



Application

01968 - 2014 Roadway Reconstruction/Modernization

02171 - White Bear Avenue (CSAH 65) Reconstruction- I-94 to Beech Street

Regional Solicitation - Roadways Including Multimodal Elements

Status: Submitted
Submitted Date: 12/01/2014 1:06 PM

Primary Contact

Name:* Joseph Frank Lux
Salutation First Name Middle Name Last Name

Title: Senior Planner

Department: Ramsey County Public Works

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Address: 1425 Paul Kirkwold Drive

***** Arden Hills Minnesota 55112
City State/Province Postal Code/Zip

Phone:* 651-266-7114
Phone Ext.

Fax: 651-266-7110

What Grant Programs are you most interested in? Regional Solicitation - Roadways Including Multimodal Elements

Organization Information

Name: RAMSEY COUNTY

Jurisdictional Agency (if different):

Organization Type: County Government

Organization Website:

Address: DEPT OF PUBLIC WORKS
1425 PAUL KIRKWOOD DR

* ARDEN HILLS Minnesota 55112
City State/Province Postal Code/Zip

County: Ramsey

Phone:* 651-266-7100
Ext.

Fax:

PeopleSoft Vendor Number 0000023983A30

Project Information

Project Name White Bear Avenue (CSAH 65) Reconstruction- I-94 to Beech Street

Primary County where the Project is Located Ramsey

Jurisdictional Agency (If Different than the Applicant):

Brief Project Description (Limit 2,800 characters; approximately 400 words) Reconstruction of White Bear Avenue (CSAH 65) between I-94 and Beech Street to include intersection improvements at Old Hudson Road, grading, base, curb and gutter, storm sewer, bituminous surfacing, and traffic signals.

Include location, road name/functional class, type of improvement, etc.

Project Length (Miles) 0.72

Connection to Local Planning:

Reference the name of the appropriate comprehensive plan, regional/statewide plan, capital improvement program, corridor study document [studies on trunk highway must be approved by MnDOT and the Metropolitan Council], or other official plan or program of the applicant agency [includes Safe Routes to School Plans] that the project is included in and/or a transportation problem/need that the project addresses. List the applicable documents and pages.

Connection to Local Planning The project is included in Ramsey County's 2014-2018 Transportation Improvement Program.

Project Funding

Are you applying for funds from another source(s) to implement this project? No

If yes, please identify the source(s)

Federal Amount \$3,130,210.00

Match Amount \$782,553.00

Minimum of 20% of project total

Project Total \$3,912,763.00

Match Percentage 20.0%

Minimum of 20%

Compute the match percentage by dividing the match amount by the project total

Source of Match Funds CSAH, MSA, and local funds.

Preferred Program Year

Select one: 2017 (Roadway Projects Only)

MnDOT State Aid Project Information: Roadway Projects

County, City, or Lead Agency Ramsey County Public Works

Functional Class of Road Class A Minor Arterial- Augmenter

Road System CSAH

TH, CSAH, MSAS, CO. RD., TWP. RD., CITY STREET

Name of Road White Bear Avenue

Example; 1st ST., MAIN AVE

Zip Code where Majority of Work is Being Performed 55106

(Approximate) Begin Construction Date 05/08/2017

(Approximate) End Construction Date 11/10/2017

LOCATION

From:
(Intersection or Address) Interstate Highway 94

*Do not include legal description;
Include name of roadway if majority of facility
runs adjacent to a single corridor.*

To:
(Intersection or Address) Beech Street

Type of Work Grading, Aggregate Base, Storm Sewer, Bituminous Surfacing, Sidewalk and Ped Ramps, Traffic Signals with Audible Ped Signals and Countdown Timers.

Examples: grading, aggregate base, bituminous base, bituminous surface, sidewalk, signals, lighting, guardrail, bicycle path, ped ramps, bridge, Park & Ride, etc.)

Old Bridge/Culvert? No

New Bridge/Culvert? No

Structure is Over/Under
(Bridge or culvert name):

Specific Roadway Elements

CONSTRUCTION PROJECT ELEMENTS/COST ESTIMATES	Cost
Mobilization (approx. 5% of total cost)	\$200,000.00
Removals (approx. 5% of total cost)	\$200,000.00
Roadway (grading, borrow, etc.)	\$534,801.00
Roadway (aggregates and paving)	\$527,672.00
Subgrade Correction (muck)	\$0.00
Storm Sewer	\$375,429.00
Ponds	\$0.00
Concrete Items (curb & gutter, sidewalks, median barriers)	\$353,473.00
Traffic Control	\$40,000.00
Striping	\$38,878.00
Signing	\$9,555.00
Lighting	\$249,957.00
Turf - Erosion & Landscaping	\$279,998.00
Bridge	\$0.00
Retaining Walls	\$103,000.00
Noise Wall	\$0.00
Traffic Signals	\$500,000.00
Wetland Mitigation	\$0.00
Other Natural and Cultural Resource Protection	\$0.00
RR Crossing	\$0.00
Roadway Contingencies	\$500,000.00
Other Roadway Elements	\$0.00
Totals	\$3,912,763.00

Specific Bicycle and Pedestrian Elements

CONSTRUCTION PROJECT ELEMENTS/COST ESTIMATES	Cost
Path/Trail Construction	\$0.00
Sidewalk Construction	\$0.00

On-Street Bicycle Facility Construction	\$0.00
Right-of-Way	\$0.00
Pedestrian Curb Ramps (ADA)	\$0.00
Crossing Aids (e.g., Audible Pedestrian Signals, HAWK)	\$0.00
Pedestrian-scale Lighting	\$0.00
Streetscaping	\$0.00
Wayfinding	\$0.00
Bicycle and Pedestrian Contingencies	\$0.00
Other Bicycle and Pedestrian Elements	\$0.00
Totals	\$0.00

Specific Transit and TDM Elements

CONSTRUCTION PROJECT ELEMENTS/COST ESTIMATES	Cost
Fixed Guideway Elements	\$0.00
Stations, Stops, and Terminals	\$0.00
Support Facilities	\$0.00
Transit Systems (e.g. communications, signals, controls, fare collection, etc.)	\$0.00
Vehicles	\$0.00
Transit and TDM Contingencies	\$0.00
Other Transit and TDM Elements	\$0.00
Totals	\$0.00

Transit Operating Costs

OPERATING COSTS	Cost
Transit Operating Costs	\$0.00
Totals	\$0.00

Totals

Total Cost	\$3,912,763.00
Construction Cost Total	\$3,912,763.00
Transit Operating Cost Total	\$0.00

Requirements - All Projects

All Projects

1. The project must be consistent with the goals and policies in these adopted regional plans: Thrive MSP 2040 (2014), the 2030 Transportation Policy Plan (amended 2013), the 2030 Regional Parks Policy Plan (amended 2013), and the 2030 Water Resources Management Policy Plan (2005).

Check the box to indicate that the project meets this requirement. Yes

2. Applicants that are not cities or counties in the seven-county metro area with populations over 5,000 must contact the MnDOT Metro State Aid Office prior to submitting their application to determine if a public agency sponsor is required.

Check the box to indicate that the project meets this requirement. Yes

3. Applicants must not submit an application for the same project in more than one funding sub-category.

Check the box to indicate that the project meets this requirement. Yes

4. The requested funding amount must be more than or equal to the minimum award and less than or equal to the maximum award. The cost of preparing a project for funding authorization can be substantial. For that reason, minimum federal amounts apply. Other federal funds may be combined with the requested funds for projects exceeding the maximum award, but the source(s) must be identified in the application. Expansion, reconstruction/modernization, and bridges must be between \$1,000,000 and \$7,000,000. Roadway system management must be between \$250,000 and \$7,000,000.

Check the box to indicate that the project meets this requirement. Yes

5. The project must comply with the Americans with Disabilities Act.

Check the box to indicate that the project meets this requirement. Yes

6. The project must be accessible and open to the general public.

Check the box to indicate that the project meets this requirement. Yes

7. The owner/operator of the facility must operate and maintain the project for the useful life of the improvement.

Check the box to indicate that the project meets this requirement. Yes

8. The project must represent a permanent improvement with independent utility. The term independent utility means the project provides benefits described in the application by itself and does not depend on any construction elements of the project being funded from other sources outside the regional solicitation, excluding the required non-federal match. Projects that include traffic management or transit operating funds as part of a construction project are exempt from this policy.

Check the box to indicate that the project meets this requirement. Yes

9. The project must not be a temporary construction project. A temporary construction project is defined as work that must be replaced within five years and is ineligible for funding. The project must also not be staged construction where the project will be replaced as part of future stages. Staged construction is eligible for funding as long as future stages build on, rather than replace, previous work.

Check the box to indicate that the project meets this requirement. Yes

10. The project applicant must send written notification regarding the proposed project to all affected communities and other levels and units of government prior to submitting the application.

Check the box to indicate that the project meets this requirement. Yes

Requirements - Roadways Including Multimodal Elements

Expansion and Reconstruction/Modernization Projects Only

1. The project must be designed to meet 10-ton load limit standards.

Check the box to indicate that the project meets this requirement. Yes

2. Federal funds are available for roadway construction and reconstruction on new alignments or within existing right-of-way, including associated construction and excavation, bridges, or installation of traffic signals, signs, utilities, bikeway or walkway components and transit components.

The project must exclude costs for right-of-way, studies, preliminary engineering, design, or construction engineering. Noise barriers, drainage projects, fences, landscaping, etc., are not eligible for funding unless included as part of a larger project, which is otherwise eligible.

Check the box to indicate that the project meets this requirement. Yes

Bridge Projects Only

3. The bridge project must be identified as a Principal Arterial (Non-Freeway facilities only) or A Minor Arterial as shown on the latest TAB approved roadway functional classification map.

Check the box to indicate that the project meets this requirement.

4. Bridges selected in previous Bridge Improvement and Replacement solicitations (1994-2011) are not eligible. A previously selected project is not eligible unless it has been withdrawn or sunset prior to the deadline for proposals in this solicitation.

Check the box to indicate that the project meets this requirement.

5. Projects requiring a grade-separated crossing of a Principal Arterial of freeway design must be limited to the federal share of those project costs identified as local (non-MnDOT) cost responsibility using MnDOT's Cost Participation for Cooperative Construction Projects and Maintenance Responsibilities manual. In the case of a federally funded trunk highway project, the policy guidelines should be read as if the funded trunk highway route is under local jurisdiction.

Check the box to indicate that the project meets this requirement.

6. The bridge must carry vehicular traffic. Bridges can carry traffic from multiple modes. However, bridges that are exclusively for bicycle or pedestrian traffic must apply under one of the Bicycle and Pedestrian Facilities sub-categories. Rail-only bridges are ineligible for funding.

Check the box to indicate that the project meets this requirement.

7. The length of the bridge must equal or exceed 20 feet.

Check the box to indicate that the project meets this requirement.

8. Project limits for bridge projects are limited from abutment to abutment.

Check the box to indicate that the project meets this requirement.

9. The project must exclude costs for studies, preliminary engineering, design, construction engineering, and right-of-way.

Check the box to indicate that the project meets this requirement.

Bridge Replacement Projects Only

10. The bridge must have a sufficiency rating less than 50. Additionally, it must also be classified as structurally deficient or functionally obsolete.

Check the box to indicate that the project meets this requirement.

Bridge Rehabilitation Projects Only

11. The bridge must have a sufficiency rating less than 80. Additionally, it must also be classified as structurally deficient or functionally obsolete.

Check the box to indicate that the project meets this requirement.

Other Attachments

File Name	Description	File Size
2171 Ramsey HSIP.pdf	Crash B/C	30 KB
Rdway.pdf	Roadway Area Definition	805 KB
RegionalEcon.pdf	Regional Economy	1.7 MB
SocioEcon.pdf	Socio Economic	1.7 MB
St. Paul Support of White Bear Avenue 1212014.pdf	City of St. Paul Support Letter	202 KB
TransitCon.pdf	Transit Connections	1.8 MB
WhiteBearLocationMap.pdf	White Bear Avenue (CSAH 65) Location Map	13.3 MB

Reliever: Freeway Facility or

Facility being relieved

Number of hours per day volume exceeds capacity (based on the Congestion Report) 0

Reliever: Non-Freeway Facility or

Facility being relieved

Number of hours per day volume exceeds capacity (based on the table below) 0

Non-Freeway Facility Volume/Capacity Table

Hour	NB/EB Volume	SB/WB Volume	Capacity	Volume exceeds capacity
12:00am - 1:00am				
1:00am - 2:00am				
2:00am - 3:00am				
3:00am - 4:00am				
4:00am - 5:00am				
5:00am - 6:00am				
6:00am - 7:00am				
7:00am - 8:00am				
8:00am - 9:00am				
9:00am - 10:00am				

- 10:00am - 11:00am
- 11:00am - 12:00pm
- 12:00pm - 1:00pm
- 1:00pm - 2:00pm
- 2:00pm - 3:00pm
- 3:00pm - 4:00pm
- 4:00pm - 5:00pm
- 5:00pm - 6:00pm
- 6:00pm - 7:00pm
- 7:00pm - 8:00pm
- 8:00pm - 9:00pm
- 9:00pm - 10:00pm
- 10:00pm - 11:00pm
- 11:00pm - 12:00am

Expander/Connector/Augmentor/Non-Freeway Principal Arterial

Select one:	Augmenter
Area	2.471
Project Length	0.748
Average Distance	3.3035
Upload Map	White Bear Avenue Roadway Definition.pdf

Measure B: Current Heavy Commercial Traffic

Location	White Bear Avenue, at 3rd Street
Current daily heavy commercial traffic volume	476.0

Measure C: Project Location Relative to Jobs, Manufacturing, and Education

Select all that apply

Direct connection to or within a mile of a Job Concentration Yes

Direct connection to or within a mile of a Manufacturing/Distribution Location

Direct connection to or within a mile of an Educational Institution Yes

Project provides a direct connection to or within a mile of an existing local activity center identified in an adopted county or city plan

County or City Plan Reference (Limit 700 characters; approximately 100 words)

This project is included in Ramsey County's 2014-2018 Transportation Improvement Program.

Upload Map

White Bear Avenue Regional Economy.pdf

Measure A: Current Daily Person Throughput

Location	Between I-94 North Ramp and Old Hudson Road
Current AADT Volume	22000.0
Existing Transit Routes on the Project	63, 80, 294, 350, 351, 353, 355, 375

Response: Current Daily Person Throughput

Average Annual Daily Transit Ridership	1923.0
Current Daily Person Throughput	30523.0

Measure B: 2030 Forecast ADT

Use Metropolitan Council model to determine forecast (2030) ADT volume	Yes
METC Staff - Forecast (2030) ADT volume	26000.0
OR	
Approved county or city travel demand model to determine forecast (2030) ADT volume	
Forecast (2030) ADT volume	0

Measure A: Project Location and Impact to Disadvantaged Populations

Select one:

Project located in Racially Concentrated Area of Poverty

Project located in Concentrated Area of Poverty

Projects census tracts are above the regional average for population in poverty or population of color

Yes

Project located in a census tract that is below the regional average for population in poverty or populations of color or includes children, people with disabilities, or the elderly.

Response (Limit 1,400 characters; approximately 200 words)

White Bear Avenue is a densely-populated mixed-use corridor that serves both as a regional facility and the needs of the neighboring properties. The proposed project will address the deficiencies in the pedestrian facilities to provide safer and more convenient access along the corridor. In addition, the project will improve throughput for transit and motor vehicles to provide access to businesses and to nearby job centers.

Upload Map

White Bear Avenue Socio-Economic.pdf

Measure B: Affordable Housing

City/Township	Segment Length (Miles)
St. Paul	0.72
	1

Total Project Length

Total Project Length	0.72
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Affordable Housing Scoring - To Be Completed By Metropolitan Council Staff

City/Township	Segment Length (Miles)	Total Length (Miles)	Score	Segment Length/Total Length	Housing Score Multiplied by Segment percent
St. Paul	0.72	0.72	98.0	1.0	98.0
		1	98	1	98

Affordable Housing Scoring - To Be Completed By Metropolitan Council Staff

Total Project Length (Miles)	0.72
Total Housing Score	98.0

Measure A: Year of Roadway Construction

Year of Original Roadway Construction or Most Recent Reconstruction	Roadway Segment Length (Miles)	Calculation	Calculation 2
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1956.0	0.72	1408.32	1956.0
	1	1408	1956

Average Construction Year

Weighted Year	1956.0
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Total Segment Length (Miles)

Total Segment Length	0.72
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Measure B: Geometric, Structural, or Infrastructure Improvements

Response (Limit 1,400 characters; approximately 200 words)

The existing roadway is structurally deficient and lacks the ability to carry current traffic loads. It consists of a bituminous overlay over a badly deteriorated concrete pavement over an unknown base. These structural deficiencies reduce the life of a mill and overlay to less than ten years, which is extremely uneconomical. Reconstructing the road to a ten-ton structure will reduce the maintenance frequency and improve cost effectiveness. Dedicated left-turn lanes will be added at Old Hudson Road to alleviate congestion. Sidewalks are currently in poor condition and will be rebuilt and ADA-compliant pedestrian ramps added and traffic signals will be upgraded to meet ADA standards with audible pedestrian signals and countdown timers.

Measure A: Cost Effectiveness of Vehicle Delay Reduction

Total Project Cost from Cost Sheet	\$3,912,763.00
Total Peak Hour Vehicle Delay Without The Project	28.52
Total Peak Hour Vehicle Delay With The Project	11.16
Total Peak Hour Vehicle Delay Reduced by Project	17.36
Cost Effectiveness	\$225,389.57
Synchro or HCM Reports	FINAL_White Bear Ave Traffic Operations report - 11-05-14.pdf

Measure B: Cost Effectiveness of Emissions Reduction

Total Project Cost from Cost Sheet	\$3,912,763.00
Total Peak Hour Kilograms Reduced by Project	187.0
Cost Effectiveness	\$20,923.87
Synchro or HCM Reports	Emissions Table - 11-24-14.pdf

Measure A: Benefit/Cost of Crash Reduction

Project Benefit/Cost Ratio	0.51
Worksheet Attachment	HSIP Wkst White Bear Old Hudson.xlsx

Measure A: Transit Connections

Existing Routes Directly Connected to the Project	63, 80, 294, 350, 351, 353, 355, 375
Planned Transitways directly connected to the project (alignment and mode determined and identified in the 2030 TPP)	N/A
Upload Map	White Bear Avenue Transit.pdf

Response

Met Council Staff Data Entry Only

Route Ridership	2105897.0
Transitway Ridership	0

Measure B: Bicycle and Pedestrian Connections

Response (Limit 1,400 characters; approximately 200 words)	<p>The area of St. Paul's East Side surrounding the project is a mixture of commercial and residential uses. Residents depend on White Bear Avenue as a pedestrian route. Due to its narrow cross section, White Bear Avenue is not included in the City's draft Bicycle Plan, which identifies parallel routes for bike travel. Sidewalks and crosswalks will be upgraded to current ADA standards as part of this project and the traffic signals at Old Hudson Road and 3rd Street will be upgraded with audible pedestrian signals and countdown timers.</p>
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Measure C: Multimodal Facilities

Response (Limit 1,400 characters; approximately 200 words)

Sidewalks and crosswalks will be upgraded to current ADA standards as part of this project and the traffic signals at Old Hudson Road and 3rd Street will be upgraded with audible pedestrian signals and countdown timers.

Transit Projects Not Requiring Construction

If the applicant is completing a transit or TDM application, only Park-and-Ride and other construction projects require completion of the Risk Assessment below. Check the box below if the project does not require the Risk Assessment fields, and do not complete the remainder of the form. These projects will receive full points for the Risk Assessment.

[Check Here if Your Transit Project Does Not Require Construction](#)

Measure A: Risk Assessment

1)Project Scope (5 Percent of Points)

Meetings or contacts with stakeholders have occurred

100%

Stakeholders have been identified

Yes

40%

Stakeholders have not been identified or contacted

0%

2)Layout or Preliminary Plan (5 Percent of Points)

Layout or Preliminary Plan completed

100%

Layout or Preliminary Plan started

Yes

50%

Layout or Preliminary Plan has not been started

0%

Anticipated date or date of completion

3)Environmental Documentation (10 Percent of Points)

EIS

EA

PM

Yes

Document Status:

Document approved (include copy of signed cover sheet) 100%

Document submitted to State Aid for review 75%

Document in progress; environmental impacts identified 50%

Document not started 0%

Anticipated date or date of completion/approval 02/26/2016

4)Review of Section 106 Historic Resources (15 Percent of Points)

No known potential for archaeological resources, no historic resources known to be eligible for/listed on the National Register of Historic Places located in the project area, and project is not located on an identified historic bridge

100%

Historic/archeological review under way; determination of no historic properties affected or no adverse effect anticipated Yes

80%

Historic/archaeological review under way; determination of adverse effect anticipated

40%

Unknown impacts to historic/archaeological resources 0%

Anticipated date or date of completion of historic/archeological review: 12/18/2015

Project is located on an identified historic bridge

5)Review of Section 4f/6f Resources (15 Percent of Points)

(4f is publicly owned parks, recreation areas, historic sites, wildlife or waterfowl refuges; 6f is outdoor recreation lands where Land and Water Conservation Funds were used for planning, acquisition, or development of the property)

No Section 4f/6f resources located in the project area Yes 100%

Project is an independent bikeway/walkway project covered by the bikeway/walkway Negative Declaration statement; letter of support received

100%

Section 4f resources present within the project area, but no known adverse effects

80%

Adverse effects (land conversion) to Section 4f/6f resources likely

30%

Unknown impacts to Section 4f/6f resources in the project area

0%

6)Right-of-Way (15 Percent of Points)

Right-of-way or easements not required

100%

Right-of-way or easements has/have been acquired

100%

Right-of-way or easements required, offers made

75%

Right-of-way or easements required, appraisals made

50%

Right-of-way or easements required, parcels identified Yes

25%

Right-of-way or easements required, parcels not identified

0%

Right-of-way or easements identification has not been completed

0%

Anticipated date or date of acquisition 04/01/2016

7)Railroad Involvement (25 Percent of Points)

No railroad involvement on project Yes

100%

Railroad Right-of-Way Agreement is executed (include signature page) 100%

Railroad Right-of-Way Agreement required; Agreement has been initiated

60%

Railroad Right-of-Way Agreement required; negotiations have begun

40%

Railroad Right-of-Way Agreement required; negotiations not begun

0%

Anticipated date or date of executed Agreement

8)Construction Documents/Plan (10 Percent of Points)

Construction plans completed/approved (include signed title sheet)

100%

Construction plans submitted to State Aid for review

75%

Construction plans in progress; at least 30% completion

50%

Construction plans have not been started

Yes

0%

Anticipated date or date of completion

01/22/2016

9) Letting

Anticipated Letting Date

01/20/2017

HSIP worksheet

Control Section	T.H. / Roadway	Location	Beginning Ref. Pt.	Ending Ref. Pt.	State, County, City or Township	Study Period Begins	Study Period Ends
		White Bear @ Old Hudson			Ramsey County	1/1/2011	12/31/2013
Description of Proposed Work		Install left turn lanes and add left turn phase					

Accident Diagram Codes	1 Rear End	2 Sideswipe Same Direction	3 Left Turn Main Line	5 Right Angle	4,7 Ran off Road	8, 9 Head On/ Sideswipe - Opposite Direction	Pedestrian	Other	Total

Study Period: Number of Crashes	Fatal	F							
	Personal Injury (PI)	A							
		B		1				1	2
		C			1				1
	Property Damage	PD	11	4	8	11	2		36

% Change in Crashes	Fatal	F							
	PI	A							
		B		-58%				-58%	
		C			-58%				
	Property Damage	PD	-58%	-58%	-58%	-58%	-58%		

**Use Desktop Reference for Crash Reduction Factors*

Change in Crashes = No. of crashes X % change in crashes	Fatal	F							
	PI	A							
		B		-0.58				-0.58	-1.16
		C			-0.58				-0.58
	Property Damage	PD	-6.38	-2.32	-4.64	-6.38	-1.16		-20.88

Year (Safety Improvement Construction) **2014**

Project Cost (exclude Right of Way)	Right of Way Costs (optional)	Traffic Growth Factor	Capital Recovery	1. Discount Rate	2. Project Service Life (n)	Total
\$ 3,912,763		2%		4.5%	20	
	F	A	B	C	PD	
			-1.16	-0.58	-20.88	
			-0.39	-0.19	-6.96	
	\$ 1,100,000	\$ 550,000	\$ 160,000	\$ 81,000	\$ 7,400	\$ 129,031
			\$ 61,867	\$ 15,660	\$ 51,504	

B/C= 0.51

Using present worth values,
B= \$ 1,984,515
C= \$ 3,912,763
See "Calculations" sheet for amortization.

