Northeast Bismarck Subarea Study

Final Report

November 17, 2015

Prepared for the Bismarck-Mandan Metropolitan Planning Organization

Bismarck-Mandan Metropolitan Planning Organization

Houston Engineering Inc.

KLJ

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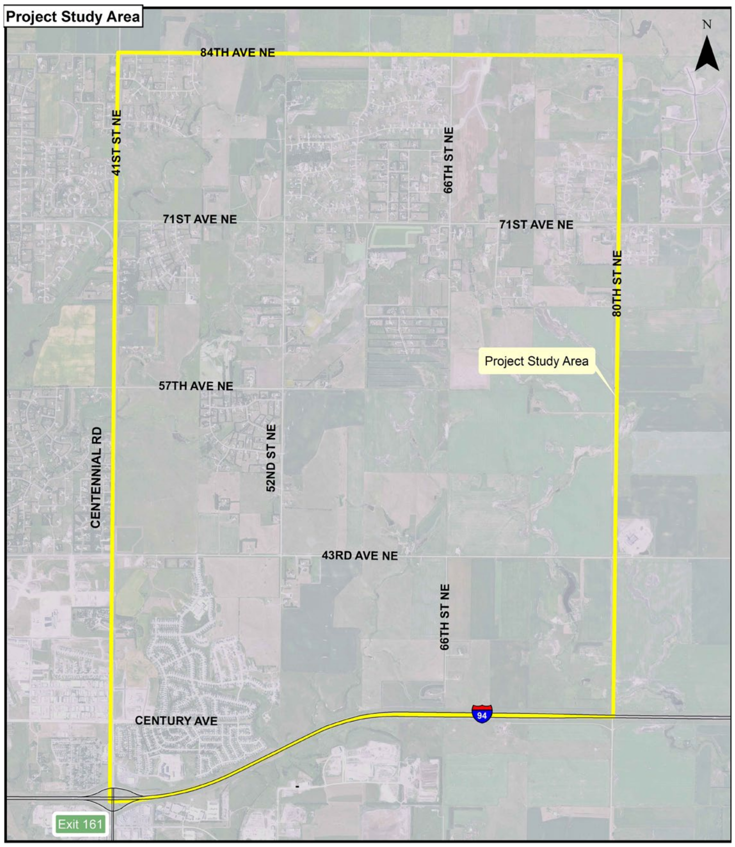
Executive Summary

STUDY BACKGROUND AND INTENT

The Northeast Bismarck Subarea Study covers a 12-square-mile area bounded on the north by 84th Avenue and the south by Interstate 94 (I-94), to the west by Centennial Road and to the east by 80th Street. The figure to the right shows the full study area.



The intent of the Northeast Bismarck Subarea Study is to develop a detailed plan to guide future investment in transportation system infrastructure, and to build on recently completed area-wide and subarea plans in the general vicinity. The output of the Northeast Bismarck Subarea Study will result in the following features:

- Development and summary of concise issues and needs memorandum
- Access management plan for key corridors in the Northeast Subarea
- Traffic operations analysis for Centennial Road, Century Avenue, 71st Avenue, 66th Street and 80th Street
- Alternative development scenario to understand the impacts of delayed roadway investments within the Northeast Subarea
- Review of Federal Highway Administration (FHWA) Interstate Justification Report (IJR) criteria relative to the proposed 66th Street/I-94 interchange
- A planning-level purpose and need statement (PNS) for development of portions of the Beltway and an interstate access revision at 66th Street and I-94
- Implementation plan with recommended year 2025, 2040 and beyond 2040 roadway projects for the Northeast Subarea

MAJOR STUDY OUTCOMES

The Northeast Bismarck Subarea Study produces an Implementation Plan for required transportation improvements. Improvements are based on projected future transportation needs in the study area. Transportation improvements are banded into three phases: 2025, 2040 and beyond 2040. Pages 6 and 7 show the recommended phasing and costs of required transportation improvements within the Northeast Subarea.

The Northeast Bismarck Subarea Study also includes an updated Traffic Operations and Access Management Plan to reflect projected conditions to the year 2040. Page 3 shows the recommended Access Management Plan for the Northeast Bismarck Subarea.

The Northeast Subarea further clarifies an ongoing proposal for a new interchange at I-94 and 66th Street. The proposed 66th Street interchange would be one piece of the larger Bismarck-Mandan Metropolitan Planning Organization (BMMPO) North-South Beltway Corridor. The Northeast Subarea Study builds upon several previous studies that have discussed the North-South Beltway.

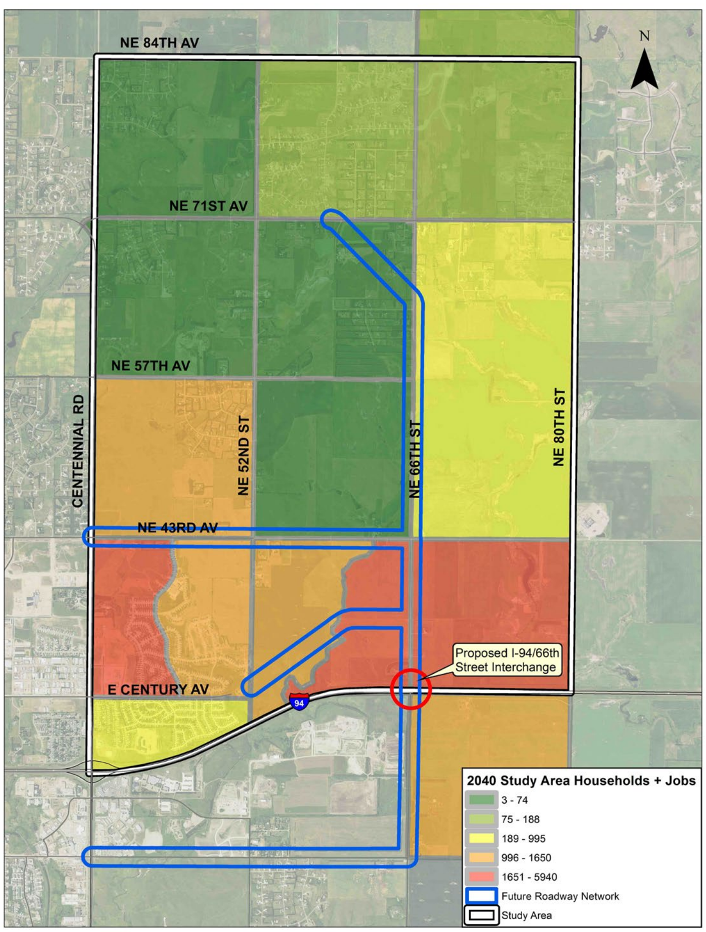
NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

A number of transportation improvements have been identified for the Northeast Bismarck Study area, and many are several years away. It is important to remember that all significant transportation investments involving federal funds, or an action of the federal government, must first consider a range of possible alternatives before a final alignment or roadway typical section would be constructed. This process of defining and examining alternatives is typically done in the NEPA phase of a project. NEPA refers to the required evaluation under the National Environmental Policy Act (NEPA).

PROJECTED GROWTH IN THE STUDY AREA

The Envision 2040 Long Range Transportation Plan (LRTP) developed household and employment projections for the BMMPO area for years 2025 and 2040. The Northeast Bismarck Subarea Study refines future transportation and infrastructure needs based on the socioeconomic data projections and other growth assumptions used for the Envision 2040 update. Projected socioeconmic development in the Northeast Subarea, through 2040, follows existing and projected roadway networks, specifically following Century Avenue, 43rd Avenue, 52nd Street and 66th Street.

Between 2010 and 2025 a total of 2,960 new households are projected in the Northeast Subarea, and another 887 between 2025 and 2040. The majority of new household growth in the study area is projected to occur between 2010 and 2025. Between 2010 and 2025 a total of 4,863 new jobs are projected in the Northeast Subarea, and an additional 9,604 new jobs are projected between 2025 and 2040. Currently, about one-third of the projected jobs are expected to occur before 2025, and the remainder between 2025 and 2040.



Future Growth Projections

ACCESS MANAGEMENT AND CORRIDOR PRESERVATION

The Northeast Bismarck Subarea Study analyzed access management within the study area to refine recommended access configuration for all existing and future arterial roadways. By planning future access onto the arterials now, future development can occur within the recommended access configuration and minimize access points along the arterial roadways, which will increase the safety and flow of the principal arterials.

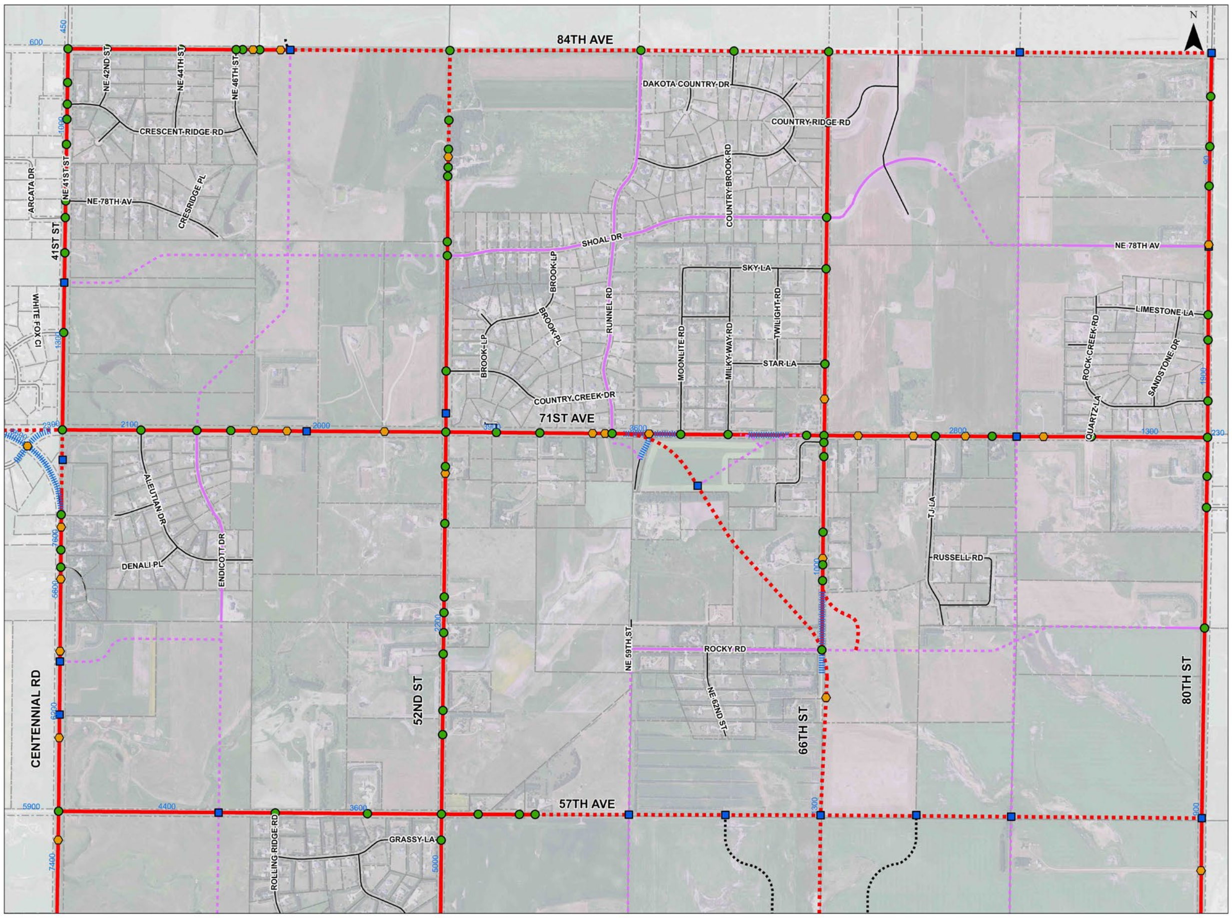
The BMMPO Fringe Road Master Plan (2014) developed roadway fabric at the arterial and collector street levels. There have also been two corridor studies performed within the study area; one studied 71st Avenue/Centennial Road and one studied 43rd Avenue. Access management recommendations for these corridors were reevaluated and new access management recommendations were established for other key corridors in the study area (see page 3).

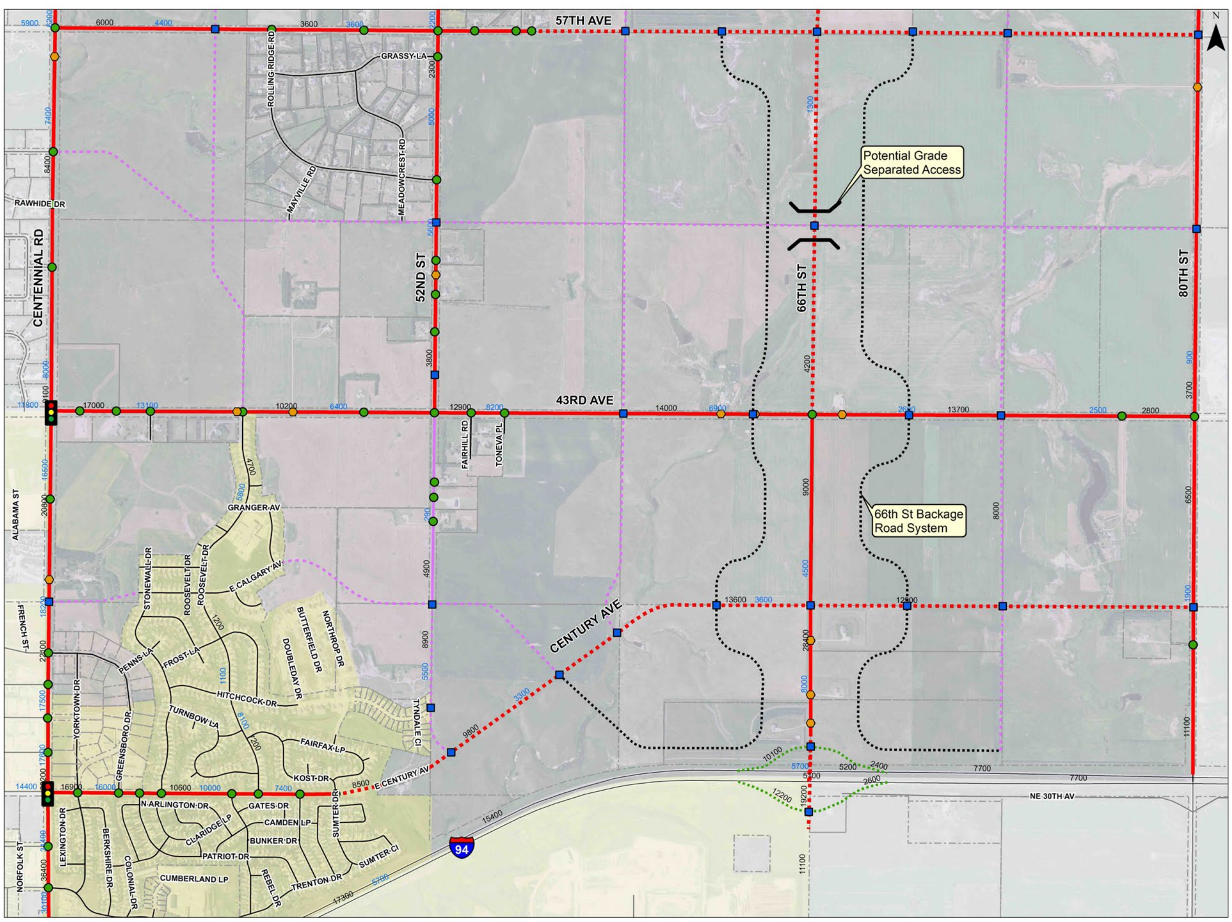
Burleigh County has not adopted a formal policy for access management, but procedures for granting access to both unplatted and platted areas are in place. Access management within the County's jurisdiction is managed through requests for Access Permits. Access may be granted at the discretion of the County Engineer and/or the County Board of Commissioners.

Access management within the City's jurisdiction is managed through the platting process, in accordance with Bismarck's 2005 Access Management Policy. The policy's primary purpose is to establish standards for spacing between access points, which vary depending on type of roadway and surrounding land use. Since 2005, and expected in the future, the City's access management will be enforced through the platting process.

Each jurisdiction retains the ability to make decisions on a case-by-case basis, approving access they feel is in the best interest of current and future development. In the case that an access is not recommended by staff, waivers or appeals can be requested by developers and may be approved by the appropriate City or County Commission. It has not been the practice of the City or County to remove access points without plat revision or land development.

Going forward it is critical for the City and County to work cooperatively to maintain appropriate access on collector and arterial roadways. Efforts should be made to continue controlling the locations of access points in the future to facilitate orderly development. The Northeast Subarea Study provides an updated framework for access management on study area corridors.


North Study Area Access Recommendations
84TH AVE
71ST AVE
57TH AVE
CENTENNIAL RD
41ST ST
52ND ST
66TH ST
80TH ST
NE 42ND ST
NE 44TH ST
NE 46TH ST
CRESCENT RIDGE RD
NE 41ST ST
NE 78TH AV
CRESSRIDGE PL
ARCATA DR
WHITE FOX CI
DAKOTA COUNTRY DR
COUNTRY RIDGE RD
COUNTRY BROOK RD
SHOAL DR
BROOK LP
BROOK PL
RUNNEL RD
COUNTRY CREEK DR
SKY LA
MOONLITE RD
MILKY WAY RD
TWILIGHT RD
STAR LA
NE 78TH AV
LIMESTONE LA
ROCK CREEK RD
SANDSTONE DR
QUARTZ LA
ALEUTIAN DR
DENALI PL
ENDICOTT DR
TJ LA
RUSSELL RD
ROCKY RD
NE 59TH ST
NE 62ND ST
GRASSY LA
ROLLING RIDGE RD
Roadway Legend
Existing Arterial
Existing Collector
Existing Local
Proposed Removal
Proposed Arterial
Proposed Collector
Potential Backage System
2000 2025 ADT
5700 2040 ADT
Access Legend
To Remain
Potential Access
Relocate or Combine Upon Redevelopment
Northeast Bismarck Subarea Study
84th Ave
71st Ave
57th Ave
43rd Ave
Century Ave
Centennial Rd
52nd St
66th St
80th St


South Study Area Access Recommendations
57TH AVE
43RD AVE
CENTURY AVE
E CENTURY AV
NE 30TH AV
CENTENNIAL RD
52ND ST
66TH ST
80TH ST
Potential Grade Separated Access
66th St Backage Road System
GRASSY LA
ROLLING RIDGE RD
MAYVILLE RD
MEADOWCREST RD
RAWHIDE DR
ALABAMA ST
FRENCH ST
NORFOLK ST
FAIRHILL RD
TONEVA PL
GRANGER AV
E CALGARY AV
STONEWALL DR
ROOSEVELT DR
BUTTERFIELD DR
NORTHROP DR
DOUBLEDAY DR
PENNS LA
FROST LA
HITCHCOCK DR
TURNBOW LA
YORKTOWN DR
GREENSBORO DR
FAIRFAX LP
KOST DR
TYNDALE CI
N ARLINGTON DR
GATES DR
CLARIDGE LP
CAMDEN LP
BUNKER DR
SUMTER DR
SUMTER CI
PATRIOT DR
LEXINGTON DR
BERKSHIRE DR
COLONIAL DR
CUMBERLAND LP
REBEL DR
TRENTON DR
94
Roadway Legend
Existing Arterial
Existing Collector
Existing Local
Proposed Removal
Proposed Arterial
Proposed Collector
Potential Backage System
2000 2025 ADT
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Access Legend
To Remain
Potential Access
Relocate or Combine Upon Redevelopment
Northeast Bismarck Subarea Study
84th Ave
71st Ave
57th Ave
43rd Ave
Century Ave
Centennial Rd
52nd St
66th St
80th St

TRUCK ANALYSIS

There is potential for the completed 66th Street and 71st Avenue corridors to attract measurable future volumes of truck traffic, especially if a proposed interchange is constructed at 66th Street and I-94. The Northeast Bismarck Subarea Study analyzed the existing truck traffic patterns within the subarea study boundaries. This analysis was completed in response to substantial concern raised by the public regarding future potential truck traffic within the Northeast Subarea. Significant concerns were raised by residents in the Northeast Subarea about future increases in truck traffic that would result from implementation of a proposed 66th Street interchange, development of the 66th Street Corridor and reconstruction of 71st Avenue. The primary goal of the analysis was to understand potential truck attraction anticipated on 71st Avenue and 66th Street with the proposed 66th Street interchange with I-94.

The through truck movements most likely to be drawn to a proposed 66th Street interchange would be the westbound to northbound movement off of I-94 and the southbound to eastbound movement onto I-94. Currently these movements occur at the Centennial and State Street interchanges. It is believed that a 66th Street interchange would absorb a portion of these movements, with the majority received from the Centennial Road/Expressway interchange. Currently, Centennial Road and 71st Avenue act as a de facto bypass for local traffic, including trucks. However, analysis indicates these are primarily local trucks, and not regional or through trucks.

Given the residential nature of 71st Avenue, several landowners expressed concern regarding future truck and traffic volumes. 71st Avenue is not likely to see any serious increase in truck traffic until the following improvements are made along 66th Street and 71st Avenue:

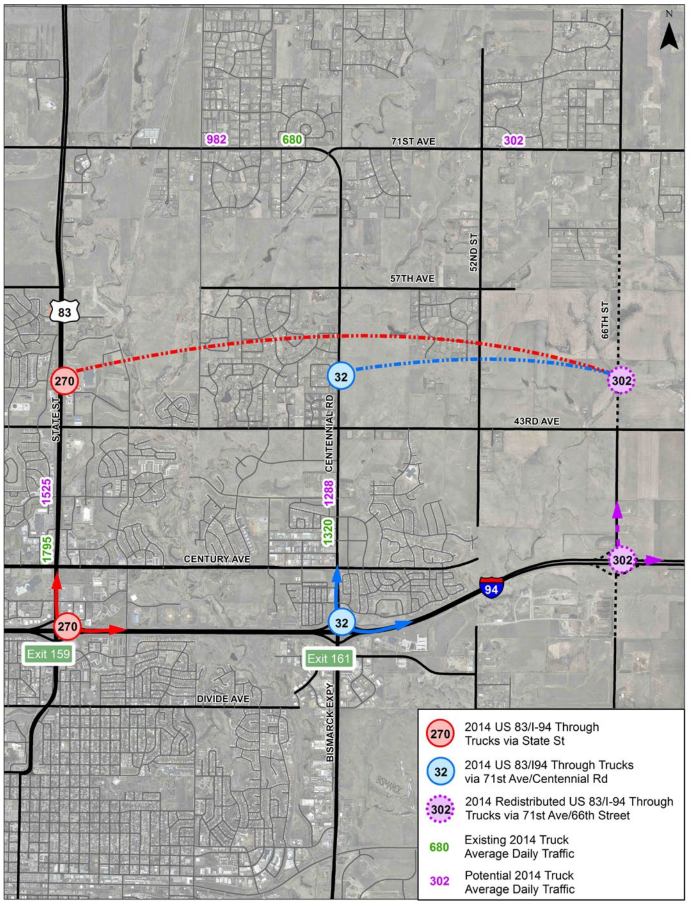
- 66th Street is fully constructed including an interchange at I-94
- Completion of the 66th Street Curve
- 71st Avenue is reconstructed and improved to a three-lane section with consolidated access points

Once these infrastructure improvements are in place, it would logically make 66th Street and 71st Avenue equally attractive to through truck movements as is either State Street or Centennial Road.

The truck attractiveness of the 71st Avenue and 66th Street corridor would be influenced by other factors as well:

- Continued industrialization of western North Dakota
- Designation of 66th and 71st Avenue as a truck route
- Future traffic conditions on State Street
- Land use and development patterns along 66th Street

Based on analysis completed as part of the Northeast Bismarck Subarea Study under current conditions, it would be expected that more than 300 trucks would use the 71st Avenue and 66th Street corridors as a direct connection between US Highway 83 and I-94. This estimate is based on current traffic volumes and reflects recent rapid growth in truck movements in the BMMPO area. However, it is important to note that both 66th Street and 71st Avenue would have been fully constructed to three-lane roadways prior to seeing this volume of truck traffic. This projection also assumes construction of a proposed interchange at 66th Street and I-94. As a product of the current fiscal constraint in the Envision 2040 LRTP, infrastructure investments within the study area are expected to be gradual, which will allow opportunity to review trends and policies to manage shifts in future truck movements through the BMMPO area.



