Application

10353 - 2018 Roadway Expansion

10873 - Interstate Highway 35E/County Road J Interchange and Corridor Improvements

Regional Solicitation - Roadways Including Multimodal Elements

Status:	Submitted
Submitted Date:	07/13/2018 10:53 AM

Primary Contact

Name:*		Joseph	Frank	Lux
	Salutation	First Name	Middle Name	Last Name
Title:	Senior Planner			
Department:	Ramsey County Public Works			
Email:	joseph.lux@co.ramsey.mn.us			
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	I-35E/County Road J Interchange
Primary County where the Project is Located	Anoka, Ramsey
Cities or Townships where the Project is Located:	Lino Lakes, North Oaks, White Bear Township
Jurisdictional Agency (If Different than the Applicant):	Anoka and Ramsey Counties

Brief Project Description (Include location, road name/functional class, type of improvement, etc.)	The project would reconstruct the I-35E/County Road J interchange, a ramp to northbound I-35E would be added, as well as a ramp from southbound I-35E. Roundabout intersections would be built at the ramp terminals. The east ramp roundabout would also control the Otter Lake Road/County Road J intersection and the west would control the ramp terminals as well as 20th Ave.S. The project would also rebuild an approximately 0.3 mile long segment of County Road J and replace the all-way stop controlled intersection at Centerville Road with a roundabout. Bike and pedestrian facilities are not present on the existing bridge or road corridor and will be added. The bridge also has a vertical curve that inhibits sight distance. The road segment to be reconstructed in this project experiences severe congestion in the AM and PM peak periods, with the Centerville Road intersection and west ramp most severely affected in the AM peak. The east ramp experiences significant backups in the PM peak, with queues regularly extending onto northbound I-35E. MnDOT has recently expressed concerns bout this backup and has provided a photo from the Regional Traffic Management Center, which is attached. An Intersection Control Evaluation was performed as part of an adjacent development proposal and is attached.
(Limit 2,800 characters; approximately 400 words)	
TIP Description Guidance (will be used in TIP if the project is selected for funding)	I-35E/County Road J Interchange
Project Length (Miles)	0.45
to the nearest one-tenth of a mile	

Project Funding

Are you applying for competitive funds from another source(s) to implement this project?	No
If yes, please identify the source(s)	
Federal Amount	$7,000,000.00

Match Amount $2,818,294.00

Minimum of 20% of project total

Project Total $9,818,294.00

Match Percentage 28.7%

Minimum of 20%
Compute the match percentage by dividing the match amount by the project total

Source of Match Funds CSAH and local funds

A minimum of 20% of the total project cost must come from non-federal sources; additional match funds over the 20% minimum can come from other federal sources

Preferred Program Year

Select one: 2023

Select 2020 or 2021 for TDM projects only. For all other applications, select 2022 or 2023.

Additional Program Years: 2021

Select all years that are feasible if funding in an earlier year becomes available.

Project Information: Roadway Projects

County, City, or Lead Agency Ramsey County Public Works

Functional Class of Road Class A Minor Arterial- Expander

Road System County Road, CSAH, MSAS, Interstate Highway

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

Road/Route No. 6081

i.e., 53 for CSAH 53

Name of Road County Road J; also Centerville Road (Anoka CSAH 21; Ramsey CSAH 59), Otter Lake Road (Anoka CSAH 84; Ramsey CSAH 60), 20th Ave. S. (Anoka CSAH 54)

Example; 1st ST., MAIN AVE

Zip Code where Majority of Work is Being Performed 55110

(Approximate) Begin Construction Date 05/17/2021

(Approximate) End Construction Date 11/26/2021

TERMINI:(Termini listed must be within 0.3 miles of any work)

From:
(Intersection or Address) Centerville Road

To:
(Intersection or Address) Otter Lake Road

DO NOT INCLUDE LEGAL DESCRIPTION

Or At

Primary Types of Work *Examples: GRADE, AGG BASE, BIT BASE, BIT SURF, SIDEWALK, CURB AND GUTTER,STORM SEWER, SIGNALS, LIGHTING, GUARDRAIL, BIKE PATH, PED RAMPS, BRIDGE, PARK AND RIDE, ETC.*	Grading, Aggregate Base, Bituminous Surfacing, Bridge Construction, Ramp Construction, Roundabout Construction, Multi-use Trail

BRIDGE/CULVERT PROJECTS (IF APPLICABLE)

Old Bridge/Culvert No.:	62836
New Bridge/Culvert No.:	TBD
Structure is Over/Under (Bridge or culvert name):	I-35E

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 2040 Transportation Policy Plan (2015), the 2040 Regional Parks Policy Plan (2015), and the 2040 Water Resources Policy Plan (2015).

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

2.The project must be consistent with the 2040 Transportation Policy Plan. Reference the 2040 Transportation Plan goals, objectives, and strategies that relate to the project.

List the goals, objectives, strategies, and associated pages:

Goal: Transportation System Stewardship (2.6)

Objectives: Maintain infrastructure in a state of good repair.

Strategies: A1, A2

Goal: Safety and Security (2.7)

Objectives: Reduce crashes, improve safety and security for all modes of passenger travel and freight transport.

Strategies: B1, B3, B4, B5, B6

Goal: Access to destinations (2.8)

Objectives: Increase availability of multi-modal travel in congested corridor.

Strategies: C1, C2, C16

Goal: Healthy Environment (2.12)

Objectives: Increase availability and attractiveness of other transportation modes.

Strategies: E3

Goal: Leveraging transportation investments to guide land use (2.14)

Objectives: Encourage local land use design that integrates highways, streets, transit, walking and bicycling.

Strategies: F3, F6, F7,

3.The project or the transportation problem/need that the project addresses must be in a local planning or programming document. 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 the Minnesota Department of Transportation 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:

City of Lino Lakes Draft 2040 Comprehensive Plan (3-13, 3-32, 6-4. 12-5, 12-6)

4.The project must exclude costs for studies, preliminary engineering, design, or construction engineering. Right-of-way costs are only eligible as part of transit stations/stops, transit terminals, park-and-ride facilities, or pool-and-ride lots. Noise barriers, drainage projects, fences, landscaping, etc., are not eligible for funding as a standalone project, but can be included as part of the larger submitted project, which is otherwise eligible.

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

5.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

6.Applicants must not submit an application for the same project elements in more than one funding application category.

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

7.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. Funding amounts by application category are listed below.
***Roadway Expansion:** $1,000,000 to $7,000,000*
***Roadway Reconstruction/ Modernization Modernization and Spot Mobility:** $1,000,000 to $7,000,000*
***Traffic Management Technologies (Roadway System Management):** $250,000 to $7,000,000*
***Bridges Rehabilitation/ Replacement:** $1,000,000 to $7,000,000*

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

8.The project must comply with the Americans with Disabilities Act (ADA).

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

9.In order for a selected project to be included in the Transportation Improvement Program (TIP) and approved by USDOT, the public agency sponsor must either have, or be substantially working towards, completing a current Americans with Disabilities Act (ADA) self-evaluation or transition plan that covers the public right of way/transportation, as required under Title II of the ADA.

The applicant is a public agency that employs 50 or more people and has an adopted ADA transition plan that covers the public right of way/transportation.

Date plan adopted by governing body

The applicant is a public agency that employs 50 or more people and is currently working towards completing an ADA transition plan that covers the public rights of way/transportation. Yes

Date process started

Date of anticipated plan completion/adoption

The applicant is a public agency that employs fewer than 50 people and has a completed ADA self-evaluation that covers the public rights of way/transportation.

Date self-evaluation completed

The applicant is a public agency that employs fewer than 50 people and is working towards completing an ADA self-evaluation that covers the public rights of way/transportation.

Date process started

Date of anticipated plan completion/adoption

(TDM Applicants Only) The applicant is not a public agency subject to the self-evaluation requirements in Title II of the ADA.

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

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

11.The owner/operator of the facility must operate and maintain the project year-round for the useful life of the improvement, per FHWA direction established 8/27/2008 and updated 6/27/2017.

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

12.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

13.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

14.The project applicant must send written notification regarding the proposed project to all affected state and local units of government prior to submitting the application.

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

Roadways Including Multimodal Elements

1.All roadway and bridge projects 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.

Roadway Expansion and Reconstruction/Modernization and Spot Mobility projects only:

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

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

Bridge Rehabilitation/Replacement projects only:

3.Projects requiring a grade-separated crossing of a principal arterial freeway must be limited to the federal share of those project costs identified as local (non-MnDOT) cost responsibility using MnDOTs 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.

4.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 application categories. Rail-only bridges are ineligible for funding.

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

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

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

6. The bridge must have a sufficiency rating less than 80 for rehabilitation projects and less than 50 for replacement projects. Additionally, the bridge must also be classified as structurally deficient or functionally obsolete.

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

Roadway Expansion, Reconstruction/Modernization and Spot Mobility, and Bridge Rehabilitation/Replacement projects only:

7. All roadway projects that involve the construction of a new/expanded interchange or new interchange ramps must have approval by the Metropolitan Council/MnDOT Interchange Planning Review Committee prior to application submittal. Please contact Michael Corbett at MnDOT (Michael.J.Corbett@state.mn.us or 651-234-7793) to determine whether your project needs to go through this process.

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

Requirements - Roadways Including Multimodal Elements

Specific Roadway Elements

CONSTRUCTION PROJECT ELEMENTS/COST ESTIMATES	Cost
Mobilization (approx. 5% of total cost)	$360,000.00
Removals (approx. 5% of total cost)	$346,820.00
Roadway (grading, borrow, etc.)	$1,080,460.00
Roadway (aggregates and paving)	$1,354,189.00
Subgrade Correction (muck)	$0.00
Storm Sewer	$351,445.00
Ponds	$0.00
Concrete Items (curb & gutter, sidewalks, median barriers)	$479,050.00
Traffic Control	$250,000.00
Striping	$54,158.00
Signing	$75,000.00
Lighting	$400,000.00
Turf - Erosion & Landscaping	$52,406.00
Bridge	$3,758,000.00
Retaining Walls	$0.00
Noise Wall (not calculated in cost effectiveness measure)	$0.00
Traffic Signals	$0.00
Wetland Mitigation	$310,710.00

Other Natural and Cultural Resource Protection	$0.00
RR Crossing	$0.00
Roadway Contingencies	$892,572.00
Other Roadway Elements	$7,374.00
Totals	**$9,772,184.00**

Specific Bicycle and Pedestrian Elements

CONSTRUCTION PROJECT ELEMENTS/COST ESTIMATES	Cost
Path/Trail Construction	$0.00
Sidewalk Construction	$46,110.00
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	**$46,110.00**

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
Contingencies	$0.00
Right-of-Way	$0.00
Other Transit and TDM Elements	$0.00
Totals	**$0.00**

Transit Operating Costs

Number of Platform hours	0
Cost Per Platform hour (full loaded Cost)	$0.00
Subtotal	$0.00
Other Costs - Administration, Overhead,etc.	$0.00

Totals

Total Cost	$9,818,294.00
Construction Cost Total	$9,818,294.00
Transit Operating Cost Total	$0.00

Congestion on adjacent Parallel Routes:

Adjacent Parallel Corridor	CSAH 96
Adjacent Parallel Corridor Start and End Points:	
Start Point:	Centerville Road
End Point:	Otter Lake Road
Free-Flow Travel Speed:	45
The Free-Flow Travel Speed is black number.	
Peak Hour Travel Speed:	38
The Peak Hour Travel Speed is red number.	
Percentage Decrease in Travel Speed in Peak Hour Compared to Free-Flow:	15.56%
Upload Level of Congestion Map:	1530021024593_Congestion Map.pdf

Principal Arterial Intersection Conversion Study:

Proposed interchange or at-grade project that reduces delay at a High Priority Intersection:

(80 Points)

Proposed at-grade project that reduces delay at a Medium Priority Intersection:

(60 Points)

Proposed at-grade project that reduces delay at a Low Priority Intersection:

(50 Points)

Proposed interchange project that reduces delay at a Medium Priority Intersection:

(40 Points)

Proposed interchange project that reduces delay at a Low Priority Intersection:

(0 Points)

Not listed as a priority in the study: Yes

(0 Points)

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

Existing Employment within 1 Mile: 5001

Existing Manufacturing/Distribution-Related Employment within 1 Mile: 1006

Existing Post-Secondary Students within 1 Mile: 0

Upload Map 1529088517031_Regional Economy Map.pdf

Please upload attachment in PDF form.

Measure C: Current Heavy Commercial Traffic

RESPONSE: Select one for your project, based on the Regional Truck Corridor Study:

Along Tier 1:

Along Tier 2:

Along Tier 3:

The project provides a direct and immediate connection (i.e., intersects) with either a Tier 1, Tier 2, or Tier 3 corridor: Yes

None of the tiers:

Measure A: Current Daily Person Throughput

Location between I-35E and Otter Lake Road

Current AADT Volume 5600

Existing Transit Routes on the Project 275

For New Roadways only, list transit routes that will likely be diverted to the new proposed roadway (if applicable).

Upload Transit Connections Map 1530021618968_Transit Map.pdf

Please upload attachment in PDF form.

Response: Current Daily Person Throughput

Average Annual Daily Transit Ridership 0

Current Daily Person Throughput	7280.0

Measure B: 2040 Forecast ADT

Use Metropolitan Council model to determine forecast (2040) ADT volume	Yes
If checked, METC Staff will provide Forecast (2040) ADT volume	7500

OR

Identify the approved county or city travel demand model to determine forecast (2040) ADT volume	
Forecast (2040) ADT volume	

Measure A: Connection to disadvantaged populations and projects benefits, impacts, and mitigation

Select one:

Project located in Area of Concentrated Poverty with 50% or more of residents are people of color (ACP50):	
(up to 100% of maximum score)	
Project located in Area of Concentrated Poverty:	
(up to 80% of maximum score)	
Projects census tracts are above the regional average for population in poverty or population of color:	
(up to 60% of maximum score)	
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:	Yes
(up to 40% of maximum score)	

1.(0 to 3 points) A successful project is one that has actively engaged low-income populations, people of color, children, persons with disabilities, and the elderly during the project's development with the intent to limit negative impacts on them and, at the same time, provide the most benefits.
Describe how the project has encouraged or will engage the full cross-section of community in decision-making. Identify the communities to be engaged and where in the project development process engagement has occurred or will occur. Elements of quality engagement include: outreach to specific communities and populations that are likely to be directly impacted by the project; techniques to reach out to populations traditionally not involved in the community engagement related to transportation projects; residents or users identifying potential positive and negative elements of the project; and surveys, study recommendations, or plans that provide feedback from populations that may be impacted by the proposed project. If relevant, describe how NEPA or Title VI regulations will guide engagement activities.

Response:

While the project is located in a census tract that is below the regional average for populations in poverty or of color, it is adjacent to industrially-zoned properties that provide employment to those groups. The addition of a ramp from southbound I-35E and to northbound I-35E will provide connections needed to expand employment in this area and provide connections to the area.

(Limit 1,400 characters; approximately 200 words)

2.(0 to 7 points) Describe the projects benefits to low-income populations, people of color, children, people with disabilities, and the elderly. Benefits could relate to safety; public health; access to destinations; travel time; gap closure; leveraging of other beneficial projects and investments; and/or community cohesion. Note that this is not an exhaustive list.

Response:

The project will provide disadvantaged populations access to employment and recreation adjacent to the areas adjacent to the interchange and provide a needed connection to and from areas of disadvantaged populations both north and south of the project area. The additional ramp access would enable additional transit connections that cannot now be served directly.

(Limit 2,800 characters; approximately 400 words)

3.(-3 to 0 points) Describe any negative externalities created by the project along with measures that will be taken to mitigate them. Negative externalities can result in a reduction in points, but mitigation of externalities can offset reductions.
Below is a list of negative impacts. Note that this is not an exhaustive list.
Increased difficulty in street crossing caused by increased roadway width, increased traffic speed, wider turning radii, or other elements that negatively impact pedestrian access.
Increased noise.
Decreased pedestrian access through sidewalk removal / narrowing, placement of barriers along the walking path, increase in auto-oriented curb cuts, etc.
Project elements that are detrimental to location-based air quality by increasing stop/start activity at intersections, creating vehicle idling areas, directing an increased number of vehicles to a particular point, etc.
Increased speed and/or cut-through traffic.
Removed or diminished safe bicycle access.
Inclusion of some other barrier to access to jobs and other destinations.
Displacement of residents and businesses.
Construction/implementation impacts such as dust; noise; reduced access for travelers and to businesses; disruption of utilities; and eliminated street crossings. These tend to be temporary.
Other

Response:

The construction of a new interchange bridge will have short-term, non-peak traffic impacts to I-35E. During bridge construction, the link across I-35E will be closed. The project has the potential to displace one home on Otter Lake Road, but it is expected that this impact can be removed during the design phase.

(Limit 2,800 characters; approximately 400 words)

Upload Map 1529089226140_Socio Economic Map.pdf

Measure B: Affordable Housing

City	Segment Length (For stand-alone projects, enter population from Regional Economy map) within each City/Township	Segment Length/Total Project Length	Score	Housing Score Multiplied by Segment percent
White Bear Township	2218.0	0.25	25.0	6.371
Lino Lakes	4662.0	0.54	60.0	32.137
North Oaks	1824.0	0.21	7.0	1.467

Total Project Length

Total Project Length (as entered in the "Project Information" form) 0.45

Affordable Housing Scoring

Total Project Length (Miles) or Population 8704.0

Total Housing Score 39.975

Affordable Housing Scoring

Measure A: Infrastructure Age

Year of Original Roadway Construction or Most Recent Reconstruction	Segment Length	Calculation	Calculation 2
1935.0	0.45	870.75	1935.0
	0	**871**	**1935**

Average Construction Year

Weighted Year 1935.0

Total Segment Length (Miles)

Total Segment Length 0.45

Measure A: Congestion Reduction/Air Quality

Total Peak Hour Delay Per Vehicle Without The Project (Seconds/Vehicle)	Total Peak Hour Delay Per Vehicle With The Project (Seconds/Vehicle)	Total Peak Hour Delay Per Vehicle Reduced by Project (Seconds/Vehicle)	Volume (Vehicles per hour)	Total Peak Hour Delay Reduced by the Project:	EXPLANATION of methodology used to calculate railroad crossing delay, if applicable.	Synchro or HCM Reports
76.5	8.18	68.32	1236	84443.52		1531340338171_County Road J_Delay Report.pdf

Vehicle Delay Reduced

Total Peak Hour Delay Reduced 84443.52

Measure B:Roadway projects that do not include new roadway segments or railroad grade-separation elements

Total (CO, NOX, and VOC) Peak Hour Emissions without the Project (Kilograms):	Total (CO, NOX, and VOC) Peak Hour Emissions with the Project (Kilograms):	Total (CO, NOX, and VOC) Peak Hour Emissions Reduced by the Project (Kilograms):
0	**0**	**0**

Total

Total Emissions Reduced: 0

Upload Synchro Report

Please upload attachment in PDF form. (Save Form, then click 'Edit' in top right to upload file.)

Measure B: Roadway projects that are constructing new roadway segments, but do not include railroad grade-separation elements (for Roadway Expansion applications only):

Total (CO, NOX, and VOC) Peak Hour Emissions without the Project (Kilograms):	Total (CO, NOX, and VOC) Peak Hour Emissions with the Project (Kilograms):	Total (CO, NOX, and VOC) Peak Hour Emissions Reduced by the Project (Kilograms):
4.38	2.59	1.79
4	**3**	**2**

Total Parallel Roadway

Emissions Reduced on Parallel Roadways	1.79
Upload Synchro Report	1531237053326_County Road J_Synchro Emission Report.pdf

Please upload attachment in PDF form. (Save Form, then click 'Edit' in top right to upload file.)

New Roadway Portion:

Cruise speed in miles per hour with the project:	0
Vehicle miles traveled with the project:	0
Total delay in hours with the project:	0
Total stops in vehicles per hour with the project:	0
Fuel consumption in gallons:	0
Total (CO, NOX, and VOC) Peak Hour Emissions Reduced or Produced on New Roadway (Kilograms):	0
EXPLANATION of methodology and assumptions used:(Limit 1,400 characters; approximately 200 words)	
Total (CO, NOX, and VOC) Peak Hour Emissions Reduced by the Project (Kilograms):	1.79

Measure B:Roadway projects that include railroad grade-separation elements

Cruise speed in miles per hour without the project:	0
Vehicle miles traveled without the project:	0
Total delay in hours without the project:	0
Total stops in vehicles per hour without the project:	0
Cruise speed in miles per hour with the project:	0

Vehicle miles traveled with the project:	0
Total delay in hours with the project:	0
Total stops in vehicles per hour with the project:	0
Fuel consumption in gallons (F1)	0
Fuel consumption in gallons (F2)	0
Fuel consumption in gallons (F3)	0
Total (CO, NOX, and VOC) Peak Hour Emissions Reduced by the Project (Kilograms):	0
EXPLANATION of methodology and assumptions used:(Limit 1,400 characters; approximately 200 words)	

Measure A: Benefit of Crash Reduction

Crash Modification Factor Used:	Conversion of intersection into multi-lane roundabout and conversion of intersection into single-lane roundabout.
(Limit 700 Characters; approximately 100 words)	
Rationale for Crash Modification Selected:	Roundabouts have proven to be safer than traditional stop sign or signal-controlled intersections, and move traffic through an intersection more quickly with less congestion on approaching roads. All intersections included in this project are subject to peak hour congestion but operate efficiently at non-peak times. Roundabout intersection control, rather than signalization will optimize operations.
(Limit 1400 Characters; approximately 200 words)	
Project Benefit ($) from B/C Ratio:	0.09
Worksheet Attachment	1531415141500_benefit-cost-worksheet-aug2015(EastI35E&OtterLakeRoad).pdf
Please upload attachment in PDF form.	

Roadway projects that include railroad grade-separation elements:

Current AADT volume:	0
Average daily trains:	0
Crash Risk Exposure eliminated:	0

Measure A: Multimodal Elements and Existing Connections

Response:

Currently the only accommodation for bikes and pedestrians on this segment of County Road J is an 8' wide shoulder, but this is compromised by turn and bypass lanes and there is no shoulder or usable sidewalk on Bridge No. 62836 over I-35E. At a minimum, the project will add a trail on one side of the road and an sidewalk on the other, and will include 10' wide sidewalks and shoulders on the new bridge. Ramsey County Parks and Anoka County Parks are working to identify a route for an east/west regional trail and this road segment is under consideration. Given the two-mile spacing of interchanges on this segment of I-35E, regardless of whether it is designated as a regional trail corridor, it will be critical to provide bike and pedestrian accomodations.

(Limit 2,800 characters; approximately 400 words)

Transit Projects Not Requiring Construction

If the applicant is completing a transit application that is operations only, check the box and do not complete the remainder of the form. These projects will receive full points for the Risk Assessment.
Park-and-Ride and other transit construction projects require completion of the Risk Assessment below.

Check Here if Your Transit Project Does Not Require Construction

Measure A: Risk Assessment - Construction Projects

1)Layout (30 Percent of Points)

Layout should include proposed geometrics and existing and proposed right-of-way boundaries.

Layout approved by the applicant and all impacted jurisdictions (i.e., cities/counties that the project goes through or agencies that maintain the roadway(s)). A PDF of the layout must be attached along with letters from each jurisdiction to receive points.

100%

Attach Layout

Please upload attachment in PDF form.

Layout completed but not approved by all jurisdictions. A PDF of the layout must be attached to receive points.

Yes

50%

Attach Layout

Please upload attachment in PDF form.

Layout has not been started

0%

Anticipated date or date of completion 10/30/2020

2)Review of Section 106 Historic Resources (20 Percent of Points)

No known historic properties eligible for or listed in the National Register of Historic Places are located in the project area, and project is not located on an identified historic bridge Yes

100%

There are historical/archeological properties present but determination of no historic properties affected is anticipated.

100%

Historic/archeological property impacted; determination of no adverse effect anticipated

80%

Historic/archeological property impacted; determination of adverse effect anticipated

40%

Unsure if there are any historic/archaeological properties in the project area.

0%

Project is located on an identified historic bridge

3)Right-of-Way (30 Percent of Points)

Right-of-way, permanent or temporary easements either not required or all have been acquired

100%

Right-of-way, permanent or temporary easements required, plat, legal descriptions, or official map complete

50%

Right-of-way, permanent or temporary easements required, parcels identified

25%

Right-of-way, permanent or temporary easements required, parcels not all identified Yes

0%

Anticipated date or date of acquisition 11/27/2020

4)Railroad Involvement (20 Percent of Points)

No railroad involvement on project or railroad Right-of-Way agreement is executed (include signature page, if applicable) Yes

100%

Signature Page

Please upload attachment in PDF form.

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

50%

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

0%

Anticipated date or date of executed Agreement

Measure A: Cost Effectiveness

Total Project Cost (entered in Project Cost Form):	$9,818,294.00
Enter Amount of the Noise Walls:	$0.00
Total Project Cost subtract the amount of the noise walls:	$9,818,294.00
Points Awarded in Previous Criteria	
Cost Effectiveness	$0.00

Other Attachments

Regional Traffic Management Center Backup Photo

612 KB

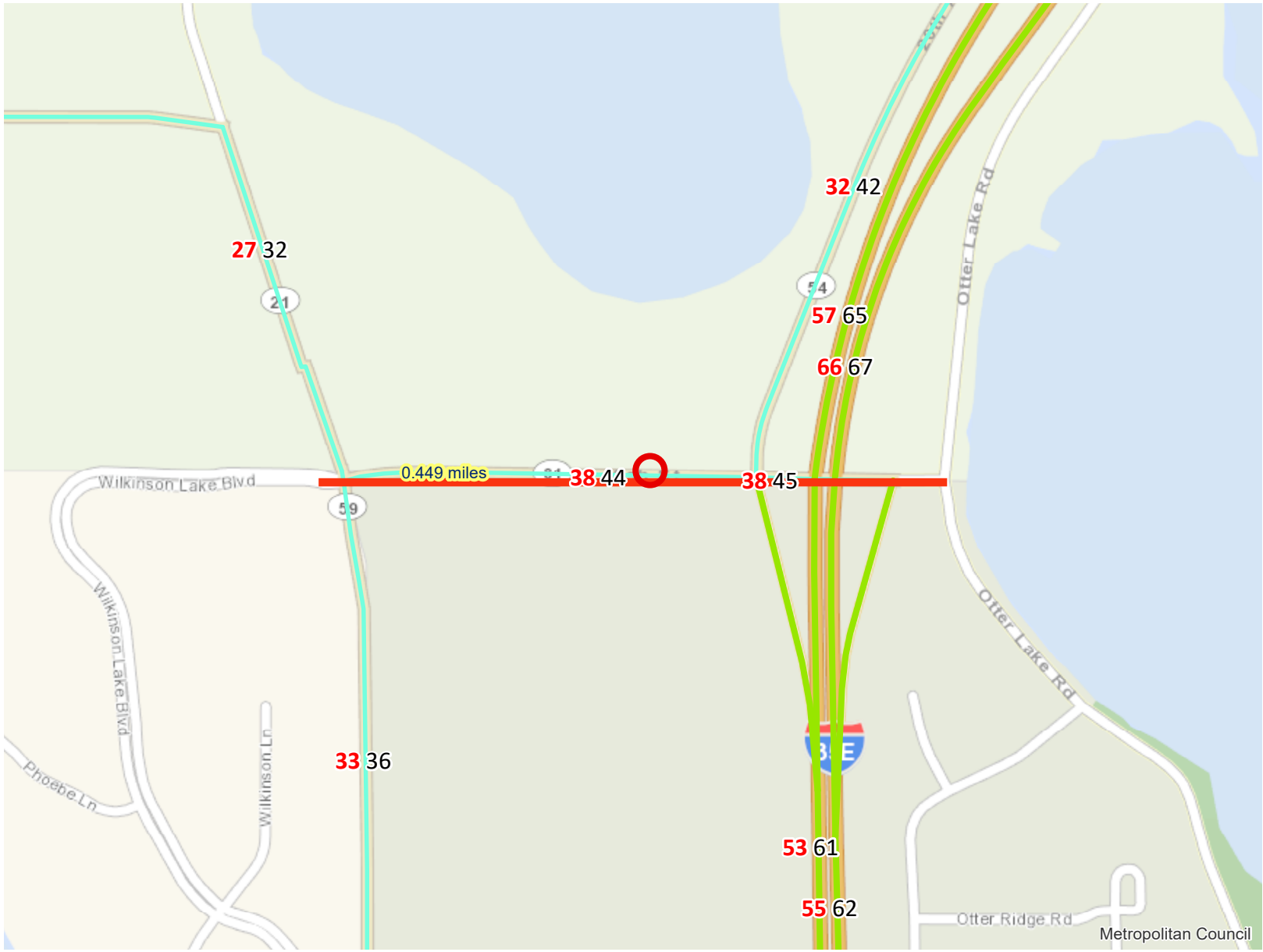
Westbound View, Showing Sight Distance Restriction

102 KB

File Name	Description	File Size
10873_RE_Ramsey_Attach_MnDOTQueuePhoto_PDF.docx.pdf	Two pictures. MnDOT freeway queue and bridge.	170 KB
210-020-008ICE signed signature page.pdf	ICE Signature Page	199 KB
Anoka County Ltr of Support_I35E_@_CRJ (7-10-18).pdf	Anoka County Support Letter	415 KB
benefit-cost-worksheet-aug2015(West I35ERamp).pdf	West I-35E Ramp Crash Reduction Benefit/Cost Spreadsheet	29 KB
benefit-cost-worksheet-aug2015JCenterville.pdf	Crash Reduction Benefit/Cost Worksheet- Centerville Road	29 KB
County Road J Estimate.pdf	Engineer's Estimate	213 KB
ICE Centerville Rd at Ash St Full Appendix.pdf	ICE Report Appendices	1.1 MB
ICE Report - Centerville Rd at CR J 091817.pdf	Intersection Control Evaluation	4.3 MB
Layout County Road J.pdf	Concept Layout	2.0 MB
Lino Lakes Support Resolution.pdf	City of Lino Lakes Resolution of Support	477 KB
MnDOT Support ltr Ramsey Co- I-35E at CR J 2018.pdf	MnDOT Letter of Support	468 KB
North Oaks Support Letter.pdf	City of North Oaks Letter of Support	25 KB

Level of Congestion

Roadway Expansion Project: I-35E/County Road J Interchange | Map ID: 1529087837625



Project Points
Project
Principal Arterials
A Minor Arterials
Principal Arterials Planned
A Minor Arterials Planned

0 0.05 0.1 0.2 0.3 0.4 Miles

Created: 6/15/2018
LandscapeRSA1

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

METROPOLITAN COUNCIL

Regional Economy

Roadway Expansion Project: I-35E/County Road J Interchange | Map ID: 1529087837625