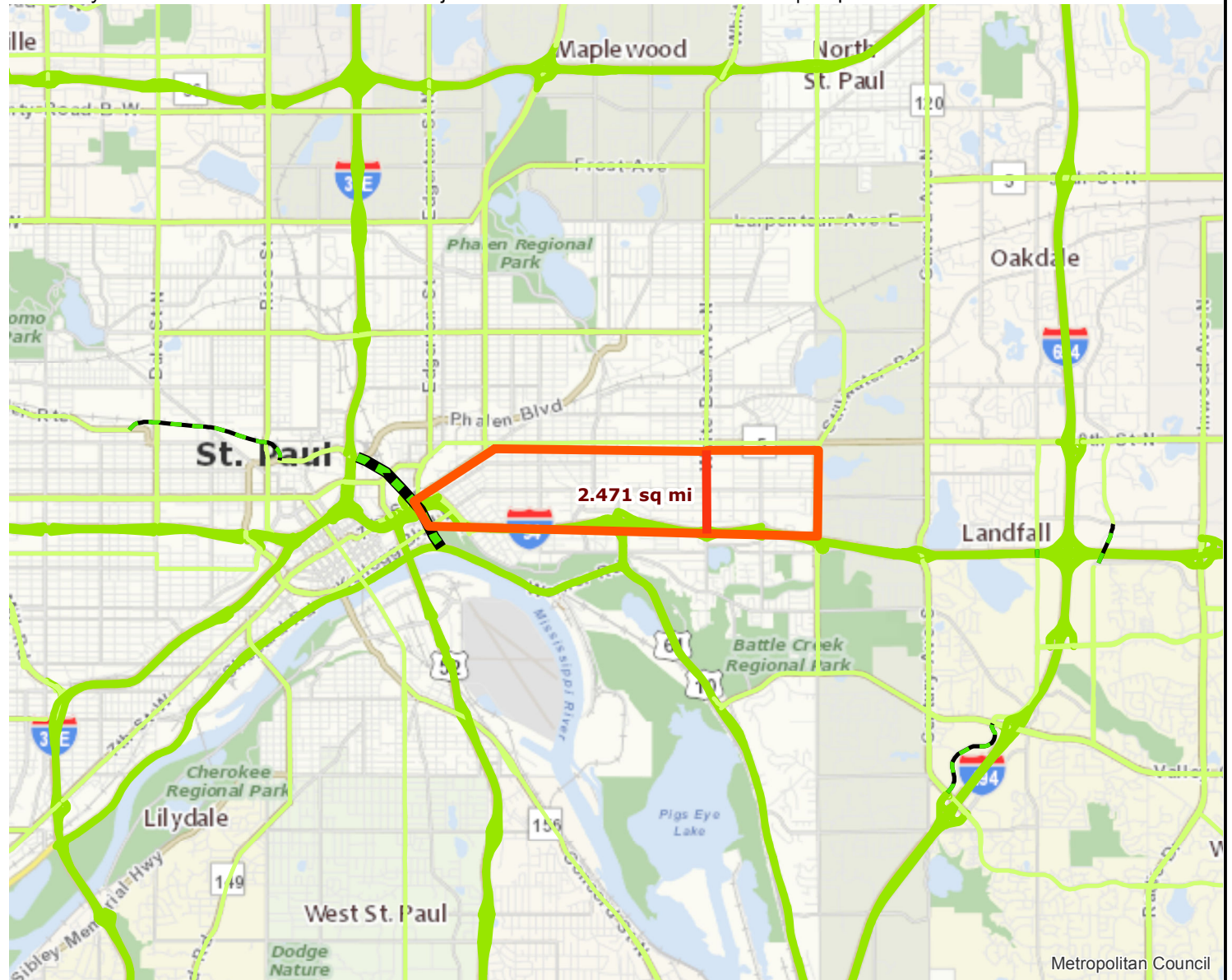
Roadway Area Definition

Roadway Reconstruction/Modernization Project: WhiteBearAve 1-94toBeech St | Map ID: 1419953527158

Results

Project Length: 0.748 miles

Project Area: 2.471 sq mi



- Project
- Principal Arterials
- Principal Arterials Planned
- Project Area
- A Minor Arterials
- A Minor Arterials Planned



Created: 12/30/2014
LandscapeRSA1



For complete disclaimer of accuracy, please visit
<http://giswebsite.metc.state.mn.us/gissitenew/notice.aspx>



Regional Economy

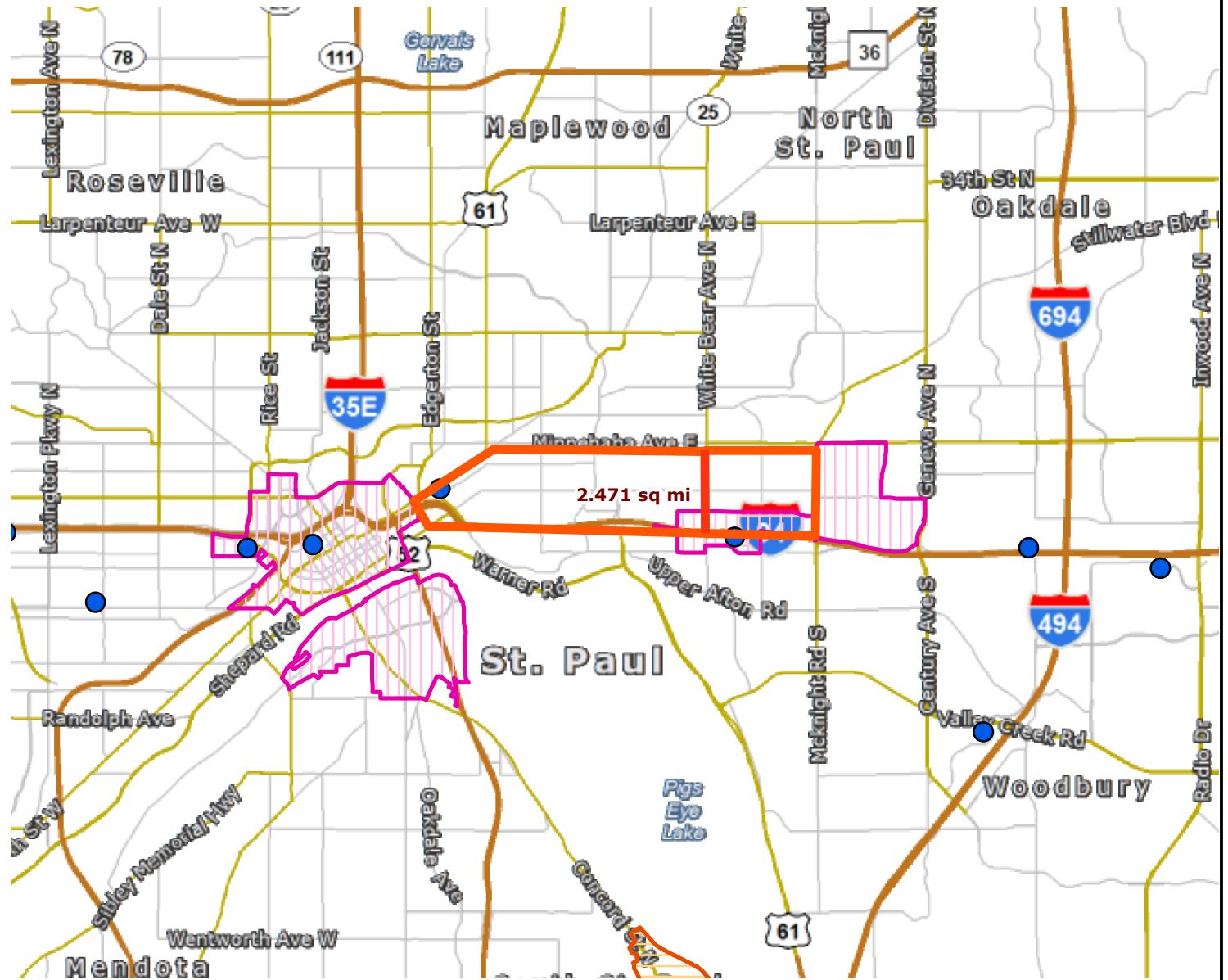
Roadway Reconstruction/Modernization Project: WhiteBearAve 1-94toBeech St | Map ID: 1419953527158

Results

Project **IN** area of Job Concentration.

Project **NOT IN** to area of Manufacturing and Distribution.

Project **CONNECTED** to area of Education Institutions.



- Project
- Project Area
- PostSecondary Education Centers
- Manufacturing/Distribution Centers
- Job Concentration Centers



Created: 12/30/2014
LandscapeRSA5



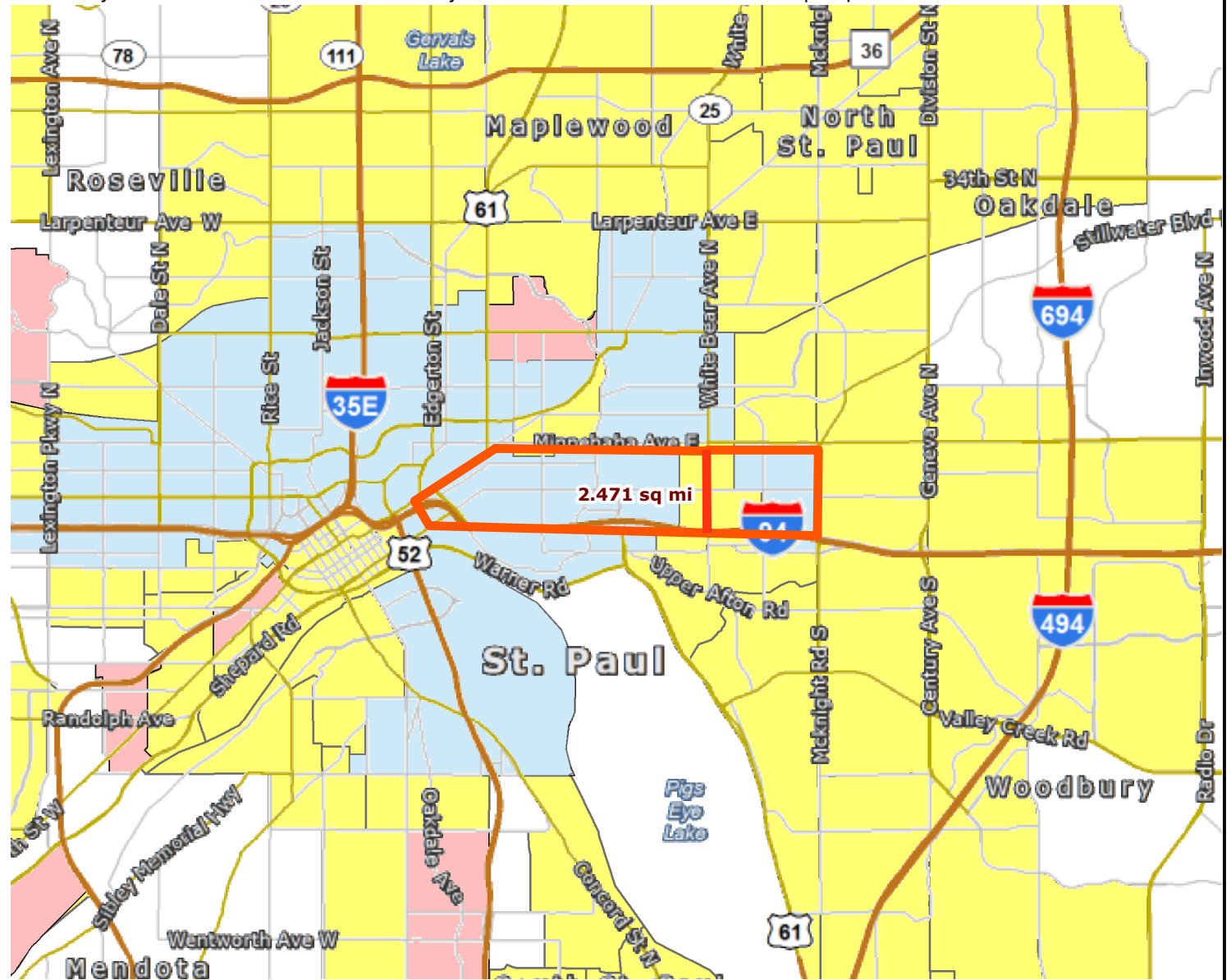
For complete disclaimer of accuracy, please visit <http://giswebsite.metc.state.mn.us/gissitenew/notice.aspx>



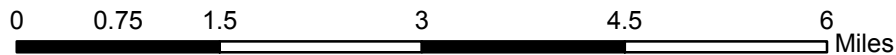
Socio-Economic Conditions Roadway Reconstruction/Modernization Project: WhiteBearAve 1-94toBeech St | Map ID: 1419953527158

Results

Project IN area of above average concentration of race or poverty.



- Project
- Racially concentrated area of poverty
- Above reg'l avg conc of race/poverty
- Concentrated area of poverty



Created: 12/30/2014
LandscapeRSA2



For complete disclaimer of accuracy, please visit <http://giswebsite.metc.state.mn.us/gissitenew/notice.aspx>



DEPARTMENT OF PUBLIC WORKS

Rich Lallier, Director



CITY OF SAINT PAUL
Christopher B. Coleman, Mayor

John Maczko, City Engineer
1500 City Hall Annex
25 W. Fourth Street
Saint Paul, MN 55102-1660

Telephone: 651-266-6137
Fax: 651-266-6222

December 1, 2014

James Tolaas
Ramsey County Engineer
Ramsey County Public Works
1425 Paul Kirkwold Drive
Arden Hills, MN 55112

Dear Mr. Tolaas:

I am writing this letter in support of your STP application for the reconstruction of White Bear Avenue from I-94 to Beach Street. White Bear Avenue is a significant and important North/South street that serves as a major connection to our East side residents and businesses. As you are aware, the roadway currently requires a significant annual maintenance effort to keep it in working order.

Sincerely,

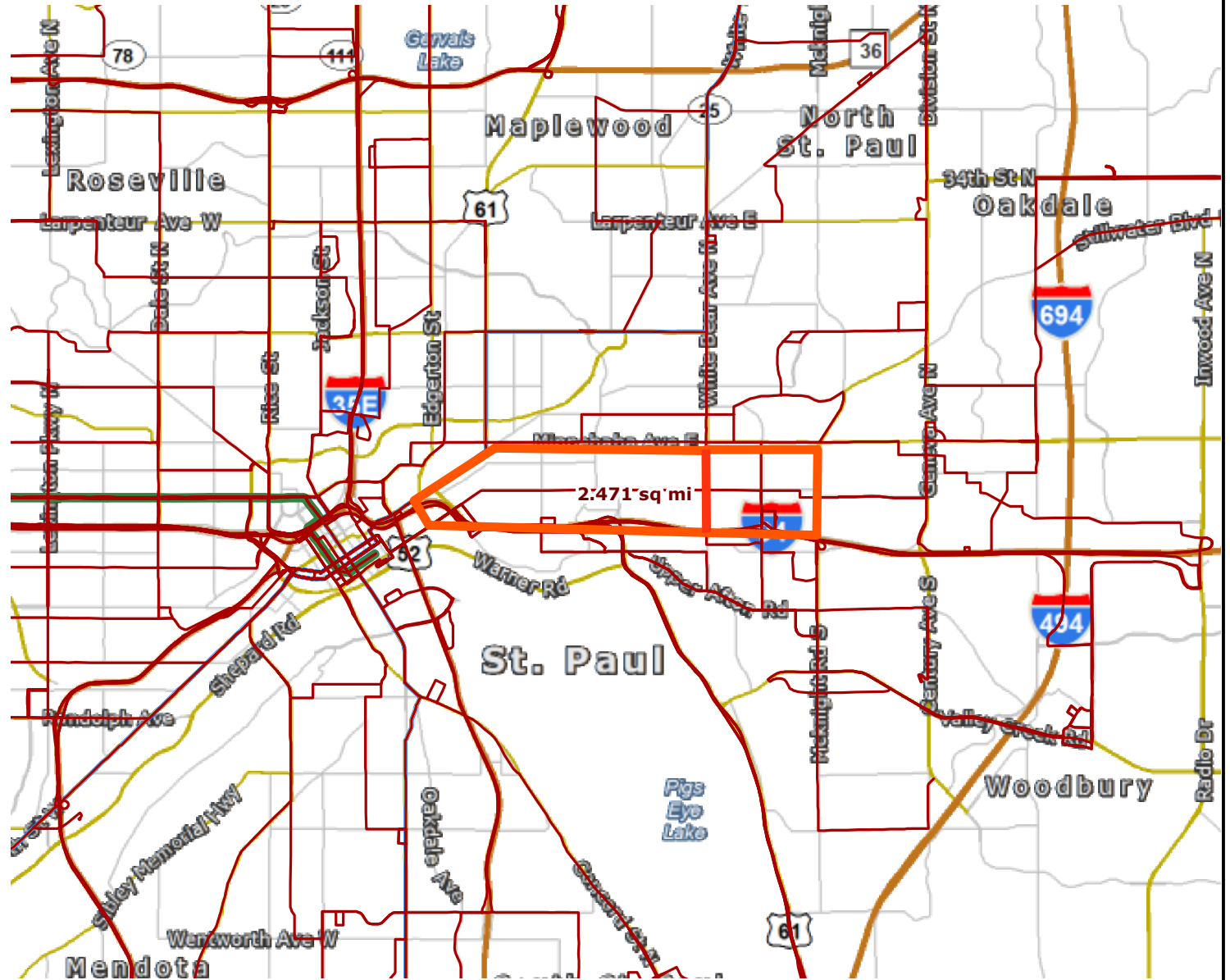
John P. Maczko, P.E., P.T.O.E.
City Engineer

C. Council President Kathy Lantry
Deputy Mayor Kristen Beckmann
Nancy Homans, Interim PW Director
Paul Kurtz



An Affirmative Action Equal Opportunity Employer





Results

Transit with a Direct Connection to project:
63 80 294 350 351 353 375

**indicates Planned Alignments*

- Project
- Transit Routes
- Transitway
- Planned Alignments
- Project Area
- Green Line
- Arterial BRT



Created: 12/30/2014
LandscapeRSA3



For complete disclaimer of accuracy, please visit
<http://giswebsite.metc.state.mn.us/gissitenew/notice.aspx>



White Bear Avenue Reconstruction I-94 to Beech Street



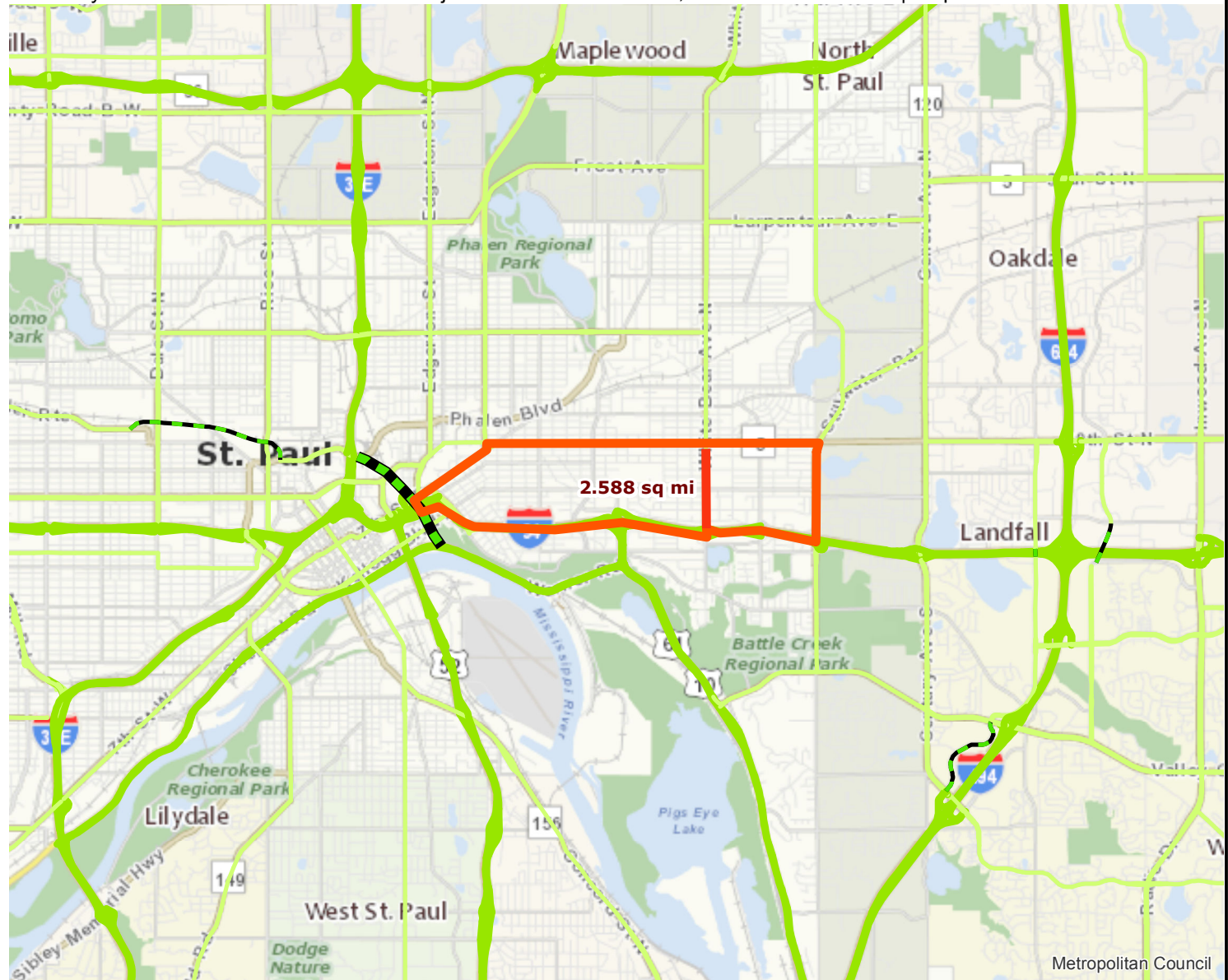
Roadway Area Definition

Roadway Reconstruction/Modernization Project: White Bear Avenue, I-94 to Beech Street | Map ID: 1416322818850

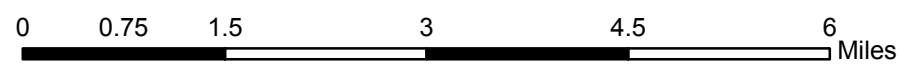
Results

Project Length: 0.721 miles

Project Area: 2.588 sq mi



- Project
- Project Area
- Principal Arterials
- A Minor Arterials
- Principal Arterials Planned
- A Minor Arterials Planned