Truck Analysis

FUTURE TRANSPORTATION NEEDS

Critical roadway investments will need to be made in a phased approach over the next 25 years. The following four projects are currently included in the fiscally constrained element of Envision 2040 and are reiterated as part of the Implementation Plan for the Northeast Bismarck Subarea.

- Construct 66th Street from Divide Avenue to 71st Avenue, which includes a grade separation of I-94
- Reconstruct 71st Avenue as a three-lane roadway from Centennial Road to 66th Street
- Reconstruct and extend Century Avenue from 52nd Street to 66th Street
- Construct an interchange at 66th Street

The City of Bismarck is attempting to move up the timing for constructing the extension of Century Avenue to match more closely with the development of the proposed 66th Street corridor improvements. Expedition is also needed on upgrades to the 43rd Avenue Corridor as well.

The BMMPO put an emphasis-added statement behind the need to expedite development and construction of a proposed interchange at 66th Street and I-94 sooner than is possible under current fiscal constraint limitations of the Envision 2040 LRTP.

As infrastructure builds according to both Envision 2040 and the Bismarck Growth Management Plan, 66th Street could serve as a north-south roadway with little or no opposing intersections/access from conflicting major east-west roadways for several years. This would be a benefit to the future operational utility of 66th Street if it were to be built well in advance of other infrastructure, particularly major east-west conflicting corridors. This would give the roadway corridor an opportunity to develop as a limited access arterial, and would assist in right-of-way preservation and access control measures in advance of meaningful future development pressure.

Major unfunded (illustrative) improvements in the Northeast Bismarck Subarea include infrastructure that will be critical to developing a balanced transportation system within the subarea. Roadway improvements within or adjacent to the Northeast Subarea study which are not funded (illustrative) within Envision 2040 are considered the minimum required investment in the local/urban street system of the Northeast Subarea.

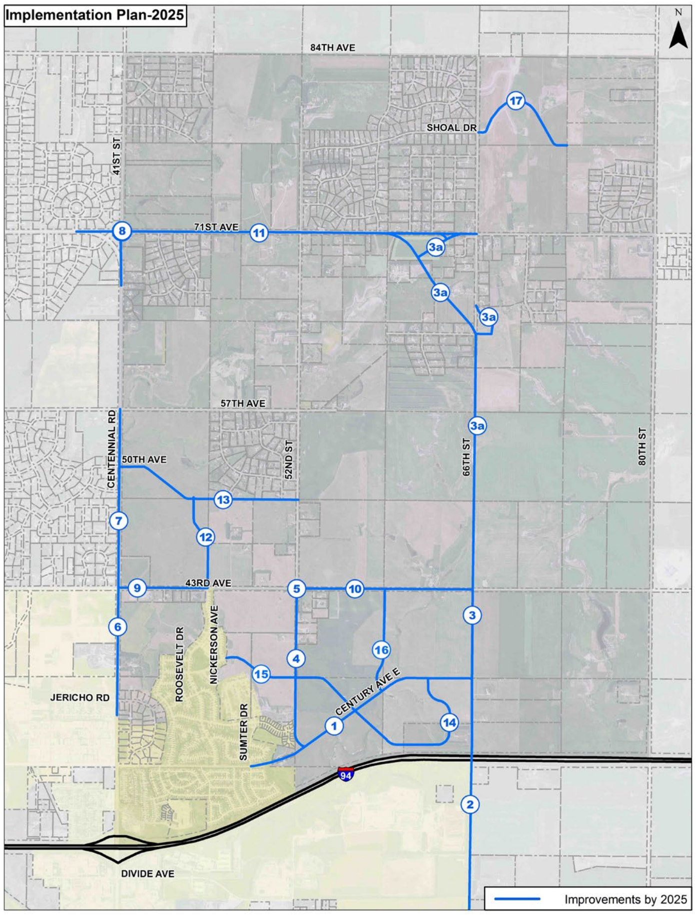
Several unfunded (illustrative) projects are needed in the Northeast Bismarck Subarea Study area:

- Reconstructing and widening 43rd Avenue between Centennial Road and 66th Street:
  - Issue: Presents lack of a significant east-west arterial roadway between Century Avenue and 71st Avenue.
  - Issue: The current Envision 2040 projections for 43rd show Average Daily Traffic (ADT) of 14,000 ADT in the area between 52nd and 66th, which currently is gravel roadway.
- Widening of 66th Street to four lanes between Century Avenue and 43rd Avenue:
  - Issue: Results in a Level of Service (LOS) F between I-94 and Century Avenue.
  - Issue: A critical segment of the beltway is projected to operate poorly soon after it is constructed.
- Improvements to Centennial Road/Expressway, including a reconstruction as a six-lane roadway and reconstruction of the I-94 Interchange:
  - Issue: This results in an LOS F north and south of I-94.

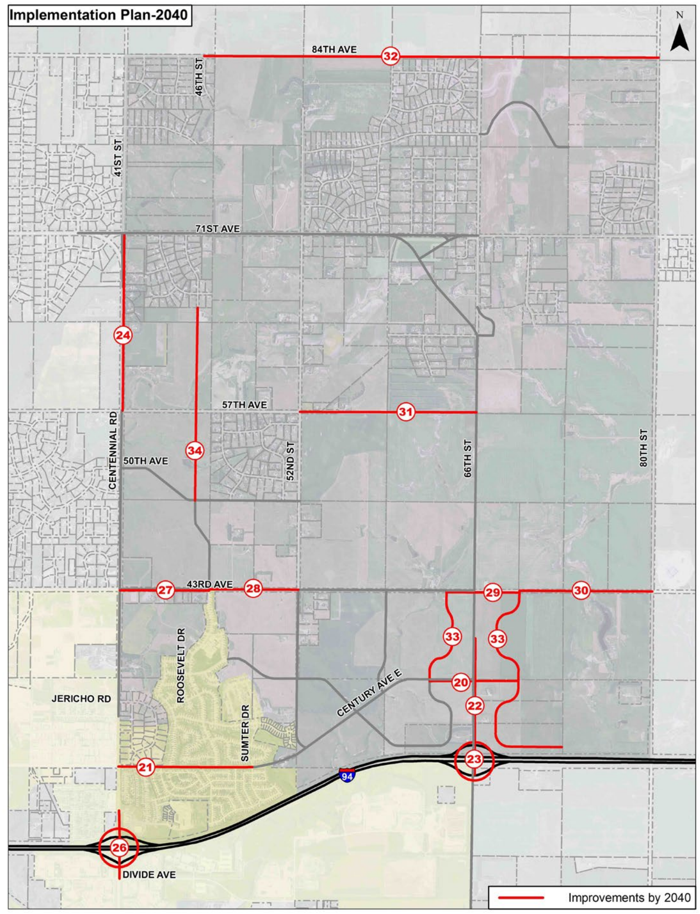
As part of the detailed traffic operations report developed as part of the Northeast Bismarck Subarea Study, additional needs were identified above and beyond those identified by Envision 2040. New needs identified beyond the Envision 2040 recommendations are also considered unconstrained or illustrative projects.

- Widen Century Avenue to four lanes ¼ mile west of 66th Street:
  - Issue: Three-lane facility along Century Avenue constrained in Envision 2040 operates at a LOS F in the 2040 condition.
- Widen Centennial Road to four lanes between Jericho Road and 43rd Avenue:
  - Issue: Three-lane facility north of Jericho Road operates at a LOS E in 2040 conditions as constrained by Envision 2040.

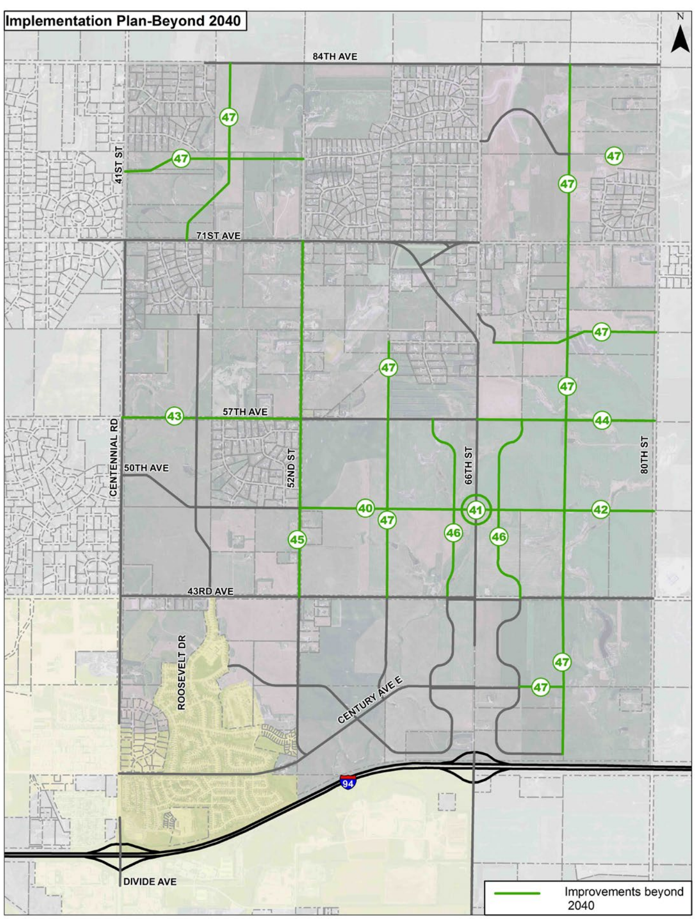
IMPLEMENTATION PLAN – 2025



IMPLEMENTATION PLAN – 2040



IMPLEMENTATION PLAN – 2040+



IMPLEMENTATION PLAN FOR NORTHEAST BISMARCK SUBAREA

Detailed corridor level needs were identified for roadways within the Northeast Bismarck Subarea. The Implementation Phasing shows the gradual improvement of roadways to meet projected future demand to the year 2040.

The cost to implement the full range of needed transportation improvements in the Northeast Subarea totals more than $300 million. Through the year 2040, only $84 million of these needs are currently fundable through city, county or North Dakota Department of Transportation (NDDOT) sources.

Implementation Phase	Cost
2025	$61,150,000
2040	$123,850,000
Beyond 2040	$117,850,000
Total	$302,850,000

The implementation element of the Northeast Bismarck Subarea Study is not fiscally constrained. All fiscally constrained and unmet needs from Envision 2040 should be considered the minimum investment in the local and urban roadway system within the Northeast Subarea. A dedicated focus is needed to find creative and innovative solutions to implement the remaining transportation needs in the Northeast Bismarck Subarea.

YEAR 2025 – SHORT TERM CORRIDOR IMPROVEMENTS						
#	Corridor	Project Description	Termini	Termini	Cost	LRTP Phase
1	Century Avenue	Construct New Three-Lane	Sumter Drive	66th Street	$17,100,000	2019-2023
2	66th Street	Construct Two-Lane + Grade Separation	Divide Avenue	Century Avenue Extension	$8,500,000	2019-2023
3	66th Street	Construct Three-Lane	43rd Avenue	Century Avenue Extension	$1,400,000	2019-2023
3a	66th Street	Construct Three-Lane (including Curve)	43rd Avenue	Top of Curve	$11,120,000	2019-2023
4	52nd Street	Construct Three-Lane	Century Avenue	43rd Avenue	$2,500,000	Not Listed
5	43rd Avenue/52nd Street	Reconstruct Intersection	x	x	Incl. in #10	Illustrative
6	Centennial Road	Widen to Five Lanes	Jericho Road	43rd Avenue	$3,100,000	Not Listed
7	Centennial Road	Widen to Three Lanes	43rd Avenue	57th Avenue	$1,200,000	2024-2032
8	Centennial Road/71st Avenue	Reconstruct and Realign Intersection	1/4 mile South of 71st Avenue	1/4 mile West of 41st Street	$580,000	2024-2032
9	43rd Avenue	Reconstruct and Widen to Three Lanes	Centennial Road	Roosevelt Drive	$1,400,000	Illustrative
10	43rd Avenue	Reconstruct as Three-Lane	52nd Street	66th Street	$3,250,000	Illustrative
11	71st Avenue	Reconstruct as Two/Three Lane	Centennial Road	66th Street	$4,000,000	2019-2023
12	Roosevelt Drive	Construct New Two-Lane	43rd Avenue	50th Avenue	$1,200,000	Not Listed
13	50th Avenue	Construct New Two-Lane	Centennial Road	52nd Street	$2,450,000	Not Listed
14	New Frontage/Backage Road	0.5 miles of New Frontage/Backage Road	South of Century Avenue/W of 66th Street		$1,200,000	Not Listed
15	Calgary Avenue	Construct New Two-Lane	Nickerson Avenue	66th Street Frontage/ Backage Road	$3,200,000	Not Listed
16	New Collector	0.7 miles of New Collector	Calgary Avenue Extension	43rd Avenue	$1,700,000	Not Listed
17	Shoal Drive	Construct New Two-Lane	66th Street	1/2 mile East of 66th Street	$1,700,000	Not Listed

YEAR 2040 LONG TERM CORRIDOR IMPROVEMENTS						
#	Corridor	Project Description	Termini	Termini	Cost	LRTP Phase
20	Century Avenue	Widen to Five Lanes	1/4 mile West of 66th Street	1/4 mile E of 66th Street	$3,650,000.00	Not Listed
21	Century Avenue	Reconstruct as Five Lanes	Centennial Road	Sumter Drive	$5,850,000.00	Not Listed
22	66th Street	Reconstruct as Five-Lane	I-94 South Ramps	1/4 mile N of Century Avenue	$5,850,000.00	Illustrative
23	66th Street Interchange	Construct Interchange	x	x	$28,250,000.00	2024-2032
24	Centennial Road	Widen to Three Lanes	57th Avenue	71st Avenue	$2,050,000.00	2032-2040
26	Centennial Road/ Expressway	Reconstruct Interchange and Reconstruct to Six Lanes	Divide Avenue	500' South of Century Avenue	$36,000,000.00	Illustrative
27	43rd Avenue	Widen to Five-Lane	Centennial Road	Roosevelt Drive	$2,500,000.00	Illustrative
28	43rd Avenue	Reconstruct as Three-Lane	Roosevelt Drive	52nd Street	$2,650,000.00	Illustrative
29	43rd Avenue	Reconstruct as Five-Lane	1/4 mile West of 66th Street	1/4 mile E of 66th Street	$3,650,000.00	Illustrative
30	43rd Avenue	Reconstruct Three-Lane	1/4 mile East of 66th Street	80th Street	$3,300,000.00	Illustrative
31	57th Avenue	Construct Two-Lane	52nd Street	66th Street	$4,100,000.00	Not Listed
32	84th Avenue	Construct Two-Lane	46th Street	80th Street	$10,150,000.00	Not Listed
33	New Frontage/Backage Road	2.0 miles of New Frontage/Backage Roads	"Between Century Avenue and 43rd Avenue, West of 66th Street Between I-94 and 43rd Avenue, East of 66th Street"		$8,100,000.00	Not Listed
34	Roosevelt Drive	Construct Two-Lane	50th Avenue	1/2 mile N of 57th Avenue	$4,100,000.00	Not Listed
LONG TERM CORRIDOR IMPROVEMENTS (BEYOND 2040)						
40	50th Avenue	Construct Two Lane	52nd Street	66th Street	$6,500,000.00	Not Listed
41	50th Avenue	Grade Separation (Overpass) at 66th Street	x	x	$11,350,000.00	Not Listed
42	50th Avenue	Construct Two-Lane	66th Street	80th Street	$6,500,000.00	Not Listed
43	57th Avenue	Reconstruct Two-Lane	Centennial Road	52nd Street	$6,500,000.00	Not Listed
44	57th Avenue	Construct New Two-Lane	66th Street	80th Street	$6,500,000.00	Not Listed
45	52nd Street	Reconstruct Two-Lane	43rd Avenue	71st Avenue	$6,500,000.00	Not Listed
46	New Frontage/Backage Road	2.2 miles of New Frontage/Backage Road	North of 43rd Avenue, East and West of 66th Street		$14,300,000.00	Not Listed
47	New Collectors	9.2 miles of New Two-Lane Collectors	x	x	$59,700,000.00	Not Listed

CONSIDERATIONS FOR IMPLEMENTATION OF THE BELTWAY
(Improvements to 66th Street and 71st Avenue)

As part of the Northeast Bismarck Subarea Study, more discussion between the City of Bismarck, Burleigh County and NDDOT took place on the function and design for the 66th Street and 71st Avenue corridors. For approximately the past 15 years, these two corridors have been envisioned as evolving into the northeast portion of the BMMPO Beltway. The City of Bismarck, Burleigh County and NDDOT should build upon existing expectations and perceptions regarding improvement needs to 66th Street and 71st Avenue, to move towards a coordinated planning and programming framework for their implementation over the next 10 to 12 years. As future planning and programming for the 66th Street and 71st Avenue corridors continue beyond the Northeast Bismarck Subarea Study there are several major considerations that should be accounted for to facilitate timely and efficient development of these corridors.

Benefits to Interregional Mobility – There are growing concerns about the viability of State Street to continue to carry the volume of traffic projected over the life of the current 2040 planning horizon. Even with the widening of State Street (US Highway 83) to six lanes from Calgary Avenue to 57th Avenue, a proposed interchange at 66th Street and a three-lane beltway around Northeast Bismarck on the 66th/71st Corridor, several segments of State Street will continue to operate at a LOS D or worse from I-94 to 71st Avenue. Also, by 2040 most of Centennial Road south of 43rd Avenue will operate at an LOS E. The gradual development of both 66th Street and 71st Avenue as three-lane arterial roadways (and beyond 2040 as five-lane arterial roadways) provides an opportunity to develop a reliever route to other north-south and east-west arterial roadways.

Jurisdictional Coordination – While most of the future 66th Street/71st Avenue Corridor is currently in the Bismarck Extraterritorial Area (ETA), Burleigh County would still be responsible for ownership, and likely maintenance, of the facility until the corridor becomes a City of Bismarck roadway. Consideration of this issue is acknowledged by the City and County, and will be factored in as development of the corridors unfolds. There needs to be a concerted effort through the BMMPO process to continue to refine cooperative planning and programming strategies to assure full implementation of needed improvements along 66th Street and 71st Avenue.

Public Outreach – Several concerns were received from residents adjacent to the 71st Avenue corridor regarding the future Beltway along 71st Avenue. Going forward, deliberate and predictable communication is needed between the City of Bismarck, Burleigh County, BMMPO and the residents along 66th Street and 71st Avenue. Efforts should be made to foster a continuous communication mechanism regarding the status of improvements along both 71st Avenue and 66th Street. Adjacent residents should be actively involved in future planning and project development efforts for improvements along both corridors.

Land Use Compatibility – A major consideration for any new or expanded roadway is land use capability. If the 66th Street and 71st Avenue corridors mature into an interregional beltway, consideration is needed regarding potential impacts to existing and future land uses along the corridor. This is particularly important for the northern portions of the corridors that are or will be developed as low-density residential; and the areas between 43rd and 71st which are planned as future residential. While current traffic projections north of 43rd Avenue range between 5,000 and 10,000 ADT, advance consideration and residential noise buffering should be considered. Adjacent residential uses are those most subject to concerns regarding noise created by future transportation corridors. Future land use planning efforts, including an update to growth management plans for the City and County, should closely review land uses along the 66th Street and 71st Avenue corridors to make sure they are the best fit with future transportation needs of the BMMPO area.

Access Management – Implementation of a firm access management plan is a critical issue for the 66th Street and 71st Avenue corridors. For the 66th/71st Corridor to succeed as a future arterial corridor (i.e. beltway), it will need to demonstrate the potential to operate at a higher LOS than several existing north-south and east-west arterials in the BMMPO area.

ADDITIONAL QUESTIONS

The Northeast Bismarck Subarea Study was accepted by the Bismarck-Mandan MPO in November 2015.

For additional informational or to inquire about details contained within the Study, please contact the Bismarck-Mandan MPO at 701 355 1840.

CHAPTER 1: INTRODUCTION & EXISTING CONDITIONS

INTRODUCTION

The Northeast Bismarck Subarea Study covers a 12 square-mile area bounded on the north by 84th Avenue and the south by Interstate 94 (I-94); to the west by Centennial Road and to the east by 80th Street. **Figure 1.1** shows the general study area and vicinity.

The intent of the Northeast Bismarck Subarea Study was to develop a detailed plan to guide future investment in transportation system infrastructure and to build on recently completed area-wide and subarea plans in the general vicinity.

The output of the Northeast Bismarck Subarea Study results in the following features:

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Based on recently completed plans and studies from the Bismarck-Mandan Metropolitan Planning Organization (BMMPO), the City of Bismarck and Burleigh County, there exists a large range of existing conditions data and future planning assumptions for the Northeast Bismarck Subarea. The following is a summary of key data sets and existing physical and environmental features within the Northeast Subarea.

ADDITIONAL STUDY BACKGROUND

Prior to the development of the Northeast Bismarck Subarea Study a number of previous studies have provided a backdrop of transportation needs and concepts. One which requires some summary is the 2009 North-South Beltway Study. The North-South Beltway Study was developed to look at a north-south beltway on each end of the BMMPO area. The 2009 Study more clearly outlined concepts for a Beltway in the BMMPO area which had been discussed since 2001.

The 2009 Study stated the purpose of the Beltway as follows:

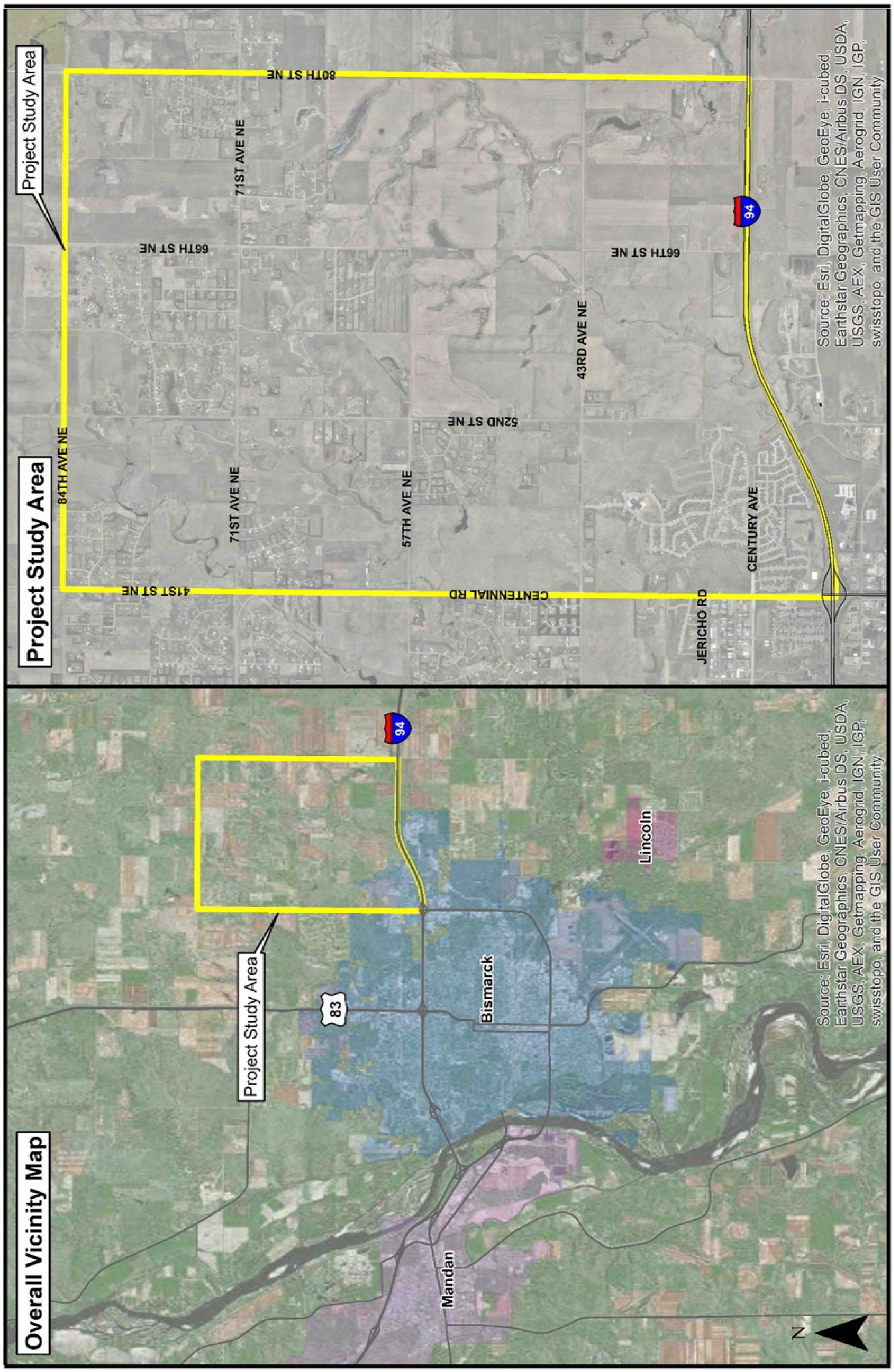
- To relieve traffic on busy, parallel routes such as US Highway 83 and Centennial Road;
- To provide commuters and freight haulers with a high safety and mobility alternative to existing routes;
- To provide linkage between area development and other community or regional destinations;
- To provide regional roadway system continuity;
- Barriers to roadway system continuity include the Missouri River, I-94 and the railroads. These barriers interfere with roadway system continuity when there are insufficient crossings to address the needs of traffic to efficiently arrive at their destination;

The North-South Beltway Study technically prioritized the general travel corridors of 66th Street and 71st Avenue for the eastern and northern corridors for the Beltway. These routes provided connectivity with the previously planned Northern Bridge Corridor Study (2004), provide more direct access to Lincoln to the south, and would provide Interstate access with a minimum 2 mile access spacing between interchanges. The primary recommendations from the North-South Beltway Study were integrated into the previous and current Long Range Transportation Plan (LRTP) for the BMMPO. The 66th Street/71st Avenue travel corridors were chosen based on an evaluation that involved technical, public and political considerations developed at the planning level.