Results

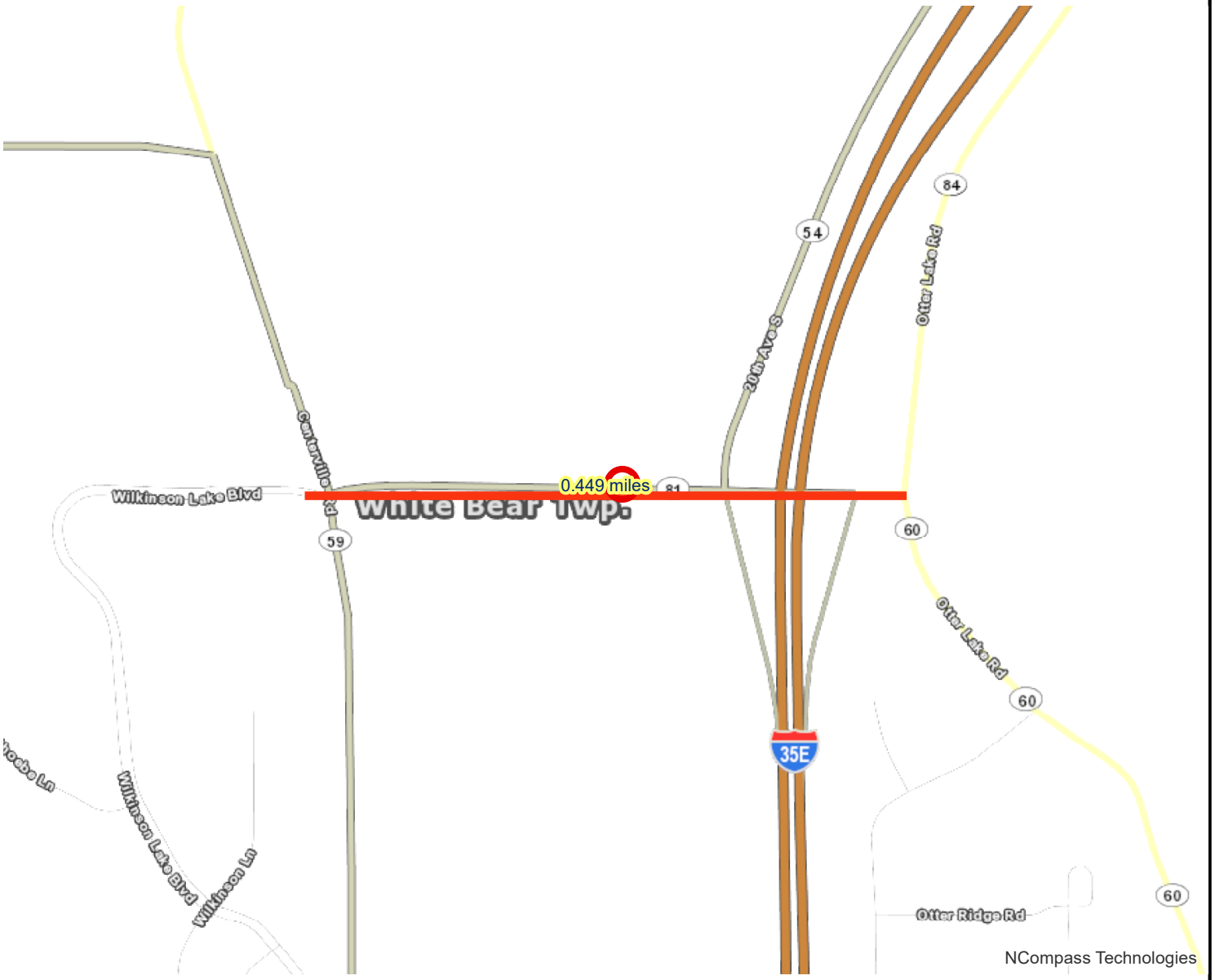
WITHIN ONE MI of project:
Postsecondary Students: 0

Totals by City:

Lino Lakes
Population: 4662
Employment: 959
Mfg and Dist Employment: 494

North Oaks
Population: 1824
Employment: 399
Mfg and Dist Employment: 6

White Bear Twp.
Population: 2218
Employment: 506
Mfg and Dist Employment: 350



Project Points
Project
Manfacturing/Distribution Centers
Job Concentration Centers

0 0.05 0.1 0.2 0.3 0.4 Miles

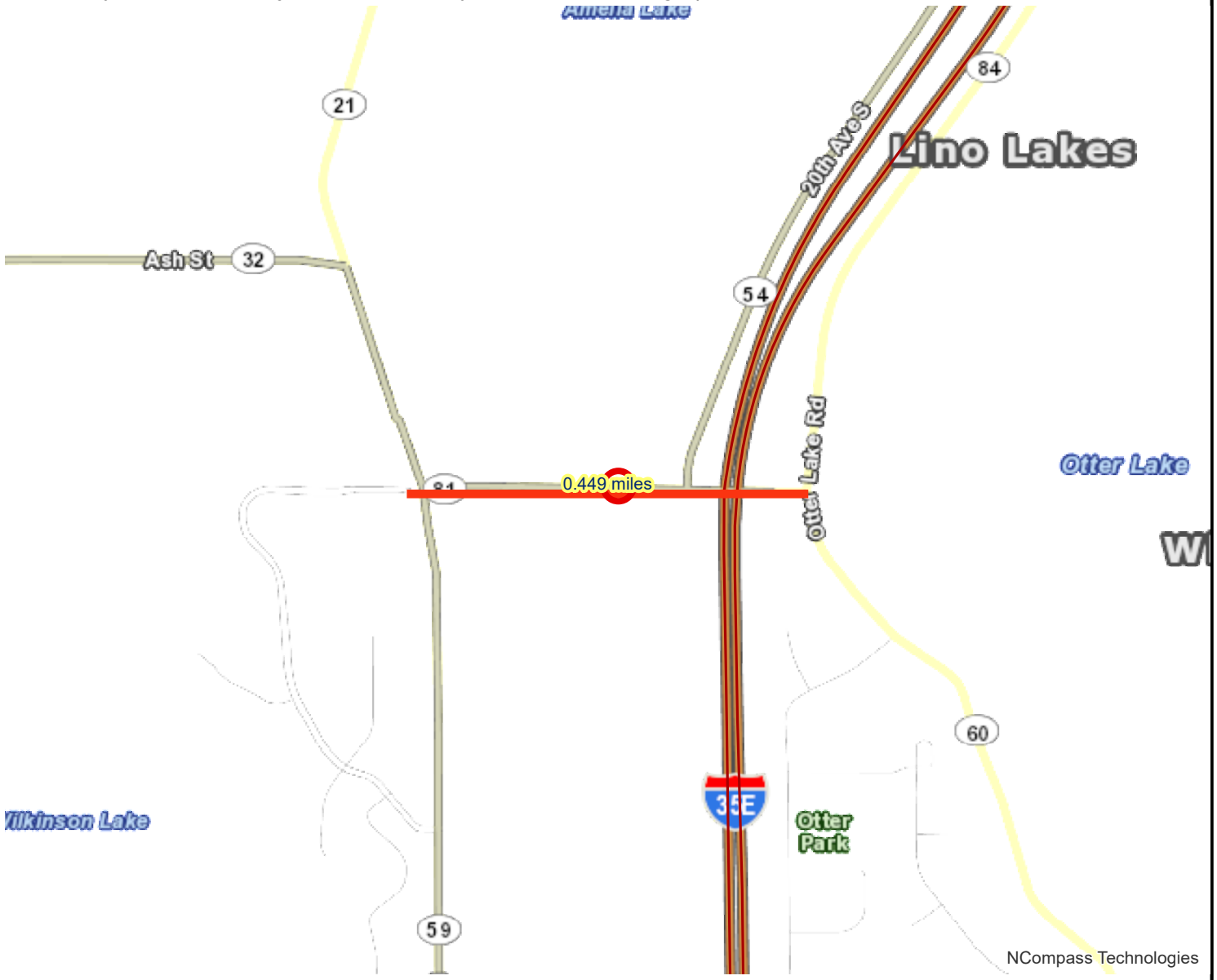
Created: 6/15/2018
LandscapeRSA5

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

METROPOLITAN COUNCIL

Transit Connections

Roadway Expansion Project: I-35E/County Road J Interchange | Map ID: 1529087837625



Results

Transit with a Direct Connection to project:
275

**indicates Planned Alignments*

Project Points
Active Stop
Project
Transit Routes

0 0.1 0.2 0.4 0.6 0.8 Miles

Created: 6/15/2018
LandscapeRSA3

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

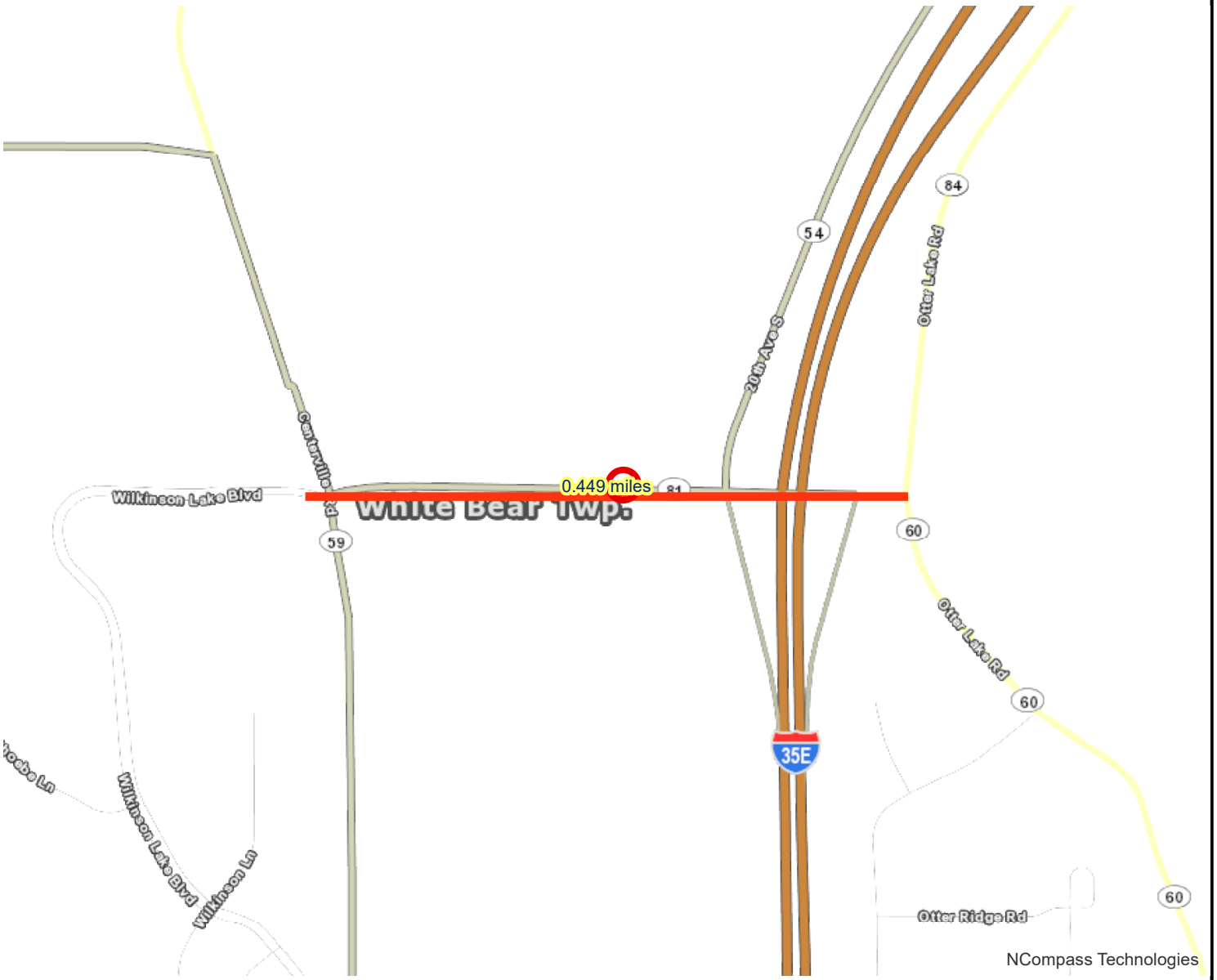
METROPOLITAN COUNCIL

Socio-Economic Conditions

Roadway Expansion Project: I-35E/County Road J Interchange | Map ID: 1529087837625

Results

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:
(0 to 12 Points)



Project Points

Project

Area of Concentrated Povertry > 50% residents of color

Area of Concentrated Poverty

Above reg'l avg conc of race/poverty

0 0.05 0.1 0.2 0.3 0.4 Miles

Created: 6/15/2018
LandscapeRSA2

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

METROPOLITAN COUNCIL

Intersection	
Intersection Delay, s/veh	76.5
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	3	1	1	0	197	7	245	0	6	118	23
Future Vol, veh/h	0	3	1	1	0	197	7	245	0	6	118	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	1	1	0	214	8	266	0	7	128	25
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	11.7	15.4	12
HCM LOS	B	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	5%	0%	60%	97%	0%	60%
Vol Thru, %	95%	0%	20%	3%	0%	39%
Vol Right, %	0%	100%	20%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	124	23	5	204	245	635
LT Vol	6	0	3	197	0	378
Through Vol	118	0	1	7	0	250
RT Vol	0	23	1	0	245	7
Lane Flow Rate	135	25	5	222	266	690
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.259	0.043	0.012	0.444	0.446	1.218
Departure Headway (Hd)	7.249	6.503	8.549	7.753	6.544	6.352
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	499	554	421	468	554	580
Service Time	4.949	4.203	6.549	5.453	4.244	4.36
HCM Lane V/C Ratio	0.271	0.045	0.012	0.474	0.48	1.19
HCM Control Delay	12.5	9.5	11.7	16.5	14.4	135.2
HCM Lane LOS	B	A	B	C	B	F
HCM 95th-tile Q	1	0.1	0	2.2	2.3	25.5

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	378	250	7
Future Vol, veh/h	0	378	250	7
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	411	272	8
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	135.2
HCM LOS	F

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	12	72	273	159	400	41	0	0	0	12	36	91
Future Vol, veh/h	12	72	273	159	400	41	0	0	0	12	36	91
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	78	297	173	435	45	0	0	0	13	39	99

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	479	0	0	375	0	0	1056	1204	457
Stage 1	-	-	-	-	-	-	803	803	-
Stage 2	-	-	-	-	-	-	253	401	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1083	-	-	1183	-	-	250	184	604
Stage 1	-	-	-	-	-	-	441	396	-
Stage 2	-	-	-	-	-	-	789	601	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1083	-	-	1183	-	-	197	0	604
Mov Cap-2 Maneuver	-	-	-	-	-	-	197	0	-
Stage 1	-	-	-	-	-	-	352	0	-
Stage 2	-	-	-	-	-	-	776	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	2.3	15.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1083	-	-	1183	-	-	487
HCM Lane V/C Ratio	0.012	-	-	0.146	-	-	0.31
HCM Control Delay (s)	8.4	0	-	8.6	0	-	15.7
HCM Lane LOS	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0	-	-	0.5	-	-	1.3

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: SD
Agency/Co.: WSB
Date Performed: 1/24/2017
Analysis Time Period: AM
Intersection: Centerville and Ash St
Jurisdiction: Lino Lakes
Units: U. S. Customary
Analysis Year: 2018
Project ID:
East/West Street: Ash St
North/South Street: Centerville Rd

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	3	15	4	197	13	250	7	119	23	392	252	7
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left		Right	BP	Left		Right	BP	Left		Right	BP
Lane Assn.	LTR				LT		R		LT		R		L		TR	
RT Bypass	None				None				None				None			
PHF	0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92	
%HV	3	3	3		3	3	3		3	3	3		3	3	3	
NumPeds	0				0				0				0			
U-Turn PHF	0.92				0.92				0.92				0.92			
U-Turn %HV	3				3				3				3			
Flow Rate	3	17	4		221	15	280		8	133	26		439	282	8	
No. Lanes	0	1	0		0	1	1		0	1	1		1	1	0	
Cnfl. Lanes	1				1				1				1			

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound			Westbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Northbound			Southbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Eastbound			Westbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858
	Northbound			Southbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	942	144	459	244
Exit. Flow	481	30	416	507

Capacity and Level of Service

	Eastbound	Westbound	Northbound	Southbound

	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		25		235	280		141	26		439	290	
Entry Cap.		441		978	978		714	714		886	886	
Volume (vph)		24		228	272		137	25		426	282	
Cap. (vph)		428		950	950		693	693		860	860	
v/c Ratio		0.06		0.24	0.29		0.20	0.04		0.50	0.33	
Critical Lane		*			*		*			*	*	
Lane Delay		9.2		6.2	6.7		7.5	5.6		10.7	7.8	
Lane LOS		A		A	A		A	A		B	A	
95 % Queue		0.2		0.9	1.2		0.7	0.1		2.8	1.4	
Approach:												
Delay		9.20			6.48			7.17			9.57	
LOS		A			A			A			A	
Intersection Delay		8.18					Intersection LOS			A		

1: Centerville Rd & Ash St

Direction	All
Future Volume (vph)	1237
Total Delay / Veh (s/v)	74
CO Emissions (kg)	3.07
NOx Emissions (kg)	0.60
VOC Emissions (kg)	0.71

2: I-35 Ramp/20th Ave S & Ash St

Direction	All
Future Volume (vph)	1097
Total Delay / Veh (s/v)	5
CO Emissions (kg)	1.01
NOx Emissions (kg)	0.20
VOC Emissions (kg)	0.23

1: Centerville Rd & Ash St

Direction	All
Future Volume (vph)	1281
Total Delay / Veh (s/v)	0
CO Emissions (kg)	1.82
NOx Emissions (kg)	0.35
VOC Emissions (kg)	0.42

2: I-35 Ramp/20th Ave S & Ash St

Direction	All
Future Volume (vph)	1136
Total Delay / Veh (s/v)	0
CO Emissions (kg)	1.26
NOx Emissions (kg)	0.25
VOC Emissions (kg)	0.29

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
		County Road J/East I-35E Ramp and Otter Lake Road			Anoka & Ramsey Co.	1/1/2013	12/31/2015

Description of Proposed Work: Convert East I-35E Ramp and Otter Lake Road intersections into a single-lane roundabout.

			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	6, 90, 99 Other	Total
Study Period: Number of Crashes	Fatal	**F**									
	Personal Injury (PI)	**A**									
		B			1						**1**
		C			1						**1**
	Property Damage	**PD**									
% Change in Crashes *Use Desktop Reference for Crash Reduction Factors	Fatal	**F**									
	PI	**A**									
		B			-48%						
		C			-48%						
	Property Damage	**PD**									
Change in Crashes = No. of crashes **X** % change in crashes	Fatal	**F**									
	PI	**A**									
		B			**-0.48**						**-0.48**
		C			**-0.48**						**-0.48**
	Property Damage	**PD**									

Year (Safety Improvement Construction): **2018**

Project Cost (exclude Right of Way): **$ 11,408,474**

Right of Way Costs (optional):

Traffic Growth Factor: **1.0%**

Capital Recovery

1. **Discount Rate**: **2%**
2. **Project Service Life (n)**: **30**

Type of Crash	Study Period: Change in Crashes	Annual Change in Crashes	Cost per Crash	Annual Benefit
F			**$ 1,140,000**	
A			**$ 570,000**	
B	**-0.48**	**-0.16**	**$ 170,000**	**$ 27,225**
C	**-0.48**	**-0.16**	**$ 83,000**	**$ 13,292**
PD			**$ 7,600**	
Total				**$ 40,517**

B/C= 0.09

Using present worth values,

B= $ 1,057,533

C= $ 11,408,474

See "Calculations" sheet for amortization.

Office of Traffic, Safety and Technology **August 2015**


C046 - #46 - I-35E SB @ Co Rd J - 6/20/2018 5:14:22.187 PM


JCT
54
SOUT
35

INTERSECTION CONTROL EVALUATION

FOR

CENTERVILLE RD (CSAH 21/CSAH 59)
AT
ASH ST (CR J)/WILKINSON LAKE BLVD

S.A.P. NO. 210-020-008
S.A.P. NO. 210-020-009
CITY PROJECT NO. TBD
WSB PROJECT NO. 2988-080

CITY OF LINO LAKES AND NORTH OAKS,
TOWN OF WHITE BEAR
ANOKA AND RAMSEY COUNTIES, MN

Funding Category: ..... Municipal and County State Aid, Local
Estimated Letting Date: ..... TBD
Work Identification: ..... Intersection Improvements

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

Charles Rickart, P.E., PTOE — 26082 Reg. No. — DATE: 09/18/2017

REVIEWED: Lino Lakes City Engineer — 43338 Reg. No. — DATE: 11/29/17

REVIEWED: Mike Kuno — North Oaks City Engineer — 45195 Reg. No. — DATE: 1/30/18

REVIEWED: Anoka County Engineer — 20235 Reg. No. — DATE: 4/27/18

REVIEWED: Ramsey County Engineer — 42030 Reg. No. — DATE: 4/30/18

APPROVED: For MnDOT Metro-Asst. Division Engineer – State Aid — DATE: 5/4/18

Anoka County
TRANSPORTATION DIVISION
Highway

Douglas W. Fischer, PE
County Engineer

July 10, 2018

Mr. Ted Schoenecker, P.E.
Ramsey County Public Works Director/Engineer
Public Works Facility
1425 Paul Kirkwood Driver
Arden Hills, MN 55112

RE: Support for I-35E/County Road J Interchange Improvements

Dear Mr. Schoenecker:

Anoka County supports the advancement of the I-35E improvements at the County Road J interchange in the City of Lino Lakes. The County understands that Ramsey County is applying for federal funding through the 2018 Metropolitan Council's Regional Solicitation program to improve safety, mobility, and reduce traffic congestion at this key interchange.

The County recognizes that the impact of these interchange improvements are regionally significant. The I-35E/County Road J interchange is a critical link for commuters with several county and city roadways converging along a short stretch of roadway to access I-35E. As such, this interchange sees high levels of traffic and frequent delays; including backups during peak PM hours which backup onto northbound I-35E.

Anoka County believes the proposed I-35E/County Road J interchange improvements will reduce traffic congestion at this interchange and will greatly improve the safety and reliability of the I-35E corridor for the region. This project will also support the population and traffic growth expected in the region while bolstering economic development.

Sincerely,

For Douglas W. Fischer, P.E.
Transportation Division Manager / County Engineer

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
		County Road J/West I-35E Ramp			Anoka & Ramsey Co.	1/1/2013	12/31/2015

Description of Proposed Work: Construct intersection into single-lane roundabout.

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	6, 90, 99 Other	Total
Study Period: Number of Crashes	Fatal	**F**									
	Personal Injury (PI)	**A**									
		B									
		C									
	Property Damage	**PD**	1								**1**
% Change in Crashes *Use Desktop Reference for Crash Reduction Factors	Fatal	**F**									
	PI	**A**									
		B									
		C									
	Property Damage	**PD**	-48%								
Change in Crashes = No. of crashes **X** % change in crashes	Fatal	**F**									
	PI	**A**									
		B									
		C									
	Property Damage	**PD**	**-0.48**								**-0.48**

Year (Safety Improvement Construction): **2018**

		Type of Crash	Study Period: Change in Crashes	Annual Change in Crashes	Cost per Crash	Annual Benefit
Project Cost (exclude Right of Way)	**$ 11,408,474**					
Right of Way Costs (optional)		**F**			**$ 1,140,000**	
Traffic Growth Factor	**1.0%**	**A**			**$ 570,000**	
Capital Recovery		**B**			**$ 170,000**	
1. Discount Rate	**2%**	**C**			**$ 83,000**	
2. Project Service Life (n)	**30**	**PD**	**-0.48**	**-0.16**	**$ 7,600**	**$ 1,217**
		Total				**$ 1,217**

B/C= 0.00

Using present worth values,

B= $ 31,768

C= $ 11,408,474

See "Calculations" sheet for amortization.

Office of Traffic, Safety and Technology **August 2015**

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
		County Road J & Centerville Road			Ramsey Co.	1/1/2013	12/31/2015

Description of Proposed Work: Construct roundabout.

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	6, 90, 99 Other	Total
Study Period: Number of Crashes	Fatal	**F**									
	Personal Injury (PI)	**A**									
		B									
		C	0								
	Property Damage	**PD**	0	0	2						**2**
% Change in Crashes *Use Desktop Reference for Crash Reduction Factors	Fatal	**F**									
	PI	**A**									
		B									
		C									
	Property Damage	**PD**			-6%						
Change in Crashes = No. of crashes **X** % change in crashes	Fatal	**F**									
	PI	**A**									
		B									
		C									
	Property Damage	**PD**			**-0.12**						**-0.12**

Year (Safety Improvement Construction): **2018**

Project Cost (exclude Right of Way): **$ 11,408,474**

Right of Way Costs (optional):

Traffic Growth Factor: **1.0%**

Capital Recovery

1. **Discount Rate:** **2%**
2. **Project Service Life (n):** **30**

Type of Crash	Study Period: Change in Crashes	Annual Change in Crashes	Cost per Crash	Annual Benefit
F			**$ 1,140,000**	
A			**$ 570,000**	
B			**$ 170,000**	
C			**$ 83,000**	
PD	**-0.12**	**-0.04**	**$ 7,600**	**$ 316**
Total				**$ 316**

B/C= 0.00

Using present worth values,

B= $ 8,246

C= $ 11,408,474

See "Calculations" sheet for amortization.

Office of Traffic, Safety and Technology **August 2015**

County Road J

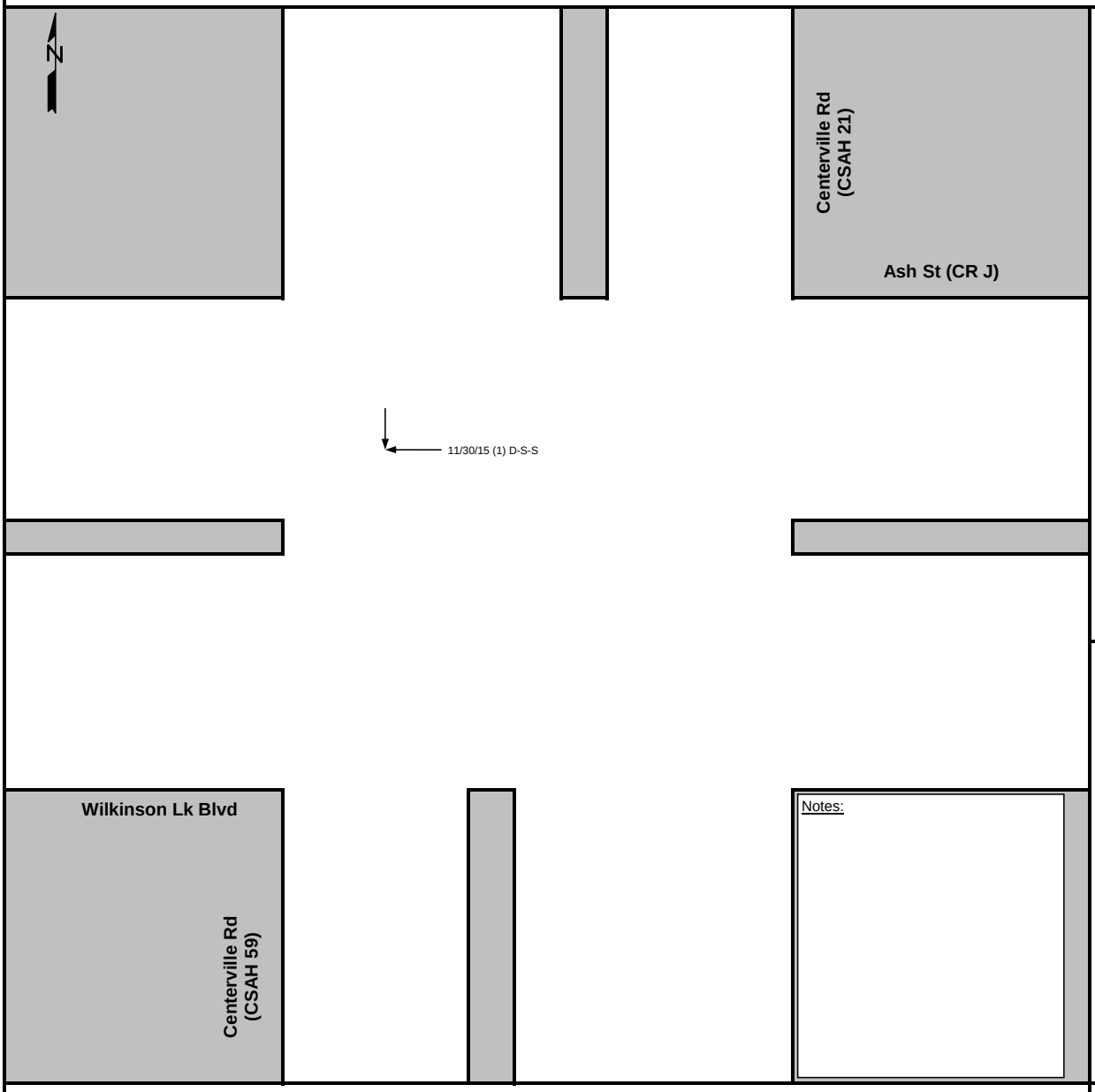
ITEM NO	CONTRACT ITEM	UNIT	TOTAL	UNIT PRICE	TOTAL AMOUNT
2021.501	MOBILIZATION	LUMP SUM	1	$ 360,000.00	$ 360,000.00
2031.502	FIELD OFFICE TYPE D - MODIFIED	EACH	1	$ 15,000.00	$ 15,000.00
2103.502	BUILDING REMOVAL	LUMP SUM	1	$ 50,000.00	$ 50,000.00
2104.504	REMOVE BITUMINOUS PAVEMNET	SQ YD	20500	$ 5.00	$ 102,500.00
2104.503	REMOVE GUARDRAIL-PLATE BEAM	LIN FT	580	$ 11.00	$ 6,380.00
2104.518	REMOVE CONCRETE APPROACH PANEL	SQ YD	200	$ 15.00	$ 3,000.00
2105.507	COMMON EXCAVATION	CU YD	25130	$ 15.00	$ 376,950.00
2105.507	SELECT GRANULAR BORROW (CV)	CU YD	18580	$ 22.00	$ 408,760.00
2106.507	SELECT GRANULAR EMBANKMENT (CV)	CU YD	10470	$ 25.00	$ 261,750.00
2105.507	COMMON EMBANKMENT (CV)	CU YD	2600	$ 5.00	$ 13,000.00
2211.507	AGGREGATE BASE (CV) CLASS 6	CU YD	6580	$ 35.00	$ 230,300.00
2301.502	DOWEL BAR	EACH	7850	$ 6.50	$ 51,025.00
2301.504	PLACE CONCRETE PAVEMENT 8"	SQ YD	12600	$ 30.00	$ 378,000.00
2301.507	STRUCTUAL CONCRETE	CU YD	2825	$ 125.00	$ 353,125.00
2302.608	SUPPLEMENTAL REINF BARS (EPOXY COATED)	POUND	3100	$ 1.25	$ 3,875.00
2357.506	BITUMINOUS MATERIAL FOR TACK COAT	GALLON	1393	$ 5.20	$ 7,243.60
2360.509	TYPE SP 9.5 NON WEAR COURSE MIX (2,B)	TON	900	$ 50.00	$ 45,000.00
2360.509	TYPE SP 12.5 NON WEAR COURSE MIX (4,B)	TON	2014	$ 55.00	$ 110,770.00
2360.509	TYPE SP 12.5 WEARING COURSE MIX (4,F)	TON	2690	$ 65.00	$ 174,850.00
2401	BRIDGE (CONSTRUCTION)	SQ FT	10568	$ 350.00	$ 3,698,800.00
2401	BRIDGE REMOVAL	LUMP SUM	1	$ 184,940.00	$ 184,940.00
2406.504	BRIDGE APPROACH PANELS	SQ YD	200	$ 200.00	$ 40,000.00
2503.503	15" RC PIPE SEWER DES 3006 CL V	LIN FT	1770	$ 40.00	$ 70,800.00
2503.503	24" RC PIPE SEWER DES 3006 CL III	LIN FT	1550	$ 70.50	$ 109,275.00
2503.602	CONNECT TO EXISTING STORM SEWER	EACH	2	$ 1,000.00	$ 2,000.00
2503.602	CONNECT TO EXISTING DRAINAGE STRUCTURE	EACH	2	$ 1,000.00	$ 2,000.00
2506.502	CASTING ASSEMBLY	EACH	42	$ 825.00	$ 34,650.00
2506.503	CONSTRUCT DRAINAGE STRUCTURE DESIGN 48-4020	LIN FT	336	$ 395.00	$ 132,720.00
2521.518	4 INCH CONCRETE WALK	SQ FT	11450	$ 7.10	$ 81,295.00
2521.518	6 INCH CONCRETE WALK	SQ FT	2600	$ 10.50	$ 27,300.00
2531.603	CONCRETE CURB AND GUTTER DESIGN B624	LIN FT	8500	$ 30.00	$ 255,000.00
2531.503	CONCRETE CURB AND GUTTER DESIGN B612	LIN FT	3275	$ 30.00	$ 98,250.00
2531.504	8 INCH CONCRETE DRIVEWAY	SQ YD	185	$ 93.00	$ 17,205.00
2531.618	TRUNCATED DOMES	SQ FT	420	$ 43.00	$ 18,060.00
2545	LIGHTING (UNITS AND INFRASTRUCTURE)	LUMP SUM	1	$ 400,000.00	$ 400,000.00
2554.603	PLATE BEAM GUARD RAIL	LIN FT	480	$ 40.00	$ 19,200.00
2563.601	TRAFFIC CONTROL	LUMP SUM	1	$ 250,000.00	$ 250,000.00
2564	SIGNING	LUMP SUM	1	$ 75,000.00	$ 75,000.00
2573.501	WATER TREATMENT (BMP)	LUMP SUM	0.91	$ 200,000.00	$ 182,000.00
2573.501	STABILIZED CONSTRUCTION EXIT	LUMP SUM	1	$ 12,000.00	$ 12,000.00
2573.501	EROSION CONTROL SUPERVISOR	LUMP SUM	1	$ 10,000.00	$ 10,000.00
2573.502	STORM DRAIN INLET PROTECTION	EACH	42	$ 250.00	$ 10,500.00
2573.503	BALE BARRIER	LIN FT	400	$ 8.90	$ 3,560.00
2573.503	SILT FENCE, TYPE MS	LIN FT	13995	$ 2.10	$ 29,389.50
2573.503	SEDIMENT CONTROL LOG TYPE COMPOST	LIN FT	1100	$ 2.20	$ 2,420.00
2574.507	COMMON TOPSOIL BORROW (CV)	CU YD	1380	$ 26.00	$ 35,880.00
2575.504	EROSION CONTROL BLANKETS CATEGORY 3N	SQ YD	12480	$ 2.00	$ 24,960.00
2575.505	SEEDING	ACRE	3.08	$ 12,000.00	$ 36,960.00
2575.508	HYDRAULIC MULCH MATRIX	POUND	22065	$ 0.70	$ 15,445.50
2582.503	INTERIM PAVEMENT MARKING	LIN FT	40035	$ 0.25	$ 10,008.75
2582.503	4" SOLID LINE MULTI-COMPONENT GROUND IN	LIN FT	43015	$ 0.90	$ 38,713.50
2582.503	4" DOUBLE SOLID LINE MULTI-COMPONENT GROUND IN	LIN FT	3020	$ 1.80	$ 5,436.00
2582.518	PAVEMENT MESSAGE PREFORM THERMOPLASTIC GROUND IN	SQ FT	450	$ 27.50	$ 12,375.00
2582.518	CROSSWALK PREFORM THERMOPLASTIC GROUND IN	SQ FT	1020	$ 27.50	$ 28,050.00
					$ 8,925,721.85
	CONTINGENCY		10%		$ 892,572.19
	ENGINEERING		25%		$ 2,231,430.46
				TOTAL	**$ 12,049,724.50**