Created: 11/18/2014
LandscapeRSA1



For complete disclaimer of accuracy, please visit <http://giswebsite.metc.state.mn.us/gissitenew/notice.aspx>



Regional Economy

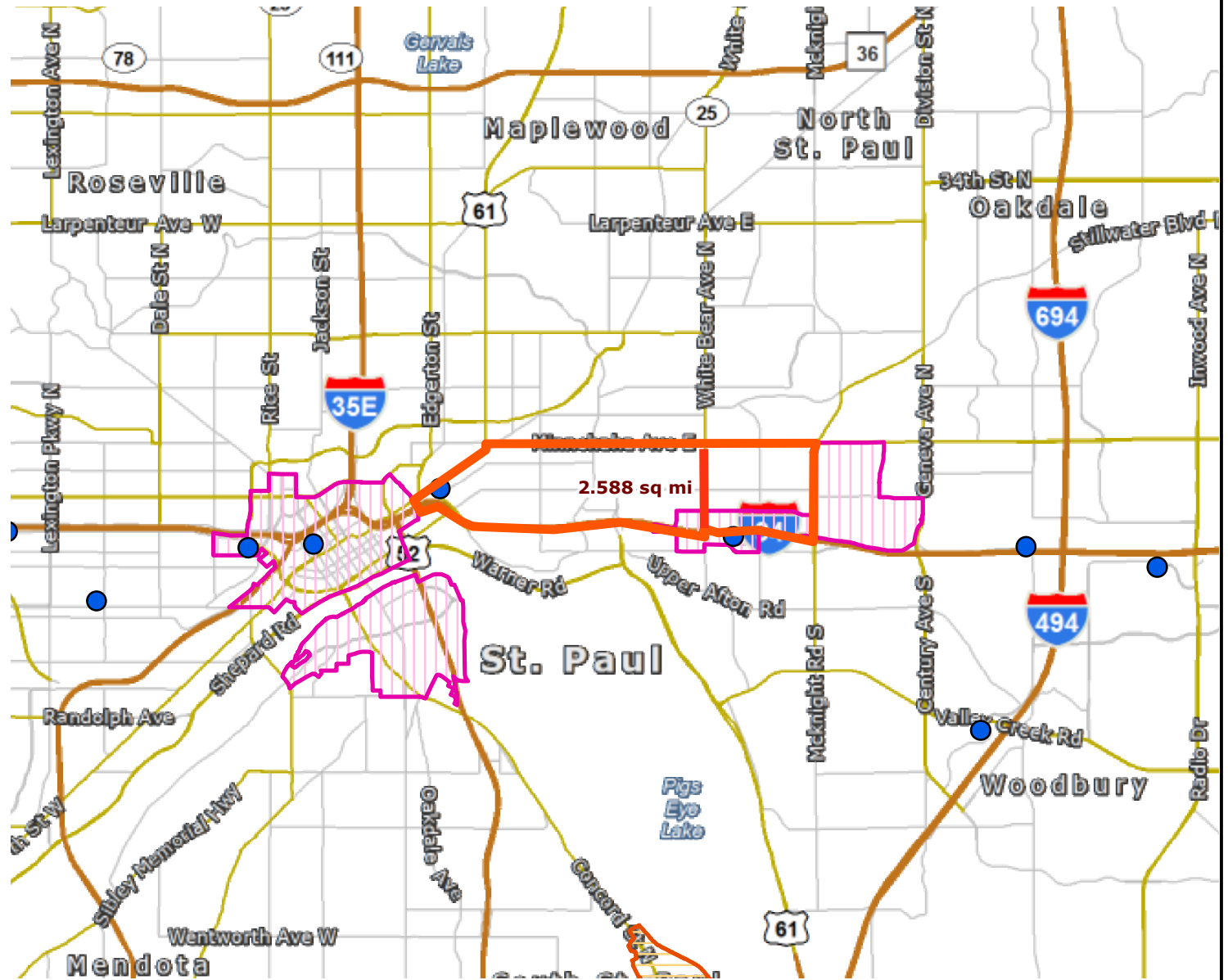
Roadway Reconstruction/Modernization Project: White Bear Avenue, I-94 to Beech Street | Map ID: 1416322818850

Results

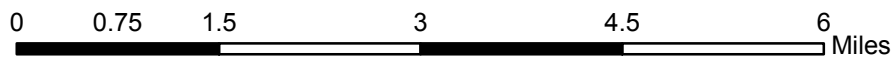
Project **IN** area of Job Concentration.

Project **NOT IN** area of Manufacturing and Distribution.

Project **CONNECTED** to area of Education Institutions.



- Project
- PostSecondary Education Centers
- Job Concentration Centers
- Project Area
- Manufacturing/Distribution Centers



Created: 11/18/2014
LandscapeRSA5

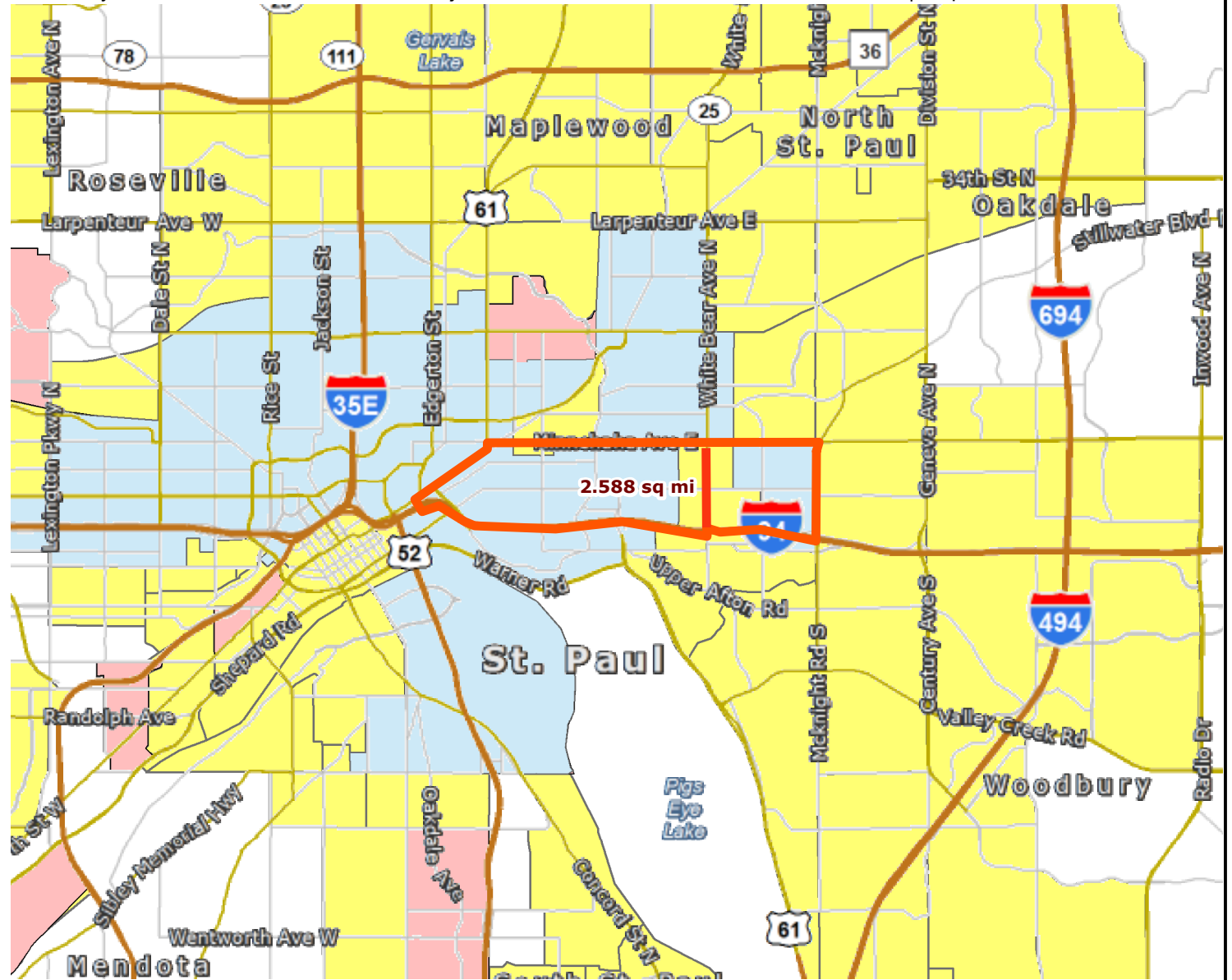


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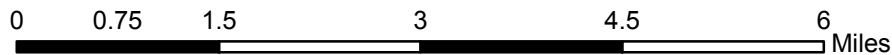


Results

Project IN area of above average concentration of race or poverty.



- Project
- Racially concentrated area of poverty
- Above reg'l avg conc of race/poverty
- Concentrated area of poverty



Traffic Operation Analysis

**White Bear Avenue
St. Paul, MN**

Prepared For:

Ramsey County Public Works
1425 Paul Kirkwold Drive
Arden Hills, MN 55112

Prepared By:



ALLIANT
ENGINEERING

233 Park Avenue South, Suite 300
Minneapolis, MN 55415

**Final Report
November 5, 2014**

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Appendix A: Intersection Delay and LOS

1.0 Introduction

Ramsey County has programmed a project that includes reconstructing White Bear Avenue from the I-94 North Ramp terminal intersection to the Beech Street intersection to begin in 2016. The project location is shown in Figure 1.

This report documents the traffic operation analysis completed for White Bear Avenue. Conclusions of this analysis are being used to help inform design decisions regarding roadway cross-section, turn lanes and signal operation improvements.

1.1 Project Study Area

Figure 2 illustrates the key signalized intersections evaluated as part of the traffic operation analysis. The key study intersections include:

- White Bear Avenue at I-94 North Ramps
- White Bear Avenue at Old Hudson Road
- White Bear Avenue at 3rd Street

As shown, the traffic operation analysis modeling limits extend outside of the reconstruction limits. This is necessary to appropriately evaluate the White Bear Avenue/I-94 North Ramp and White Bear Avenue/3rd Street intersections.

1.2 Existing Conditions

White Bear Avenue is a four lane undivided arterial roadway with a 30 mile per hour (mph) posted speed limit. Key geometric and traffic operation characteristics of the existing conditions include:

- The cross-sectional street width is 40 to 56 feet with a grass boulevard and a 5 to 6 foot sidewalk. White Bear Avenue operates with two travel lanes in each direction.
- The corridor is fully developed, and acquiring additional right-of-way may be disruptive and cost prohibitive.
- Designated left turn lanes are provided on the northbound/southbound approaches at the White Bear Avenue/3rd Street intersection. Designated turn lanes are not provided at the other key intersections, which creates congestion along the corridor during the PM Peak time period.
- On-street parking is provided along much of the length of the corridor and is lightly utilized. There is a no parking zone for northbound traffic north of Old Hudson Road from 4:00 p.m. to 6:00 p.m.
- Metro Transit Routes 63 and 80 serve White Bear Avenue. Bus stops are located at most intersections within the study area.

- Most traffic signals are two phase operation. Protected/permissive left turn phasing for northbound traffic is provided at the White Bear Avenue/I-94 North Ramp intersection and southbound traffic at the 1-94 South Ramp intersection.

Key features of the existing characteristics are illustrated in Figure 3.

1.3 Project Description

The proposed reconstruction project will include full depth reconstruction between the existing face of curbs. A few considerations include:

- To maintain on-street parking, mature boulevard trees, and sidewalk space, the proposed typical section will remain similar to existing with a 40 to 56 foot roadway width, green space boulevard and a six foot sidewalk.
- The County is considering additional widening at Old Hudson Road to provide dedicated left turn lanes. The need for the left turn lanes will be evaluated as part of this study.
- Alternative roadway cross-sections, intersection lane assignments and turn lane considerations at other locations along the corridor will be evaluated as part of this study.

1.4 Study Objective

Minnesota Rule 8820.9936 requires at least four through traffic lanes for all routes with a projected traffic volume greater than 15,000 ADT, unless a capacity analysis demonstrates that an alternative lane configuration achieves a LOS D or better. The objective of this analysis is to document the expected level of service and to identify feasible improvements to achieve a LOS D operation where needed.

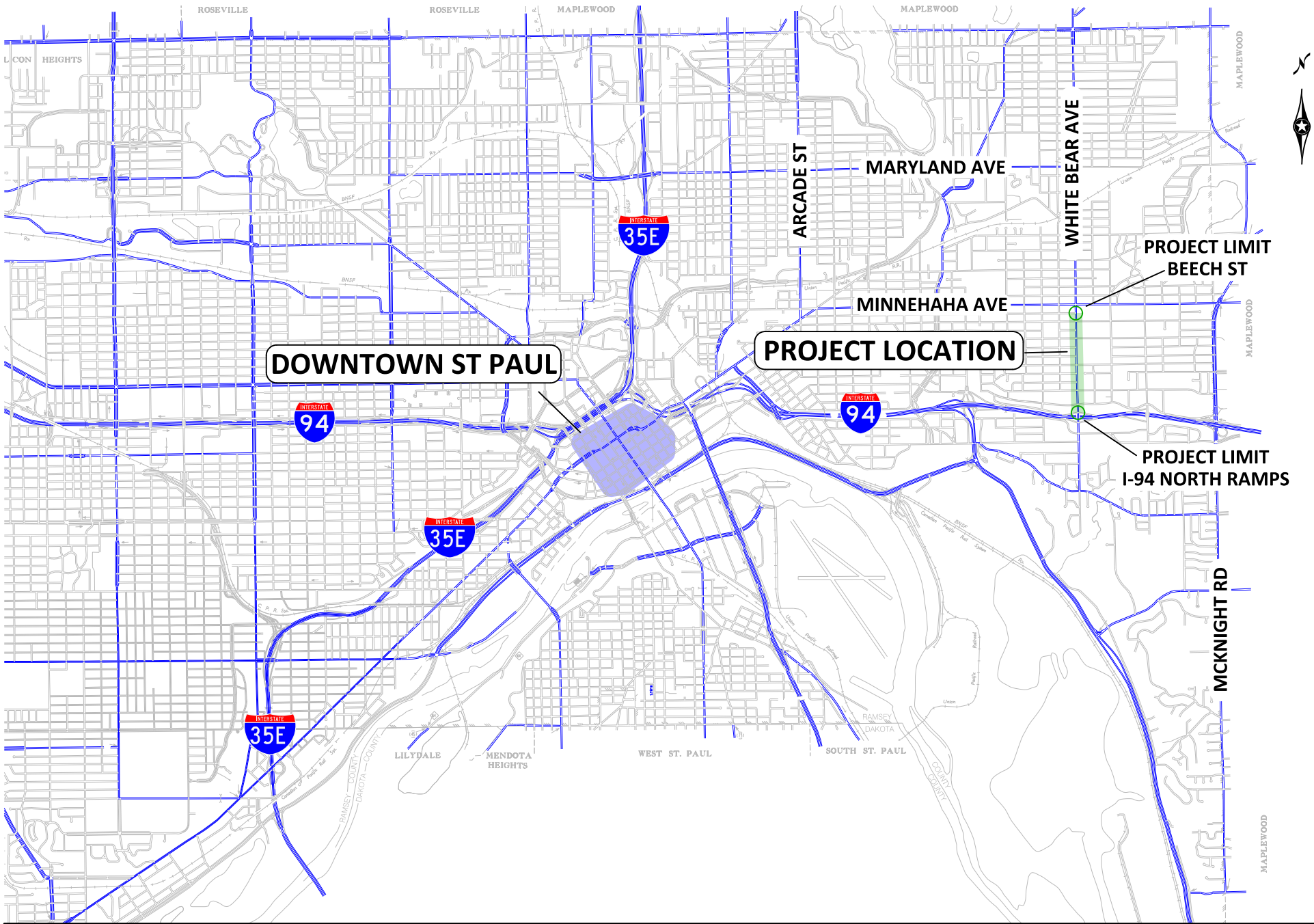
To further support Ramsey County in developing their proposed layout for White Bear Avenue, this traffic operation analysis will:

- Document the existing geometric and traffic operation characteristics.
- Document future year 2036 traffic forecasts.
- Conduct a traffic operation analysis of the proposed alternatives and document the expected intersection and arterial performance of the facility.
- Identify and evaluate any recommended geometric or traffic control changes necessary.

1.5 Elements of Study

The following elements are included in the traffic operation analysis:

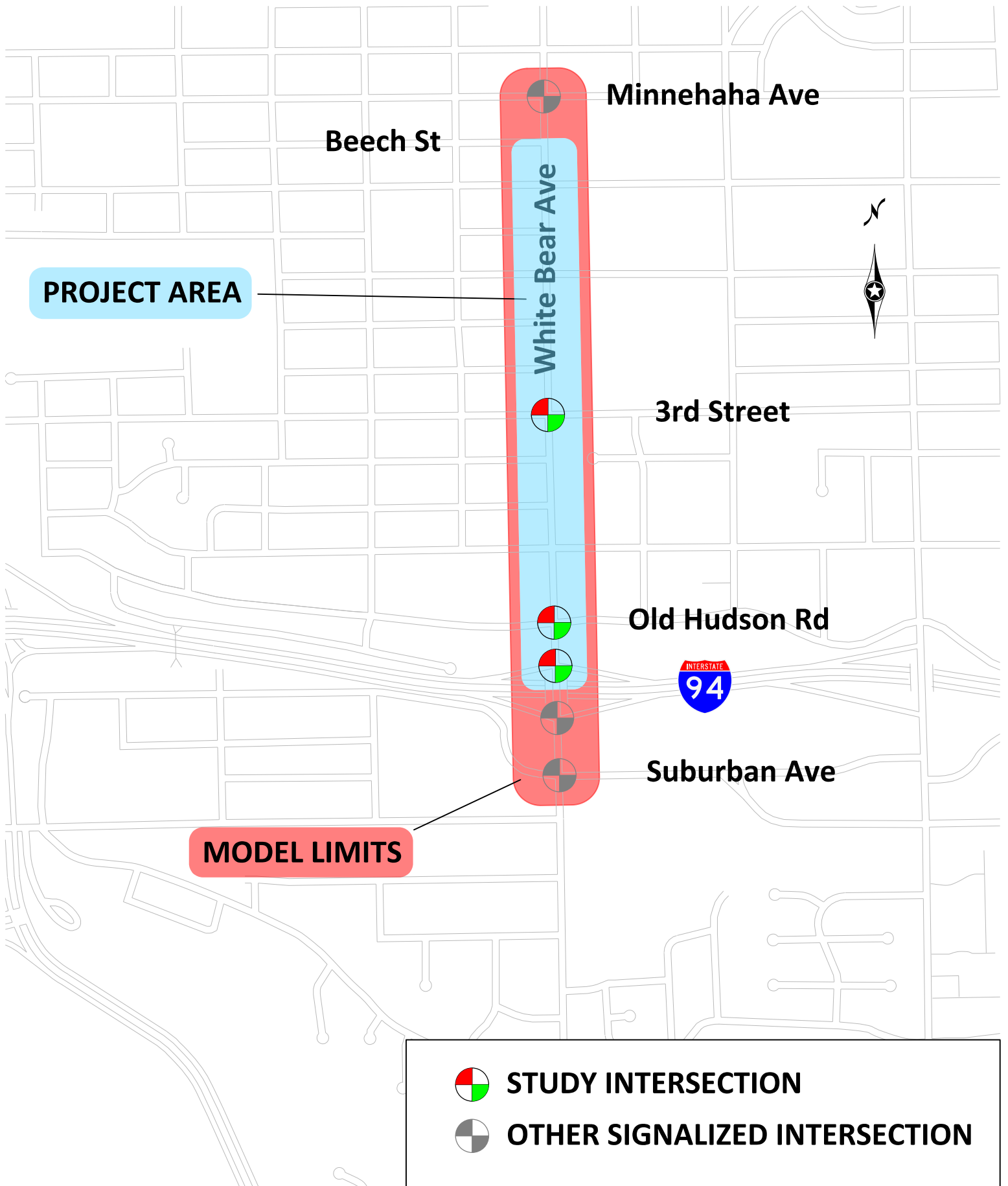
- Traffic Volumes (Section 2.0)
- Safety Analysis (Section 3.0)
- Traffic Operation Analysis (Section 4.0)
- Conclusions and Recommendations (Section 5.0)

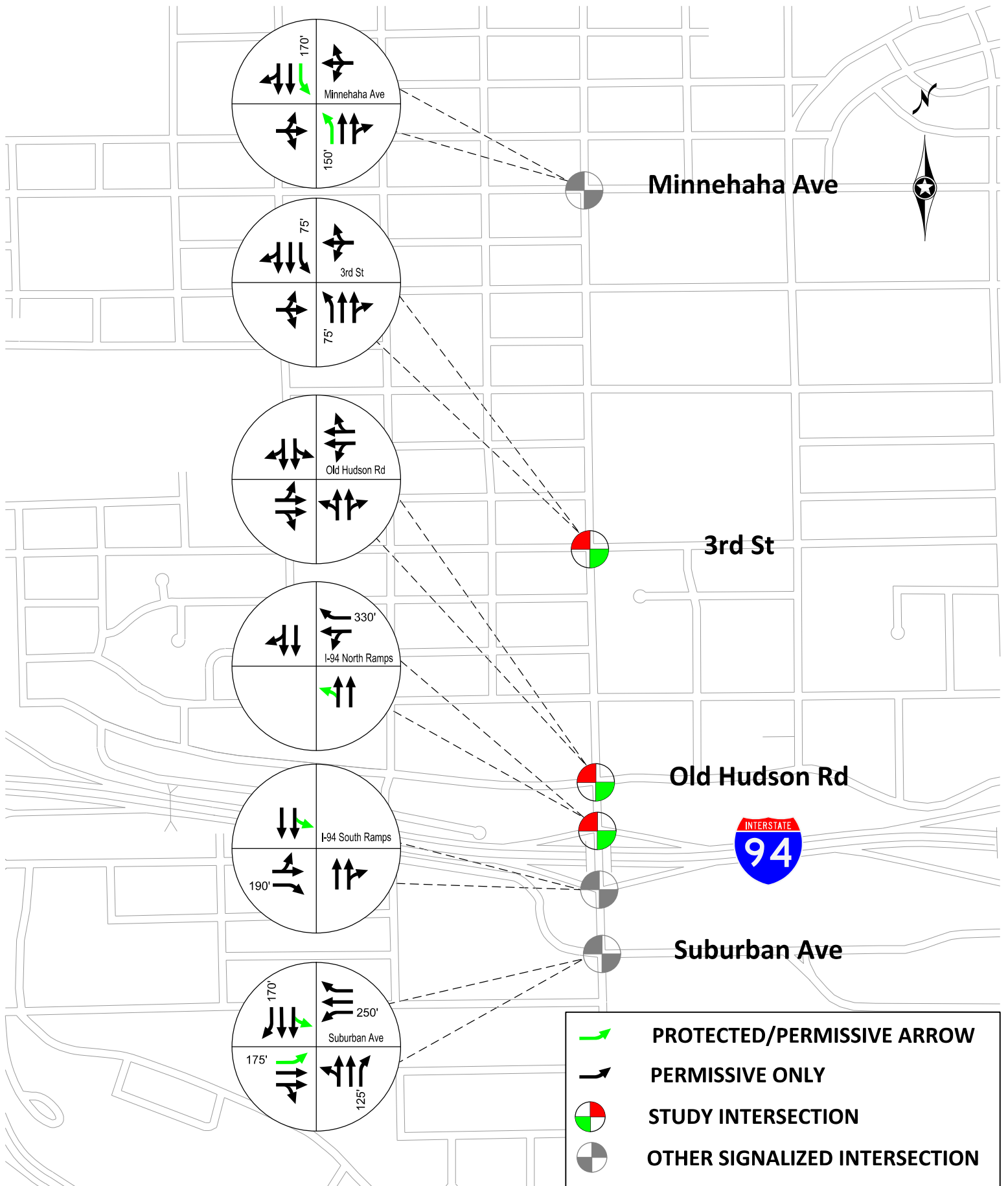


White Bear Avenue Traffic Operations Analysis

*Figure 1
Project Location*







White Bear Avenue Traffic Operations Analysis

Figure 3
Existing Roadway Geometrics

2.0 Traffic Volumes

The following sections document the existing and forecast traffic volumes and characteristics within the project study area.