The Beltway was and is intended to develop over time as additive improvements are implemented to the existing transportation system of the BMMPO area. The Beltway would serve to manage existing and projected traffic that would naturally occur, both for vehicular and truck movements. The Beltway's primary function would not be as a truck reliever route or *bypass* around Bismarck. Other communities in western North Dakota have had *bypasses* or truck reliever routes constructed to remove truck traffic from the city center. While the Beltway would provide additional connectivity between US 83 and Interstate 94, it is not intended to be dedicated as a formal bypass or truck reliever route.

The Northeast Subarea Study is not intended to reevaluate the technical merits of the Beltway designation along 66th Street and 71st Avenue. The Northeast Subarea Study integrated the framework from the both the North-South Beltway Study and the Envision 2040 LRPT. Through the development of the Northeast Bismarck Subarea study many important data sets were reviewed and analyzed to better understand projected conditions along a fully completed 66th Street and 71st Avenue Corridor. Analysis also looked at conditions along other corridors within the Northeast Subarea with and without a proposed interchange or grade separation at I-94. This information is included throughout the Northeast Subarea Study.

Prior to any additional detailed corridor level improvements being implemented, analysis completed as part of this and all previous studies would be updated to include a range of all feasible alternatives, potentially as part of a National Environmental Protection Act (NEPA) process.



Northeast Bismarck
Subarea Study

Figure 1.1
Study Area

EXISTING CONDITIONS

JURISDICTIONAL BOUNDARIES

The study area includes a mosaic of jurisdictions including Burleigh County, the City of Bismarck, Gibbs Township and Hay Creek Township. Less than 10% of the study area is within the Bismarck city limits (southwest part of the study area). The majority of the study area is currently within the Bismarck extraterritorial area (ETA), therefore under City zoning jurisdiction. The northeast corner of the study area is not within the City ETA, therefore is under Burleigh County zoning jurisdiction.

Existing jurisdictional boundaries can be seen in **Figure 1.2.**

ROADWAYS BY JURISDICTION

Since the study area is on the fringe of the Bismarck urban area, roadways are under different jurisdictions, with a mix of paved (concrete or asphalt) and gravel roadways. The current roadway jurisdiction and pavement types throughout the study area can be seen in **Figure 1.2**. Most pavement in the study area is in good to excellent condition; however, a detailed pavement condition assessment was not considered a part of the scope for the Northeast Bismarck Subarea Study.

Table 1.1 shows the approximate centerline and lane mileage of each pavement type by jurisdiction within the study area.

Table 1.1 - Roadway Mileage by Pavement Surface Type and Ownership

Surface Type	Jurisdiction	Centerline Mileage	Lane Mileage
Paved	City	10	21.2
	County	14	28
	Township	11.2	22.4
	Other	4.2	8.4
	Overall	39.4	80
Gravel	City	0	0
	County	4.7	9.4
	Township	5.9	11.8
	Other	0	0
	Overall	10.6	21.2
All Types	City	10	21.2
	County	18.7	37.4
	Township	17.1	34.2
	Other	4.2	8.4
	Overall	50	101.2

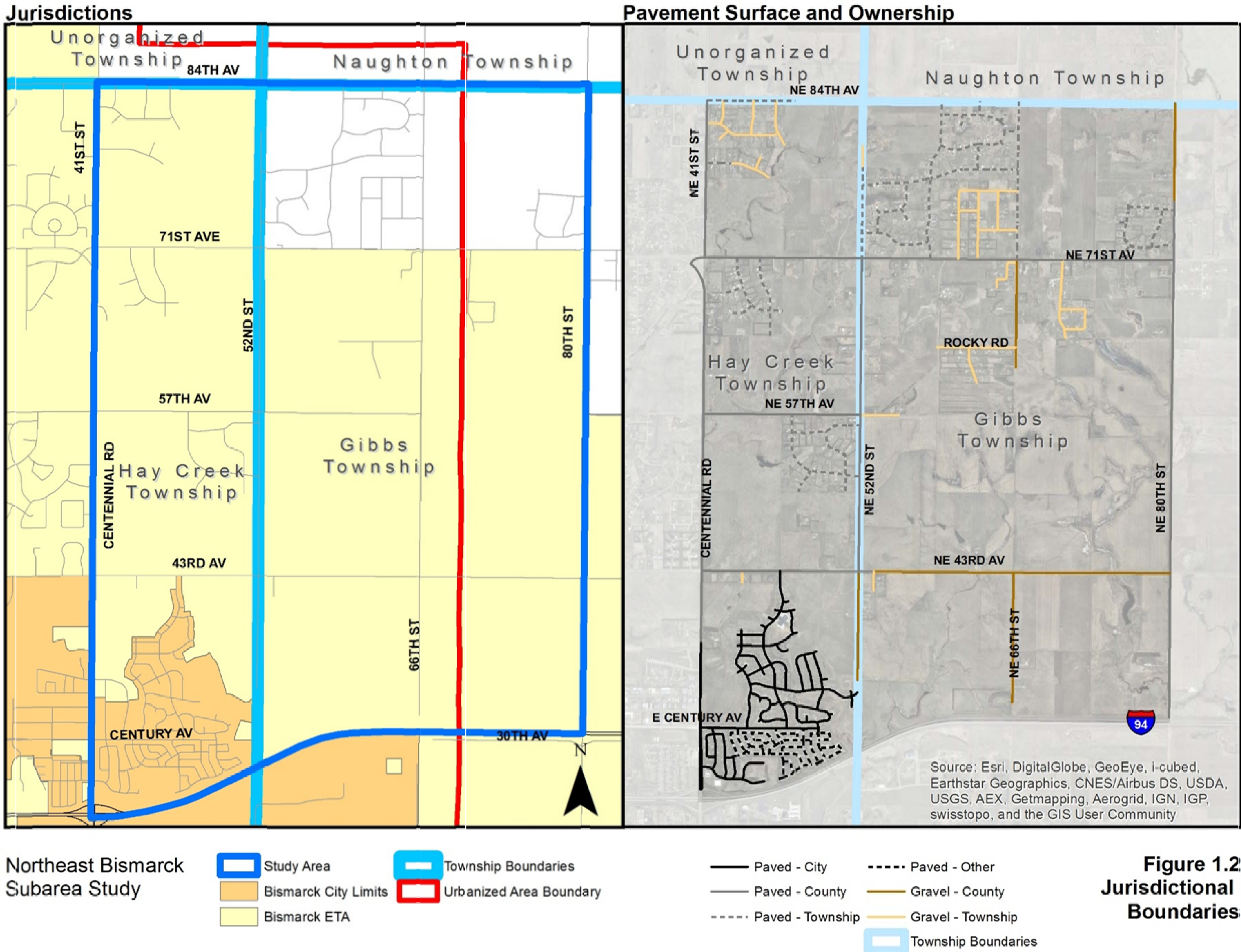


Figure 1.2 Jurisdictional Boundaries

URBANIZED AREA BOUNDARY

The east portion of the study area falls outside of the existing urbanized area (UZA), which was amended and adopted by the BMMPO in 2013. This portion is between 80th Street NE and approximately 0.10 miles east of 66th Street NE. Roads not within the BMMPO UZA and not functionally classified as "Urban" by BMMPO and the North Dakota Department of Transportation (NDDOT) are not currently eligible for Urban Roads Program (URP) funds through the BMMPO Transportation Improvement Program (TIP) process.

EXISTING AND FUTURE LAND USE (CITY AND COUNTY)

EXISTING LAND USE

Most of the study area currently consists of either rural residential or agricultural land uses; however, the southwest portion of the study area is within Bismarck city limits and is urban in character.

The urban southwest part of the study area consists mainly of urban residential neighborhoods, but there are some commercial areas adjacent to the Centennial Road corridor between I-94 and 43rd Avenue.

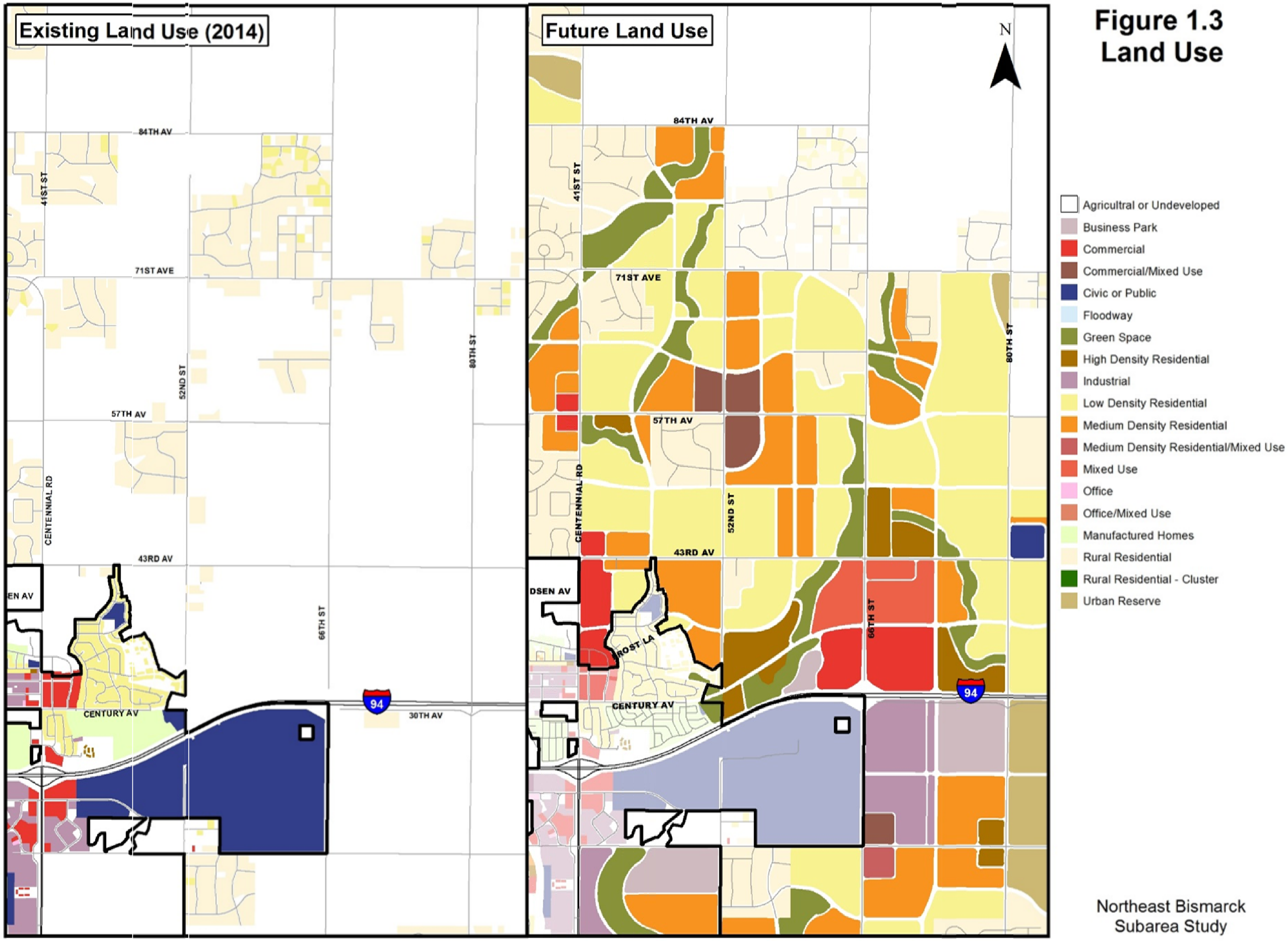
Existing land use can be seen in **Figure 1.3**, which is current as of fall 2014. It should be noted that due to rapid development in the subarea, some areas indicated as undeveloped on this figure are currently being developed or have developed since the fall of 2014.

FUTURE LAND USE

Much of the study area will be developed as a mix of low and medium-density residential, with a smaller amount of high-density residential development planned as well. Most planned high-density residential areas are located in the south part of the study area. While future study area development will be primarily residential, there are also some planned commercial/mixed use areas. Commercial development is planned adjacent to the proposed 66th Street interchange, and mixed use developments are planned adjacent to the intersections of 66th Street with 43rd Street and 52nd Street with 57th Avenue.

The planned future land use can be seen in **Figure 1.3.**

Figure 1.3
Land Use



Northeast Bismarck
Subarea Study

Given the generally undeveloped nature of the northeast area of Bismarck, there are currently few multimodal facilities. There is also very little development of parks and school facilities. Transit, bicycle and pedestrian routes can be seen in **Figure 1.4.** What follows is a general overview of existing and projected conditions in the study area covering multimodal, park and school facilities.

TRANSIT

Capital Area Transit (CAT) currently only serves the extreme southwest corner of the Northeast Bismarck Subarea. Route C-2 services Century Avenue and a portion of Centennial Road. The most recently approved Transit Development Plan (TDP) for BMMPO does not assume any expansion of transit service into the study area by 2015.

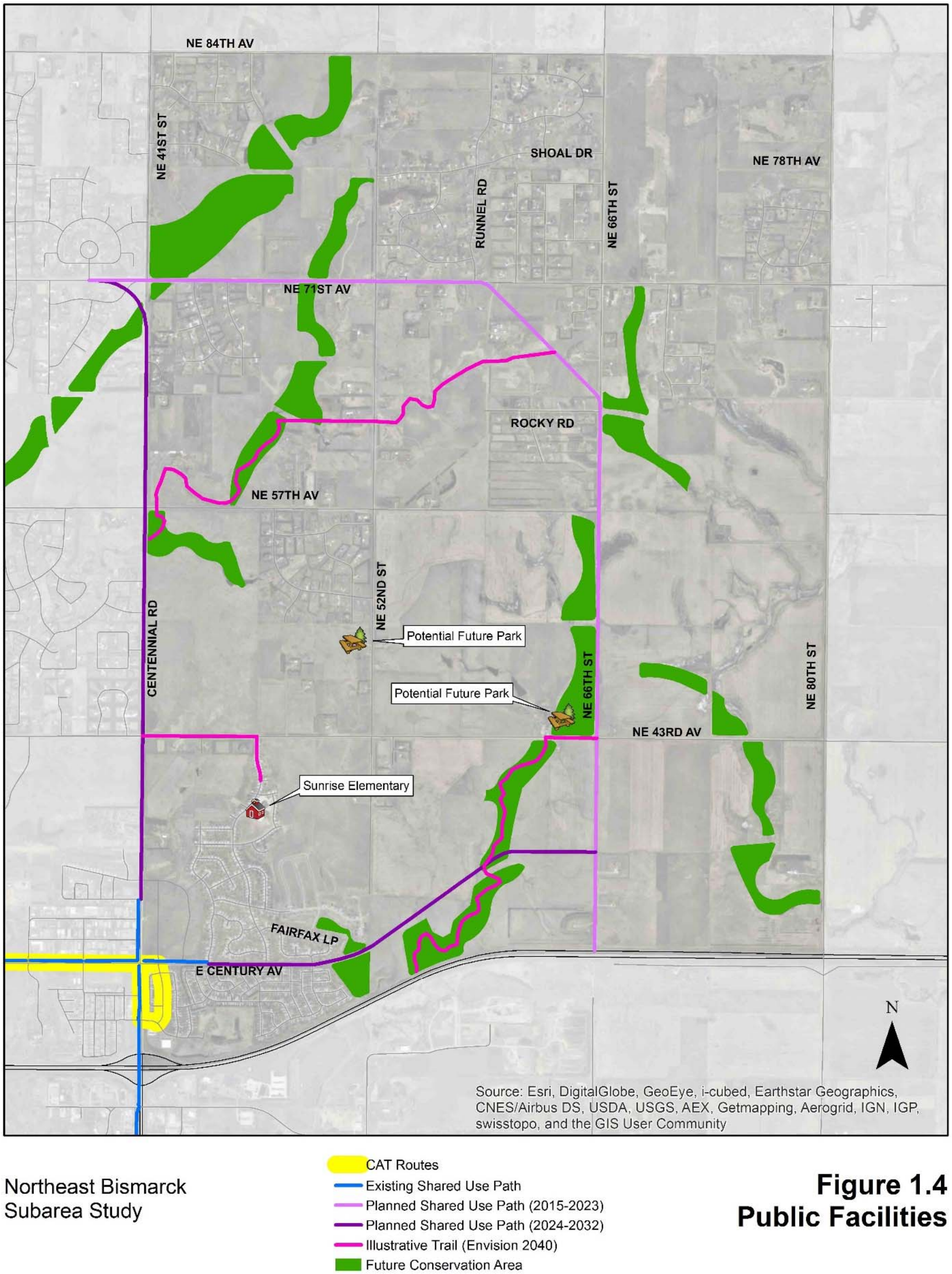
BICYCLE/PEDESTRIAN

There are currently shared-use facilities along both Century Avenue and Centennial Road in the southwest portion of the study area. The Envision 2040 long range plan includes new shared-use facilities along 66th Street and 71st Avenue (the proposed beltway alignment) as short-range projects (2015-2023) and the extension of facilities along Century Avenue and Centennial Road as mid-range projects (2024-2032). Sidewalks are in place along roads in urbanized residential neighborhoods in the southwest study area.

EXISTING PARKS, SCHOOLS AND OTHER PUBLIC FACILITIES

The only public facility in the study area is Sunrise Elementary School, which is located on Roosevelt Drive, south of 43rd Avenue NE. The enrollment of this school has grown from 463 students when it opened in August 2010 to 580 students at the start of the 2014-2015 school year. Legacy High School exists just to the west of the study area boundary, and is planned to open in the fall of 2015. No additional information was made available by the Bismarck Public School District at this point on the planning process regarding the potential for additional development of school facilities within the Northeast Subarea.

As part of the Existing Conditions Assessment of the Northeast Bismarck Subarea Study, a review of current or future plans developed by the Bismarck Public School District and Bismarck Park District was conducted. As is shown in **Figure 1.3**, a number of future greenways have been identified within the current future land use plan for the Northeast Subarea. It is assumed these areas will become public-use areas managed by the Bismarck Park District. Based on a consultation with the Bismarck Park District, it was determined that two conceptual locations for future park facilities have been preliminarily identified within the study area. Those are shown on **Figure 1.4.**



Northeast Bismarck Subarea Study

Figure 1.4
Public Facilities

NATURAL AND ENVIRONMENTAL FEATURES

ENVIRONMENTAL JUSTICE AREAS

Environmental justice (EJ) in the transportation planning process makes sure roadway improvements do not have disproportionately high and adverse impacts on minority populations or low-income populations. BMMPO develops an EJ analysis annually as part of the development of the Metropolitan Transportation Improvement Program.

After a review of the most recent available US Census Bureau data reported by the BMMPO as part of their 2015-2018 TIP, there does not appear to be significant concentrations of either low-income or minority households in the Northeast Subarea. There does appear to be a potential concentration of lower income households in the northwest quadrant of Centennial Road and I-94. A more detailed EJ analysis would take place once a definitive set of transportation improvements have been identified.

WETLANDS AND FLOODPLAIN

Wetlands

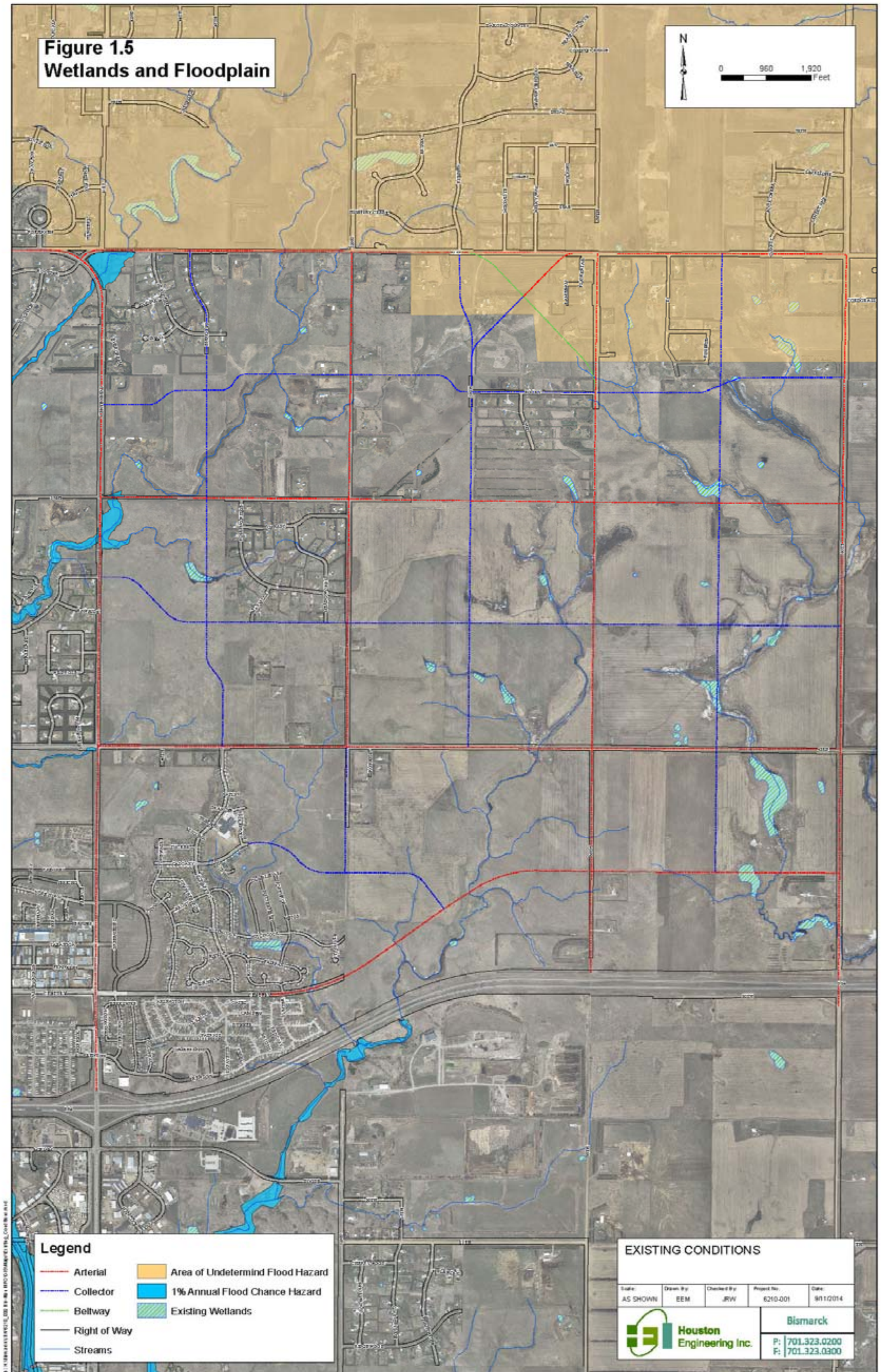
Impacts to wetlands should be avoided or minimized during roadway improvement projects. Identifying potential wetland impacts early in the planning process will help make sure that potential projects will either not adversely impact wetlands, or will allow the development of measures to mitigate such impacts.