APPENDIX A

Crash Diagrams

Crash Diagram
Centerville Rd & Ash St/ Wilkinson Lk Blvd, Lino Lakes, MN

January 2011 - December 2015



Symbols

Moving Vehicle

Backing Vehicle

Non-moving Vehicle

Pedestrian

Parked Vehicle

Fixed Object

Bicycle

Fatality

Injury

Collision Types

Rear End

Head-On

Side Swipe

Out of Control

Left Turn

Right Angle

Classification by Type

	Side Swipe	Rear End	Right Angle	Left Turn	Ran Off Road	Head On	Ped/Bike	Other
Fatal	0	0	0	0	0	0	0	0
Personal Injury	0	0	0	0	0	0	0	0
Prop. Damage	0	0	1	0	0	0	0	0
Total	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**

Light

L = Daylight
DN = Dawn
DU = Dusk
DL = Dark Lighted
DO = Dark, Lights Off
D = Dark, Unlighted

Weather		Pavement		Time of Year		Time of Day	
Clear	0	Dry	0	Winter (Dec - Feb)	0	6:00 AM - 10:00 AM	0
Cloudy	0	Wet	0	Spring (Mar - May)	0	10:00 AM - 4:00 PM	0
Fog	0	Icy	0	Summer (Jun - Aug)	0	4:00 PM - 7:00 PM	1
Rain	0	Snow	1	Fall (Sep - Nov)	1	7:00 PM - 12:00 AM	0
Sleet	0	Unknown	0			12:00 AM - 6:00 AM	0
Snow	1					Unknown	0
Mist	0						
Other	0						

Weather

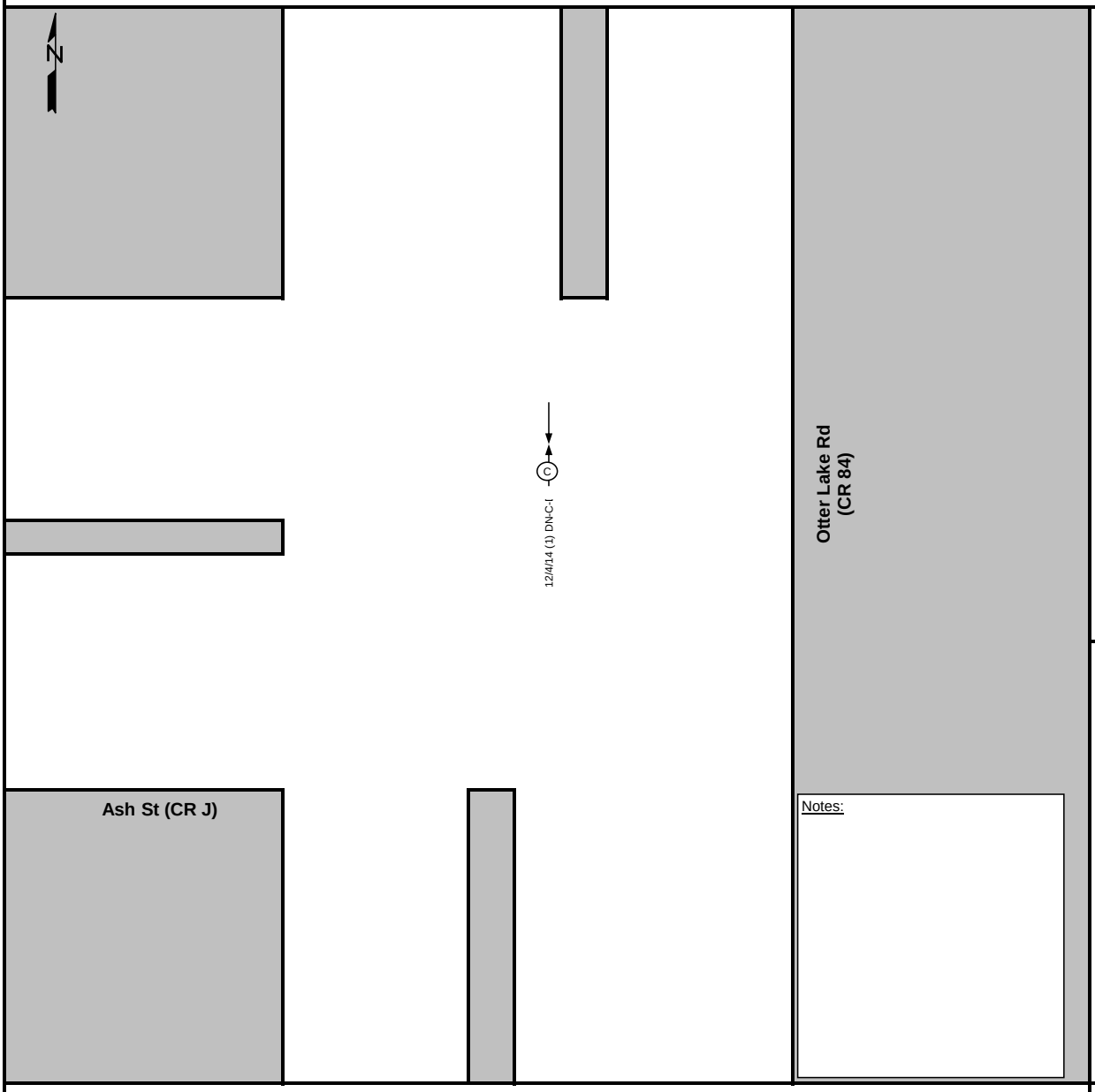
C = Clear
CL = Cloudy
R = Rain
S = Snow
SL = Sleet
F = Fog

Surface

D = Dry
I = Icy
W = Wet
S=Snow

Crash Diagram
Ash St & Otter Lake Rd, Lino Lakes, MN

January 2011 - December 2015



Symbols

Moving Vehicle

Backing Vehicle

Non-moving Vehicle

Pedestrian

Parked Vehicle

Fixed Object

Bicycle

Fatality

Injury

Collision Types

Rear End

Head-On

Side Swipe

Out of Control

Left Turn

Right Angle

Classification by Type

	Side Swipe	Rear End	Right Angle	Left Turn	Ran Off Road	Head On	Ped/Bike	Other
Fatal	0	0	0	0	0	0	0	0
Personal Injury	0	0	0	0	0	1	0	0
Prop. Damage	0	0	0	0	0	0	0	0
Total	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**

Light

L = Daylight
DN = Dawn
DU = Dusk
DL = Dark Lighted
DO = Dark, Lights Off
D = Dark, Unlighted

Weather	
Clear	1
Cloudy	0
Fog	0
Rain	0
Sleet	0
Snow	0
Mist	0
Other	0

Pavement	
Dry	1
Wet	0
Icy	0
Snow	0
Unknown	0

Time of Year	
Winter (Dec - Feb)	1
Spring (Mar - May)	0
Summer (Jun - Aug)	0
Fall (Sep - Nov)	0

Time of Day	
6:00 AM - 10:00 AM	0
10:00 AM - 4:00 PM	0
4:00 PM - 7:00 PM	0
7:00 PM - 12:00 AM	1
12:00 AM - 6:00 AM	0
Unknown	0

Weather

C = Clear
CL = Cloudy
R = Rain
S = Snow
SL = Sleet
F = Fog

Surface

D = Dry
I = Icy
W = Wet
S=Snow

APPENDIX B

Existing Traffic Counts

File Name : 2 - Wilkinson Lake Blvd-CR J & Centerville Rd, 1-6-16
Site Code : 2
Start Date : 1/6/2016
Page No : 1

Wilkinson Lake Blvd-CR J & Centerville
Lino Lakes, MN

Groups Printed- Cars + - Trucks

	Centerville Rd Southbound						CR J Westbound						Centerville Rd Northbound						Wilkinson Lake Blvd Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
12:00 AM	0	0	0	0	0	0	0	0	0	4	0	4	0	0	1	0	0	1	0	0	0	0	0	0	5
12:15 AM	0	4	2	0	0	6	0	0	0	5	0	5	0	0	3	1	0	4	0	0	0	0	0	0	15
12:30 AM	0	2	1	0	0	3	0	0	0	1	0	1	0	0	0	1	0	1	0	0	0	0	0	0	5
12:45 AM	0	2	4	0	0	6	0	0	0	5	0	5	0	0	2	2	0	4	0	0	0	0	0	0	15
Total	0	8	7	0	0	15	0	0	0	15	0	15	0	0	6	4	0	10	0	0	0	0	0	0	40
01:00 AM	0	4	0	0	0	4	0	0	0	7	0	7	0	0	3	0	0	3	0	0	0	0	0	0	14
01:15 AM	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	1	0	1	0	0	0	0	0	0	4
01:30 AM	0	3	0	0	0	3	0	0	0	1	0	1	0	0	3	2	0	5	0	0	0	0	0	0	9
01:45 AM	0	0	3	0	0	3	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	4
Total	0	7	3	0	0	10	0	0	0	11	0	11	0	0	7	3	0	10	0	0	0	0	0	0	31
02:00 AM	0	0	1	0	0	1	0	0	0	3	0	3	0	0	2	0	0	2	0	0	0	0	0	0	6
02:15 AM	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	3
02:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:45 AM	0	2	0	0	0	2	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4
Total	0	4	1	0	0	5	0	0	0	5	0	5	0	0	2	1	0	3	0	0	0	0	0	0	13
03:00 AM	0	2	1	0	0	3	0	0	0	3	0	3	0	0	0	2	0	2	0	0	0	0	0	0	8
03:15 AM	0	5	0	0	0	5	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	7
03:30 AM	0	3	0	0	0	3	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
03:45 AM	0	4	2	0	0	6	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	7
Total	0	14	3	0	0	17	0	0	0	5	0	5	0	0	2	2	0	4	0	0	0	0	0	0	26
04:00 AM	0	11	0	0	0	11	0	0	0	2	0	2	0	0	2	0	0	2	0	0	0	0	0	0	15
04:15 AM	0	5	2	1	0	8	0	6	1	1	0	8	0	0	1	0	0	1	0	0	0	0	0	0	17
04:30 AM	0	9	6	0	0	15	0	17	0	2	0	19	0	0	3	4	0	7	0	0	0	0	0	0	41
04:45 AM	0	19	9	0	0	28	0	18	0	1	0	19	0	0	3	1	0	4	0	0	0	0	0	0	51
Total	0	44	17	1	0	62	0	41	1	6	0	48	0	0	9	5	0	14	0	0	0	0	0	0	124
05:00 AM	0	27	9	0	0	36	0	6	2	2	0	10	0	0	6	2	0	8	0	0	0	0	0	0	54
05:15 AM	0	25	11	0	0	36	0	14	1	10	0	25	0	0	7	2	0	9	0	0	0	0	0	0	70
05:30 AM	0	39	26	1	0	66	0	27	3	7	0	37	0	0	7	0	0	7	0	0	0	0	0	0	110
05:45 AM	0	57	30	5	0	92	0	51	5	14	0	70	0	0	15	1	0	16	0	0	1	0	0	1	179
Total	0	148	76	6	0	230	0	98	11	33	0	142	0	0	35	5	0	40	0	0	1	0	0	1	413
06:00 AM	0	61	25	3	0	89	0	14	4	20	0	38	0	0	7	2	0	9	0	1	2	0	0	3	139
06:15 AM	0	74	28	2	0	104	0	24	2	21	0	47	0	1	12	3	0	16	0	1	1	0	0	2	169
06:30 AM	0	81	46	1	0	128	0	51	4	24	0	79	0	2	14	2	0	18	0	1	0	0	0	1	226
06:45 AM	0	88	64	2	0	154	0	57	3	40	0	100	0	1	15	5	0	21	0	0	1	0	0	1	276
Total	0	304	163	8	0	475	0	146	13	105	0	264	0	4	48	12	0	64	0	3	4	0	0	7	810
07:00 AM	0	99	51	1	0	151	0	27	1	51	0	79	0	0	24	4	0	28	0	0	1	0	0	1	259
07:15 AM	0	92	66	1	0	159	0	43	1	61	0	105	0	1	26	7	0	34	0	2	0	0	0	2	300
07:30 AM	0	86	66	1	0	153	0	67	0	65	0	132	0	2	32	5	0	39	0	0	0	1	0	1	325
07:45 AM	0	89	59	4	0	152	0	54	5	60	0	119	0	5	32	6	0	43	0	1	0	0	0	1	315
Total	0	366	242	7	0	615	0	191	7	237	0	435	0	8	114	22	0	144	0	3	1	1	0	5	1199

File Name : 2 - Wilkinson Lake Blvd-CR J & Centerville Rd, 1-6-16
Site Code : 2
Start Date : 1/6/2016
Page No : 2

Wilkinson Lake Blvd-CR J & Centerville
Lino Lakes, MN

Groups Printed- Cars + - Trucks

	Centerville Rd Southbound						CR J Westbound						Centerville Rd Northbound						Wilkinson Lake Blvd Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
08:00 AM	0	88	33	4	0	125	0	24	5	58	0	87	0	2	27	6	0	35	0	0	0	0	0	0	247
08:15 AM	0	81	33	2	0	116	0	20	0	34	0	54	0	0	24	7	0	31	0	2	1	0	0	3	204
08:30 AM	0	60	33	2	0	95	0	11	6	37	0	54	0	2	26	4	0	32	0	0	1	2	0	3	184
08:45 AM	0	63	36	3	0	102	0	11	1	27	0	39	0	0	14	5	0	19	0	0	1	0	0	1	161
Total	0	292	135	11	0	438	0	66	12	156	0	234	0	4	91	22	0	117	0	2	3	2	0	7	796
09:00 AM	0	58	31	2	0	91	0	16	5	31	0	52	0	0	14	6	0	20	0	0	2	0	0	2	165
09:15 AM	0	73	30	0	0	103	0	11	2	30	0	43	0	1	12	7	0	20	0	0	0	0	0	0	166
09:30 AM	0	47	27	0	0	74	0	10	3	27	0	40	0	2	11	7	2	22	0	0	1	1	2	4	140
09:45 AM	0	41	14	4	0	59	0	13	3	21	0	37	0	3	14	8	0	25	0	0	0	0	0	0	121
Total	0	219	102	6	0	327	0	50	13	109	0	172	0	6	51	28	2	87	0	0	3	1	2	6	592
10:00 AM	0	28	14	1	0	43	0	5	1	18	0	24	0	1	14	7	0	22	0	2	3	0	0	5	94
10:15 AM	0	30	18	5	0	53	0	10	3	30	0	43	0	0	15	9	0	24	0	2	3	4	0	9	129
10:30 AM	0	35	11	1	0	47	0	8	3	19	0	30	0	0	13	9	0	22	0	5	2	0	0	7	106
10:45 AM	0	26	12	1	0	39	0	12	1	27	0	40	0	2	11	14	0	27	0	1	2	1	0	4	110
Total	0	119	55	8	0	182	0	35	8	94	0	137	0	3	53	39	0	95	0	10	10	5	0	25	439
11:00 AM	0	33	17	3	0	53	0	14	3	34	0	51	0	1	10	12	0	23	0	0	1	3	0	4	131
11:15 AM	0	41	17	2	0	60	0	10	2	26	0	38	0	2	23	13	0	38	0	3	3	2	0	8	144
11:30 AM	0	31	18	1	0	50	0	10	2	27	0	39	0	2	25	12	0	39	0	2	2	4	0	8	136
11:45 AM	0	32	13	2	0	47	0	10	2	27	0	39	0	1	16	13	0	30	0	2	3	0	0	5	121
Total	0	137	65	8	0	210	0	44	9	114	0	167	0	6	74	50	0	130	0	7	9	9	0	25	532
12:00 PM	0	38	16	1	0	55	0	12	0	33	0	45	0	4	18	18	0	40	0	1	3	4	0	8	148
12:15 PM	0	35	13	1	0	49	0	13	2	34	0	49	0	0	18	21	0	39	0	1	2	1	0	4	141
12:30 PM	0	32	28	0	0	60	0	15	1	28	0	44	0	0	28	11	0	39	0	2	1	0	0	3	146
12:45 PM	0	26	21	1	0	48	0	10	1	35	0	46	0	3	22	13	0	38	0	0	6	1	0	7	139
Total	0	131	78	3	0	212	0	50	4	130	0	184	0	7	86	63	0	156	0	4	12	6	0	22	574
01:00 PM	0	37	19	1	0	57	0	12	1	29	0	42	0	1	24	15	0	40	0	2	2	3	0	7	146
01:15 PM	0	34	10	1	0	45	0	12	1	37	0	50	0	3	26	18	0	47	0	2	3	2	0	7	149
01:30 PM	0	45	22	1	0	68	0	14	3	31	0	48	0	1	18	11	0	30	0	1	1	0	0	2	148
01:45 PM	0	38	18	4	0	60	0	13	8	41	0	62	0	1	26	12	0	39	0	0	1	0	0	1	162
Total	0	154	69	7	0	230	0	51	13	138	0	202	0	6	94	56	0	156	0	5	7	5	0	17	605
02:00 PM	0	45	23	1	0	69	0	11	2	35	0	48	0	3	37	21	0	61	0	4	6	2	0	12	190
02:15 PM	0	44	22	0	0	66	0	21	2	50	0	73	0	3	27	18	0	48	0	5	9	1	0	15	202
02:30 PM	0	38	19	0	0	57	0	14	2	52	0	68	0	1	58	91	0	150	0	2	1	1	0	4	279
02:45 PM	0	45	29	3	0	77	0	4	5	54	0	63	0	2	34	19	0	55	0	4	6	0	0	10	205
Total	0	172	93	4	0	269	0	50	11	191	0	252	0	9	156	149	0	314	0	15	22	4	0	41	876
03:00 PM	0	38	19	1	0	58	0	12	1	58	0	71	0	1	42	31	0	74	0	5	5	4	0	14	217
03:15 PM	0	74	33	0	0	107	0	7	3	76	0	86	0	0	38	27	0	65	0	2	7	3	0	12	270
03:30 PM	0	60	21	1	0	82	0	8	4	97	0	109	0	1	72	91	0	164	0	5	4	0	0	9	364
03:45 PM	0	77	25	4	0	106	0	8	0	91	0	99	0	3	61	30	0	94	0	5	5	1	0	11	310
Total	0	249	98	6	0	353	0	35	8	322	0	365	0	5	213	179	0	397	0	17	21	8	0	46	1161

File Name : 2 - Wilkinson Lake Blvd-CR J & Centerville Rd, 1-6-16
Site Code : 2
Start Date : 1/6/2016
Page No : 3

Wilkinson Lake Blvd-CR J & Centerville
Lino Lakes, MN

Groups Printed- Cars + - Trucks

	Centerville Rd Southbound						CR J Westbound						Centerville Rd Northbound						Wilkinson Lake Blvd Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
04:00 PM	0	66	25	1	0	92	0	8	4	99	0	111	0	0	55	29	0	84	0	2	4	1	0	7	294
04:15 PM	0	92	30	1	0	123	0	8	2	87	0	97	0	0	68	23	0	91	0	1	4	2	0	7	318
04:30 PM	0	76	37	1	0	114	0	7	2	118	0	127	0	1	68	56	0	125	0	4	3	1	0	8	374
04:45 PM	0	92	38	1	0	131	0	11	2	109	0	122	0	1	69	45	0	115	0	2	5	2	0	9	377
Total	0	326	130	4	0	460	0	34	10	413	0	457	0	2	260	153	0	415	0	9	16	6	0	31	1363
05:00 PM	0	91	33	7	0	131	0	4	1	115	0	120	0	1	63	32	0	96	0	1	5	0	0	6	353
05:15 PM	0	78	35	2	0	115	0	6	4	105	0	115	0	4	68	33	2	107	0	1	3	0	0	4	341
05:30 PM	0	87	24	5	0	116	0	5	4	110	0	119	0	0	67	25	0	92	0	4	0	1	0	5	332
05:45 PM	0	87	22	5	0	114	0	11	1	73	0	85	0	2	56	33	0	91	0	1	2	1	0	4	294
Total	0	343	114	19	0	476	0	26	10	403	0	439	0	7	254	123	2	386	0	7	10	2	0	19	1320
06:00 PM	0	61	19	3	0	83	0	3	0	65	0	68	0	2	47	16	0	65	0	0	2	3	0	5	221
06:15 PM	0	41	20	1	0	62	0	8	2	65	0	75	0	1	36	24	0	61	0	2	2	2	0	6	204
06:30 PM	0	40	24	2	0	66	0	7	1	58	0	66	0	2	37	10	0	49	0	3	3	1	0	7	188
06:45 PM	0	30	13	2	0	45	0	7	3	44	0	54	0	2	15	10	0	27	0	0	4	1	0	5	131
Total	0	172	76	8	0	256	0	25	6	232	0	263	0	7	135	60	0	202	0	5	11	7	0	23	744
07:00 PM	0	26	15	1	0	42	0	8	1	42	0	51	0	0	19	8	0	27	0	3	1	2	0	6	126
07:15 PM	0	31	28	2	0	61	0	7	0	35	0	42	0	1	25	9	0	35	0	3	2	0	0	5	143
07:30 PM	0	21	9	0	0	30	0	3	1	42	0	46	0	0	23	13	0	36	0	4	4	4	0	12	124
07:45 PM	0	16	16	4	0	36	0	1	0	40	0	41	0	1	17	7	0	25	0	0	2	2	0	4	106
Total	0	94	68	7	0	169	0	19	2	159	0	180	0	2	84	37	0	123	0	10	9	8	0	27	499
08:00 PM	0	10	10	1	0	21	0	5	0	36	0	41	0	2	21	9	0	32	0	2	2	3	0	7	101
08:15 PM	0	17	5	0	0	22	0	6	1	44	0	51	0	1	14	12	0	27	0	1	4	1	0	6	106
08:30 PM	0	14	10	0	0	24	0	1	0	34	0	35	0	1	15	8	0	24	0	4	2	1	0	7	90
08:45 PM	0	19	10	0	0	29	0	7	0	31	0	38	0	0	15	13	0	28	0	2	4	2	0	8	103
Total	0	60	35	1	0	96	0	19	1	145	0	165	0	4	65	42	0	111	0	9	12	7	0	28	400
09:00 PM	0	15	8	0	0	23	0	3	0	23	0	26	0	0	12	6	0	18	0	1	1	1	0	3	70
09:15 PM	0	14	9	2	0	25	0	10	0	31	0	41	0	1	17	6	0	24	0	0	0	0	0	0	90
09:30 PM	0	12	6	1	0	19	0	7	0	18	0	25	0	1	7	10	0	18	0	3	1	0	0	4	66
09:45 PM	0	4	3	3	0	10	0	2	1	25	0	28	0	0	7	5	0	12	0	0	0	2	0	2	52
Total	0	45	26	6	0	77	0	22	1	97	0	120	0	2	43	27	0	72	0	4	2	3	0	9	278
10:00 PM	0	7	1	1	0	9	0	1	0	12	0	13	0	0	4	3	0	7	0	3	4	1	0	8	37
10:15 PM	0	11	6	2	0	19	0	1	1	16	0	18	0	0	6	5	0	11	0	3	1	0	0	4	52
10:30 PM	0	5	3	1	0	9	0	0	0	12	0	12	0	0	6	1	0	7	0	2	0	0	0	2	30
10:45 PM	0	9	3	1	0	13	0	5	1	14	0	20	0	0	4	4	0	8	0	0	1	0	0	1	42
Total	0	32	13	5	0	50	0	7	2	54	0	63	0	0	20	13	0	33	0	8	6	1	0	15	161
11:00 PM	0	8	4	0	0	12	0	2	0	11	0	13	0	0	9	4	0	13	0	0	2	1	0	3	41
11:15 PM	0	3	2	0	0	5	0	0	0	12	0	12	0	0	6	8	0	14	0	0	0	0	0	0	31
11:30 PM	0	5	4	0	0	9	0	2	0	6	0	8	0	0	5	0	0	5	0	0	2	0	0	2	24
11:45 PM	0	4	0	0	0	4	0	0	0	7	0	7	0	0	4	8	0	12	0	0	0	0	0	0	23
Total	0	20	10	0	0	30	0	4	0	36	0	40	0	0	24	20	0	44	0	0	4	1	0	5	119

File Name : 2 - Wilkinson Lake Blvd-CR J & Centerville Rd, 1-6-16
Site Code : 2
Start Date : 1/6/2016
Page No : 4

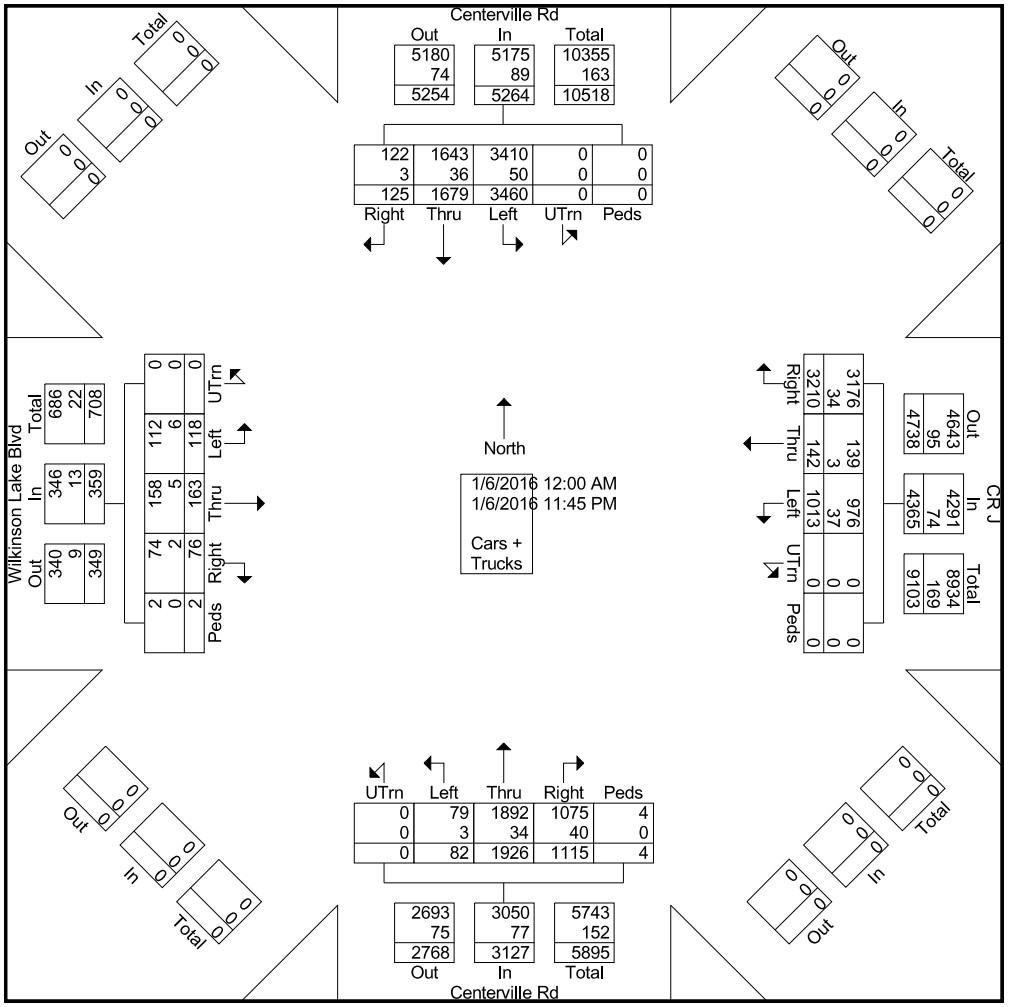
Wilkinson Lake Blvd-CR J & Centerville
Lino Lakes, MN