2.1 Existing Traffic Volumes

Ramsey County provided existing intersection turning movement volumes for each intersection. The turning movement counts were conducted in July and August 2014. The existing a.m. and p.m. peak hour volumes are shown in Figure 4 and the existing annual average daily traffic (AADT) volumes are shown in Table 1.

Table 1. Existing AADT Volumes

Roadway	Segment	Existing AADT ¹
		2014
White Bear Avenue	Suburban Avenue to I-94 South Ramps	17,100
	I-94 North Ramps to Old Hudson Road	22,000
	Old Hudson Road to 3rd Street	18,600
	4th Street to 5th Street	19,800
	Margaret Street to Beech Street	19,800

¹ Derived from year 2014 intersection turning movement and approach volume counts.

2.2 Forecast 2036 Traffic Volumes

White Bear Avenue exists within a fully developed area of St. Paul. Growth in traffic may likely occur in the future as a result of localized redevelopment or changes in area traffic patterns. Although there has been some up and down variation, historically, traffic volumes along White Bear Avenue have remained relatively constant with a slight upward trend from year to year.

To develop the 2036 forecast volumes, the following data sources were evaluated:

- 20 year historical AADT
- State Aid project factor for Ramsey County (1.2)
- City of St. Paul 2030 Comprehensive Plan

Based on a review of the available data sources, an annual growth rate of 0.5 percent per year was derived for White Bear Avenue. A 0.1 percent per year is estimated for the segment of White Bear Avenue south of I-94. The forecast year 2036 AADT along with the existing AADT and 20 year historical average is shown in Table 2.

Table 2. Forecast 2036 AADT

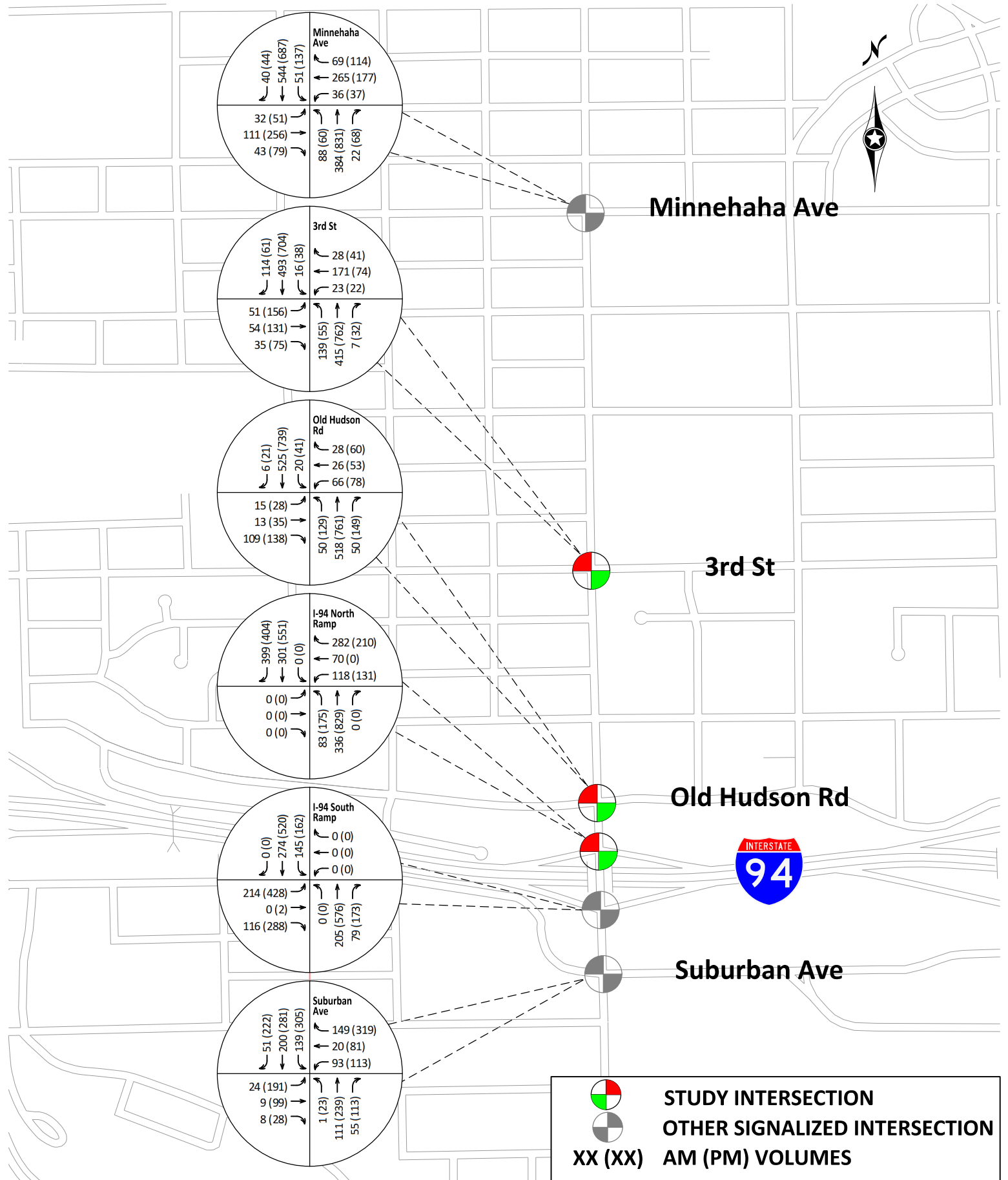
Roadway	Segment	20 Year Average	Existing AADT ¹	Forecast AADT ³	Annual Growth Rate ²
		1994-2014	2014	2036	
White Bear Avenue	Suburban Avenue to I-94 South Ramps	18,000	17,100	17,500	0.1%
	I-94 North Ramps to Old Hudson Road	20,800	22,000	24,600	0.5%
	Old Hudson Road to 3rd Street	18,300	18,600	20,800	0.5%
	4th Street to 5th Street	17,500	19,800	22,100	0.5%
	Margaret Street to Beech Street	17,600	19,800	22,100	0.5%

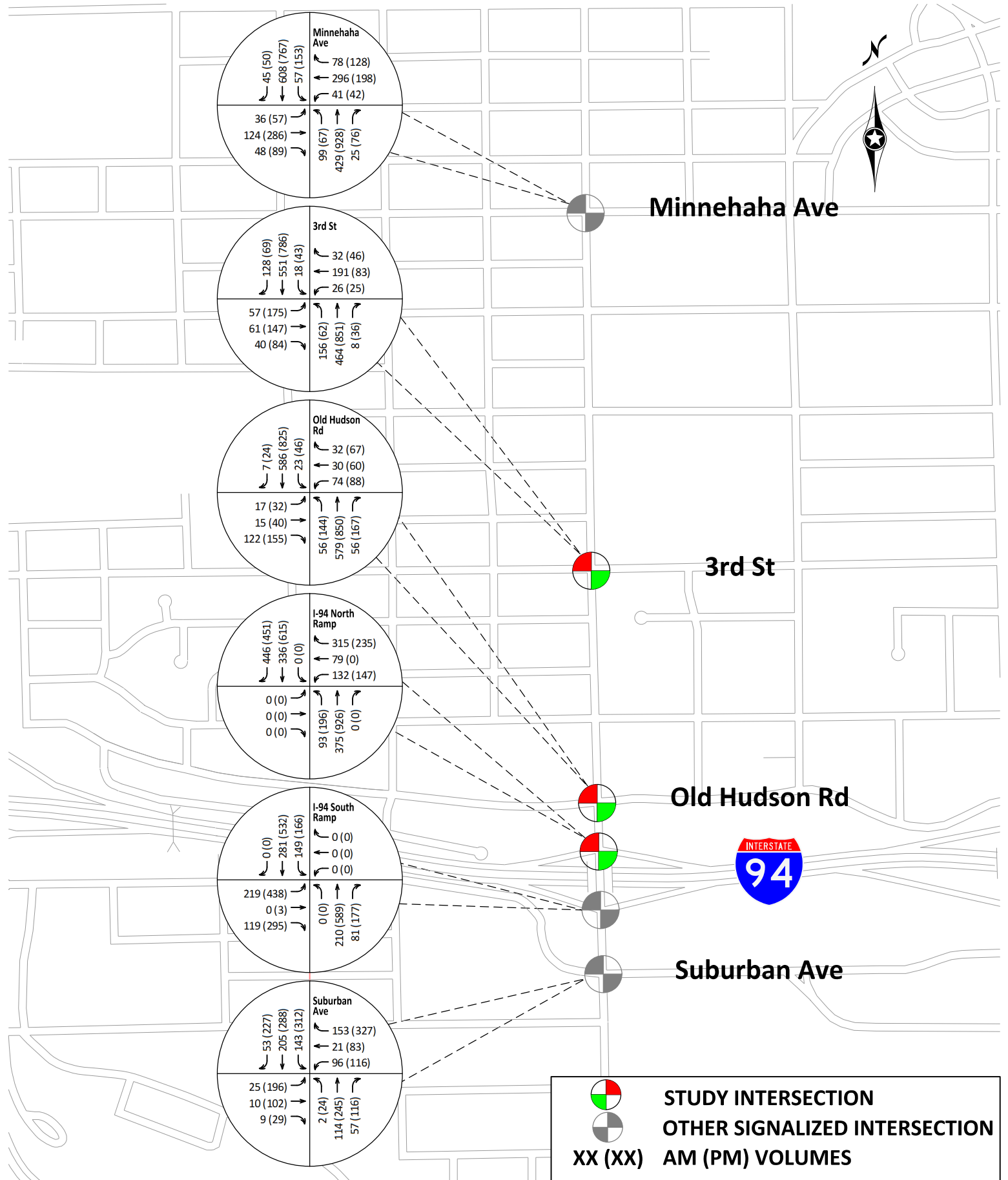
¹ Derived from year 2014 intersection turning movement and approach volume counts.

² Background growth rate derived based upon the forecast 2036 AADT compared to the 2014 existing AADT.

³ Proposed forecast AADT based on evaluation of historical regression analysis, 20 year average, characteristics of the surrounding land use and comparison to other forecast projections (e.g., State Aid Factor and St. Paul Transportation Plan).

Applying the annual growth rate, the year 2036 intersection traffic volumes for the a.m. and p.m. peak hours were developed as illustrated on Figure 5.





3.0 Safety Analysis

Ramsey County provided intersection crash data for the years 2011 to 2013. Evaluation of current crash characteristics may identify certain patterns correctable by signal timing changes, signal phasing changes, or geometry improvements.

3.1 Crash Rate Analysis

A key factor in the safety analysis is the crash rate. The crash rate for any intersection is defined as the number of crashes occurring per million entering vehicles (MEV). Table 3 summarizes the existing crash rate for each intersection compared to the statewide average for similar traffic control types.

Crash occurrence is somewhat random by nature. Identifying every intersection with a crash rate above the statewide average value in an analysis would produce a large amount of data that may not be statistically relevant with respect to safety deficiencies. The critical crash rate identifies those locations that have a crash rate higher than similar facilities by a statistically significant amount. The critical crash rate is calculated by adjusting the system wide average based on the amount of exposure and a statistical constant indicating level of confidence¹. At locations where the actual crash rate exceeds the critical crash rate, it is 99 percent certain that an intersection design deficiency exists, or there are hazardous characteristics present at the location.

Crash severity quantifies how severe the crashes are at a particular location. In the crash information database maintained by MnDOT, crashes are categorized into three major categories of severity; property damage – no injuries occurred, type A, B and C injury crashes and fatal crashes. The purpose for analyzing this statistic is to identify locations that experience a low crash rate but have a high percentage of injury or fatal crashes. Conversely, locations which have high crash rates with a large proportion of property damage crashes may not warrant as much priority when deficiencies are being addressed.

Table 3. Crash Rate Summary

Intersection	Total Crashes ¹	MEV	Crash Rate	Statewide Average Crash Rate ²	Critical Crash Rate	Intersection Severity Rate ³	Statewide Average Severity Rate ²
White Bear Ave. & 3rd St.	19	29,382,713	0.65	0.70	1.11	0.92	0.97
White Bear Ave. & Old Hudson Rd.	39	30,772,925	1.27	0.70	1.10	1.46	0.97
White Bear Ave. & Margaret St.	6	23,894,271	0.25	0.18	0.42	0.42	0.26

MEV - Million Entering Vehicles

¹ Source: Ramsey County 2011- 2013

² Source: MnDOT Intersection Green Sheets 2012

³ Severity Rate Factors: 5 for Fatal Crash, 3 for Injury Crash, and 1 for Property Damage Only Crash.

¹ MnDOT Traffic Safety Fundamentals Handbook, August 2008.



The analysis indicates that the White Bear Avenue/Old Hudson Road and White Bear Avenue/Margaret Street intersections have crash rates higher than the statewide average. However, only Old Hudson Road exceeds the critical crash rate, indicating there is a statistically significant concern that a safety deficiency may exist. It should be noted that the statewide average reflects all high volume, low speed signalized intersections on the trunk highway system. This may not best reflect the urbanized characteristics of signalized intersections within St. Paul. As such, an average crash rate higher than 0.70 may very well be expected. Therefore, the crash rate comparison should be taken in context with the type of crashes and contributing factors occurring.

3.2 Crash Type Distribution

Figure 3 documents the crash type distribution. The crash type distribution was compared to the typical values compiled from data throughout Minnesota.