Floodplain

Flooding can cause significant damage to roadways, with flood-damaged roadways often requiring extensive rehabilitation or even reconstruction. To minimize potential for roadway flood damage, it is important that future roadways are either not constructed in flood-prone areas, or are designed to withstand potential flooding scenarios.

The Special Flood Hazard Area (SFHA) or 100-year floodplain (i.e. one percent annual change of flooding) and wetlands within the study area can be seen in **Figure 1.5.**

Many of the wetlands and floodplain areas identified in Figure 1.5 are considered future Conservation areas as part of the Bismarck Growth Management Future Land Use Plan. This designation supports protecting the areas from development and ensuring future use is passive open space use such as greenways, trail corridor and park facilities.



Source: National Wetland Inventory (NWI)

PROJECTED GROWTH

The Envision 2040 Long Range Transportation Plan (LRTP) developed household and employment projections for the BMMPO area for years 2025 and 2040. Future socioeconomic data in the form of households and jobs is allocated to traffic analysis zones (TAZ) for use in the Bismarck-Mandan travel demand model.

As part of socioeconomic data projections, growth assumptions for the study area were developed to drive the overall Envision 2040 update. The LRTP projections will be used as part of the Northeast Bismarck Subarea Study to assist in better understanding alternative development scenarios regarding future transportation and infrastructure needs. Currently, the development shown in the Northeast Subarea through 2040 follows existing and projected roadway networks, specifically following Century Avenue, 43rd Avenue, 52nd Street and 66th Street.

Between 2010 and 2025 a total of 2,960 new households are projected in the Northeast Subarea, and another 887 between 2025 and 2040. The majority of new household growth in the study area is projected to occur between 2010 and 2025. Between 2010 and 2025 a total of 4,863 new jobs are projected in the Northeast Subarea, and an additional 9,604 new jobs are projected between 2025 and 2040. Currently, about one-third of the projected jobs are projected to occur before 2025, and the remainder between 2026 and 2040.

Socioeconomic data by TAZ for years 2010, 2025 and 2040 can be seen in **Table 1.3** and in **Figure 1.6**.

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Table 1.2 - Projected Household and Employment Growth by TAZ

TAZ	Households					Jobs				
	2010	2025	2040	Change 2010 to 2025	Change 2025 to 2040	2010	2025	2040	Change 2010 to 2025	Change 2025 to 2040
17	57	183	184	126	1	4	4	4	0	0
18	154	154	154	0	0	13	13	13	0	0
19	58	58	58	0	0	3	3	3	0	0
33	64	64	64	0	0	10	10	10	0	0
34	42	42	42	0	0	9	9	9	0	0
35	30	30	30	0	0	2	2	965	0	963
39	5	1,340	1,340	1,335	0	0	0	0	0	0
40	3	3	3	0	0	0	0	0	0	0
41	57	239	1124	182	885	5	526	526	521	0
72	264	476	477	212	1	6	299	3,049	2,993	50
73	597	597	597	0	0	136	268	268	132	0
359	1	1	1	0	0	0	1,303	3,958	1,303	2,655
360	4	4	4	0	0	0	0	5,936	0	5,936
361	114	1,219	1,219	1,105	0	136	50	50	86	0
Subarea Totals	**1,450**	**4,410**	**5,297**	**2,960**	**887**	**324**	**5,187**	**14,791**	**4,863**	**9,604**

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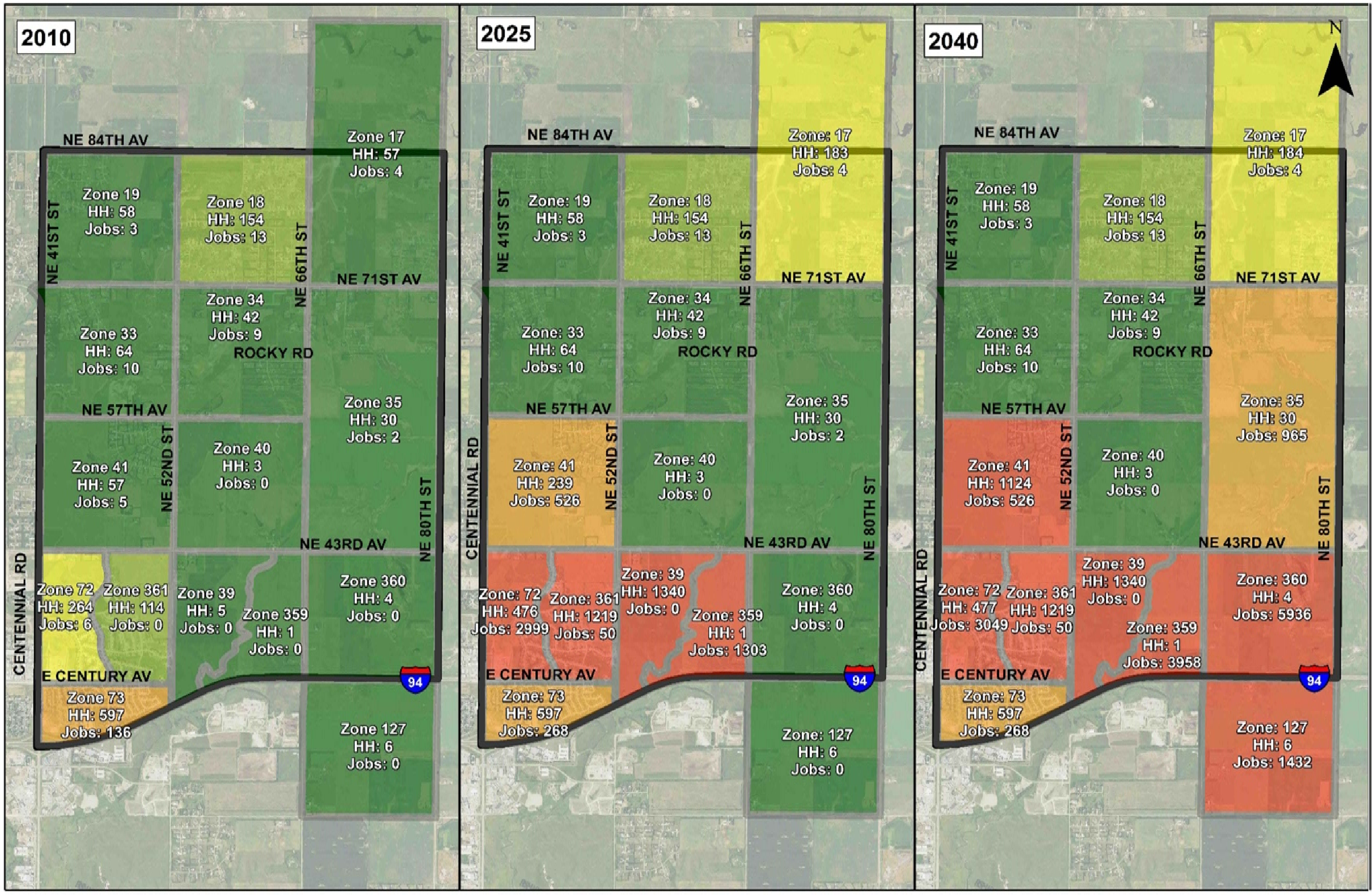

Northeast Bismarck
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Households + Jobs (All Years)

- 1 - 74
- 75 - 167
- 168 - 270
- 271 - 995
- 996 - 5940

Figure 1.6
Traffic Analysis Zones

CHAPTER 2: PUBLIC INVOLVEMENT

PUBLIC INPUT SUMMARY

The Northeast Bismarck Subarea Study was developed under the guidance of the BMMPO Public Participation Plan (PPP). Outreach efforts were deployed to maximize opportunities for the public and key stakeholders to actively participate in the development of the study.

A project *Study Committee* (SC) assisted in developing and refining the technical elements of the study. The SC met a total of 6 times, and was comprised of the following individuals:

- Mark Berg, Bismarck Engineering Department;
- Jenny Wollmouth, Bismarck Community Development Department, Planning Division;
- Jeff Heintz, Bismarck Public Works Department;
- Randy Bina, Bismarck Park District;
- Marcus Hall/Ray Ziegler, Burleigh County;
- Chuck Peterson, Freight/Trucking Industry Representative;
- Rachel Drewlow, Bismarck Mandan MPO;
- Steve Saunders, Bismarck Mandan MPO;
- Michael Johnson, NDDOT Local Government Division;
- Sheri Lares, FHWA North Dakota Division;

A website was developed to act as an information hub on the progress of the study and as a conduit for study updates. The website was developed in cooperation with Agency MABU, and was posted at www.nebismarckstudy.com. The website was used to provide background information on the overall study development, post project deliverables and channel public inquiries. The project website was used most aggressively around each of the two public input meetings held as part of the study process.

Two *Public Input Meetings* (PIMs) were held as part of the Northeast Bismarck Subarea Study. Each meeting was advertised in the Bismarck Tribune, notices were distributed to local media outlets, and approximately 1,250 properties were mailed direct meeting notifications. Meetings dates and locations were as follows:

- PIM #1 – March 16, 2015 at Sunrise Elementary School;
- PIM #2 – June 30, 2015 at Sunrise Elementary School.

Appendix C contains a listing of comments received, public notices and meeting sign-in sheets for both PIMs. Included also is a copy of the updated project website FAQ responding to specific project wide concerns expressed by the public during PIM #1.

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CHAPTER 3: TRAFFIC ANALYSIS

EXISTING TRAFFIC VOLUMES AND TRAFFIC CONTROL

Average daily traffic (ADT) volumes were obtained for 2012 and 2013 from NDDOT and BMMPO, respectively. Currently, most routes in the study area are fairly low-volume roads that carry less than 2,500 vehicles per day, with some rural roadways carrying less than 200 vehicles per day. However, Century Avenue and Centennial Road carry higher traffic volumes within the developed and developing parts of the Northeast Subarea. Locations with available ADT data can be seen in **Figure 3.1**.

There are four signalized intersections in the study area, all located along Centennial Road. The intersections are located at:

- Centennial Road/Bismarck Expressway and North I-94 ramps;
- Centennial Road and Trenton Drive;
- Centennial Road and Century Avenue;
- Centennial Road and 43rd Avenue.

EXISTING TRAFFIC OPERATIONS

Intersection level of service (LOS) analysis was performed at nine study area intersections for AM and PM peak hours. LOS is a letter grade ("A" through "F"), which is assigned to transportation infrastructure to describe the quality of traffic operations. LOS "A" indicates good traffic flow with little delay, and LOS "F" indicates breakdown of traffic flow with high amounts of delay. For the Northeast Bismarck Subarea Study, LOS "D" or worse will be considered operationally deficient in accordance with NDDOT design standards. Results from intersection LOS analysis can be seen in **Table 3.1**.

Existing traffic operations are generally desirable, with deficiencies only being observed at the two-way stop controlled intersections of Centennial Road with 43rd Avenue and Centennial Road with 71st Avenue. The recently installed traffic signal at Centennial Road and 43rd Avenue is expected to provide intersection LOS "A" at this location, mitigating the existing deficiency. There are no current plans to address the deficiency at Centennial Road and 71st Avenue.

Table 3.1 - Existing Intersection Levels of Service

Intersection	Lane Geometry	Traffic Control	Time Period	Level of Service/ Delay (seconds)				
				Overall	EB	WB	NB	SB
Centennial Rd and E Century Ave	Existing	Signal	AM Peak	C	B	C	B	B
			PM Peak	B	B	C	B	B
Centennial Road and 43rd Ave	Existing	Signal	AM Peak	A	B	C	A	B
			PM Peak	A	A	B	A	A
Centennial Rd and 57th Ave	Existing	Two-Way Stop	AM Peak	–	B	C	–	–
			PM Peak	–	B	C	–	–
Centennial Rd and 71st Ave	Existing	Two-Way Stop	AM Peak	–	B	D	–	–
			PM Peak	–	C	C	–	–
41st St and 84th Ave	Existing	Two-Way Yield	AM Peak	–	–	–	A	A
			PM Peak	–	–	–	A	A
52nd St and 71st Ave	Existing	Two-Way Stop	AM Peak	–	–	–	A	B
			PM Peak	–	–	–	B	A
66th St and 71st Ave	Existing	Two-Way Stop	AM Peak	–	–	–	A	A
			PM Peak	–	–	–	A	A
80th St and 43rd Ave	Existing	Two-Way Stop	AM Peak	–	A	A	–	–
			PM Peak	–	A	A	–	–
80th St and 71st Ave	Existing	Two-Way Yield	AM Peak	–	–	–	A	A
			PM Peak	–	–	–	A	A

Note: Deficiencies highlighted in red

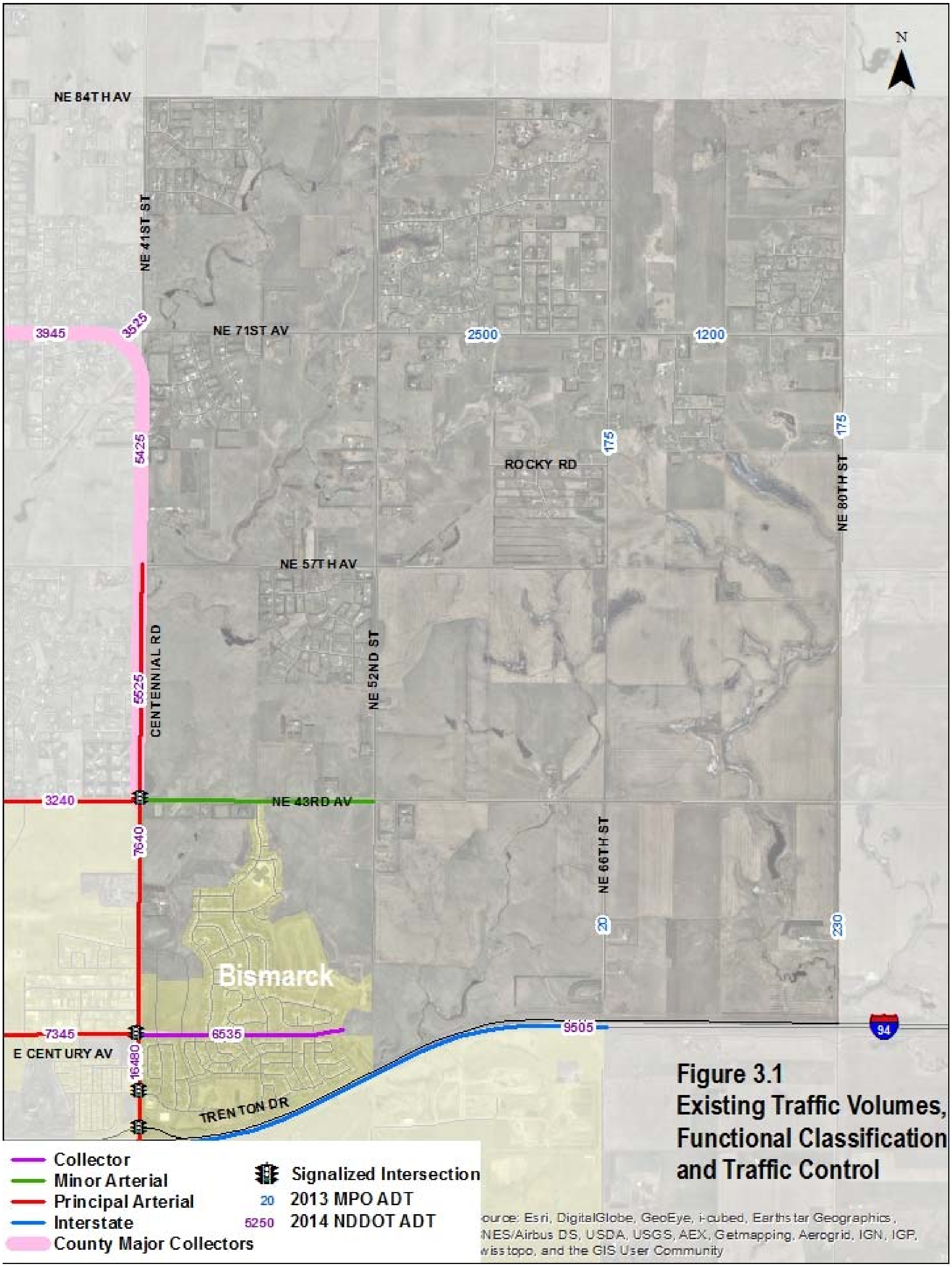

Figure 3.1
Existing Traffic Volumes, Functional Classification and Traffic Control

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

FUTURE TRAFFIC ANALYSIS

The Traffic Analysis element of the Northeast Bismarck Subarea study is intended to analyze future traffic scenarios (Year 2025 and Year 2040) to determine the traffic, recommended roadway improvements and intersection geometry and traffic control within the study area. The NDSU Advanced Traffic Analysis Center (ATAC) prepared 2025 and 2040 base model outputs confined to the 2040 Bismarck-Mandan Envision 2040 Long Range Transportation Plan (LRTP) fiscally constrained network. The Envision 2040 LRTP identified projects in the short term horizon (through 2023), mid-term (2024 through 2032) and long term (2033 through 2040) and these projects were implemented into the model geometry at their appropriate horizon. The Envision 2040 LRTP recommended projects were analyzed within the study area to determine the capacity of the planned network and to identify any deficiencies and recommended improvements to alleviate those deficiencies.

The future land use throughout the majority of the study area is low and medium density residential. There are areas of high density residential and commercial land use anticipated along 66th Street particularly south of 43rd Avenue. Much of this growth however is anticipated to occur between 2025 and 2040. This high traffic generating area is one of the critical issues addressed by this element of the study.

A second critical issue will be the functionality of the proposed beltway using 66th Street and 71st Avenue to connect US 83 to I-94. This beltway would utilize 1/2 mile access spacing or greater when possible. It would concentrate the commercial land use traffic to a few key intersections along 66th Street primarily south of 43rd Avenue, and it may require access modification/ relocation in the developed portions of 71st Avenue.

It is important to remember that the system improvements contemplated as part of this element of the study only considered improvements included in the Envision 2040 LRTP. For example, an interchange at 80th Street and I-94 is not currently listed as a constrained or unfunded need within the current Envision 2040 LRTP. Therefore, this scenario was not analyzed herein. Any major improvement discussed in this analysis would be subject to a more detailed alternatives analysis as part of a NEPA process if a Federal action were brought about by that project.

ANTICIPATED ROADWAY IMPROVEMENTS

The 2025 and 2040 models used for this element of the study include fiscally constrained roadway improvements identified in the LRTP. **Figure 3.2** shows the improvements incorporated into the 2025 and 2040 models. The relevant roadway improvements within the study area (or near study area boundaries) anticipated to be completed by 2025 are as follows:

- Construct 66th Street as a two-lane rural roadway from County Highway 10 to 71st Avenue, including I-94 grade separation (no interchange);
- Extend Divide Avenue as a three-lane urban roadway from Bismarck Expressway to 66th Street;

- Extend/Reconstruct Century Avenue as a three-lane urban roadway from Centennial Road to 66th Street.

The relevant roadway improvements within the study area anticipated to be completed by 2040 are as follows:

- All fiscally constrained improvements listed for 2025 scenario;
- Convert grade separation at I-94 and 66th Street (included in 2025 scenario) to full interchange;
- Widen Centennial Road to a three-lane roadway from 43rd Avenue to 71st Avenue;
- Widen 43rd Avenue to a four-lane divided urban roadway between 26th Street and Centennial Road.

Additional roadway links were added to the traffic models that were outside of the fiscally constrained network to replicate anticipated infrastructure in the commercial sector of the study. Those additional links include:

- Extend Century Avenue ½ mile east of 66th Street;
- Addition of collector roadway between Century Avenue and 43rd Avenue (on the ½ section line).

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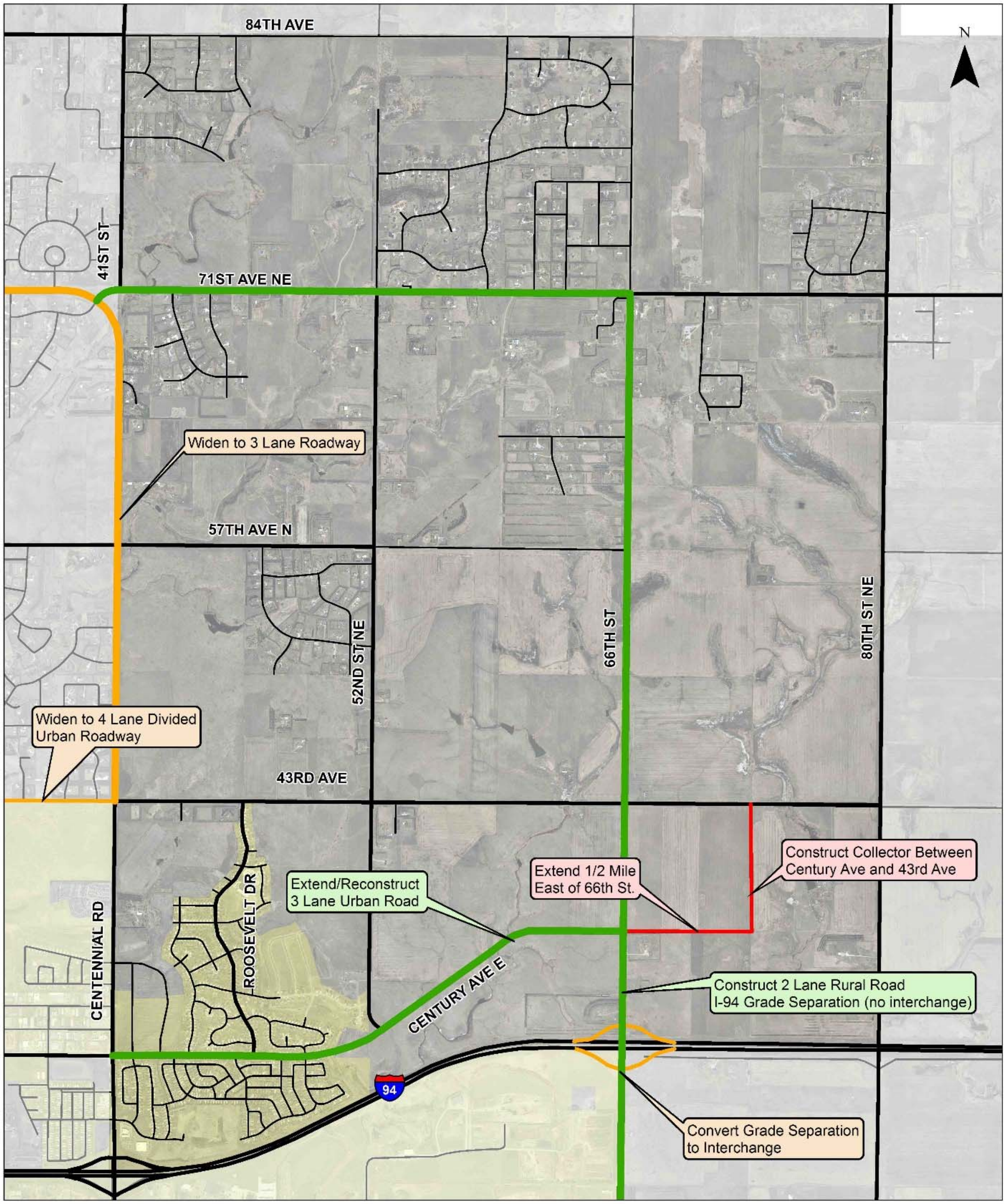

Fiscally Constrained Improvments in 2025 Model
Fiscally Constrained Improvments in 2040 Model
Additional Improvments in 2040 Model

Northeast Bismarck Subarea Study

Figure 3.2
2025 and 2040 Fiscally Constrained Improvements

SCENARIO DEVELOPMENT

A base scenario was analyzed for each event year (2025 and 2040). Alternative scenarios were developed to identify the impacts of delaying or removing some of the planned infrastructure improvements specifically regarding 66th Street north of the interstate.