Groups Printed- Cars + - Trucks

	Centerville Rd Southbound						CR J Westbound						Centerville Rd Northbound						Wilkinson Lake Blvd Eastbound						
	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
Grand Total	0	3460	1679	125	0	5264	0	1013	142	3210	0	4365	0	82	1926	1115	4	3127	0	118	163	76	2	359	13115
Apprch %	0	65.7	31.9	2.4	0		0	23.2	3.3	73.5	0		0	2.6	61.6	35.7	0.1		0	32.9	45.4	21.2	0.6		
Total %	0	26.4	12.8	1	0	40.1	0	7.7	1.1	24.5	0	33.3	0	0.6	14.7	8.5	0	23.8	0	0.9	1.2	0.6	0	2.7	
Cars +	0	3410	1643	122	0	5175	0	976	139	3176	0	4291	0	79	1892	1075	4	3050	0	112	158	74	2	346	12862
% Cars +	0	98.6	97.9	97.6	0	98.3	0	96.3	97.9	98.9	0	98.3	0	96.3	98.2	96.4	100	97.5	0	94.9	96.9	97.4	100	96.4	98.1
Trucks	0	50	36	3	0	89	0	37	3	34	0	74	0	3	34	40	0	77	0	6	5	2	0	13	253
% Trucks	0	1.4	2.1	2.4	0	1.7	0	3.7	2.1	1.1	0	1.7	0	3.7	1.8	3.6	0	2.5	0	5.1	3.1	2.6	0	3.6	1.9

File Name : 2 - Wilkinson Lake Blvd-CR J & Centerville Rd, 1-6-16
Site Code : 2
Start Date : 1/6/2016
Page No : 5

Wilkinson Lake Blvd-CR J & Centerville
Lino Lakes, MN



File Name : 2 - Wilkinson Lake Blvd-CR J & Centerville Rd, 1-6-16
Site Code : 2
Start Date : 1/6/2016
Page No : 6

Wilkinson Lake Blvd-CR J & Centerville
Lino Lakes, MN

	Centerville Rd Southbound						CR J Westbound						Centerville Rd Northbound						Wilkinson Lake Blvd Eastbound						
Start Time	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	UTrn	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 AM to 09:45 AM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 07:00 AM																									
07:00 AM	0	99	51	1	0	151	0	27	1	51	0	79	0	0	24	4	0	28	0	0	1	0	0	1	259
07:15 AM	0	92	66	1	0	159	0	43	1	61	0	105	0	1	26	7	0	34	0	2	0	0	0	2	300
07:30 AM	0	86	66	1	0	153	0	67	0	65	0	132	0	2	32	5	0	39	0	0	0	1	0	1	325
07:45 AM	0	89	59	4	0	152	0	54	5	60	0	119	0	5	32	6	0	43	0	1	0	0	0	1	315
Total Volume	0	366	242	7	0	615	0	191	7	237	0	435	0	8	114	22	0	144	0	3	1	1	0	5	1199
% App. Total	0	59.5	39.3	1.1	0		0	43.9	1.6	54.5	0		0	5.6	79.2	15.3	0		0	60	20	20	0		
PHF	.000	.924	.917	.438	.000	.967	.000	.713	.350	.912	.000	.824	.000	.400	.891	.786	.000	.837	.000	.375	.250	.250	.000	.625	.922
Peak Hour Analysis From 10:00 AM to 01:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 01:00 PM																									
01:00 PM	0	37	19	1	0	57	0	12	1	29	0	42	0	1	24	15	0	40	0	2	2	3	0	7	146
01:15 PM	0	34	10	1	0	45	0	12	1	37	0	50	0	3	26	18	0	47	0	2	3	2	0	7	149
01:30 PM	0	45	22	1	0	68	0	14	3	31	0	48	0	1	18	11	0	30	0	1	1	0	0	2	148
01:45 PM	0	38	18	4	0	60	0	13	8	41	0	62	0	1	26	12	0	39	0	0	1	0	0	1	162
Total Volume	0	154	69	7	0	230	0	51	13	138	0	202	0	6	94	56	0	156	0	5	7	5	0	17	605
% App. Total	0	67	30	3	0		0	25.2	6.4	68.3	0		0	3.8	60.3	35.9	0		0	29.4	41.2	29.4	0		
PHF	.000	.856	.784	.438	.000	.846	.000	.911	.406	.841	.000	.815	.000	.500	.904	.778	.000	.830	.000	.625	.583	.417	.000	.607	.934
Peak Hour Analysis From 02:00 PM to 11:45 PM - Peak 1 of 1																									
Peak Hour for Entire Intersection Begins at 04:30 PM																									
04:30 PM	0	76	37	1	0	114	0	7	2	118	0	127	0	1	68	56	0	125	0	4	3	1	0	8	374
04:45 PM	0	92	38	1	0	131	0	11	2	109	0	122	0	1	69	45	0	115	0	2	5	2	0	9	377
05:00 PM	0	91	33	7	0	131	0	4	1	115	0	120	0	1	63	32	0	96	0	1	5	0	0	6	353
05:15 PM	0	78	35	2	0	115	0	6	4	105	0	115	0	4	68	33	2	107	0	1	3	0	0	4	341
Total Volume	0	337	143	11	0	491	0	28	9	447	0	484	0	7	268	166	2	443	0	8	16	3	0	27	1445
% App. Total	0	68.6	29.1	2.2	0		0	5.8	1.9	92.4	0		0	1.6	60.5	37.5	0.5		0	29.6	59.3	11.1	0		
PHF	.000	.916	.941	.393	.000	.937	.000	.636	.563	.947	.000	.953	.000	.438	.971	.741	.250	.886	.000	.500	.800	.375	.000	.750	.958

APPENDIX C

Traffic Signal Warrant Analysis

SIGNAL WARRANTS ANALYSIS

Year: 2016
Existing Condition: All-Way Stop

LOCATION: Centerville Rd & Ash St/ Wilkinson Rd
COUNTY: Anoka
REF. POINT:
DATE: 1/25/2017
OPERATOR: Mallori F

WARRANT 1 - EIGHT HOUR VOLUME

POPULATION < 10,000?	No
0.70 FACTOR USED?	YES
EXISTING SIGNAL ?	No
0.80 FACTOR USED?	No

Speed	Approach Description		Lanes
50	Major App 1	Centerville Rd (SB)	1
50	Major App 3	Centerville Rd (NB)	1
40	Minor App 2	Ash St (CRJ) (WB)	1
30	Minor App 4	Wilkinson Rd (SB)	1

Notes:

						THRESHOLDS 1A/1B/1C: 350/525	105/53	105/53		280/420	84/42	84/42	
HOUR	MAJOR APP 1	MAJOR APP. 3	TOTAL 1+3	MINOR APP. 2	MINOR APP. 4	MAJOR 1A/1B	MINOR 2 1A/1B	MINOR 4 1A/1B	**MET SAME 1A/1B**	MAJOR 1C A/B	MINOR 2 1C A/B	MINOR 4 1C A/B	**MET SAME 1C (A/B)**
12:00 AM - 1:00 AM	15	0	15	6	0	/	/	/	**/**	/	/	/	**/**
1:00 AM - 2:00 AM	10	0	10	7	0	/	/	/	**/**	/	/	/	**/**
2:00 AM - 3:00 AM	5	0	5	2	0	/	/	/	**/**	/	/	/	**/**
3:00 AM - 4:00 AM	17	0	17	2	0	/	/	/	**/**	/	/	/	**/**
4:00 AM - 5:00 AM	62	42	104	9	0	/	/	/	**/**	/	/	/	**/**
5:00 AM - 6:00 AM	230	109	339	35	1	/	/	/	**/**	X/	/	/	**/**
6:00 AM - 7:00 AM	475	159	634	52	7	X/X	/	/	**/**	X/X	/X	/	**/X**
7:00 AM - 8:00 AM	615	198	813	122	5	X/X	X/X	/	**X/X**	X/X	X/X	/	**X/X**
8:00 AM - 9:00 AM	438	78	516	95	7	X/	/X	/	**/**	X/X	X/X	/	**X/X**
9:00 AM - 10:00 AM	327	63	390	57	4	X/	/X	/	**/**	X/	/X	/	**/**
10:00 AM - 11:00 AM	182	43	225	56	25	/	/X	/	**/**	/	/X	/	**/**
11:00 AM - 12:00 PM	210	53	263	80	25	/	/X	/	**/**	/	/X	/	**/**
12:00 PM - 1:00 PM	212	54	266	93	22	/	/X	/	**/**	/	X/X	/	**/**
1:00 PM - 2:00 PM	230	64	294	100	17	/	/X	/	**/**	X/	X/X	/	**X/**
2:00 PM - 3:00 PM	269	61	330	165	41	/	X/X	/	**/**	X/	X/X	/	**X/**
3:00 PM - 4:00 PM	353	43	396	218	46	X/	X/X	/	**X/**	X/	X/X	/X	**X/**
4:00 PM - 5:00 PM	460	44	504	520	31	X/	X/X	/	**X/**	X/X	X/X	/	**X/X**
5:00 PM - 6:00 PM	476	36	512	508	19	X/	X/X	/	**X/**	X/X	X/X	/	**X/X**
6:00 PM - 7:00 PM	256	31	287	270	23	/	X/X	/	**/**	X/	X/X	/	**X/**
7:00 PM - 8:00 PM	169	21	190	168	27	/	X/X	/	**/**	/	X/X	/	**/**
8:00 PM - 9:00 PM	96	20	116	130	28	/	X/X	/	**/**	/	X/X	/	**/**
9:00 PM - 10:00 PM	77	23	100	86	9	/	/X	/	**/**	/	X/X	/	**/**
10:00 PM - 11:00 PM	50	9	59	40	15	/	/	/	**/**	/	/	/	**/**
11:00 PM - 12:00 AM	30	4	34	48	5	/	/	/	**/**	/	/X	/	**/**

	Met (Hr)	Required (Hr)	Warrant Satisfied?
Warrant 1A	4	8	Not Satisfied
Warrant 1B	1	8	Not Satisfied
Warrant 1C (Cond A)	**8**	8	Not Satisfied
Warrant 1C (Cond B)	5	8	

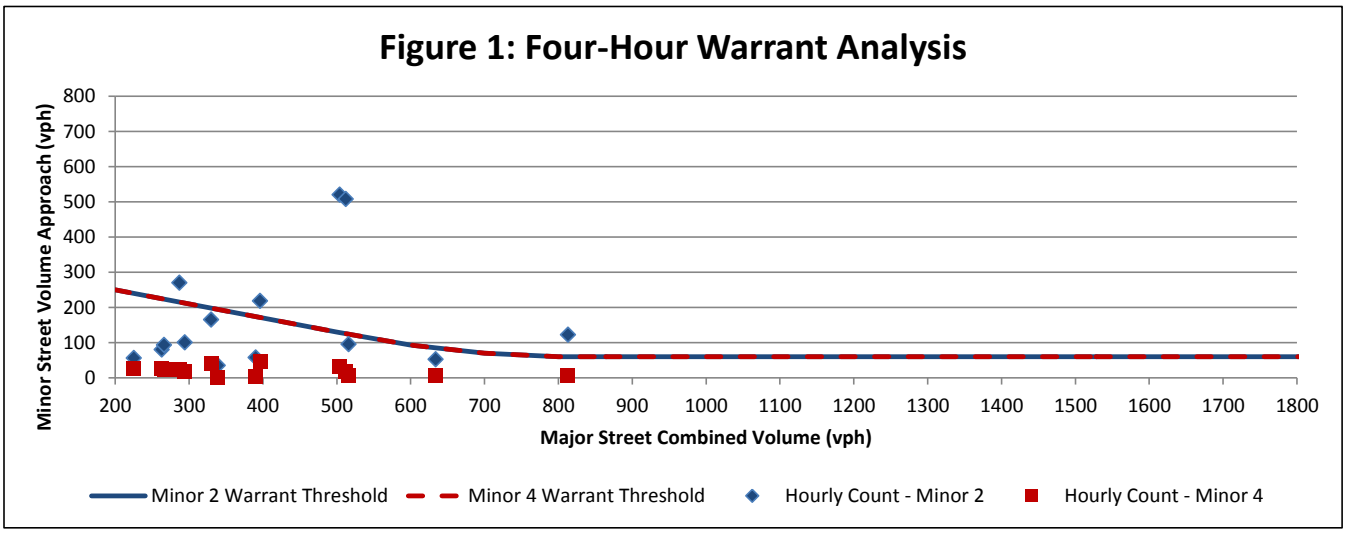
LOCATION: Centerville Rd & Ash St/ Wilkinson Rd
COUNTY: Anoka
REF. POINT:
DATE: 1/25/2017
OPERATOR: Mallori F

0.70 FACTOR USED? YES
POPULATION < 10,000? No

Speed	Approach Description		Lanes
50	Major App1:	Centerville Rd (SB)	1
50	Major App3:	Centerville Rd (NB)	1
40	Minor App2:	Ash St (CRJ) (WB)	1
30	Minor App4:	Wilkinson Rd (SB)	1

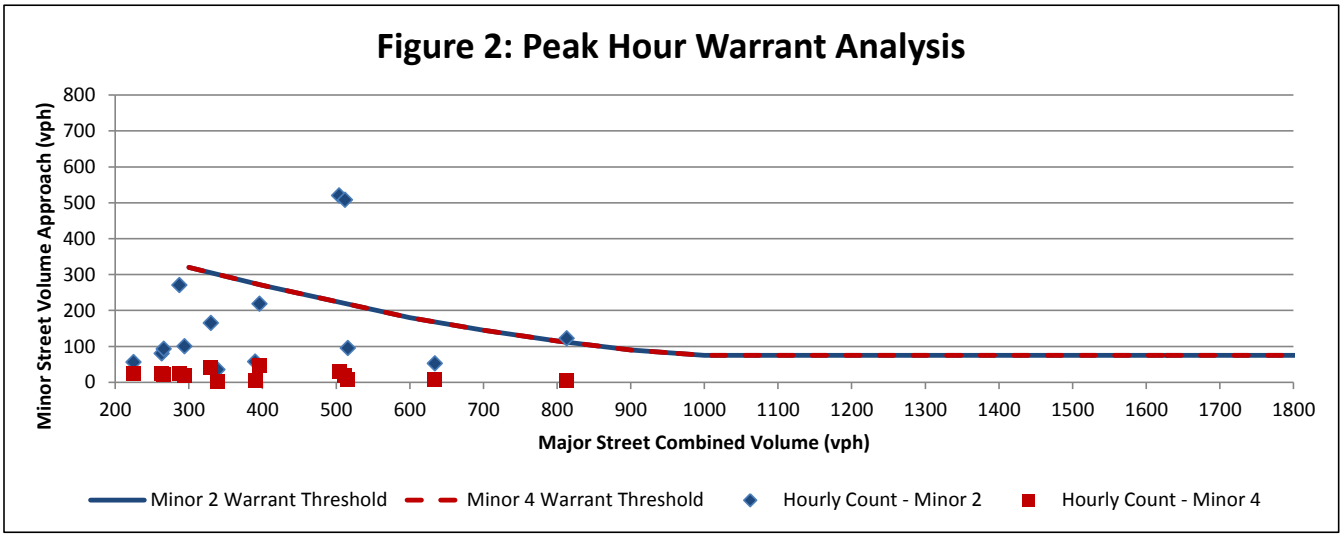
Notes:

WARRANT 2 - FOUR HOUR VOLUME



	Met (Hr)	Required (Hr)	Warrant Satisfied?
Warrant 2	5	4	Satisfied

WARRANT 3 - PEAK HOUR VOLUME



	Met (Hr)	Required (Hr)	Warrant Satisfied?
Warrant 3	3	1	Satisfied

APPENDIX D

LOS Results Analysis

Intersection	
Intersection Delay, s/veh	67
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	3	1	1	0	191	7	237	0	6	114	22
Future Vol, veh/h	0	3	1	1	0	191	7	237	0	6	114	22
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	1	1	0	208	8	258	0	7	124	24
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	11.5	14.9	11.8
HCM LOS	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	5%	0%	60%	96%	0%	60%
Vol Thru, %	95%	0%	20%	4%	0%	39%
Vol Right, %	0%	100%	20%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	120	22	5	198	237	615
LT Vol	6	0	3	191	0	366
Through Vol	114	0	1	7	0	242
RT Vol	0	22	1	0	237	7
Lane Flow Rate	130	24	5	215	258	668
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.249	0.041	0.012	0.431	0.431	1.171
Departure Headway (Hd)	7.159	6.413	8.387	7.656	6.448	6.306
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	505	562	429	473	562	582
Service Time	4.859	4.113	6.387	5.356	4.148	4.314
HCM Lane V/C Ratio	0.257	0.043	0.012	0.455	0.459	1.148
HCM Control Delay	12.2	9.4	11.5	16	13.9	117.1
HCM Lane LOS	B	A	B	C	B	F
HCM 95th-tile Q	1	0.1	0	2.1	2.2	23

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	366	242	7
Future Vol, veh/h	0	366	242	7
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	398	263	8
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	117.1
HCM LOS	F

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	12	70	346	154	387	40	0	0	0	12	35	88
Future Vol, veh/h	12	70	346	154	387	40	0	0	0	12	35	88
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	76	376	167	421	43	0	0	0	13	38	96

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	464	0	0	452	0	0	1067	1255	442
Stage 1	-	-	-	-	-	-	777	777	-
Stage 2	-	-	-	-	-	-	290	478	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1097	-	-	1109	-	-	246	172	615
Stage 1	-	-	-	-	-	-	453	407	-
Stage 2	-	-	-	-	-	-	759	556	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1097	-	-	1109	-	-	192	0	615
Mov Cap-2 Maneuver	-	-	-	-	-	-	192	0	-
Stage 1	-	-	-	-	-	-	361	0	-
Stage 2	-	-	-	-	-	-	746	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	2.3	15.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1097	-	-	1109	-	-	486
HCM Lane V/C Ratio	0.012	-	-	0.151	-	-	0.302
HCM Control Delay (s)	8.3	0	-	8.8	0	-	15.6
HCM Lane LOS	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0	-	-	0.5	-	-	1.3

Intersection	
Intersection Delay, s/veh	43
Intersection LOS	E

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	9	16	6	0	34	10	413	0	2	260	153
Future Vol, veh/h	0	9	16	6	0	34	10	413	0	2	260	153
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	10	17	7	0	37	11	449	0	2	283	166
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	13.3	33.9	17.7
HCM LOS	B	D	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	1%	0%	29%	77%	0%	71%
Vol Thru, %	99%	0%	52%	23%	0%	28%
Vol Right, %	0%	100%	19%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	262	153	31	44	413	460
LT Vol	2	0	9	34	0	326
Through Vol	260	0	16	10	0	130
RT Vol	0	153	6	0	413	4
Lane Flow Rate	285	166	34	48	449	500
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.587	0.309	0.085	0.104	0.841	1.032
Departure Headway (Hd)	7.647	6.921	9.416	8.051	6.933	7.427
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	476	522	383	448	525	490
Service Time	5.347	4.621	7.416	5.751	4.633	5.427
HCM Lane V/C Ratio	0.599	0.318	0.089	0.107	0.855	1.02
HCM Control Delay	20.6	12.7	13.3	11.7	36.3	76.8
HCM Lane LOS	C	B	B	B	E	F
HCM 95th-tile Q	3.7	1.3	0.3	0.3	8.6	14.7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	326	130	4
Future Vol, veh/h	0	326	130	4
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	354	141	4
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	76.8
HCM LOS	F

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	75	204	264	81	517	87	0	0	0	7	23	21
Future Vol, veh/h	75	204	264	81	517	87	0	0	0	7	23	21
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	82	222	287	88	562	95	0	0	0	8	25	23

Major/Minor	Major1			Major2						Minor2		
Conflicting Flow All	657	0	0	509	0	0				1313	1457	609
Stage 1	-	-	-	-	-	-				785	785	-
Stage 2	-	-	-	-	-	-				528	672	-
Critical Hdwy	4.12	-	-	4.12	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	931	-	-	1056	-	-				175	130	495
Stage 1	-	-	-	-	-	-				449	404	-
Stage 2	-	-	-	-	-	-				592	454	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	931	-	-	1056	-	-				132	0	495
Mov Cap-2 Maneuver	-	-	-	-	-	-				132	0	-
Stage 1	-	-	-	-	-	-				389	0	-
Stage 2	-	-	-	-	-	-				516	0	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	1	20.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	931	-	-	1056	-	-	293
HCM Lane V/C Ratio	0.088	-	-	0.083	-	-	0.189
HCM Control Delay (s)	9.2	0	-	8.7	0	-	20.1
HCM Lane LOS	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	-	-	0.3	-	-	0.7

Intersection	
Intersection Delay, s/veh	76.5
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	3	1	1	0	197	7	245	0	6	118	23
Future Vol, veh/h	0	3	1	1	0	197	7	245	0	6	118	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	1	1	0	214	8	266	0	7	128	25
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	11.7	15.4	12
HCM LOS	B	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	5%	0%	60%	97%	0%	60%
Vol Thru, %	95%	0%	20%	3%	0%	39%
Vol Right, %	0%	100%	20%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	124	23	5	204	245	635
LT Vol	6	0	3	197	0	378
Through Vol	118	0	1	7	0	250
RT Vol	0	23	1	0	245	7
Lane Flow Rate	135	25	5	222	266	690
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.259	0.043	0.012	0.444	0.446	1.218
Departure Headway (Hd)	7.249	6.503	8.549	7.753	6.544	6.352
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	499	554	421	468	554	580
Service Time	4.949	4.203	6.549	5.453	4.244	4.36
HCM Lane V/C Ratio	0.271	0.045	0.012	0.474	0.48	1.19
HCM Control Delay	12.5	9.5	11.7	16.5	14.4	135.2
HCM Lane LOS	B	A	B	C	B	F
HCM 95th-tile Q	1	0.1	0	2.2	2.3	25.5

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	378	250	7
Future Vol, veh/h	0	378	250	7
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	411	272	8
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	135.2
HCM LOS	F

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	12	72	273	159	400	41	0	0	0	12	36	91
Future Vol, veh/h	12	72	273	159	400	41	0	0	0	12	36	91
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	78	297	173	435	45	0	0	0	13	39	99

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	479	0	0	375	0	0	1056	1204	457
Stage 1	-	-	-	-	-	-	803	803	-
Stage 2	-	-	-	-	-	-	253	401	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1083	-	-	1183	-	-	250	184	604
Stage 1	-	-	-	-	-	-	441	396	-
Stage 2	-	-	-	-	-	-	789	601	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1083	-	-	1183	-	-	197	0	604
Mov Cap-2 Maneuver	-	-	-	-	-	-	197	0	-
Stage 1	-	-	-	-	-	-	352	0	-
Stage 2	-	-	-	-	-	-	776	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	2.3	15.7
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1083	-	-	1183	-	-	487
HCM Lane V/C Ratio	0.012	-	-	0.146	-	-	0.31
HCM Control Delay (s)	8.4	0	-	8.6	0	-	15.7
HCM Lane LOS	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0	-	-	0.5	-	-	1.3

Intersection	
Intersection Delay, s/veh	51.1
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	9	17	6	0	35	10	427	0	2	269	158
Future Vol, veh/h	0	9	17	6	0	35	10	427	0	2	269	158
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	10	18	7	0	38	11	464	0	2	292	172
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	13.7	39.8	19.1
HCM LOS	B	E	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	1%	0%	28%	78%	0%	71%
Vol Thru, %	99%	0%	53%	22%	0%	28%
Vol Right, %	0%	100%	19%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	271	158	32	45	427	475
LT Vol	2	0	9	35	0	337
Through Vol	269	0	17	10	0	134
RT Vol	0	158	6	0	427	4
Lane Flow Rate	295	172	35	49	464	516
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.62	0.327	0.09	0.108	0.884	1.086
Departure Headway (Hd)	7.832	7.104	9.722	8.185	7.062	7.569
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	465	510	371	441	515	485
Service Time	5.532	4.804	7.722	5.885	4.762	5.569
HCM Lane V/C Ratio	0.634	0.337	0.094	0.111	0.901	1.064
HCM Control Delay	22.5	13.2	13.7	11.9	42.7	93.7
HCM Lane LOS	C	B	B	B	E	F
HCM 95th-tile Q	4.1	1.4	0.3	0.4	9.8	16.7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	337	134	4
Future Vol, veh/h	0	337	134	4
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	366	146	4
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	93.7
HCM LOS	F

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	76	211	273	84	535	90	0	0	0	7	24	22
Future Vol, veh/h	76	211	273	84	535	90	0	0	0	7	24	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	83	229	297	91	582	98	0	0	0	8	26	24

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	679	0	0	526	0	0	1356	1504	630
Stage 1	-	-	-	-	-	-	813	813	-
Stage 2	-	-	-	-	-	-	543	691	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	913	-	-	1041	-	-	165	121	482
Stage 1	-	-	-	-	-	-	436	392	-
Stage 2	-	-	-	-	-	-	582	446	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	913	-	-	1041	-	-	122	0	482
Mov Cap-2 Maneuver	-	-	-	-	-	-	122	0	-
Stage 1	-	-	-	-	-	-	374	0	-
Stage 2	-	-	-	-	-	-	503	0	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	1	21.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	913	-	-	1041	-	-	281
HCM Lane V/C Ratio	0.09	-	-	0.088	-	-	0.205
HCM Control Delay (s)	9.3	0	-	8.8	0	-	21.1
HCM Lane LOS	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	-	-	0.3	-	-	0.8

Intersection	
Intersection Delay, s/veh	222.6
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	4	1	1	0	277	10	344	0	9	165	32
Future Vol, veh/h	0	4	1	1	0	277	10	344	0	9	165	32
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	4	1	1	0	301	11	374	0	10	179	35
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	14	24.7	15.5
HCM LOS	B	C	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	5%	0%	67%	97%	0%	60%
Vol Thru, %	95%	0%	17%	3%	0%	39%
Vol Right, %	0%	100%	17%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	174	32	6	287	344	892
LT Vol	9	0	4	277	0	531
Through Vol	165	0	1	10	0	351
RT Vol	0	32	1	0	344	10
Lane Flow Rate	189	35	7	312	374	970
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.386	0.064	0.015	0.639	0.643	1.861
Departure Headway (Hd)	8.415	7.655	10.832	8.997	7.773	6.909
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	431	471	332	406	467	533
Service Time	6.115	5.355	8.832	6.697	5.473	4.909
HCM Lane V/C Ratio	0.439	0.074	0.021	0.768	0.801	1.82
HCM Control Delay	16.3	10.9	14	26.3	23.4	411.8
HCM Lane LOS	C	B	B	D	C	F
HCM 95th-tile Q	1.8	0.2	0	4.3	4.4	61.9

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	531	351	10
Future Vol, veh/h	0	531	351	10
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	577	382	11
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	411.8
HCM LOS	F

Intersection	
Int Delay, s/veh	7.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	17	102	562	223	561	58	0	0	0	17	51	128
Future Vol, veh/h	17	102	562	223	561	58	0	0	0	17	51	128
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	111	611	242	610	63	0	0	0	18	55	139

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	673	0	0	722	0	0	1579	1885	641
Stage 1	-	-	-	-	-	-	1126	1126	-
Stage 2	-	-	-	-	-	-	453	759	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	918	-	-	880	-	-	120	71	475
Stage 1	-	-	-	-	-	-	310	280	-
Stage 2	-	-	-	-	-	-	640	415	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	918	-	-	880	-	-	64	0	475
Mov Cap-2 Maneuver	-	-	-	-	-	-	64	0	-
Stage 1	-	-	-	-	-	-	172	0	-
Stage 2	-	-	-	-	-	-	616	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	2.8	53.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	918	-	-	880	-	-	271
HCM Lane V/C Ratio	0.02	-	-	0.275	-	-	0.786
HCM Control Delay (s)	9	0	-	10.6	0	-	53.9
HCM Lane LOS	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	0.1	-	-	1.1	-	-	6

Intersection	
Intersection Delay, s/veh	173
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	13	23	9	0	49	15	599	0	3	377	222
Future Vol, veh/h	0	13	23	9	0	49	15	599	0	3	377	222
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	14	25	10	0	53	16	651	0	3	410	241
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	17.9	161	43.4
HCM LOS	C	F	E

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	1%	0%	29%	77%	0%	71%
Vol Thru, %	99%	0%	51%	23%	0%	28%
Vol Right, %	0%	100%	20%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	380	222	45	64	599	668
LT Vol	3	0	13	49	0	473
Through Vol	377	0	23	15	0	189
RT Vol	0	222	9	0	599	6
Lane Flow Rate	413	241	49	70	651	726
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.903	0.48	0.136	0.16	1.305	1.62
Departure Headway (Hd)	9.733	8.991	12.867	9.24	8.107	8.849
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	376	403	281	391	456	421
Service Time	7.433	6.691	10.867	6.94	5.807	6.849
HCM Lane V/C Ratio	1.098	0.598	0.174	0.179	1.428	1.724
HCM Control Delay	57.2	19.7	17.9	13.7	176.7	312.3
HCM Lane LOS	F	C	C	B	F	F
HCM 95th-tile Q	9.2	2.5	0.5	0.6	25.5	38

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	473	189	6
Future Vol, veh/h	0	473	189	6
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	514	205	7
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	312.3
HCM LOS	F

Intersection	
Int Delay, s/veh	5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	109	296	383	117	750	126	0	0	0	10	33	30
Future Vol, veh/h	109	296	383	117	750	126	0	0	0	10	33	30
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	118	322	416	127	815	137	0	0	0	11	36	33

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	952	0	0	738	0	0	1905	2113	884
Stage 1	-	-	-	-	-	-	1138	1138	-
Stage 2	-	-	-	-	-	-	767	975	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	722	-	-	868	-	-	75	51	344
Stage 1	-	-	-	-	-	-	306	276	-
Stage 2	-	-	-	-	-	-	458	330	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	722	-	-	868	-	-	36	0	344
Mov Cap-2 Maneuver	-	-	-	-	-	-	36	0	-
Stage 1	-	-	-	-	-	-	208	0	-
Stage 2	-	-	-	-	-	-	320	0	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	1.2	95.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	722	-	-	868	-	-	110
HCM Lane V/C Ratio	0.164	-	-	0.147	-	-	0.721
HCM Control Delay (s)	11	0	-	9.9	0	-	95.7
HCM Lane LOS	B	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.6	-	-	0.5	-	-	3.9

Intersection	
Intersection Delay, s/veh	87.1
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	3	15	4	0	197	13	250	0	7	119	23
Future Vol, veh/h	0	3	15	4	0	197	13	250	0	7	119	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	3	16	4	0	214	14	272	0	8	129	25
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	12.1	16	12.4
HCM LOS	B	C	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	6%	0%	14%	94%	0%	60%
Vol Thru, %	94%	0%	68%	6%	0%	39%
Vol Right, %	0%	100%	18%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	126	23	22	210	250	651
LT Vol	7	0	3	197	0	392
Through Vol	119	0	15	13	0	252
RT Vol	0	23	4	0	250	7
Lane Flow Rate	137	25	24	228	272	708
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.269	0.044	0.052	0.46	0.46	1.272
Departure Headway (Hd)	7.455	6.704	8.642	7.918	6.721	6.469
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	485	537	417	459	541	566
Service Time	5.155	4.404	6.642	5.618	4.421	4.481
HCM Lane V/C Ratio	0.282	0.047	0.058	0.497	0.503	1.251
HCM Control Delay	12.9	9.7	12.1	17.2	15	157
HCM Lane LOS	B	A	B	C	B	F
HCM 95th-tile Q	1.1	0.1	0.2	2.4	2.4	28.3

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	392	252	7
Future Vol, veh/h	0	392	252	7
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	426	274	8
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	157
HCM LOS	F

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	17	77	291	159	409	41	0	0	0	12	36	93
Future Vol, veh/h	17	77	291	159	409	41	0	0	0	12	36	93
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	84	316	173	445	45	0	0	0	13	39	101