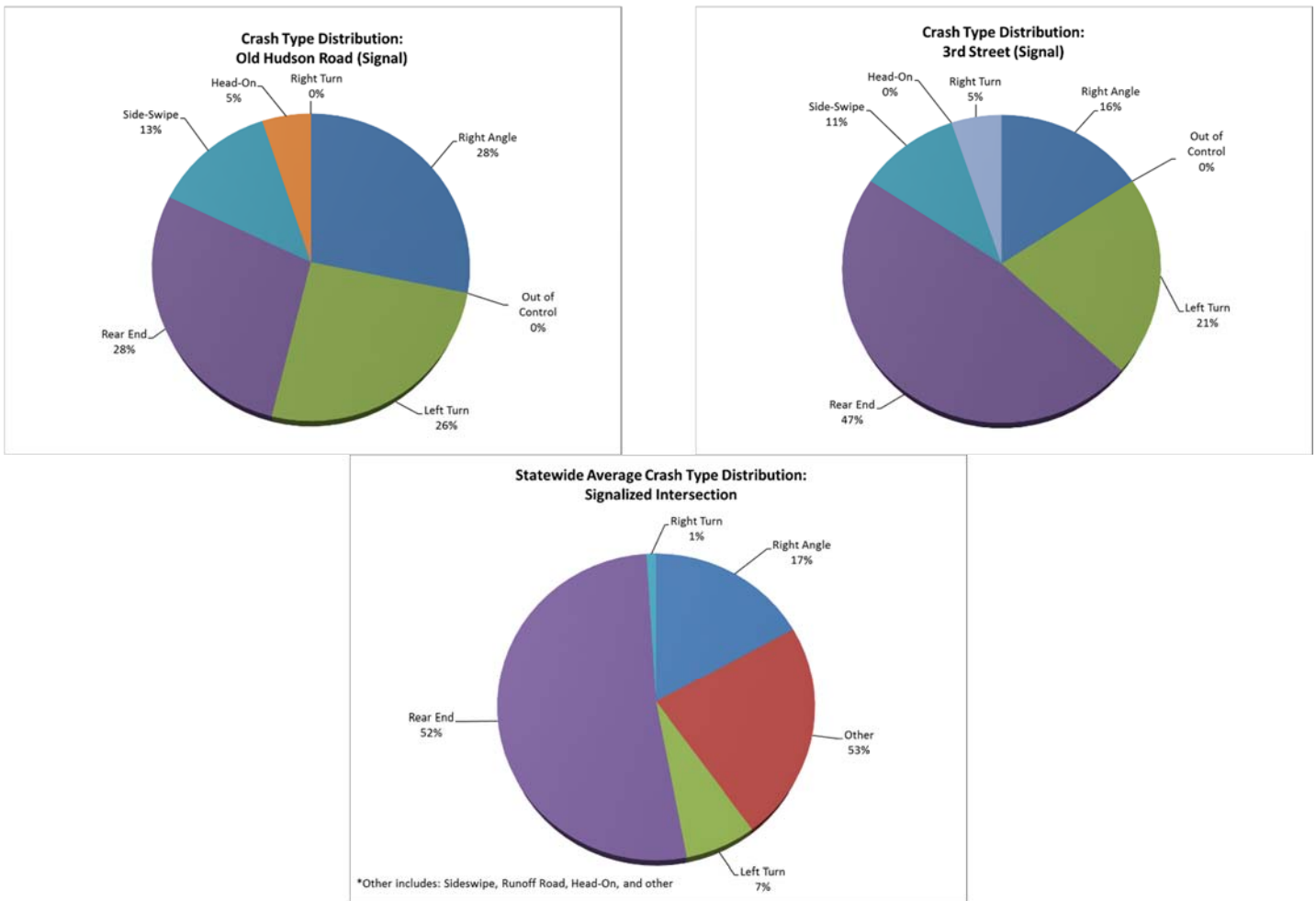


Figure 6. Crash Type Distribution Summary

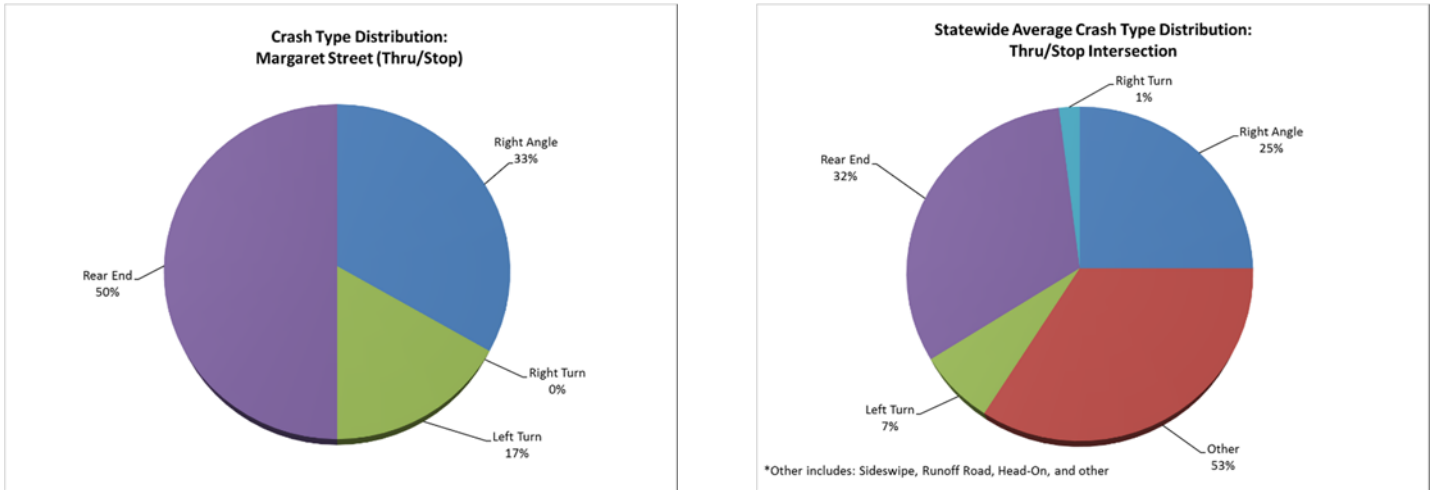


Figure 6. Crash Type Distribution Summary Cont'd



Figure 7. Crash Type Distribution By Approach

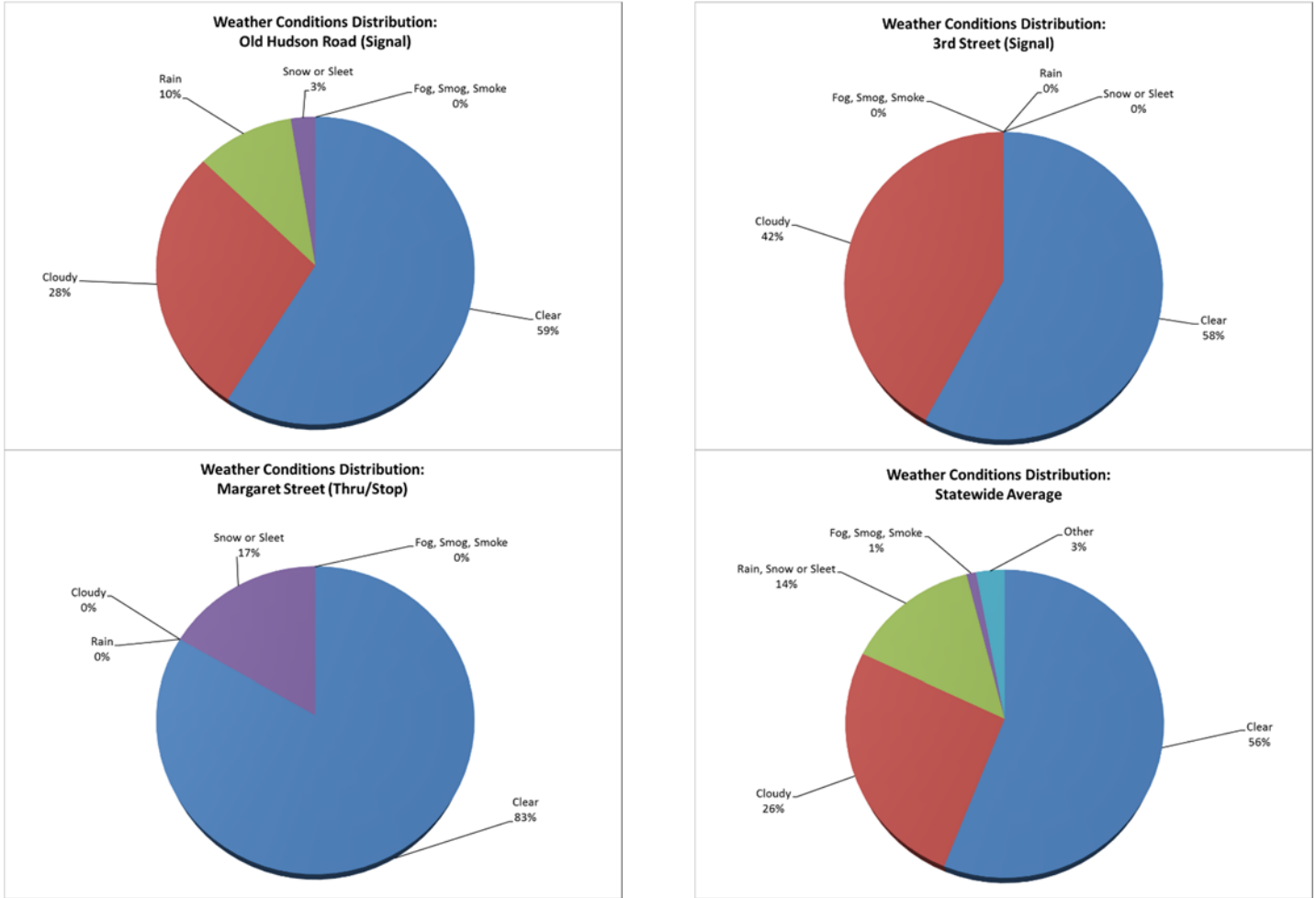


Figure 8. Crash Type Distribution Versus Weather

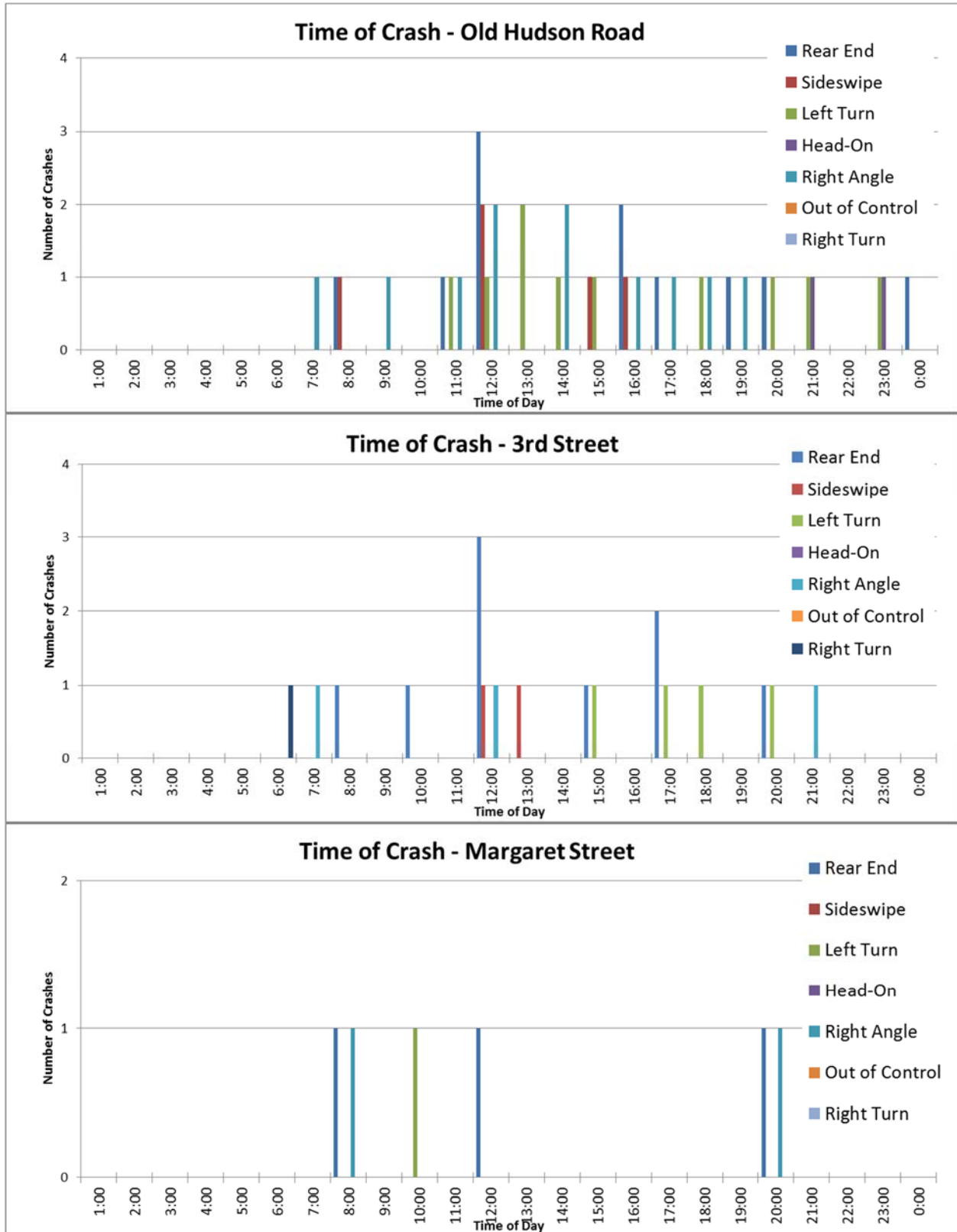


Figure 9. Crash Type Distribution Versus Time of Day

3.3. Safety Analysis Conclusions

Based on a review of the existing intersections crash experience, the following conclusions are made:

- The White Bear Avenue/3rd Street intersection has a crash rate below the statewide average rate. The intersection of White Bear Avenue and Old Hudson Road's crash rate exceeds both the average rate and critical crash rate.
- In addition, the data indicates that the left turn and right angle type crashes at White Bear Avenue/Old Hudson Road are significantly higher than the statewide average.
- Sideswipe type crashes represent a high percentage of the overall crashes occurring at the study intersections, which is consistent with a multi-lane undivided urban arterial without turn lanes.
- The weather conditions and road conditions distribution percentages appeared to be close to the statewide averages and do not appear to be a strong contributing factor.
- A majority of the crashes took place during the middle of the day and afternoon hours, which is consistent with the highest traffic volume periods.
- Rear end type crashes appear to be consistent with expected percentages found at signalized intersections.

Overall the crash experience is indicative of facilities with higher traffic volumes, shared turn lane operation and permissive traffic signal phasing. To most effectively reduce the crash types occurring at these intersections, improvement measures will need to focus on reducing congestion, provide exclusive turn lanes and provide opportunities for protected/permissive left turn phasing.

4.0 Traffic Operation Analysis

A traffic operation analysis was conducted for White Bear Avenue during the a.m. and p.m. peak hours. The analysis evaluates the operational performance of the existing year 2014 conditions, opening year 2016 and the forecast 2036 conditions.

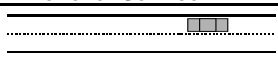
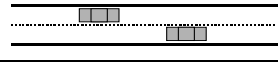

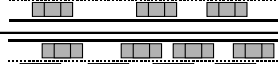

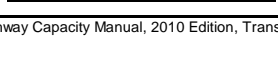
4.1 Analysis Tool

The traffic operation analysis performed for the existing conditions and the forecast year conditions was completed using SimTraffic8.0. SimTraffic8.0 is a microscopic simulation tool and was used to evaluate the operational performance of the traffic signal control options. SimTraffic8.0 was selected based upon its ability to better replicate the traffic peaking behavior and interaction across a corridor and network of traffic signal systems.

4.2 Level of Service

The term level of service (LOS), as taken from the *Highway Capacity Manual (HCM)*², refers to the ability of an intersection to process traffic volumes. It is defined as the delay to vehicles caused by the traffic control at the intersection or average operating speed along an urban arterial. The results of this measure of effectiveness (MOE) are typically presented in the form of a letter grade (A-F) that provides a qualitative indication of the operational efficiency or effectiveness. By definition, LOS A conditions represent high-quality operations and LOS F conditions represent very poor operations. The general relationship between intersection delay, average operating speed and LOS are graphically displayed in Table 4.

Table 4. LOS Definition

Level of Service	Description	Signalized Intersection	Urban Street LOS
		Intersection Delay (s/veh)	Average Travel Speed (mph)
A	 Free Flow. Low volumes and no delays.	0 - 10	>26
B	 Stable Flow. Speeds restricted by travel conditions, minor delays.	>10 - 20	>20 - 26
C	 Stable Flow. Speeds and maneuverability closely controlled due to higher volumes.	>20 - 35	>15 - 20
D	 Stable Flow. Speeds considerably affected by change in operating conditions. High density traffic restricts maneuverability, volume near capacity.	>35 - 55	>12 - 15
E	 Unstable Flow. Low speeds, considerable delay, volume at or slightly over capacity.	>55 - 80	>9 - 12
F	 Forced Flow. Very low speeds, volumes exceed capacity, long delays with stop and go traffic.	> 80	0 - 9

Source: Highway Capacity Manual, 2010 Edition, Transportation Research Board, Exhibit 18-4 for Signalized Intersections and Exhibit 19-1 for Unsignalized Intersection:

² Highway Capacity Manual, 2010 Edition, Transportation Research Board

4.3 Existing and Forecast No-Build Analysis Results

A traffic operation analysis was completed for the existing 2014, opening year 2016 and year 2036 forecast conditions under the existing intersection lane geometrics and signal control. The purpose of this analysis is provide a baseline condition, which the need for future improvement alternatives (if necessary) can be compared. Intersection delays and corridor average operating speeds are reported using SimTraffic8.0 and represent an average of five recorded random number seeds.

The key MOE's evaluated include; overall intersection delay and average speed. The existing year 2014, opening year 2016 and forecast year 2036 overall intersection delay results are summarized in Table 5. The existing year 2014, opening year 2016 and forecast year 2036 average vehicle speeds (urban arterial LOS) are illustrated in Table 6. The detailed approach delay and LOS are attached for reference in Appendix A.

Table 5. Existing and Forecast No-Build Intersection MOE Results

Intersection	MOE	Existing Conditions (Year 2014)		Year 2016 No Build		Year 2036 No Build		
		AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	
		Overall	Overall	Overall	Overall	Overall	Overall	
White Bear Avenue & Suburban Avenue	Delay (s/v)	8.7	18.8	9.3	18.6	9.4	143.9	
	LOS	A	B	A	B	A	F	
White Bear Avenue & I-94 South Ramps	Delay (s/v)	12.1	37.2	12.1	37.5	11.9	62.9	
	LOS	B	D	B	D	B	E	
White Bear Avenue & I-94 North Ramps	Delay (s/v)	10.7	34.8	10.9	36.5	12.4	52.1	
	LOS	B	C	B	D	B	D	
White Bear Avenue & Old Hudson Road	Delay (s/v)	10.7	48.5	11.1	46.4	11.6	78.4	
	LOS	B	D	B	D	B	E	
White Bear Avenue & 3rd Street	Delay (s/v)	12.9	15.2	13.3	15.2	16.4	16.2	
	LOS	B	B	B	B	B	B	
White Bear Avenue & Minnehaha Avenue	Delay (s/v)	14.3	18.7	15.1	22.2	16.3	26.5	
	LOS	B	B	B	C	B	C	
Total Network		Delay (hr)	28.4	110.8	30.7	113.8	35.8	233.8

1. AM and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table 6. Existing and Forecast No-Build Arterial MOE Results

Direction	Travel Route	MOE	Existing Conditions (Year 2014)		Year 2016 No Build		Year 2036 No Build	
			AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
			Overall	Overall	Overall	Overall	Overall	Overall
NB	White Bear: Suburban Avenue to Minnehaha Avenue	Speed (mph)	21.7	13.9	21.4	14.0	21.0	5.4
		LOS	B	D	B	D	B	F
SB	White Bear: Minnehaha Avenue to Suburban Avenue	Speed (mph)	20.9	13.3	20.8	13.5	20.6	11.6
		LOS	B	D	B	D	B	E

1. AM and PM Peak speeds computed using SimTraffic averaged over 5 random seeds

The following summarizes the results of the intersection traffic operation analysis:

- Overall all intersections are expected to operate at an acceptable LOS C or better during the a.m. peak hour.
- During the existing and forecast 2016 p.m. peak hour, the White Bear Avenue/Old Hudson Road intersection operates at a LOS D. However, periods of northbound congestion currently exists between Suburban Avenue and Old Hudson Road and southbound congestion between Old Hudson Road and I-94.
- Under the forecast 2036 conditions, significant congestion and delay is expected. The primary contributing factors include the shared through/left turn operation at the I-94 interchange and the Old Hudson Road intersections.

4.4 Alternatives Analysis

A traffic operation analysis was completed for several cross-section alternatives and intersection improvement scenarios under the opening year 2016 and year 2036 a.m. and p.m. peak hour forecast conditions. The traffic operation and safety analysis of the existing and future no-build conditions indicated the need for left turn lanes at key intersections including northbound/southbound White Bear Avenue/Old Hudson Road, and southbound White Bear Avenue/I-94 South Ramps. A descriptive summary of each scenario evaluated is provided in Table 7. There are three primary scenarios:

- Scenario 1: Maintain existing lane geometrics and employ improved traffic signal operation strategies.
- Scenario 2: Three-lane cross-section and evaluate alternative lane configurations and need for turn lanes.
- Scenario 3: Maintain four lane cross-section and evaluate alternative lane configurations, signal operations and need for turn lanes.

Each primary scenario evaluates multiple lane configurations and intersection improvement (signal operations and geometrics) sub-scenarios to provide a comparison of operational performance. This comparison analysis will help to identify the most beneficial improvement measures. The intersection lane configurations and traffic control for Scenario 2 and Scenario 3, including sub-scenarios, are illustrated in Figure 10 and Figure 11, respectively.

The traffic operations analysis identified the existing four-lane bridge over I-94 contributes to congestion experienced at Old Hudson Road. In order to effectively assess and compare potential improvement alternatives at Old Hudson Road, each scenario assumes a five-lane wide bridge.

Table 7. Alternatives Analysis Scenario Descriptions

Scenario	Description
No Build	Existing signal timing and existing lane geometry.
1	Optimize traffic signal timing and maintain existing lane geometry.
1a	<ul style="list-style-type: none"> - Optimize traffic signal timing - Add a northbound protected/permissive left turn phase at Old Hudson Road - Maintain existing lane geometry.
2	<ul style="list-style-type: none"> - Three lane cross-section along the entire length of the corridor - Optimize traffic signal timing
2a	<ul style="list-style-type: none"> - Provide a three lane cross-section north of Old Hudson Road. Maintain existing four-lane cross-section south of Old Hudson Road - Optimize traffic signal timing - Provide exclusive left turn lanes at Old Hudson Road
2b	<ul style="list-style-type: none"> - Scenario 2a plus - Add northbound and southbound right turn lanes at 3rd Street.
2c	<ul style="list-style-type: none"> - Provide a three lane cross-section north of 3rd Street. Maintain existing four-lane cross-section south of 3rd Street - Optimize traffic signal timing - Provide exclusive left turn lanes at Old Hudson Road
2d	<ul style="list-style-type: none"> - Scenario 2a plus - add northbound and southbound right turn lanes at 3rd Street and at Minnehaha Avenue.
3	Add northbound and southbound left turn lanes at Old Hudson Road and optimize traffic signal timing.
3a	<ul style="list-style-type: none"> - Scenario 3 plus - Reconfigure the Old Hudson Road eastbound approach to consist of 1-LT lane, 1-TH lane, 1-RT lane and the westbound approach to consist of 1-LT lane, 1-TH/RT lane.
3b	<ul style="list-style-type: none"> - Scenario 3a plus - Add protected/permissive left turn phases for all directions at Old Hudson Road.
3c	<ul style="list-style-type: none"> - Scenario 3 plus - Add northbound and southbound right turn lanes at Old Hudson Road and 3rd Street. - Add a southbound right turn lane at I-94 North Ramp.
3d	<ul style="list-style-type: none"> - Scenario 3a plus - Add a southbound right turn lane at I-94 North Ramp. - Extend the I-94 North Ramp northbound left to I-94 South Ramp. - At I-94 South Ramp reconfigure the southbound approach to consist of 1-LT and 1-TH lane. - At Suburban Avenue reconfigure the southbound approach to consist of 1-LT lane, 1-TH lane, 1-RT lane and the northbound approach to consist of 1-LT lane, 2-TH lanes, 1-RT lane.
3e	<ul style="list-style-type: none"> - Scenario 3b plus - Add northbound and southbound right turn lanes at Old Hudson Road and 3rd Street. - Add a southbound right turn lane at I-94 North Ramp.

White Bear Avenue Scenarios

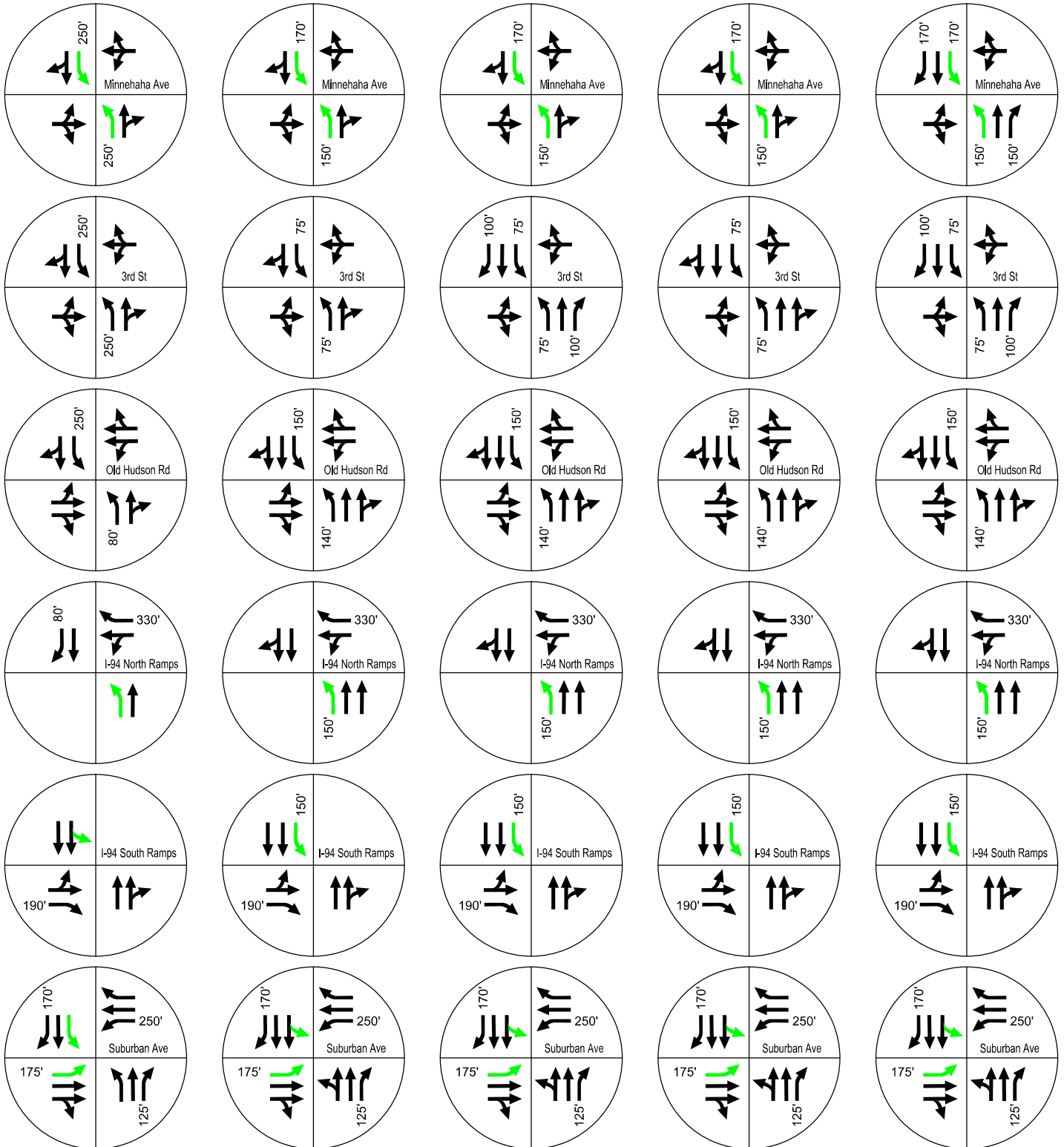
Scenario 2

Scenario 2a

Scenario 2b

Scenario 2c

Scenario 2d



	PROTECTED/PERMISSIVE ARROW
	PERMISSIVE ONLY

White Bear Avenue Scenarios

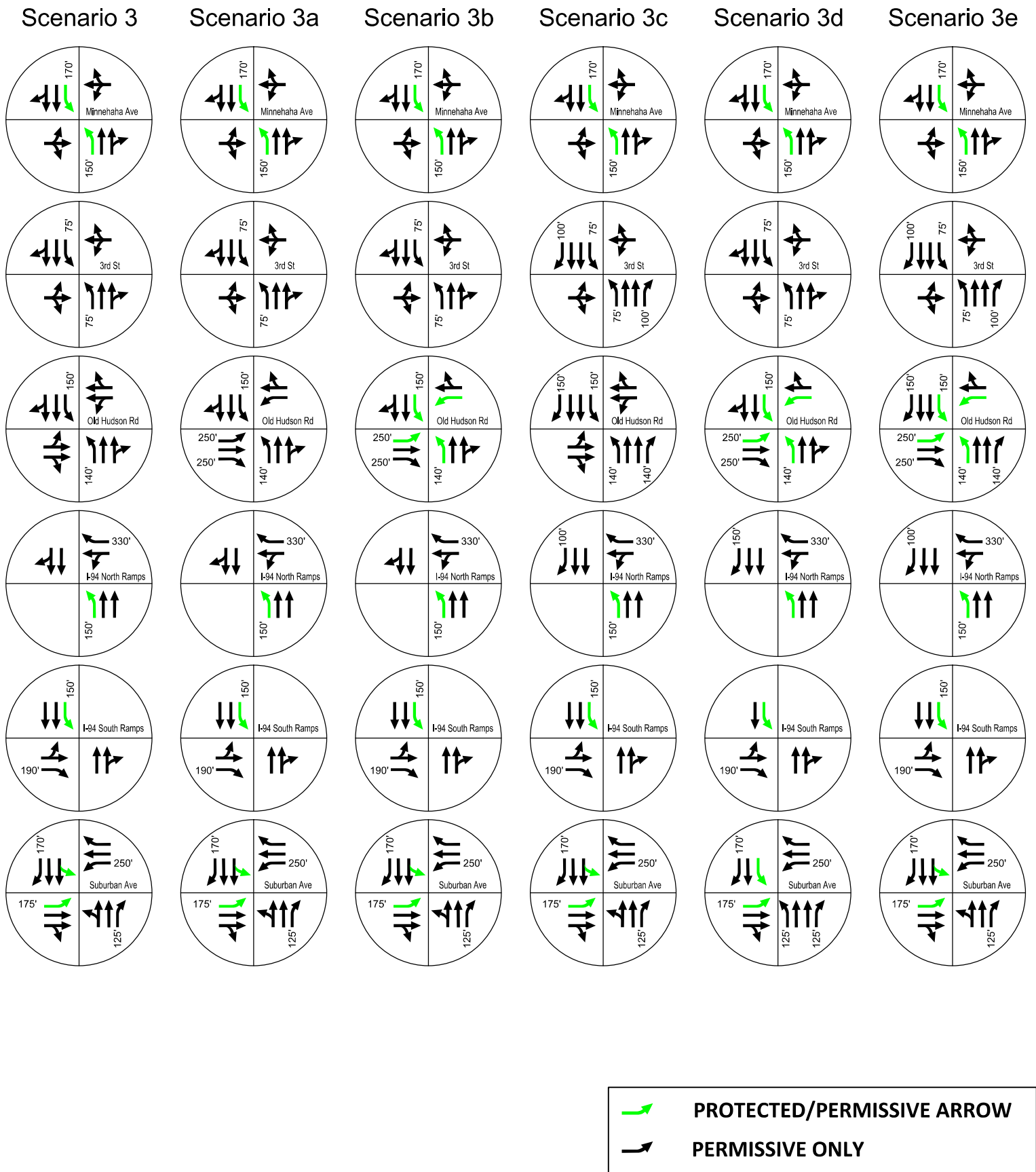


Table 8 and Table 9 summarizes the forecast year 2016 and year 2036 overall intersection delay results for each scenario, respectively. Table 10 summarizes the forecast year 2016 and year 2036 average vehicle speeds (urban arterial LOS). The detailed movement delay and LOS are attached for reference in Appendix A. The results of the operation analysis will help identify the most effective improvements and may be used by Ramsey County to help prioritize or secure right of way for future implementation.