The base scenario was analyzed for 2025 and 2040 at all study intersections. Additional analysis was performed in scenarios 1A, 1B and 2 only if the model output was substantially different than the base output. Corridors not previously studied in MPO documents were analyzed in greater detail (71st Avenue, 66th Street, Century Avenue) than previously studied corridors (43rd Avenue, Centennial Road). The model output ADTs were converted into peak hour movements using a k-factor of 0.10, 50/50 directional distribution and existing turning movements (where available).

Base Scenario

The approved 2025 and 2040 travel demand model network from the Envision 2040 LRTP was used for the Base Scenario. Base Scenario modeling assumes the existing 2025 and 2040 projected employment and household growth in the Northeast Bismarck Subarea per the approved Envision 2040 LRTP. The Base Scenario assumes a grade-separated crossing of 66th Street and I-94 in the 2025 network and a proposed interchange at this location in the 2040 network as per the LRTP.

Scenario 1

Assumes identical job and housing growth from base scenario but adds or removes links (specifically regarding 66th Street at I-94) to determine the effects to the study area. Scenarios 1A and 1B were analyzed.

<u>Scenario 1A</u>

> Grade-separated crossing at 66th Street and I-94 maintained but <u>no</u> access to the interstate is provided at this location. Traffic could still cross I-94 at 66th Street but east-west travel within the study area would occur primarily on the arterial streets and the existing Centennial Road interchange.

<u>Scenario 1B</u>

> No grade-separated crossing or interchange at 66th Street and I-94. North-south traffic within the study area would be pushed to 80th Street and Centennial Road interstate crossings.

Scenario 2

Infrastructure matches Scenario 1B with no grade-separated crossing or interchange at 66th Street and I-94. Scenario 2 was developed to show changes in future development patterns if there was no grade separation and I-94 interchange at 66th Street and impacts on the future projected roadway network.

See **Figure 3.3** for the comparison of the location of the jobs between the 2040 Base Scenario and 2040 Scenario 2. Seventy five percent of the projected job growth in the northwest quadrant of the I-94/66th Interchange (TAZ 360) was shifted to the TAZ 40, a section bounded by 66th Street, 52nd Street, 43rd Avenue and 57th Avenue. This adjustment reflects likely changes in commercial development trends in the Northeast Subarea of Bismarck if I-94 access were not to occur at 66th Street.

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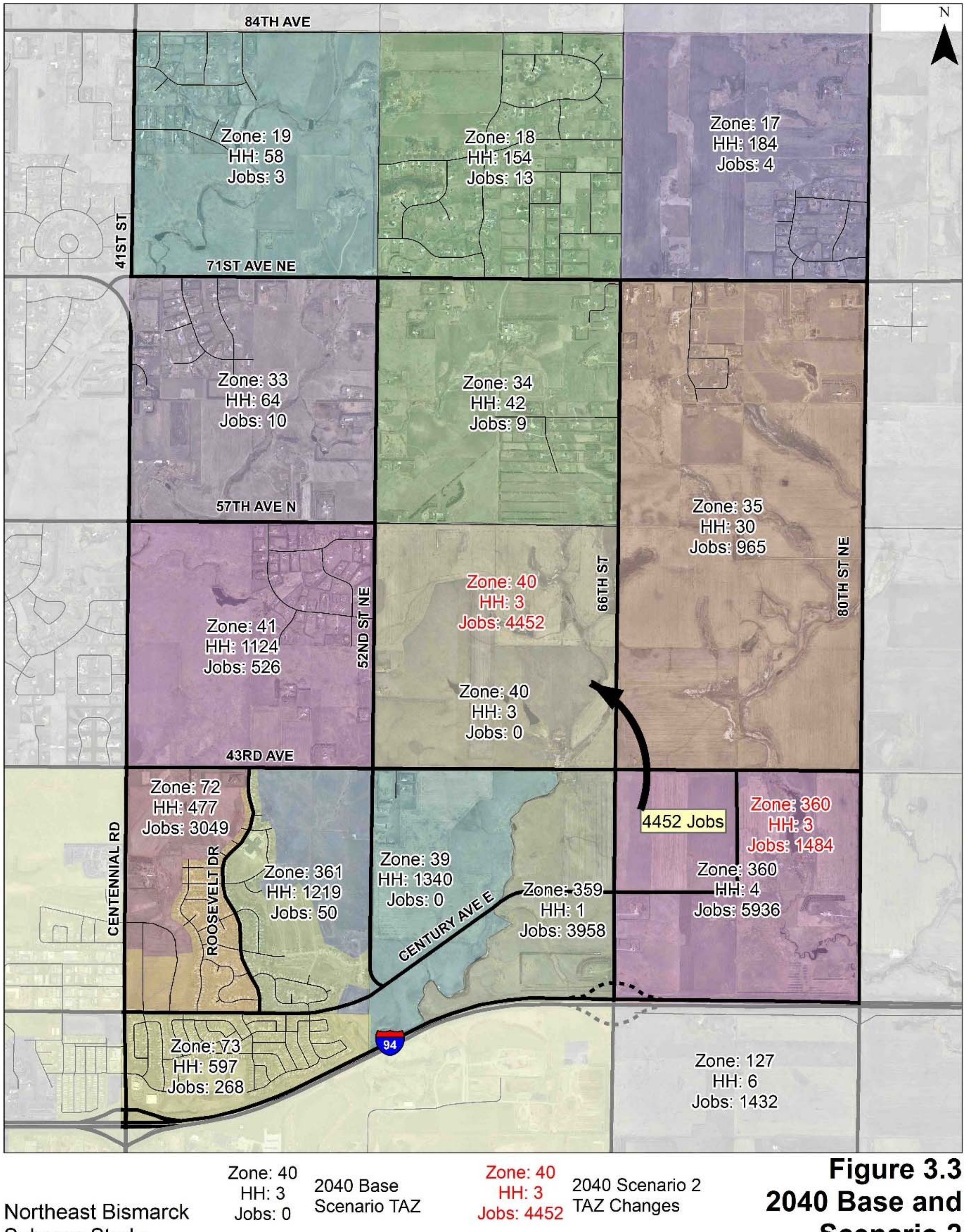


Northeast Bismarck
Subarea Study

Figure 3.3
2040 Base and Scenario 2 TAZ Comparison

TRAFFIC ANALYSIS RESULTS – BASE SCENARIO

Intersection capacity analysis evaluates the delay at intersections based on traffic volumes entering the intersection over a one hour time period. Overall intersection delays and approach delays were determined using Synchro 8, which uses delay and level of service models based on the 2010 *Highway Capacity Manual* (HCM). Level of service (LOS) is a measure which qualitatively describes intersection operations using letter grades between LOS "A" and LOS "F". LOS "A" indicates good traffic flow with little delay and LOS "F" indicates breakdown of traffic flow. LOS "D" is the typical threshold to indicate a deficiency at an intersection. NDDOT considers LOS "D" acceptable for urban/suburban principal arterials. LOS "F" is also assigned when demand exceeds capacity. For two way stop control, a LOS is provided for any minor approach as well as any major approach left turn movement.

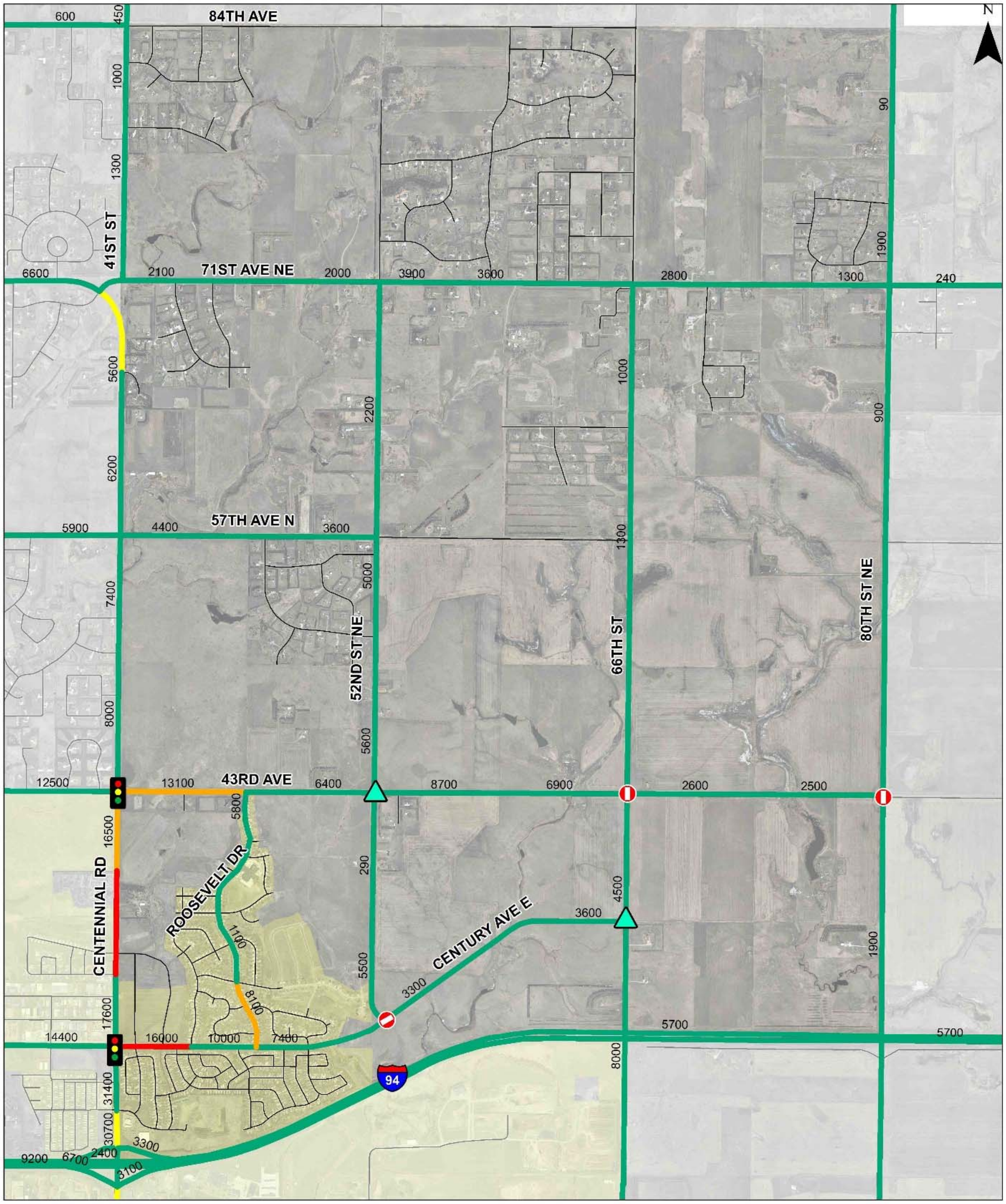
2025 Base Scenario

Two way stop control was adequate for intersections north of 43rd Avenue and east of Centennial Road in the 2040 Base Scenario. Therefore the 2025 Base Scenario analyzed the study area 43rd Avenue and south. The 2040 recommended lane geometry was used for the 2025 scenario capacity analysis. Adequate roadway infrastructure is planned to be in place by 2025 to serve the area south of 43rd Avenue. 2025 travel demand output also shows adequate intersection capacity for the entire study area in 2025. See **Figure 3.4** for the 2025 ADT and roadways LOS.

2040 Base Scenario

The 2040 Base Scenario was analyzed at each major intersection in the study area. The intersections were studied using the lane configuration from the LRTP. The peak hour traffic volumes calculated from the 2040 Base model were added to the network. Deficiencies were identified and geometry and traffic control devices were improved until each approach would operate at LOS C or better. Results will be reported by north-south corridor.

See **Figure 3.5** for the recommended traffic control devices and lane configurations. See **Figure 3.6** for the capacity of the roadways in the 2040 Base Scenario based on the ATAC calculations with the roadway improvements from the Envision 2040 LRTP.



Northeast Bismarck Subarea Study

LOS A-C	16000 2025 ADT
LOS D	2025 Signal or Roundabout
LOS E	2025 Signal
LOS F	2025 Two Way Stop Control

Figure 3.4 2025 ADT and Roadways

Centennial Road

In the *Envision 2040* LRTP, Centennial Road is planned to be constructed as a three-lane rural roadway between 43rd Avenue and 71st Avenue. This improvement is further substantiated through the traffic analyses completed by the Northeast Bismarck Subarea Study. However, Centennial Road would need to be constructed with two through lanes each direction from Jericho Road to 43rd Avenue. This five lane improvement is not currently included within the Envision 2040 LRTP. What follows is a description of intersection LOS issues along Centennial Road.

Centennial Road & Century Avenue Intersection

The intersection of Century Avenue and Centennial Road would operate at LOS C with the existing lane geometry.

Centennial Road and 43rd Avenue Intersection

43rd Avenue is currently proposed to be expanded to a four-lane section west of Centennial Road and is built as a two lane section east of Centennial Road. A two-lane section would be inadequate and 43rd Avenue would need to be constructed with two through lanes each direction from Centennial Road to Roosevelt Drive. 43rd Avenue would be adequate as a two lane road from Roosevelt Drive to 80th Street based on the 2040 Base model outputs.

The 43rd Avenue Corridor Study differs from the Subarea Study in that it recommends a five lane section from Centennial Road to 66th Street and a three lane section from 66th Street to 80th Street. One reason for the variation in recommendations is that the 2040 traffic volumes vary between the two studies.

The ADT on 43rd Avenue between Centennial Road and Roosevelt Drive had similar projected traffic levels for both studies with 16,200 ADT for the Corridor Study and 17,000 for the Subarea Study. However, the 43rd Avenue Corridor study had higher projected daily traffic volumes on 43rd Avenue east of Roosevelt Drive compared to the Northeast Bismarck Subarea Study. For the segment between Roosevelt Drive and 52nd Street, the Corridor Study projected an ADT of 14,400 whereas the Subarea Study used an ADT of 10,200. From 52nd Street to 66th Street, the Corridor Study used an ADT of 15,800 whereas the Subarea Study used an ADT of 12,900 east of 52nd Street and 14,000 west of 66th Street. From 66th Street to 80th Street, the Corridor Study used an ADT of 9,200 and the Subarea Study used an ADT of 13,700 east of 66th Street and 2,800 west of 80th Street. The projected ADTs used in the Northeast Subarea Study are the same ADTs used in the LRTP.

Centennial Road and 71st Avenue Intersection

With 71st Avenue and 66th Street identified as part of the regional beltway, the need for continuous traffic flow along the beltway (71st Avenue) would be greater than the current continuous traffic flow between 71st Avenue and Centennial Road. Vehicles can currently make this free-flow movement as the alignment of Centennial Road curves into 71st Avenue. This intersection was studied both with its existing geometry as well as an alternative alignment that is shown in Inset B of **Figure 3.5**. This alignment would move the intersection to the current intersection of 71st Avenue and 41st Street creating a standard four-legged intersection. A signal or roundabout would need to be installed at this realigned intersection in order to allow vehicles taking a NB left from Centennial Road on to 71st Avenue an opportunity to turn, whereas two way stop control would be adequate for the current alignment of 71st Avenue and Centennial Road with the 2040 Base model outputs.

The intersection capacity of each studied intersection along Centennial Road is shown in **Table 3.2**.

Table 3.2 - Centennial Road Intersection Capacity Analysis

Intersection		Lane Configuration	Traffic Control	Level of Service/ Delay (seconds)				
				Overall	EB	WB	NB	SB
Centennial Rd	Century Ave & Centennial Rd	Existing	Signal	C	C	C	C	C
				29.6	34.9	33.7	22.3	34.7
	43rd Ave & Centennial Rd	Proposed	Signal	C	C	C	B	B
				23.0	23.9	29.9	19.1	16.8
	57th Ave & Centennial Rd	Proposed	Signal	B	C	C	A	A
				13.9	22.2	29.6	4.2	4.1
	71st Ave & Centennial Rd	Proposed	NW and SE Stop	-	A	A	C	C
				-	7.9	8.3	18.9	24.9
		Relocated	Signal	B	C	C	A	A
				17.2	24.1	24.6	7.4	5.5

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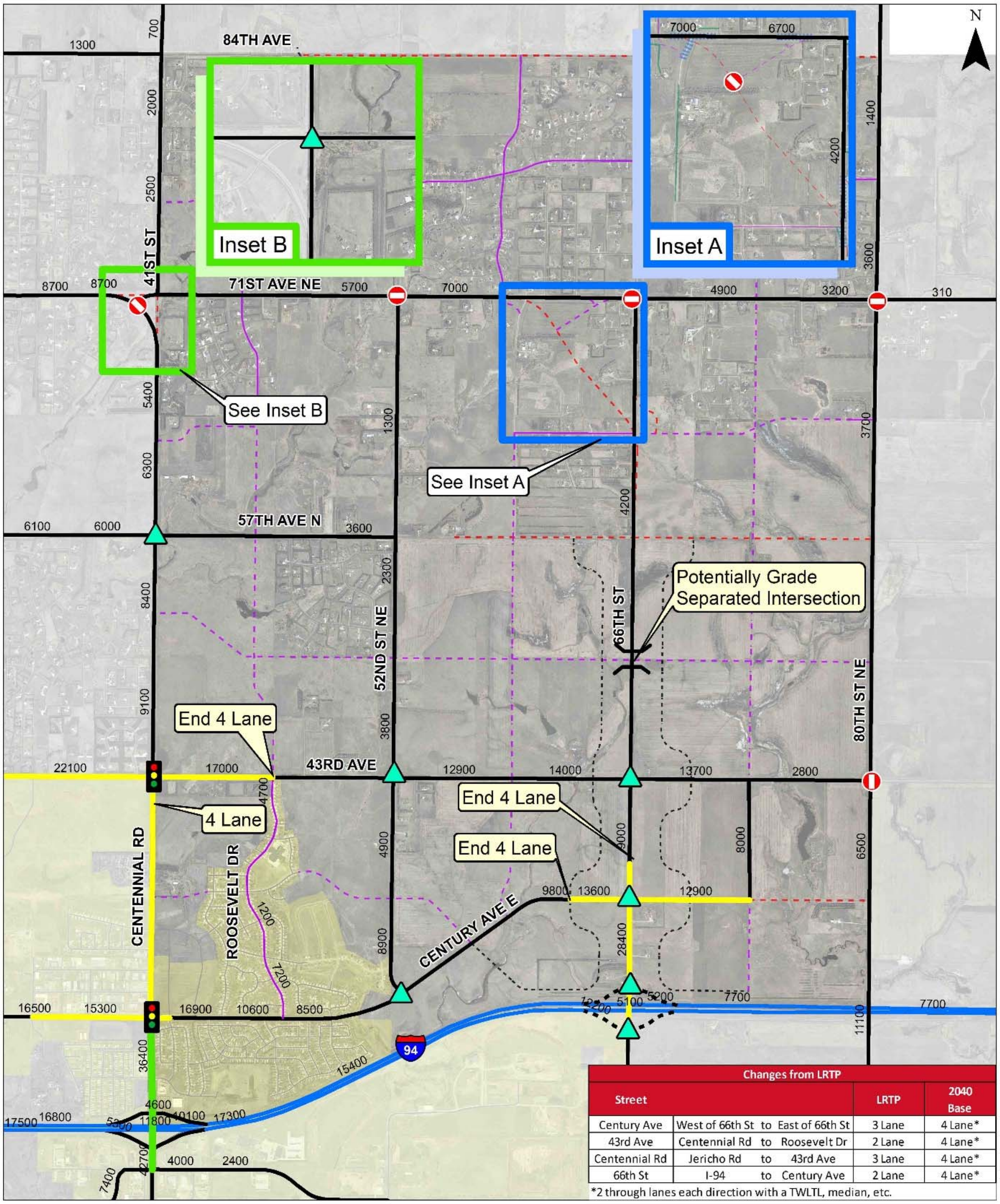
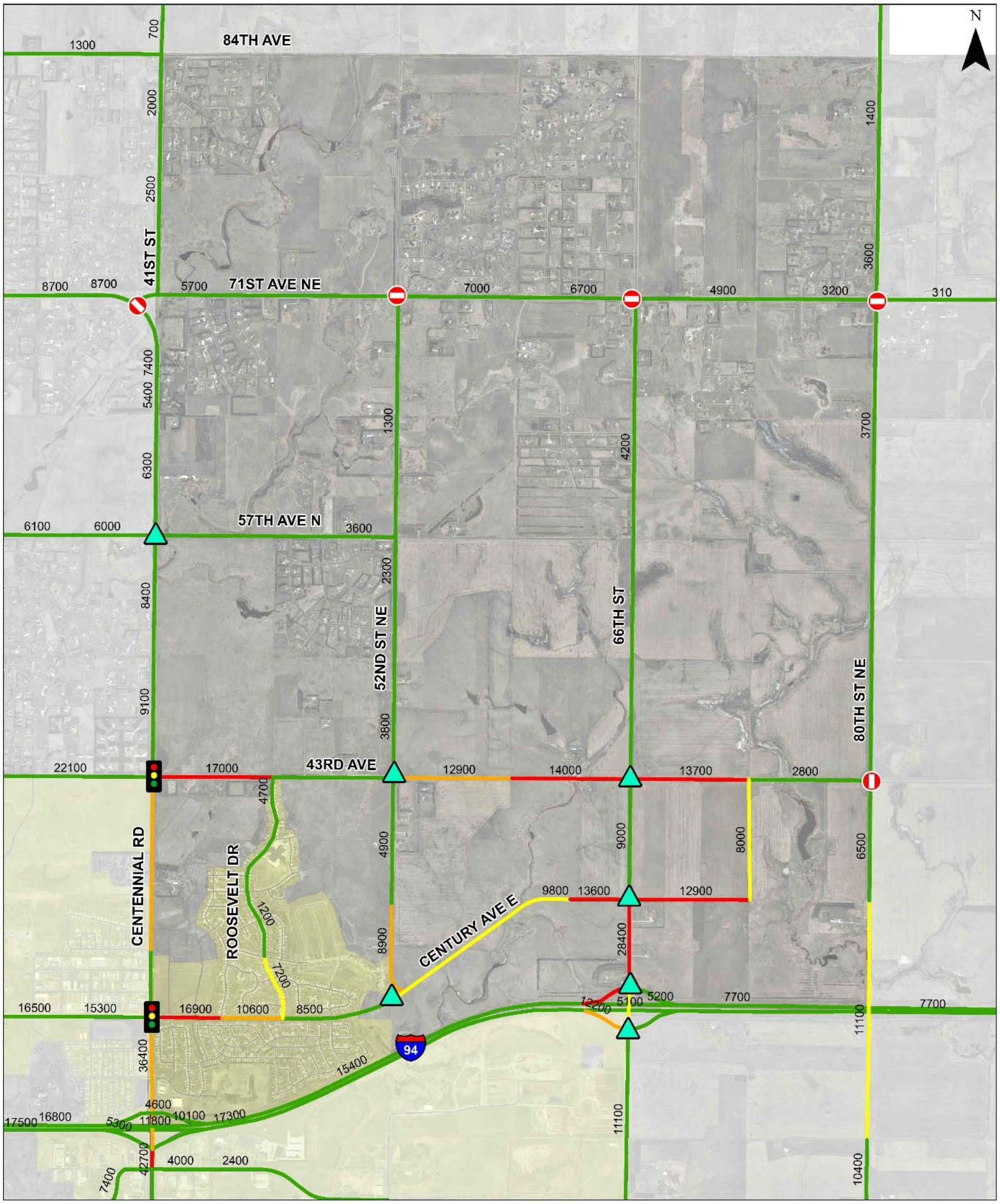


Changes from LRTP

Street				LRTP	2040 Base
Century Ave	West of 66th St	to	East of 66th St	3 Lane	4 Lane*
43rd Ave	Centennial Rd	to	Roosevelt Dr	2 Lane	4 Lane*
Centennial Rd	Jericho Rd	to	43rd Ave	3 Lane	4 Lane*
66th St	I-94	to	Century Ave	2 Lane	4 Lane*

*2 through lanes each direction with a TWLTL, median, etc.

Figure 3.5 Recommended 2040 Lane Configuration



Northeast Bismarck Subarea Study

LOS A-C
LOS D
LOS E
LOS F

16900 2040 ADT
Signal or Roundabout
Signal
Two Way Stop Control

Figure 3.6
2040 Base Scenario Roadway LOS

52nd Street

52nd Street is planned to be constructed as a two lane road from Century Avenue and 71st Avenue, which would be adequate based on 2040 Base model outputs.

