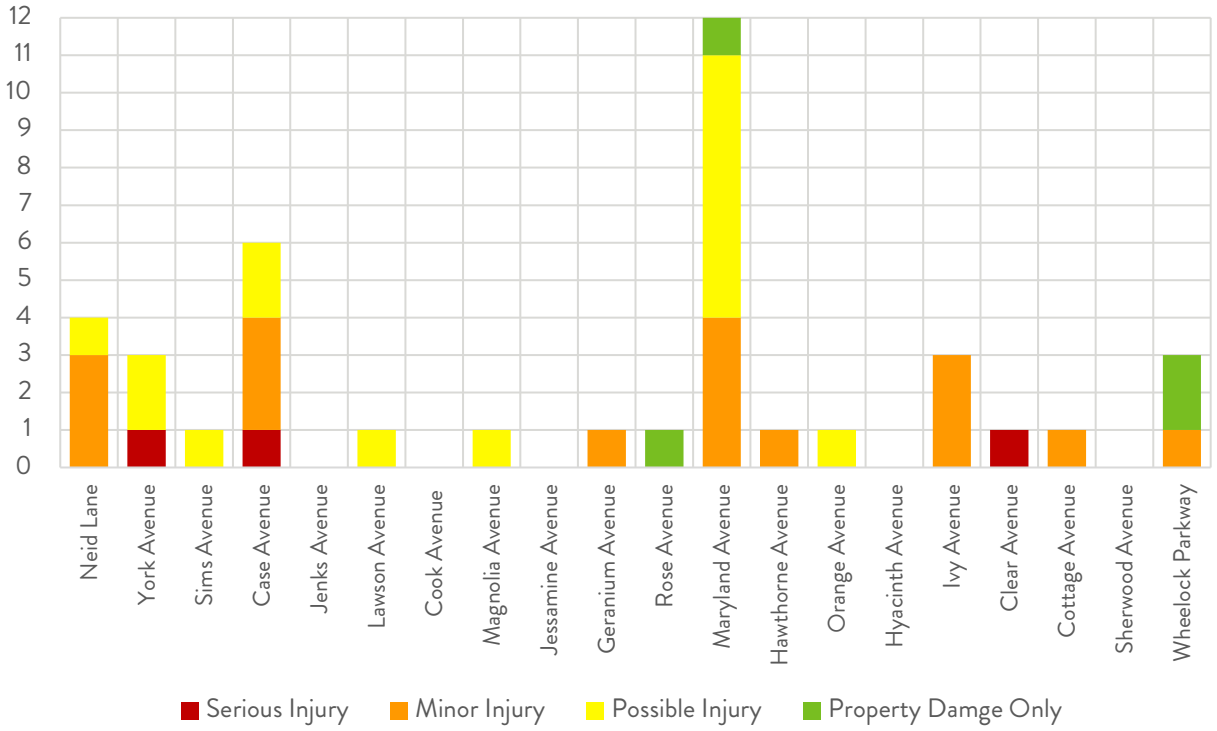
A significant number of pedestrian and bicyclist crashes along Arcade Street (US 61) involved children ranging in age from 12- to 18-years-old. A total of 16 crashes (40 percent of all recorded pedestrian or bicyclist crashes) involved a child, of which 11 occurred during the school day either in the afternoon or early evening. All crashes at Ivy Avenue, Clear Avenue, and Cottage Avenue, locations near Johnson Senior High School, involved children. Moreover, there is a concerning pattern at signalized intersections where nearly 75 percent of these crashes at an intersection occurred. This may illustrate a desire for people to cross at a traffic signal instead of an uncontrolled intersection. There were no time of day or weather trends; however, over 50 percent of crashes were angle which means a vehicle turned into a person crossing.

**Figure 21. Pedestrian and Bicyclist Crashes by Intersection (2010-2019)**




*Source: SRF Consulting Group, 2020*

**Figure 22. Pedestrian and Bicyclist Crashes by Severity (2010-2019)**




*Source: SRF Consulting Group, 2020*

## All Crashes (2015-2019)

A total of 308 crashes were reported along Arcade Street (US 61) over the last five years (see Figure 26 and Figure 27). This equates to a crash frequency of 62 crashes per year and a crash density of 257 crashes per mile for the 1.2-mile corridor. Over 90 percent of crashes occurred at intersections (284 total), with nearly 60 percent of those (180) concentrated at the six signalized intersections in the study area. Crashes were evenly distributed by day of the week and month of the year; however, a significant number of crashes were observed between 3:00 p.m. and 6:00 p.m. which accounts for over 40 percent of all crashes.

A total of 40 crashes involved a young motorist or non-motorist (18 years or younger), which equates to 13 percent of all recorded crashes along Arcade Street (US 61). This illustrates how in addition to a high number of children being involved in crashes while primarily walking across Arcade Street (US 61), high schoolers that are new drivers also included in a significant portion of total crashes.

The top six intersections by number of recorded crashes along Arcade Street (US 61) are listed below, of which the top four are signalized (see Figure 23).

- Maryland Avenue: 81 (25 percent of total)
- Wheelock Parkway: 41 (13 percent of total)
- Case Avenue: 22 (seven percent of total)
- Ivy Avenue: 15 (five percent of total, half of all crashes involved a teenager aged 15 to 18)
- Jenks Avenue and York Avenue: 14 each (4.5 percent of total per intersection)

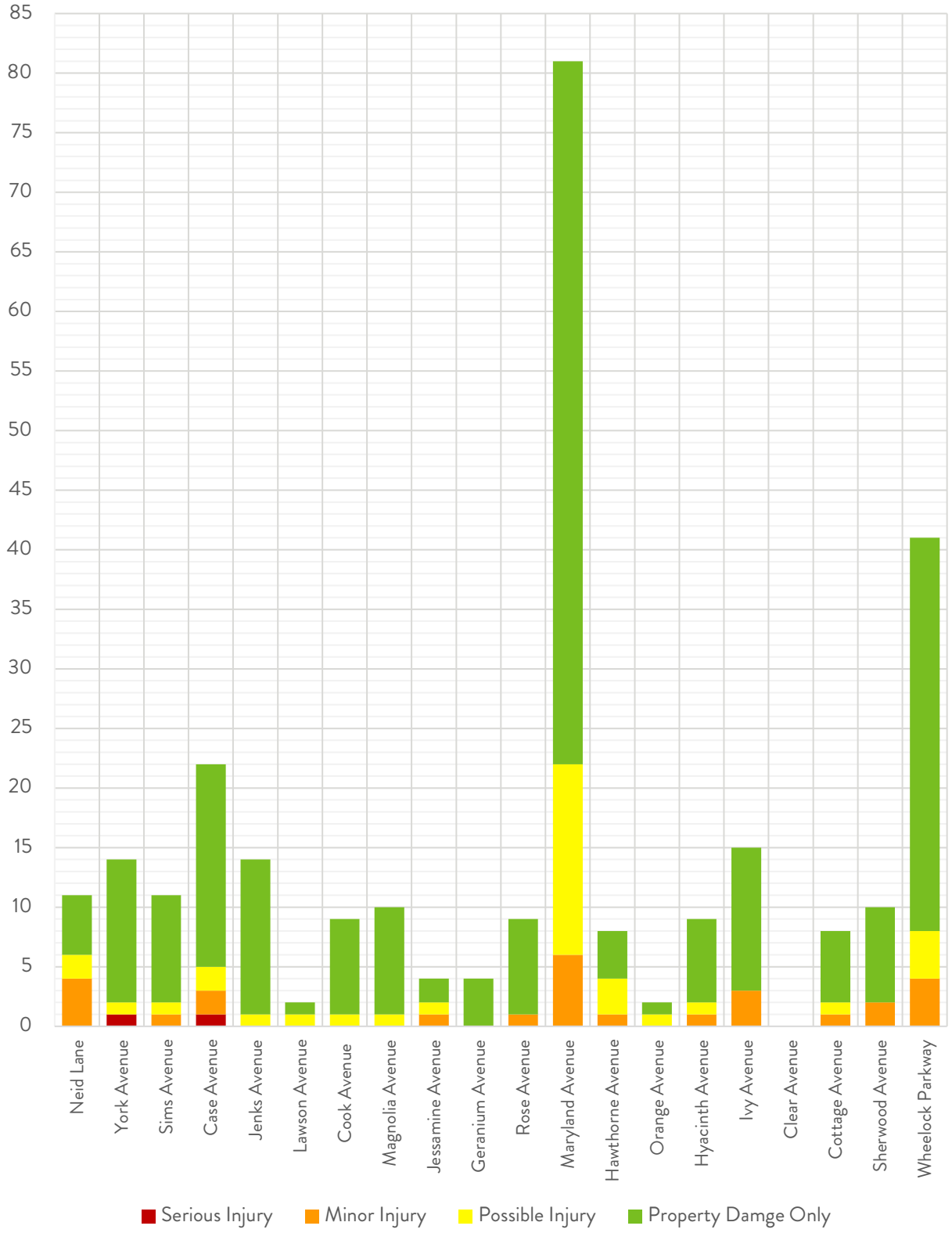
The frequent manner of collision at these high-crash locations were angle, rear-end, and left-turn crashes (see Figure 28). However, failure to yield was the top contributing factor in injury crashes at each location. The top contributing factors at Ivy Avenue, where younger drivers are potentially accessing Johnson Senior High School, were failure to yield right-of-way and driver distraction.

Notably, over 30 percent of all crashes were hit-and-run and approximately 12 percent involved a collision with a parked/stalled vehicle. Other frequent crash types along the corridor include angle crashes (22 percent) and rear-end collisions (17 percent), which were most common at signalized intersections.

A total of 24 crashes were recorded at a mid-block location with nearly 50 percent within a two-block segment of Arcade Street from Neid Lane to Sims Avenue. Much of this is driven by crashes recorded at driveways between Neid Lane and York Avenue.

Crash rates or other comparative safety data analysis was not considered due to the scope of this Study. This could be further analyzed as a part of the concurrent MnDOT project.

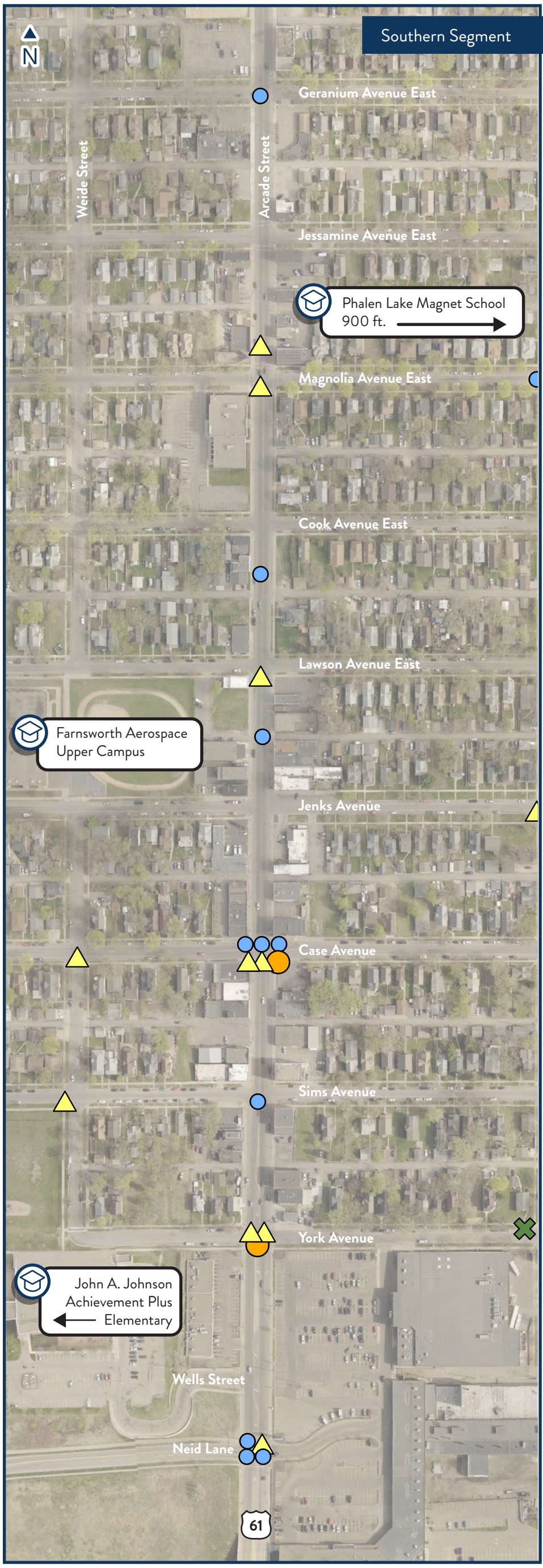
**Figure 23. All Intersection Crashes by Severity (2015-2019)**




*Source: SRF Consulting Group, 2020*

Northern Segment

Southern Segment


**Pedestrian and Bicycle Crashes by Severity (2010-2019)**

St. Paul, MN

Figure 24

Focus School

Fatal

Serious Injury

Minor Injury

Possible Injury

Property Damage Only

Unknown Severity

*Note: Circle size is not relevant to presented data.*

Northern Segment

Southern Segment

N

61

Wheelock Parkway East

Arcade Street

Sherwood Avenue

Cottage Avenue East

Clear Avenue

Johnson Senior High School

Ivy Avenue East

Farnsworth Aerospace
Lower Campus

Hyacinth Avenue East

Orange Avenue East

Hawthorne Avenue East

Weide Street

Maryland Avenue East

Rose Avenue East

0 250 500 ft

Geranium Avenue East

Jessamine Avenue East

Phalen Lake Magnet School
900 ft.

Magnolia Avenue East

Cook Avenue East

Lawson Avenue East

Farnsworth Aerospace
Upper Campus

Jenks Avenue

Case Avenue

Sims Avenue

York Avenue

John A. Johnson
Achievement Plus
Elementary

Wells Street

Neid Lane

61

**Pedestrian and Bicycle Crash Density (2010-2019)**

St. Paul, MN

Figure 25

Focus School

Higher Crash Density

Lower Crash Density

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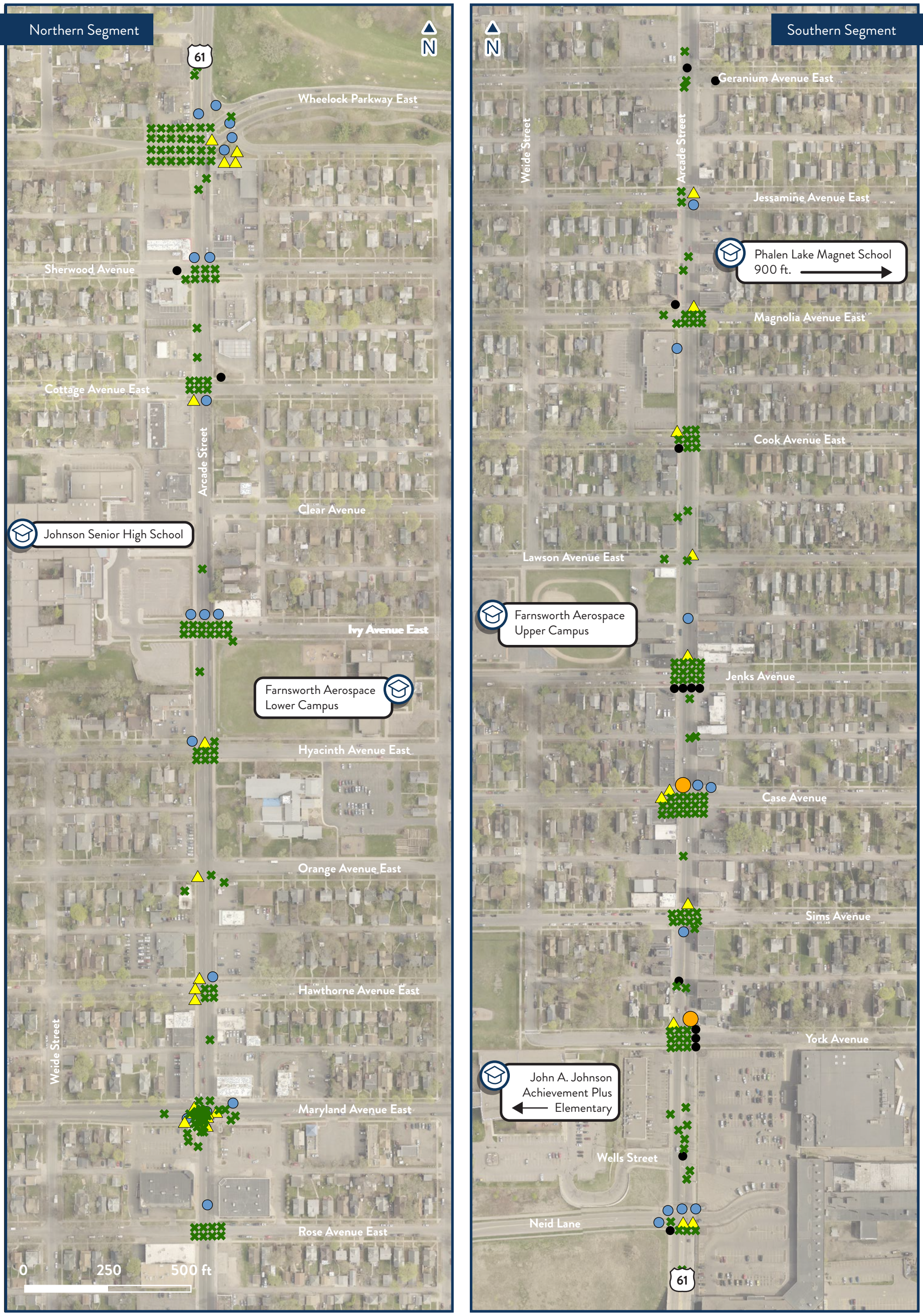
Northern Segment

Southern Segment




**All Crashes by Severity (2015 - 2019)**

St. Paul, MN

Figure 26

- Focus School
- Fatal
- Serious Injury
- Minor Injury
- Possible Injury
- Property Damage Only
- Unknown Severity

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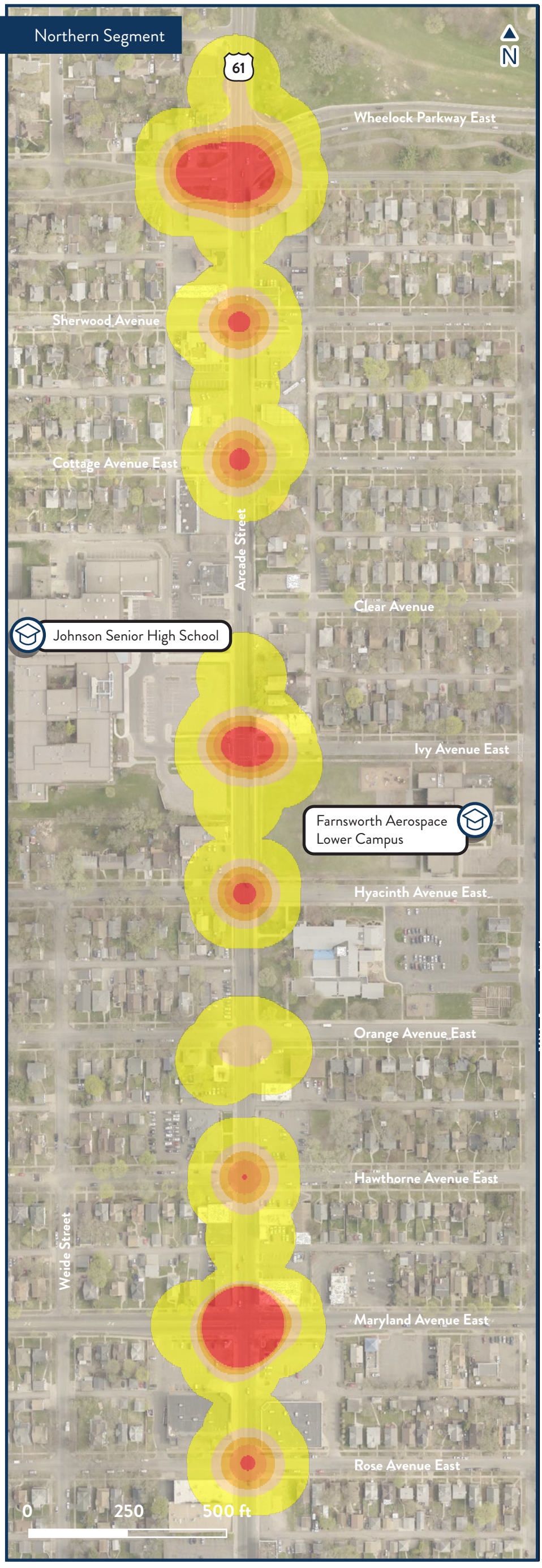
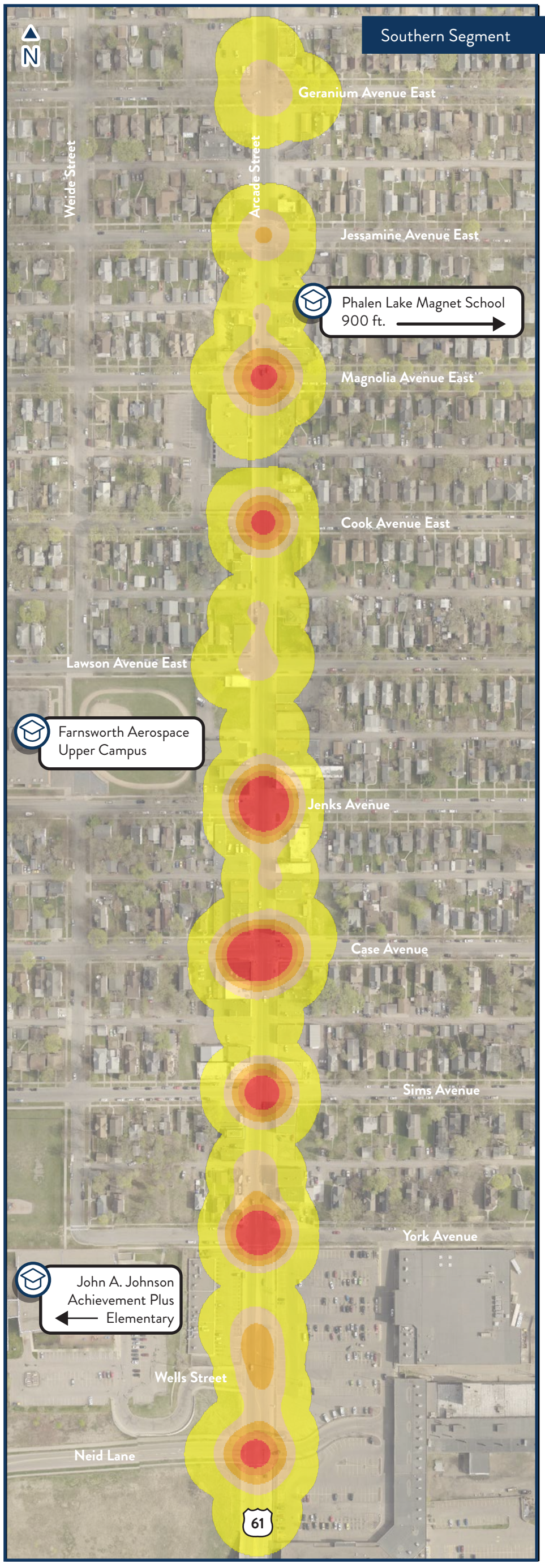
## Northern Segment