The following summarizes the results of the arterial intersection traffic operation analysis:

- The implementation of optimized signal timing (Scenario 1) along White Bear Avenue is expected to provide considerable improvement over the forecast 2036 no build scenario. Overall, the total network delay is reduced in half and a LOS D or better is expected at each intersection.
- Overall most intersections are expected to operate at an acceptable LOS C or better during the a.m. peak hour for all scenarios. The White Bear Avenue/3rd Street intersection operates at LOS D in 2036 for Scenario 2a. The White Bear Avenue/Minnehaha Avenue intersection operates at LOS D in 2036 for Scenarios 2b, 2c, and 2d.
- During the p.m. peak period, a three lane cross-section is not expected to provide acceptable level of traffic operations and will not satisfy Minnesota Rule 8820.9936. All of the three-lane section scenarios (Scenarios 2, 2a, 2b, 2c, and 2d) operate at a LOS F for many of the intersections. The scenarios evaluated multiple locations for transitioning between a four-lane and three-lane cross-section; and also evaluated the benefit of adding exclusive right turn lanes. The analysis concludes that a single travel lane in the northbound cannot accommodate the forecast traffic volume demand without excessive delays and queuing or traffic volume diversion.
- The implementation of northbound and southbound left turn lanes at Old Hudson Road (Scenarios 3, 3a, 3b, 3c, 3d, and 3e), results in an estimated additional 35 percent reduction in network delay over providing optimized signal timing (Scenario 1). For each of these scenarios, most intersections are expected to operate at an acceptable LOS C or better during the a.m. and p.m. peak hours.
- Reconfiguring the Old Hudson Road to a 3-lane cross-section (Scenario 3a, lane configurations shown in Figure 11) results in a neutral traffic operation improvement; however, is expected to provide improved safety characteristics by segregating turning movements into exclusive lanes. The addition of protected/permissive signal phasing (Scenario 3b) increases intersection delay; however, additional safety benefit is expected.
- The addition of right turn lanes at the White Bear Avenue/3rd Street, Old Hudson Road and I-94 North Ramp intersections is expected to provide improved intersections operations (approximately 8 percent additional reduction in delay). With exception to the right turn lane at the I-94 North Ramp, the overall delay reduction is fairly minimal and may not be the cost-beneficial improvement.

Table 8. Forecast Year 2016 Alternatives Analysis Results – Intersection LOS

AM Peak Hour

Intersection	MOE	Year 2016 AM Peak Hour													
		No Build	S1	S1a	S2	S2a	S2b	S2c	S2d	S3	S3a	S3b	S3c	S3d	S3e
		Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall
White Bear Avenue & Suburban Avenue	Delay (s/v)	9.3	9.3	10.0	9.8	9.2	9.0	9.3	9.7	9.2	9.6	8.8	9.5	9.4	9.1
	LOS	A	A	B	A	A	A	A	A	A	A	A	A	A	A
White Bear Avenue & I-94 South Ramps	Delay (s/v)	12.1	11.8	11.8	13.0	12.0	11.6	11.4	12.1	11.3	11.4	11.1	11.6	11.8	11.4
	LOS	B	B	B	B	B	B	B	B	B	B	B	B	B	B
White Bear Avenue & I-94 North Ramps	Delay (s/v)	10.9	11.6	12.8	12.5	10.6	11.3	11.4	10.4	11.4	11.2	10.5	10.2	10.1	9.9
	LOS	B	B	B	B	B	B	B	B	B	B	B	B	B	A
White Bear Avenue & Old Hudson Road	Delay (s/v)	11.1	9.7	11.3	11.4	9.3	9.1	9.5	10.6	9.1	9.4	9.8	8.7	9.7	9.3
	LOS	B	A	B	B	A	A	A	B	A	A	A	A	A	A
White Bear Avenue & 3rd Street	Delay (s/v)	13.3	13.8	13.2	18.1	20.1	16.2	15.4	17.4	12.9	12.6	13.8	12.4	14.8	12.8
	LOS	B	B	B	B	C	B	B	B	B	B	B	B	B	B
White Bear Avenue & Minnehaha Avenue	Delay (s/v)	15.1	15.5	16.6	22.1	24.8	28.6	26.9	31.3	16.1	16.5	16.0	16.1	15.5	16.1
	LOS	B	B	B	C	C	C	C	C	B	B	B	B	B	B
Total Network	Delay (hr)	30.7	30.1	32.0	37.2	36.6	37.6	35.7	39.9	29.7	29.8	29.5	28.6	30.3	28.9

PM Peak Hour

Intersection	MOE	Year 2016 PM Peak Hour													
		No Build	S1	S1a	S2	S2a	S2b	S2c	S2d	S3	S3a	S3b	S3c	S3d	S3e
		Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall
White Bear Avenue & Suburban Avenue	Delay (s/v)	18.6	16.0	15.5	238.9	14.5	14.3	14.3	14.2	14.0	14.0	13.3	14.3	20.5	14.3
	LOS	B	B	B	F	B	B	B	B	B	B	B	B	C	B
White Bear Avenue & I-94 South Ramps	Delay (s/v)	37.5	26.7	24.2	47.6	19.0	19.1	19.6	20.3	19.5	19.6	19.8	19.6	29.1	20.6
	LOS	D	C	C	D	B	B	B	C	B	B	B	B	C	C
White Bear Avenue & I-94 North Ramps	Delay (s/v)	36.5	18.3	18.4	21.9	13.0	13.3	12.6	10.9	13.5	13.0	11.7	10.3	10.1	9.6
	LOS	D	B	B	C	B	B	B	B	B	B	B	B	B	A
White Bear Avenue & Old Hudson Road	Delay (s/v)	46.4	24.5	23.4	92.2	11.0	11.9	11.4	12.4	13.3	14.5	14.2	9.9	17.4	12.0
	LOS	D	C	C	F	B	B	B	B	B	B	B	A	B	B
White Bear Avenue & 3rd Street	Delay (s/v)	15.2	13.5	13.5	35.7	26.1	19.7	16.7	19.7	13.1	13.0	13.3	12.6	13.4	12.5
	LOS	B	B	B	D	C	B	B	B	B	B	B	B	B	B
White Bear Avenue & Minnehaha Avenue	Delay (s/v)	22.2	18.7	18.3	105.9	84.9	95.4	84.4	75.1	17.6	18.0	18.1	18.6	18.1	19.3
	LOS	C	B	B	F	F	F	F	E	B	B	B	B	B	B
Total Network	Delay (hr)	113.8	78.0	73.8	305.3	114.9	120.7	108.6	104.6	60.6	61.4	60.3	57.4	71.4	59.6

1. AM and PM Peak delays computed using SimTraffic averaged over 5 random seeds



Table 9. Forecast Year 2036 Alternatives Analysis Results – Intersection LOS

AM Peak Hour

Intersection	MOE	Year 2036 AM Peak Hour													
		No Build	S1	S1a	S2	S2a	S2b	S2c	S2d	S3	S3a	S3b	S3c	S3d	S3e
		Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall
White Bear Avenue & Suburban Avenue	Delay (s/v)	9.4	10.2	9.5	9.4	9.4	8.8	8.9	9.2	9.2	9.6	9.2	9.4	9.8	8.9
	LOS	A	B	A	A	A	A	A	A	A	A	A	A	A	A
White Bear Avenue & I-94 South Ramps	Delay (s/v)	11.9	11.5	11.2	12.9	11.5	11.5	11.3	11.5	11.0	11.2	11.3	11.0	11.3	11.1
	LOS	B	B	B	B	B	B	B	B	B	B	B	B	B	B
White Bear Avenue & I-94 North Ramps	Delay (s/v)	12.4	13.2	13.9	18.3	13.4	12.4	11.7	11.7	11.9	12.2	11.1	11.1	10.4	10.3
	LOS	B	B	B	B	B	B	B	B	B	B	B	B	B	B
White Bear Avenue & Old Hudson Road	Delay (s/v)	11.6	10.5	11.7	14.6	11.5	10.0	9.5	10.9	9.4	9.4	9.8	9.4	9.3	9.6
	LOS	B	B	B	B	B	A	A	B	A	A	A	A	A	A
White Bear Avenue & 3rd Street	Delay (s/v)	16.4	15.8	15.0	29.8	39.4	19.5	16.3	18.1	14.5	15.3	14.3	14.2	15.2	13.7
	LOS	B	B	B	C	D	B	B	B	B	B	B	B	B	B
White Bear Avenue & Minnehaha Avenue	Delay (s/v)	16.3	17.6	19.6	25.2	33.3	52.9	45.0	46.9	17.0	17.8	17.1	18.0	17.0	16.5
	LOS	B	B	B	C	C	D	D	D	B	B	B	B	B	B
Total Network	Delay (hr)	35.8	36.0	37.9	52.6	56.7	56.2	49.1	52.4	33.4	35.2	33.2	33.7	33.1	32.1

PM Peak Hour

Intersection	MOE	Year 2036 PM Peak Hour													
		No Build	S1	S1a	S2	S2a	S2b	S2c	S2d	S3	S3a	S3b	S3c	S3d	S3e
		Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall
White Bear Avenue & Suburban Avenue	Delay (s/v)	143.9	16.8	16.0	348.2	22.1	15.7	14.5	14.2	13.8	14.5	14.2	14.1	39.4	14.9
	LOS	F	B	B	F	C	B	B	B	B	B	B	B	D	B
White Bear Avenue & I-94 South Ramps	Delay (s/v)	62.9	26.1	26.0	66.3	27.2	23.2	20.7	20.9	18.6	20.7	19.6	19.2	29.7	20.1
	LOS	E	C	C	E	C	C	C	C	B	C	B	B	C	C
White Bear Avenue & I-94 North Ramps	Delay (s/v)	52.1	25.7	23.8	44.0	32.1	35.0	18.8	13.2	14.4	14.7	13.6	11.8	11.6	10.3
	LOS	D	C	C	D	C	D	B	B	B	B	B	B	B	B
White Bear Avenue & Old Hudson Road	Delay (s/v)	78.4	46.0	68.7	130.1	25.9	26.0	20.4	16.1	14.8	14.5	18.0	10.5	18.0	13.0
	LOS	E	D	E	F	C	C	C	B	B	B	B	B	B	B
White Bear Avenue & 3rd Street	Delay (s/v)	16.2	14.9	14.8	58.3	74.5	62.8	74.6	40.3	14.1	13.9	14.5	13.9	14.5	13.5
	LOS	B	B	B	E	E	E	E	D	B	B	B	B	B	B
White Bear Avenue & Minnehaha Avenue	Delay (s/v)	26.5	21.8	22.2	122.4	154.9	164.1	182.3	134.4	20.6	20.5	22.4	21.0	20.8	21.0
	LOS	C	C	C	F	F	F	F	F	C	C	C	C	C	C
Total Network	Delay (hr)	233.8	107.0	122.2	410.4	236.8	235.5	233.7	177.5	69.4	71.5	74.3	65.5	92.4	67.0

1. AM and PM Peak delays computed using SimTraffic averaged over 5 random seeds



Table 10. Forecast Year 2016 and 2036 Alternatives Analysis Results – Urban Arterial LOS

Year 2016 AM Peak Hour

Direction	Travel Route	MOE	Year 2016 AM Peak Hour													
			No Build	S1	S1a	S2	S2a	S2b	S2c	S2d	S3	S3a	S3b	S3c	S3d	S3e
			Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall
NB	White Bear: Suburban Avenue to Minnehaha Avenue	Speed (mph)	21.4	24.1	24.5	23.3	23.1	24.0	23.9	24.5	24.8	24.6	24.9	24.9	25.1	24.9
		LOS	B	B	B	B	B	B	B	B	B	B	B	B	B	B
SB	White Bear: Minnehaha Avenue to Suburban Avenue	Speed (mph)	20.8	23.6	22.6	20.7	22.5	22.7	22.9	23.1	23.6	23.9	24.3	24.2	24.1	24.5
		LOS	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Year 2016 PM Peak Hour

Direction	Travel Route	MOE	Year 2016 PM Peak Hour													
			No Build	S1	S1a	S2	S2a	S2b	S2c	S2d	S3	S3a	S3b	S3c	S3d	S3e
			Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall
NB	White Bear: Suburban Avenue to Minnehaha Avenue	Speed (mph)	14.0	18.7	19.1	7.2	14.8	13.8	13.7	17.9	20.2	20.5	20.3	20.9	18.3	20.0
		LOS	D	C	C	F	D	D	D	C	B	B	B	B	C	C
SB	White Bear: Minnehaha Avenue to Suburban Avenue	Speed (mph)	13.5	18.0	17.8	13.0	20.2	20.1	20.7	21.4	21.8	21.9	22.4	22.6	21.0	23.3
		LOS	D	C	C	D	B	B	B	B	B	B	B	B	B	B

Year 2036 AM Peak Hour

Direction	Travel Route	MOE	Year 2036 AM Peak Hour													
			No Build	S1	S1a	S2	S2a	S2b	S2c	S2d	S3	S3a	S3b	S3c	S3d	S3e
			Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall
NB	White Bear: Suburban Avenue to Minnehaha Avenue	Speed (mph)	21.0	23.3	23.9	20.3	17.9	22.5	23.6	23.8	24.7	24.6	24.4	24.6	24.7	24.6
		LOS	B	B	B	B	C	B	B	B	B	B	B	B	B	B
SB	White Bear: Minnehaha Avenue to Suburban Avenue	Speed (mph)	20.6	22.9	22.2	19.6	21.7	22.2	22.3	22.9	23.7	23.3	24.2	24.0	24.2	24.7
		LOS	B	B	B	C	B	B	B	B	B	B	B	B	B	B

Year 2036 PM Peak Hour

Direction	Travel Route	MOE	Year 2036 PM Peak Hour													
			No Build	S1	S1a	S2	S2a	S2b	S2c	S2d	S3	S3a	S3b	S3c	S3d	S3e
			Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall
NB	White Bear: Suburban Avenue to Minnehaha Avenue	Speed (mph)	5.4	16.4	17.7	4.0	7.5	7.7	7.5	11.3	20.2	19.7	19.3	20.1	17.5	19.7
		LOS	F	C	C	F	F	F	F	E	B	C	C	C	C	C
SB	White Bear: Minnehaha Avenue to Suburban Avenue	Speed (mph)	11.6	16.7	13.5	12.8	16.9	18.1	19.4	20.3	21.4	21.5	21.4	22.2	20.8	22.7
		LOS	E	C	D	D	C	C	C	B	B	B	B	B	B	B

1. AM and PM Peak speeds computed using SimTraffic averaged over 5 random seeds



5.0 Conclusions and Recommendations

The safety and traffic operation analysis draws the following key conclusions:

- The intersection of White Bear Avenue and Old Hudson Road's crash rate exceeds both the average rate and critical crash rate.
- In addition, the data indicates that the left turn and right angle type crashes at White Bear Avenue/Old Hudson Road are significantly higher than the statewide average.
- Overall the crash experience is indicative of facilities with higher traffic volumes, shared turn lane operation and permissive traffic signal phasing. To most effectively reduce the crash types occurring at these intersections, improvement measures will need to focus on reducing congestion, provide exclusive turn lanes and provide opportunities for protected/permissive left turn phasing.
- The implementation of optimized signal timing (Scenario 1) along White Bear Avenue is expected to provide considerable improvement over the forecast 2036 no build scenario. Overall, the total network delay is reduced in half and a LOS D or better is expected at each intersection.
- Overall most intersections are expected to operate at an acceptable LOS C or better during the a.m. peak hour for all scenarios. The White Bear Avenue/3rd Street intersection operates at LOS D in 2036 for Scenario 2a. The White Bear Avenue/Minnehaha Avenue intersection operates at LOS D in 2036 for Scenarios 2b, 2c, and 2d.
- During the p.m. peak period, a three lane cross-section is not expected to provide acceptable level of traffic operations and will not satisfy Minnesota Rule 8820.9936. All of the three-lane section scenarios (Scenarios 2, 2a, 2b, 2c, and 2d) operate at a LOS F for many of the intersections. The scenarios evaluated multiple locations for transitioning between a four-lane and three-lane cross-section; and also evaluated the benefit of adding exclusive right turn lanes. The analysis concludes that a single travel lane in the northbound cannot accommodate the forecast traffic volume demand without excessive delays and queuing or traffic volume diversion.
- The implementation of northbound and southbound left turn lanes at Old Hudson Road (Scenarios 3, 3a, 3b, 3c, 3d, and 3e), results in an estimated additional 35 percent reduction in network delay over providing optimized signal timing (Scenario 1). For each of these scenarios, most intersections are expected to operate at an acceptable LOS C or better during the a.m. and p.m. peak hours.
- Reconfiguring the Old Hudson Road to a 3-lane cross-section (Scenario 3a, lane configurations shown in Figure 11) results in a neutral traffic operation improvement; however, is expected to provide improved safety characteristics by segregating turning movements into exclusive lanes. The addition of protected/permissive signal phasing (Scenario 3b) increases intersection delay; however, additional safety benefit is expected.
- The addition of right turn lanes at the White Bear Avenue/3rd Street, Old Hudson Road and I-94 North Ramp intersections is expected to provide improved

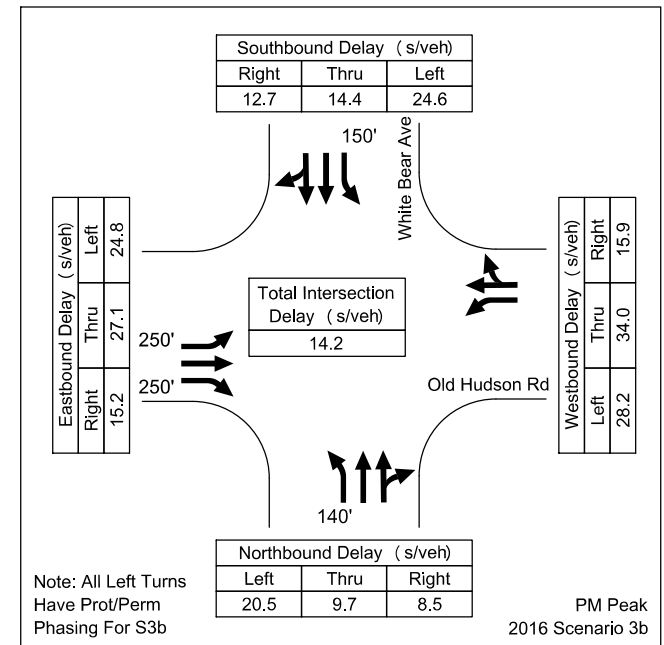
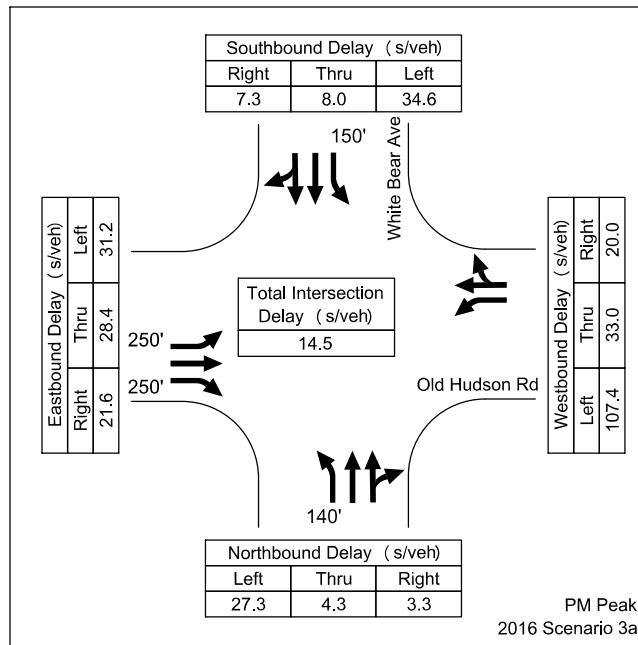
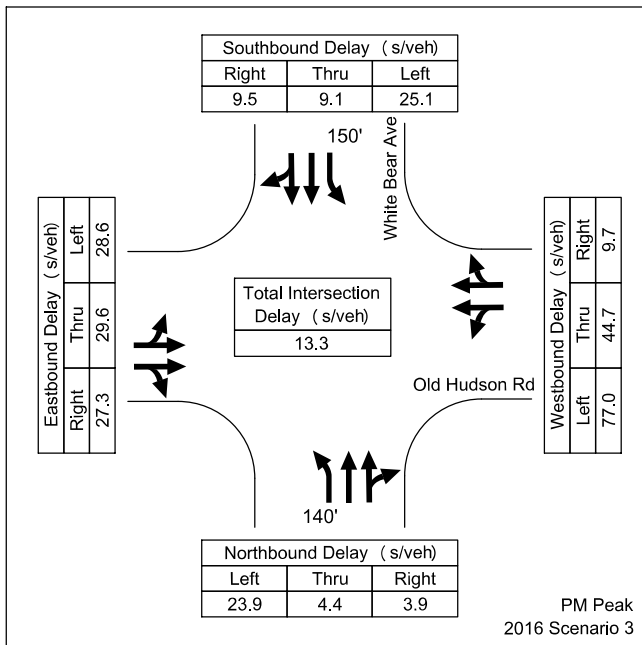
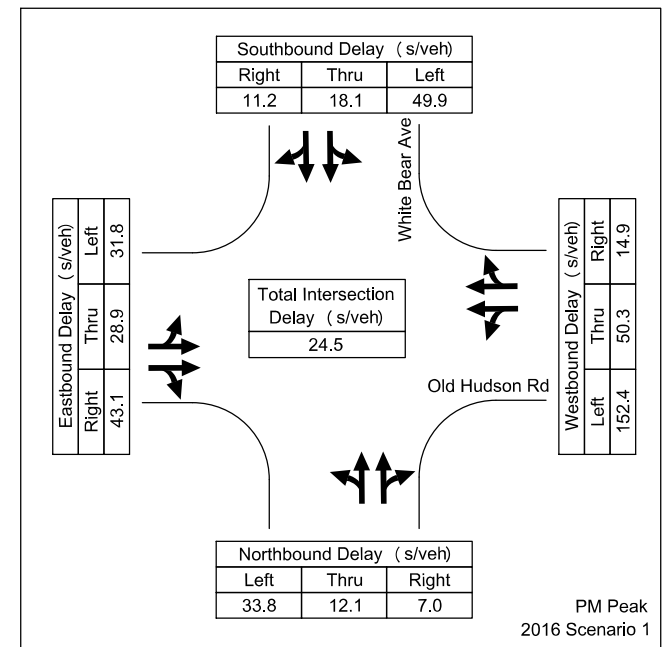
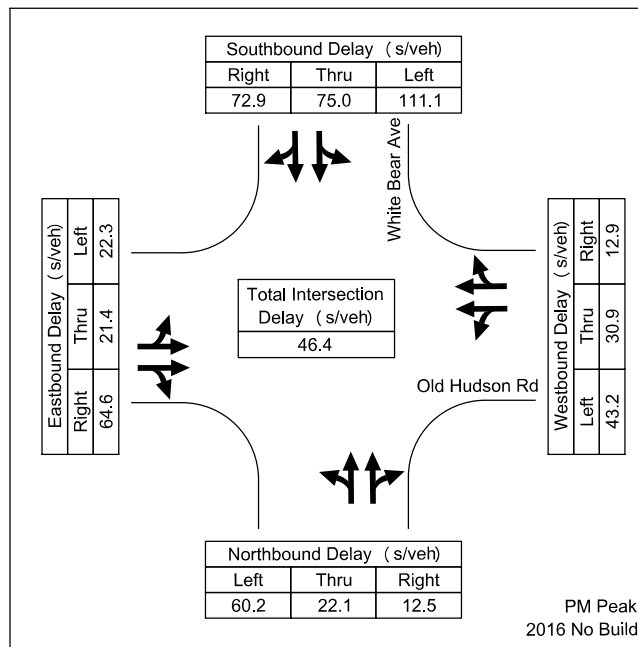
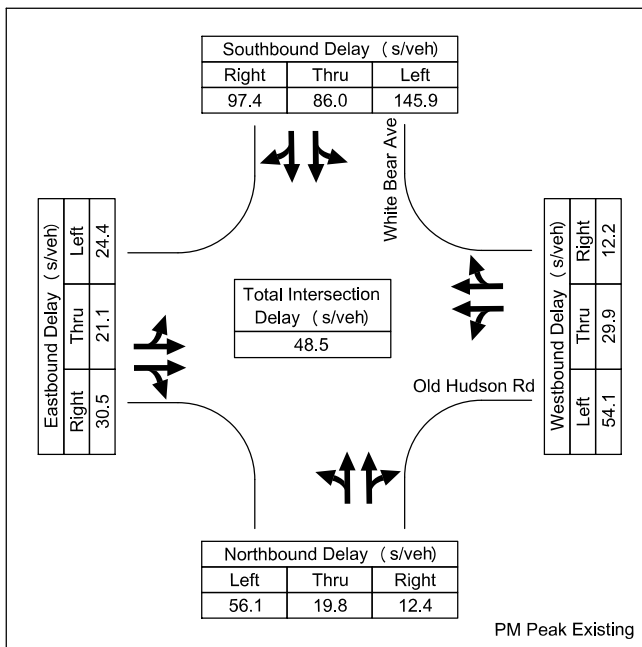
intersections operations (approximately 8 percent additional reduction in delay). With exception to the right turn lane at the I-94 North Ramp, the overall delay reduction is fairly minimal and may not be the cost-beneficial improvement.