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	489	0	0	400	0	0	1091	1249	467
Stage 1	-	-	-	-	-	-	812	812	-
Stage 2	-	-	-	-	-	-	279	437	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1074	-	-	1159	-	-	238	173	596
Stage 1	-	-	-	-	-	-	437	392	-
Stage 2	-	-	-	-	-	-	768	579	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1074	-	-	1159	-	-	185	0	596
Mov Cap-2 Maneuver	-	-	-	-	-	-	185	0	-
Stage 1	-	-	-	-	-	-	347	0	-
Stage 2	-	-	-	-	-	-	750	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	2.3	16.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1074	-	-	1159	-	-	475
HCM Lane V/C Ratio	0.017	-	-	0.149	-	-	0.323
HCM Control Delay (s)	8.4	0	-	8.7	0	-	16.1
HCM Lane LOS	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	-	-	0.5	-	-	1.4

Intersection	
Intersection Delay, s/veh	57.7
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	9	27	8	0	35	25	441	0	5	271	158
Future Vol, veh/h	0	9	27	8	0	35	25	441	0	5	271	158
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	10	29	9	0	38	27	479	0	5	295	172
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	14.3	43.6	20.4
HCM LOS	B	E	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	2%	0%	20%	58%	0%	71%
Vol Thru, %	98%	0%	61%	42%	0%	28%
Vol Right, %	0%	100%	18%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	276	158	44	60	441	485
LT Vol	5	0	9	35	0	346
Through Vol	271	0	27	25	0	135
RT Vol	0	158	8	0	441	4
Lane Flow Rate	300	172	48	65	479	527
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.645	0.335	0.124	0.142	0.911	1.131
Departure Headway (Hd)	8.051	7.317	9.942	8.247	7.223	7.725
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	453	495	363	438	503	474
Service Time	5.751	5.017	7.942	5.947	4.923	5.741
HCM Lane V/C Ratio	0.662	0.347	0.132	0.148	0.952	1.112
HCM Control Delay	24.2	13.7	14.3	12.3	47.9	109.6
HCM Lane LOS	C	B	B	B	E	F
HCM 95th-tile Q	4.5	1.5	0.4	0.5	10.6	18.4

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	346	135	4
Future Vol, veh/h	0	346	135	4
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	376	147	4
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	109.6
HCM LOS	F

Intersection	
Int Delay, s/veh	2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	79	214	286	84	559	90	0	0	0	7	24	27
Future Vol, veh/h	79	214	286	84	559	90	0	0	0	7	24	27
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	86	233	311	91	608	98	0	0	0	8	26	29

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	705	0	0	543	0	0	1399	1554	657
Stage 1	-	-	-	-	-	-	839	839	-
Stage 2	-	-	-	-	-	-	560	715	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	893	-	-	1026	-	-	155	113	465
Stage 1	-	-	-	-	-	-	424	381	-
Stage 2	-	-	-	-	-	-	572	434	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	893	-	-	1026	-	-	113	0	465
Mov Cap-2 Maneuver	-	-	-	-	-	-	113	0	-
Stage 1	-	-	-	-	-	-	361	0	-
Stage 2	-	-	-	-	-	-	489	0	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	1	21.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	893	-	-	1026	-	-	283
HCM Lane V/C Ratio	0.096	-	-	0.089	-	-	0.223
HCM Control Delay (s)	9.5	0	-	8.9	0	-	21.3
HCM Lane LOS	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.3	-	-	0.3	-	-	0.8

Intersection	
Intersection Delay, s/veh	236.8
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	4	15	4	0	277	16	349	0	10	166	32
Future Vol, veh/h	0	4	15	4	0	277	16	349	0	10	166	32
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	4	16	4	0	301	17	379	0	11	180	35
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	14.7	26.3	16.2
HCM LOS	B	D	C

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	6%	0%	17%	95%	0%	60%
Vol Thru, %	94%	0%	65%	5%	0%	39%
Vol Right, %	0%	100%	17%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	176	32	23	293	349	908
LT Vol	10	0	4	277	0	545
Through Vol	166	0	15	16	0	353
RT Vol	0	32	4	0	349	10
Lane Flow Rate	191	35	25	318	379	987
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.402	0.066	0.059	0.658	0.66	1.928
Departure Headway (Hd)	8.655	7.892	10.964	9.219	8.002	7.034
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	419	457	329	395	455	523
Service Time	6.355	5.592	8.964	6.919	5.702	5.043
HCM Lane V/C Ratio	0.456	0.077	0.076	0.805	0.833	1.887
HCM Control Delay	17.1	11.1	14.7	28	24.9	441.8
HCM Lane LOS	C	B	B	D	C	F
HCM 95th-tile Q	1.9	0.2	0.2	4.5	4.7	65

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	545	353	10
Future Vol, veh/h	0	545	353	10
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	592	384	11
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	441.8
HCM LOS	F

Intersection	
Int Delay, s/veh	68.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕						⇕	
Traffic Vol, veh/h	22	107	520	223	570	58	0	0	0	17	51	130
Future Vol, veh/h	22	107	520	223	570	58	0	0	0	17	51	130
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	116	565	242	620	63	0	0	0	18	55	141

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	683	0	0	682	0	0	1583	1865	651
Stage 1	-	-	-	-	-	-	1136	1136	-
Stage 2	-	-	-	-	-	-	447	729	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	910	-	-	911	-	-	88	73	469
Stage 1	-	-	-	-	-	-	246	277	-
Stage 2	-	-	-	-	-	-	591	428	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	910	-	-	911	-	-	56	~ 39	469
Mov Cap-2 Maneuver	-	-	-	-	-	-	56	~ 39	-
Stage 1	-	-	-	-	-	-	234	157	-
Stage 2	-	-	-	-	-	-	563	408	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	2.7	$ 571.1
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	910	-	-	911	-	-	105
HCM Lane V/C Ratio	0.026	-	-	0.266	-	-	2.05
HCM Control Delay (s)	9.1	0	-	10.4	0	-	$ 571.1
HCM Lane LOS	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	0.1	-	-	1.1	-	-	18.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	185
Intersection LOS	F

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Lane Configurations												
Traffic Vol, veh/h	0	13	33	11	0	49	30	613	0	6	379	222
Future Vol, veh/h	0	13	33	11	0	49	30	613	0	6	379	222
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	14	36	12	0	53	33	666	0	7	412	241
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	1

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	2	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	2	1	2
HCM Control Delay	18.9	175.3	46.7
HCM LOS	C	F	E

Lane	NBLn1	NBLn2	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	2%	0%	23%	62%	0%	71%
Vol Thru, %	98%	0%	58%	38%	0%	28%
Vol Right, %	0%	100%	19%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	385	222	57	79	613	678
LT Vol	6	0	13	49	0	482
Through Vol	379	0	33	30	0	190
RT Vol	0	222	11	0	613	6
Lane Flow Rate	418	241	62	86	666	737
Geometry Grp	7	7	6	7	7	6
Degree of Util (X)	0.923	0.485	0.173	0.198	1.351	1.666
Departure Headway (Hd)	9.975	9.227	13.126	9.331	8.272	9.03
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	368	393	275	387	446	413
Service Time	7.675	6.927	11.126	7.031	5.972	7.03
HCM Lane V/C Ratio	1.136	0.613	0.225	0.222	1.493	1.785
HCM Control Delay	62	20.3	18.9	14.3	196.1	332.8
HCM Lane LOS	F	C	C	B	F	F
HCM 95th-tile Q	9.6	2.6	0.6	0.7	27.2	39.5

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Lane Configurations				
Traffic Vol, veh/h	0	482	190	6
Future Vol, veh/h	0	482	190	6
Peak Hour Factor	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	524	207	7
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	2
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	332.8
HCM LOS	F

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	112	299	396	117	724	126	0	0	0	10	33	35
Future Vol, veh/h	112	299	396	117	724	126	0	0	0	10	33	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	122	325	430	127	787	137	0	0	0	11	36	38

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	924	0	0	755	0	0	1894	2109	855
Stage 1	-	-	-	-	-	-	1110	1110	-
Stage 2	-	-	-	-	-	-	784	999	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	739	-	-	855	-	-	77	51	358
Stage 1	-	-	-	-	-	-	315	285	-
Stage 2	-	-	-	-	-	-	450	321	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	739	-	-	855	-	-	36	0	358
Mov Cap-2 Maneuver	-	-	-	-	-	-	36	0	-
Stage 1	-	-	-	-	-	-	216	0	-
Stage 2	-	-	-	-	-	-	311	0	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	1.2	86.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	739	-	-	855	-	-	120
HCM Lane V/C Ratio	0.165	-	-	0.149	-	-	0.707
HCM Control Delay (s)	10.8	0	-	9.9	0	-	86.9
HCM Lane LOS	B	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.6	-	-	0.5	-	-	3.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	15	4	197	13	250	7	119	23	392	252	7
Future Volume (veh/h)	3	15	4	197	13	250	7	119	23	392	252	7
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	3	16	4	214	14	272	8	129	25	426	274	8
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	398	329	82	461	426	749	318	277	236	694	883	26
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.15	0.15	0.15	0.24	0.49	0.49
Ln Grp Delay, s/veh	14.0	0.0	14.0	17.4	13.9	8.1	16.9	19.2	17.2	11.0	0.0	7.3
Ln Grp LOS	B		B	B	B	A	B	B	B	B		A
Approach Vol, veh/h		23			500			162			708	
Approach Delay, s/veh		14.0			12.2			18.8			9.5	
Approach LOS		B			B			B			A	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Case No	1.2	5.0		6.0		4.0		5.0
Phs Duration (G+Y+Rc), s	15.8	13.4		17.1		29.2		17.1
Change Period (Y+Rc), s	4.5	6.5		6.5		6.5		6.5
Max Green (Gmax), s	24.5	21.5		26.5		50.5		26.5
Max Allow Headway (MAH), s	3.7	4.8		3.9		4.8		3.9
Max Q Clear (g_c+I1), s	10.2	4.9		2.4		6.2		9.0
Green Ext Time (g_e), s	1.1	2.0		1.7		2.3		1.6
Prob of Phs Call (p_c)	1.00	1.00		1.00		1.00		1.00
Prob of Max Out (p_x)	0.00	0.02		0.00		0.00		0.00

Left-Turn Movement Data								
Assigned Mvmt	1	5		7				3
Mvmt Sat Flow, veh/h	1774	1093		1089				1386

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		1863		1439		1801		1863

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		360		53		1583

Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	3
Lane Assignment	(Pr/Pm)							

Lanes in Grp	1	1	0	1	0	0	0	1
Grp Vol (v), veh/h	426	8	0	3	0	0	0	214
Grp Sat Flow (s), veh/h/ln	1774	1093	0	1089	0	0	0	1386
Q Serve Time (g_s), s	8.2	0.3	0.0	0.1	0.0	0.0	0.0	6.6
Cycle Q Clear Time (g_c), s	8.2	0.3	0.0	0.4	0.0	0.0	0.0	7.0
Perm LT Sat Flow (s_l), veh/h/ln	1228	1093	0	1089	0	0	0	1386
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	8.9	6.9	0.0	10.6	0.0	0.0	0.0	10.6
Perm LT Serve Time (g_u), s	4.0	6.9	0.0	10.3	0.0	0.0	0.0	10.2
Perm LT Q Serve Time (g_ps), s	2.6	0.3	0.0	0.1	0.0	0.0	0.0	6.6
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
Lane Grp Cap (c), veh/h	694	318	0	398	0	0	0	461
V/C Ratio (X)	0.61	0.03	0.00	0.01	0.00	0.00	0.00	0.46
Avail Cap (c_a), veh/h	1200	664	0	773	0	0	0	938
Upstream Filter (I)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	10.1	16.9	0.0	14.0	0.0	0.0	0.0	16.6
Incr Delay (d2), s/veh	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	11.0	16.9	0.0	14.0	0.0	0.0	0.0	17.4
1st-Term Q (Q1), veh/ln	3.9	0.1	0.0	0.0	0.0	0.0	0.0	2.5
2nd-Term Q (Q2), veh/ln	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	4.1	0.1	0.0	0.0	0.0	0.0	0.0	2.6
%ile Storage Ratio (RQ%)	0.35	0.01	0.00	0.00	0.00	0.00	0.00	0.26
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T						T
Lanes in Grp	0	1	0	0	0	0	0	1
Grp Vol (v), veh/h	0	129	0	0	0	0	0	14
Grp Sat Flow (s), veh/h/ln	0	1863	0	0	0	0	0	1863
Q Serve Time (g_s), s	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.3
Cycle Q Clear Time (g_c), s	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.3
Lane Grp Cap (c), veh/h	0	277	0	0	0	0	0	426
V/C Ratio (X)	0.00	0.47	0.00	0.00	0.00	0.00	0.00	0.03
Avail Cap (c_a), veh/h	0	866	0	0	0	0	0	1067
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	18.0	0.0	0.0	0.0	0.0	0.0	13.9
Incr Delay (d2), s/veh	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	19.2	0.0	0.0	0.0	0.0	0.0	13.9
1st-Term Q (Q1), veh/ln	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.1

2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.1
%ile Storage Ratio (RQ%)	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	25	0	20	0	282	0	272
Grp Sat Flow (s), veh/h/ln	0	1583	0	1799	0	1853	0	1583
Q Serve Time (g_s), s	0.0	0.6	0.0	0.4	0.0	4.2	0.0	5.1
Cycle Q Clear Time (g_c), s	0.0	0.6	0.0	0.4	0.0	4.2	0.0	5.1
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1583.3
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.3
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.20	0.00	0.03	0.00	1.00
Lane Grp Cap (c), veh/h	0	236	0	411	0	909	0	749
V/C Ratio (X)	0.00	0.11	0.00	0.05	0.00	0.31	0.00	0.36
Avail Cap (c_a), veh/h	0	736	0	1031	0	2024	0	1294
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	17.0	0.0	13.9	0.0	7.1	0.0	7.8
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	17.2	0.0	14.0	0.0	7.3	0.0	8.1
1st-Term Q (Q1), veh/ln	0.0	0.3	0.0	0.2	0.0	2.1	0.0	2.1
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.3	0.0	0.2	0.0	2.2	0.0	2.2
%ile Storage Ratio (RQ%)	0.00	0.03	0.00	0.02	0.00	0.07	0.00	0.28
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	11.6
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	15	4	197	13	250	7	119	23	392	252	7
Future Volume (veh/h)	3	15	4	197	13	250	7	119	23	392	252	7
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	3	16	4	214	14	272	8	129	25	426	274	8
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	398	329	82	461	426	749	318	277	236	694	883	26
Arrive On Green	0.23	0.23	0.23	0.23	0.23	0.23	0.15	0.15	0.15	0.24	0.49	0.49
Sat Flow, veh/h	1089	1439	360	1386	1863	1583	1093	1863	1583	1774	1801	53
Grp Volume(v), veh/h	3	0	20	214	14	272	8	129	25	426	0	282
Grp Sat Flow(s),veh/h/ln	1089	0	1799	1386	1863	1583	1093	1863	1583	1774	0	1853
Q Serve(g_s), s	0.1	0.0	0.4	6.6	0.3	5.1	0.3	2.9	0.6	8.2	0.0	4.2
Cycle Q Clear(g_c), s	0.4	0.0	0.4	7.0	0.3	5.1	0.3	2.9	0.6	8.2	0.0	4.2
Prop In Lane	1.00		0.20	1.00		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	398	0	411	461	426	749	318	277	236	694	0	909
V/C Ratio(X)	0.01	0.00	0.05	0.46	0.03	0.36	0.03	0.47	0.11	0.61	0.00	0.31
Avail Cap(c_a), veh/h	773	0	1031	938	1067	1294	664	866	736	1200	0	2024
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.0	0.0	13.9	16.6	13.9	7.8	16.9	18.0	17.0	10.1	0.0	7.1
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.3	0.0	1.2	0.2	0.9	0.0	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.2	2.6	0.1	2.2	0.1	1.6	0.3	4.1	0.0	2.2
LnGrp Delay(d),s/veh	14.0	0.0	14.0	17.4	13.9	8.1	16.9	19.2	17.2	11.0	0.0	7.3
LnGrp LOS	B		B	B	B	A	B	B	B	B		A
Approach Vol, veh/h		23			500			162			708	
Approach Delay, s/veh		14.0			12.2			18.8			9.5	
Approach LOS		B			B			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	15.8	13.4		17.1		29.2		17.1
Change Period (Y+Rc), s	4.5	6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s	24.5	21.5		26.5		50.5		26.5
Max Q Clear Time (g_c+I1), s	10.2	4.9		2.4		6.2		9.0
Green Ext Time (p_c), s	1.1	2.0		1.7		2.3		1.6

Intersection Summary	
HCM 2010 Ctrl Delay	11.6
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	3.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	17	77	291	159	409	41	0	0	0	12	36	93
Future Vol, veh/h	17	77	291	159	409	41	0	0	0	12	36	93
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	18	84	316	173	445	45	0	0	0	13	39	101

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	489	0	0	400	0	0	1091	1249	467
Stage 1	-	-	-	-	-	-	812	812	-
Stage 2	-	-	-	-	-	-	279	437	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	1074	-	-	1159	-	-	238	173	596
Stage 1	-	-	-	-	-	-	437	392	-
Stage 2	-	-	-	-	-	-	768	579	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	1074	-	-	1159	-	-	185	0	596
Mov Cap-2 Maneuver	-	-	-	-	-	-	185	0	-
Stage 1	-	-	-	-	-	-	347	0	-
Stage 2	-	-	-	-	-	-	750	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	2.3	16.1
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	1074	-	-	1159	-	-	475
HCM Lane V/C Ratio	0.017	-	-	0.149	-	-	0.323
HCM Control Delay (s)	8.4	0	-	8.7	0	-	16.1
HCM Lane LOS	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.1	-	-	0.5	-	-	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	27	8	35	25	441	5	271	158	346	135	4
Future Volume (veh/h)	9	27	8	35	25	441	5	271	158	346	135	4
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	10	29	9	38	27	479	5	295	172	376	147	4
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	368	393	122	494	537	764	395	414	352	536	889	24
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.22	0.22	0.22	0.19	0.49	0.49
Ln Grp Delay, s/veh	15.7	0.0	15.4	16.2	15.3	12.2	18.0	23.6	21.2	14.6	0.0	8.4
Ln Grp LOS	B		B	B	B	B	B	C	C	B		A
Approach Vol, veh/h		48			544			472			527	
Approach Delay, s/veh		15.5			12.7			22.6			12.8	
Approach LOS		B			B			C			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Case No	1.2	5.0		6.0		4.0		5.0
Phs Duration (G+Y+Rc), s	16.0	19.7		23.6		35.7		23.6
Change Period (Y+Rc), s	4.5	6.5		6.5		6.5		6.5
Max Green (Gmax), s	20.1	25.9		26.5		50.5		26.5
Max Allow Headway (MAH), s	3.7	4.6		4.1		4.6		4.1
Max Q Clear (g_c+I1), s	10.8	10.7		3.1		4.7		15.3
Green Ext Time (g_e), s	0.8	2.5		2.2		3.0		1.8
Prob of Phs Call (p_c)	1.00	1.00		1.00		1.00		1.00
Prob of Max Out (p_x)	0.04	0.06		0.00		0.00		0.09

Left-Turn Movement Data								
Assigned Mvmt	1	5		7				3
Mvmt Sat Flow, veh/h	1774	1231		889				1364

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		1863		1365		1805		1863

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		423		49		1583

Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	3
Lane Assignment	(Pr/Pm)							

Lanes in Grp	1	1	0	1	0	0	0	1
Grp Vol (v), veh/h	376	5	0	10	0	0	0	38
Grp Sat Flow (s), veh/h/ln	1774	1231	0	889	0	0	0	1364
Q Serve Time (g_s), s	8.8	0.2	0.0	0.5	0.0	0.0	0.0	1.2
Cycle Q Clear Time (g_c), s	8.8	0.2	0.0	1.1	0.0	0.0	0.0	2.2
Perm LT Sat Flow (s_l), veh/h/ln	922	1231	0	889	0	0	0	1364
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	15.2	13.2	0.0	17.1	0.0	0.0	0.0	17.1
Perm LT Serve Time (g_u), s	4.5	13.2	0.0	16.5	0.0	0.0	0.0	16.2
Perm LT Q Serve Time (g_ps), s	4.5	0.2	0.0	0.5	0.0	0.0	0.0	1.2
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
Lane Grp Cap (c), veh/h	536	395	0	368	0	0	0	494
V/C Ratio (X)	0.70	0.01	0.00	0.03	0.00	0.00	0.00	0.08
Avail Cap (c_a), veh/h	793	659	0	509	0	0	0	710
Upstream Filter (I)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	12.9	18.0	0.0	15.6	0.0	0.0	0.0	16.1
Incr Delay (d2), s/veh	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	14.6	18.0	0.0	15.7	0.0	0.0	0.0	16.2
1st-Term Q (Q1), veh/ln	4.2	0.1	0.0	0.1	0.0	0.0	0.0	0.5
2nd-Term Q (Q2), veh/ln	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	4.4	0.1	0.0	0.1	0.0	0.0	0.0	0.5
%ile Storage Ratio (RQ%)	0.37	0.01	0.00	0.01	0.00	0.00	0.00	0.05
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T						T
Lanes in Grp	0	1	0	0	0	0	0	1
Grp Vol (v), veh/h	0	295	0	0	0	0	0	27
Grp Sat Flow (s), veh/h/ln	0	1863	0	0	0	0	0	1863
Q Serve Time (g_s), s	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.6
Cycle Q Clear Time (g_c), s	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.6
Lane Grp Cap (c), veh/h	0	414	0	0	0	0	0	537
V/C Ratio (X)	0.00	0.71	0.00	0.00	0.00	0.00	0.00	0.05
Avail Cap (c_a), veh/h	0	813	0	0	0	0	0	832
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	21.3	0.0	0.0	0.0	0.0	0.0	15.2
Incr Delay (d2), s/veh	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	23.6	0.0	0.0	0.0	0.0	0.0	15.3
1st-Term Q (Q1), veh/ln	0.0	4.4	0.0	0.0	0.0	0.0	0.0	0.3

2nd-Term Q (Q2), veh/ln	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	4.7	0.0	0.0	0.0	0.0	0.0	0.3
%ile Storage Ratio (RQ%)	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.01
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	172	0	38	0	151	0	479
Grp Sat Flow (s), veh/h/ln	0	1583	0	1788	0	1854	0	1583
Q Serve Time (g_s), s	0.0	5.6	0.0	0.9	0.0	2.7	0.0	13.3
Cycle Q Clear Time (g_c), s	0.0	5.6	0.0	0.9	0.0	2.7	0.0	13.3
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1583.3
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.24	0.00	0.03	0.00	1.00
Lane Grp Cap (c), veh/h	0	352	0	515	0	913	0	764
V/C Ratio (X)	0.00	0.49	0.00	0.07	0.00	0.17	0.00	0.63
Avail Cap (c_a), veh/h	0	691	0	799	0	1578	0	1015
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	20.1	0.0	15.4	0.0	8.3	0.0	11.4
Incr Delay (d2), s/veh	0.0	1.0	0.0	0.1	0.0	0.1	0.0	0.9
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	21.2	0.0	15.4	0.0	8.4	0.0	12.2
1st-Term Q (Q1), veh/ln	0.0	2.4	0.0	0.5	0.0	1.3	0.0	5.7
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	2.5	0.0	0.5	0.0	1.4	0.0	5.9
%ile Storage Ratio (RQ%)	0.00	0.26	0.00	0.04	0.00	0.05	0.00	0.74
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	15.8
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	27	8	35	25	441	5	271	158	346	135	4
Future Volume (veh/h)	9	27	8	35	25	441	5	271	158	346	135	4
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	10	29	9	38	27	479	5	295	172	376	147	4
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	368	393	122	494	537	764	395	414	352	536	889	24
Arrive On Green	0.29	0.29	0.29	0.29	0.29	0.29	0.22	0.22	0.22	0.19	0.49	0.49
Sat Flow, veh/h	889	1365	423	1364	1863	1583	1231	1863	1583	1774	1805	49
Grp Volume(v), veh/h	10	0	38	38	27	479	5	295	172	376	0	151
Grp Sat Flow(s),veh/h/ln	889	0	1788	1364	1863	1583	1231	1863	1583	1774	0	1854
Q Serve(g_s), s	0.5	0.0	0.9	1.2	0.6	13.3	0.2	8.7	5.6	8.8	0.0	2.7
Cycle Q Clear(g_c), s	1.1	0.0	0.9	2.2	0.6	13.3	0.2	8.7	5.6	8.8	0.0	2.7
Prop In Lane	1.00		0.24	1.00		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	368	0	515	494	537	764	395	414	352	536	0	913
V/C Ratio(X)	0.03	0.00	0.07	0.08	0.05	0.63	0.01	0.71	0.49	0.70	0.00	0.17
Avail Cap(c_a), veh/h	509	0	799	710	832	1015	659	813	691	793	0	1578
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.6	0.0	15.4	16.1	15.2	11.4	18.0	21.3	20.1	12.9	0.0	8.3
Incr Delay (d2), s/veh	0.0	0.0	0.1	0.1	0.0	0.9	0.0	2.3	1.0	1.7	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.5	0.5	0.3	5.9	0.1	4.7	2.5	4.4	0.0	1.4
LnGrp Delay(d),s/veh	15.7	0.0	15.4	16.2	15.3	12.2	18.0	23.6	21.2	14.6	0.0	8.4
LnGrp LOS	B		B	B	B	B	B	C	C	B		A
Approach Vol, veh/h		48			544			472			527	
Approach Delay, s/veh		15.5			12.7			22.6			12.8	
Approach LOS		B			B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	16.0	19.7		23.6		35.7		23.6
Change Period (Y+Rc), s	4.5	6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s	20.1	25.9		26.5		50.5		26.5
Max Q Clear Time (g_c+I1), s	10.8	10.7		3.1		4.7		15.3
Green Ext Time (p_c), s	0.8	2.5		2.2		3.0		1.8

Intersection Summary	
HCM 2010 Ctrl Delay	15.8
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	79	214	286	84	559	90	0	0	0	7	24	27
Future Vol, veh/h	79	214	286	84	559	90	0	0	0	7	24	27
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	86	233	311	91	608	98	0	0	0	8	26	29

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	705	0	0	543	0	0	1399	1554	657
Stage 1	-	-	-	-	-	-	839	839	-
Stage 2	-	-	-	-	-	-	560	715	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	893	-	-	1026	-	-	118	113	465
Stage 1	-	-	-	-	-	-	360	381	-
Stage 2	-	-	-	-	-	-	513	434	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	893	-	-	1026	-	-	93	82	465
Mov Cap-2 Maneuver	-	-	-	-	-	-	93	82	-
Stage 1	-	-	-	-	-	-	308	324	-
Stage 2	-	-	-	-	-	-	439	371	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	1	52.5
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	893	-	-	1026	-	-	136
HCM Lane V/C Ratio	0.096	-	-	0.089	-	-	0.464
HCM Control Delay (s)	9.5	0	-	8.9	0	-	52.5
HCM Lane LOS	A	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.3	-	-	0.3	-	-	2.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	15	4	277	16	349	10	166	32	545	353	10
Future Volume (veh/h)	4	15	4	277	16	349	10	166	32	545	353	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	4	16	4	301	17	379	11	180	35	592	384	11
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	371	392	98	475	507	910	267	297	253	727	956	27
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.16	0.16	0.16	0.30	0.53	0.53
Ln Grp Delay, s/veh	17.9	0.0	17.7	24.2	17.6	8.1	23.6	27.7	24.0	18.6	0.0	9.5
Ln Grp LOS	B		B	C	B	A	C	C	C	B		A
Approach Vol, veh/h		24			697			226			987	
Approach Delay, s/veh		17.7			15.3			27.0			15.0	
Approach LOS		B			B			C			B	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Case No	1.2	5.0		6.0		4.0		5.0
Phs Duration (G+Y+Rc), s	24.4	17.0		24.4		41.4		24.4
Change Period (Y+Rc), s	4.5	6.5		6.5		6.5		6.5
Max Green (Gmax), s	25.5	20.5		26.5		50.5		26.5
Max Allow Headway (MAH), s	3.7	4.8		3.9		4.8		3.9
Max Q Clear (g_c+I1), s	18.7	7.9		2.6		10.4		16.0
Green Ext Time (g_e), s	1.2	2.6		2.5		3.4		1.9
Prob of Phs Call (p_c)	1.00	1.00		1.00		1.00		1.00
Prob of Max Out (p_x)	0.30	0.15		0.00		0.00		0.13

Left-Turn Movement Data								
Assigned Mvmt	1	5		7				3
Mvmt Sat Flow, veh/h	1774	985		984				1386

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		1863		1439		1802		1863

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		360		52		1583

Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	3
Lane Assignment	(Pr/Pm)							

Lanes in Grp	1	1	0	1	0	0	0	1
Grp Vol (v), veh/h	592	11	0	4	0	0	0	301
Grp Sat Flow (s), veh/h/ln	1774	985	0	984	0	0	0	1386
Q Serve Time (g_s), s	16.7	0.6	0.0	0.2	0.0	0.0	0.0	13.4
Cycle Q Clear Time (g_c), s	16.7	0.6	0.0	0.6	0.0	0.0	0.0	14.0
Perm LT Sat Flow (s_l), veh/h/ln	1162	985	0	984	0	0	0	1386
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	12.5	10.5	0.0	17.9	0.0	0.0	0.0	17.9
Perm LT Serve Time (g_u), s	4.6	10.5	0.0	17.5	0.0	0.0	0.0	17.4
Perm LT Q Serve Time (g_ps), s	4.6	0.6	0.0	0.2	0.0	0.0	0.0	13.4
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
Lane Grp Cap (c), veh/h	727	267	0	371	0	0	0	475
V/C Ratio (X)	0.81	0.04	0.00	0.01	0.00	0.00	0.00	0.63
Avail Cap (c_a), veh/h	877	416	0	499	0	0	0	656
Upstream Filter (I)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	13.6	23.5	0.0	17.8	0.0	0.0	0.0	22.8
Incr Delay (d2), s/veh	5.0	0.1	0.0	0.0	0.0	0.0	0.0	1.4
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	18.6	23.6	0.0	17.9	0.0	0.0	0.0	24.2
1st-Term Q (Q1), veh/ln	8.1	0.2	0.0	0.1	0.0	0.0	0.0	5.1
2nd-Term Q (Q2), veh/ln	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	9.1	0.2	0.0	0.1	0.0	0.0	0.0	5.3
%ile Storage Ratio (RQ%)	0.77	0.02	0.00	0.01	0.00	0.00	0.00	0.54
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T						T
Lanes in Grp	0	1	0	0	0	0	0	1
Grp Vol (v), veh/h	0	180	0	0	0	0	0	17
Grp Sat Flow (s), veh/h/ln	0	1863	0	0	0	0	0	1863
Q Serve Time (g_s), s	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.4
Cycle Q Clear Time (g_c), s	0.0	5.9	0.0	0.0	0.0	0.0	0.0	0.4
Lane Grp Cap (c), veh/h	0	297	0	0	0	0	0	507
V/C Ratio (X)	0.00	0.61	0.00	0.00	0.00	0.00	0.00	0.03
Avail Cap (c_a), veh/h	0	580	0	0	0	0	0	749
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	25.7	0.0	0.0	0.0	0.0	0.0	17.6
Incr Delay (d2), s/veh	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	27.7	0.0	0.0	0.0	0.0	0.0	17.6
1st-Term Q (Q1), veh/ln	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.2