## Southern Segment




**All Crashes Density (2015-2019)**

St. Paul, MN

Figure 27

Focus School

Higher Crash Density

Lower Crash Density

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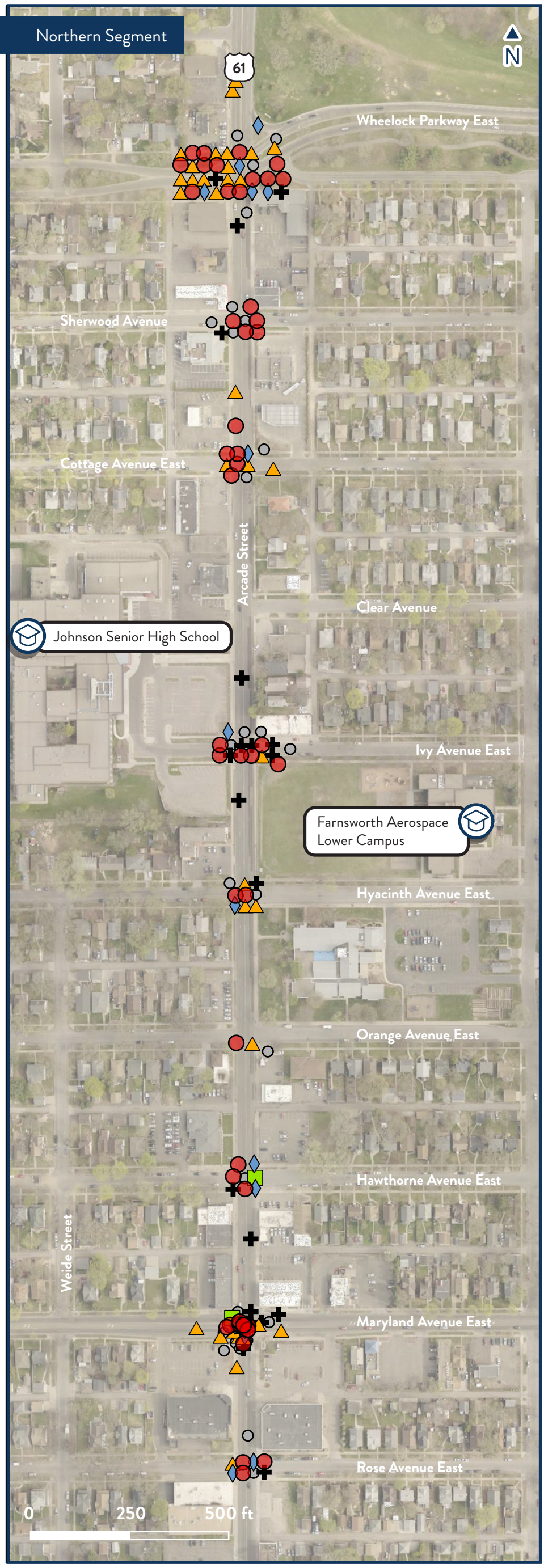
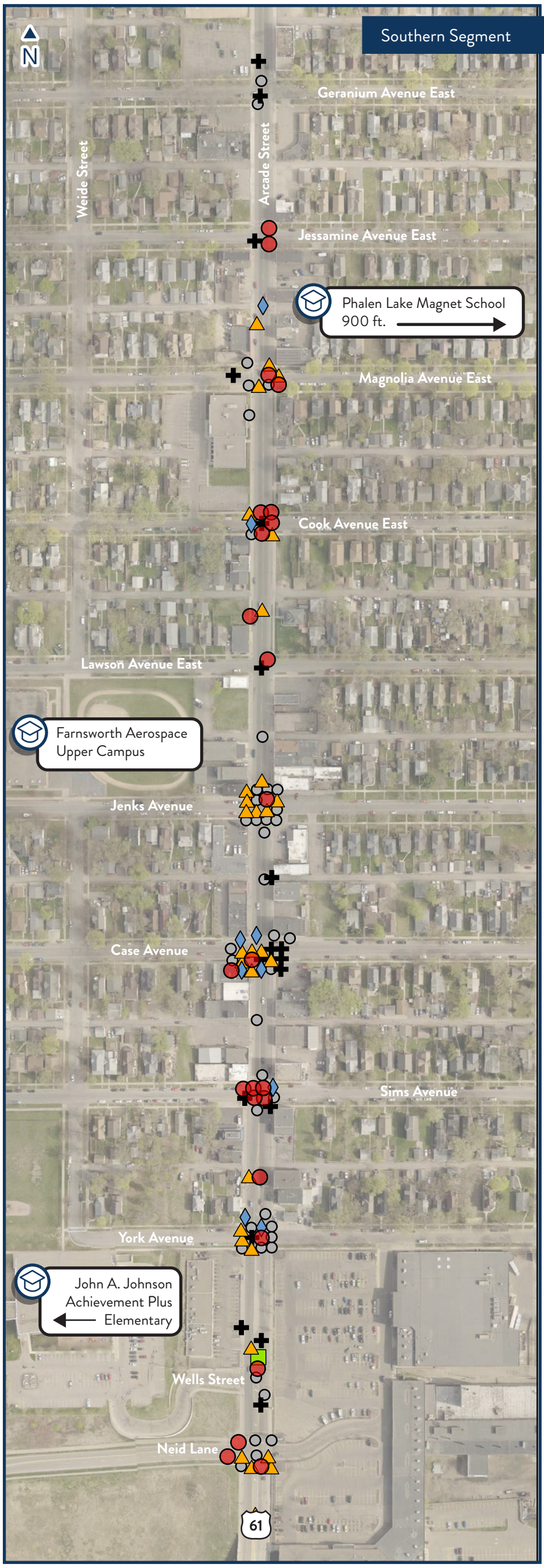
MINNESOTA SAFE ROUTES TO SCHOOL

Northern Segment

Southern Segment




**All Crashes by Manner of Collision (2015-2019)**

St. Paul, MN

Figure 28

- Focus School
- Angle
- Front to Front
- Front to Rear
- Sideswipe
- Rear to Side
- Other

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MINNESOTA SAFE ROUTES TO SCHOOL

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# CHAPTER 3: ISSUE IDENTIFICATION AND NEEDS SUMMARY

The next step in the planning process includes the application of existing conditions data to understand issues that will highlight areas of need. Those locations will be the focus of the Study to prioritize solutions.

## IDENTIFIED TRANSPORTATION ISSUES

The roadway design and multimodal issues for Arcade Street include broad themes organized from the issues analysis to devise key needs for further consideration (see Figure 29).

| | |
|---|---|
| **Issue #1** | Existing design of Arcade Street (i.e., lane configurations) presents safety and mobility issues for all users and hinders multimodal access to/from the five schools on, or adjacent to, the corridor. |
| **Issue #2** | High-volume, signalized intersections represent a significant barrier for children to walk, roll, or bike safely or comfortably across Arcade Street as most crashes occur at these intersections.<br>Safe and accessible crossings of Arcade Street do not exist between the signalized intersections. There are two marked crosswalks at uncontrolled locations with no other enhancements. |
| **Issue #3** | Existing sidewalk along Arcade Street is not well-maintained nor presents a comfortable and enjoyable area to walk or roll. A lack of street trees, pedestrian-scale lighting, and other improvements (e.g., ADA-compliance) create an unsafe and unwelcoming space. |

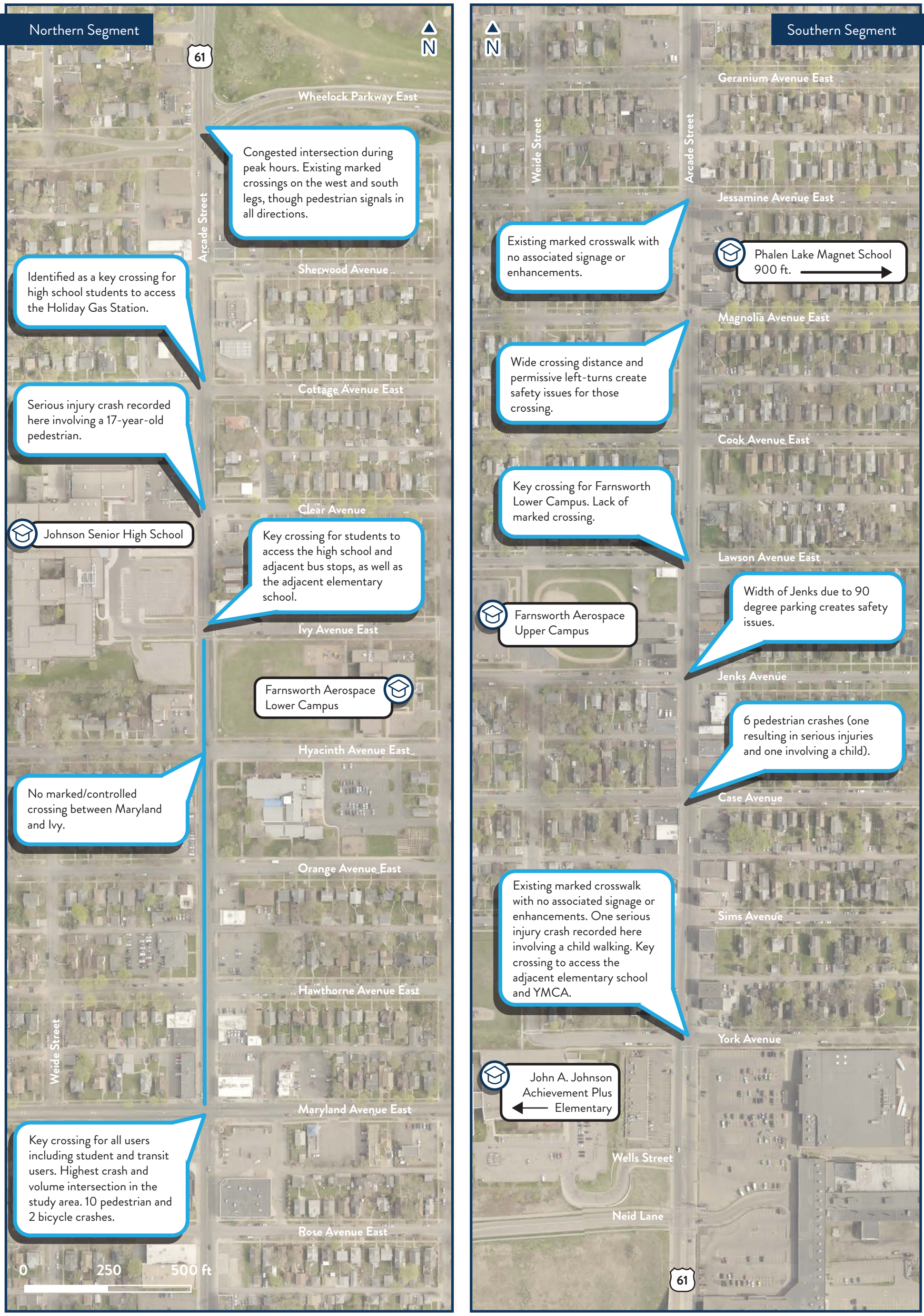
## SUMMARY OF NEEDS

The needs are informed by the broad issues defined for the Study for the corridor (see corresponding colors).

| | |
|---|---|
| **Roadway Design** | Reconstruct the roadway to improve the configuration of Arcade Street and create a corridor that is safe and accessible for users of all ages and abilities. |
| **Crossing Enhancements** | Enhance crossing infrastructure at high-volume, signalized intersections to improve connections across Arcade Street and ensure that they do not continue to be potential barriers for children.<br>Implement crossing infrastructure at key uncontrolled locations along the 1.2-mile Arcade Street corridor to create a convenient and connected multimodal transportation network. |
| **Connectivity to Walk** | Reconstruct sidewalk infrastructure along Arcade Street to enhance the comfort, accessibility, and environment of walking or rolling along the corridor, as well as access to destinations (i.e., schools, parks, businesses, etc.). |

## Northern Segment

## Southern Segment




**Identified Issues**

St. Paul, MN

Figure 29

Focus School

Identified multimodal issue

# CHAPTER 4: ALTERNATIVE EVALUATION

Potential alternatives are based upon evaluated opportunities that would improve or eliminate identified issues and needs. This section organizes potential improvements and project opportunities to address the high-level needs identified by the Study using the latest state and national guidance. Potential projects were vetted using engineering judgment and reviewed by Saint Paul Public Schools, the City of Saint Paul, Ramsey County, MnDOT, and Metro Transit.

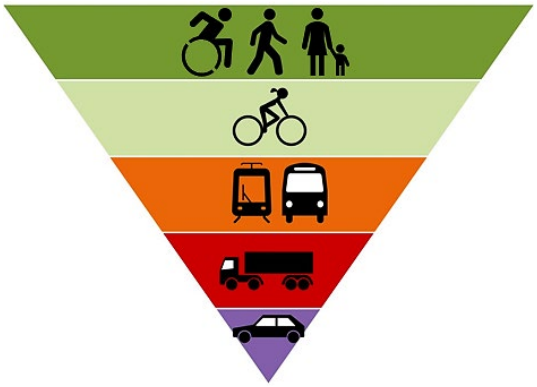
| | |
|---|---|
| **Roadway Configuration and Design** | Review alternatives for a potential four- to three-lane conversion along a portion of Arcade Street. Consider other lane configuration, access, and traffic control changes as a part of a hybrid alternative that could be implemented during the 2024 project. |
| **Major, Uncontrolled, and Side-Street Crossings** | Analysis of crossing infrastructure enhancements at all crossings of Arcade Street and the perpendicular intersecting roadways. Prioritized upgrades will improve the safety and comfort for children to overcome the barrier that Arcade Street poses. |
| **Sidewalk and Pedestrian-realm Upgrades** | Organize potential upgrades to the existing sidewalk along Arcade Street and corresponding pedestrian-realm to improve the walking experience along the corridor as the community desires. |

*Arcade Street looking north at Rose Avenue. Source: SRF Consulting Group, 2020*

# ROADWAY CONFIGURATION AND DESIGN

Four alternatives (including a "no build" scenario) were initially studied from York Avenue to Wheelock Parkway to highlight tradeoffs for future consideration and how each fulfills the needs identified by this Study. These alternatives were evaluated using a combination of existing conditions data and engineering judgment to maximize multimodal access, overall safety, and maintain reasonable traffic flows on an urban roadway. Based on this preliminary evaluation, a hybrid alternative was identified by the project team and evaluated in more detail. Further analysis for the hybrid alternative including traffic operations and queueing analysis is provided later in this document.

Note that a key consideration of future roadway configurations is the need for modal priority to ensure driving is not incentivized as set forth by the *Saint Paul For All – 2040 Comprehensive Plan (2019)* and objectives highlighted by the "6 E's" of SRTS. The image at right illustrates how walking or rolling are the modal priority for improvements along Arcade Street (US 61), followed by bicycling and transit. Driving is the least prioritized mode.



## Corridor Alternatives

The following initial corridor alternatives were evaluated from York Avenue to Wheelock Parkway:

- **No Build:** Maintain existing conditions.
- **Alternative 1:** Two-lane roadway (one travel lane in each direction) with no turn lanes at any intersection except Maryland Avenue; left-turn lanes are added along Arcade Street at Maryland Avenue.
- **Alternative 2:** Two-lane roadway (one travel lane in each direction) with left-turn lanes at all intersections.
- **Alternative 3:** Three-lane roadway with one travel lane in each direction and a continuous two-way, left-turn lane (or median).

Of note, no lane configuration changes were considered across all alternatives from Neid Lane to York Avenue due to the scope of this Study, as well as other concurrent projects studying Arcade Street and Neid Lane (i.e., the Rush Line Bus Rapid Transit project). It is recommended that further review during design development of access management along this segment be completed, as well as consideration of modifying the York Avenue intersection's south leg to reduce the existing crossing distance from a five-lane section.

## Alternatives Evaluation

A preliminary evaluation of the alternatives was performed to identify tradeoffs for each option and to measure key criteria quantitatively and qualitatively (Table 2).

- **Access**: How the roadway configuration facilitates safe and efficient access to adjacent side-streets, alleyways, and driveways.
- **Operations**: How the roadway configuration accommodates average daily traffic demand at intersections and along roadway segments.
- **Parking**: How the roadway configuration maximizes the on-street parking supply where appropriate.
- **Safety**: How the roadway configuration enhances safety for all users along and across the corridor.
- **Multimodal**: How the roadway configuration supports safe, comfortable, and convenient connections and crossings of Arcade Street for children walking, rolling, or bicycling.

**Table 2. Arcade Street Alternative Evaluation Matrix**

| | Access | Operations | Parking | Safety | Multimodal |
|---|---|---|---|---|---|
| **Existing – No Build** | – | – | – | – | – |
| **Alternative 1** | ✖ | ✖ | ✚ | ✖ | ✚ |
| **Alternative 2** | – | ✖ | – | ✚ | ✚ |
| **Alternative 3** | ✚ | ✖ | ✖ | ✚ | ✚ |
| **Hybrid Alternative** | ✚ | ✖ | – | ✚ | ✚ |

✚ = *positive impact*, – = *neutral impact*, ✖ = *negative impact*

*Source: SRF Consulting Group, 2020*

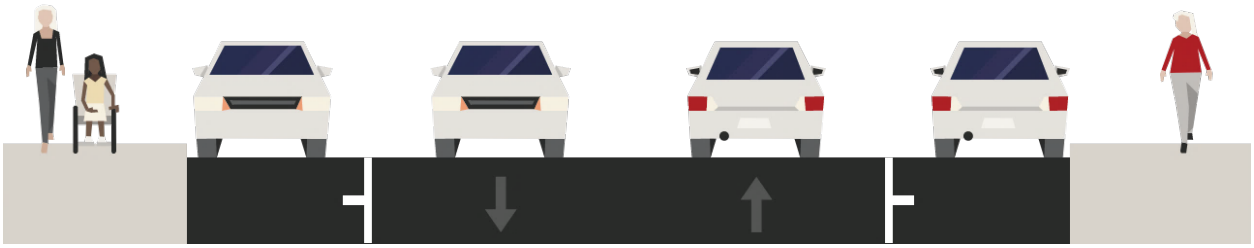
Based upon the evaluation matrix, the most favorable alternative appears to be Alternative 3 as it provides the most opportunities for improvement while limiting impacts to access. The on-street parking supply may be more limited due to the new configuration while overall safety and multimodal connectivity is improved. Shorter crossings are expected because of fewer travel lanes, while also providing opportunities for curb extensions, pedestrian island refuge medians, and/or an expanded pedestrian realm.

In November 2020, these alternatives were presented to staff from the school district, City of Saint Paul, Ramsey County, MnDOT, and Metro Transit. A hybrid alternative was further evaluated per the feedback that was received regarding a desire for combining Alternative's 2 and 3 along the south and north segments of Arcade Street (US 61), respectively. Therefore, the hybrid alternative was assumed to be the locally favored alternative for this Study, though this could change as the project continues into design development.

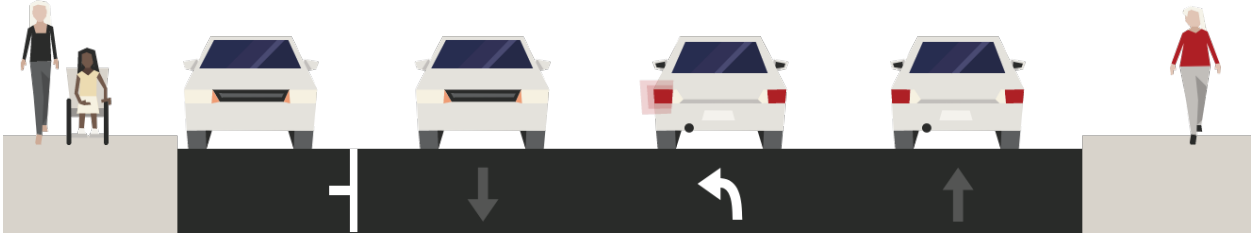
The hybrid alternative was developed with the following configurations (images illustrate potential lane configurations only and do not show additional detail to be decided upon by future design development):

- **Three-lane Section:** A four-to-three lane conversion from Geranium Avenue to Wheelock Parkway largely maintains the existing roadway capacity while improving the safety, multimodal elements, and access along that section of Arcade Street. Traffic operations worsen under all alternatives requiring a consideration of other items such as proven safety benefits from four-to-three lane conversions and opportunities for curb extensions or pedestrian island refuge medians from the lane reduction to improve and prioritize conditions for people walking, rolling, bicycling, or taking transit.

- **Two-lane Section:** Maintaining one travel lane in each direction from York Avenue to Jessamine Avenue, and not adding traffic capacity via a three-lane expansion due to the steady or largely decreasing volumes over the last 20 years and ensuring a balance with multimodal improvements to note incentivize driving (which does not align with SRTS or the City of Saint Paul's modal goals).



- **Two-lane Section:** A three-to-two lane conversion from Jessamine Avenue to Geranium Avenue. Roadway capacity could be partially maintained with turn lanes. Overall traffic operations degrade over existing conditions; however, a balanced modal approach is important, as well as considering all-day operations instead of only the peak hours which may see increased congestion from the changes.



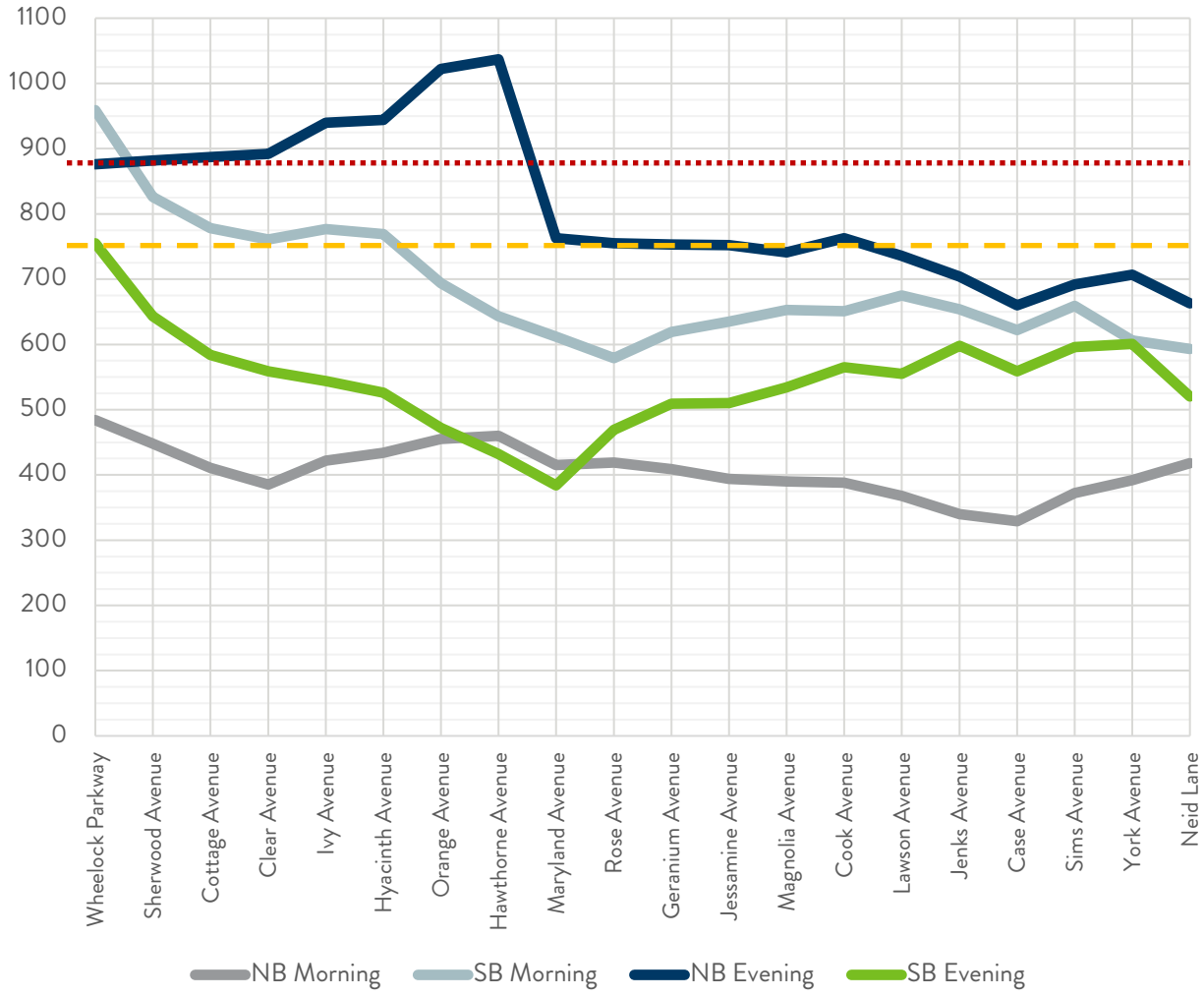
The project team confirmed the hybrid alternative approach; therefore, all potential crossing improvements evaluated as a part of this Study assumed those lane configurations. The following sections illustrate the hybrid alternative evaluation process with respect to traffic volumes, operations, queueing, parking, and access.