The intersection capacity of each studied intersection along 52nd Street is shown in **Table 3.3**.

Table 3.3 – 52nd Street Intersection Capacity Analysis

	Intersection	Lane Configuration	Traffic Control	Level of Service/ Delay (seconds)				
				Overall	EB	WB	NB	SB
52nd Street	Century Ave & 52nd St	Proposed	Signal	C	B	C	-	B
				21.3	13.9	31.7	-	16.9
	43rd Ave & 52nd St	Proposed	Signal	B	B	A	A	B
				12.2	19.2	7.0	7.8	16.6
	71st Ave & 52nd St	Existing	NB and SB Stop	-	A	A	B	C
				-	7.9	8.0	12.3	18.3

66th Street

In the *Envision 2040* LRTP, 66th Street is planned to be a 2 lane road and Century Avenue is planned to be a 3 lane road from Centennial Road to 66th Street. Both of these configurations would be inadequate. 66th Street would need to be constructed with two through lanes each direction from south of the I-94 ramps through the intersection of Century Avenue. Century Avenue would need to be constructed with two through lanes in each direction both east and west of the intersection with 66th Street. These improvements can be attributed to the large commercial sector planned for north of the interstate along 66th Street. This combined with ½ mile access spacing forces the traffic on Century Avenue and 66th Street for access to I-94. The intersection at 50th Avenue would potentially become a grade separated intersection.

66th Street and 71st Avenue

With 71st Avenue and 66th Street identified as the regional beltway, the need for continuous traffic flow between 71st Avenue and 66th Street would increase in the future. An alternative alignment was studied and is shown in Inset A of **Figure 3.5**. This alignment would shift the intersection into a three legged intersection with traffic being able to continue from 71st Avenue to 66th Street without stopping. It should be noted that even without a reconfiguration, the intersection would perform above a LOS C under two-way stop control.

The intersection capacity of each studied intersection along 66th Street is shown in **Table 3.4**.

Table 3.4 - 66th Street Intersection Capacity Analysis

	Intersection	Lane Configuration	Traffic Control	Level of Service/ Delay (seconds)				
				Overall	EB	WB	NB	SB
66th Street	Century Ave & 66th St	Proposed	Signal	C	C	C	B	C
				23.8	27.9	29.4	18.0	27.9
	43rd Ave & 66th St	Proposed	Signal	C	C	C	C	C
				25.4	22.5	30.5	22.3	25.4
	71st Ave & 66th St	Proposed	NB and SB Stop	-	A	A	C	B
				-	7.7	7.7	19.9	14.7
		Beltway	SE Stop	-	-	B	-	A
				-	-	14.3	-	8.0

80th Street

80th Street would remain as a two-lane roadway. Based on the 2040 Base model outputs, a two-lane road would be sufficient for the 2040 traffic volumes.

The existing 80th Street overpass at I-94 has clearance issues from over height vehicles on the Interstate. It has been damaged previously and closed for travel while repairs are made. Closing the 80th Street overpass for repairs in the future will have a greater impact when there is a projected ADT of 11,000 using the structure every day in 2040.

The intersection capacity of each studied intersection along 80th Street is shown in **Table 3.5**.

Table 3.5 - 80th Street Intersection Capacity Analysis

	Intersection	Lane Configuration	Traffic Control	Level of Service/ Delay (seconds)				
				Overall	EB	WB	NB	SB
80th Street	43rd Ave & 80th St	Existing	EB and WB Stop	-	B	C	A	A
				-	10.6	20.8	7.9	0.0
	71st Ave & 80th St	Existing	NB and SB Stop	-	A	A	C	B
				-	7.4	7.4	15.1	11.7

I-94 and 66th Street Interchange

Three alternative layouts were evaluated for the I-94 interchange: diamond, partial clover and single-point urban interchange (SPUI). These layouts were lifted from concepts developed as part of the BMMPO I-94 Corridor Study. The 2040 model predicts an ADT of above 10,000 for both the westbound on ramp and the eastbound off ramp and under 3,000 ADT for the eastbound on ramp and westbound off ramp. This imbalance reflects the interchange's eastern location relative to the rest of Bismarck-Mandan. The majority of the traffic would be north of I-94 within the commercial and high density residential land uses. The ADT on 66th Street north of the interchange is anticipated to be 28,000 while south of the interchange 11,000.

Diamond Interchange

A diamond interchange would perform at or above a LOS C at both the north and south ramps. However, in order to achieve a LOS C on the eastbound off ramp, a large portion of the available signal green time needs to be attributed to this movement at the south ramp. This intersection configuration would be susceptible to future traffic growth beyond 2040 where there may be additional demand on the east ramps as well as additional northbound to westbound left turn movements that would require green time to service. This additional demand would reduce the available green time to the existing movements and lower the LOS overall at the intersection. This would be expected to occur after 2040 though and no capacity issues would be anticipated for a diamond interchange through 2040.

Capacity issues would not be as likely to occur at the north ramp terminal. The major turning movement in 2040 is the southbound to westbound right turn onto the interstate (expected to be yield controlled). This movement can occur without conflicting with many other movements. In addition, the majority of the westbound off ramp traffic would likely also be right turns northbound into the commercial development. This movement could also occur without conflicting with many other movements. The northbound to westbound left turn movement would be in conflict but with the extension of East Divide Avenue to 66th Street south of I-94, many vehicles south of I-94 would not need to access Interstate to travel west into Bismarck and therefore would lessen the amount of traffic making this movement at the ramp.

Partial Clover Interchange (NE and SE quadrants)

A partial clover-leaf interchange was identified in the MPO I-94 Corridor Study as a potential geometric alternative. This configuration was evaluated with loops in the northeast and southeast quadrants. The northeast loop would redirect northbound to westbound (66th Street to I-94) traffic from a north ramp left-turn to an on-ramp loop instead. The southeast loop would redirect eastbound to northbound (I-94 to 66th Street) traffic from a south ramp left turn to an off-ramp loop instead.

The off-ramp loop in the southeast quadrant would reduce the amount of green time attributed to the south ramp. There is a high volume of traffic anticipated to make this movement. Separate analysis were conducted with one requiring the off-ramp traffic to merge into the northbound lanes on 66th Street (2 lanes northbound) at the ramp point and the other providing a separate northbound lane (3 lanes northbound) utilized for both the southeast quadrant off-ramp traffic and the northeast quadrant on-ramp traffic. If the off-ramp traffic were required to yield to existing northbound traffic, the 95th percentile queue of stopped traffic would exceed 450 feet and may spill back onto the interstate. It is recommended to provide a third northbound lane used for on-ramp and off-ramp merging traffic if a partial clover-leaf interchange is moved forward.

The on-ramp loop in the northeast quadrant would remove the north ramp northbound to westbound left-turning traffic. The north ramp is not anticipated to carry a heavy volume of this movement. The overall reduction in delay is minimal.

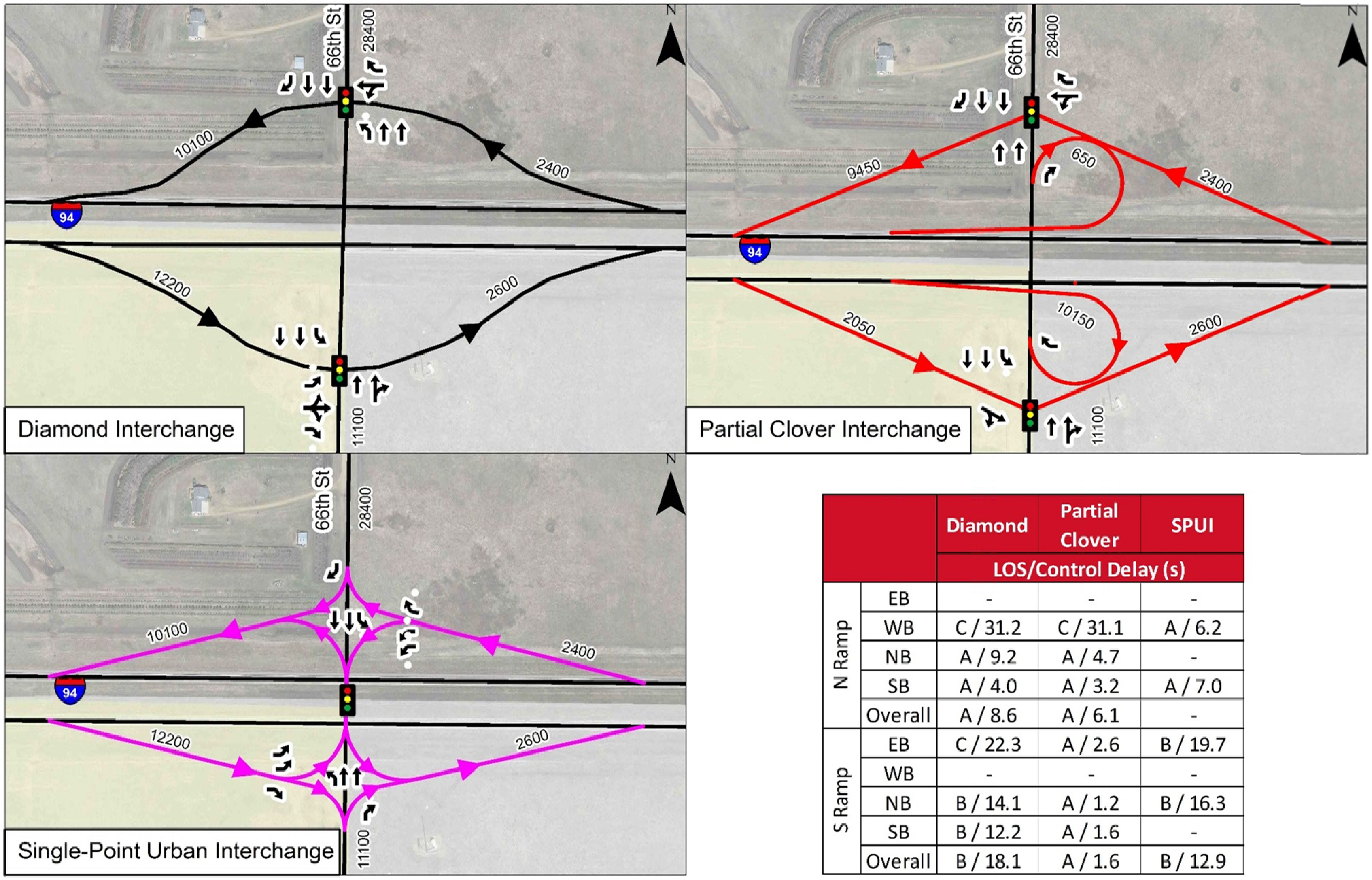
Single-Point Urban Interchange (SPUI)

A SPUI interchange was also identified in the MPO I-94 Corridor Study as a potential geometric alternative. The primary advantage of the SPUI interchange configuration is the reduced right-of-way requirement and improved operational efficiency over a standard diamond interchange. A SPUI interchange is most commonly found in urbanized areas where the opportunity to purchase additional right of way is limited due to adjacent development. The SPUI interchange centralizes all ramp movements to a single point above or below the interstate and a signal cycles through non-conflicting movements.

The SPUI interchange operates most efficiently when all four ramp movements are of similar traffic volumes. The ramps on the west side of the interchange would control the amount of green time associated to those movements but equal time would be placed on the east ramps even though the traffic volumes would be considerably lower. This would not be the most efficient usage of the green time. A SPUI is also a more expensive option that would require a wider structure and retaining walls.

Interstate Summary

The interchange configuration with the least overall delay would be the partial cloverleaf. This configuration allows for the largest ramp movement to interact with 66th Street without the need for a traffic signal. The SPUI interchange would have acceptable levels of delay but with the corridor currently undeveloped, the right of way impacts of a larger partial cloverleaf would be of less concern. Through the year 2040, a diamond ramp layout is projected to be adequate for the 2040 Base model traffic outputs. See **Figure 3.7** for a comparison of the layouts evaluated for the interchange and the intersection capacity of each alternative.



		Diamond	Partial Clover	SPUI
		LOS/Control Delay (s)		
N Ramp	EB	-	-	-
	WB	C / 31.2	C / 31.1	A / 6.2
	NB	A / 9.2	A / 4.7	-
	SB	A / 4.0	A / 3.2	A / 7.0
	Overall	A / 8.6	A / 6.1	-
S Ramp	EB	C / 22.3	A / 2.6	B / 19.7
	WB	-	-	-
	NB	B / 14.1	A / 1.2	B / 16.3
	SB	B / 12.2	A / 1.6	-
	Overall	B / 18.1	A / 1.6	B / 12.9

Northeast Bismarck
Subarea Study

Figure 3.7
Interchange Alternatives

Roundabout Analysis

Roundabouts were analyzed at all major intersections along the proposed beltway and within the study area where a signal may be warranted by 2040. A roundabout configuration would facilitate the movement of vehicles along the beltway and would minimize the amount of stopping required. See **Figure 3.8** for the proposed roundabout layout. **Table 3.6** shows the intersection capacity of each of the intersections with a roundabout.

Roundabout Benefits

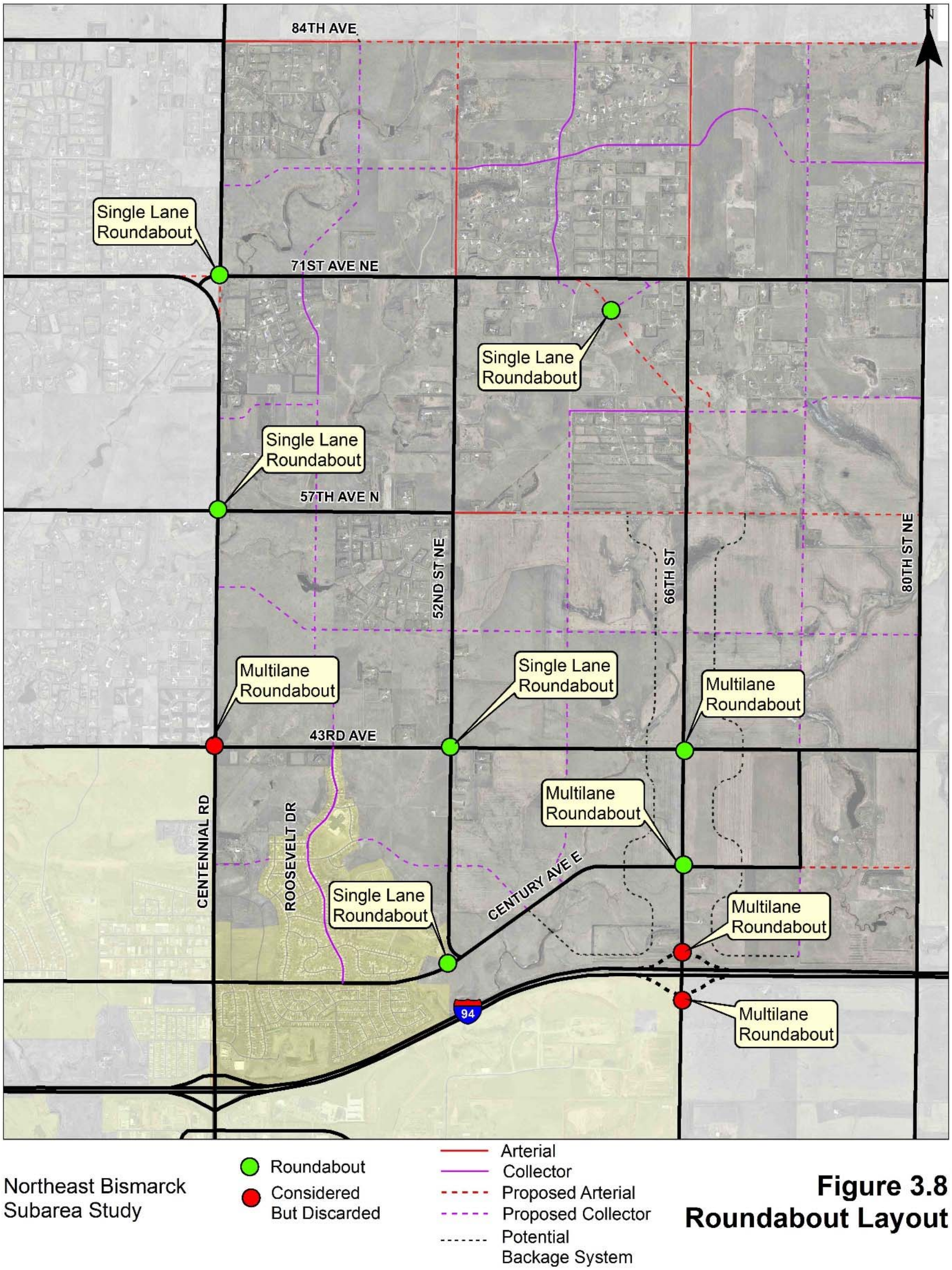
Roundabouts provide the benefits of:

- Reducing vehicular conflict points compared to conventional intersections
- Reducing crash severity due to lower intersection speeds and traffic characteristics
- Reducing the need to come to a complete stop at an intersection, benefiting truck traffic of stop and go traffic, which trucks prefer to slow down rather than stop
- Potentially lower traffic noise at intersections from reduction in start-up traffic
- Proactive intersection configuration to build to suit future demand rather than reactive signal installation only placed after traffic volumes justify its construction

No additional roadway upgrades were needed from the 2040 Base recommended lane configuration with the exception of a roundabout at 43rd Avenue and Centennial Road, which would require two northbound lanes through the intersection. Some of the multilane roundabouts required right turn slip lanes in order to function at LOS C or better. With the exception of the interchanges and the intersection of 43rd Avenue and Centennial Road, adding a roundabout decreased the delay of the intersection overall and many of the approaches.

It would not be recommended to construct a roundabout at the intersection of 43rd Avenue and Centennial Road, because it would require adding an additional northbound lane north of the intersection. It would also not be recommended to install roundabouts on the interstate ramps, since it would be easier to add a partial clover layout in the future to a signalized intersection than to a roundabout.

It would be recommended to consider roundabout configurations to the major beltway intersections along 66th Street and 71st Avenue. All of the intersections along the beltway experienced decreased delay with the installation of a roundabout. Most notably, the intersection of 43rd Avenue and 66th Street experienced an overall reduction in delay of 11.5 seconds, improving from 25.4 seconds delay with a signal to 13.9 seconds delay with a roundabout. The intersections of 71st Avenue and Centennial Road and Century Avenue and 66th Street had reductions in delay of 7.2 and 6.1 seconds respectively.



Northeast Bismarck Subarea Study

Figure 3.8
Roundabout Layout

Table 3.6 - Roundabout Intersection Capacity Analysis

Intersection	Lane Configuration	Level of Service/ Delay (seconds)				
		Overall	EB	WB	NB	SB
71st Ave & Centennial Rd	Single Lane Roundabout	A	B	A	B	A
		10.0	10.6	9.6	10.3	8.0
71st Ave & 66th St	Single Lane Roundabout	A	A	A	A	-
		7.7	7.9	7.2	7.8	-
57th St & Centennial Rd	Single Lane Roundabout	B	B	B	B	B
		11.1	10.8	10.7	11.7	10.9
43rd Ave & Centennial Rd	Multilane Roundabout	C	C	C	C	B
		17.7	18.0	21.6	15.5	14.9
43rd Ave & 52nd St	Single Lane Roundabout	C	C	C	B	B
		16.1	17.0	18.0	12.9	11.8
43rd Ave & 66th St	Multilane Roundabout	B	B	B	A	A
		11.2	12.0	11.9	9.8	8.9
Century Ave & 52nd St	Single Lane Roundabout	B	B	B	-	B
		12.5	12.3	12.7	-	12.4
Century Ave & 66th St	Multilane Roundabout	C	C	C	B	C
		17.7	24.5	24.7	10.5	20.5
I94 N Ramp & 66th St	Multilane Roundabout	A	-	C	B	A
		8.6	-	17.5	13.7	1.9
I94 S Ramp & 66th St	Multilane Roundabout	C	C	-	C	A
		18.0	20.5	-	24.3	5.6

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2040 SCENARIOS – ALTERNATIVE SCENARIO ANALYSIS

Three additional scenarios were studied for 2040 traffic conditions: Scenario 1A, 1B and 2. Scenario 1A assumes similar commercial and residential growth in the area, however, there is only a grade separated structure at I-94 instead of an interchange. Scenario 1B analyzes similar commercial and residential growth in the subarea, however, there are no improvements to 66th Street at I-94 (no interchange or grade separated structures). Scenario 2 is similar to Scenario 1B in there are no improvements to 66th Street at I-94, however, the commercial development has been moved from the area bounded by I-94, 66th Street, 80th Street and 43rd Avenue to the area bounded by 52nd Street, 57th Avenue, 66th Street and 43rd Avenue.

It should be noted that the analysis in this section is not to suggest a reduction in future investment in the local and urban street system of the BMMPO. All fiscally constrained and unmet needs from Envision 2040 should be considered the minimum investment in the local and urban roadway system within the Northeast Subarea. Rather this scenario analysis simply tests the impacts generated to the local system without a proposed interchange or grade separation at 66th Street.

2040 Scenario 1A

2040 Scenario 1A assumes the same traffic demand within the study area, however, 66th Street would be only a grade-separated crossing at the interstate and not an interchange. East and west streets such as Century Avenue, 43rd Avenue, 57th Avenue and streets such as East Divide Avenue south of the interstate would have a higher ADT as more vehicles would be using these routes instead of the interstate. East Divide Avenue ADT increases from 6,900 in the 2040 Base Model to 12,500 in the 2040 Scenario 1A. North and south streets such as Centennial Road, 52nd Street, 80th Street and 66th Street north of Century Avenue would have a higher ADT because the traffic would disperse more rather than focusing on 66th Street to access the interstate.

The ADTs along 71st Avenue increase in the 2040 Scenario 1A as compared to the 2040 Base Scenario. One of the areas with the largest change is between 52nd Street and 66th Street, which increases from 7,000 in the 2040 Base Scenario to 9,000 in the 2040 Scenario 1A. This increase can be partially attributed to more boundary traffic using 71st Avenue as their access into and from Bismarck and other destinations instead of the interchange as in the 2040 Base Scenario.

See **Figure 3.9** for the comparison of the lane geometry and intersection control between 2040 Scenario 1A and the LRTP.

Improvements beyond LRTP

Centennial Road would need to be built with two through lanes in each direction from Jericho Road to 43rd Avenue.

43rd Avenue would need to be built for two through lanes in each direction from Centennial Road to Roosevelt Drive. This is similar to what the 43rd Avenue Corridor Study recommends with this segment. However, the 43rd Avenue Corridor Study recommends the five lane section to continue from Roosevelt Drive to 66th Street, where the analysis for the 2040 Scenario 1A found that only having one through lane in each direction would be sufficient.

Century Avenue would need to be built with two through lanes in each direction both east and west of the 66th Street intersection.

Additions from 2040 Base Recommendations

No improvements were needed from the 2040 Base Recommendations.

While Century Avenue and 43rd Avenue may not need to be built out further than the 2040 Base Recommendations, the roadways would be operating closer to their full capacity.

Changes from 2040 Base Recommendations

66th Street could potentially be reduced from two through lanes in each direction through Century Avenue to a two lane road because of the lower traffic volumes. However, as a major north-south corridor, assuming and planning for a future four lane facility is critical.

The intersection of Century Avenue and Centennial Road would operate at LOS C.

2040 Scenario 1B

2040 Scenario 1B assumes the same traffic demand within the study area, however, 66th Street would not be a grade separated crossing or interchange at I-94. East and west streets such as Century Avenue and 43rd Avenue would have an increased ADT. 43rd Avenue has an ADT of 14,000 in the 2040 Base model and an ADT of 19,800 in the 2040 Scenario 1B. North and south streets such as Centennial Road, 52nd Street, 66th Street and 80th Street would have an increased ADT. 66th Street between Century Avenue and 43rd Avenue increases from an ADT of 9,000 in the 2040 Base scenario to 17,300 in the 2040 Scenario 1B.

The ADT on 71st Avenue is higher in 2040 Scenario 1B than it is in the 2040 Base Scenario. One of the segments with the most change is between 52nd Street and 66th Street which increases from 7,000 in the 2040 Base Scenario to 11,400 in the 2040 Scenario 1B. This change can be partially attributed to traffic from the boundaries of the study area using 71st Avenue as the access to and from various parts of Bismarck. Previously with the grade separation and/or the interchange, traffic was able to have easier access to and from various regions in the study area.