2nd-Term Q (Q2), veh/ln	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.2
%ile Storage Ratio (RQ%)	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	35	0	20	0	395	0	379
Grp Sat Flow (s), veh/h/ln	0	1583	0	1799	0	1854	0	1583
Q Serve Time (g_s), s	0.0	1.3	0.0	0.5	0.0	8.4	0.0	8.8
Cycle Q Clear Time (g_c), s	0.0	1.3	0.0	0.5	0.0	8.4	0.0	8.8
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1583.3
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.9
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.20	0.00	0.03	0.00	1.00
Lane Grp Cap (c), veh/h	0	253	0	490	0	983	0	910
V/C Ratio (X)	0.00	0.14	0.00	0.04	0.00	0.40	0.00	0.42
Avail Cap (c_a), veh/h	0	493	0	724	0	1421	0	1116
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	23.8	0.0	17.6	0.0	9.2	0.0	7.8
Incr Delay (d2), s/veh	0.0	0.2	0.0	0.0	0.0	0.3	0.0	0.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	24.0	0.0	17.7	0.0	9.5	0.0	8.1
1st-Term Q (Q1), veh/ln	0.0	0.5	0.0	0.3	0.0	4.3	0.0	3.8
2nd-Term Q (Q2), veh/ln	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	0.6	0.0	0.3	0.0	4.4	0.0	3.9
%ile Storage Ratio (RQ%)	0.00	0.06	0.00	0.02	0.00	0.15	0.00	0.49
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	16.5
HCM 2010 LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	15	4	277	16	349	10	166	32	545	353	10
Future Volume (veh/h)	4	15	4	277	16	349	10	166	32	545	353	10
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	4	16	4	301	17	379	11	180	35	592	384	11
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	371	392	98	475	507	910	267	297	253	727	956	27
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.16	0.16	0.16	0.30	0.53	0.53
Sat Flow, veh/h	984	1439	360	1386	1863	1583	985	1863	1583	1774	1802	52
Grp Volume(v), veh/h	4	0	20	301	17	379	11	180	35	592	0	395
Grp Sat Flow(s),veh/h/ln	984	0	1799	1386	1863	1583	985	1863	1583	1774	0	1854
Q Serve(g_s), s	0.2	0.0	0.5	13.4	0.4	8.8	0.6	5.9	1.3	16.7	0.0	8.4
Cycle Q Clear(g_c), s	0.6	0.0	0.5	14.0	0.4	8.8	0.6	5.9	1.3	16.7	0.0	8.4
Prop In Lane	1.00		0.20	1.00		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	371	0	490	475	507	910	267	297	253	727	0	983
V/C Ratio(X)	0.01	0.00	0.04	0.63	0.03	0.42	0.04	0.61	0.14	0.81	0.00	0.40
Avail Cap(c_a), veh/h	499	0	724	656	749	1116	416	580	493	877	0	1421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.8	0.0	17.6	22.8	17.6	7.8	23.5	25.7	23.8	13.6	0.0	9.2
Incr Delay (d2), s/veh	0.0	0.0	0.0	1.4	0.0	0.3	0.1	2.0	0.2	5.0	0.0	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.3	5.3	0.2	3.9	0.2	3.2	0.6	9.1	0.0	4.4
LnGrp Delay(d),s/veh	17.9	0.0	17.7	24.2	17.6	8.1	23.6	27.7	24.0	18.6	0.0	9.5
LnGrp LOS	B		B	C	B	A	C	C	C	B		A
Approach Vol, veh/h		24			697			226			987	
Approach Delay, s/veh		17.7			15.3			27.0			15.0	
Approach LOS		B			B			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	24.4	17.0		24.4		41.4		24.4
Change Period (Y+Rc), s	4.5	6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s	25.5	20.5		26.5		50.5		26.5
Max Q Clear Time (g_c+I1), s	18.7	7.9		2.6		10.4		16.0
Green Ext Time (p_c), s	1.2	2.6		2.5		3.4		1.9

Intersection Summary	
HCM 2010 Ctrl Delay	16.5
HCM 2010 LOS	B

Intersection	
Int Delay, s/veh	7.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	22	107	520	223	570	58	0	0	0	17	51	130
Future Vol, veh/h	22	107	520	223	570	58	0	0	0	17	51	130
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	116	565	242	620	63	0	0	0	18	55	141

Major/Minor	Major1			Major2						Minor2		
Conflicting Flow All	683	0	0	682	0	0				1583	1865	651
Stage 1	-	-	-	-	-	-				1136	1136	-
Stage 2	-	-	-	-	-	-				447	729	-
Critical Hdwy	4.12	-	-	4.12	-	-				6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-				5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-				5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-				3.518	4.018	3.318
Pot Cap-1 Maneuver	910	-	-	911	-	-				120	73	469
Stage 1	-	-	-	-	-	-				306	277	-
Stage 2	-	-	-	-	-	-				644	428	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	910	-	-	911	-	-				65	0	469
Mov Cap-2 Maneuver	-	-	-	-	-	-				65	0	-
Stage 1	-	-	-	-	-	-				174	0	-
Stage 2	-	-	-	-	-	-				614	0	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	2.7	53.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	910	-	-	911	-	-	273
HCM Lane V/C Ratio	0.026	-	-	0.266	-	-	0.788
HCM Control Delay (s)	9.1	0	-	10.4	0	-	53.9
HCM Lane LOS	A	A	-	B	A	-	F
HCM 95th %tile Q(veh)	0.1	-	-	1.1	-	-	6.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	33	11	49	30	613	6	379	222	482	190	6
Future Volume (veh/h)	13	33	11	49	30	613	6	379	222	482	190	6
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q, veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj (A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	14	36	12	53	33	666	7	412	241	524	207	7
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Opposing Right Turn Influence	Yes			Yes			Yes			Yes		
Cap, veh/h	270	328	109	401	457	769	419	515	437	579	1035	35
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Prop Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.28	0.28	0.28	0.24	0.58	0.58
Ln Grp Delay, s/veh	22.2	0.0	21.6	23.1	21.4	27.1	19.4	29.3	23.8	25.5	0.0	7.5
Ln Grp LOS	C		C	C	C	C	B	C	C	C		A
Approach Vol, veh/h		62			752			660			738	
Approach Delay, s/veh		21.7			26.5			27.1			20.3	
Approach LOS		C			C			C			C	

Timer:	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Case No	1.2	5.0		6.0		4.0		5.0
Phs Duration (G+Y+Rc), s	22.1	26.8		24.5		48.9		24.5
Change Period (Y+Rc), s	4.5	6.5		6.5		6.5		6.5
Max Green (Gmax), s	26.5	28.0		18.0		59.0		18.0
Max Allow Headway (MAH), s	3.7	4.6		4.1		4.6		4.1
Max Q Clear (g_c+I1), s	16.4	17.1		4.1		6.0		20.0
Green Ext Time (g_e), s	1.2	3.2		2.9		4.6		0.0
Prob of Phs Call (p_c)	1.00	1.00		1.00		1.00		1.00
Prob of Max Out (p_x)	0.06	0.31		0.10		0.00		1.00

Left-Turn Movement Data								
Assigned Mvmt	1	5		7				3
Mvmt Sat Flow, veh/h	1774	1163		744				1352

Through Movement Data								
Assigned Mvmt		2		4		6		8
Mvmt Sat Flow, veh/h		1863		1338		1791		1863

Right-Turn Movement Data								
Assigned Mvmt		12		14		16		18
Mvmt Sat Flow, veh/h		1583		446		61		1583

Left Lane Group Data								
Assigned Mvmt	1	5	0	7	0	0	0	3
Lane Assignment	(Pr/Pm)							

Lanes in Grp	1	1	0	1	0	0	0	1
Grp Vol (v), veh/h	524	7	0	14	0	0	0	53
Grp Sat Flow (s), veh/h/ln	1774	1163	0	744	0	0	0	1352
Q Serve Time (g_s), s	14.4	0.3	0.0	1.1	0.0	0.0	0.0	2.3
Cycle Q Clear Time (g_c), s	14.4	0.3	0.0	2.1	0.0	0.0	0.0	3.9
Perm LT Sat Flow (s_l), veh/h/ln	776	1163	0	744	0	0	0	1352
Shared LT Sat Flow (s_sh), veh/h/ln	0	0	0	0	0	0	0	0
Perm LT Eff Green (g_p), s	22.3	20.3	0.0	18.0	0.0	0.0	0.0	18.0
Perm LT Serve Time (g_u), s	5.2	20.3	0.0	17.0	0.0	0.0	0.0	16.5
Perm LT Q Serve Time (g_ps), s	5.2	0.3	0.0	1.1	0.0	0.0	0.0	2.3
Time to First Blk (g_f), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Serve Time pre Blk (g_fs), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Prop LT Inside Lane (P_L)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
Lane Grp Cap (c), veh/h	579	419	0	270	0	0	0	401
V/C Ratio (X)	0.90	0.02	0.00	0.05	0.00	0.00	0.00	0.13
Avail Cap (c_a), veh/h	793	541	0	270	0	0	0	401
Upstream Filter (I)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	14.5	19.3	0.0	22.1	0.0	0.0	0.0	23.0
Incr Delay (d2), s/veh	11.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	25.5	19.4	0.0	22.2	0.0	0.0	0.0	23.1
1st-Term Q (Q1), veh/ln	10.0	0.1	0.0	0.2	0.0	0.0	0.0	0.9
2nd-Term Q (Q2), veh/ln	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	1.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00
%ile Back of Q (50%), veh/ln	11.8	0.1	0.0	0.2	0.0	0.0	0.0	0.9
%ile Storage Ratio (RQ%)	1.00	0.01	0.00	0.02	0.00	0.00	0.00	0.09
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Middle Lane Group Data								
Assigned Mvmt	0	2	0	4	0	6	0	8
Lane Assignment		T						T
Lanes in Grp	0	1	0	0	0	0	0	1
Grp Vol (v), veh/h	0	412	0	0	0	0	0	33
Grp Sat Flow (s), veh/h/ln	0	1863	0	0	0	0	0	1863
Q Serve Time (g_s), s	0.0	15.1	0.0	0.0	0.0	0.0	0.0	1.0
Cycle Q Clear Time (g_c), s	0.0	15.1	0.0	0.0	0.0	0.0	0.0	1.0
Lane Grp Cap (c), veh/h	0	515	0	0	0	0	0	457
V/C Ratio (X)	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.07
Avail Cap (c_a), veh/h	0	710	0	0	0	0	0	457
Upstream Filter (I)	0.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	24.7	0.0	0.0	0.0	0.0	0.0	21.3
Incr Delay (d2), s/veh	0.0	4.6	0.0	0.0	0.0	0.0	0.0	0.1
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	29.3	0.0	0.0	0.0	0.0	0.0	21.4
1st-Term Q (Q1), veh/ln	0.0	7.8	0.0	0.0	0.0	0.0	0.0	0.5

2nd-Term Q (Q2), veh/ln	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	8.4	0.0	0.0	0.0	0.0	0.0	0.5
%ile Storage Ratio (RQ%)	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.01
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Right Lane Group Data								
Assigned Mvmt	0	12	0	14	0	16	0	18
Lane Assignment		R		T+R		T+R		R
Lanes in Grp	0	1	0	1	0	1	0	1
Grp Vol (v), veh/h	0	241	0	48	0	214	0	666
Grp Sat Flow (s), veh/h/ln	0	1583	0	1784	0	1852	0	1583
Q Serve Time (g_s), s	0.0	9.5	0.0	1.5	0.0	4.0	0.0	18.0
Cycle Q Clear Time (g_c), s	0.0	9.5	0.0	1.5	0.0	4.0	0.0	18.0
Prot RT Sat Flow (s_R), veh/h/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1583.3
Prot RT Eff Green (g_R), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.6
Prop RT Outside Lane (P_R)	0.00	1.00	0.00	0.25	0.00	0.03	0.00	1.00
Lane Grp Cap (c), veh/h	0	437	0	437	0	1070	0	769
V/C Ratio (X)	0.00	0.55	0.00	0.11	0.00	0.20	0.00	0.87
Avail Cap (c_a), veh/h	0	604	0	437	0	1488	0	769
Upstream Filter (I)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
Uniform Delay (d1), s/veh	0.0	22.7	0.0	21.5	0.0	7.4	0.0	16.8
Incr Delay (d2), s/veh	0.0	1.1	0.0	0.1	0.0	0.1	0.0	10.3
Initial Q Delay (d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	0.0	23.8	0.0	21.6	0.0	7.5	0.0	27.1
1st-Term Q (Q1), veh/ln	0.0	4.2	0.0	0.8	0.0	2.1	0.0	11.8
2nd-Term Q (Q2), veh/ln	0.0	0.1	0.0	0.0	0.0	0.0	0.0	2.2
3rd-Term Q (Q3), veh/ln	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q Factor (f_B%)	0.00	1.00	0.00	1.00	0.00	1.00	0.00	1.00
%ile Back of Q (50%), veh/ln	0.0	4.3	0.0	0.8	0.0	2.1	0.0	14.0
%ile Storage Ratio (RQ%)	0.00	0.44	0.00	0.06	0.00	0.07	0.00	1.78
Initial Q (Qb), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Final (Residual) Q (Qe), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Delay (ds), s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Q (Qs), veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sat Cap (cs), veh/h	0	0	0	0	0	0	0	0
Initial Q Clear Time (tc), h	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Intersection Summary	
HCM 2010 Ctrl Delay	24.5
HCM 2010 LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	13	33	11	49	30	613	6	379	222	482	190	6
Future Volume (veh/h)	13	33	11	49	30	613	6	379	222	482	190	6
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1863	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	14	36	12	53	33	666	7	412	241	524	207	7
Adj No. of Lanes	1	1	0	1	1	1	1	1	1	1	1	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	270	328	109	401	457	769	419	515	437	579	1035	35
Arrive On Green	0.25	0.25	0.25	0.25	0.25	0.25	0.28	0.28	0.28	0.24	0.58	0.58
Sat Flow, veh/h	744	1338	446	1352	1863	1583	1163	1863	1583	1774	1791	61
Grp Volume(v), veh/h	14	0	48	53	33	666	7	412	241	524	0	214
Grp Sat Flow(s),veh/h/ln	744	0	1784	1352	1863	1583	1163	1863	1583	1774	0	1852
Q Serve(g_s), s	1.1	0.0	1.5	2.3	1.0	18.0	0.3	15.1	9.5	14.4	0.0	4.0
Cycle Q Clear(g_c), s	2.1	0.0	1.5	3.9	1.0	18.0	0.3	15.1	9.5	14.4	0.0	4.0
Prop In Lane	1.00		0.25	1.00		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	270	0	437	401	457	769	419	515	437	579	0	1070
V/C Ratio(X)	0.05	0.00	0.11	0.13	0.07	0.87	0.02	0.80	0.55	0.90	0.00	0.20
Avail Cap(c_a), veh/h	270	0	437	401	457	769	541	710	604	793	0	1488
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.1	0.0	21.5	23.0	21.3	16.8	19.3	24.7	22.7	14.5	0.0	7.4
Incr Delay (d2), s/veh	0.1	0.0	0.1	0.1	0.1	10.3	0.0	4.6	1.1	11.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	0.8	0.9	0.5	14.0	0.1	8.4	4.3	11.8	0.0	2.1
LnGrp Delay(d),s/veh	22.2	0.0	21.6	23.1	21.4	27.1	19.4	29.3	23.8	25.5	0.0	7.5
LnGrp LOS	C		C	C	C	C	B	C	C	C		A
Approach Vol, veh/h		62			752			660			738	
Approach Delay, s/veh		21.7			26.5			27.1			20.3	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2		4		6		8
Phs Duration (G+Y+Rc), s	22.1	26.8		24.5		48.9		24.5
Change Period (Y+Rc), s	4.5	6.5		6.5		6.5		6.5
Max Green Setting (Gmax), s	26.5	28.0		18.0		59.0		18.0
Max Q Clear Time (g_c+I1), s	16.4	17.1		4.1		6.0		20.0
Green Ext Time (p_c), s	1.2	3.2		2.9		4.6		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	24.5
HCM 2010 LOS	C

Intersection	
Int Delay, s/veh	4.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕						↕	
Traffic Vol, veh/h	112	299	396	117	724	126	0	0	0	10	33	35
Future Vol, veh/h	112	299	396	117	724	126	0	0	0	10	33	35
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	-	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	122	325	430	127	787	137	0	0	0	11	36	38

Major/Minor	Major1			Major2			Minor2		
Conflicting Flow All	924	0	0	755	0	0	1894	2109	855
Stage 1	-	-	-	-	-	-	1110	1110	-
Stage 2	-	-	-	-	-	-	784	999	-
Critical Hdwy	4.12	-	-	4.12	-	-	6.42	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	5.42	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	5.42	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318
Pot Cap-1 Maneuver	739	-	-	855	-	-	77	51	358
Stage 1	-	-	-	-	-	-	315	285	-
Stage 2	-	-	-	-	-	-	450	321	-
Platoon blocked, %		-	-		-	-			
Mov Cap-1 Maneuver	739	-	-	855	-	-	36	0	358
Mov Cap-2 Maneuver	-	-	-	-	-	-	36	0	-
Stage 1	-	-	-	-	-	-	216	0	-
Stage 2	-	-	-	-	-	-	311	0	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	1.2	86.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	739	-	-	855	-	-	120
HCM Lane V/C Ratio	0.165	-	-	0.149	-	-	0.707
HCM Control Delay (s)	10.8	0	-	9.9	0	-	86.9
HCM Lane LOS	B	A	-	A	A	-	F
HCM 95th %tile Q(veh)	0.6	-	-	0.5	-	-	3.9

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: SD
Agency/Co.: WSB
Date Performed: 1/24/2017
Analysis Time Period: AM
Intersection: Centerville and Ash St
Jurisdiction: Lino Lakes
Units: U. S. Customary
Analysis Year: 2018
Project ID:
East/West Street: Ash St
North/South Street: Centerville Rd

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	3	15	4	197	13	250	7	119	23	392	252	7
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left		Right	BP	Left		Right	BP	Left		Right	BP
Lane Assn.	LTR				LT		R		LT		R		L		TR	
RT Bypass	None				None				None				None			
PHF	0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92	
%HV	3	3	3		3	3	3		3	3	3		3	3	3	
NumPeds	0				0				0				0			
U-Turn PHF	0.92				0.92				0.92				0.92			
U-Turn %HV	3				3				3				3			
Flow Rate	3	17	4		221	15	280		8	133	26		439	282	8	
No. Lanes	0	1	0		0	1	1		0	1	1		1	1	0	
Cnfl. Lanes	1				1				1				1			

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound			Westbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Northbound			Southbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Eastbound			Westbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858
	Northbound			Southbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	942	144	459	244
Exit. Flow	481	30	416	507

Capacity and Level of Service

	Eastbound	Westbound	Northbound	Southbound

	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		25		235	280		141	26		439	290	
Entry Cap.		441		978	978		714	714		886	886	
Volume (vph)		24		228	272		137	25		426	282	
Cap. (vph)		428		950	950		693	693		860	860	
v/c Ratio		0.06		0.24	0.29		0.20	0.04		0.50	0.33	
Critical Lane		*			*		*			*	*	
Lane Delay		9.2		6.2	6.7		7.5	5.6		10.7	7.8	
Lane LOS		A		A	A		A	A		B	A	
95 % Queue		0.2		0.9	1.2		0.7	0.1		2.8	1.4	
Approach:												
Delay		9.20			6.48			7.17			9.57	
LOS		A			A			A			A	
Intersection Delay		8.18					Intersection LOS			A		

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: SD
Agency/Co.: WSB
Date Performed: 1/24/2017
Analysis Time Period: PM
Intersection: Centerville and Ash St
Jurisdiction: Lino Lakes
Units: U. S. Customary
Analysis Year: 2018
Project ID:
East/West Street: Ash St
North/South Street: Centerville Rd

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	9	27	8	35	25	441	5	271	158	346	135	4
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left		Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Lane Assn.	LTR				LT	R		LT	R		L	TR	
RT Bypass	None				None			None			None		
PHF	0.92	0.92	0.92		0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
%HV	3	3	3		3	3	3	3	3	3	3	3	3
NumPeds	0				0			0			0		
U-Turn PHF	0.92				0.92			0.92			0.92		
U-Turn %HV	3				3			3			3		
Flow Rate	10	30	9		39	28	494	6	303	177	387	151	4
No. Lanes	0	1	0		0	1	1	0	1	1	1	1	0
Cnfl. Lanes	1				1			1			1		

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound			Westbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Northbound			Southbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Eastbound			Westbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858
	Northbound			Southbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	577	319	427	73
Exit. Flow	594	38	807	199

Capacity and Level of Service

	Eastbound	Westbound	Northbound	Southbound

	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		49		67	494		309	177		387	156	
Entry Cap.		634		821	821		737	737		1051	1051	
Volume (vph)		48		65	480		300	172		376	151	
Cap. (vph)		616		797	797		715	715		1020	1020	
v/c Ratio		0.08		0.08	0.60		0.42	0.24		0.37	0.15	
Critical Lane		*			*		*			*	*	
Lane Delay		6.7		5.3	14.1		10.7	7.8		7.4	4.9	
Lane LOS		A		A	B		B	A		A	A	
95 % Queue		0.3		0.3	4.1		2.1	0.9		1.7	0.5	
Approach:												
Delay		6.72			13.06			9.67			6.69	
LOS		A			B			A			A	
Intersection Delay		9.75					Intersection LOS			A		

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: SD
Agency/Co.: WSB
Date Performed: 1/24/2017
Analysis Time Period: AM
Intersection: Centerville and Ash St
Jurisdiction: Lino Lakes
Units: U. S. Customary
Analysis Year: 2038
Project ID:
East/West Street: Ash St
North/South Street:

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	4	15	4	277	16	349	10	166	32	545	353	10
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left		Right	BP	Left		Right	BP	Left		Right	BP	Left		Right	BP
Lane Assn.	LTR				LT		R		LT		R		L		TR	
RT Bypass	None				None				None				None			
PHF	0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92	
%HV	3	3	3		3	3	3		3	3	3		3	3	3	
NumPeds	0				0				0				0			
U-Turn PHF	0.92				0.92				0.92				0.92			
U-Turn %HV	3				3				3				3			
Flow Rate	4	17	4		310	18	391		11	186	36		610	395	11	
No. Lanes	0	1	0		0	1	1		0	1	1		1	1	0	
Cnfl. Lanes	1				1				1				1			

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound			Westbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Northbound			Southbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Eastbound			Westbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858
	Northbound			Southbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	1315	201	631	339
Exit. Flow	663	40	581	710

Capacity and Level of Service

	Eastbound	Westbound	Northbound	Southbound

	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		26		328	391		197	36		610	406	
Entry Cap.		303		924	924		601	601		805	805	
Volume (vph)		25		318	380		191	35		592	394	
Cap. (vph)		294		897	897		583	583		781	781	
v/c Ratio		0.09		0.36	0.42		0.33	0.06		0.76	0.50	
Critical Lane		*			*		*			*	*	
Lane Delay		13.8		8.0	9.0		10.8	6.9		21.3	11.7	
Lane LOS		B		A	A		B	A		C	B	
95 % Queue		0.3		1.6	2.1		1.4	0.2		7.2	2.9	
Approach:												
Delay		13.82			8.56			10.19			17.49	
LOS		B			A			B			C	

Intersection Delay 13.37 Intersection LOS B

Phone: Fax:
E-Mail:

ROUNDABOUT ANALYSIS

Analyst: SD
Agency/Co.: WSB
Date Performed: 1/24/2017
Analysis Time Period: PM
Intersection: Centerville and Ash St
Jurisdiction: Lino Lakes
Units: U. S. Customary
Analysis Year: 2038
Project ID:
East/West Street: Ash St
North/South Street: Centerville Rd

Volume Adjustments and Site Characteristics

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
Volume	13	33	11	49	30	613	6	379	222	482	190	6
U-Turn Vol	0			0			0			0		
% Thrus Left Lane												

	Eastbound			Westbound			Northbound			Southbound		
	Left		Right	BP	Left		Right	BP	Left		Right	BP
Lane Assn.	LTR				LT		R		LT		R		L		TR	
RT Bypass	None				None				None				None			
PHF	0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92		0.92	0.92	0.92	
%HV	3	3	3		3	3	3		3	3	3		3	3	3	
NumPeds	0				0				0				0			
U-Turn PHF	0.92				0.92				0.92				0.92			
U-Turn %HV	3				3				3				3			
Flow Rate	15	37	12		55	34	686		7	424	249		540	213	7	
No. Lanes	0	1	0		0	1	1		0	1	1		1	1	0	
Cnfl. Lanes	1				1				1				1			

Duration, T 0.25 hrs.

Critical and Follow-Up Headway Adjustment

	Eastbound			Westbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Northbound			Southbound		
Crit. Hdwy	5.1929	5.1929	5.1929	5.1929	5.1929	5.1929
	Eastbound			Westbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858
	Northbound			Southbound		
Flup. Hdwy	3.1858	3.1858	3.1858	3.1858	3.1858	3.1858

Flow Computations

	Eastbound	Westbound	Northbound	Southbound
Circ. Flow	808	446	592	96
Exit. Flow	825	47	1125	280

Capacity and Level of Service

	Eastbound	Westbound	Northbound	Southbound

	Left	Right	BP	Left	Right	BP	Left	Right	BP	Left	Right	BP
Entry Flow		64		88	686		431	249		540	219	
Entry Cap.		504		724	724		626	626		1027	1027	
Volume (vph)		62		85	666		418	242		524	213	
Cap. (vph)		489		703	703		607	607		998	998	
v/c Ratio		0.13		0.12	0.95		0.69	0.40		0.53	0.21	
Critical Lane		*			*		*			*	*	
Lane Delay		9.1		6.4	46.2		21.5	11.8		10.2	5.6	
Lane LOS		A		A	E		C	B		B	A	
95 % Queue		0.4		0.4	13.7		5.4	1.9		3.2	0.8	
Approach:												
Delay		9.07			41.72			17.93			8.85	
LOS		A			E			C			A	

Intersection Delay 22.74 Intersection LOS C

INTERSECTION CONTROL EVALUATION

Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)/Wilkinson Lake Blvd

Cities of Lino Lakes and North Oaks
White Bear Township
Anoka and Ramsey County, MN

09/18/2017

Prepared for:
City of Lino Lakes
600 Town Center Parkway
Lino Lakes, MN 55014

WSB PROJECT NO. 2988-080

INTERSECTION CONTROL EVALUATION

FOR

CENTERVILLE RD (CSAH 21/CSAH 59)
AT
ASH ST (CR J)/WILKINSON LAKE BLVD

S.A.P. NO. TBD
CITY PROJECT NO. TBD
WSB PROJECT NO. 2988-080

CITY OF LINO LAKES AND NORTH OAKS,
TOWN OF WHITE BEAR
ANOKA AND RAMSEY COUNTIES, MN

Funding Category: ..... Municipal and County State Aid, Local
Estimated Letting Date: .....TBD
Work Identification:.....Intersection Improvements

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

Charles Rickart, P.E., PTOE — 26082 Reg. No. — DATE: 09/18/2017

REVIEWED: _____ Lino Lakes City Engineer — _____ Reg. No. — DATE: _____

REVIEWED: _____ North Oaks City Engineer — _____ Reg. No. — DATE: _____

REVIEWED: _____ Anoka County Engineer — _____ Reg. No. — DATE: _____

REVIEWED: _____ Ramsey County Engineer — _____ Reg. No. — DATE: _____

APPROVED: _____ MnDOT Metro-Asst. Division Engineer – State Aid — DATE: _____

TABLE OF CONTENTS

LIST of FIGURES / TABLES

INTRODUCTION

The purpose of this report is to evaluate the traffic control and intersection lane geometry needed for the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J)/Wilkinson Lake Blvd. The intersection is located on the border of Lino Lakes, North Oaks and White Bear Township in both Anoka and Ramsey Counties.

The intersection is being studied in conjunction with a new residential development being proposed in the northwest corner of the intersection. This development is proposed to include 29 single family homes, 30 twin homes and a 147 unit senior apartment building. A Traffic Study was conducted for the proposed development dated January 22, 2016 with an update dated, February 9, 2016.

Concerns have been raised with respect to operations of the Centerville Road (CSAH 21/CSAH 59) and Ash Street (CR J)/Wilkinson Lake Blvd intersection and the interaction with the Ash Street (CR J) and 20th Avenue (CSAH 84)/I35E southbound ramp intersection.

This report documents the existing conditions, operations, and safety concerns at the intersection and analyzes the proposed future traffic volumes with the existing and proposed traffic control and lane geometry.

DESCRIPTION OF LOCATION

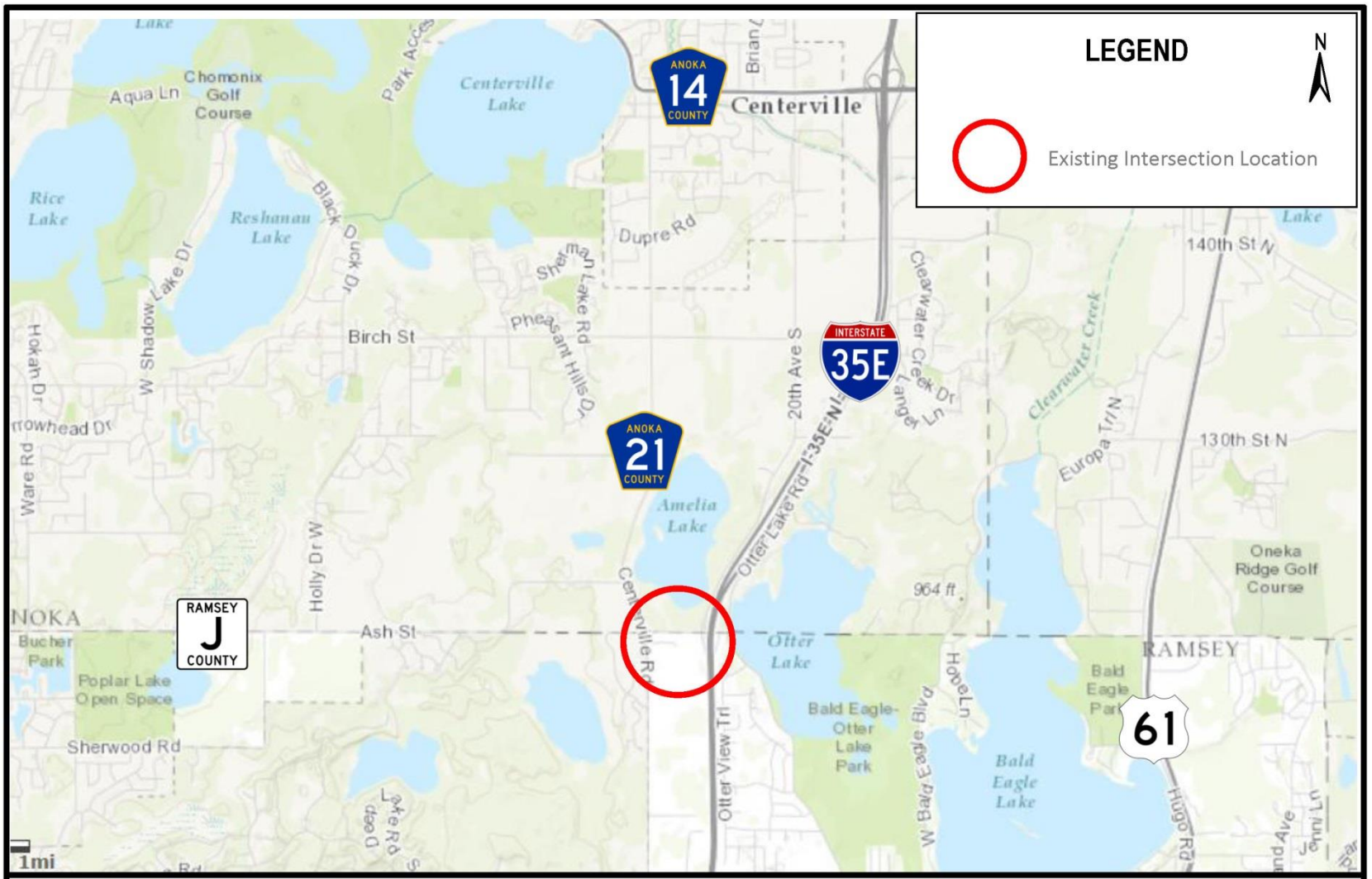
Centerville Road is a north/south two lane A Minor Arterial Expander running parallel to I35E on the west side. This roadway is Anoka County Road (CSAH) 21 north of Ash Street (CR J) to Main Street (CSAH 14) in Centerville. South of Ash Street (CR J) the roadway is Ramsey County Road (CSAH 59) to Koehler Road (CSAH 15) in Vadnais Heights. In the project area Centerville Road (CSAH 59) south of Ash Street (CR J) provides access to several commercial and residential properties. North of Ash Street (CR J) there is access to Centerville Road (CSAH 21) only to residential property.