## Traffic Volumes

Traffic volume profiles were studied to understand how a three-lane roadway configuration could accommodate existing traffic volumes during the morning and evening peak hours, as well as over a 13-hour period (6:00 a.m. to 7:00 p.m.).

Using the peak hour volume approach, most of Arcade Street would be under the threshold capacity for a three-lane roadway during both peak periods (see Figure 30). Traffic volumes along Arcade Street from Maryland Avenue to the south are low enough to continue to be a two-lane roadway. The only section that would potentially exceed the capacity of a three-lane roadway is the northbound direction during the evening peak hour from Maryland Avenue to Sherwood Avenue. However, the peak hour volume profile illustrates only two hours of the day where traffic volumes could exceed the hybrid alternative's planning level capacity.

**Figure 30. Arcade Street Peak Hour Volume Profile**




*= three-lane roadway at-capacity* *= three-lane roadway approaching capacity*

*Volumes derived from peak hour TMCs at signalized intersections from 2018 and balanced using StreetLight and engineering judgment.*

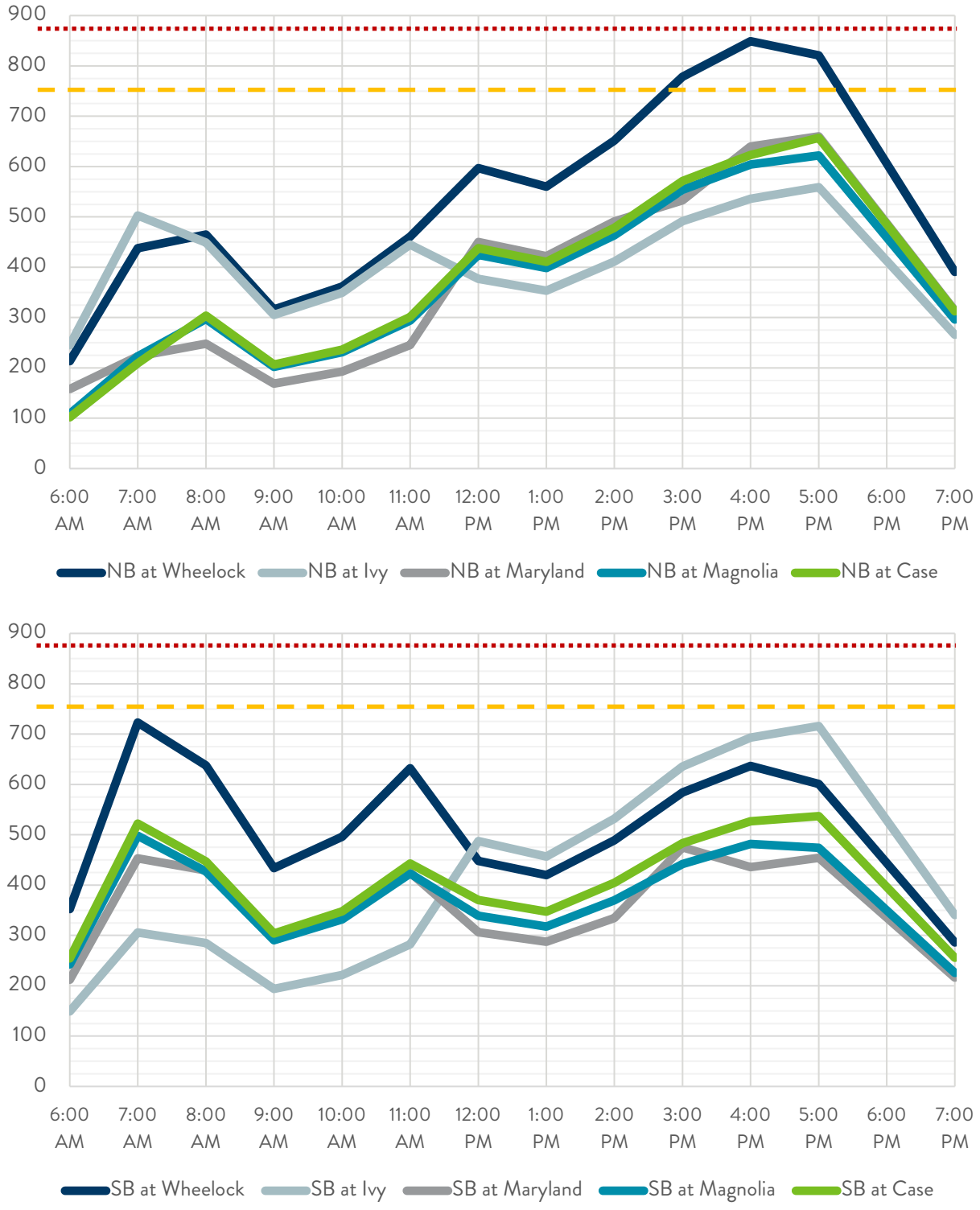
*Source: SRF Consulting Group, 2020*

Using the 12-hour hour volume profiles, northbound and southbound traffic was studied at five signalized intersections (see Figure 31). All southbound traffic volumes are below the capacity of a three-lane roadway; some sections are considerably lower and include all signalized intersections south of Maryland Avenue. All northbound traffic volumes are also below capacity, except at Wheelock Parkway where from 3:00 p.m. to 5:00 p.m. it is estimated that traffic volumes could approach the capacity of a three-lane facility.

Overall, this approach confirms that a two-lane roadway would be acceptable south of Maryland Avenue and a three-lane facility north of Maryland would provide sufficient capacity for the majority of the day. Further analysis is required per the concurrent MnDOT study and design development, and external to the scope of this Study.


*Arcade Street looking south at Clear Avenue. Source: SRF Consulting Group, 2020*

**Figure 31. Arcade Street 12-Hour Volume Profile (northbound and southbound)**




*= three-lane roadway at-capacity* *= three-lane roadway approaching capacity*

*Volumes derived from peak hour TMCs at signalized intersections from 2018. Off-peak hours devised using NCHRP Report 365, table 41 – Urban Size of 200,000 to 499,999, page 84. Source: SRF Consulting Group, 2020*

# Traffic Operations

Traffic operations were studied using Synchro/SimTraffic 11 and the existing traffic volumes to compare current no-build operations to the hybrid alternative (see Table 3 and Figure 32).

Based on this operations analysis, the hybrid alternative largely maintains existing traffic operations with minimal increases in delay during the morning and afternoon from Neid Lane to Magnolia Avenue. From Jessamine Avenue to Wheelock Parkway, delays increase under the hybrid alternative. Most of the delay occurs from Geranium Avenue to Hyacinth Avenue, which is a result of congestion and queues from the Maryland Avenue intersection impacting adjacent intersections.

**Table 3. Hybrid Alternative Traffic Operations Comparison**

| Intersection | Traffic Control[1] | Traffic Operations | Existing (No Build) | | Hybrid Alternative | |
|---|---|---|---|---|---|---|
| | | | AM[2] | PM | AM | PM |
| Wheelock Parkway | Signal | Delay (sec) | 13 (23) | 30 (61) | 14 (27) | 46 **(>120)** |
| | | LOS | B (C) | C (E) | B (C) | D **(F)** |
| Sherwood Avenue | SSSC | Delay (sec) | 11 | 17 | 13 | 23 |
| | | LOS | B | C | B | C |
| Cottage Avenue | SSSC | Delay (sec) | 8 | 15 | 18 | 20 |
| | | LOS | A | B | C | C |
| Clear Avenue | SSSC | Delay (sec) | 8 | 8 | 24 | 17 |
| | | LOS | A | A | C | C |
| Ivy Avenue | Signal | Delay (sec) | 7 (19) | 6 (24) | 10 (21) | 9 (27) |
| | | LOS | A (B) | A (C) | A (C) | A (C) |
| Hyacinth Avenue | SSSC | Delay (sec) | 14 | 15 | **45** | 20 |
| | | LOS | B | B | **E** | C |
| Orange Avenue | SSSC | Delay (sec) | 13 | 21 | 28 | 24 |
| | | LOS | B | C | D | C |
| Hawthorne Avenue | SSSC | Delay (sec) | 9 | 17 | **>120** | 20 |
| | | LOS | A | C | **F** | C |
| Maryland Avenue | Signal | Delay (sec) | 48 **(78)** | 48 **(63)** | **67 (>120)** | **83 (116)** |
| | | LOS | D **(E)** | D **(E)** | **E (F)** | **F (F)** |

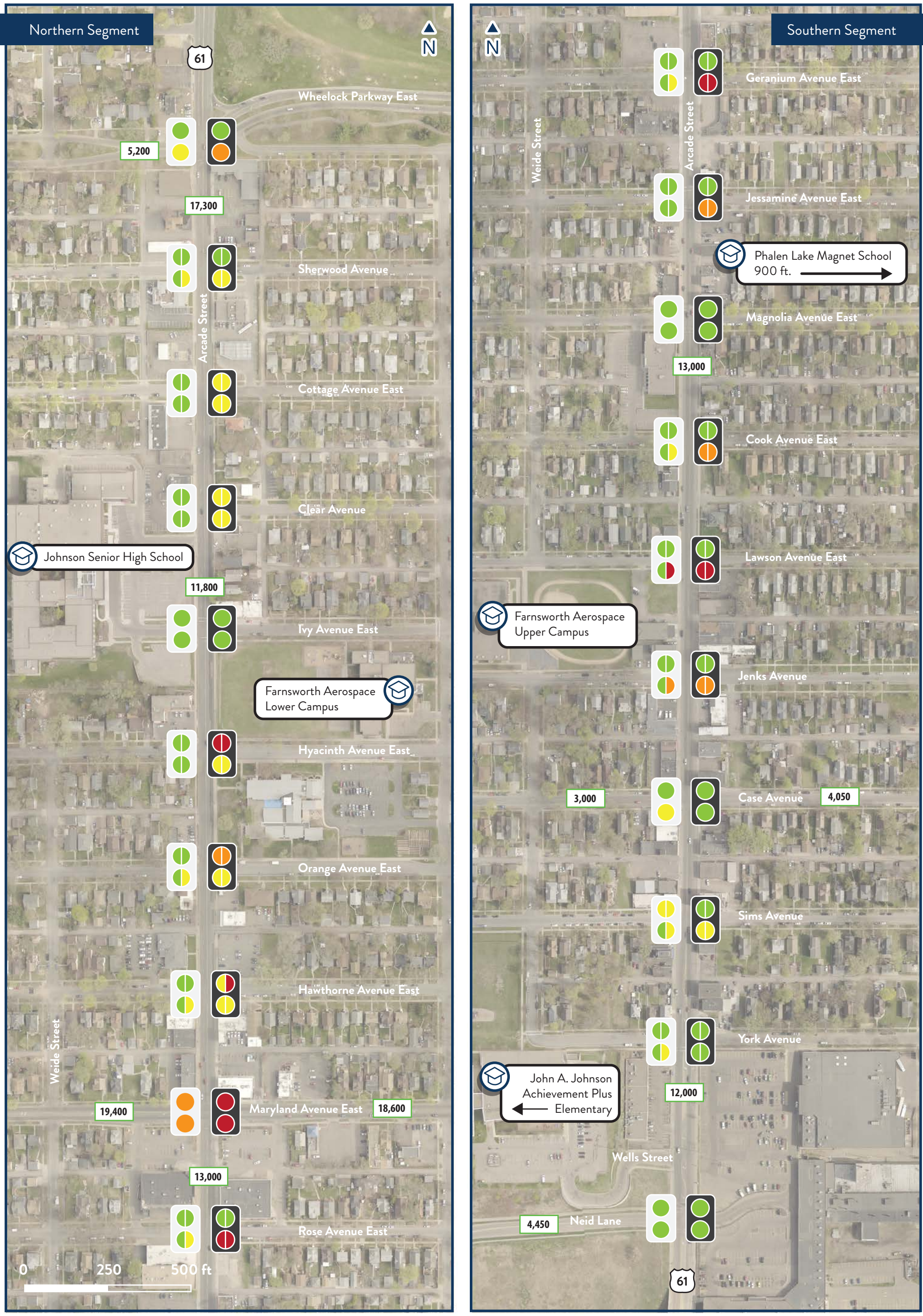
| Intersection | Traffic Control[1] | Traffic Operations | Existing (No Build) | | Hybrid Alternative | |
|---|---|---|---|---|---|---|
| | | | AM[2] | PM | AM | PM |
| Rose Avenue | SSSC | Delay (sec) | 13 | 17 | 12 | **>120** |
| | | LOS | B | C | B | **F** |
| Geranium Avenue | SSSC | Delay (sec) | 13 | 18 | 14 | **>120** |
| | | LOS | B | C | B | **F** |
| Jessamine Avenue | SSSC | Delay (sec) | 13 | 15 | 12 | 30 |
| | | LOS | B | B | B | D |
| Magnolia Avenue | Signal | Delay (sec) | 5 (29) | 7 (26) | 8 (26) | 12 (27) |
| | | LOS | A (C) | A (C) | A (C) | B (C) |
| Cook Avenue | SSSC | Delay (sec) | 13 | 23 | 12 | 35 |
| | | LOS | B | C | B | D |
| Lawson Avenue | SSSC | Delay (sec) | 11 | **68** | 12 | **36** |
| | | LOS | B | **F** | B | **E** |
| Jenks Avenue | SSSC | Delay (sec) | 14 | 28 | 12 | 34 |
| | | LOS | B | D | B | D |
| Case Avenue | Signal | Delay (sec) | 9 (32) | 15 (27) | 9 (30) | 12 (32) |
| | | LOS | A (C) | B (C) | A (C) | B (C) |
| Sims Avenue | SSSC | Delay (sec) | 17 | 24 | 13 | 16 |
| | | LOS | C | C | B | C |
| York Avenue | SSSC | Delay (sec) | 10 | 15 | 10 | 15 |
| | | LOS | A | C | B | B |
| Neid Lane | Signal | Delay (sec) | 7 (34) | 14 (29) | 7 (34) | 14 (29) |
| | | LOS | A (C) | B (C) | A (C) | B (C) |

*[1] Northbound and southbound left-turns under the hybrid alternative are analyzed as protected-permissive at all signalized intersections. Signal = traffic signal; SSSC = side-street, stop-controlled.*
*[2] All SSSC delay = worst approach. All signal delay = overall (worst approach)*
*Source: SRF Consulting Group, 2020*

Further traffic operations analysis is required per the concurrent MnDOT study, and external to the planning-level scope of this Study. Tradeoffs and modal priority considerations are likely required due to the estimated congestion that could occur during the peak hours, primarily driven by the Maryland Avenue intersection and spillback to adjacent locations.

Northern Segment

Southern Segment




**Traffic Condition Comparison: Existing & Hybrid Alternative**

St. Paul, MN

Figure 32

Focus School

EXISTING
Morning
Evening

HYBRID
Morning
Evening

Overall Intersection

Worst Movement

Level of Service
- A or B
- C
- D
- E or F

# AADT

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A sensitivity test was completed at the Maryland Avenue intersection to understand geometric opportunities to improve the significant delays and spillover that effects adjacent intersections. Based upon discussions with the project team, geometric changes were not further considered due to negative impacts to crossing safety and limited existing right-of-way. Access modifications could be considered at Rose Avenue and Hawthorne Avenue to limit conflicts as they are adjacent to Maryland Avenue. This could include right-in/right-out or three-quarter access management strategies; however, further analysis is required during design development to determine the potential impacts to traffic operations, safety, and neighborhood access.

## Traffic Queueing

A high-level study of potential queueing at each approach under the hybrid alternative was studied to understand locations where side-streets could be impacted during the morning or evening peak hours. Locations that could exceed queues greater than one city block include:

- Eastbound at Wheelock Parkway
- Eastbound, Southbound, and Westbound at Maryland Avenue
- Northbound, Eastbound, and Westbound at both Rose Avenue and Geranium Avenue

The main cause of most queueing, except for Wheelock Parkway, is deficient operations at Maryland Avenue which exacerbates adjacent intersections, most notably the two-blocks from Geranium Avenue to Rose Avenue. Further review of lane configurations, storage lane lengths, and traffic controls (i.e., protected or protected-permissive left-turns) is required during design development keeping in mind the balanced multimodal approach set forth by SRTS and the City of Saint Paul's plans.

## Corridor Operations

Overall travel time and average speed from Neid Lane to Wheelock Parkway was studied using SimTraffic 11 (Table 4). This review indicates that travel is most effected by the hybrid alternative in the peak directions during the morning and evening peak hours which are southbound and northbound, respectively.

**Table 4. Corridor Operations Comparison**

| Peak Hour | Traffic Operations | Existing (No Build) | | Hybrid Alternative | | Change | |
|---|---|---|---|---|---|---|---|
| | | NB | SB | NB | SB | NB | SB |
| Morning | Travel Time (min) | 4 | 4 | 4 | 5 | +/-0 | +1 |
| | Avg. Speed (mph) | 21 | 22 | 23 | 16 | +2 | -6 |
| Afternoon | Travel Time (min) | 5 | 5 | 6 | 4 | +1 | -1 |
| | Avg. Speed (mph) | 19 | 16 | 14 | 21 | -5 | +5 |

*Source: SRF Consulting Group, 2020*

# CROSSING IMPROVEMENTS

The study of crossing improvements across, and along, Arcade Street was performed and included both uncontrolled and controlled crossings. Roadways with higher traffic volumes and perceived speeds can become barriers for children to walk, roll, or bike safely, comfortably, and conveniently to access their school. It is critical to ensure that children can safely and comfortably cross Arcade Street due to the five schools that are on, or adjacent to the corridor. Moreover, the crash history involving pedestrian and bicyclists (and more notably children) illustrate how crossing enhancements at key locations can improve access and safety for those of all ages and abilities.

Potential crossing infrastructure was reviewed using the latest guidance from the Federal Highway Administration's (FHWA) *Safe Transportation for Every Pedestrian (STEP) Guide (2018)*, *Minnesota Manual of Uniform Traffic Control Devices (2020)*, MnDOT's *Minnesota Best Practices for Pedestrian and Bicycle Safety (2021)*, Minnesota Local Road Research Board's (LRRB) *Uncontrolled Pedestrian Crossing Guide (2020)*, Saint Paul's *Street Design Manual (2016)*, and the National Association of City Transportation Officials' (NACTO) *Urban Street Design Guide*.

Each infrastructure item has an estimated average cost using planning-level guidance found in MnDOT's *Minnesota Best Practices for Pedestrian and Bicycle Safety* or the Minnesota LRRB *Uncontrolled Pedestrian Crossing Guide*. The net benefit is described as a crash modification factor (CMF) from the Crash Modification Factors Clearinghouse. A low-cost improvement could have a high benefit illustrating how the two measures are not exclusive. Infrastructure elements were identified using location-specific engineering judgment.

## Crossing Prioritization

The 20 intersection crossings were prioritized using the following measures to quantitatively identify crossing locations that could be upgraded as a part of the concurrent rehabilitation project in 2024. This process also helps identify potential long-term improvements that could be implemented as funding opportunities arise.

**Public Input Criteria**

- **Community Feedback:** The number of times a location was identified by survey comment or the interactive map.

**Safety Criteria**

- **Child Pedestrian and Bicyclist Crashes:** The number of recorded crashes involving a child walking or bicycling between 2010 and 2019.
- **Pedestrian and Bicyclist Crashes:** The number of all recorded pedestrian and bicyclist crashes between 2010 and 2019.

- **Peak Hour Turning Volumes:** The sum of northbound and southbound right- and left-turning volumes along Arcade Street plus the sum of all side-street volumes.
- **StreetLight Pedestrian and Bicycle Demand:** The sum of the pedestrian and bicycle index per crossing which represent general demand or activity and does not demonstrate the actual count.

**Potential Demand Criteria**

- **Student Population:** The total number of students living within one-quarter of one-mile of the specific crossing point using student household location data by city block.
- **School or Destination for Children:** The number of schools or destinations that could attract children (i.e., parks, libraries, and community centers).
- **Metro Transit Bus Stop:** The number of bus stops immediately adjacent to the crossing.

**Infrastructure Criteria (Existing and Planned)**

- **Existing Marked Crossing:** If the crossing is currently marked or not.
- **Bicycle Network:** If the crossing is part of Saint Paul's existing or proposed bicycle network.
- **Previous Plan:** If the crossing was identified in a previous planning effort or study.

The crossings were numerically ranked by each of the 11 measures. The average ranking of all measures per criteria were organized to produce an overall criterion rank that illustrates how each intersection scored from a lower to higher number in order of priority. The breakdown by overall criteria shows how each intersection ranks by safety, demand, infrastructure, and public input (see Table 5). The intersections are further distilled in two ways (i.e., safety and demand criteria only and all criteria) to show the potential similarities or differences by measure or criteria, and how final prioritized improvements could be formulated as measured against each location and discussed further in Chapter 5 (see Table 6). Uncontrolled crossings were also ranked using the two distillation methods due to the skew presented by higher-activity signalized intersections (see Table 7). However, crossings could be implemented in any order as funding allows, stakeholders desire, and/or new multimodal infrastructure crossing Arcade Street is built (see Appendix B for the Excel tool).

Of note, mid-block crossings were not considered due to community feedback where very few do not cross at an intersection. Given the urban context and equal block spacing for a potential crossing every 300 feet, any crossing infrastructure should be focused on the intersections.