The intersections analyzed for this scenario were the major intersections on Century Avenue, 43rd Avenue and 57th Avenue. See **Figure 3.10** for the comparison of the lane geometry and stop control between 2040 Scenario 1B and the 2040 Base scenario.

Improvements beyond LRTP

43rd Avenue would need to be built with two through lanes in each direction from Centennial Road to 66th Street. This is consistent with the recommendations from the 43rd Avenue Corridor study.

Centennial Road would need to be built to two through lanes in each direction from Jericho Road to 57th Avenue.

Additions to 2040 Base Recommendations

43rd Avenue would need to be built with two through lanes in each direction from Centennial Road to 66th Street, instead of only through the intersection of Centennial Road in the 2040 Base Recommendations.

Centennial Road would need to be expanded to two through lanes in each direction from Century Avenue to 57th Avenue, instead of only from Century Avenue to 43rd Avenue as in the 2040 Base Recommendations.

<u>Changes from 2040 Base Recommendations</u>

Century Avenue would be reduced from two through lanes in each direction through the 66th Street intersection to a three lane section from Century Avenue to 66th Street.

66th Street would be reduced from two through lanes in each direction through Century Avenue to a 2 lane road.

The intersection of Century Avenue and Centennial Road would operate at LOS D with at least three approaches operating at LOS D.

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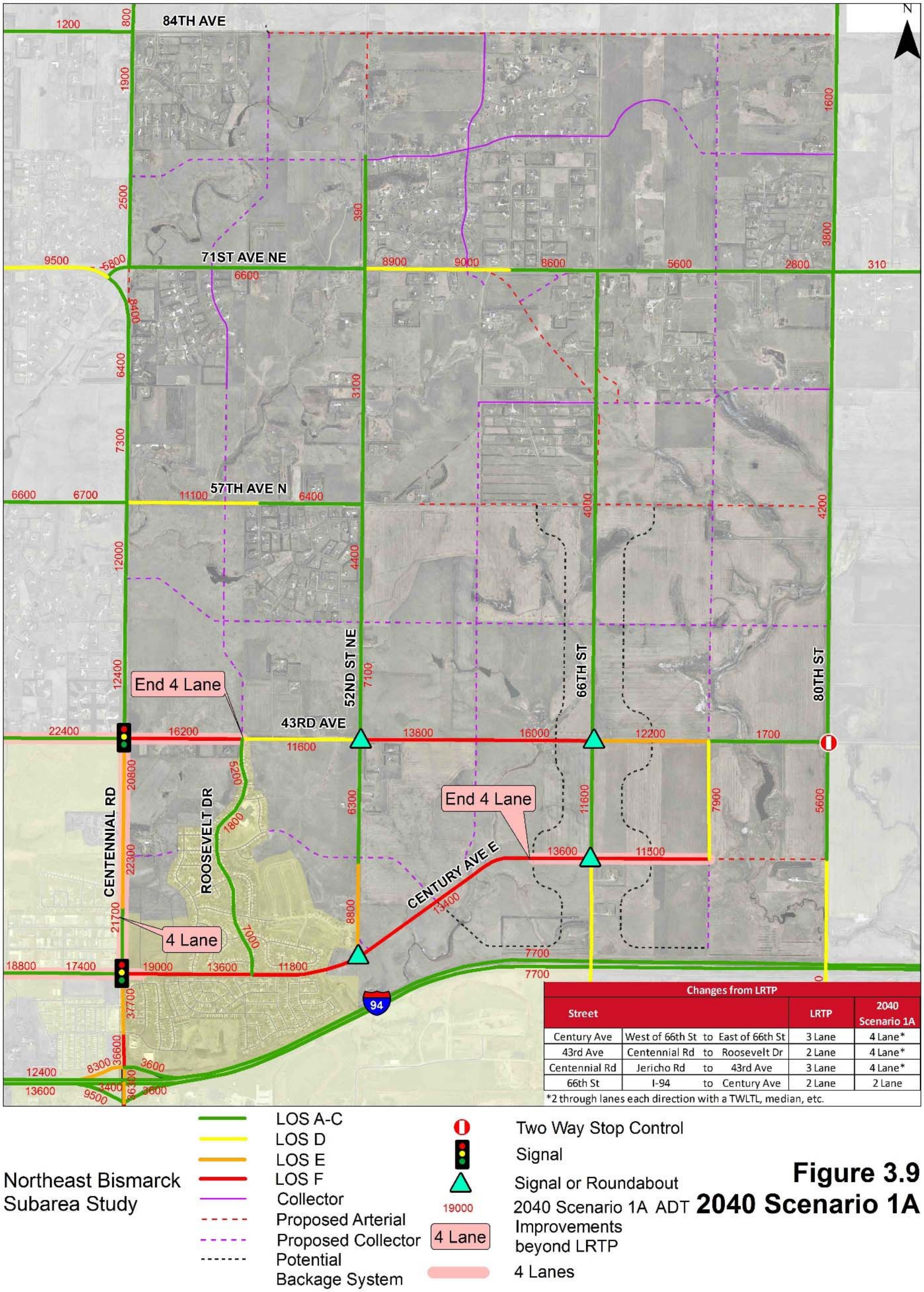
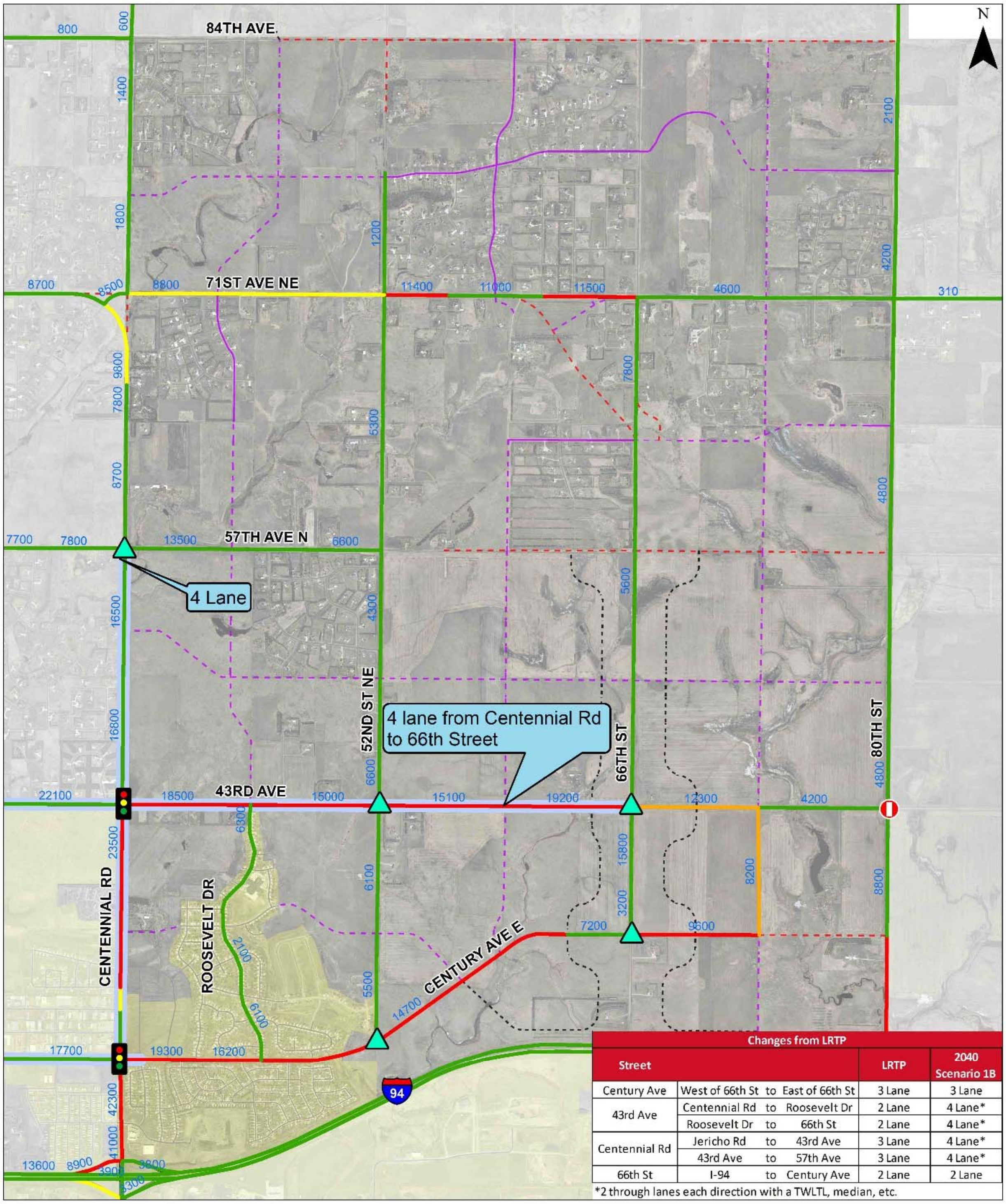


Changes from LRTP						
Street					LRTP	2040 Scenario 1A
Century Ave	West of 66th St	to	East of 66th St		3 Lane	4 Lane*
43rd Ave	Centennial Rd	to	Roosevelt Dr		2 Lane	4 Lane*
Centennial Rd	Jericho Rd	to	43rd Ave		3 Lane	4 Lane*
66th St	I-94	to	Century Ave		2 Lane	2 Lane

*2 through lanes each direction with a TWLTL, median, etc.

Northeast Bismarck Subarea Study

Figure 3.9
2040 Scenario 1A



Changes from LRTP				LRTP	2040 Scenario 1B
Street				**LRTP**	**2040 Scenario 1B**
Century Ave	West of 66th St	to	East of 66th St	3 Lane	3 Lane
43rd Ave	Centennial Rd	to	Roosevelt Dr	2 Lane	4 Lane*
	Roosevelt Dr	to	66th St	2 Lane	4 Lane*
Centennial Rd	Jericho Rd	to	43rd Ave	3 Lane	4 Lane*
	43rd Ave	to	57th Ave	3 Lane	4 Lane*
66th St	I-94	to	Century Ave	2 Lane	2 Lane

*2 through lanes each direction with a TWLTL, median, etc.

Northeast Bismarck Subarea Study

Figure 3.10
2040 Scenario 1B

2040 Scenario 2

2040 Scenario 2 assumes that the growth will take place in a different location if the infrastructure is not constructed crossing I-94 at 66th Street. East and west streets such as 43rd Avenue, 57th Avenue and to a lesser extent Century Avenue would have an increased ADT. 57th Avenue increases from an ADT of 6,000 in the 2040 Base Scenario to 15,600 in the 2040 Scenario 2.

North and south streets such as 80th Street, 66th Street (N of 43rd Avenue), 52nd Street and Centennial Road would have an increased ADT. 52nd Street increases from an ADT of 2,300 in the 2040 Base Scenario to 9,300 in the 2040 Scenario 2. The intersections analyzed for this scenario were the major intersections on Century Avenue, 43rd Avenue and 57th Avenue.

The ADT on 71st Avenue is similar between the 2040 Scenario 2 and the 2040 Base Scenario. The ADT in the 2040 Scenario 2 is higher than the 2040 Base Scenario from Centennial Road to 52nd Street, however, it is lower than the 2040 Base Scenario from 52nd Street to 80th Street. With 2040 Scenario 2, the main region of jobs is located along 52nd Street, compared to 66th Street in the previous scenarios. Therefore, more traffic will need to use 71st Avenue as a way to access the development along 52nd Street.

See **Figure 3.11** for the comparison of the lane geometry and stop control between 2040 Scenario 2 and the 2040 Base scenario.

Improvements beyond LRTP

43rd Avenue would need to be expanded to two through lanes in each direction from Centennial Road to 52nd Street.

Centennial Road would need to be expanded to two through lanes in each direction from Jericho Road to 57th Avenue.

Additions to 2040 Base Recommendations

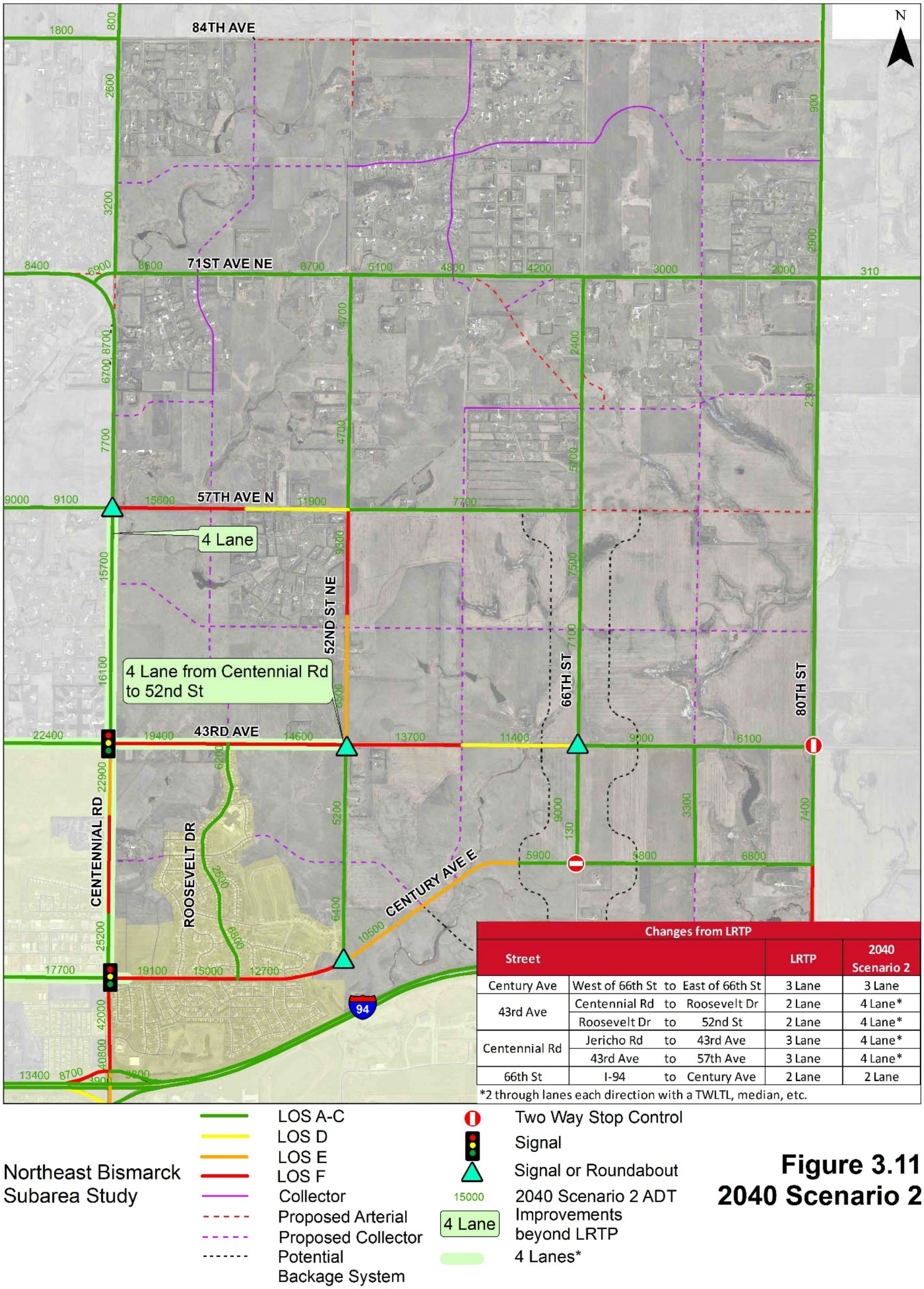
Like Scenario 1B, Centennial Road would need to be built out to two through lanes in each direction from Century Avenue to 57th Avenue in order to accommodate the large volumes of traffic turning onto and off of 57th Avenue and 43rd Avenue, instead of having the two through lanes in each direction end at 43rd Avenue, as is the case in the 2040 Base recommendations.

43rd Avenue would need to be expanded to two through lanes in each direction from Centennial Road to 52nd Street, instead of having the two through lanes in each direction end after the intersection of Centennial Road.

Changes from 2040 Base Recommendations

Like Scenario 1B, Century Avenue would be reduced from two through lanes in each direction through 66th Street to a 3 lane road.

The intersection of Century Avenue and Centennial Road would operate at LOS D with at least three approaches operating at LOS D



Changes from LRTP

Street				LRTP	2040 Scenario 2
Century Ave	West of 66th St	to	East of 66th St	3 Lane	3 Lane
43rd Ave	Centennial Rd	to	Roosevelt Dr	2 Lane	4 Lane*
	Roosevelt Dr	to	52nd St	2 Lane	4 Lane*
Centennial Rd	Jericho Rd	to	43rd Ave	3 Lane	4 Lane*
	43rd Ave	to	57th Ave	3 Lane	4 Lane*
66th St	I-94	to	Century Ave	2 Lane	2 Lane

*2 through lanes each direction with a TWLTL, median, etc.

Northeast Bismarck
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Figure 3.11
2040 Scenario 2

Existing N/S Corridors

It was speculated that with the building of an interchange at 66th Street, vehicles traveling to US 83 from I-94 and vice versa would use the 71st Avenue and 66th Street corridors as a Beltway. This would pull traffic off of State Street and Centennial Road and decrease the amount of traffic using the other interchanges to access US 83. However, the model outputs did not show this trend of regional trips being pulled off of State Street or Centennial Road to use the interchange on 66th Street as a way to access I-94. It does show a decrease in traffic at State Street and Centennial Road but it is attributed primarily to the local traffic and not the regional traffic which may be moving to the future 66th Street and 71st Avenue corridors.

The proposed interstate ramp on 66th Street is pulling traffic from the northeast subarea study boundaries, such as from 71st Avenue and 80th Street. Vehicles that would normally be using these streets as an access to Centennial Road, south Bismarck, or to 43rd Avenue would instead be using 66th Street to get to the interstate.

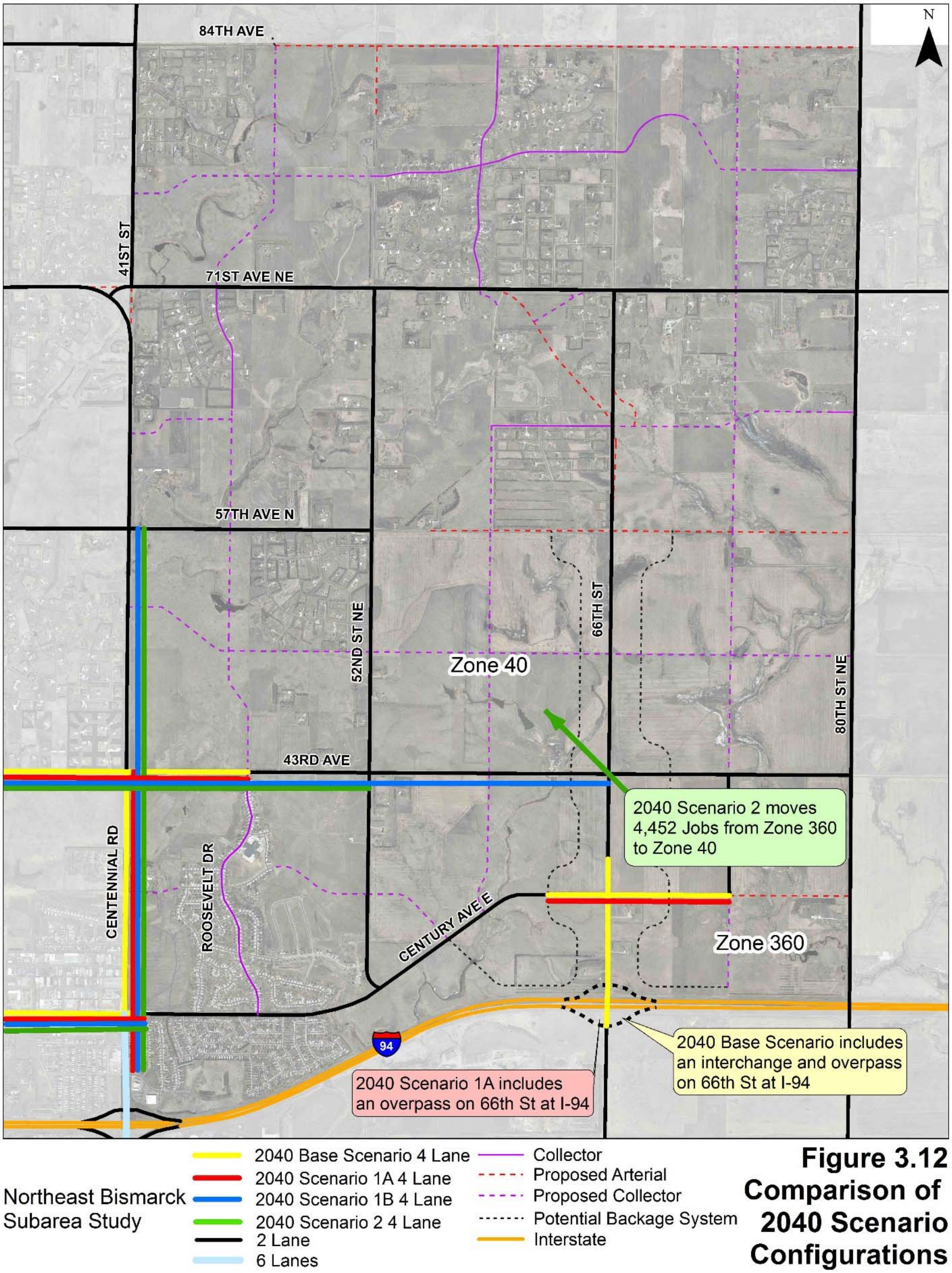
For the 2040 Base and 2040 Scenario 1A, the ADT on the north side of the proposed interstate ramps on State Street and Centennial Road were approximately 6,000 less and 5,000 less respectively as compared to the 2040 Scenario 1B and 2040 Scenario 2. This shows that the proposed interchange at 66th Street will increase the ability of traffic to access the interstate.

See **Table 3.7** for a comparison of ADTs on State Street, Centennial Road and 71st Avenue.

Table 3.7 – Comparison of ADTs between Scenarios

Corridor	Location	ADT			
		2040 Base	2040 1A	2040 1B	2040 2
State St	South of I94	42,900	39,900	42,200	42,500
	North of I94	61,600	61,500	67,000	66,900
	Calgary Ave to 43rd Ave	47,800	48,900	53,100	53,100
	South of 71st Ave	29,700	29,800	30,300	29,900
Centennial Rd	South of I94	42,700	42,600	44,300	43,800
	North of I94	35,600	36,600	41,200	40,800
	71st Ave	7,400	8,400	9,400	8,700
71st Ave	Centennial Rd to 52th St	5,000	5,800	8,400	6,900
East Divide Ave	West of 66th St	6,900	12,500	6,400	10,000

See **Figure 3.12** for a comparison of the 2040 Scenarios.



Northeast Bismarck Subarea Study

Figure 3.12 Comparison of 2040 Scenario Configurations

CHAPTER 4: TRUCK ANALYSIS

INTRODUCTION

The purpose of this element of the Northeast Bismarck Subarea Study is to analyze the existing truck traffic patterns and predict the anticipated truck traffic within the subarea study boundaries. This analysis is based on the substantial concern raised by the public regarding future potential truck traffic within the Northeast Subarea. The analysis performed in previous MPO studies was reviewed and incorporated as appropriate. Existing truck movement trends were developed based on data collected by NDDOT and by KLJ in 2014. Significant concern were raised by residents in the Northeast Subarea about future increases in truck traffic that would result from implementation of the 66th Street Interchange, development of the 66th Street Corridor and reconstruction of 71st Avenue. The primary goal of this analysis is to develop a truck volume projection anticipated on 71st Avenue and 66th Street with the proposed 66th Street interchange with Interstate 94.

PREVIOUS STUDY

The MPO completed a corridor study along 71st Avenue and Centennial Road in 2008. Within this study, a truck origin/destination analysis was completed to determine how much of the truck traffic utilizing the corridor:

A. Had an origin or destination between US 83 and Interstate 94 and
B. Had an origin or destination outside of US 83 and Interstate 94 and therefore would travel the 71st Avenue/Centennial Road corridor from end to end

Centennial Road/71st Avenue Corridor

2008 truck volumes on Centennial Road near Interstate 94 were approximately 450 trucks per day for each southbound and northbound direction (900 total). Truck volumes on 71st Avenue near US 83 were 140 trucks per day in each direction (280 total). The amount of trucks traveling through the corridor from end to end was estimated at 120 trucks per day per direction (240 total) which would represent 90% of the total 71st Avenue truck traffic but only 25% of the total Centennial Road truck traffic.