Ash Street (CR J) is an east/west two lane A Minor Arterial Expander running from Centerville Road (CSAH 21/CSAH 59) to Otter Lake Road (CSAH 84) on the east side of I35E. Ash Street (CR J) provides direct access to the commercial properties south of the roadway. On and off ramp access to I35E to and from the south is provided from Ash Street (CR J). No access is provided to I35E to or from the north from Ash Street (CR J).

20th Avenue South (CSAH 54) is north/south two lane A Minor Arterial Reliever parallel to I35E running from Ash Street (CR J) where is it intersects with the I35E south on-ramp to Main Street (CSAH 14) in Centerville.

Otter Lake Road (CSAH 84/CR 148) is a north/south two lane major collector running parallel to I35E on the east side. This roadway is Anoka County Road (CSAH) 84 north of Ash Street (CR J) to Main Street (CSAH 14) in Centerville. South of Ash Street (CR J) the roadway is a B Minor Arterial designated as Ramsey County Road (CR) 148 to White Bear Parkway (CSAH 93) in White Bear Lake.

Figure 1 shows the intersection location within the context of the surrounding area.



Intersection Control Evaluation
Centerville Rd (CSAH 21/ CSAH 59) at Ash St (CR J)
City of Lino Lakes, Minnesota

Figure 1
Project Location

EXISTING CONDITIONS

The intersections on Ash Street (CR J) between Centerville Road (CSAH 21/CSAH 59) and Otter Lake Road (CSAH 84) are currently all un-signalized with stop control. The following is a summary of the existing conditions at each of the area intersections:

Ash Street (CR J) at Centerville Road (CSAH 21/CSAH 59)/Wilkinson Lake Blvd:

- All Way Stop Control
- 50 MPH on Centerville Road (CSAH 21/CSAH 59)
- 40 MPH on Ash Street (CR J)
- Wilkinson Lake Blvd private street
- Lane Configuration:
    - SB Centerville Rd – one left/through/right lane
    - NB Centerville Rd – one left/through lane, one right lane
    - WB Ash St – one left/through lane, one right lane
    - EB Wilkinson Lake Blvd – one left/through/right lane

Ash Street (CR J) at 20th Avenue (CSAH 54)/I35E on-ramp:

- Side Street Stop Control
- 50 MPH on 20th Avenue (CSAH 54)
- 40 MPH on Ash Street (CR J)
- Lane Configuration:
    - SB 20th Ave – one left/through/right lane
    - WB Ash St – one left/through/right lane
    - EB Ash St – one left/through/right lane

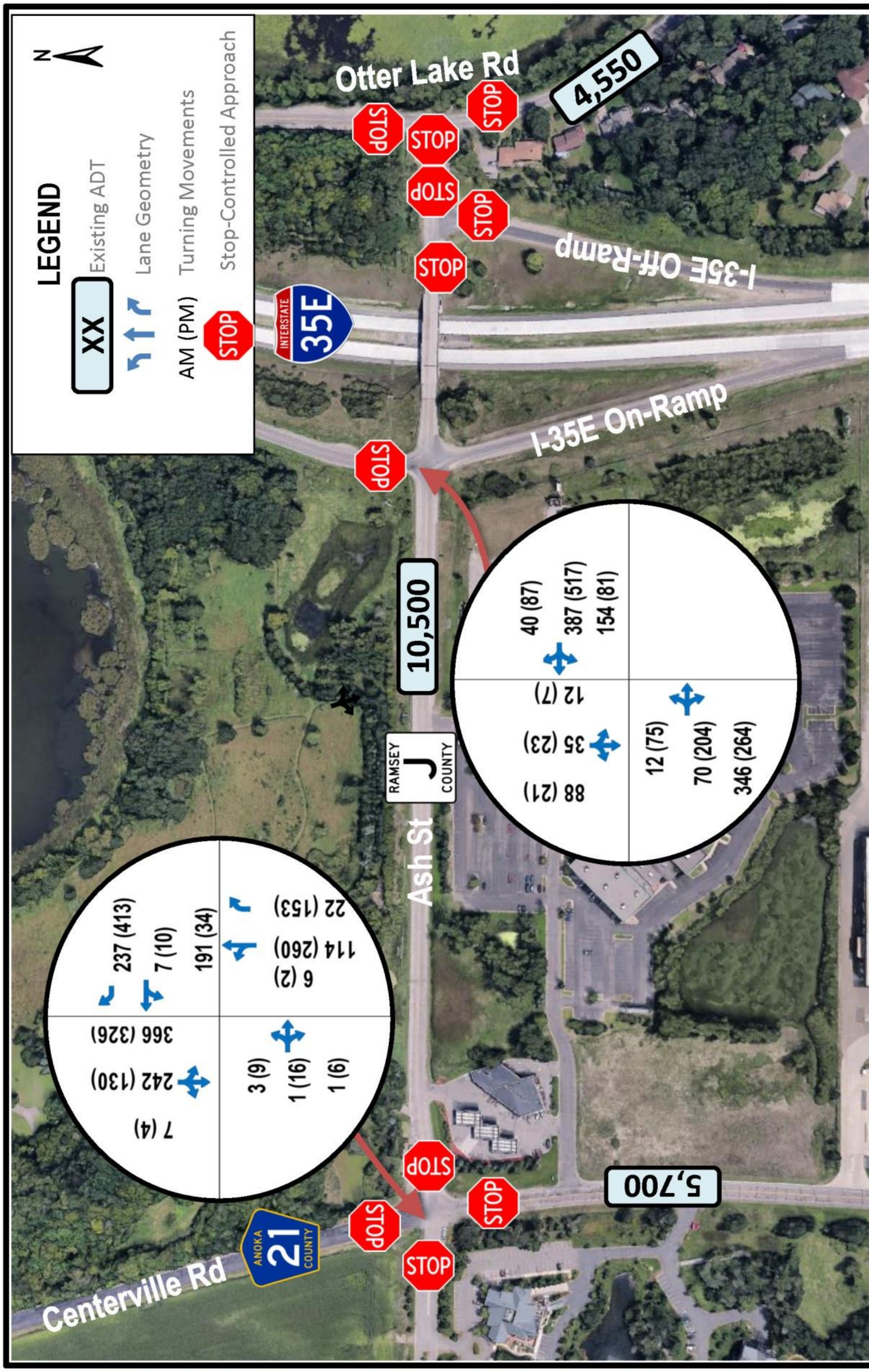
Ash Street (CR J) at I35E off-ramp:

- All Way Stop Control
- 40 MPH on Ash Street (CR J)
- Lane Configuration:
    - NB I35E off-ramp – one right lane, one left lane
    - WB Ash St – one through lane
    - EB Ash St – one through lane

Ash Street (CR J) at Otter Lake Blvd (CSAH 84):

- All Way Stop Control
- 50 MPH north on Otter Lake Blvd
- 35 MPH south on Otter Lake Blvd
- 40 MPH on Ash Street (CR J)
- Lane Configuration:
    - SB Otter Lake Blvd – one through/right lane
    - NB Otter Lake Blvd – one left/through lane
    - EB Ash St – one left lane, one right lane

The existing intersection conditions are shown on **Figure 2**.



Intersection Control Evaluation

Centerville Rd (CSAH 21/ CSAH 59) at Ash St (CR J)

City of Lino Lakes, Minnesota

WSB & Associates, Inc. | City of Lino Lakes

Figure 2

Existing Conditions

Traffic turning movements at the intersections of Ash Street (CR J) at Centerville Road (CSAH 21/CSAH 59) and Ash Street (CR J) at 20th Avenue (CSAH 54)/I35E on-ramp were counted on January 6, 2016 by Spack Consulting. These traffic counts are provided in **Appendix A** and shown on **Figure 2**. Existing Average Daily Traffic (ADT) volumes from the MnDOT and Ramsey County ADT maps are also shown on **Figure 2.**

Existing crash data included with this study was obtained using the Minnesota Crash Mapping Analysis Tool (MnCMAT) developed by MnDOT. The database includes crashes reported to MnDOT by local law enforcement agencies.

The crash data presented is for the years of 2011-2015. The MnCMAT database does not provide access to the original handwritten crash reports, which contain some details that are not represented in the MnCMAT database. Crashes that resulted in damages under $1000 may not be included in the database results as well. A summary of the existing crash data is shown in ***Table 1.***

Table 1: Crash Data Summary

Location	Crashes										
	2011		2012		2013		2014		2015		Total Crashes
	PD	PI	PD	PI	PD	PI	PD	PI	PD	PI	
Ash St at Centerville Rd / Wilkinson Lake Blvd	0	0	0	0	0	0	0	0	1	0	1
Ash St at 20th Ave / I35E on-ramp	0	0	0	0	0	0	0	0	0	0	0
Ash St at I35E off-ramp	0	0	0	0	0	0	0	0	0	0	0
Ash St at Otter Lake Rd	0	0	0	0	0	0	0	1	0	0	1

The results indicate that the primary intersections in the area are at or below the MnDOT Metro and Statewide average crash rates and severity rates.

The crash rates for the intersection are given below in **Table 2**.

Table 2: Crash Rate Summary

Location	Number of Crashes	Daily Entering Vehicles	Crash Rate*			Severity Rate	
			Calculated	Average	Critical***	Calculated	Average**
Ash St at Centerville Rd / Wilkinson Lake Blvd	1	13,350	0.04	0.35	0.57	0.04	0.50
Ash St at Otter Lake Rd	1	9,975	0.05	0.35	0.61	0.11	0.50

* – Intersection crash rates are expressed in crashes per million entering vehicles.
** – Average for urban through-stop intersection using MnDOT 2013 green sheets
*** – Critical crash rates are expressed in crashes per million entering vehicles with 0.96 confidence level

FUTURE CONDITIONS

Traffic growth in the area will occur between existing conditions and any given future year due to other development within the region. This background growth must be accounted for and included in future year traffic forecasts. Reviewing the historical traffic counts in the area, traffic has stayed somewhat constant or dropped over the past few years. However, in order to account for some background growth in traffic the MnDOT State Aid traffic growth projection factor of 1.4 over a 20 year period (1.7%/year) was used to project traffic from the 2016 counts to the 2018 and 2038 analysis years. This factor would account for any future land use outline in the City's Comprehensive Plan.

In addition to the regional background traffic, future traffic related to proposed Hawkins Residential development was determined and included with the overall future traffic projections for the build conditions. The estimated trip generation from the proposed development is shown in ***Table 3.*** The trip generation used to estimate the proposed site traffic is also based on rates for other similar land uses as documented in the Institute of Transportation Engineers *Trip Generation Manual, 9th* Edition. The table shows the daily, weekday AM and PM peak hour trip generation for the proposed development.

Table 3: Estimated Development Site Trip Generation

Planned Use	Size	Daily	AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out
Single Family	29 units	276	21	5	16	29	18	11
Townhomes	30 units	174	13	2	11	15	10	5
Senior Housing	147 units	506	29	10	19	37	20	17
Total New Trips		**956**	**63**	**17**	**46**	**81**	**48**	**33**

Source: Institute of Transportation Engineers Trip Generation Manual, 9th Edition

Traffic forecasts were prepared by adding the projected annual background traffic growth and the projected non-development traffic growth to the existing 2016 traffic counts to determine the "No-Build" traffic conditions. The proposed development traffic was then added to the no-build traffic conditions to determine the 2018 and 2038 Build traffic conditions. ***Figures 3 - 6*** shows the projected 2018 and 2038 No-Build and Build AM and PM peak hour traffic volumes.

MnDOT has also explored a future improvement of adding roundabouts at the Ash Street (CR J) I35E Ramp intersections. Two alternative concepts have been discussed. ***Figure 7*** shows a drawing that accommodates the existing traffic movements only and; ***Figure 8*** shows a drawing that includes an exit ramp from southbound I35E and an entrance ramp to northbound I35E. Although either of these improvements have not been approved, preliminary discussions with MnDOT and the Counties favor the alternative that adds the ramps to and from the north.

LEGEND
Lane Geometry
Turning Movements
AM (PM)
Stop-Controlled Approach
STOP
N
Otter Lake Rd
I-35E Off-Ramp
I-35E On-Ramp
INTERSTATE 35E
Ash St
RAMSEY COUNTY J
Centerville Rd
ANOKA 21 COUNTY
41 (90)
400 (535)
159 (84)
12 (7)
36 (24)
91 (22)
12 (76)
72 (211)
273 (273)
245 (427)
7 (10)
197 (35)
23 (158)
118 (269)
6 (2)
378 (337)
250 (134)
7 (4)
3 (9)
1 (17)
1 (6)
Intersection Control Evaluation
Centerville Rd (CSAH 21/ CSAH 59) at Ash St (CR J)
City of Lino Lakes, Minnesota
Figure 3
2018 No Build Condition
WSB & Associates, Inc.
CITY OF LINO LAKES

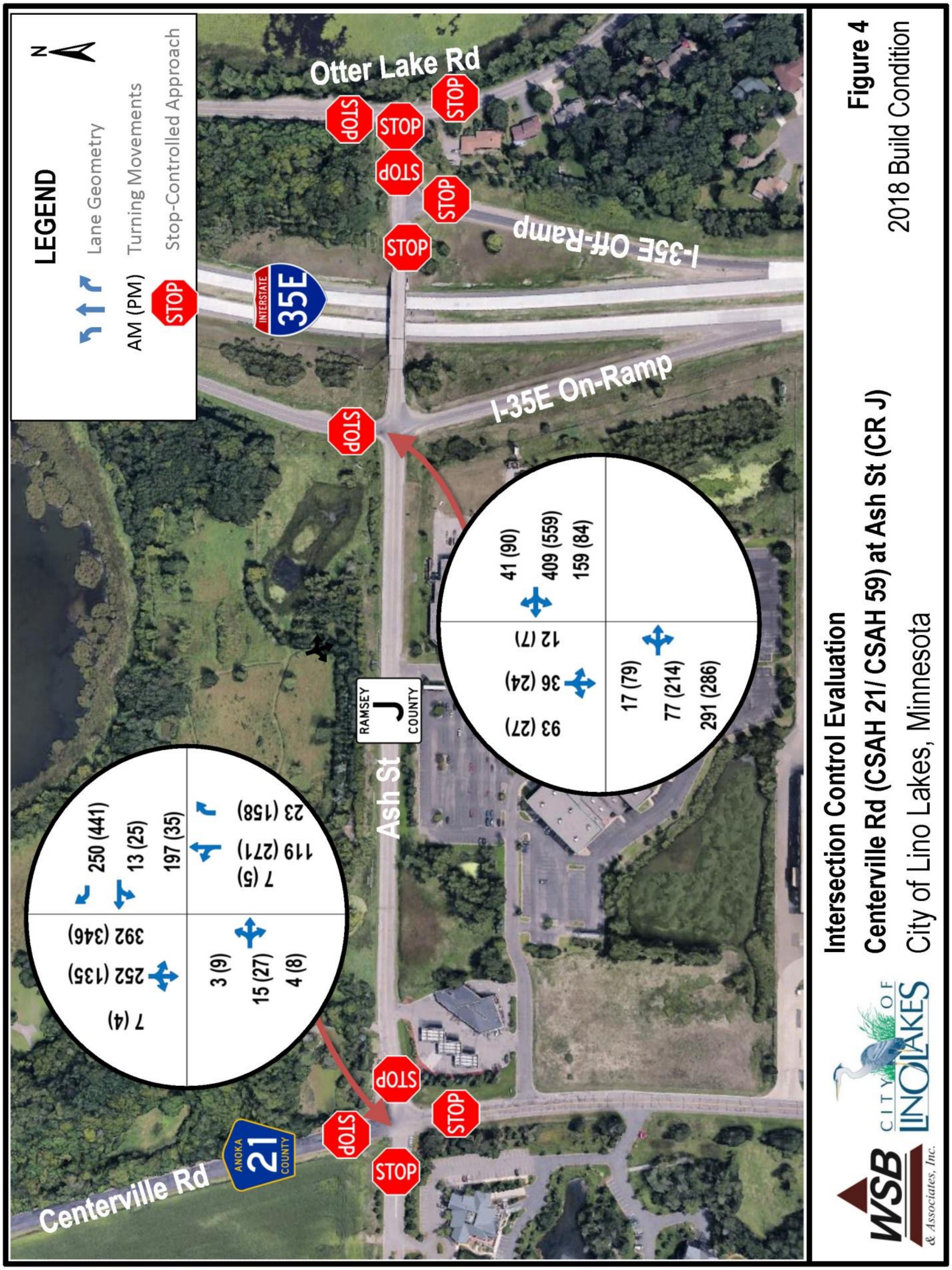
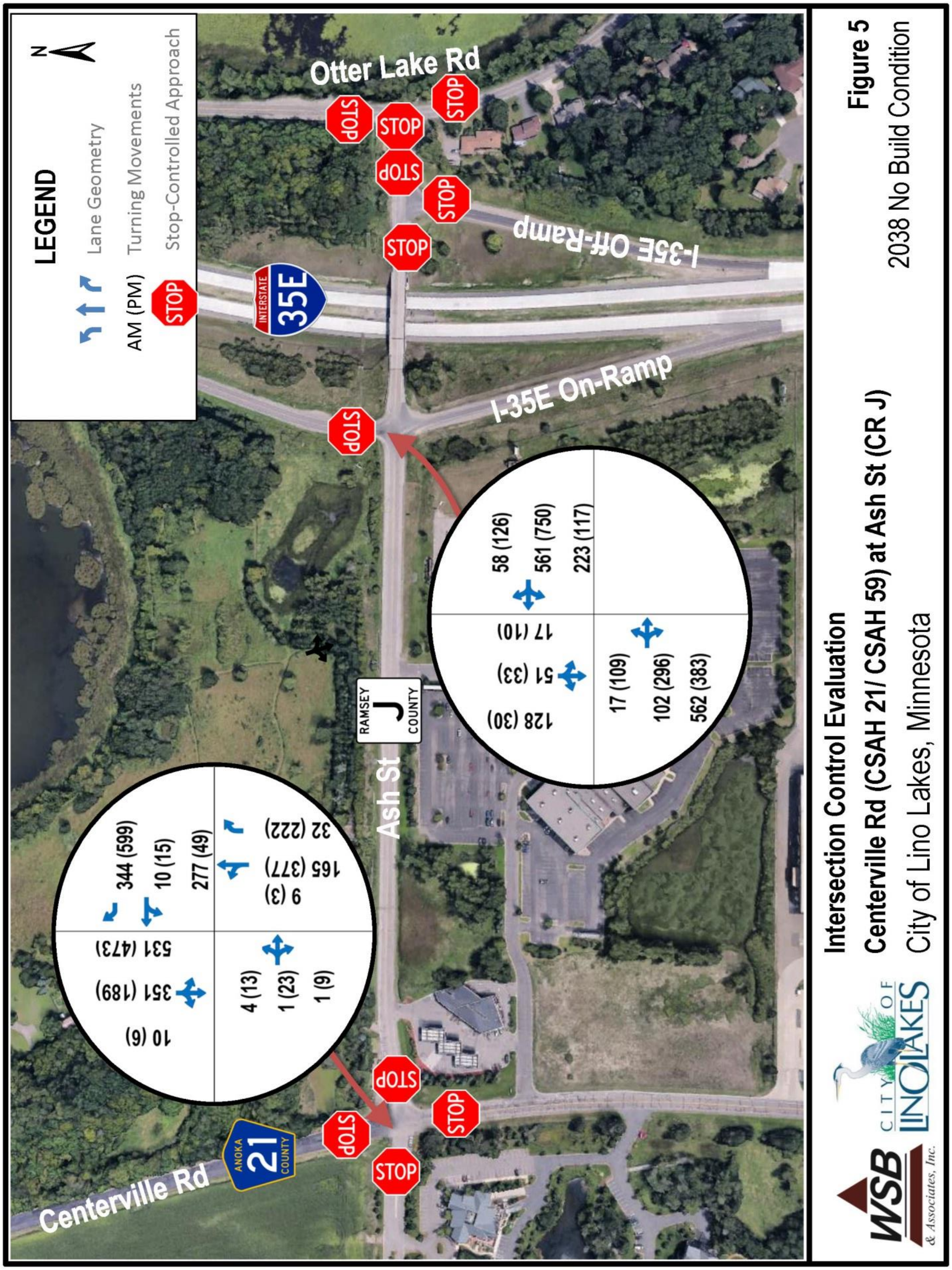


Figure 4
2018 Build Condition

Intersection Control Evaluation
Centerville Rd (CSAH 21/ CSAH 59) at Ash St (CR J)
City of Lino Lakes, Minnesota


LEGEND
Lane Geometry
AM (PM) Turning Movements
Stop-Controlled Approach
Otter Lake Rd
I-35E Off-Ramp
I-35E On-Ramp
35E
Ash St
Centerville Rd
21
STOP
Intersection Control Evaluation
Centerville Rd (CSAH 21/ CSAH 59) at Ash St (CR J)
City of Lino Lakes, Minnesota
Figure 5
2038 No Build Condition

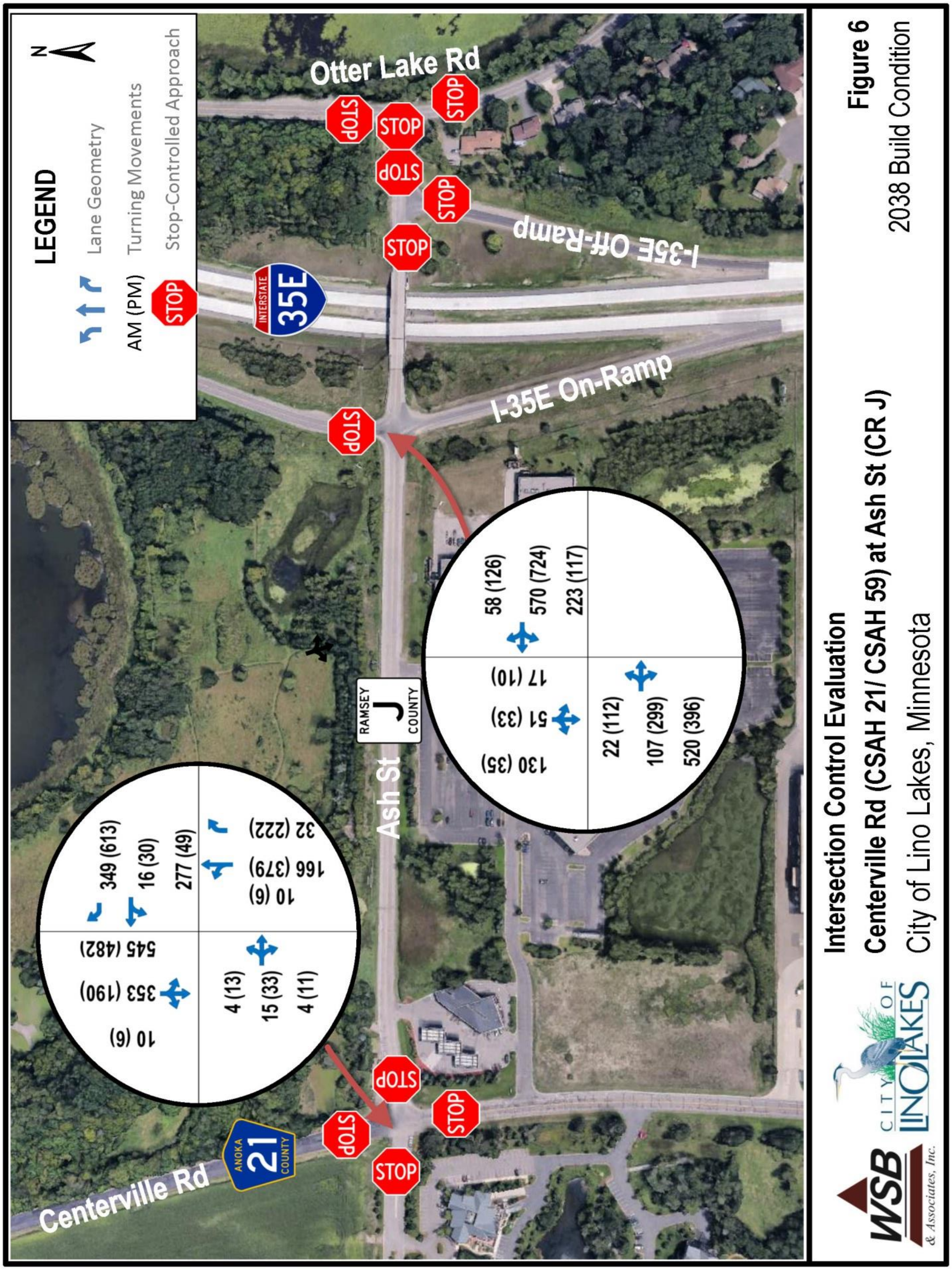
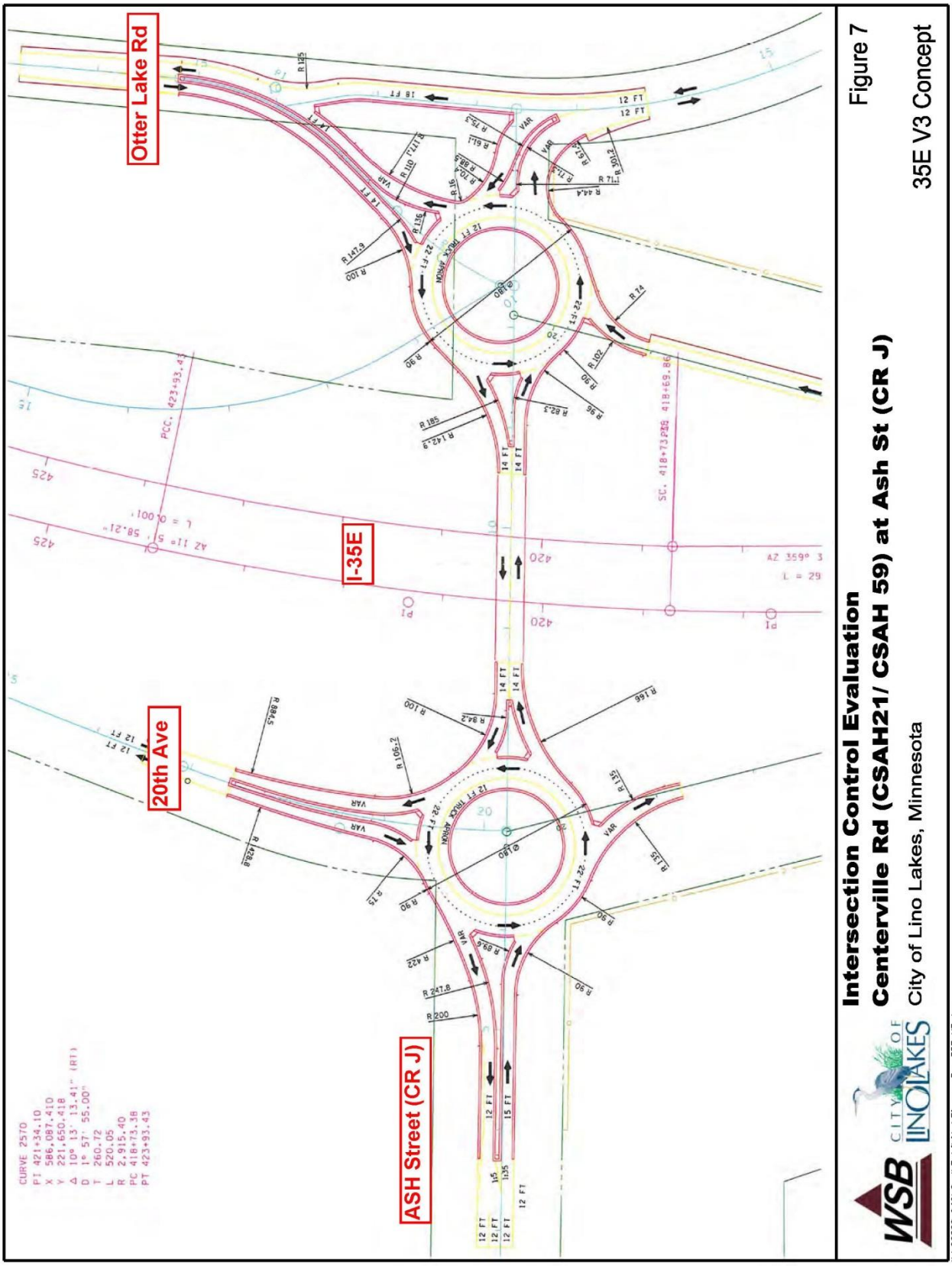
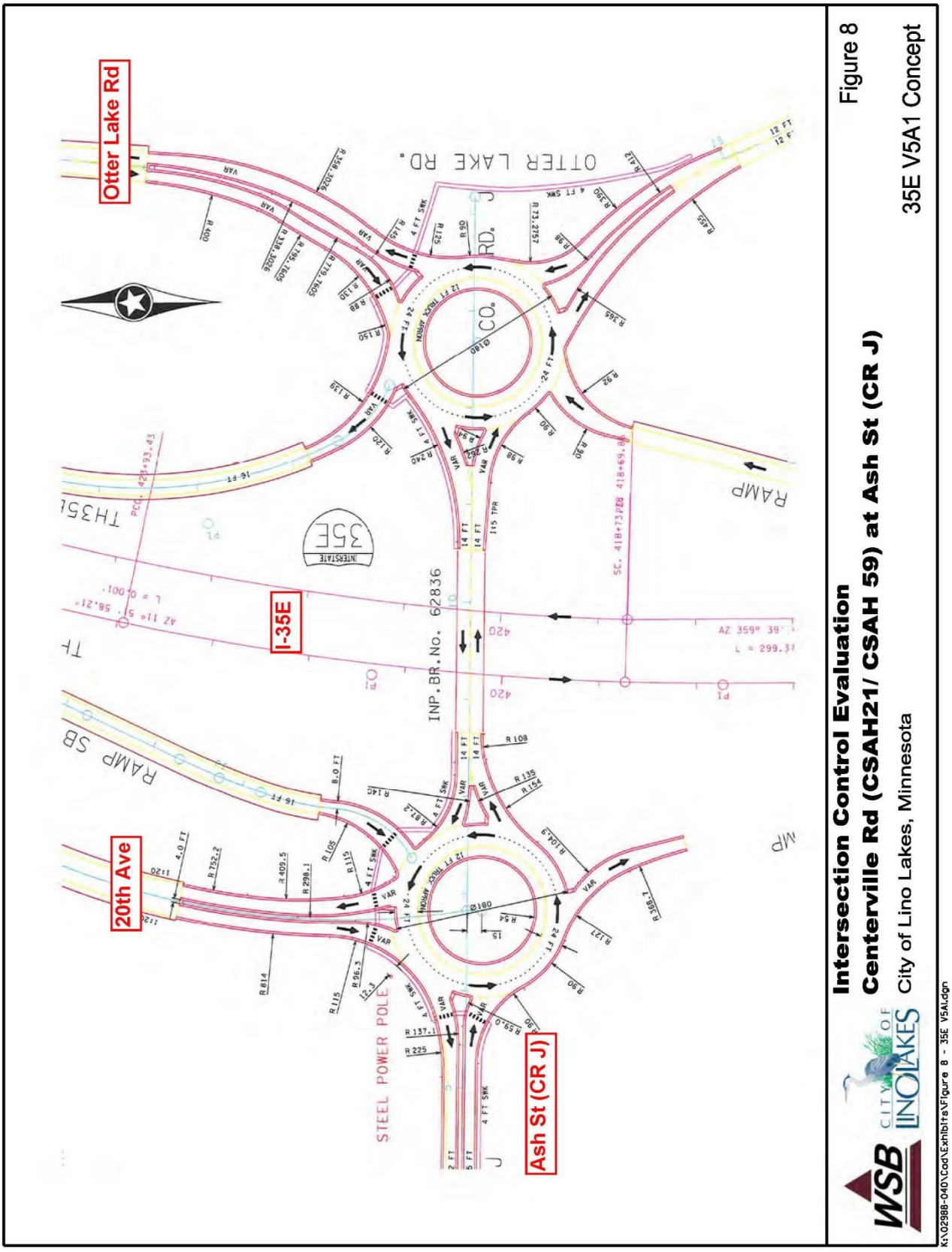


Figure 6
2038 Build Condition

Intersection Control Evaluation
Centerville Rd (CSAH 21/ CSAH 59) at Ash St (CR J)
City of Lino Lakes, Minnesota


Otter Lake Rd
I-35E
20th Ave
ASH Street (CR J)
Intersection Control Evaluation
Centerville Rd (CSAH21/ CSAH 59) at Ash St (CR J)
City of Lino Lakes, Minnesota
Figure 7
35E V3 Concept
WSB
CITY OF LINO LAKES
K:\02988-040\Cad\Exhibits\Figure 7 - 35E V3.dgn


Otter Lake Rd
I-35E
20th Ave
Ash St (CR J)
INP. BR. No. 62836
STEEL POWER POLE
OTTER LAKE RD.
RAMP SB
RAMP
35E
INTERSTATE
Figure 8
35E V5A1 Concept
Intersection Control Evaluation
Centerville Rd (CSAH21/ CSAH 59) at Ash St (CR J)
City of Lino Lakes, Minnesota
WSB
CITY OF LINO LAKES
K:\02988-040\Cad\Exhibits\Figure 8 - 35E V5A1.dgn

ALTERNATIVE CONTROL ANALYSIS

The following traffic control options were studied for the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J):

- All-way stop (Existing Condition)
- Traffic signal
- Roundabout

The following subsections detail the criteria and analysis used for determining the appropriate traffic control for this intersection.