### Table 5. Arcade Street Crossing Ranking by Criteria

| Intersection | Safety | Intersection | Demand | Intersection | Infrast-ructure | Intersection | Public Input |
|---|---|---|---|---|---|---|---|
| Maryland Avenue | 1.3 | Maryland Avenue | 3.3 | Wheelock Parkway | 1 | Maryland Avenue | 1 |
| Case Avenue | 3.0 | Magnolia Avenue | 4.3 | Neid Lane | 1 | Ivy Avenue | 1 |
| York Avenue | 5.0 | York Avenue | 5.3 | Case Avenue | 1 | Cottage Avenue | 3 |
| Ivy Avenue | 5.3 | Lawson Avenue | 5.5 | Jessamine Avenue | 1 | Jenks Avenue | 4 |
| Wheelock Parkway | 6.5 | Case Avenue | 5.8 | Maryland Avenue | 5 | Case Avenue | 5 |
| Neid Lane | 6.8 | Ivy Avenue | 6.3 | Hyacinth Avenue | 5 | York Avenue | 6 |
| Rose Avenue | 7.8 | Cottage Avenue | 6.6 | Ivy Avenue | 7 | Lawsone Avenue | 6 |
| Cottage Avenue | 8.3 | Geranium Avenue | 6.6 | York Avenue | 7 | Wheelock Parkway | 6 |
| Lawson Avenue | 9.0 | Rose Avenue | 7.4 | Lawson Avenue | 7 | Rose Avenue | 6 |
| Jenks Avenue | 9.5 | Jenks Avenue | 7.6 | Jenks Avenue | 7 | Hyacinth Avenue | 6 |
| Hawthorne Avenue | 10.0 | Cook Avenue | 8.2 | Magnolia Avenue | 7 | Neid Lane | 6 |
| Hyacinth Avenue | 10.3 | Sims Avenue | 8.3 | Cottage Avenue | 12 | Jessamine Avenue | 6 |
| Geranium Avenue | 10.3 | Jessamine Avenue | 9.3 | Geranium Avenue | 12 | Geranium Avenue | 6 |
| Orange Avenue | 10.8 | Orange Avenue | 9.9 | Rose Avenue | 12 | Orange Avenue | 6 |
| Magnolia Avenue | 12.3 | Wheelock Parkway | 10.6 | Sims Avenue | 12 | Magnolia Avenue | 6 |
| Sims Avenue | 12.3 | Hyacinth Avenue | 10.8 | Orange Avenue | 12 | Sims Avenue | 6 |
| Sherwood Avenue | 12.3 | Neid Lane | 10.9 | Sherwood Avenue | 12 | Sherwood Avenue | 6 |
| Clear Avenue | 12.5 | Clear Avenue | 11.9 | Clear Avenue | 12 | Clear Avenue | 6 |
| Jessamine Avenue | 13.3 | Hawthorne Avenue | 12.3 | Hawthorne Avenue | 12 | Hawthorne Avenue | 6 |
| Cook Avenue | 13.8 | Sherwood Avenue | 13.8 | Cook Avenue | 12 | Cook Avenue | 6 |

*Source: SRF Consulting Group, 2020*

The comparative ranking shows how the top four intersections do not change when tested for either safety and demand measures only, or all criteria. When all criteria are measured and ranked, signalized intersections rise to the top even if they do not represent a key location for the purposes of SRTS (i.e., Neid Lane). A combination of both rankings, along with engineering judgment, was used to formulate priority crossing locations further detailed in Chapter 5.

**Table 6. Arcade Street Crossing Prioritization (all intersections)**

| Intersection | Safety + Demand | Intersection | All Criteria |
|---|---|---|---|
| Maryland Avenue | 2.3 | Maryland Avenue | 2.6 |
| Case Avenue | 4.4 | Case Avenue | 3.7 |
| York Avenue | 5.1 | Ivy Avenue | 4.9 |
| Ivy Avenue | 5.8 | York Avenue | 5.8 |
| Lawson Avenue | 7.3 | Wheelock Avenue | 6.0 |
| Cottage Avenue | 7.4 | Neid Avenue | 6.2 |
| Rose Avenue | 7.6 | Lawson Avenue | 6.9 |
| Magnolia Avenue | 8.3 | Jenks Avenue | 7.0 |
| Geranium Avenue | 8.4 | Jessamine Avenue | 7.4 |
| Wheelock Parkway | 8.6 | Magnolia Avenue | 7.4 |
| Jenks Avenue | 8.6 | Cottage Avenue | 7.5 |
| Neid Lane | 8.8 | Hyacinth Avenue | 8.0 |
| Sims Avenue | 10.3 | Rose Avenue | 8.3 |
| Orange Avenue | 10.3 | Geranium Avenue | 8.7 |
| Hyacinth Avenue | 10.5 | Sims Avenue | 9.6 |
| Cook Avenue | 11.0 | Orange Avenue | 9.7 |
| Hawthorne Avenue | 11.1 | Cook Avenue | 10.0 |
| Jessamine Avenue | 11.3 | Hawthorne Avenue | 10.1 |
| Clear Avenue | 12.2 | Clear Avenue | 10.6 |
| Sherwood Avenue | 13.0 | Sherwood Avenue | 11.0 |

*Source: SRF Consulting Group, 2020*

Due to the weight of signalized intersections when ranked with all 20 study intersections, a test of reviewing only uncontrolled locations was completed to see how the rankings may change. The top five intersections remain the same between the two rankings of criteria. Furthermore, the top five uncontrolled intersections are in the top ten for at least one of the two overall rankings when included with the signalized intersections in the previous table.

**Table 7. Arcade Street Crossing Prioritization (uncontrolled crossings only)**

| Intersection | Safety + Demand | Intersection | All Criteria |
|---|---|---|---|
| York Avenue | 2.8 | York Avenue | 2.9 |
| Lawson Avenue | 3.8 | Lawson Avenue | 3.4 |
| Cottage Avenue | 4.0 | Jenks Avenue | 3.6 |
| Rose Avenue | 4.0 | Cottage Avenue | 3.8 |
| Jenks Avenue | 4.7 | Rose Avenue | 4.3 |
| Geranium Avenue | 5.2 | Hyacinth Avenue | 4.5 |
| Sims Avenue | 5.9 | Jessamine Avenue | 4.6 |
| Hyacinth Avenue | 6.5 | Geranium Avenue | 4.8 |
| Orange Avenue | 6.5 | Sims Avenue | 5.2 |
| Cook Avenue | 6.7 | Orange Avenue | 5.5 |
| Hawthorne Avenue | 7.1 | Cook Avenue | 5.6 |
| Jessamine Avenue | 7.2 | Hawthorne Avenue | 5.8 |
| Clear Avenue | 7.6 | Clear Avenue | 6.0 |
| Sherwood Avenue | 8.4 | Sherwood Avenue | 6.5 |

*Source: SRF Consulting Group, 2020*

## Signalized Intersections

The signalized intersections along Arcade Street represent the busiest crossings (for all modes) and serve as important connections to access the schools, as well as other destinations such as transit and parks. There are six signalized intersections along Arcade Street, of which four are either directly adjacent to a school or within one-quarter of a mile and provide the only controlled crossing of Arcade Street to access the school. These locations include Ivy Avenue, Maryland Avenue, Magnolia Avenue, and Case Avenue. Potential crossing improvements were analyzed to increase the safety and comfort for these crossings and should be considered as a part of the concurrent design project (see Table 8). Accessibility features including accessible pedestrian signals and pedestrian countdown timers should be considered as a part of future design development.

**Table 8. Crossing Infrastructure Options at Signalized Intersections**

| Infrastructure | Guidance | Avg Cost Est. | CMF |
|---|---|---|---|
| High Visibility Crosswalk Markings and Stop Bar | Continental design and at least six feet wide to provide a comfortable crossing. Stop bar minimum four feet, up to eight feet from crosswalk to limit vehicle encroachment. | $3,000 per crossing | 0.6 |
| Curb Ramps | Directional, ADA-compliant curb ramps to shorten crossing distance, reduce exposure, and enhance accessibility. | Location dependent | Unavailable |
| Hardened Centerline | Flex posts on the centerline with a modular rubber nose. Slows left-turning vehicles by impacting the turning angle. | $1,000 per crossing | Unavailable |
| No Right-Turn on Red Signage | Reduce conflicts between vehicles and people crossing by restricting right-turns at high-volume intersections. | $200 static; $3,000 LED | Unavailable |
| Leading Pedestrian Interval (LPI)[1] | Provides people crossing a minimum three second and maximum ten second head start to enter the intersection with a corresponding green signal for vehicles in the same direction. | Infrastructure dependent | 0.87 |
| Curb Extension | Maximize extension as it aligns with applicable design vehicle turning radius. Reduces the crossing distance as well as improves motorist vision of people crossing. | $2,000 to $3,500 per corner[2] | 0.55 |
| Pedestrian Island Refuge | Minimum six-feet wide, preferred eight to ten feet wide. Provides a two-stage crossing and shortens the overall crossing distance. | $25,000 to $50,000 per crossing | 0.46 – 0.54 |
| Pedestrian-scale Lighting | Adheres to illumination guidance. | $10,000 to $40,00 per intersection | 0.55 |

*[1] Range was determined by measuring the distance to clear one travel lane at 3 feet/second to 3.5 feet/second. Further analysis is required.*

*[2] $10,000 to $20,000 per corner with storm sewer impacts.*

*Source: Minnesota's Best Practices for Pedestrian and Bicycle Safety, MnDOT (2021); Manual on Uniform Traffic Control Devices (September 2020); Uncontrolled Pedestrian Crosswalk Quick Reference Guidance, Minnesota Local Road Research Board (2020); Portland Bureau of Transportation; Evaluation Report Left-turn Calming Pilot Project (2020); Crash Modification Factors Clearinghouse*

## Signal Timing

Appropriate walk and pedestrian clearance time for people that may walk slower, such as children, is important to ensure crossings are accessible. The MN MUTCD guidance includes a walk time of at least seven seconds unless the pedestrian volumes and characteristics do not support such time in which it can be reduced to four seconds.[5] The federal MUTCD provides a visual guide for crossing distance, walking speed, and pedestrian clearance time.[6] Pedestrian clearance across all signalized intersection legs should be reviewed to ensure the timing is appropriate for children walking at three feet per second if possible. The suggested timing could change if curb extensions are implemented and the existing crossing distances change.

## Protected or Protected/Permissive Left-turns

Permissive left-turn phasing can create conflict points for pedestrians crossing the street with a green light parallel to turning vehicles and motorists only looking for a gap in traffic. Implementing protected-permissive, or protected-only left-turns, would partially or fully separate left-turning traffic with pedestrians crossing. Furthermore, permissive left-turns (which all northbound and southbound signals along Arcade Street currently are) contribute to drivers accepting smaller gaps, turning at higher speeds, and trying to "sneak" through intersection following the yellow and all-red signal intervals (higher number of angle crashes). The left-turn signal control contributes to this bad behavior that endangers all users of the intersection.

## No Right-Turn On Red

Prohibiting right-turns on red can potentially reduce crashes that involve turning vehicles and pedestrians by eliminating motorists looking for gaps in traffic to complete their turn while not seeing if someone is crossing (over 50 percent of multimodal crashes were angle). Static or electronic signs can be used (example of a LED sign at right). Right-turn prohibitions may be signed to occur during specific times of day or can be blank-out which means it is dark unless activated by a crosswalk-push button.

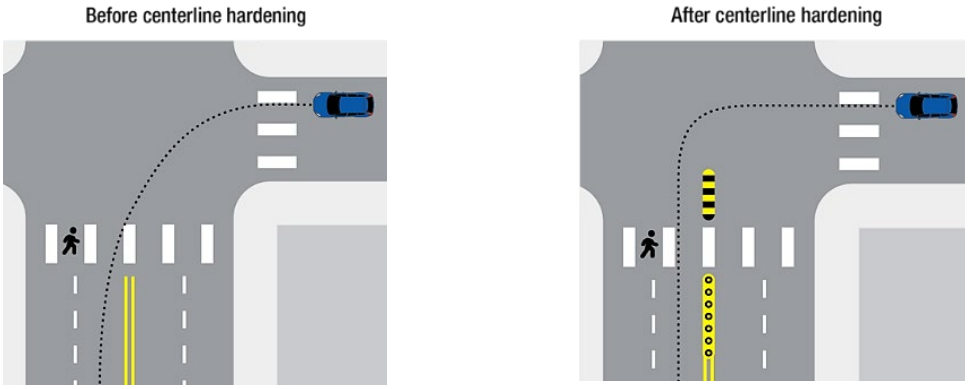
## Leading Pedestrian Interval

The MN MUTCD has guidance for LPIs stating that at least a three second duration and up to ten seconds may be used to provide pedestrians enough time to cross at least one lane of traffic, or far enough to position pedestrians ahead of right- and/or left-turning vehicles before traffic is released. To identify a reasonable time for crossing one lane of each intersection approach, a walking speed mesaure of three feet per second should be used to accommodate children who inherenlty walk slower. LPIs have been implemented along most intersections in the study area, though each should be reviewed to see how they accommodate children.

[5] Minnesota Department of Transportation. (2012). *Minnesota Manual of Uniform Traffic Control Devices*, 4E-3 – 4E-4.
[6] National Academies of Sciences, Engineering, and Medicine 2015. Signal Timing Manual - Second Edition. Washington, DC: The National Academies Press. https://doi.org/10.17226/22097.

### Hardened Centerline

The enhancement includes interconnected flex posts and a rubber modular speed bump at the nose. The New York City Department of Transportation (NYC DOT) has extensively studied the improvement and identified that left-turn speeds decreased by more than 50 percent while significantly reducing pedestrian exposure to turning vehicles. This is an effective tool at locations where right-of-way cannot accommodate curb extensions or pedestrian island refuges, or low-cost and quick build improvements are desired (discussed further in Chapter 5). The NYC DOT also tracked snow maintenance and determined that about 20 percent of hardened centerlines (out of 82 locations as of 2020) were damaged over the course of one winter season. It was noted, however, that no snowplows were damaged, and the damage to the infrastructure was low enough in cost to support the overall benefit of the enhancement.[7]




## Uncontrolled Crossings

The study of crossing improvements at uncontrolled crossings was completed to improve the connectivity across Arcade Street as it is a barrier today for children to walk, roll, or bike safely, comfortably, and conveniently to access their school. There are 14 side-street, stop-controlled intersections in the study area which are uncontrolled crossings of Arcade Street. Results from the online survey showed that many people trying to cross Arcade Street today have difficult doing so because motorists will not stop for them.

Enhancements were identified through a lens of accommodating those of all ages and abilities and increasing the number of controlled crossings to reduce the existing spacing of about one-quarter of a mile which is not convenient nor accessible (see Table 9).

Of note, Arcade Street was studied as a three-lane roadway with a median (or two-way left-turn lane) from Geranium Avenue to Wheelock Parkway, and either a three-lane without a median (or two-lanes with a turn lane) or two-lane (without a turn lane) due to the existing curb-to-curb width of Arcade Street along the other segments.

[7] New York City Department of Transportation. (2020). *Traffic Calming Program.* https://www1.nyc.gov/html/dot/html/pedestrians/turn-calming.shtml

### Table 9. Crossing Infrastructure Options at Uncontrolled Crossings

| Infrastructure | Guidance | Avg. Cost Est | CMF |
|---|---|---|---|
| High Visibility Crosswalk Marking | Continental design and at least six feet wide to provide a comfortable crossing. | $3,000 per crossing | 0.6 |
| Advanced Yield Markings | Minimum 20 feet, preferred 30-50 feet from crosswalk. Markings increase the comfort of people crossing and motorist site distance. | $1,500 per crossing | 0.75 - 0.89 |
| Curb Ramps | Directional, ADA-compliant curb ramps to shorten crossing distance, reduce exposure, and enhance accessibility. Tightened curb radii slow turning vehicles. | Location dependent | Unvail-able |
| Curb Extension | Maximize extension as it aligns with applicable design vehicle turning radius. Reduces the crossing distance as well as improves motorist vision of people crossing. | $2,000 to $3,500 per corner[1] | 0.55 |
| Pedestrian Island Refuge | Minimum six-feet wide, preferred eight to ten feet wide. Minimum 20 feet long, preferred 40 to 60 feet long. | $25,000 to $50,000 per crossing | 0.46 – 0.54 |
| Rectangular Rapid Flashing Beacon | Increases driver awareness of pedestrians crossing and has shown to produce motorist yield compliance of 70 to 95 percent. | $15,000+ (up to $100,000) each | 0.53 |
| Pedestrian Hybrid Beacon | Motorist yield compliance of over 90 percent, significantly improving the safety of crossing high-volume roadways. Mast and signal heads in each direction. | $100,000 to $170,000 each | 0.45 |
| Pedestrian-scale Lighting | Adheres to illumination guidance. | $10,000 to $40,00 per intersection | 0.55 |

[1] *$10,000 to $20,000 per corner with storm sewer impacts.*

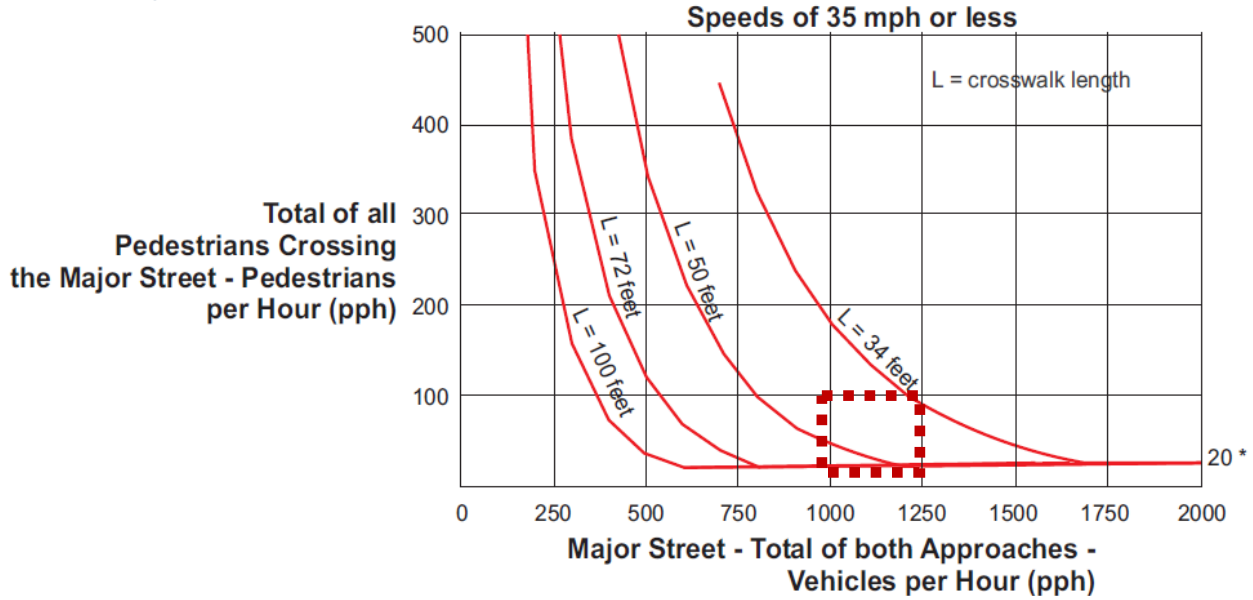
*Source: Minnesota's Best Practices for Pedestrian and Bicycle Safety, MnDOT (2021); Manual on Uniform Traffic Control Devices (September 2020); Uncontrolled Pedestrian Crosswalk Quick Reference Guidance, Minnesota Local Road Research Board (2020); Crash Modification Factors Clearinghouse*

Uncontrolled crossings of Arcade Street were studied to facilitate greater multimodal connectivity. The following guidance was reviewed for implementation of RRFBs, PHBs, or other crossing enhancements.

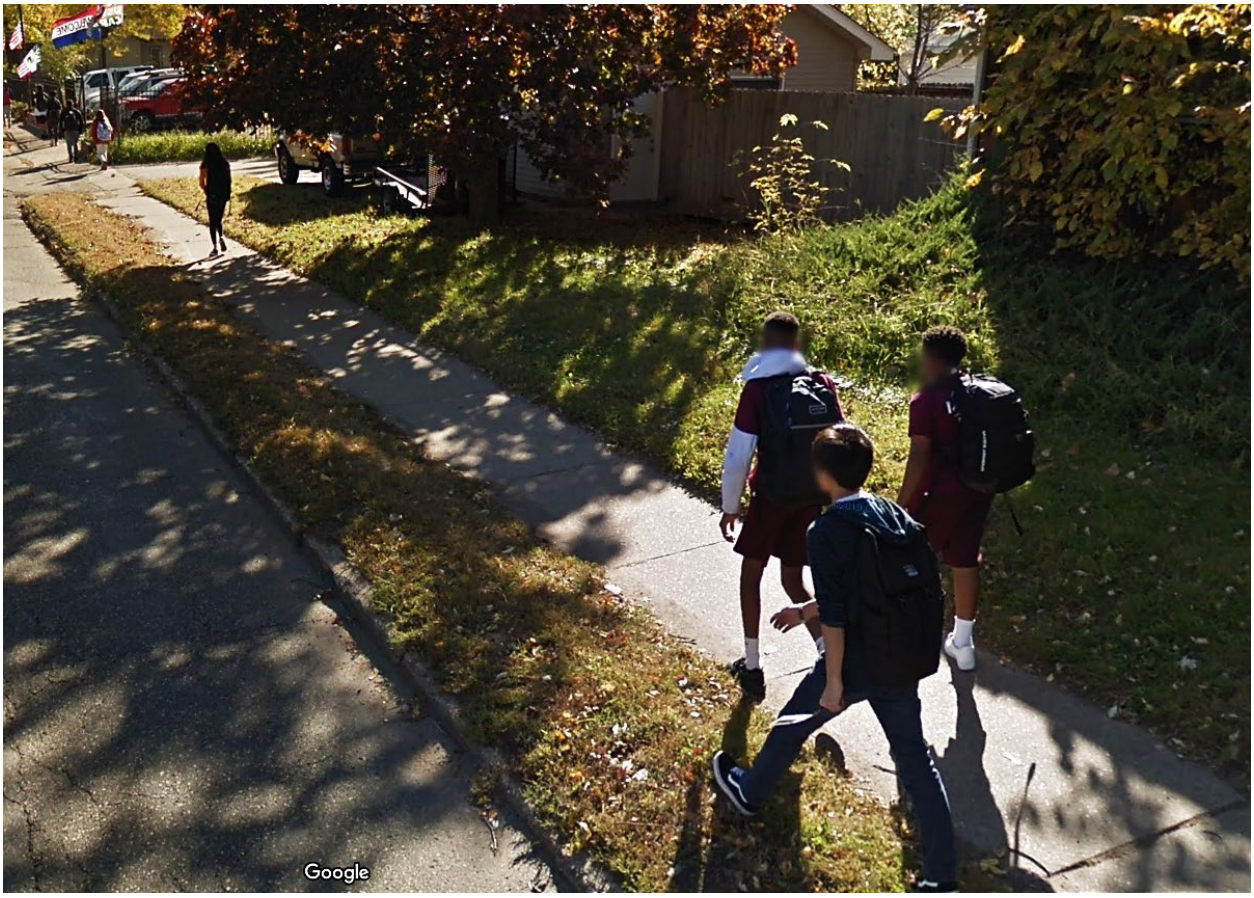
- MN MUTCD's warrant analysis for PHBs along lower speed roadways (see Figure 33)
- The FHWA's *Safe Transportation for Every Pedestrian (STEP) Guide (2018)* was reviewed to identify potential infrastructure for crossing enhancements (Figure 34).

Based on MnDOT's guidance, the peak vehicles per hour (vph) calculation was determined. The highest vph is approximately 1,200 and the crossing distance of Arcade Street is about 50 feet. This would require approximately 20 to 50 pedestrians per hour or 10 to 25 children to warrant implementation of a PHB.