5.1 Recommendations

Based on the safety and traffic operation analysis, field observations and alternatives analysis, the following considerations should be made:

- Within the project limits of White Bear Avenue evaluated, a four lane roadway is recommended.
- The implementation of optimized signal timing along White Bear Avenue is expected to result in an estimated 54 percent reduction in total network delay. An overall LOS D or better is expected under existing and forecast traffic volumes. Optimized signal timing plans should be developed and implemented. In addition, the White Bear Avenue/3rd Street intersection should be included in the signal coordination patterns. (Scenario 1).
- The provision of exclusive left turn lanes along White Bear Avenue at Old Hudson Road is expected to result in an additional 35 percent improvement. (Scenario 3).
- Consideration should be made to reconfigure Old Hudson Road to a three lane cross-section (Scenario 3a).
- Protected/permissive left turn operation (flashing yellow arrow) should be considered at the White Bear Avenue/Old Hudson Road intersection. The safety characteristics of the intersection are expected to be improved, with minimal increase in motorist delay (additional signal phases and lost time). Overall, a LOS B is expected. (Scenario 3b)
- The preliminary evaluation completed for the I-94/White Bear Avenue interchange indicates that a 5-lane bridge (if diamond operation is maintained) and an exclusive southbound right turn lane at the north ramp terminal are necessary into the future. Detailed evaluation of the I-94/White Bear Avenue interchange, or interchange configurations was not included as part of this study but should be completed in the future.

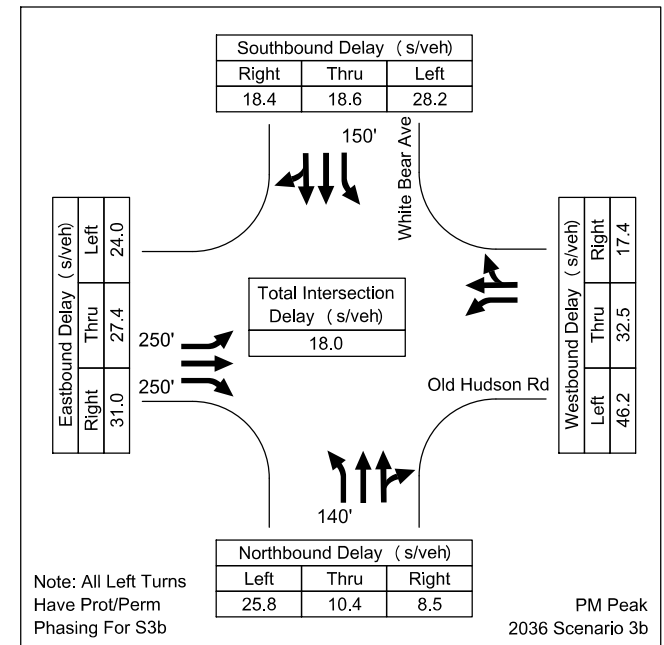
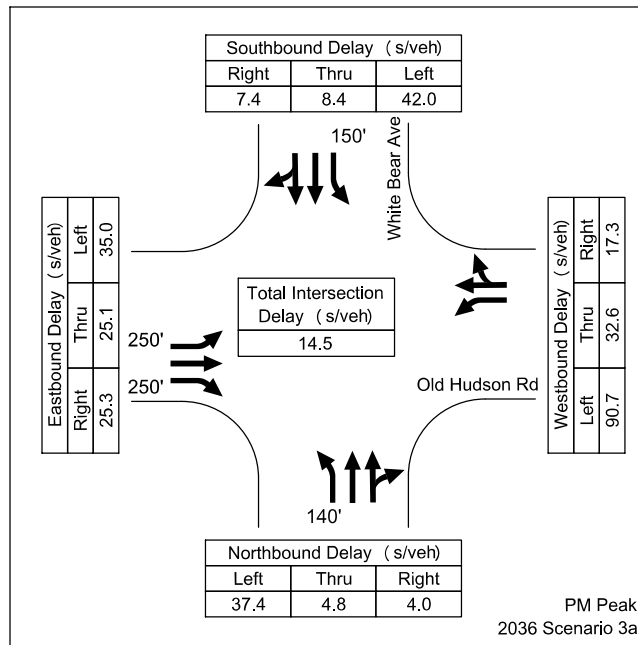
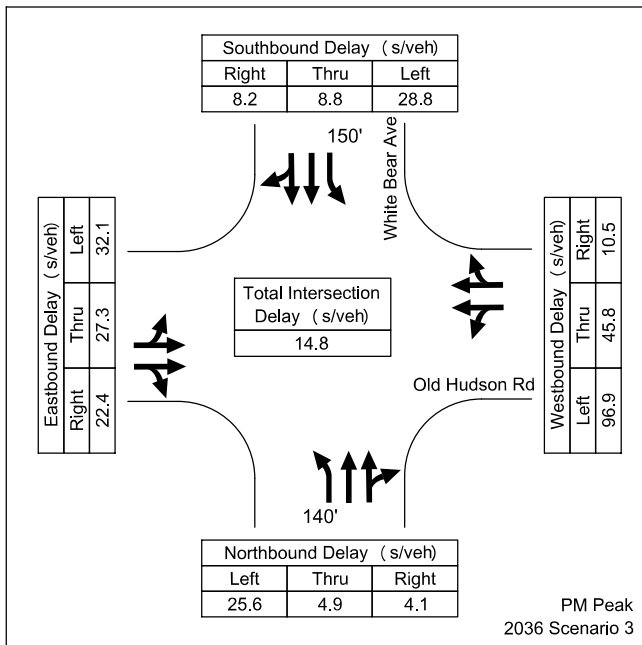
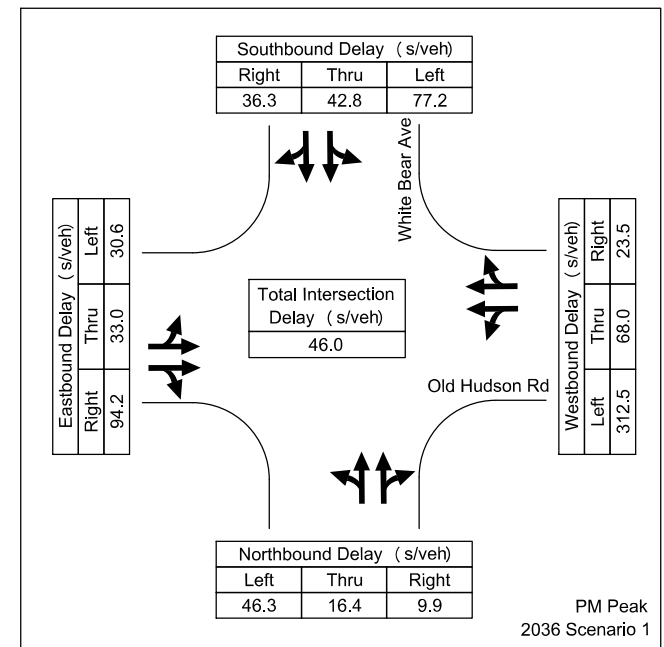
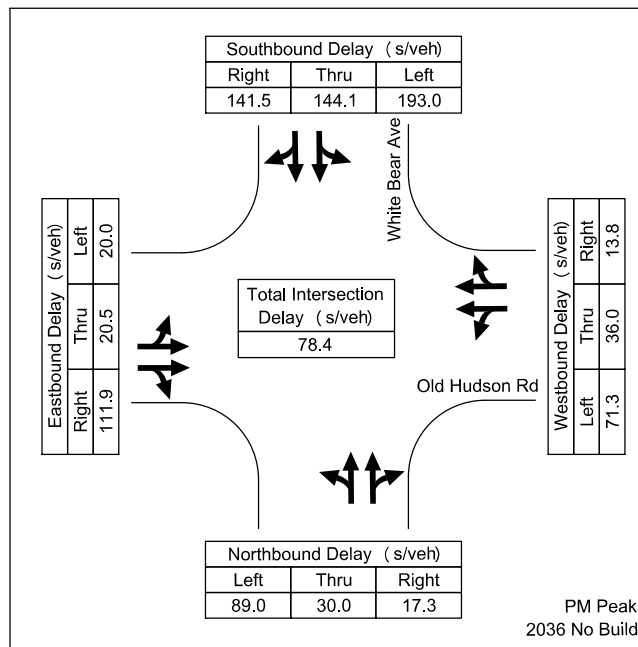
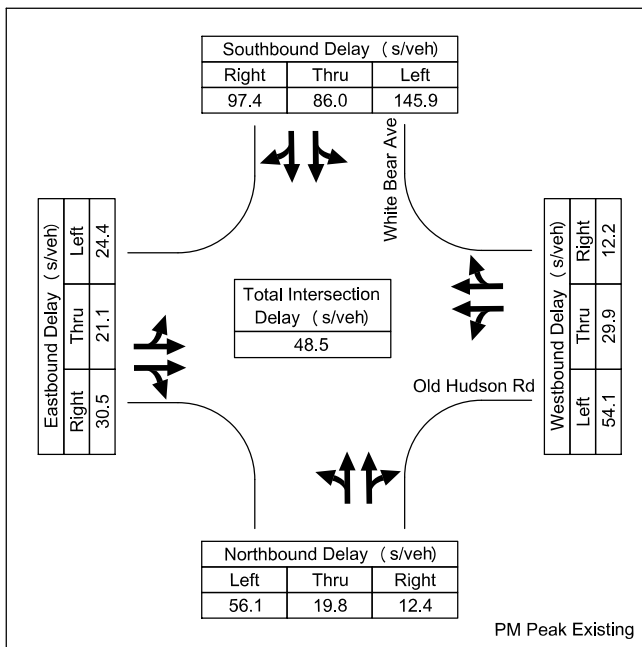
Based on the conclusions and recommendations listed above, a detailed summary comparison of the key preferred scenarios for the White Bear Avenue/Old Hudson Road intersection under 2016 and 2036 volumes is illustrated in Figure 12 and Figure 13, respectively.



White Bear Avenue Traffic Operations Analysis

Figure 12
White Bear Avenue and Old Hudson Road
Intersection Delay Summary Forecast 2016





White Bear Avenue Traffic Operations Analysis

Figure 13
White Bear Avenue and Old Hudson Road
Intersection Delay Summary Forecast 2036



Appendix A:
Traffic Operation Analysis Results – Intersections

Traffic parameters used in Synchro/Simtraffic models

1. Peak Hour Factor (PHF) of 1.00 used in Synchro model. Volumes used were peak 15 minute volume times four.
2. Five 15 minute volumes were used in the Simtraffic model for the AM Peak and PM Peak time periods.
3. AM Peak intervals included 7:00, 7:15, 7:30, 7:45, and 8:00 a.m. 7:00 was the seeding interval while the remaining intervals were recorded.
4. PM Peak intervals included 4:45, 5:00, 5:15, 5:30, and 5:45 p.m. 4:45 was the seeding interval while the remaining intervals were recorded.
5. Heavy vehicle percentage of 2% was used in the Synchro model.
6. Ideal Saturated Flow of 1800 vphpl used in models.
7. Turning speeds adjusted at select locations to calibrate models.
8. Mandatory distance adjusted for southbound White Bear Ave at I-94 North Ramp to calibrate models.

Table A-1. 2014 Existing Conditions

Node	Intersection	MOE	Peak Hours									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	20.2	12.4	6.9	6.1	8.8	24.2	16.7	18.8	13.5	17
		LOS	C	B	A	A	A	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	17.9	0	6	11.7	12.1	18.4	0	45.4	48.4	37.2
		LOS	B	A	A	B	B	B	A	D	D	D
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	12.3	11.6	9.1	10.7	0	18.6	52.2	22.3	34.8
		LOS	A	B	B	A	B	A	B	D	C	C
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	11.3	17.3	9.6	10.4	10.7	27.9	34	23.5	89	48.5
		LOS	B	B	A	B	B	C	C	C	F	D
105	White Bear Avenue & 3rd Street	Delays (s/v)	18.7	18.1	11.1	11.4	12.9	19.9	16.3	13.2	15.1	15.2
		LOS	B	B	B	B	B	B	B	B	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	19.2	23.1	10.7	10.5	14.3	41.1	28.4	14.5	9.7	18.7
		LOS	B	C	B	B	B	D	C	B	A	B

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-2. 2016 No Build Conditions

Node	Intersection	MOE	2016 No Build Conditions									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	16.6	13.5	7.2	6.8	9.5	25.2	16.7	17.3	12.8	16.7
		LOS	B	B	A	A	A	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	18.5	0	5.9	11.5	12.1	18.9	0	44.2	49.6	37.5
		LOS	B	A	A	B	B	B	A	D	D	D
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	12.5	12.2	9.1	10.9	0	19.7	53.5	24.6	36.5
		LOS	A	B	B	A	B	A	B	D	C	D
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	11.3	17.7	9.8	10.9	11.1	50.2	29.6	25.4	76.9	46.4
		LOS	B	B	A	B	B	D	C	C	E	D
105	White Bear Avenue & 3rd Street	Delays (s/v)	18.7	17.8	12.2	11.4	13.3	20.5	17	13.5	14	15.2
		LOS	B	B	B	B	B	C	B	B	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	19.6	24.3	12.1	10.6	15.1	54.4	35.4	14.6	9.7	22.2
		LOS	B	C	B	B	B	D	D	B	A	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-3. 2036 No Build Conditions

Node	Intersection	MOE	2036 No Build Conditions									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	20	13.1	6.9	6.3	9.3	308.4	60.3	93.7	18.2	88.7
		LOS	C	B	A	A	A	F	E	F	B	F
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	18.5	0	6.2	10.9	11.9	40.5	0	119.8	36.4	62.9
		LOS	B	A	A	B	B	D	A	F	D	E
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	13.1	14.5	10.8	12.4	0	28.8	91.3	25.5	52.1
		LOS	A	B	B	B	B	A	C	F	C	D
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	11.6	16.4	10.6	11.6	11.6	82.3	43.5	35.4	134.9	78.4
		LOS	B	B	B	B	B	F	D	D	F	E
105	White Bear Avenue & 3rd Street	Delays (s/v)	17.6	18.5	19.4	12.7	16.4	20.2	17.3	14.3	15.9	16.2
		LOS	B	B	B	B	B	C	B	B	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	19.6	27.4	12.1	12	16.3	64.5	54.9	15.4	10.3	26.5
		LOS	B	C	B	B	B	E	D	B	B	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-4. 2016 Scenario 1 Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	21.7	17.2	6.5	3.4	9.4	22.7	15	14.1	13.9	15.6
		LOS	C	B	A	A	A	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.9	0	7	5.5	11.8	21.9	0	26.9	31.6	26.7
		LOS	C	A	A	A	B	C	A	C	C	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.1	11.3	8.1	11.6	0	20.9	14	21.8	18.3
		LOS	A	B	B	A	B	A	C	B	C	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.1	27.3	7.3	7	9.7	38.7	81.1	14.1	19.4	24.5
		LOS	B	C	A	A	A	D	F	B	B	C
105	White Bear Avenue & 3rd Street	Delays (s/v)	30.7	31.4	8.5	8.1	13.8	31.6	26.3	7.4	9.4	13.5
		LOS	C	C	A	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	25.7	30.4	7.9	9.7	15.5	31.2	28.1	15.7	12.9	18.7
		LOS	C	C	A	A	B	C	C	B	B	B

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-5. 2036 Scenario 1 Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	25.5	18.1	7.2	3.8	10.1	23.5	16	15.2	14	16.3
		LOS	C	B	A	A	B	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	22.7	0	8.8	5	11.5	23.2	0	33.9	21	26.1
		LOS	C	A	A	A	B	C	A	C	C	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.7	12.7	10.5	13.2	0	28.3	27.4	23	25.7
		LOS	A	B	B	B	B	A	C	C	C	C
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.6	33.3	7.8	7.3	10.5	82.3	152	18.9	45.2	46
		LOS	B	C	A	A	B	F	F	B	D	D
105	White Bear Avenue & 3rd Street	Delays (s/v)	32.5	30.9	12.6	9.6	15.8	32.4	25.7	9.5	11	14.9
		LOS	C	C	B	A	B	C	C	A	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	26.3	35	9.3	11.2	17.6	38.5	30.4	18	14.9	21.8
		LOS	C	D	A	B	B	D	C	B	B	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-6. 2016 Scenario 1a Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	24.3	17.7	6.3	4	9.8	23.4	14.6	14.5	12.4	15.2
		LOS	C	B	A	A	A	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.2	0	6.8	6.1	11.8	22.5	0	26	24.1	24.2
		LOS	C	A	A	A	B	C	A	C	C	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.9	14.6	8.1	12.8	0	20.4	15.6	20.7	18.4
		LOS	A	B	B	A	B	A	C	B	C	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.4	30.8	5.6	12.2	11.3	30.7	58	10.5	29.6	23.4
		LOS	B	C	A	B	B	C	E	B	C	C
105	White Bear Avenue & 3rd Street	Delays (s/v)	30.1	31.1	7.6	7.9	13.2	30.3	24.5	7.7	9.9	13.5
		LOS	C	C	A	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	25.4	33.6	8.3	10.5	16.6	32.1	26.9	15.2	12.6	18.3
		LOS	C	C	A	B	B	C	C	B	B	B

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-7. 2036 Scenario 1a Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	23.1	17.3	6	4.3	9.6	23	14.9	15.2	13.3	15.7
		LOS	C	B	A	A	A	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	22.9	0	7.2	5.3	11.2	24.7	0	29.3	23.6	26
		LOS	C	A	A	A	B	C	A	C	C	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.6	15.7	10.5	13.9	0	23.8	21.8	25.9	23.8
		LOS	A	B	B	B	B	A	C	C	C	C
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	16.6	32.1	6.4	11.8	11.7	94.4	211.3	14.4	99.1	68.7
		LOS	B	C	A	B	B	F	F	B	F	E
105	White Bear Avenue & 3rd Street	Delays (s/v)	30.2	30.3	11.6	9.3	15	32.9	26	9.4	10.7	14.8
		LOS	C	C	B	A	B	C	C	A	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	28.4	40.8	9.4	11.9	19.6	41.1	29.9	18.6	14.7	22.2
		LOS	C	D	A	B	B	D	C	B	B	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-8. 2016 Scenario 2 Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	22.5	17.5	6.7	4	9.8	1032.6	83.6	59.8	20.2	145.6
		LOS	C	B	A	A	A	F	F	E	C	F
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.2	0	9.6	7.2	13	28.9	0	89.2	34	47.6
		LOS	C	A	A	A	B	C	A	F	C	D
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	19.2	12.7	7.7	12.5	0	30	20.5	20	21.9
		LOS	A	B	B	A	B	A	C	C	C	C
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	18.4	29.4	8	9.5	11.4	235.1	478.9	15.9	56	92.2
		LOS	B	C	A	A	B	F	F	B	E	F
105	White Bear Avenue & 3rd Street	Delays (s/v)	32.2	30.4	12.8	15.3	18.1	32.3	24.9	38.4	36.6	35.7
		LOS	C	C	B	B	B	C	C	D	D	D
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	34.4	32.1	12.6	19.7	22.1	34	32.5	238.6	32.8	105.9
		LOS	C	C	B	B	C	C	C	F	C	F

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-9. 2036 Scenario 2 Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	24.5	16.4	6.4	3.6	9.2	1143.3	128.6	264.6	16.8	218.5
		LOS	C	B	A	A	A	F	F	F	B	F
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.5	0	11.6	6	12.9	77.6	0	128.3	16.1	66.3
		LOS	C	A	B	A	B	E	A	F	B	E
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	31.3	16.7	10.5	18.3	0	112.7	42.9	19.4	44
		LOS	A	C	B	B	B	A	F	D	B	D
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	19.9	45.2	10.5	10.4	14.6	290.1	1285.7	27.1	39.6	130.1
		LOS	B	D	B	B	B	F	F	C	D	F
105	White Bear Avenue & 3rd Street	Delays (s/v)	30.9	30.5	41.3	19.1	29.8	36.9	24.7	116.1	29.5	58.3
		LOS	C	C	D	B	C	D	C	F	C	E
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	31.5	37.6	15.6	23.6	25.2	61.5	49.8	242.6	72.8	122.4
		LOS	C	D	B	C	C	E	D	F	E	F

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-10. 2016 Scenario 2a Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	22.7	17.6	6.4	3.3	9.3	21.7	15.4	14.6	9.9	14.1
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.9	0	7.6	4.7	12	22.1	0	26.4	7.7	19
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	15.8	9.9	7.6	10.6	0	18.4	8	16.4	13
		LOS	A	B	A	A	B	A	B	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	13.4	31.4	6	4.4	8.5	20.6	31.6	6.6	5.4	9.9
		LOS	B	C	A	A	A	C	C	A	A	A
105	White Bear Avenue & 3rd Street	Delays (s/v)	28.3	30.6	17.3	13.6	18.8	34.2	26	22.3	21.2	24.2
		LOS	C	C	B	B	B	C	C	C	C	C
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	46	54	10.1	12.5	24.8	185.6	174.5	71.5	19.8	84.9
		LOS	D	D	B	B	C	F	F	E	B	F

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-11. 2036 Scenario 2a Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	24.4	16.4	6.8	3.6	9.4	36.7	21.1	19	9.7	19
		LOS	C	B	A	A	A	D	C	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	24.2	0	7.9	4.5	11.5	28.8	0	45.2	7.6	27.2
		LOS	C	A	A	A	B	C	A	D	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	23.3	11.2	8.1	13.4	0	66.2	34.9	17.4	32.1
		LOS	A	C	B	A	B	A	E	C	B	C
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	16.8	36.1	9	4.1	10.4	37.9	80.7	23.6	6.7	24.4
		LOS	B	D	A	A	B	D	F	C	A	C
105	White Bear Avenue & 3rd Street	Delays (s/v)	31.2	29.7	62.4	17.9	36.6	32.6	26	104.5	50.5	66.1
		LOS	C	C	E	B	D	C	C	F	D	E
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	58.6	76.2	13.4	15.6	33.3	298.7	267.2	178.2	30.9	154.9
		LOS	E	E	B	B	C	F	F	F	C	F