All-Way Stop Criteria

The existing intersection is control with an all-way stop. Part 2B of the Minnesota Manual on Uniform Traffic Control Devices (MnMUTCD) contains information pertaining to the all-way stop control with criteria relating to vehicular volumes and crash history that define the minimum conditions under which installing an all-way stop could be justified.

Traffic Signal Warrant Analysis

Part 4 of the MnMUTCD contains information pertaining to highway traffic signals, including a series of traffic-signal warrants that define the minimum conditions under which installing a traffic signal could be justified. These traffic signal warrants are considered national guidelines to promote continuity of traffic control devices and to maximize the benefit of traffic signals by selecting the appropriate intersections. The following are the nine MnMUTCD traffic signal warrants:

- Warrant 1 - Eight-Hour Vehicle Volume
- Warrant 2 - Four-Hour Vehicle Volume
- Warrant 3 - Peak Hour Vehicle Volume
- Warrant 4 - Pedestrian Volume
- Warrant 5 - School Crossing
- Warrant 6 - Coordinated Signal System
- Warrant 7 - Crash Experience
- Warrant 8 - Roadway Network
- Warrant 9 - Intersection Near a Grade Crossing

Twenty-four hours of turning movements were counted on January 6, 2016 and used to perform the warrant analysis.

According to the MnMUTCD, inclusion of right-turn volumes for warrant analysis is dependent on engineering judgment, site factors and turning movement volumes. By applying engineering judgment, right-turn movements on all four approaches of the intersection were removed from the analysis due to the presence of right-turn lanes in each approach.

The following is the result of the traffic signal warrant analysis. See ***Appendix B*** for additional information.

- Warrant 1 – Eight-Hour Vehicle Volume: **NOT MET**
- Warrant 2 – Four-Hour Vehicle Volume: **MET**
- Warrant 3 – Peak-hour Vehicle Volume: **MET**
- Warrant 4 – Pedestrian Volume: **N/A**
- Warrant 5 – School Crossing: **N/A**
- Warrant 6 – Coordinated Signal System: **N/A**
- Warrant 7 – Crash Experience: **NOT MET**
- Warrant 9 – Intersection Near a Grade Crossing: **N/A**

Signal Warrants 2 and 3 are met with existing traffic volumes, lane geometry, and speed limits.

Roundabout Criteria

Although no traffic warrants for roundabouts currently exist, the MnDOT Intersection Control Evaluation Manual states that if a traffic signal or an all-way stop warrant is met, a roundabout should also be considered as a warranted traffic control device. As discussed above the intersection is currently controlled by an all-way stop and does meet traffic signal warrants.

The Intersection Control Evaluation Manual also states that site-specific safety issues may cause a roundabout to be justified. As seen in ***Table 4***, a roundabout would reduce the current crash rate. Furthermore, a roundabout will improve future roadway conditions as shown in the Operational Analysis section of this report.

Crash Evaluation

Crash reductions for each type of intersection control were estimated based on the proposed layout and the crash reduction factors from the Federal Highway Administration (FHWA) Crash Reduction Factors and the Minnesota Department of Transportation (MnDOT) Roundabout Crash Reduction Factors. ***Table 4*** shows the projected crash rate and yearly crashes for each traffic control type using the existing traffic volumes. Fewer crashes mean a reduced cost to the local economy in terms of lost productivity related to property damage, injuries, and congestion on local roadways.

Table 4: Existing and Projected Crash Rates by Traffic Control Type

Traffic Control	Crash Reduction Factor*	Crash Rate**	Projected Crashes Per Year
Through-Stop (existing)	NA	NA	0.60
Signalized (Metro district average rate)	NA	0.18	0.18
Urban Single Lane Roundabout	0.60	0.38	0.36
Urban Multi-lane Roundabout	0.65	0.41	0.39

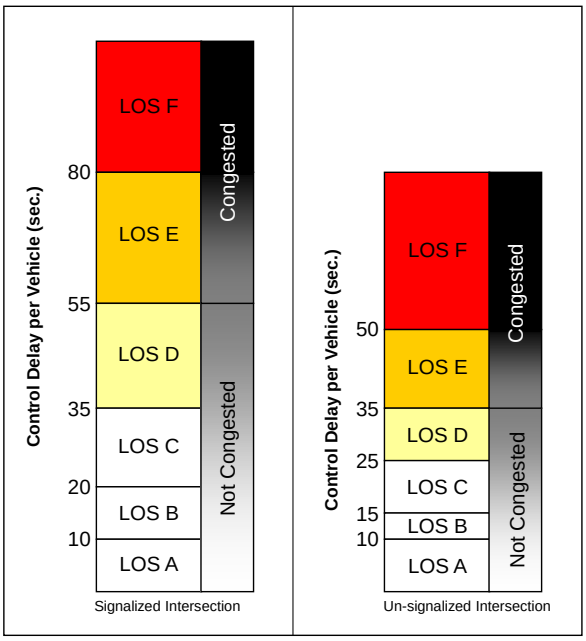
* Crash reduction factors taken from MnDOT's HSIP Program guidance

** Crash rate for proposed improvements = crash reduction factor multiplied by the existing intersection crash rate

A traffic signal would cut the crash rate by over two-thirds greatly improving the safety of the intersection. A single or multi-lane roundabout would also cut the crash rate by roughly one-third, which would make it an effective safety measure as well.

Intersection Capacity Evaluation

Intersection operations are evaluated in terms of average seconds of delay per vehicle for the intersection, and for each approach and turning movement. The average number of seconds of delay is broken into six ranges assigned letter grades A through F defining each level of service (LOS) as shown in ***Figure 9***. The ranges for un-signalized intersections are narrower than the ranges for signalized intersections. This is because many factors including the intangible factors of driver discomfort and frustration are considered. Studies have indicated that a one-minute delay at a red light is perceived as being more tolerable than one minute waiting for a gap in traffic at a stop sign, especially when there are vehicles queued behind. It is generally recognized that LOS D is the lowest acceptable LOS for urban intersections. Intersection capacity is also defined in terms of queue lengths of stopped vehicles. A 100-foot queue is approximately equal to four cars.



SOURCE: Level of Service thresholds from the Highway Capacity Manual.

K:\Traffic\Level of Service (LOS)\LOS Delay Graphic.ppt

Figure 9: Level of Service Guidelines

Synchro / SimTraffic and RODEL software were used to simulate existing and future traffic operations at the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street. Synchro is a macroscopic software application used for optimizing traffic signal timing and performing capacity analysis of roadway networks consisting of stop, yield, and signalized traffic control conditions. The underlying equations are based on Highway Capacity Manual procedures. SimTraffic is a microscopic software application that performs simulation and animation of vehicular traffic based on Synchro inputs. SimTraffic follows individual cars and uses a wide variety of variables (including some random variables) to simulate real-world driver behavior.

RODEL is a software program that predicts the traffic performance of roundabouts. The capacity estimates are based on research completed at the British Transport and Road Research Laboratory (TRRL) and use empirical equations originally published in 1980. RODEL calculates the capacity of each roundabout entry as a function of the circulating flow past that entry and six other geometric parameters. An important feature of RODEL is the capability to vary the evaluation confidence level, which provides a factor of safety that takes into account the variability of traffic predictions and flow characteristics. RODEL, however, is not able to model the interaction of traffic in a system of intersections.

Traffic operations at the intersection of Centerville Road (CR 21/CR 59) at Ash Street (CR J) were evaluated using traffic volume for: existing (2016) conditions; 2018 no-build and build conditions, and; 2038 no-build and build conditions, discussed previously.

Analysis was conducted for each traffic control option including: all-way stop control (existing conditions); traffic signal control, and roundabout control. A discussion of the assumptions and analysis results is discussed below.

All-Way Stop Analysis

2016 (Existing Conditions): The analysis of the 2016 conditions with existing lane geometrics and all-way stop control show the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J) is operating at an overall LOS F in the AM peak hour and LOS E in the PM peak hour. Specifically the southbound approach and the westbound right turn movements are showing unsatisfactory levels of service. The results of the existing condition traffic operations analysis are summarized in ***Table 5***. Detailed modeling results are provided in ***Appendix D***.

Table 5: 2016 Existing Condition Operations Summary

Intersection			AM Peak				PM Peak			
Control	Location	Appr	Movement Delay (LOS)			Intersection Delay(LOS)	Movement Delay (LOS)			Intersection Delay/LOS
			Left	Through	Right		Left	Through	Right	
Stop	Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)	NB	12.2 (B)		9.4 (A)	67.0 (F)	20.6 (C)		12.7 (B)	43.0 (E)
		WB	16.0 (C)		13.9 (B)		11.7 (B)		36.3 (E)	
		SB	117.1 (F)				76.8 (F)			
		EB	11.5 (B)				13.3 (B)			
Stop	Ash St at 20th Ave/I35E Ramp	WB	8.8 (A)			3.1 (A)	8.7 (A)			1.9 (A)
		SB	15.6 (C)				20.1 (C)			
		EB	8.3 (A)				9.2 (A)			

2018 No-Build Conditions: Similar to the existing condition analysis the 2018 no-build conditions with existing lane geometrics and all-way stop control show the intersection would be operating at an overall LOS F in the AM and PM peak hours. Specifically the southbound approach and the westbound right turn movements are showing unsatisfactory levels of service. The results of the 2018 no-build condition traffic operations analysis are summarized in ***Table 6***. Detailed modeling results are provided in ***Appendix D***.

Table 6: 2018 No Build Condition Operations Summary

Intersection			AM Peak				PM Peak			
Control	Location	Appr	Movement Delay (LOS)			Intersection Delay(LOS)	Movement Delay (LOS)			Intersection Delay/LOS
			Left	Through	Right		Left	Through	Right	
Stop	Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)	NB	12.5 (B)		9.5 (A)	76.5 (F)	22.5 (C)		13.2 (B)	51.1 (F)
		WB	16.5 (C)		14.4 (B)		11.9 (B)		42.7 (E)	
		SB	135.2 (F)				93.7 (F)			
		EB	11.7 (B)				13.7 (B)			
Stop	Ash St at 20th Ave/I35E Ramp	WB	8.6 (A)			3.3 (A)	8.8 (A)			1.9 (A)
		SB	15.7 (C)				21.1 (C)			
		EB	8.4 (A)				9.3 (A)			

2038 No-Build Conditions: The analysis of the 2038 no-build conditions with existing lane geometrics and all-way stop control show the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J) would be operating at an overall LOS F in the AM and PM peak hours. Specifically the southbound approach, northbound left/through movement and the westbound right turn movements are showing unsatisfactory levels of service. In addition the southbound approach at the intersection of Ash Street (CR J) at 20th Avenue/I35E Ramp would also be operating an LOS F during the AM and PM hours. The results of the 2038 no-build condition traffic operations analysis are summarized in ***Table 7***. Detailed modeling results are provided in ***Appendix D***.

Table 7: 2038 No Build Condition Operations Summary

Intersection			AM Peak				PM Peak			
Control	Location	Appr	Movement Delay (LOS)			Intersection Delay(LOS)	Movement Delay (LOS)			Intersection Delay/LOS
			Left	Through	Right		Left	Through	Right	
Stop	Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)	NB	16.3 (C)		10.9 (A)	222.6 (F)	57.2 (F)		19.7 (C)	173.0 (F)
		WB	26.3 (D)		23.4 (C)		13.7 (B)		176.7 (F)	
		SB	411.8 (F)				312.3 (F)			
		EB	14.0 (B)				17.9 (B)			
Stop	Ash St at 20th Ave/I35E Ramp	WB	10.6 (B)			7.6 (A)	9.9 (A)			5.0 (A)
		SB	53.9 (F)				95.7 (F)			
		EB	9.0 (A)				11.0 (B)			

2018 Build Conditions: The 2018 build conditions assume that the proposed Hawkins residential project is fully developed. Similar to the 2018 no-build condition analysis the 2018 build conditions with existing lane geometrics and all-way stop control show the intersection would be operating at an overall LOS F in the AM and PM peak hours. Specifically the southbound approach and the westbound right turn movements are showing unsatisfactory levels of service. The results of the 2018 build condition traffic operations analysis are summarized in ***Table 8***. Detailed modeling results are provided in ***Appendix D***.

Table 8: 2018 Build Condition Operations Summary

Intersection			AM Peak				PM Peak			
Control	Location	Appr	Movement Delay (LOS)			Intersection Delay(LOS)	Movement Delay (LOS)			Intersection Delay/LOS
			Left	Through	Right		Left	Through	Right	
Stop	Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)	NB	12.9 (B)		9.7 (A)	87.1(F)	24.2 (C)		13.7 (B)	52.7 (F)
		WB	17.2 (C)		15.0 (B)		12.3 (B)		47.9 (E)	
		SB	157.0 (F)				109.6 (F)			
		EB	12.1 (B)				14.3 (B)			
Stop	Ash St at 20th Ave/I35E Ramp	WB	8.7 (A)			3.4 (A)	8.9 (A)			3.3 (A)
		SB	16.1 (C)				21.3 (C)			
		EB	8.4 (A)				9.5 (A)			

2038 Build Conditions: The 2038 build conditions assume that the proposed Hawkins residential project is fully developed. Similar to the 2038 no-build condition analysis the 2038 build conditions with existing lane geometrics and all-way stop control show the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J) would be operating at an overall LOS F in the AM and PM peak hours. Specifically the southbound approach, northbound left/through movement and the westbound right turn movements are showing unsatisfactory levels of service. The results of the 2038 no-build condition traffic operations analysis are summarized in ***Table 9***. Detailed modeling results are provided in ***Appendix D***.

Table 9: 2038 Build Condition Operations Summary

Intersection			AM Peak				PM Peak			
Control	Location	Appr	Movement Delay (LOS)			Intersection Delay(LOS)	Movement Delay (LOS)			Intersection Delay/LOS
			Left	Through	Right		Left	Through	Right	
Stop	Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)	NB	17.1(C)		11.1 (B)	236.8 (F)	62.0 (F)		20.3 (C)	185.0 (E)
		WB	28.0 (D)		24.9 (C)		14.3 (B)		196.1(F)	
		SB	411.8 (F)				332.8 (F)			
		EB	14.7 (B)				18.9 (B)			
Stop	Ash St at 20th Ave/I35E Ramp	WB	10.4 (A)			7.8 (A)	9.9 (A)			4.9 (A)
		SB	53.9 (F)				86.9 (F)			
		EB	9.1 (A)				10.8 (A)			

In addition the southbound approach at the intersection of Ash Street (CR J) at 20th Avenue/I35E Ramp would also be operating an LOS F during the AM and PM hours. As discussed previously MnDOT has been considering future roundabout improvement to the I35E ramp intersections. With the addition of roundabouts at these intersections all movements would operate at acceptable levels in the future.

Traffic Signal Alternative Analysis

This alternative assumes a new traffic control signal at the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J). In addition, based on the all-way stop analysis, the following roadway lane configuration was included:

- Northbound Centerville Road (CR 59) – one left turn, one through and one right turn lane
- Southbound Centerville Road (CR 21) – one left turn, one through/right turn lane
- Eastbound Wilkinson Lake Blvd – one left turn, one through/right turn lane
- Westbound Ash Street (CR J) - one left turn, one through and one right turn lane

Figure 10 shows the proposed intersection configuration.

2018 Traffic Signal Build Conditions: The 2018 build conditions assume a traffic signal system with the proposed lane configuration with the proposed Hawkins residential project fully developed. Based on these assumptions the intersection would be operating at an overall LOS B in the AM and PM peak hours. The results of the 2018 traffic signal build condition traffic operations analysis are summarized in ***Table 10.*** Detailed modeling results are provided in ***Appendix D***.

Table 10: 2018 Traffic Signal Build Condition Operations Summary

Intersection			AM Peak				PM Peak			
Control	Location	Appr	Movement Delay (LOS)			Intersection Delay(LOS)	Movement Delay (LOS)			Intersection Delay/LOS
			Left	Through	Right		Left	Through	Right	
Signal	Centerville Rd (CSAH 21/ CSAH 59) at Ash St (CR J)	NB	16.9 (B)	19.2 (B)	17.2 (B)	11.6 (B)	18.0 (B)	23.6 (C)	21.2 (C)	15.8 (B)
		WB	17.4 (B)	13.9 (B)	8.1 (A)		16.2 (B)	15.3 (B)	12.2 (B)	
		SB	11.0 (B)	7.3 (A)			14.6 (B)	8.4 (A)		
		EB	14.0 (B)	14.0 (B)			15.7 (B)	15.4 (B)		

2038 Traffic Signal Build Conditions: Similar to the 2018 traffic signal build conditions the 2038 build conditions assumes a traffic signal system with the proposed lane configuration and the proposed Hawkins residential project fully developed. Based on these assumptions the intersection would be operating at an overall LOS B in the AM peak hour and LOS C in and PM peak hour. The results of the 2038 traffic signal build condition traffic operations analysis are summarized in ***Table 11.*** Detailed modeling results are provided in ***Appendix D***.

Table11: 2038 Traffic Signal Build Condition Operations Summary

Intersection			AM Peak				PM Peak			
Control	Location	Appr	Movement Delay (LOS)			Intersection Delay(LOS)	Movement Delay (LOS)			Intersection Delay/LOS
			Left	Through	Right		Left	Through	Right	
Signal	Centerville Rd (CSAH 21/ CSAH 59) at Ash St (CR J)	NB	23.6 (C)	27.7 (C)	24.0 (C)	16.5 (B)	19.4 (B)	29.3 (C)	23.8 (C)	24.5 (C)
		WB	24.2 (C)	17.6 (B)	8.1 (A)		23.1 (C)	21.4 (C)	27.1 (C)	
		SB	18.6 (B)	9.5 (A)			25.5 (C)	7.5 (A)		
		EB	17.9 (B)	17.7 (B)			22.2 (C)	21.6 (C)		

<u>Roundabout Alternative Analysis</u>

This alternative assumes a new roundabout at the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J). Based on the all-way stop analysis, the following lane configuration was included:

- Northbound Centerville Road (CR 59) – one left/through lane and one right lane
- Southbound Centerville Road (CR 21) – one left lane, one through/right lane
- Eastbound Wilkinson Lake Blvd – one lane
- Westbound Ash Street (CR J) - one left/through lane and one right lane

Figure 11 shows the proposed intersection roundabout configuration.

2018 Roundabout Build Conditions: The 2018 build conditions assume a roundabout with the proposed Hawkins residential project fully developed. Based on these assumptions the intersection would be operating at an overall LOS A in the AM and PM peak hours. The results of the 2018 roundabout build condition traffic operations analysis are summarized in ***Table 12.*** Detailed modeling results are provided in ***Appendix D***.

Table 12: 2018 Roundabout Operations Summary

Intersection			AM Peak Hour		PM Peak Hour	
Control	**Location**	**Approach**	**Approach Delay (LOS)**	**Intersection Delay (LOS)**	**Approach Delay (LOS)**	**Intersection Delay (LOS)**
Roundabout	Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)	NB	7.2 (A)	8.2 (A)	9.7 (A)	9.8 (A)
		WB	6.5 (A)		13.1 (B)	
		SB	9.6 (A)		6.7 (A)	
		EB	9.2 (A)		6.7 (A)	

2038 Roundabout Signal Build Conditions: Similar to the 2018 roundabout build conditions the 2038 build conditions assumes a roundabout with the proposed lane configuration and the proposed Hawkins residential project fully developed. Based on these assumptions the intersection would be operating at an overall LOS B in the AM peak hour and LOS C in and PM peak hour. The results of the 2038 roundabout build condition traffic operations analysis are summarized in ***Table 13.*** Detailed modeling results are provided in ***Appendix D***.

Table 13: 2038 Roundabout Operations Summary

Intersection			AM Peak Hour		PM Peak Hour	
Control	**Location**	**Approach**	**Approach Delay (LOS)**	**Intersection Delay (LOS)**	**Approach Delay (LOS)**	**Intersection Delay (LOS)**
Roundabout	Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)	NB	10.2 (B)	13.4 (B)	17.9 (C)	22.7 (C)
		WB	8.6 (A)		41.7 (E)	
		SB	17.5 (C)		8.9 (A)	
		EB	13.8 (B)		9.1 (A)	

Right of Way Impacts

There will be some impacts to the existing right of way and new permanent easements will need to be established to construct the proposed traffic signal or roundabout alternatives. ***Figure 10*** and ***Figure 11*** show the proposed alternative configures in relationship to the existing right-of-way. Based on these figures the roundabout alternative would require approximately 30% more right of way. The exact location and dimensions will be determined with preparation of the feasibility study and final design documents.

Project Costs

The preliminary planning level project cost was determined based on similar projects. Based on the proposed alternatives shown on ***Figures 10*** and ***Figure 11*** the following estimated cost can be assumed: traffic signal alternative with roadway improvements - $1,500,000; roundabout alternative - $1,000,000. A detailed cost estimate will be prepared with the feasibility study and during final design.

Intersection Control Evaluation

Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)

Figure 10


N
0
100
200 ft
Centerville Road
Ash Street
Intersection Control Evaluation
Centerville Rd (CSAH 21/CSAH 59) at Ash St (CR J)
Figure 11
WSB
CITY OF LINO LAKES

CONCLUSION

Traffic volumes at the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J) are expected to rise through 2038 and the existing intersection geometry with the existing all-way stop control is inadequate to handle these volumes with an acceptable level of service. In order to provide improved acceptable levels of service at the intersection, an all-way stop, traffic signal system or roundabout alternatives were considered.

Based on the analysis outlined in this document the following can be concluded:

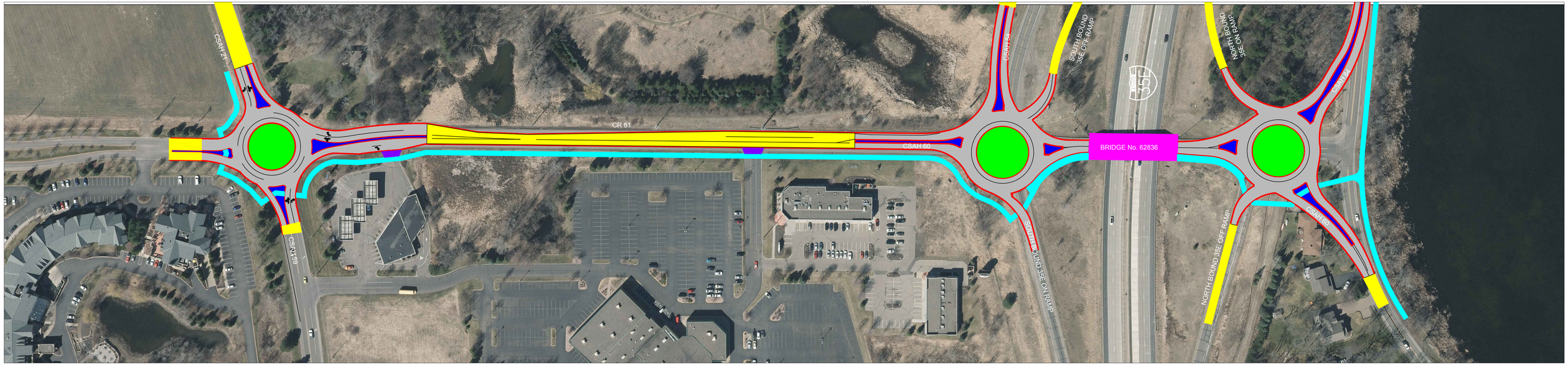
1. Either a traffic signal system or roundabout both with roadway improvements at the intersection of Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J) will accommodate traffic volumes through 2038. While both alternatives will provide the needed improvements, construction of a roundabout will improve safety and traffic flow by eliminating conflicting turning movements while maintaining acceptable queue lengths and delay times.

2. The implementation of future improvements at the Ash Street (CR J) intersections with I35E, including the addition of the southbound Off-Ramp and northbound On-Ramp to I35E will provide improved access and operations for these intersections.

It is therefore recommended that the City of Lino Lakes proceed with the proposed multi-lane roundabout at the intersection Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J). A roundabout at this intersection is justified. Traffic volumes at the intersection meet required traffic signal warrants as well as, the roundabout will provide improved traffic operations over existing conditions with forecasted traffic volumes and the roundabout is projected to reduce the number and severity of crashes at the intersection.

In addition it is recommended that the City continue to work with MnDOT, Ramsey County and Anoka County on the implementation of future improvements on Ash Street (CR J) at the intersections with I35E.

COUNTY ROAD J (ASH STREET, COUNTY ROAD 81)
CENTERVILLE ROAD TO OTTER LAKE ROAD



CITY OF LINO LAKES
RESOLUTION NO. 18-78

RESOLUTION OF SUPPORT FEDERAL FUNDING FOR INTERSTATE 35E & COUNTY ROAD J INTERCHANGE, AND THE CENTERVILLE ROAD & COUNTY ROAD J INTERSECTION PROJECTS

WHEREAS, the City Council passed Resolution 17-115 on October 9, 2017 approving the Intersection Control Evaluation (ICE) Report for Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J)/Wilkinson Lake Blvd; and

WHEREAS, the roadways of Interstate (I) 35E, Centerville Road (CSAH 21/CSAH 59) and Ash Street (CR J)/Wilkinson Lake Blvd are under the jurisdiction of multiple agencies including the City of Lino Lakes, the City of North Oaks, Anoka County and Ramsey County and the Minnesota Department of Transportation; and

WHEREAS, interchange improvements have been laid out by the Minnesota Department of Transportation for I 35E and CR J, and

WHEREAS, Ramsey County in coordination with Anoka County are applying for Federal Funding for the I 35E and CR J interchange improvements, and the Centerville Road (CSAH 21/CSAH 59) at Ash Street (CR J)/Wilkinson Lake Blvd intersection improvements.

NOW, THEREFORE BE IT FURTHER RESOLVED by The City Council of The City of Lino Lakes that the City Council hereby supports Federal Funding for the I-35E & County Road J Interchange, and the Centerville Road & County Road J Intersection Improvements.

Adopted by the Council of the City of Lino Lakes this 25th day of June, 2018.

The motion for the adoption of the foregoing resolution was introduced by Council Member Maher and was duly seconded by Council Member Manthey and upon vote being taken thereon, the following voted in favor thereof:

Maher, Manthey, Rafferty, Stoesz, Reinert

The following voted against same:

none

Jeff Reinert, Mayor

ATTEST:

Julianne Bartell, City Clerk

MnDOT Metro District
1500 West County Road B-2
Roseville, MN 55113

July 2, 2018

Ted Schoenecker
Director, Ramsey County Public Works
1425 Paul Kirkwold Drive
Arden Hills, Minnesota, 55112

Re: Letter of Support for Ramsey County
Metro Council/Transportation Advisory Board 2018 Regional Solicitation Funding Request for Improvements to CR J Interchange at I-35E

Dear Mr. Schoenecker,

This letter documents MnDOT Metro District's support for Ramsey County's funding request to the Metro Council for the 2018 regional solicitation for 2022-23 funding for improvements to the CR J Interchange at I-35E.

As proposed, this project would impact MnDOT right-of-way on I-35E. As the agency with jurisdiction over I-35E, MnDOT will support Ramsey County and will allow the improvements proposed in the application for the improvements to the CR J Interchange at I-35E. Details of a future maintenance agreement with Ramsey County will need to be determined during project development to define how the improvements will be maintained for the project's useful life.

No funding from MnDOT is currently programmed for this project. In addition, the Metro District currently does not anticipate any available discretionary funding in years 2022-23 that could fund project construction, nor do we have the resources to assist with construction or with MnDOT services such as the design or construction engineering of the project. However, I would request that you please continue to work with MnDOT Area staff to coordinate project development and to periodically review needs and opportunities for cooperation.

MnDOT Metro District looks forward to continued cooperation with Ramsey County as this project moves forward and as we work together to improve safety and travel options within the Metro Area.

If you have questions or require additional information at this time, please reach out to Sheila Kauppi, your North Area Manager, at Sheila.Kauppi@state.mn.us or 651-234-7718.

Sincerely,

Scott McBride
Metro District Engineer

CC: Sheila Kauppi, Metro District North Area Manager
Lynne Bly, Metro Program Director
Dan Erickson, Metro State Aid Engineer

CITY OF
NorthOaks
Building on a tradition of innovation

June 12, 2018

Ted Shoenecker
Public Works Director
Ramsey County Public Works Department

Dear Ted,

The City of North Oaks enthusiastically supports Ramsey County's application for federal funds for the County Road J/Centerville Road/I-35E/Otter Lake Road improvement. This improvement is needed to address regional traffic issues. We look forward to working with you on this improvement.

Sincerely,

Michael Robertson
City Administrator
mrobertson@cityofnorthoaks.com