**Figure 33. Arcade Street PHB Warrant Analysis for Lower Speed Roadways (<35 mph)**




▪▪ = *hourly range of the sum for peak hour northbound and southbound volumes*
*Minimum threshold of 20 pedestrian per hour or 10 children per hour if near a school.*
*Source: Minnesota MUTCD (September 2020)*




*Children walking along Arcade Street immediately south of Hyacinth Avenue. Source: Google Streetview*

## Figure 34. Arcade Street FHWA STEP Guidance Analysis

| Roadway Configuration | Posted Speed Limit and AADT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Vehicle AADT <9,000 | | | Vehicle AADT 9,000–15,000 | | | Vehicle AADT >15,000 | | |
| | ≤30 mph | 35 mph | ≥40 mph | ≤30 mph | 35 mph | ≥40 mph | ≤30 mph | 35 mph | ≥40 mph |
| **2 lanes** (1 lane in each direction) | ● 2 4 5 6 | ● 5 6 7 9 | ① 5 6 ● 9 | ● 4 5 6 | ● 5 6 7 9 | ① 5 6 ● 9 | ● 4 5 6 7 9 | ① 5 6 7 9 | ① 5 6 ● 9 |
| **3 lanes with raised median** (1 lane in each direction) | ● 2 3 4 5 | ● ❸ 5 7 9 | ① ❸ 5 ● 9 | ① 3 4 5 7 9 | ① ❸ 5 ● 9 | ① ❸ 5 ● 9 | ① ❸ 4 5 7 9 | ① ❸ 5 ● 9 | ① ❸ 5 9 |
| **3 lanes w/o raised median** (1 lane in each direction with a two-way left-turn lane) | ● 2 3 4 5 6 7 9 | ● ❸ 5 6 7 9 | ① ❸ 5 6 9 | ① 3 4 5 6 7 9 | ① ❸ 5 6 ● 9 | ① ❸ 5 6 9 | ① ❸ 4 5 6 7 9 | ① ❸ 5 6 9 | ① ❸ 5 6 9 |
| **4+ lanes with raised median** (2 or more lanes in each direction) | ● ❸ 5 7 8 9 | ● ❸ 5 7 8 9 | ① ❸ 5 8 9 | ① ❸ 5 7 8 9 | ① ❸ 5 ● 8 9 | ① ❸ 5 8 9 | ① ❸ 5 ● 8 9 | ① ❸ 5 8 9 | ① ❸ 5 8 9 |
| **4+ lanes w/o raised median** (2 or more lanes in each direction) | ● ❸ 5 6 7 8 9 | ① ❸ 5 ❻ 7 8 9 | ① ❸ 5 6 8 9 | ① ❸ 5 6 7 8 9 | ① ❸ 5 ❻ ● 8 9 | ① ❸ 5 ❻ 8 9 | ① ❸ 5 6 ● 8 9 | ① ❸ 5 ❻ 8 9 | ① ❸ 5 ❻ 8 9 |

Given the set of conditions in a cell,

- # Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location.
- ● Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location.
- ○ Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.*

The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.

1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs
2 Raised crosswalk
3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line
4 In-Street Pedestrian Crossing sign
5 Curb extension
6 Pedestrian refuge island
7 Rectangular Rapid-Flashing Beacon (RRFB)**
8 Road Diet
9 Pedestrian Hybrid Beacon (PHB)**

= *Arcade Street*

*Source: Safe Transportation for Every Pedestrian (STEP) Guide (2018), Federal Highway Administration*

The FHWA's STEP Guide supports the implementation of an RRFB or PHB, among other improvements, per the existing AADT, posted speed limit, and three-lane roadway configuration. If a two-lane section with no turn lanes is present, then RRFBs may not be warranted, though engineering judgment is required to ensure the crossing is accessible for people of all ages and abilities. A two-lane section with a turn-lane should be considered three-lanes. All three-lane sections would warrant an RRFB at minimum, unless a PHB is warranted. Further analysis is required per the concurrent MnDOT study and design development of the future project.

## Other Considerations

### Access Modifications

Side-street access closures could double as a pedestrian island refuge at key locations. Four were identified by this Study due to either their classification as future bike boulevards (Hyacinth Avenue and Jessamine Avenue) or proximity to Maryland Avenue (Rose Avenue and Hawthorne Avenue). A nearby example at Maryland Avenue and Greenbrier Street shows one way of how this could be accomplished (see below).

*Source: Google Maps*

### Side-Street Crossings

Appropriate side-street traffic controls and crossing enhancements should be considered in addition to enhancements at key intersections along Arcade Street. Of note, most side-streets along Arcade Street have a crossing width of 40 or more feet which is considerably wider than required for low-volume intersection legs with no marked turn lanes. Curb extensions installed concurrently could significantly enhance crossings not only of Arcade Street but also those walking along Arcade Street. Sight distance could also be improved as right-turning vehicles today can slip around queued left-turning vehicles which creates unsafe conditions.

A critical side-street crossing to consider such improvements is the westbound leg of Jenks Avenue where the crossing distance is 50 feet (greater than Arcade Street), and 90-degree parking is allowed that contributes to hazards for all users using the intersection. The north leg crosswalk is skewed, creating an unnecessary jog, and crossing distance. Improvements to this specific location have been identified in previous studies as well.

# PEDESTRIAN-REALM UPGRADES

Upgrades and enhancements to the sidewalk system and pedestrian-realm along Arcade Street were identified as a priority by the community from the online survey. A brief overview of potential considerations for the concurrent rehabilitation project are highlighted as that effort continues into design development.

## Sidewalk

Sidewalk connectivity is a critical piece of multimodal infrastructure, providing space for children to walk, run, skate and play, and bike (if younger).[8] Providing sidewalk facilities can reduce pedestrian crashes by up to 88 percent per the FHWA when compared to walking in the roadway.

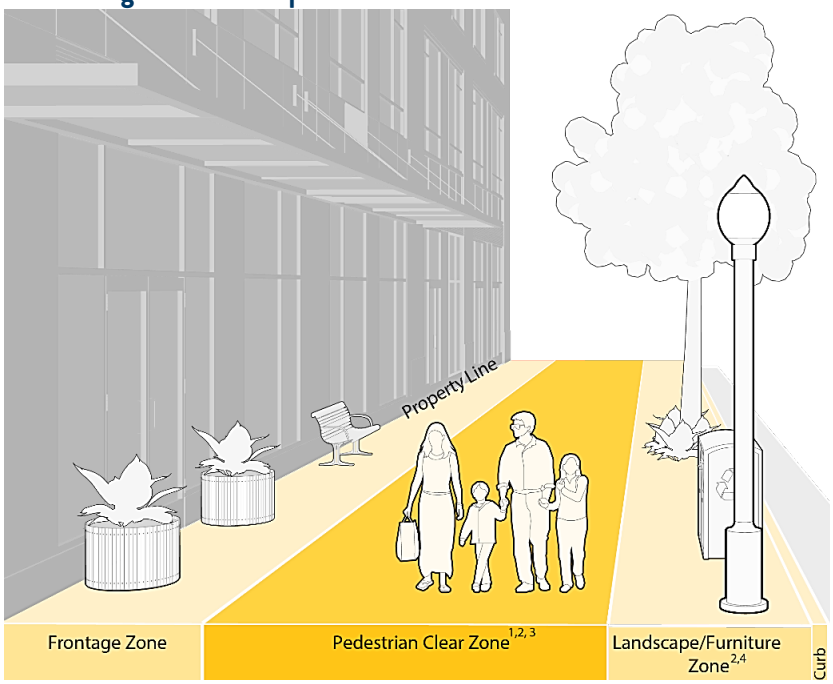
Adequately maintained sidewalks are important toward ensuring people of all ages and abilities can access their destination, including children walking or rolling to school. Sidewalks along Arcade Street should be further reviewed for future maintenance and upgrades. A preliminary review identified locations with heaving, cracks, and uneven sidewalk that could prevent a mobility challenged child from using the sidewalk and creating general safety hazards (i.e., tripping, etc.).

Sidewalk widening is another consideration that could benefit children accessing the schools who typically like to walk in groups or alongside an adult. Existing sidewalks are primarily six feet wide with a two-foot buffer (for signage, no landscaping present). The clear zone of a sidewalk is the unobstructed width of the sidewalk and must be a minimum of four feet per the Americans with Disabilities Act of 1990 (ADA) (see Figure 35).

The City of Saint Paul's Street Design Manual (2016) was reviewed to understand the desired sidewalk width along Arcade Street per local guidance (see Figure 36). The Manual would recommend a 11-foot-wide to 16-foot-wide pedestrian realm due to the corridor's classification as mixed-use and include appropriate street furniture, street trees/landscaping, lighting, and other amenities. The existing public realm is only 8-feet-wide today including the sidewalk and narrow buffer which does not align with guidance. The proposed cross-sections could provide opportunities to widen sidewalk by reducing travel lanes and potentially eliminating on-street parking. Exact increases in widths are dependent upon future design development.

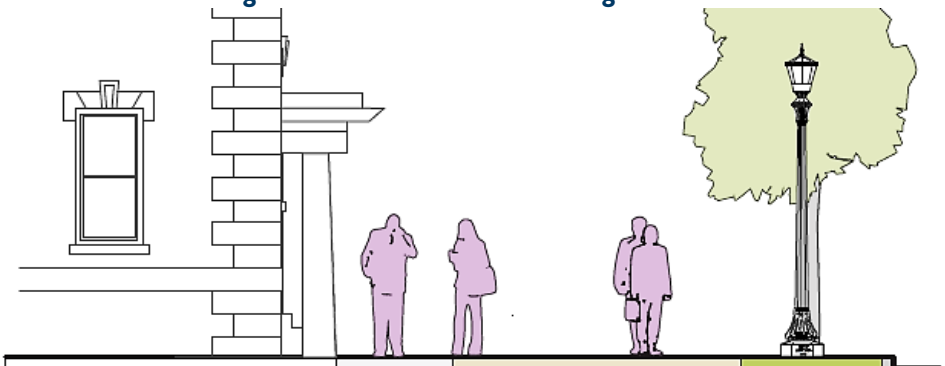
[8] Saferoutesinfo.org. (n.d.). *Sidewalks.* http://guide.saferoutesinfo.org/engineering/sidewalks.cfm#corridor

**Figure 35. Example of Sidewalk Pedestrian Clear Zones**




*Source: City of Seattle*

**Figure 36. Saint Paul Street Design Manual**



| STREET TYPE | Frontage Zone Pref. | Frontage Zone Min. des. | Pedestrian Zone Preferred | Pedestrian Zone Minimum Desirable | Boulevard & Furnishings Zone Pref. | Boulevard & Furnishings Zone Min. des. | Curb & Gutter (varies) |
|---|---|---|---|---|---|---|---|
| Downtown Streets | 2' | 0' | 12' | 8' | 6' | 5' | |
| Mixed-Use Corridor Streets | 2' | 0' | 8' | 6' | 6' | 5' | |
| Residential Corridor Streets | 2' | 0' | 5' | 5' | 6' | 5' | |
| Neighborhood Streets | 2' | 0' | 6' | 6' | 6' | 5' | |
| Industrial Streets | 2' | 0' | 5' | 5' | 6' | 5' | |
| Parkways | Varies | | 6' | 5' | 10' | 6' | |

Table Notes: St. Paul is a built environment. These dimensions reflect ideals which may or may not be achieved.

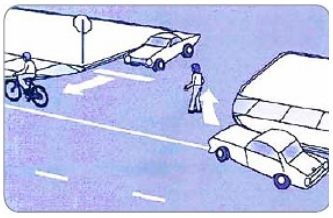
*Source: City of Saint Paul Street Design Manual (2016)*

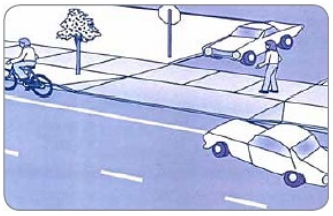
### Landscaping and Trees

There are no street trees or landscaping along Arcade Street today. Survey results from the community showed a strong desire for landscaping, benches/trash receptables, public art, and other improvements to the public realm along the corridor. From a SRTS perspective, high-quality landscaping and trees have shown to support cognitive development and improve educational experiences for children and the environment (e.g., air quality, urban heat island reduction, etc.) which aligns with the program's objectives.[9] Potential improvements should consider street trees and other landscaping to improve the walking and bicycling experience, as well as the environment. Green infrastructure, such as stormwater filtration, could also be implemented as a part of the concurrent project and align with the environmental goals of SRTS. The green infrastructure could double as a living laboratory and educational space for children at nearby schools as well.

## Driveway/Alleyway Crossings

A high-level review of driveway and alleyway crossings showed many locations not achieving ADA-compliance. An example pictured at right is an alleyway crossing between Jenks Avenue and Lawson Avenue, adjacent to Farnsworth Aerospace Upper Campus. There is not a continuous sidewalk connection across the alleyway access and the slope would make it difficult for an individual in a wheelchair to navigate (see existing and improved examples at right). All alleyway and driveway crossings should be reviewed by the concurrent MnDOT study to ensure ADA-compliant crossings exist or are appropriately upgraded during design development.





[9] *Turner-Skoff, Jessica B. (2019). The benefits of trees for livable and sustainable communities. Journal of Plants, People, Planet, 1(4), 323-335. https://doi.org/10.1002/ppp3.39*

# CHAPTER 5: POTENTIAL PROJECTS

This chapter summarizes the prioritized crossings as identified and described in Chapter 4 (see Figure 37). Other considerations are discussed including vehicular speeds, pedestrian-scale lighting, bicycle parking, and creating joyful spaces for children to walk.

## PRIORITY CROSSINGS

Based upon the ranking analysis, adherence to reasonable spacing between crossings, and engineering judgment, three priority levels were developed to organize crossing upgrades for implementation.

- **Priority 1:** High-priority crossings for potential implementation as a part of the upcoming rehabilitation project as funding allows.
- **Priority 2:** Medium-priority crossings that could be implemented in the mid-term as funding allows or as needs are tracked and identified by staff.
- **Priority 3:** Low-priority crossings that could be implemented in the long-term as funding allows or as needs are tracked and identified by staff.

Further analysis should be completed as a part of the design development process to maximize funding. Prioritized crossings do not consider potential physical barriers related to existing roadway or utility infrastructure, or other items that could arise upon further review and design of the rehabilitation project, and outside the scope of this Study.

Of note, adhering to reasonable spacing between crossings is important to ensure a corridor is not a barrier to walking, rolling, or bicycling. NACTO broadly defines acceptable distance between crossings as within an approximate three-minute walk, otherwise the likelihood for humans to perform risk-taking behavior exponentially increases due to the distance by out of direction travel and perceived benefit related to time savings. Of note, no state or national guidance exists identifying specific measured distances between marked crossings. Crossing placement is heavily dependent upon the surrounding context, land use and destinations, network connectivity, and other factors. A high-level analysis of agency best practices in the United States showed typical marked crossing spacing from 200 to 600 feet when warranted. A minimum spacing of 200 feet between signalized crossings is identified in the MN MUTCD.[10] A minimum spacing of 350 feet between marked crosswalks is identified in the City of Saint Paul's  crosswalk evaluation guidance.

[10] Minnesota Department of Transportation. (2012). *Minnesota Manual of Uniform Traffic Control Devices,* 4C.05, Paragraph 04.

Northern Segment

Southern Segment

61

Wheelock Parkway East

Arcade Street

Weide Street

Sherwood Avenue

Cottage Avenue East

Clear Avenue

Johnson Senior High School

Ivy Avenue East

Farnsworth Aerospace
Lower Campus

Hyacinth Avenue East

Orange Avenue East

Hawthorne Avenue East

Maryland Avenue East

Rose Avenue East

0 250 500 ft

Geranium Avenue East

Jessamine Avenue East

Phalen Lake Magnet School
900 ft.

Magnolia Avenue East

Cook Avenue East

Lawson Avenue East

Farnsworth Aerospace
Upper Campus

Jenks Avenue

Case Avenue

Sims Avenue

York Avenue

John A. Johnson
Achievement Plus
Elementary

Wells Street

Neid Lane

61

**Prioritized Safe Routes to School Crossing Improvements**

St. Paul, MN

Figure 37

Focus School

Existing Sidewalk

Existing Shared Lane (Sharrow)

Existing Trail

Existing Bikeable/Wide Shoulder

# Improvement ID

**Priority 1:** High-priority crossings for implementation as a part of the upcoming rehabilitation project or in the near-term.
**Priority 2:** Medium-priority crossings for implementation when warranted by the City/MnDOT.
**Priority 3:** Low-priority crossings for tracking purposes and potential implementation in the long-term if desired.

SRF

DEPARTMENT OF TRANSPORTATION

MINNESOTA SAFE ROUTES TO SCHOOL

# QUICK BUILD CROSSING INFRASTRUCTURE

The cost associated with temporary installation of crossing improvements identified in this Study were reviewed. If there is a need or desire by all relevant parties to expedite implementation, one option would be to install temporary infrastructure also referred to as a "quick build" process. "Quick build" is a project delivery method that allows for the rapid deployment of multimodal safety improvements using temporary materials.[11] Those materials can include signage, pavement markings or striping, and bollards or flex posts. Such materials can implement crossing upgrades or other multimodal infrastructure within an expedited timeline.

Implementing the potential crossing improvements with temporary infrastructure is an interim opportunity following the completion of final design and during the process of requesting and securing funding as well as constructing the permanent improvement.

Three considerations of quick-build infrastructure:

- Ensure a maintenance plan and agreement is in place. Bollards or flex posts can be routinely knocked over by motorists, pavement markings can fade, etc. It is important to not allow temporary projects to fall into disrepair while also understanding that these projects are not long-term solutions.
- Temporary infrastructure is an opportunity to see if a design works for relatively low up-front costs. An example could be the proposed curb extension where such a design could be tested, and tracked, to ensure it does not hinder larger vehicles turning. Depending upon the outcome the design can be tweaked or removed from consideration. This is the opportunity in which design modifications may be completed prior to construction of curb and gutter, pavement, and other permanent infrastructure that is much more costly to move or remove.
- There is also an opportunity to broadly collect data that could support funding requests and future construction of permanent improvements at these locations, as well as data for the school district or City to use in future applicable projects.

It is estimated that quick-build crossings could be implemented for approximately $8,500 per location on average, though it could be higher or lower depending upon the specific location. This cost estimate does not include infrastructure items such as pedestrian-scale lighting or account for potential maintenance needs.

[11] Metropolitan Transportation Commission. (n.d.). *Quick-Build Materials.* https://mtc.ca.gov/our-work/plans-projects/bicycle-pedestrian-mobility/complete-streets/quick-build-materials

# OTHER CONSIDERATIONS

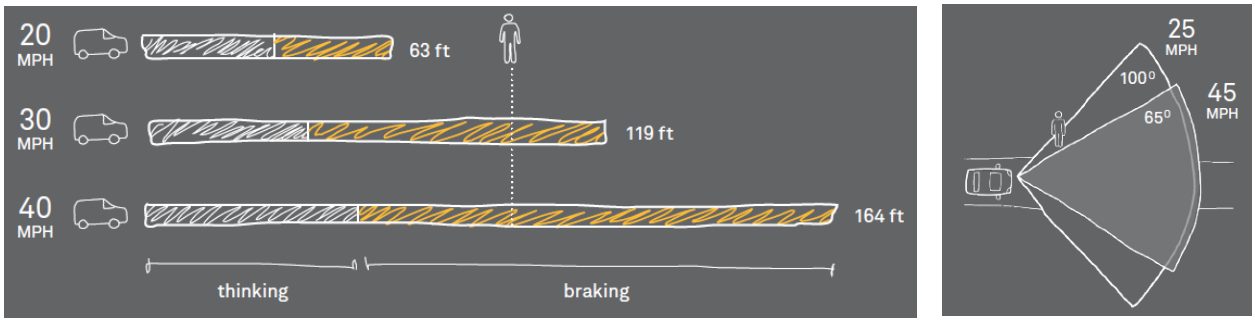
## Vehicle Speeds

Geometric improvements (i.e., traffic calming), coupled with lowered posted speed, could reduce speeds along Arcade Street. Lowering the posted speed will not decrease speeds alone. Medians can double as chicanes that slow traffic as lanes shift. An example is Portland Avenue in Richfield, which meanders at intersections with pedestrian island refuges and narrowed lanes (ten feet plus gutter pan). Narrowed lanes and traffic calming could lower speeds due to increased friction for motorists while maximizing ROW for multimodal uses. MnDOT standards identify travel lane widths of 10 or 11 feet (inclusion of the gutter pan as a part of the lane width is location dependent) along urban and suburban collector roadways under 50 mph.[12] Tighter lane widths are credited with positively impacting a street's safety without affecting traffic operations.

*Portland Avenue in Richfield. Source: Google Streetview*

Speed is a critical factor toward lowering the risk of serious injury or death when someone is struck by a vehicle. Children are at even higher risk due to their body size and corresponding increase in the popularity of larger vehicles (i.e., sport utility vehicles) in the United States. Speed correlates directly with a motorist's stopping distance and vision which can be life or death for people walking and bicycling (see Figure 38).

**Figure 38. Stopping and Sight Distance**

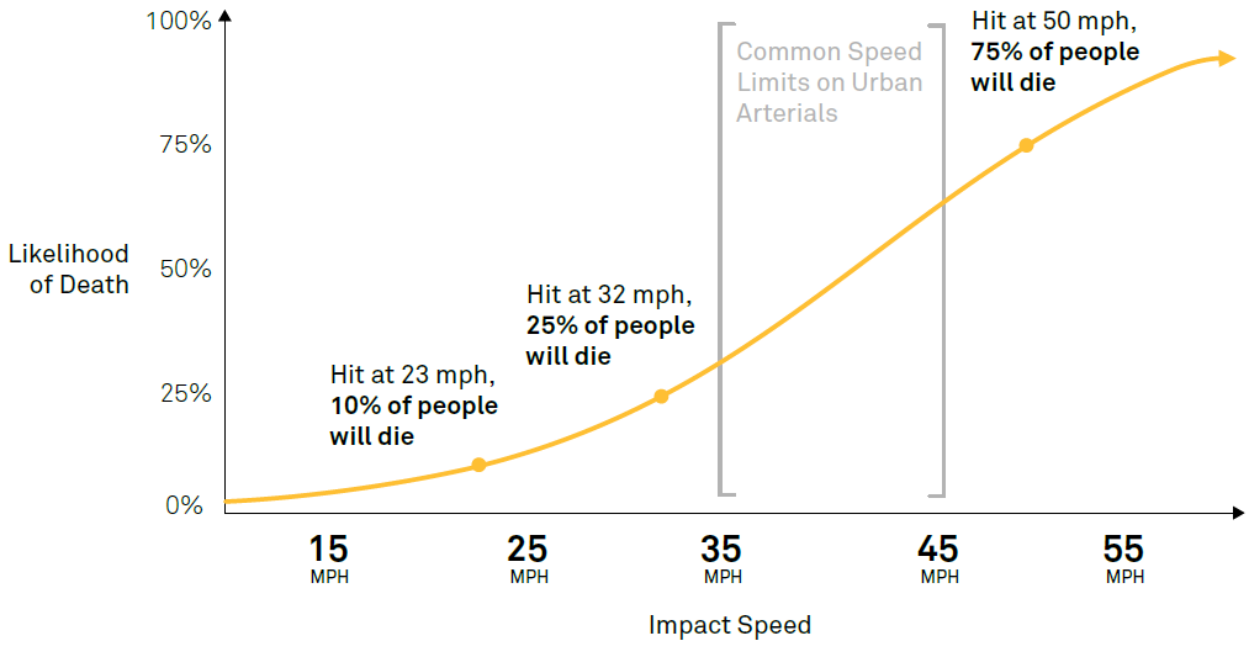



*Source: City Limits: Setting Safe Speed Limits on Urban Streets (2020), National Association of Transportation Officials*

[12] Minnesota Department of Transportation. (2018). *Travel Lane Width Standards for State Highways, Technical Memoranda 18-08-RS-06.*

The traffic speed and corresponding risk of serious injury or death shows how even minor changes in vehicular speed can produce major benefits as severity exponentially increases with speed, most notably above 35 mph (see Figure 39). A person could have an approximate 25 percent likelihood of death if they were hit by a car at 30 mph while crossing the road at an uncontrolled location while there is a 50 percent likelihood of death if hit by a car at 40 mph.