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-12. 2016 Scenario 2b Conditions

Node	Intersection	MOE										
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	23.5	16.8	6	3.4	9.1	23.4	14.2	14.6	10	14
		LOS	C	B	A	A	A	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	22.9	0	8.4	4.8	11.6	23.1	0	25.5	8	19.1
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.1	9.6	8.3	11.3	0	18.8	8	16.7	13.3
		LOS	A	B	A	A	B	A	B	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	13.5	28	5.8	4.5	8	21.3	38.7	7	5.5	10.8
		LOS	B	C	A	A	A	C	D	A	A	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	29.8	30.6	9.1	11.2	15	32.9	26.8	12.5	15.9	18.2
		LOS	C	C	A	B	B	C	C	B	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	69.5	58.3	9.8	13.4	28.6	133.7	227.7	99.8	23.9	95.4
		LOS	E	E	A	B	C	F	F	F	C	F

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-13. 2036 Scenario 2b Conditions

Node	Intersection	MOE										
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	23.8	16	6.1	3.1	8.8	25.1	16.6	14.9	9.3	14.8
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.1	0	9.6	4.3	11.5	26.5	0	35.4	7.3	23.2
		LOS	C	A	A	A	B	C	A	D	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	18.1	10.4	9.7	12.4	0	97.9	29.5	18.8	35
		LOS	A	B	B	A	B	A	F	C	B	D
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	14.6	34.6	6.3	4.6	8.9	44	88.4	21.5	7.1	24.6
		LOS	B	C	A	A	A	D	F	C	A	C
105	White Bear Avenue & 3rd Street	Delays (s/v)	29.3	29.4	16.8	12.8	18.2	33.9	26.9	95.5	30.9	55.5
		LOS	C	C	B	B	B	C	C	F	C	E
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	116.7	136.6	11.2	14.9	52.9	283.5	303.4	198.4	30.9	164.1
		LOS	F	F	B	B	D	F	F	F	C	F

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-14. 2016 Scenario 2c Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	23.8	17.3	5.9	3.3	9.2	22.9	14.7	14.5	9.7	14
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	22.8	0	8.2	4.4	11.4	21.6	0	28	7.9	19.6
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	16.7	9.7	8.8	11.4	0	18.2	7.5	16.1	12.6
		LOS	A	B	A	A	B	A	B	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.3	31.5	5.8	6.6	9.5	21.6	37.7	6.3	8.5	11.4
		LOS	B	C	A	A	A	C	D	A	A	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	32.3	31.2	10.8	5	13.5	30.6	26.3	12.2	7.7	14.7
		LOS	C	C	B	A	B	C	C	B	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	37.5	64.8	8.8	12.7	26.4	136.5	116	100.9	23.9	81.9
		LOS	D	E	A	B	C	F	F	F	C	F

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-15. 2036 Scenario 2c Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	23.5	16.4	6	3.4	9	23.8	14.8	14.6	9.3	14
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.4	0	8.6	4.4	11.3	23.9	0	30.3	7.5	20.7
		LOS	C	A	A	A	B	C	A	C	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.9	9.4	8.9	11.7	0	38.3	12.9	17.8	18.8
		LOS	A	B	A	A	B	A	D	B	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.2	30.6	6	7	9.5	35.5	73.2	14.3	10.4	20.4
		LOS	B	C	A	A	A	D	E	B	B	C
105	White Bear Avenue & 3rd Street	Delays (s/v)	29.9	30.1	12.6	6	14.1	35	24.3	152.7	11.2	71.8
		LOS	C	C	B	A	B	D	C	F	B	E
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	115.8	96.8	10	16.5	44.1	300.4	389.2	185.4	31.1	170.3
		LOS	F	F	B	B	D	F	F	F	C	F

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-16. 2016 Scenario 2d Conditions

Node	Intersection	MOE										
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	24.9	18.9	5.7	3.1	9.5	26.8	16.1	12.9	8.2	14
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	26.2	0	7.1	4.4	12.1	27.8	0	23	9.1	20.3
		LOS	C	A	A	A	B	C	A	C	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	18.8	9.7	5.3	10.4	0	20.2	8.2	10.3	10.9
		LOS	A	B	A	A	B	A	C	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.9	32.8	4.8	8.1	9.6	22.2	33.1	5.1	10.6	11.1
		LOS	B	C	A	A	A	C	C	A	B	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	36.4	35.2	11.9	9.6	16.7	39.9	29	12.1	13.4	18.7
		LOS	D	D	B	A	B	D	C	B	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	89.6	59.6	10.3	12.9	31.3	140.8	249.5	44.1	18.8	75.1
		LOS	F	E	B	B	C	F	F	D	B	E

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-17. 2036 Scenario 2d Conditions

Node	Intersection	MOE										
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	25.4	18.4	6.2	2.8	9.3	25.9	15.6	12.7	8.7	13.9
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	25.4	0	6.9	4.2	11.5	27.8	0	25.3	9.3	20.9
		LOS	C	A	A	A	B	C	A	C	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	20	11.1	6.5	11.7	0	26.6	10.5	11.1	13.2
		LOS	A	C	B	A	B	A	C	B	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.7	32.8	5.1	8	9.7	27.6	40.1	9.2	11.8	14.6
		LOS	B	C	A	A	A	C	D	A	B	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	35	33.9	14.1	10.5	17.4	40.3	28	52.1	21	37
		LOS	D	C	B	B	B	D	C	D	C	D
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	163.4	90.4	11.3	14.7	46.9	295.9	285.7	130.9	24.3	134.4
		LOS	F	F	B	B	D	F	F	F	C	F

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-18. 2016 Scenario 3 Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	25.3	16.6	6.1	3.4	9.1	22.3	14.4	15.1	9	13.7
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	22.4	0	8.1	4.5	11.3	22.4	0	27.3	7.6	19.5
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.9	9.7	8	11.4	0	18.6	7.8	17.7	13.5
		LOS	A	B	A	A	B	A	B	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.7	28.6	5.7	6.6	9.1	28.1	45.3	6.6	10	13.3
		LOS	B	C	A	A	A	C	D	A	B	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	31.1	29.9	7.7	7.7	12.9	31.2	26.3	6.9	9	13.1
		LOS	C	C	A	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	25.6	31	8.1	10.8	16.1	31.3	27.3	13.5	12.2	17.6
		LOS	C	C	A	B	B	C	C	B	B	B

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-19. 2036 Scenario 3 Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	22.9	17.3	6.3	3.3	9.3	21.4	14.3	14.1	9.7	13.6
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	22.6	0	8.2	4	11	21.5	0	26.8	7.4	18.6
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.8	9.7	9.2	11.9	0	19.3	8.3	19	14.4
		LOS	A	B	A	A	B	A	B	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.2	30.4	5.8	7.1	9.4	27.7	57.3	7.5	10	14.8
		LOS	B	C	A	A	A	C	E	A	B	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	31.4	31.1	10.3	8.5	14.5	32.9	25.3	7.5	10.7	14.1
		LOS	C	C	B	A	B	C	C	A	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	28.7	33.4	8.7	10.4	17	37.7	30.4	15.6	14.2	20.6
		LOS	C	C	A	B	B	D	C	B	B	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-20. 2016 Scenario 3a Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	25.8	17.8	6.2	3.5	9.8	22.3	14.2	13.7	9.8	13.7
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	22.8	0	8.2	4.5	11.4	22.7	0	27.1	8.3	19.6
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.4	10	7.7	11.2	0	18.1	7.8	16.4	13
		LOS	A	B	B	A	B	A	B	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	14.4	29.8	5.6	7.2	9.4	24.4	61.8	7.1	9.3	14.5
		LOS	B	C	A	A	A	C	E	A	A	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	30.7	29.2	7.4	7.5	12.6	29.5	24.6	7.1	9.6	13
		LOS	C	C	A	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	26.1	32	8.4	10.1	16.5	30.2	31	13.7	12.2	18
		LOS	C	C	A	B	B	C	C	B	B	B

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-21. 2036 Scenario 3a Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	27.3	16.8	6.1	3.7	9.5	24.2	14.5	14.2	9.9	14.3
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	22.9	0	8.3	4.2	11.2	22.2	0	31.4	7.5	20.7
		LOS	C	A	A	A	B	C	A	C	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	18.1	9.9	9.8	12.2	0	21.1	8.9	18.5	14.7
		LOS	A	B	A	A	B	A	C	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	18	31.4	5.6	6.7	9.4	26.8	52	8.7	9.9	14.5
		LOS	B	C	A	A	A	C	D	A	A	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	29.6	30.4	12.8	9	15.3	32.7	25.5	7.6	10.3	13.9
		LOS	C	C	B	A	B	C	C	A	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	26.8	36.4	9	11.6	17.8	35.4	31.6	15.6	14.8	20.5
		LOS	C	D	A	B	B	D	C	B	B	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-22. 2016 Scenario 3b Conditions

Node	Intersection	MOE										
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	23.3	15.9	6.6	2.9	8.8	23.6	13.6	13	8.1	13
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.3	0	7.4	4.2	11.1	23.4	0	26.6	8.2	19.8
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.2	9.6	6.4	10.5	0	19	7.5	13.4	11.7
		LOS	A	B	A	A	B	A	B	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	14.3	22.3	6.8	9.1	9.8	19	25.1	10.8	14.9	14.2
		LOS	B	C	A	A	A	B	C	B	B	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	32.4	31.1	8.1	8	13.8	31.5	27.4	7.3	9.1	13.3
		LOS	C	C	A	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	24.9	32.9	7.1	9.8	16	33.1	27.9	13.9	12.4	18.1
		LOS	C	C	A	A	B	C	C	B	B	B

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-23. 2036 Scenario 3b Conditions

Node	Intersection	MOE										
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	20.9	17.3	6.2	3.2	9.1	22.8	13.9	15.4	9.3	13.9
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23	0	8.6	4	11.3	21.9	0	29.3	6.9	19.6
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.9	9.7	7.3	11.1	0	20.3	8.4	16.7	13.6
		LOS	A	B	A	A	B	A	C	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	14.8	24.1	6.9	8.6	9.8	29.4	32.9	12.2	19	18
		LOS	B	C	A	A	A	C	C	B	B	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	30.4	29.4	10.4	8.5	14.3	32.9	24.2	8.3	10.8	14.5
		LOS	C	C	B	A	B	C	C	A	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	27.2	35.1	7.8	10.7	17.1	39	43	15.2	14.7	22.4
		LOS	C	D	A	B	B	D	D	B	B	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-24. 2016 Scenario 3c Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	21.7	17.1	6.4	3.6	9.5	23.2	14.6	13.7	9.8	13.9
		LOS	C	B	A	A	A	C	B	B	A	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.1	0	8.1	4.2	11.6	23.7	0	26.3	7.7	19.6
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	16.3	9.2	6.6	10.2	0	18.7	7	10.8	10.3
		LOS	A	B	A	A	B	A	B	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	14.8	29.5	5.1	6.4	8.7	18.6	30.1	5.4	8.5	9.9
		LOS	B	C	A	A	A	B	C	A	A	A
105	White Bear Avenue & 3rd Street	Delays (s/v)	30.9	29.7	7	6.7	12.4	30.8	25.4	6.4	8.9	12.6
		LOS	C	C	A	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	25.4	31.9	7.7	10.1	16.1	31.5	30.7	14	13.1	18.6
		LOS	C	C	A	B	B	C	C	B	B	B

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-25. 2036 Scenario 3c Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	22.1	17.8	6.7	3.3	9.5	21.8	14.3	14	10	13.9
		LOS	C	B	A	A	A	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.6	0	7.9	3.9	11	22.1	0	27.6	7.3	19.2
		LOS	C	A	A	A	B	C	A	C	A	B
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	18	10	7.1	11.1	0	20	8.2	12.7	11.8
		LOS	A	B	B	A	B	A	C	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.2	34.4	5.4	6.7	9.4	18	34	5.8	8.7	10.5
		LOS	B	C	A	A	A	B	C	A	A	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	29.5	30.8	10.2	8.1	14.2	32.8	25.4	7.7	9.8	13.9
		LOS	C	C	B	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	27.6	36	9	11	18	34.5	35.4	16.1	14.8	21
		LOS	C	D	A	B	B	C	D	B	B	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-26. 2016 Scenario 3d Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	24.2	17.4	5.9	4	9.4	25.2	26.4	21	12.5	19.7
		LOS	C	B	A	A	A	C	C	C	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.8	0	7.8	4.5	11.8	30.3	0	46.3	9.1	29.1
		LOS	C	A	A	A	B	C	A	D	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.8	9.3	5.3	10.1	0	17.4	7.8	9.9	10.1
		LOS	A	B	A	A	B	A	B	A	A	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	14	23	6.3	9.3	9.7	21.8	27.3	11.5	21.2	17.4
		LOS	B	C	A	A	A	C	C	B	C	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	28.9	30.3	11.4	8.9	14.8	31.9	25.9	7	9.5	13.4
		LOS	C	C	B	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	26	30.7	7.3	10.1	15.5	33.4	29.5	12.8	12.8	18.1
		LOS	C	C	A	B	B	C	C	B	B	B

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-27. 2036 Scenario 3d Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	20.7	16.8	7.4	4.2	9.7	32.1	44.6	24.7	12.8	26.2
		LOS	C	B	A	A	A	C	D	C	B	C
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.5	0	8.2	3.9	11.3	29.8	0	51.1	8.5	29.7
		LOS	C	A	A	A	B	C	A	D	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.3	9.8	5.8	10.4	0	20.4	8.4	11.7	11.6
		LOS	A	B	A	A	B	A	C	A	B	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	14.2	21.2	6.9	8.2	9.3	24.7	26.9	12.4	21.1	18
		LOS	B	C	A	A	A	C	C	B	C	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	33	29.2	12.2	9	15.2	31.1	24.2	8.6	11.2	14.5
		LOS	C	C	B	A	B	C	C	A	B	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	28.9	34.5	7.6	10.6	17	35.9	35.1	15.1	14.7	20.8
		LOS	C	C	A	B	B	D	D	B	B	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-28. 2016 Scenario 3e Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	23.5	17.2	6.1	3.1	9	24	13.4	14.7	10.1	14
		LOS	C	B	A	A	A	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	23.2	0	7.8	4.3	11.4	24	0	28.3	8.4	20.6
		LOS	C	A	A	A	B	C	A	C	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	16.8	9.4	5.4	9.9	0	20	7	8.6	9.6
		LOS	A	B	A	A	A	A	C	A	A	A
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	13.5	22.9	6.3	8.7	9.3	18.5	24.1	8.3	12.1	12
		LOS	B	C	A	A	A	B	C	A	B	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	30.6	30.6	7.4	7.1	12.8	28.4	24.7	7.1	8.8	12.5
		LOS	C	C	A	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	26.7	32.5	6.7	10.4	16.1	36.7	32.4	13.6	12.8	19.3
		LOS	C	C	A	B	B	D	C	B	B	B

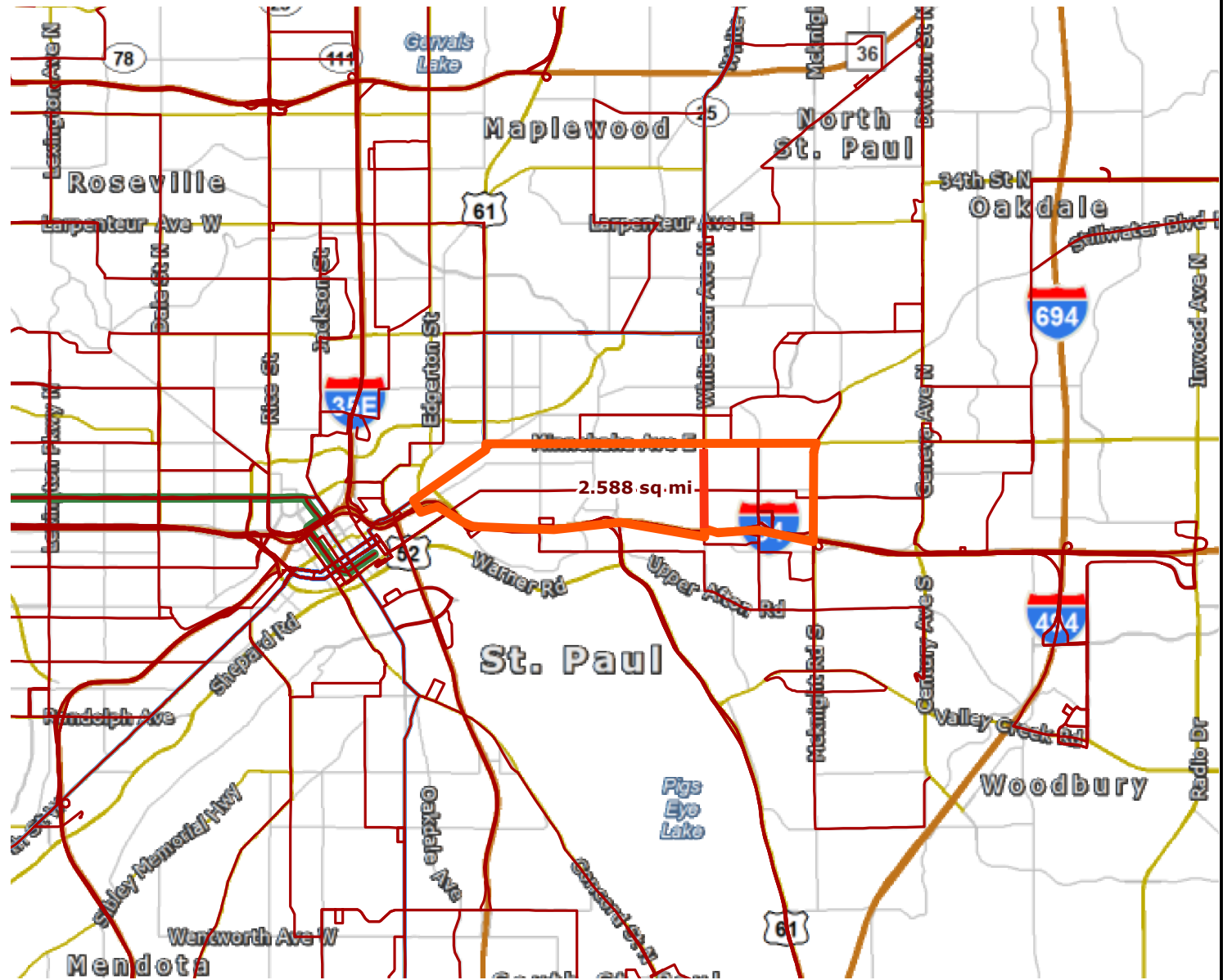
1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Table A-29. 2036 Scenario 3e Conditions

Node	Intersection	MOE	Peak Hour									
			AM Peak Hour					PM Peak Hour				
			EB	WB	NB	SB	Int.	EB	WB	NB	SB	Int.
101	White Bear Avenue & Suburban Avenue	Delays (s/v)	23.6	16.7	5.8	3.2	8.9	23.8	14.2	14	11.2	14.6
		LOS	C	B	A	A	A	C	B	B	B	B
102	White Bear Avenue & I-94 South Ramps	Delays (s/v)	22.8	0	8.5	3.9	11.1	23.9	0	28.6	7.6	20.1
		LOS	C	A	A	A	B	C	A	C	A	C
103	White Bear Avenue & I-94 North Ramps	Delays (s/v)	0	17.2	9.8	6	10.3	0	19.9	7.9	9.3	10.3
		LOS	A	B	A	A	B	A	B	A	A	B
104	White Bear Avenue & Old Hudson Road	Delays (s/v)	15.8	23	6.6	8.1	9.6	19	26.2	9.3	13.1	13
		LOS	B	C	A	A	A	B	C	A	B	B
105	White Bear Avenue & 3rd Street	Delays (s/v)	31.3	29.6	9.1	7.9	13.7	30.1	25.8	7.6	9.9	13.5
		LOS	C	C	A	A	B	C	C	A	A	B
106	White Bear Avenue & Minnehaha Avenue	Delays (s/v)	25.2	33.8	7.8	10.6	16.5	39.8	31.7	15.4	14.7	21
		LOS	C	C	A	B	B	D	C	B	B	C

1. AM Peak and PM Peak delays computed using SimTraffic averaged over 5 random seeds

Time Period	Intersection	MOE	Peak Hour Existing Condition (Year 2014)	White Bear Avenue & Old Hudson Road Emissions													
				No Build - Same Timing and Geometry as Existing	S1 - Adjusted Signal Timing	S1a - Adjusted Signal Timing and Added Phase at Old Hudson	S2 - Three Lane Section from Suburban to Minnehaha	S2a - Three Lane Section North of Old Hudson	S2b - S2a Plus Added Right Turn Lanes at 3rd	S2c - Three Lane Section North of 3rd	S2d - S2a Plus Added Right Turn Lanes at 3rd and Minnehaha	S3 - Added Left Turn Lanes at Old Hudson	S3a - S3 Plus Improved East/West Geometry at Old Hudson	S3b - S3a Plus Added Left Turn Phases at Old Hudson	S3c - Added Right and Left Turn Lanes at Old Hudson and 3rd. Added SBR at N Ramp	S3d - Exclusive SBL Turn Lane at Suburban	S3e - S3b Plus Added Right and Left Turn Lanes at Old Hudson and 3rd. Added SBR at N Ramp
				Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall	Overall
2016 AM	White Bear Avenue & Old Hudson Road	HC Emissions (g)	91	99	90	93	88	45	47	91	48	94	92	96	80	91	89
		CO Emissions (g)	2589	2770	2538	2698	2369	1455	1514	2575	1595	2635	2565	2658	2297	2638	2462
		Nox Emissions (g)	301	327	298	310	291	156	160	299	166	310	301	312	267	304	290
2016 PM	White Bear Avenue & Old Hudson Road	HC Emissions (g)	138	144	145	146	117	66	63	130	68	133	135	140	135	132	138
		CO Emissions (g)	3899	4076	3938	3951	3679	2064	2046	3576	2174	3709	3737	3772	3631	3698	3695
		Nox Emissions (g)	445	459	464	469	367	226	218	427	232	436	437	448	439	436	440
2036 AM	White Bear Avenue & Old Hudson Road	HC Emissions (g)	91	93	103	113	104	54	49	91	50	99	98	110	99	99	110
		CO Emissions (g)	2589	2731	2890	3161	2760	1672	1591	2664	1665	2816	2829	3022	2726	2812	2925
		Nox Emissions (g)	301	317	339	372	340	178	169	308	174	328	328	357	325	330	350
2036 PM	White Bear Avenue & Old Hudson Road	HC Emissions (g)	138	166	146	167	189	75	67	147	75	135	149	145	133	144	134
		CO Emissions (g)	3899	4818	4293	4932	5174	2344	2243	4059	2390	3949	4091	4083	3751	4131	3723
		Nox Emissions (g)	445	510	472	529	463	240	232	477	256	454	487	476	438	483	444



Results

Transit with a Direct Connection to project:
63 80 294 350 351 353 355 375

**indicates Planned Alignments*

- ▬ Project
- ▬ Transit Routes
- ▬ Transitway
- ▬ Planned Alignments
- Project Area
- ▬ Green Line
- ▬ Arterial BRT



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LandscapeRSA3



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