**Figure 39. Likelihood of Injury or Death by Traffic Speed**




*Source: City Limits: Setting Safe Speed Limits on Urban Streets (2020), NACTO*

In addition to posted speed reductions and geometric improvements, the use of both dynamic speed signs and speed enforcement during peak school periods should also be considered. A review of MnDOT-approved dynamic speeds signs showed one option for a school zone with speed feedback display and flashers to further draw a motorist's attention for compliance (see example image at right). Estimated cost per dynamic speeds display is $10,000 and per LED flashing school sign is $3,000. Both options draw motorist's attention and encourage drivers to slow down by making them aware of their current speed. The LED sign alerts drivers to the school zone speed and can be programmed for specific time of day, day of week, and month of year to ensure it only flashes when necessary.

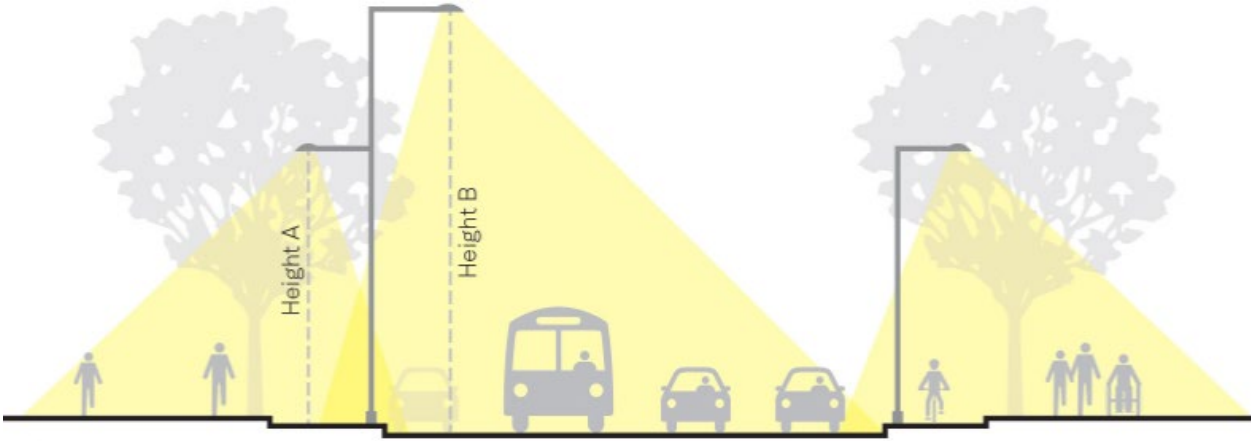

*Source: RU2 Systems, Fast-250 Radar Speed Feedback Sign with Flashers*

School zones could be explored along key segments of Arcade Street either adjacent to school property (i.e., Johnson Senior High School and Farnsworth Aerospace Lower Campus) or near a school crossing that serves the other three schools. Additional analysis is required per the MN MUTCD.

## Pedestrian-scale Lighting

Pedestrian-scale lighting is shorter and more frequently placed along a corridor to better illuminate people walking or bicycling as opposed to typical vehicle-oriented lighting (see Figure 40). Such lighting is critical at roadway crossings and can reduce all types of injury crashes by 59 percent.[13] The shorter lighting increases the lux (amount of light in lumens per square meter) which is recommended 20 to 40 lux at five feet above the road surface to provide adequate vertical illumination within a crosswalk. Typically, pedestrian-scaled lighting is 12 to 15 feet tall (less than 20 feet) and is spaced approximately every 50 to 80 feet along a corridor or within ten feet of a crosswalk. Spacing and placement is context specific, however.

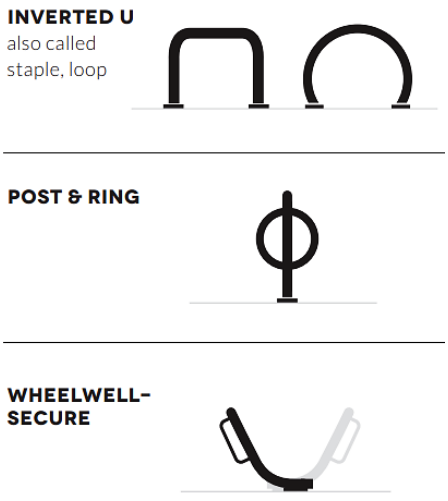
**Figure 40. Lighting Design Guidance for Pedestrians and Bicyclists**




*Source: Lighting Design Guidance, Global Designing Cities Initiative*

## Bicycle Parking

Implement convenient, high-quality bicycle parking that match desire lines (internal sidewalk connections) and are near each school's main entrance. Placement should be in a location where a bicyclist would not have to dismount until reaching the bike parking area. The Association of Pedestrian and Bicycle Professionals' (APBP) *Essentials of Bike Parking (2015)* describes the various types and styles of racks, as well as those to avoid due to various performance concerns. The three styles pictured at right are those most recommended by APBP per their analysis.




[13] Gibbons, Ronald B. (2008). *Informational Report on Lighting Design for Midblock Crosswalks.* Virginia Tech Transportation Institute. FHWA-HRT-08-05, 1-32, Office of Safety Research and Development, Federal Highway Administration.

## Wayfinding and Playful Spaces

NACTO's *Designing Streets for Kids (2020)* is a good resource when considering how to make streets and public spaces safer, more comfortable, healthier, and joyful for children. It is important to think about street design from a three-foot high perspective (i.e., the perspective of a child). Numerous opportunities are identified in the guidance document and could be included upon further review of future improvements proposed in this Study and applications relevant to school campuses.

One potentially applicable item is an example from Detroit, Michigan called the Brightmoor Runway. A sidewalk was transformed into a running track paved with red rubber surface, painted with the distance, and included a speed display. This interactive play space in the public realm provided children with an opportunity to engage in physical activity while waiting for their school bus (pictured below).[14] Such artistic and playful opportunities have numerous benefits and can be low-cost improvements with lasting impacts.



[14] National Association of City Transportation Officials. (2020). *Designing Cities for Kids, page 41.*

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# CHAPTER 6: NEXT STEPS

This Study offers a range of potential infrastructure improvements to improve multimodal conditions along, and across, Arcade Street (US 61). Actionable next steps were organized to ensure this document is fully utilized and implemented to the best of the City of Saint Paul's ability in coordination with MnDOT and Saint Paul Public Schools. The proposed next steps are important as they will seek to maximize the Study's analysis and potential improvements that will enhance the Arcade Street corridor where children cannot safely, comfortably, or conveniently walk, roll, or bike today.

## AGENCY COORDINATION

The most critical step toward implementing potential infrastructure improvements is to identify a champion that will devote some portion of their time implementing this Study. Champions could be applicable City and/or School District representatives as their time permits.

It is also helpful to organize a small team or committee (ideal size of five or less members) that include representatives from the City, MnDOT, school district, and school staff (i.e., school principals), as well as key stakeholders if applicable. The group's objective can include identifying funding opportunities and creatively financing projects, building relationships, and educating the community about the planned improvements, and prioritizing projects identified in the Study. It may be helpful to have this group maintain a regular meeting schedule such as monthly or quarterly meeting frequencies to maintain proper engagement.

## IDENTIFY PRIORITIES

Prioritizing projects is essential toward an orderly and timely implementation process. Key questions to consider include:

- What project would provide the most benefit relative to cost and effort?
- What does the City of Saint Paul and Saint Paul Public Schools view as key improvements?
- Which projects could be incorporated into other work already taking place?
- Which project is most likely to receive funding?

Potential crossing prioritization was included in Chapter 5 based upon need per a variety of factors as well as engineering judgment. Additional local vetting is recommended.

## FOCUSED TIMELINE AND ACTIONABLE STEPS

Once priorities are identified, create a timeline of short- (0-1 years), mid- (1-3 years), and long-term goals (3-5 years). Do not extend past five years as that is a reasonable amount of time to require updated analysis and planning. The action plan does not need to be detailed and can simply identify planned improvements, responsible parties, the estimated cost, and associated time period. The action plan will help to focus the group on next steps and keep everyone on track, progress the plan forward each meeting, and be prepared for funding opportunities such as SRTS or those from the Metropolitan Council which are most applicable for multimodal projects. Additionally, integrating with work already planned by city, county, and state agencies, or the school district, will ensure cost effective implementation when those synergies arise. It is important to remember that project implementation takes time and each small step forward supports the broader effort and continues that longer progression forward towards eventual success.

## CELEBRATE WINS

Make sure to celebrate wins and promote the completion of Safe Routes to School projects (Walk and Bike to School Days are good times do so) to educate the public and promote the program that is critical to children's health (47 more minutes of physical activity per week) and their ability to walk, roll, or bike to school.


*Source: MnDOT*

# APPENDICIES

Appendix A – Community Feedback Data

Appendix B – Crossing Prioritization Tool

Appendix C – Parking Utilization Data

# APPENDIX A

# ARCADE STREET **ENGAGEMENT SUMMARY**

## WHAT ENGAGEMENT OCCURRED?

Project partners designed an engagement website to ask for community input on the Arcade Street Safe Routes to School initiative. Five public school campuses are located along, or within one-quarter mile of Arcade Street.

Community feedback and input received will influence how MnDOT prioritizes potential improvements for the Arcade Street project in 2024.

### HOW DID WE GATHER FEEDBACK?

Online engagement occurred September 22nd through October 26th, 2020 via an Engagement Website, Online Survey and Wikimap.

### WHO DID WE HEAR FROM?

**ENGAGEMENT WEBSITE**
343 unique visitors
576 total visits
55% accessed via Desktop
40% accessed via Cell Phone
5% accessed via Tablet

**SURVEY RESULTS**
125 survey responses
38 open-ended comments
28 Wikimap comments

**DEMOGRAPHIC QUESTIONS**
School Affiliation
Connection to Arcade Street
Zip Code
Age
Race/Ethnicity
Gender

### WHAT DID WE ASK?

**HOW SAFE DO YOU FEEL ON ARCADE STREET?**


**WHERE DO YOU CROSS ARCADE STREET?**

- **Approximately 80 percent of respondents cross at an intersection** (49% traffic signal vs. 31% without a signal).
- Nearly 10 percent do not cross Arcade Street.

**WHAT ARE YOUR TOP CONCERNS ABOUT ARCADE STREET?**

- **The top three concerns (in order) are traffic speed, crossing safety, and walking or bicycling comfort.**
- Nearly 70 percent of resopndents voted for one of those three concerns.

**HOW COULD ARCADE STREET BE IMPROVED?**

**WALKING**

Top four choices (in order) include vehicles stopping at crossings, more street trees/landscaping, lower vehicle speed, and wider sidewalks. Nearly two-thirds of respondents chose one of these options.

**DRIVING**

The top four choices (in order) include turn lanes, less on-street parking, medians, and traffic signals. Nearly 75 percent of respondents voted for one of these improvements.

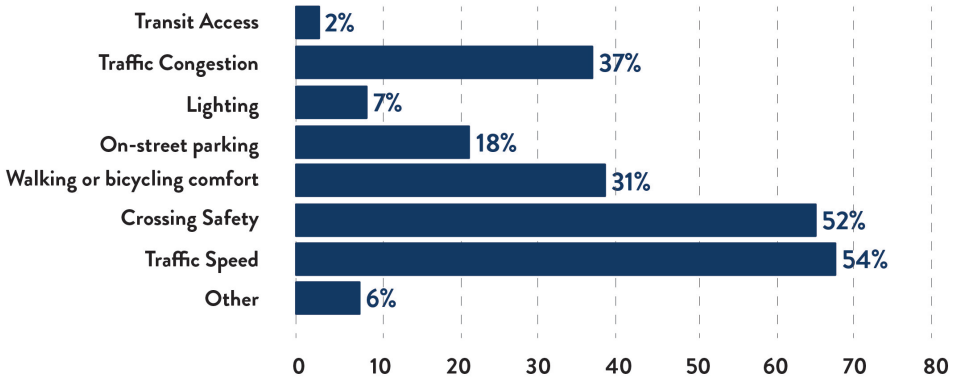
## WHAT **THEMES** DID WE HEAR?

- **Prioritize safety** for people walking, bicycling, or taking transit.
- Desire for **bicycle connectivity and pedestrian improvements**. Most specifically separated bike lanes are desired.
- **Improve transit amenities** near Case Avenue, Maryland Avenue, Ivy Avenue, and Nebraska Avenue.
- **Balance on-street parking** by prioritizing right-of-way for people walking, bicycling, and taking transit while providing space for businesses if needed.
- **Many unsafe intersections** for pedestrians and bikers (controlled and uncontrolled).
- **Cleanliness, streetscaping and development** would enhance Arcade Street and create a safer and more comfortable feeling environment.

## WHAT **CONCERNS** DID WE HEAR?

1. Vehicles speeding, unsafe driving behavior, and failure to yield for people walking or bicycling.
2. Lack of turn lanes create backups, congestion and unsafe driving.
3. Safety and comfort to walk or bike along or across Arcade Street.
4. Buses tend to block traffic and bus stops could be improved with shelters and amenities.

MY GREATEST CONCERNS ABOUT ARCADE STREET ARE:




## WHAT **SUGGESTIONS** DID WE HEAR?

| | | |
|---|---|---|
| Reduce the number of traffic lanes for vehicles, create space for dedicated bike lanes. | Add left turn arrows at lights near Johnson Senior High School (E Ivy Avenue), E. Jenks Avenue, Maryland Avenue. | No parking signs within 60 feet of intersections near the schools to improve motorist sight distance of children crossing. |
| Improve crosswalks so vehicles stop for people crossing (i.e. flashing beacons). | Add traffic calming along Arcade Street to slow speeds and reduce unsafe driving behavior. | Improve bus stops to enhance the experience of transit users and upgrade streetscape (i.e. trees, lighting, trash cans). |

## St. Paul – Arcade Street

**Introduction**:
The Minnesota Department of Transportation (MnDOT) would like to hear from you about future transportation improvements along Arcade Street in Saint Paul. Five public school campuses are along, or within one-quarter mile, of Arcade Street. MnDOT is considering improvements to assist students walking or bicycling to these schools more comfortably and safely. The project will also benefit the community and how people safely and efficiently travel along the street.

Input from this survey will influence how MnDOT prioritizes potential improvements for inclusion within a repaving project planned for Arcade Street in 2024.

The project's objectives include:

- Repave the road for a smoother driving surface
- Replace cracked or not-level sidewalks
- Replace curb ramps and traffic signal push buttons so they are accessible to people with disabilities
- Improve the safety and comfort for people crossing the street
- Replace aging storm sewers

**Questions:**

1. When you cross Arcade Street while walking, bicycling, or accessing Metro Transit do you cross…
    a. At a traffic signal
    b. Mid-block (between two city blocks)
    c. At an intersection (without a traffic signal)
    d. I do not cross Arcade Street
2. How safe do you feel crossing Arcade Street while walking, bicycling, or accessing Metro Transit?
    a. I do not feel safe
    b. I feel somewhat safe
    c. I do feel safe
    d. I do not cross Arcade Street
3. My greatest concerns about Arcade Street are… (identify your top two choices)
    a. Traffic speed
    b. Crossing safety
    c. Walking or bicycling comfort
    d. On-street parking
    e. Lighting
    f. Traffic congestion
    g. Transit access
    h. Other (please specify)

4. What would improve your experience walking along Arcade Street? (identify your top two choices)
    a. Wider sidewalks
    b. Vehicles stopping when I cross
    c. More trees and landscaping
    d. Better lighting
    e. Public art and other infrastructure (trash receptacles, bike racks, benches, etc.)
    f. Lower vehicle speeds
    g. I do not walk along or across Arcade Street
    h. Other (please specify)
5. What would improve your experience on driving along the corridor? (identify your top two choices)
    a. More parking
    b. Less parking
    c. Turn lanes
    d. Traffic signals
    e. Medians
    f. Lighting
    g. Other (please specific)
6. Are you a parent or guardian of a student, or a student currently enrolled at one of the following schools (mark all that apply or select N/A if this does not pertain to you):
    a. John A. Johnson Elementary
    b. Phalen Lake Elementary
    c. Farnsworth Lower PreK-4
    d. Farnsworth Aerospace Upper 5-8
    e. Johnson Senior High School
    f. Not applicable (N/A)
7. Do you… (check all that apply)
    a. Live on Arcade Street
    b. Live near Arcade Street (within four city blocks)
    c. Live near Arcade Street (outside of four city blocks)
    d. Work at or own a business along Arcade Street
    e. Commute to work or school along Arcade Street
    f. Other (please describe)
8. What is your Zip Code?
9. What is your gender?
    a. Male
    b. Female
    c. Prefer not to say
    d. Other, please specify:
10. What is your Race/Ethnicity?
    a. White/Caucasian

   b. Black/African American
   c. Hispanic/Latinx
   d. Asian/Pacific Islander
   e. Native American
   f. Other, please specify:

11. What is your age?
   a. 10 or younger
   b. 11-13
   c. 14-18
   d. 18-34
   e. 35-54
   f. 55-64
   g. 65-74
   h. 75 or older

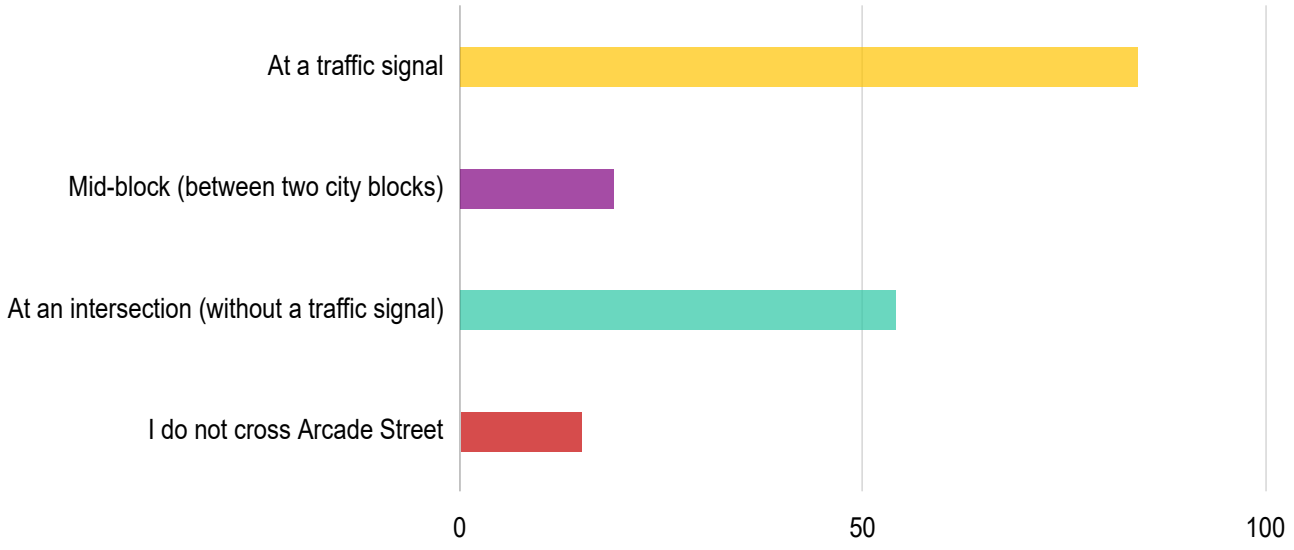
**Interactive Map:**

- Organize corridor extents to define the project area (E 7th St to Larpenteur)
- Points options:
   - Walking comment
   - Safety crossing the street comment
   - Bicycling comment
   - Transit comment
   - Vehicle traffic comment
   - Other comment

# Safe Routes to School - Arcade Street

**Saint Paul - Arcade Street Safe Routes to School Survey**

○ **1.) When you cross Arcade Street while walking, bicycling, or accessing Metro Transit do you cross…**

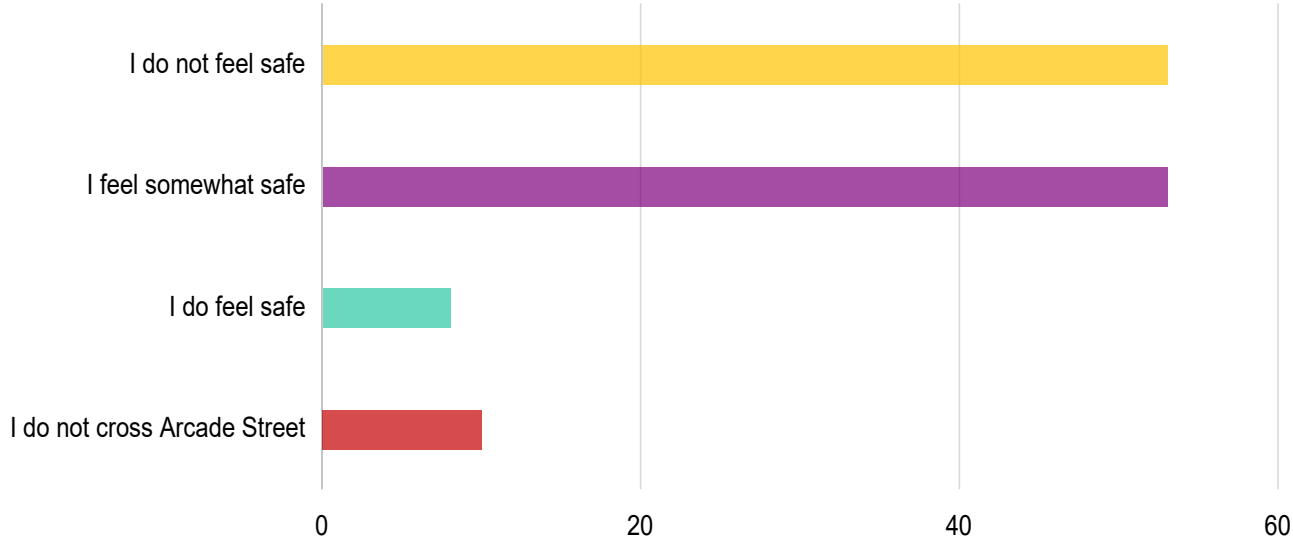



| Answers | Count | Percentage |
|---|---|---|
| At a traffic signal | 84 | 67.2% |
| Mid-block (between two city blocks) | 19 | 15.2% |
| At an intersection (without a traffic signal) | 54 | 43.2% |
| I do not cross Arcade Street | 15 | 12% |

Answered: 125 Skipped: 0

**Saint Paul - Arcade Street Safe Routes to School Survey**

○ **2.) How safe do you feel crossing Arcade Street while walking, bicycling, or accessing Metro Transit?**

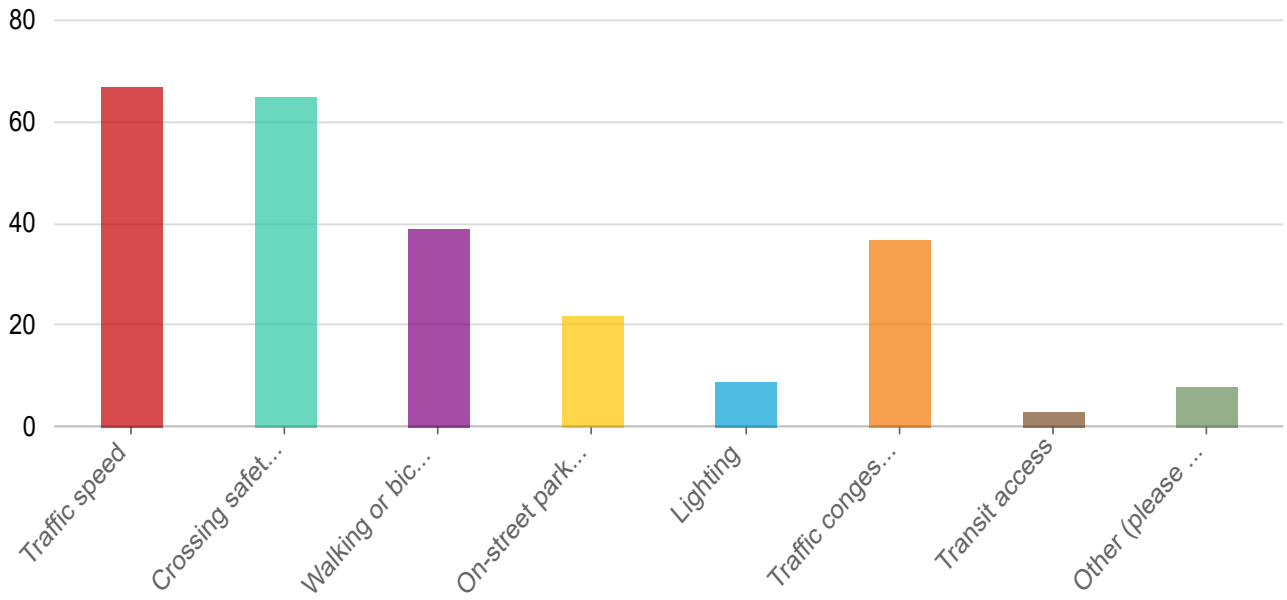



| Answers | Count | Percentage |
|---|---|---|
| I do not feel safe | 53 | 42.4% |
| I feel somewhat safe | 53 | 42.4% |
| I do feel safe | 8 | 6.4% |
| I do not cross Arcade Street | 10 | 8% |

Answered: 124 Skipped: 1

**Saint Paul - Arcade Street Safe Routes to School Survey**

○ **3.) My greatest concerns about Arcade Street are…**

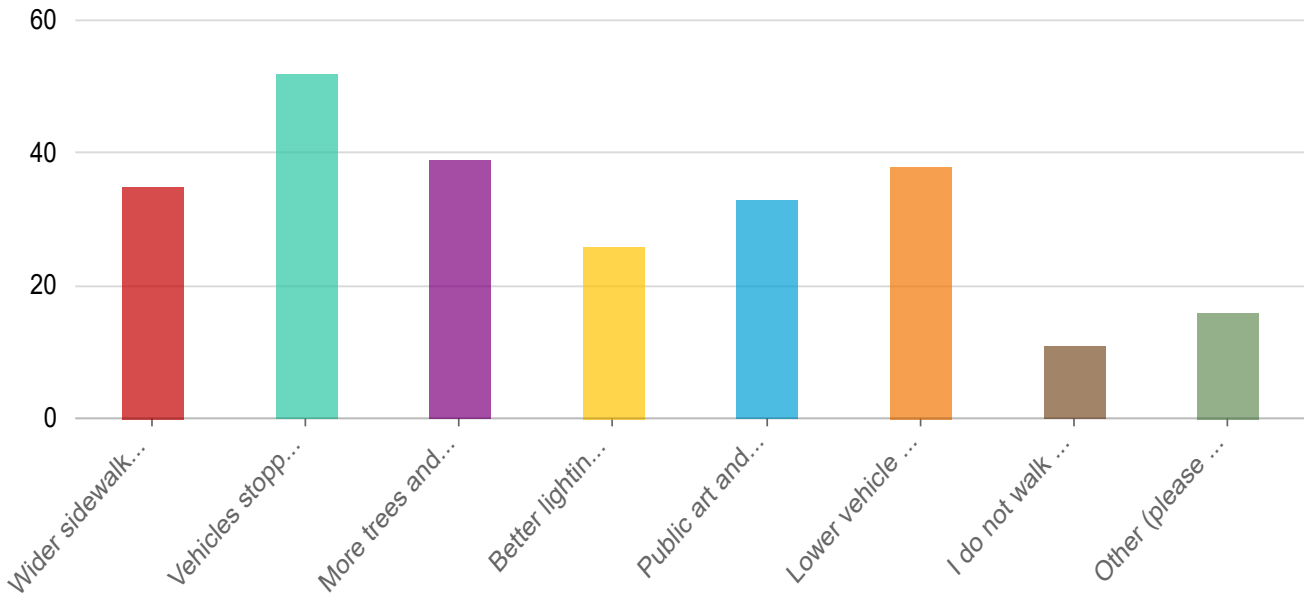



| Answers | Count | Percentage |
|---|---|---|
| Traffic speed | 67 | 53.6% |
| Crossing safety | 65 | 52% |
| Walking or bicycling comfort | 39 | 31.2% |
| On-street parking | 22 | 17.6% |
| Lighting | 9 | 7.2% |
| Traffic congestion | 37 | 29.6% |
| Transit access | 3 | 2.4% |
| Other (please specify) | 8 | 6.4% |

Answered: 125 Skipped: 0

**Saint Paul - Arcade Street Safe Routes to School Survey**

**○ 4.) What would improve your experience walking along Arcade Street?**

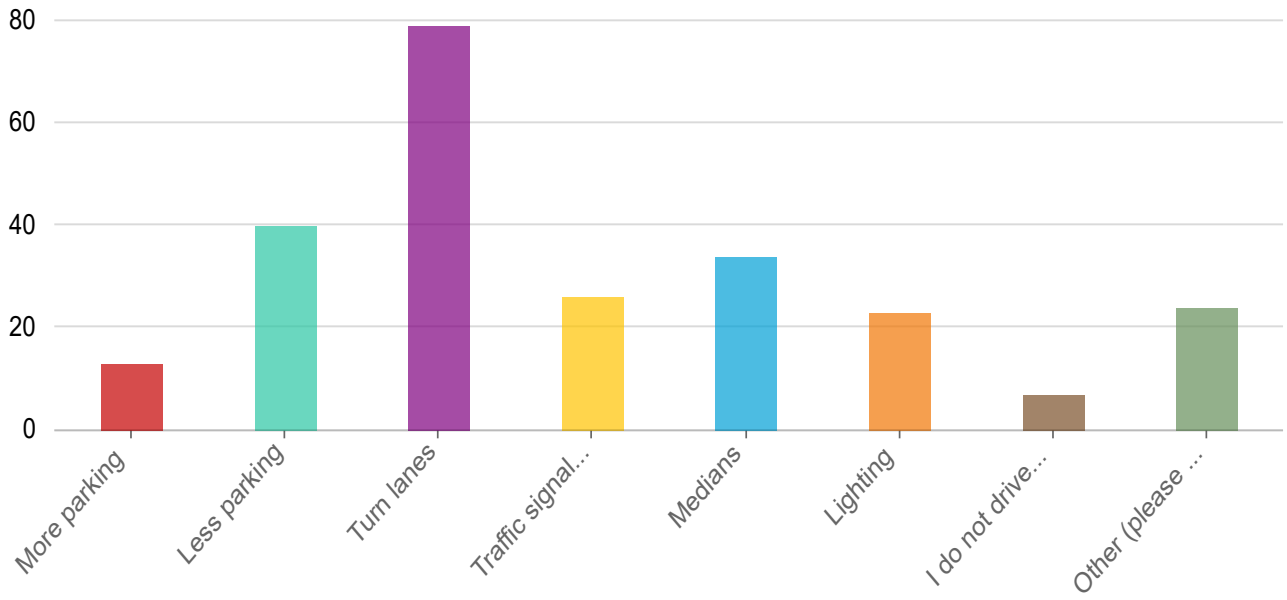



| Answers | Count | Percentage |
|---|---|---|
| Wider sidewalks | 35 | 28% |
| Vehicles stopping when I cross | 52 | 41.6% |
| More trees and landscaping | 39 | 31.2% |
| Better lighting | 26 | 20.8% |
| Public art and other infrastructure (trash receptacles, bike racks, benches, etc.) | 33 | 26.4% |
| Lower vehicle speeds | 38 | 30.4% |
| I do not walk along or across Arcade Street | 11 | 8.8% |
| Other (please specify) | 16 | 12.8% |

Answered: 125 Skipped: 0

**Saint Paul - Arcade Street Safe Routes to School Survey**

**○ 5.) What would improve your experience on driving along Arcade Street?**

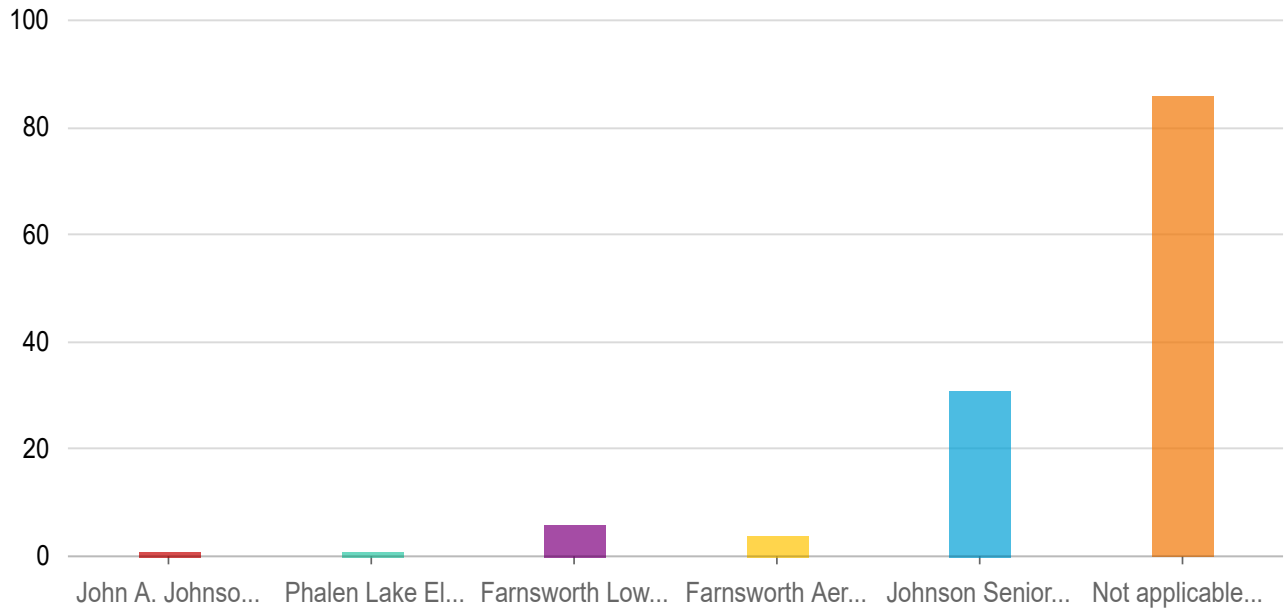



| Answers | Count | Percentage |
|---|---|---|
| More parking | 13 | 10.4% |
| Less parking | 40 | 32% |
| Turn lanes | 79 | 63.2% |
| Traffic signals | 26 | 20.8% |
| Medians | 34 | 27.2% |
| Lighting | 23 | 18.4% |
| I do not drive along or across Arcade Street | 7 | 5.6% |
| Other (please specify) | 24 | 19.2% |

Answered: 123 Skipped: 2

**Saint Paul - Arcade Street Safe Routes to School Survey**

**○ 6.) Are you a parent or guardian of a student, or a student currently enrolled at one of the following s…**

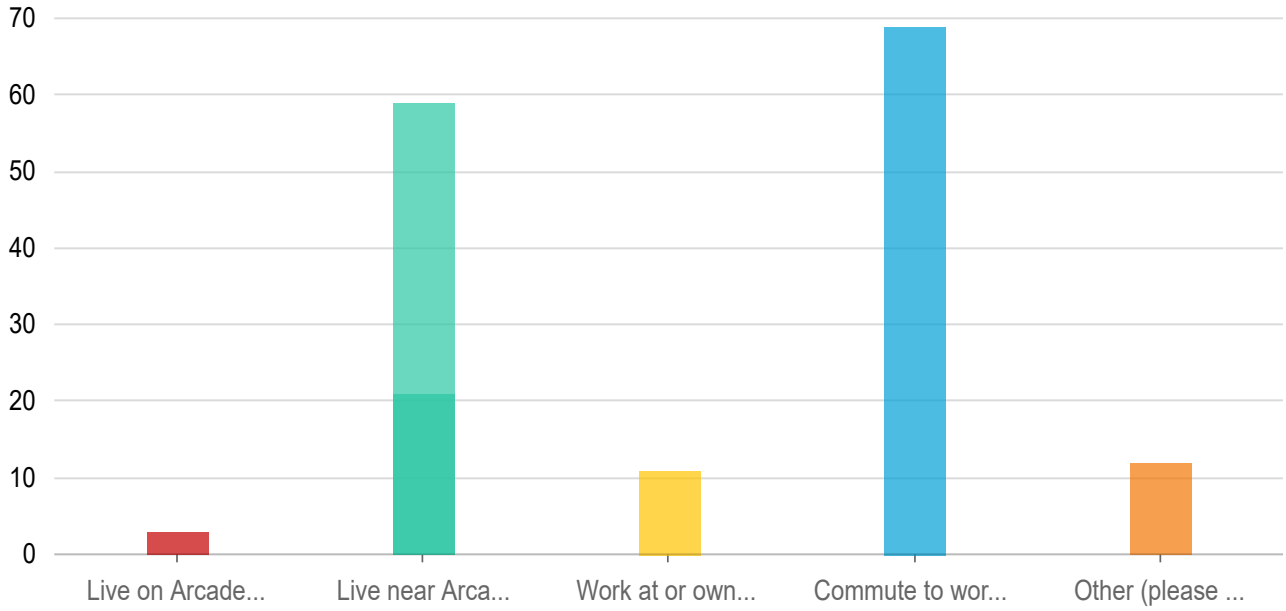



| Answers | Count | Percentage |
|---|---|---|
| John A. Johnson Elementary | 1 | 0.8% |
| Phalen Lake Elementary | 1 | 0.8% |
| Farnsworth Lower PreK-4 | 6 | 4.8% |
| Farnsworth Aerospace Upper 5-8 | 4 | 3.2% |
| Johnson Senior High School | 31 | 24.8% |
| Not applicable (N/A) | 86 | 68.8% |

Answered: 121 Skipped: 4

**Saint Paul - Arcade Street Safe Routes to School Survey**

○ **7.) Do you…**




| Answers | Count | Percentage |
|---|---|---|
| Live on Arcade Street | 3 | 2.4% |
| Live near Arcade Street (within four city blocks) | 59 | 47.2% |
| Live near Arcade Street (outside of four city blocks) | 21 | 16.8% |
| Work at or own a business along Arcade Street | 11 | 8.8% |
| Commute to work or school along Arcade Street | 69 | 55.2% |
| Other (please specify) | 12 | 9.6% |

Answered: 120 Skipped: 5

**○ 8.) What is your Zip Code?**

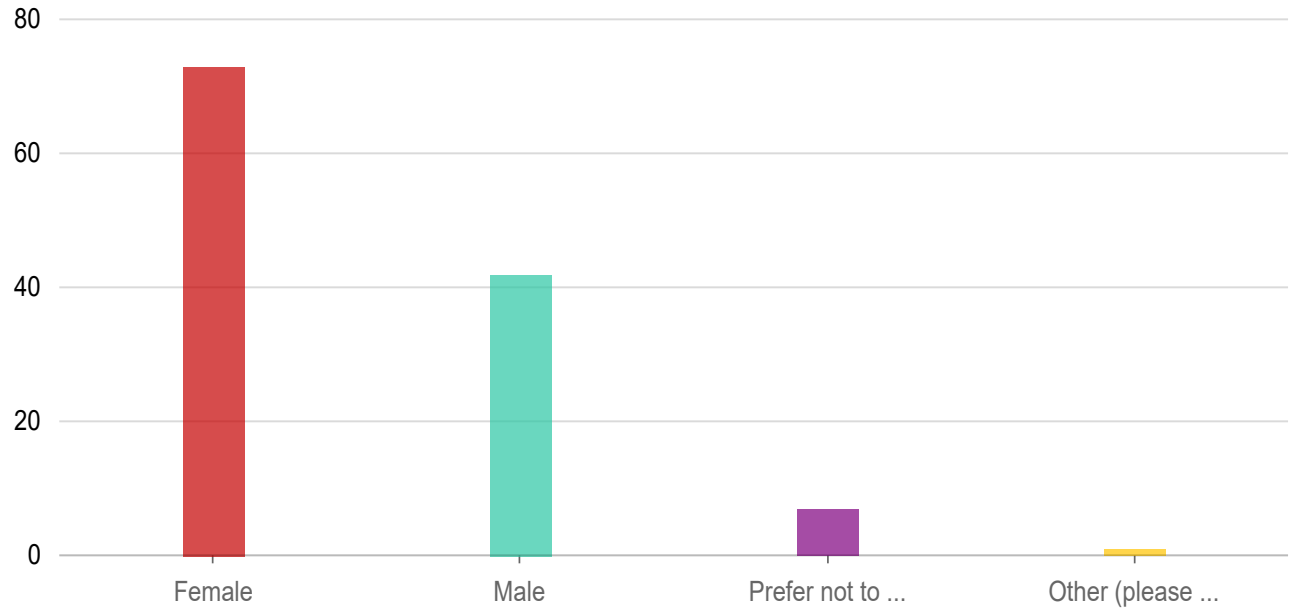

| Word | Count |
|---|---|
| 55106 | 76 |
| 55130 | 11 |
| 55117 | 6 |
| 55119 | 4 |
| 55109 | 3 |
| 55115 | 2 |
| 55033 | 1 |
| 55103 | 1 |
| 55104 | 1 |
| 55108 | 1 |
| 55116 | 1 |
| 55128 | 1 |
| 55343 | 1 |
| 55406 | 1 |
| 55415 | 1 |

| | |
|---|---|
| 55418 | 1 |
| 55432 | 1 |

Answered: 113 Skipped: 12

**Saint Paul - Arcade Street Safe Routes to School Survey**

○ **9.) What is your gender?**

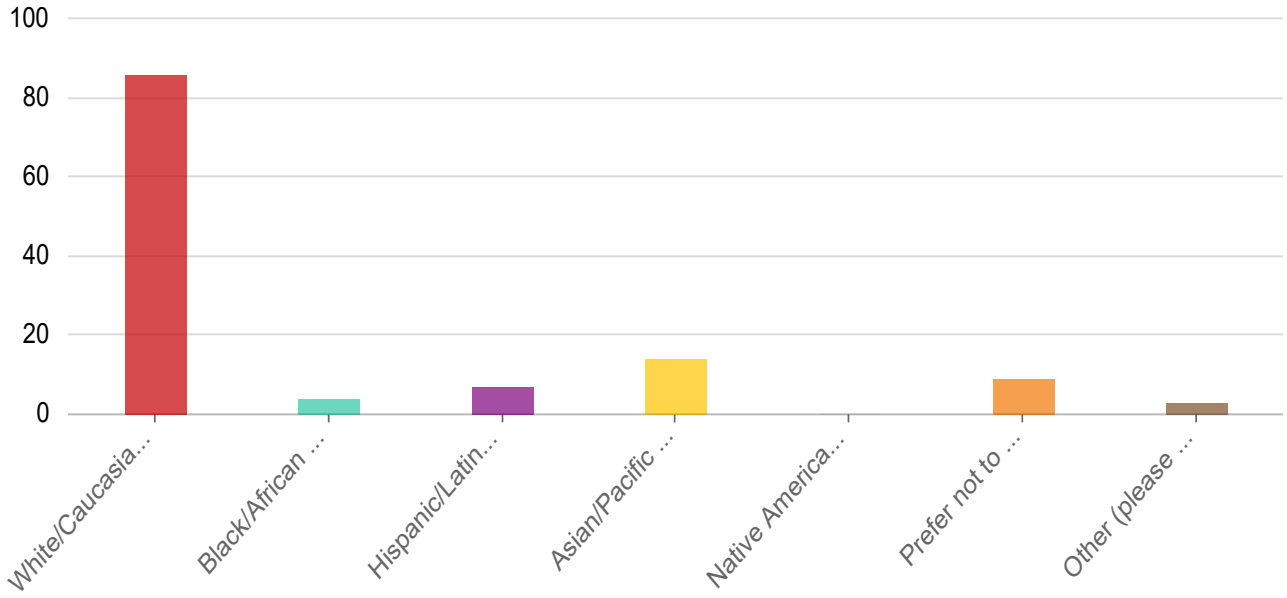



| Answers | Count | Percentage |
|---|---|---|
| Female | 73 | 58.4% |
| Male | 42 | 33.6% |
| Prefer not to say | 7 | 5.6% |
| Other (please specify) | 1 | 0.8% |

Answered: 123 Skipped: 2

**Saint Paul - Arcade Street Safe Routes to School Survey**

○ **10.) What is your Race/Ethnicity?**

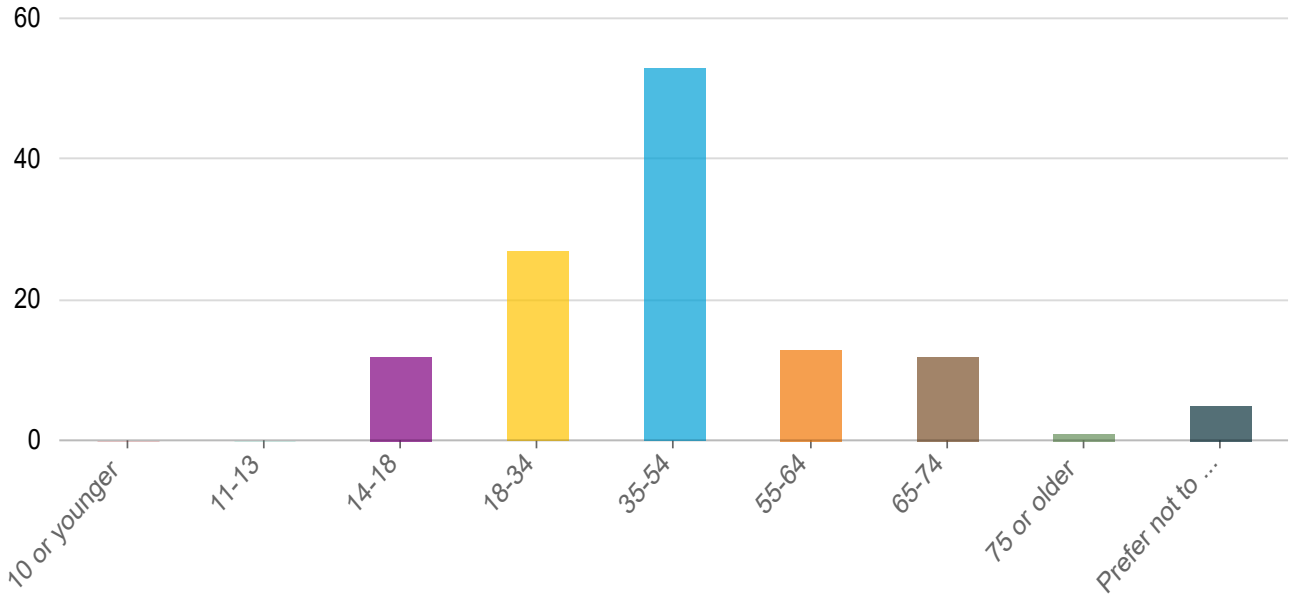



| Answers | Count | Percentage |
|---|---|---|
| White/Caucasian | 86 | 68.8% |
| Black/African American | 4 | 3.2% |
| Hispanic/Latinx | 7 | 5.6% |
| Asian/Pacific Islander | 14 | 11.2% |
| Native American | 0 | 0% |
| Prefer not to say | 9 | 7.2% |
| Other (please specify) | 3 | 2.4% |

Answered: 123 Skipped: 2

**Saint Paul - Arcade Street Safe Routes to School Survey**

○ **What is your age?**




| Answers | Count | Percentage |
|---|---|---|
| 10 or younger | 0 | 0% |
| 11-13 | 0 | 0% |
| 14-18 | 12 | 9.6% |
| 18-34 | 27 | 21.6% |
| 35-54 | 53 | 42.4% |
| 55-64 | 13 | 10.4% |
| 65-74 | 12 | 9.6% |
| 75 or older | 1 | 0.8% |
| Prefer not to say | 5 | 4% |

Answered: 123 Skipped: 2

My greatest concerns about Arcade Street are…

- I like Arcade as it is.
- Cars running lights (on purpose)
- Using turn lanes to pass.
- When cars are turning in or out of Arcade, the streets are so narrow that pedestrians can get hit often.
- Drivers never stop, even when required by law.
- Walking and Bicycling Safety- separated paths, green bike lanes or crossings. Flashing Beacons at crossings by schools
- North south bike lanes
- No turn lanes on Arcade and Maryland results in backup and car drivers moving into the lane to their right to try and get through a green light.
- When buses stopped, ALL traffic stop. Need indentation for buses!!

What would improve your experience walking along Arcade…

- Bigger street to accommodate street parking.
- Bike path
- No parking signs within 60 feet of intersections near the schools as to avoid blind spots when kids may start to cross.
- Make 1 lane each direction with a bike lane. Remove parking if you have to.
- New construction to help local businesses grow, safer overall would be great!
- Space between car lanes and sidewalk. The cars get so close to the sidewalk because the lanes are so narrow
- Something to mitigate amount of Trash on the street/sidewalks
- Reducing Arcade to two lanes with a turn lane in the middle, like Maryland Ave
- Less vehicle focus
- Better access to Lake Phalen by Frost Avenue park entrance off Arcade
- crosswalk signals (e.g. flashing light) at Orange Ave intersection
- Fewer traffic lanes for cars
- Separate bike paths and lanes. Flashing Beacons at intersections going to schools
- Bike lanes to get to where I can walk, such as eat street Payne Ave

What would improve your experience driving along Arcade…

- sidewalks where there are none, bike paths, coordinated lights so getting through one = through another;  less parking
- Cleanliness
- Slower speed. One lane only. People swerve back and forth between the 2 lanes.
- Bike lanes
- It gets congested at lights and its hard to see people. Better turn lanes, similar to Phalen, Maryland
- either more or less parking. either make it a functioning city street with more parked cars and fewer lanes or stop letting cars part just north of Maryland for half a block
- Better enforcement of traffic laws (running lights, illegal turns, illegal passing, speeding)
- Lower LOS to aid in slower speeds
- Resurfacing!
- Traffic circles, to slow traffic and ease congestion at the stop lights, especially needed at the intersection of Arcade & Wheelock Pkwy.
- Bike lanes
- Left turn arrows at Arcade/Maryland intersection
- More police presence
- Free traffic lanes for cars
- I don't recall having any issues while driving on Arcade--it's mainly while walking and trying to cross Arcade at an uncontrolled intersection.
- Better surface
- Separated bike lanes and paths. Green painted bike lanes and crossings. Slow speeds 15-20 mph.
- Designated north south bike lane near by to keep traffic separated.
- Wider roads. Arcade needs to be two lane AND parking for businesses.

| Category | Location | Initial Comment | Comment | Comment Date | Like | Dislike |
|---|---|---|---|---|---|---|
| Other Comment | Case Avenue | Many Johnson senior high students use this bus stop at case ave all year round. Even through the winter. There is only one small bench there and nothing to cover them from the rain or snow. | | | | |
| Walking Comment | Cottage Avenue | many students get food from the gas station here before and during school hours, but they have to cross without a crosswalk or signal and cars don't stop | I Agree | 9/25/2020 20:46 | 3 | 0 |
| Walking Comment | Cottage Avenue | many students get food from the gas station here before and during school hours, but they have to cross without a crosswalk or signal and cars don't stop | I Agree, I worry about cars going to fast. | 10/3/2020 4:17 | 3 | 0 |
| Walking Comment | Cottage Avenue | many students get food from the gas station here before and during school hours, but they have to cross without a crosswalk or signal and cars don't stop | I Agree | 10/6/2020 16:28 | 3 | 0 |
| Vehicle Traffic Comment | Cottage Avenue | Vehicles are going much too fast. They don't stop for walkers or bicycles. I would like to see a traffic "calming system" such as Maryland Avenue has instituted. I would like to see it from Maryland Avenue to Larpentuer at least and possibly as far as Parkway Drive/Frost Avenue. | | | | |
| Walking Comment | Ivy Avenue | Students at Johnson High School use the MTC busses to commute to and from school. The bus stop is near the northwest corner of the intersection of Arcade and Ivy. More than once a student has been hit by a car while crossing the intersection in front of the bus, while it is dropping passengers off. To be clear, the student should have looked, however, it seems like there is an easy way to make this situation less dangerous. | I Agree | 9/25/2020 20:45 | 2 | 0 |
| Walking Comment | Ivy Avenue | Students at Johnson High School use the MTC busses to commute to and from school. The bus stop is near the northwest corner of the intersection of Arcade and Ivy. More than once a student has been hit by a car while crossing the intersection in front of the bus, while it is dropping passengers off. To be clear, the student should have looked, however, it seems like there is an easy way to make this situation less dangerous. | I Agree, let's prioritize the situation to make it less dangerous. | 10/3/2020 4:18 | 2 | 0 |
| Vehicle Traffic Comment | Ivy Avenue | Please add a left turn signal. Traffic gets really congested when there is oncoming traffic when turning into Johnson. | I have witnessed an accident here. A green arrow going north would have helped. The woman traveling northbound had to be taken away in an ambulance. | 10/3/2020 4:20 | | |
| Transit Comment | Ivy Avenue | There isn't a bus shelter here, and I know it would be tight to fit it next to the elementary school playground. Still, it can get pretty windy and cold. | | | | |
| Bicycling Comment | Ivy Avenue | Many Johnson High School students and a few staff commute to school by bike. Please make sure to prioritize the safety of bikers--it's the greenest way to travel outside of walking! | | | | |
| Bicycling Comment | Ivy Avenue | Improved bike lanes/safety awareness for those staff/students who choose to bike to school. Total Pedal Power! | | | | |
| Walking Comment | Jenks Avenue | Lots of students from Farnsworth or Johnson cross here and it can be dangerous to pedestrians and motorists if traffic signals and walk signals are not being adhered to. Sometimes people (not saying students, just people) randomly walk across Maryland at all hours of the day, in a crosswalk, out of a crosswalk, diagonal across the road, and expect cars to stop, which is not safe. | | | | |
| Vehicle Traffic Comment | Jenks Avenue | It is nearly impossible to turn left from Eastbound Jenks onto Nortbound Arcade. I worked at Farnsworth for 9 years and started coming home a different way since it can take forever to turn left here, and often you are backing cars up that are trying to turn right onto Southbound Arcade. | | | | |
| Vehicle Traffic Comment | Larpenteur Avenue | Traffic comes in pretty quickly here. It would be safer to add a traffic light, then move from 4 lanes to 2 lanes and a turn lane at this point. | I Agree | 10/6/2020 16:27 | 1 | 0 |
| Transit Comment | Larpenteur Avenue | This is the saddest bus stop. It's so overgrown with weeds! | | | | |
| Vehicle Traffic Comment | Maryland Avenue | It's so hard to get into the turn lane here because of the parking, and traffic gets really crazy just trying to merge around the parked cars | I Agree | 9/25/2020 20:46 | 1 | 0 |
| Vehicle Traffic Comment | Maryland Avenue | It's so hard to get into the turn lane here because of the parking, and traffic gets really crazy just trying to merge around the parked cars | I agree, this is hard. Because of this parking, I usually turn west earlier on Arcade, and drive through neighborhoods instead of going directly from Arcade to Maryland. | 10/3/2020 4:21 | 1 | 0 |
| Transit Comment | Maryland Avenue | This is a major intersection for transit. Let's make sure to prioritize bus traffic and transfers in the redesign process. | | | | |
| Vehicle Traffic Comment | Maryland Avenue | This intersection can be nuts. There needs to be green turn arrows turning onto Maryland from the South or the North. If you are heading southbound on Arcade and are trying to turn left onto Maryland going East, you are taking your life in your hands on a green light since so many northbound cars zoom around the line of cars backed up to turn left to go West on Maryland, and you cannot often see them until you are out in the intersection and turning left yourself. This is just a dangerous intersection for everyone. And the parked cars allowed in the right southbound lane before Maryland screw everything up. | | | | |
| Vehicle Traffic Comment | Maryland Avenue | Cars (heading Eastbound on Maryland) turning left into Burger King sometimes back traffic up a bit. | | | | |
| Walking Comment | Maryland Avenue | Lots of Farnsworth Upper students cross Arcade here and it can be very dangerous since there are some motorists that speed up and down Arcade Street. This could/should be a 4 way stop or a lighted intersection for everyone's safety. | | | | |
| Transit Comment | Nebraska Avenue | The current plan just drops northbound bus commuters off on the golf course, no matter what the weather. Could we put a crosswalk in here? Or at least a place to stand until it's safe to cross? | | | | |

# APPENDIX B

| Intersection | Traffic Control | Safety Criteria | | | | Potential Demand Criteria (#) | | | Infrastructure (Existing + Planned) Criteria | | | Public Criteria | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total Bike/Ped Crashes (children) | Total Bike/Ped Crashes | Total Turning Volume (AM+PM) | Total StreetLight Index (Ped+Bike) | Student Population (0.25 miles) | School or Child Destinations (0.25 miles) | Adjacent Bus Stop | Existing Marked Crossing | Bicycle Network (planned or existing) | Included in a Previous Plan | Public Feedback (# identified) | | | | | Safety Rank | | | | Demand Rank | | Inf. Rank | Public Rank | Safety + Demand | All |
| Maryland | Signal | 3 | 12 | 4,192 | 1,124 | 39 | 1 | 4 | 1 | 0 | 1 | 6 | *1* | *1* | *1* | *2* | **1.3** | *7* | *4* | *1* | **3.3** | *2* | **5** | **1** | **2.3** | **2.6** |
| Case | Signal | 2 | 6 | 795 | 790 | 49 | 0 | 2 | 1 | 1 | 1 | 1 | *3* | *2* | *4* | *3* | **3.0** | *3* | *15* | *2* | **5.8** | *3* | **1** | **5** | **4.4** | **3.7** |
| Ivy | Signal | 3 | 3 | 681 | 508 | 12 | 3 | 2 | 1 | 0 | 0 | 6 | *1* | *4* | *5* | *11* | **5.3** | *17* | *1* | *2* | **6.3** | *1* | **7** | **1** | **5.8** | **4.9** |
| York | SSSC | 1 | 3 | 442 | 1,781 | 24 | 2 | 2 | 1 | 0 | 0 | 0 | *4* | *4* | *11* | *1* | **5.0** | *12* | *2* | *2* | **5.3** | *1* | **7** | **6** | **5.1** | **5.8** |
| Wheelock | Signal | 0 | 3 | 1,965 | 513 | 4 | 0 | 2 | 1 | 1 | 1 | 0 | *10* | *4* | *2* | *10* | **6.5** | *19* | *15* | *2* | **10.6** | *3* | **1** | **6** | **8.6** | **6.0** |
| Neid | Signal | 1 | 4 | 1,100 | 341 | 0 | 0 | 2 | 1 | 1 | 1 | 0 | *4* | *3* | *3* | *17* | **6.8** | *20* | *15* | *2* | **10.9** | *3* | **1** | **6** | **8.8** | **6.2** |
| Lawson | SSSC | 0 | 1 | 508 | 436 | 39 | 1 | 2 | 0 | 0 | 1 | 0 | *10* | *7* | *6* | *13* | **9.0** | *7* | *4* | *2* | **5.5** | *1* | **7** | **6** | **7.3** | **6.9** |
| Jenks | SSSC | 0 | 0 | 493 | 630 | 45 | 1 | 0 | 0 | 0 | 1 | 2 | *10* | *16* | *7* | *5* | **9.5** | *4* | *4* | *13* | **7.6** | *1* | **7** | **4** | **8.6** | **7.0** |
| Magnolia | Signal | 0 | 1 | 294 | 399 | 65 | 2 | 2 | 1 | 0 | 0 | 0 | *10* | *7* | *18* | *14* | **12.3** | *1* | *2* | *2* | **4.3** | *1* | **7** | **6** | **8.3** | **7.4** |
| Jessamine | SSSC | 0 | 0 | 271 | 565 | 39 | 1 | 0 | 1 | 1 | 1 | 0 | *10* | *16* | *19* | *8* | **13.3** | *7* | *4* | *13* | **9.3** | *3* | **1** | **6** | **11.3** | **7.4** |
| Cottage | SSSC | 1 | 1 | 449 | 447 | 24 | 1 | 2 | 0 | 0 | 0 | 4 | *4* | *7* | *10* | *12* | **8.3** | *12* | *4* | *2* | **6.6** | *0* | **12** | **3** | **7.4** | **7.5** |
| Hyacinth | SSSC | 0 | 0 | 456 | 619 | 20 | 1 | 0 | 0 | 1 | 1 | 0 | *10* | *16* | *9* | *6* | **10.3** | *16* | *4* | *13* | **10.8** | *2* | **5** | **6** | **10.5** | **8.0** |
| Rose | SSSC | 1 | 1 | 296 | 656 | 41 | 1 | 1 | 0 | 0 | 0 | 0 | *4* | *7* | *16* | *4* | **7.8** | *6* | *4* | *12* | **7.4** | *0* | **12** | **6** | **7.6** | **8.3** |
| Geranium | SSSC | 0 | 1 | 334 | 528 | 34 | 1 | 2 | 0 | 0 | 0 | 0 | *10* | *7* | *15* | *9* | **10.3** | *10* | *4* | *2* | **6.6** | *0* | **12** | **6** | **8.4** | **8.7** |
| Sims | SSSC | 0 | 1 | 429 | 155 | 45 | 1 | 0 | 0 | 0 | 0 | 0 | *10* | *7* | *12* | *20* | **12.3** | *4* | *4* | *13* | **8.3** | *0* | **12** | **6** | **10.3** | **9.6** |
| Orange | SSSC | 1 | 1 | 372 | 233 | 24 | 0 | 2 | 0 | 0 | 0 | 0 | *4* | *7* | *14* | *18* | **10.8** | *12* | *15* | *2* | **9.9** | *0* | **12** | **6** | **10.3** | **9.7** |
| Cook | SSSC | 0 | 0 | 379 | 343 | 60 | 1 | 0 | 0 | 0 | 0 | 0 | *10* | *16* | *13* | *16* | **13.8** | *2* | *4* | *13* | **8.2** | *0* | **12** | **6** | **11.0** | **10.0** |
| Hawthorne | SSSC | 0 | 1 | 296 | 598 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | *10* | *7* | *16* | *7* | **10.0** | *11* | *15* | *13* | **12.3** | *0* | **12** | **6** | **11.1** | **10.1** |
| Clear | SSSC | 1 | 1 | 144 | 208 | 11 | 1 | 0 | 0 | 0 | 0 | 0 | *4* | *7* | *20* | *19* | **12.5** | *18* | *4* | *13* | **11.9** | *0* | **12** | **6** | **12.2** | **10.6** |
| Sherwood | SSSC | 0 | 0 | 470 | 385 | 22 | 0 | 0 | 0 | 0 | 0 | 0 | *10* | *16* | *8* | *15* | **12.3** | *15* | *15* | *13* | **13.8** | *0* | **12** | **6** | **13.0** | **11.0** |

# APPENDIX C

| Major Street | Limit 1 | Limit 2 | Parking West (ft) | Parking East (ft) | Supply (West) | Supply (East) | Demand Wed, May 2, 2018, 2-4 pm (West) | Demand Wed, May 2, 2018, 2-4 pm (East) | Occupancy Wed, May 2, 2018, 2-4 pm (West) | Occupancy Wed, May 2, 2018, 2-4 pm (East) | Demand Fri, Sept 7, 2018, 4-6 pm (West) | Demand Fri, Sept 7, 2018 , 4-6 pm(East) | Occupancy Fri, Sept 7, 2018, 4-6 pm (West) | Occupancy Fri, Sept 7, 2018, 4-6 pm (East) | Demand Fri, April 19, 2019, 11a-1p (West) | Demand Fri, April 19, 2019, 11a-1p (East) | Occupancy Fri, April 19, 2019, 11a-1p (West) | Occupancy Fri, April 19, 2019, 11a-1p (East) | Demand Thur, Aug, 29, 2019, 10a-12p (West) | Demand Thur, Aug, 29, 2019, 10a-12p (East) | Occupancy Thur, Aug, 29, 2019, 10a-12p (West) | Occupancy Thur, Aug, 29, 2019, 10a-12p (East) | Demand Thur, June 25 2020, 11:30p (West) | Demand Thur, June 25, 2020, 11:30p (East) | Occupancy Thur, June 25, 2020, 11:30p (West) | Occupancy Thur, June 25, 2020, 11:30p (East) | Demand Sat, June 27, 2020 (West) | Demand Sat, June 27, 2020 (East) | Occupancy Sat, June 27, 2020 (West) | Occupancy Sat, June 27, 2020 (East) | Highest Demand (West) | Highest Demand (East) | Highest Occupancy (West) | Highest Occupancy (East) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arcade Street | Neid Lane | York Avenue | 0 | 0 | 0 | 0 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% |
| Arcade Street | York Avenue | Sims Avenue | 170 | 175 | 6 | 7 | 0 | 4 | 0% | 57% | 2 | 4 | 33% | 57% | 0 | 2 | 0% | 29% | 1 | 4 | 17% | 57% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 2 | 4 | 33% | 57% |
| Arcade Street | Sims Avenue | Case Avenue E | 0 | 205 | 0 | 8 | 0 | 0 | 0% | 0% | 0 | 1 | 0% | 13% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 1 | 0% | 13% | 0 | 0 | 0% | 0% | 0 | 1 | 0% | 13% |
| Arcade Street | Case Avenue | Jenks Avenue E | 130 | 135 | 5 | 5 | 2 | 0 | 40% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 2 | 0 | 40% | 0% |
| Arcade Street | Jenks Avenue | Lawson Avenue E | 120 | 215 | 4 | 8 | 3 | 1 | 75% | 13% | 2 | 3 | 50% | 38% | 2 | 3 | 50% | 38% | 0 | 1 | 0% | 13% | 0 | 0 | 0% | 0% | 1 | 1 | 25% | 13% | 3 | 3 | 75% | 38% |
| Arcade Street | Lawson Avenue | Cook Avenue | 230 | 210 | 9 | 8 | 5 | 3 | 56% | 38% | 0 | 1 | 0% | 13% | 4 | 0 | 44% | 0% | 2 | 0 | 22% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 5 | 3 | 56% | 38% |
| Arcade Street | Cook Avenue | Magnolia Avenue E | 0 | 118 | 0 | 4 | 0 | 0 | 0% | 0% | 0 | 1 | 0% | 25% | 0 | 0 | 0% | 0% | 0 | 1 | 0% | 25% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 1 | 0% | 25% |
| Arcade Street | Magnolia Avenue | Jessamine Avenue E | 155 | 90 | 6 | 3 | 5 | 0 | 83% | 0% | 6 | 3 | 100% | 100% | 4 | 3 | 67% | 100% | 4 | 1 | 67% | 33% | 0 | 0 | 0% | 0% | 1 | 0 | 17% | 0% | 6 | 3 | 100% | 100% |
| Arcade Street | Jessamine Avenue | Geranium Avenue E | 165 | 175 | 6 | 7 | 2 | 0 | 33% | 0% | 3 | 4 | 50% | 57% | 0 | 1 | 0% | 14% | 0 | 1 | 0% | 14% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 3 | 4 | 50% | 57% |
| Arcade Street | Geranium Avenue | Rose Avenue E | 205 | 135 | 8 | 5 | 0 | 1 | 0% | 20% | 0 | 2 | 0% | 40% | 0 | 0 | 0% | 0% | 0 | 1 | 0% | 20% | 0 | 2 | 0% | 40% | 0 | 2 | 0% | 40% | 0 | 2 | 0% | 40% |
| Arcade Street | Rose Avenue | Maryland Avenue E | 0 | 0 | 0 | 0 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% |
| Arcade Street | Maryland Avenue | Hawthorne Avenue E | 215 | 165 | 8 | 6 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 2 | 0 | 25% | 0% | 4 | 0 | 50% | 0% | 1 | 0 | 13% | 0% | 0 | 0 | 0% | 0% | 4 | 0 | 50% | 0% |
| Arcade Street | Hawthorne Avenue | Orange Avenue E | 215 | 135 | 8 | 5 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% |
| Arcade Street | Orange Avenue | Hyacinth Avenue E | 210 | 225 | 8 | 9 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% |
| Arcade Street | Hyacinth Avenue | Ivy Avenue E | 240 | 260 | 9 | 10 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% |
| Arcade Street | Ivy Avenue | Clear Avenue E | 180 | 210 | 7 | 8 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% |
| Arcade Street | Clear Avenue | Cottage Avenue E | 200 | 240 | 8 | 9 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% |
| Arcade Street | Cottage Avenue | Sherwood Avenue | 170 | 202 | 6 | 8 | 1 | 0 | 17% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 1 | 0 | 17% | 0% |
| Arcade Street | Sherwood Avenue | Wheelock Parkway | 168 | 60 | 6 | 2 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% |
| Arcade Street | Wheelock Parkway | Nevada Avenue E | 0 | 0 | 0 | 0 | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% | 0 | 0 | 0% | 0% |
| | | | | **Total** | **104** | **112** | **18** | **9** | **17%** | **8%** | **13** | **19** | **13%** | **17%** | **12** | **9** | **12%** | **8%** | **11** | **9** | **11%** | **8%** | **1** | **3** | **1%** | **3%** | **2** | **3** | **2%** | **3%** | **26** | **21** | **25%** | **19%** |