Centennial Road/Interstate 94 Ramps

Of the 120 directional daily trucks north of Interstate 94 Ramps, 90% had an origin/destination continuing south on Bismarck Expressway and 10% had an origin/destination east on Interstate 94. No trucks had an origin/destination west on Interstate 94 that were also identified at the 71st Avenue/US 83 intersection. This particular movement would be four additional miles of driving with two miles on 71st Avenue and two miles on Interstate 94 in exchange for traveling down Centennial Road (and reduced signalization) instead of US 83.

71st Avenue/US 83 Intersection

Of the 120 directional daily trucks east of the 71st Avenue/US 83 intersection, 90% had an origin/destination north along US 83 and 10% had an origin/destination continuing west on ND 1804 (71st Avenue). No trucks had an origin/destination south on US 83 that were also identified at the Centennial Road/Interstate 94 Ramps.

State Street Corridor

The origin/destination study also analyzed the truck traffic along US 83 (State Street) between Interstate 94 and the 71st Avenue/ND 1804 intersection. 2008 truck volumes on US 83 near Interstate 94 were approximately 600 trucks per day for each southbound and northbound direction (1200 total). Truck volumes on US 83 near 71st Avenue were 240 trucks per day in each direction (480 total). The amount of trucks traveling through the corridor from end to end was estimated at 200 trucks per day per direction (400 total) which would represent 75% of the US 83 truck traffic near 71st Avenue but only 30% of the US 83 truck traffic near Interstate 94.

US 83/Interstate 94 Ramps

Of the 200 directional daily trucks north of the Interstate 94 Ramps, 40%-50% had an origin/destination west along Interstate 94, 40%-50% had an origin/destination east along Interstate 94 and 10% had an origin/destination south along State Street.

71st Avenue/US 83 Intersection

Of the 200 directional daily trucks south of the 71st Avenue/US 83 intersection, 90% had an origin/destination north along US 83 and 10% had an origin/destination continuing west on ND 1804 (71st Avenue). No trucks had an origin/destination east on 71st Avenue that were also identified at the US 83/Interstate 94 Ramps.

Key Conclusions from Previous Study

Key conclusions from the previous truck origin/destination study were that US 83 corridor served 85% of the through trips of interstate traffic to US 83 while 71st Avenue/Centennial Road primarily served trucks that were local or Bismarck-area truck trips.

2014 ANALYSIS

Existing truck movement data was recorded in 2014 by the following sources:

- NDDOT MioVision automated 24-hour traffic counts at Interstate 94 ramps and along US 83. Truck volume taken as the sum of the medium and articulated classified vehicles.
- NDDOT GIS webpage for truck ADT. Note that the ADT listed is the average annual daily traffic volume and is lower in most cases than the sum of the medium and articulated trucks from the MioVision.
- KLJ intersection turning movement counts.

A piece of data that was not available was detailed truck movements at the intersection of US 83 and 71st Avenue. Available truck data can be found in **Figure 4.1** and **Figure 4.2**. The data that was available was compared to the 2008 origin/designation study to analyze differences and similarities in truck volumes and trends from 2008 to 2014.

Increased Truck Volumes

Truck volumes have increased on US 83 by 600 trucks representing a 50% overall increase compared to 2008 data and a 6.9% annual growth. The increase on Centennial Road in both number (515 trucks) and in percentage (62%, 8.4% annual growth) is similar to US 83. The increase on 71st Avenue is most pronounced having a similar increase in number of trucks compared to the other corridors (400 trucks) but a much greater percentage change (143%, 15.9% annual growth). This data is shown in the table below.

Table 4.1 - Two-Way Truck Traffic

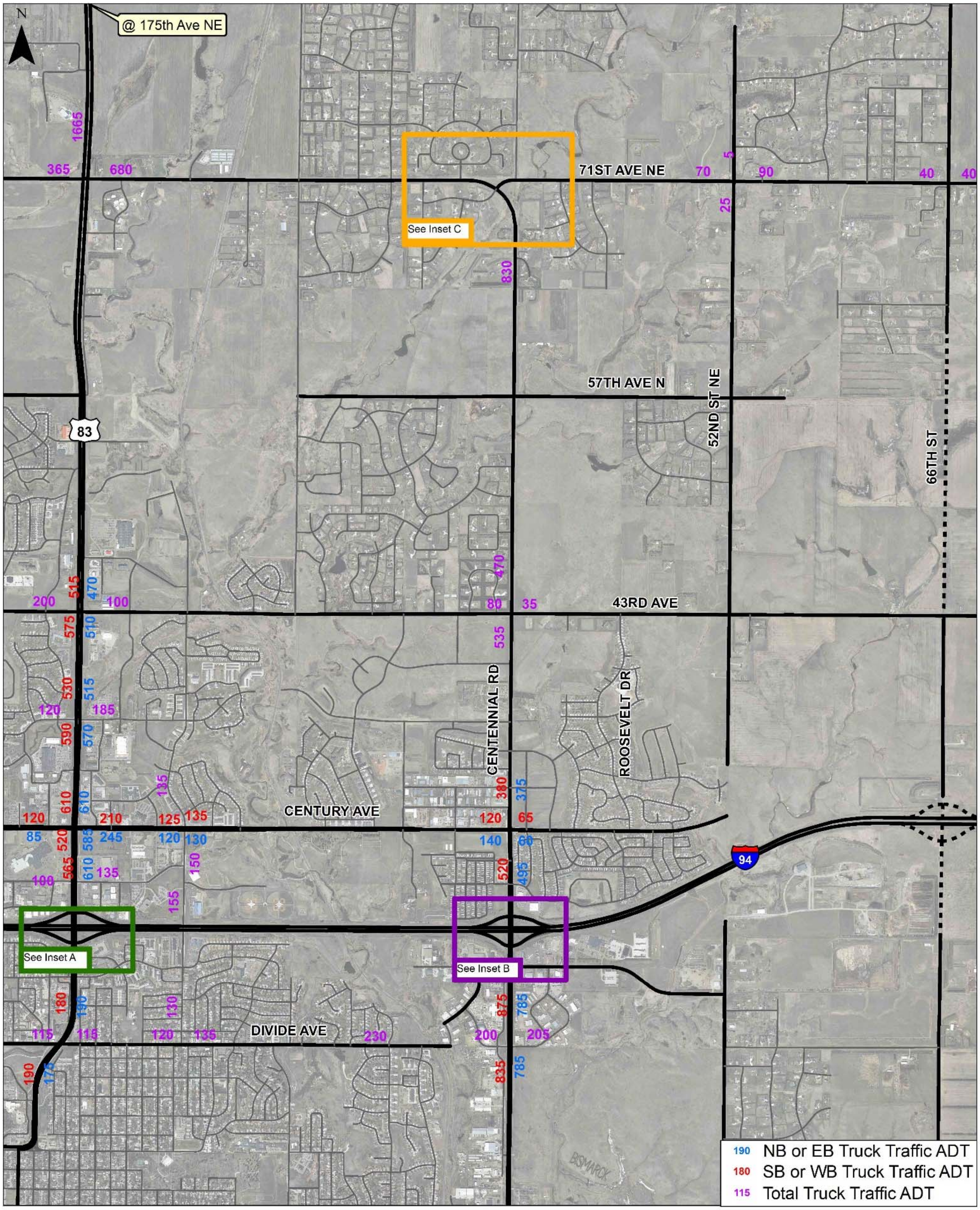
Corridor	Location	Two Way Truck ADT		% Change	Average Annual % Change
		2008	2014		
US 83	North of I94	1200	1795	50%	6.9%
Centennial Road	North of I94	825	1339	62%	8.4%
71st Avenue	East of US 83	280	680	143%	15.9%

Origin/Destination Comparison

Origin/destination information is not available on the 2014 truck data but detailed turning movement counts are available at the interstate ramps that provide a similar percentage distribution of US 83 and Centennial Road truck movements at the Interstate ramps. Based on growth rate changes shown between 2008 and 2014 in overall truck traffic on both State Street and Centennial Road, KLJ updated through movement O/D data collected as part of the 2008 Centennial Road/71st Avenue Corridor Study. This updated data is shown in **Table 4.2.** The approach used was to apply growth rates for State Street (50%) and Centennial Road (62%) to through truck movements on both corridors. Without a new O/D Study, this data is only speculative based on past trends in relation to existing conditions.

Table 4.2 - Updated Through Movement Origin/Destination Comparison

Corridor	2008	% Change	2014
State Street/US 83			
Southbound US 83 to Eastbound I-94	110	50%	165
Westbound I-94 to Northbound US 83	70	50%	105
Centennial Road			
Southbound Centennial Road to Eastbound I-94	10	62%	16
Westbound I-94 to Northbound Centennial Road	10	62%	16
Total Through Movements	**200**		**302**



Northeast Bismarck
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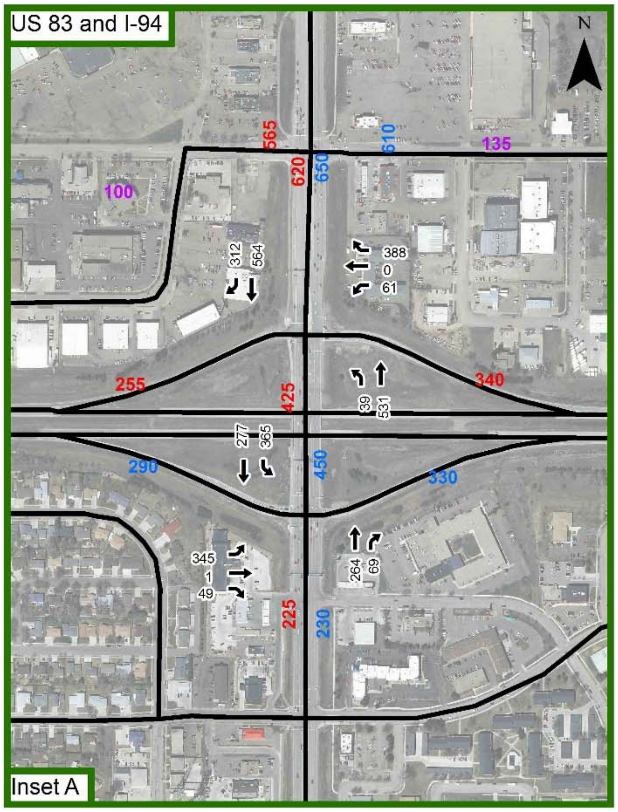
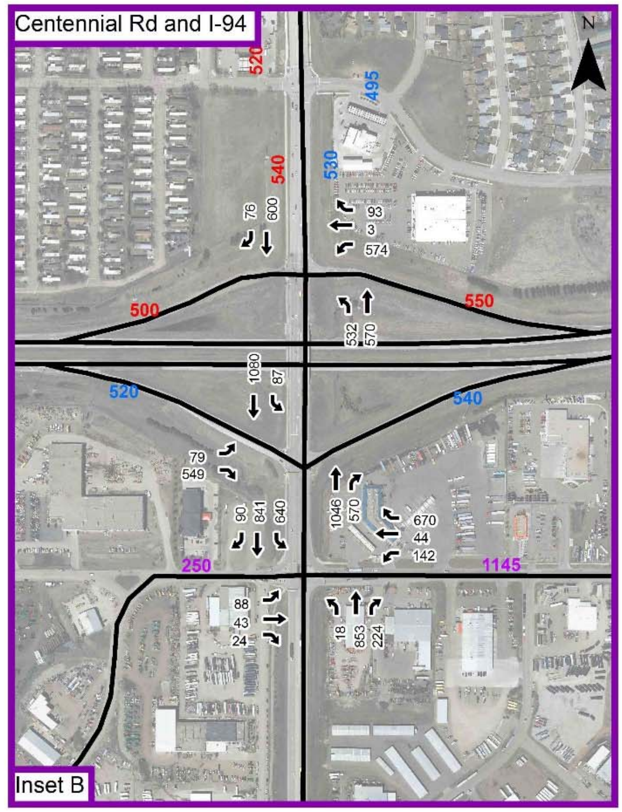
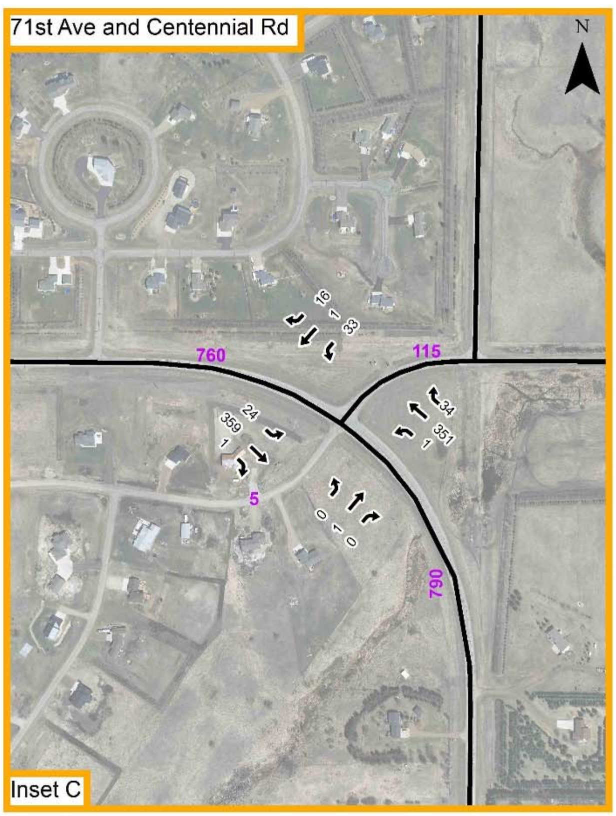
Figure 4.1
2014 Truck Volumes







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190	NB or EB Truck Traffic ADT
180	SB or WB Truck Traffic ADT
115	Total Truck Traffic ADT

Figure 4.2
2014 Truck Volumes (Inset)

US 83/Interstate 94 Ramps

Of the two-way truck volume on US 83 north of the Interstate 94 Ramps, approximately 35% had an origin/destination west along Interstate 94 (312 to 345 trucks), 42% had an origin/destination east along Interstate 94 (365 to 380 trucks) and 22% had an origin/destination south along State Street (186 to 199 trucks). These percentage splits are similar to the 2008 origin/destination study percentages indicating that the truck growth occurred relatively evenly and cannot be attributed to truck growth on one particular movement. This trend is consistent with the development that has occurred since 2008 in regards to no major truck generating developments (large truck stops, trans-loading facilities, oil and gas facilities) occurring near the interchange that would greatly influence the truck distribution.

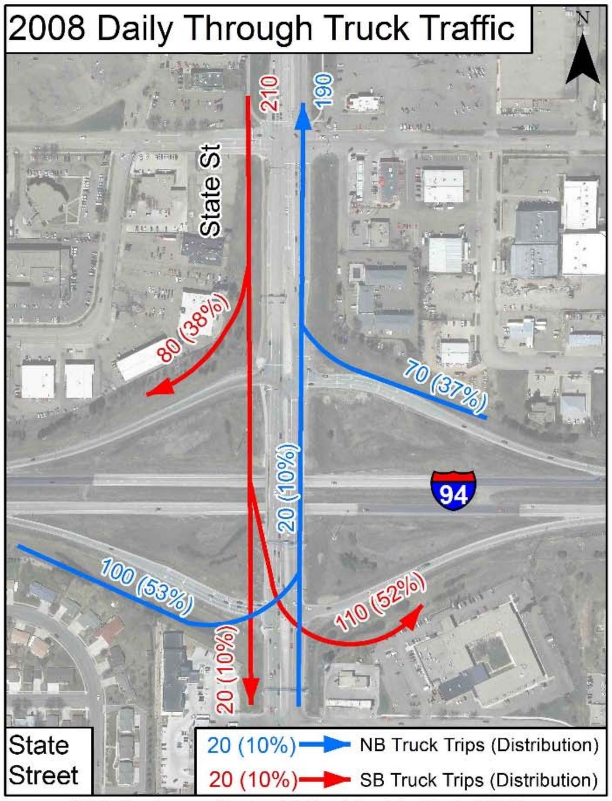
The difference between the 2014 truck percentage south of Interstate 94 of 22% and the 2008 through truck percentage of 10% is likely not due to any change in truck patterns but rather the differences in the data. The 2014 data is total truck volumes while the 2008 data is only the through trucks. The truck volumes south of Interstate 94 are not as likely to be associated with truck volumes north of 71st Avenue on US 83. These truck volumes south of Interstate 94 would be more local in nature as the Interstate provides an attractive conduit for the regional truck trips.

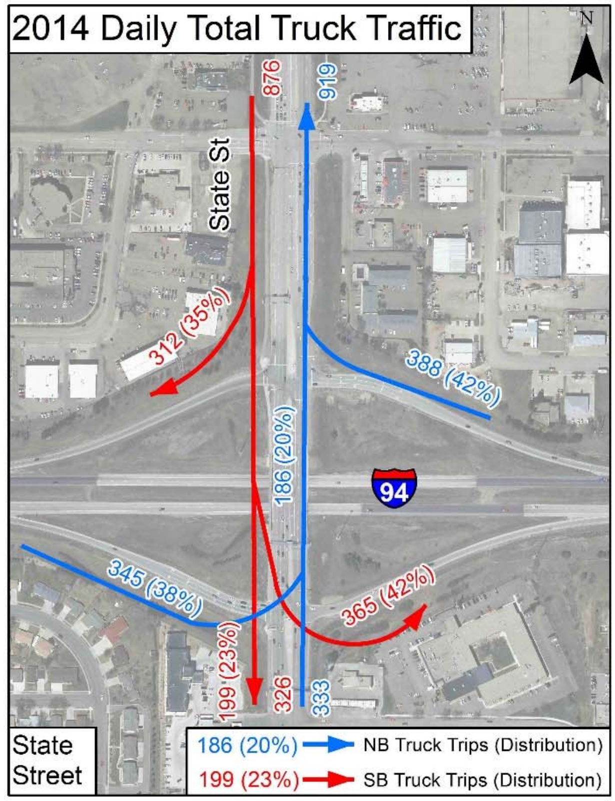
Centennial Road/Interstate 94 Ramps

Of the two-way truck volume on Centennial Road north of the Interstate 94 Ramps, approximately 12% had an origin/destination west along Interstate 94 (76 to 79 trucks), 13% had an origin/destination east along Interstate 94 (87 to 93 trucks) and 75% had an origin/destination south along Bismarck Expressway (491 to 506 trucks). Once again, the difference between the total truck percentage in 2014 and the 2008 origin/destination study percentage can be attributed to difference in the data sets. It can still be assumed that 2008 trend of no trucks having an origin/destination west on Interstate 94 also being identified at the 71st Avenue/US 83 intersection due to the additional mileage of "backtracking". See **Figure 4.3** for comparison of truck percentages between 2008 and 2014 truck data.

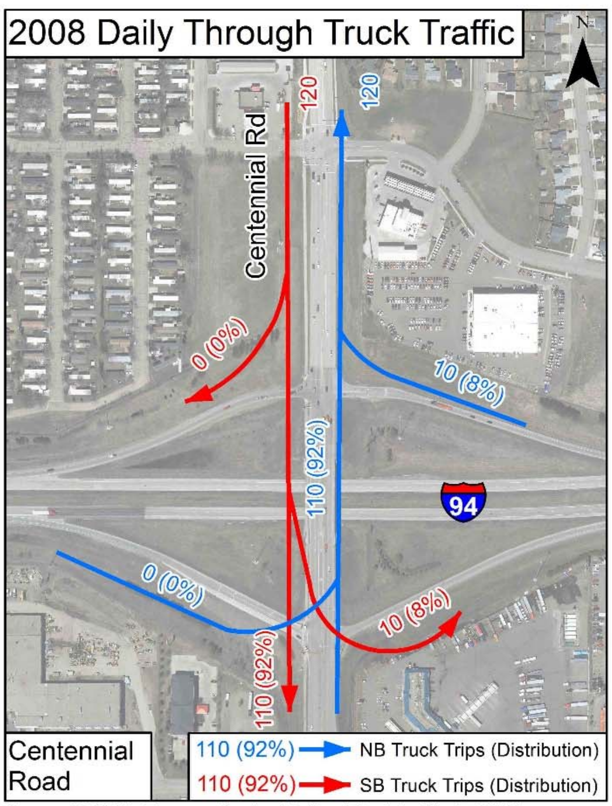
When comparing total truck movements at the intersection, the following observations were made:

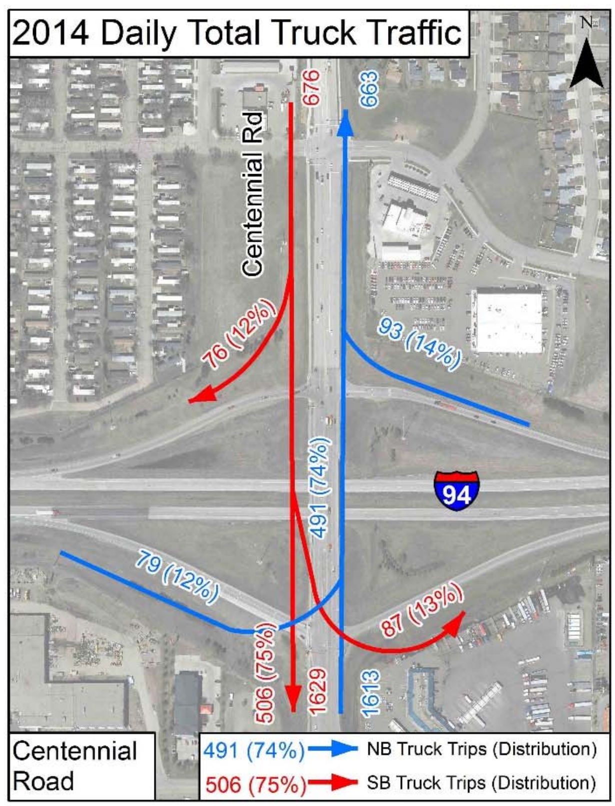
- No change in the total southbound Centennial Road to eastbound Interstate 94 movement (88 trucks)
- 339 of the 514 additional trucks on Centennial Road were attributed to Bismarck Expressway south of Interstate 94. Northern Plains Commerce Center has continued to infill with industrial development along Bismarck Expressway. Many of these additional truck trips may have origins/destinations within that industrial park.
- Remaining 175 additional trips were split among the off and on ramps for both eastbound and westbound Interstate 94 traffic.





Source: MPO 71st Avenue-Centennial Road Corridor Study (2008)





Source: MPO 71st Avenue-Centennial Road Corridor Study (2008)

Northeast Bismarck
Subarea Study

Figure 4.3
2008 & 2014 Truck Volumes:
I-94/Centennial Rd &
I-94/State St

FUTURE TRUCK ATTRACTION TO THE NORTHEAST BISMARCK SUBAREA

The future through truck movements most likely to be drawn to a new 66th Street interchange would be the westbound to northbound movement off of Interstate 94 and the southbound to eastbound movement onto Interstate 94.

Currently these movements occur at the Centennial and State Street interchanges. It is believed that a 66th Street interchange would absorb a portion of these movements, with the majority received from the Centennial interchange. Currently, Centennial Road and 71st Avenue act as a defacto *bypass* for local traffic, including trucks. However, analysis indicates these are primarily local trucks, and not regional or through trucks. This may be due to a lack of signage of Centennial Road and 71st Avenue as a formal truck route.

If the regional truck traffic is not currently utilizing 71st Avenue and Centennial Road as a connection between I-94 and US 83, it is unlikely that the regional truck traffic would utilize the 71st Avenue and 66th Street route as a new connection between I-94 and US 83 in the future. One event that may change this scenario would be the designation of 66th Street and 71st Avenue as a formal truck bypass between US 83 and I-94. Based on comments received as part of the public input process, designating 66th Street and 71st Avenue as a formal truck route is highly unpopular.

71st Avenue is not likely to see any serious increase in truck traffic until the following improvements are made along 66th Street and 71st Avenue:

- 66th Street is fully constructed including an interchange at I-94;
- Completion of the 66th Street Curve;
- 71st Avenue is reconstructed and improved to a three lane section with consolidated access points.

Once these infrastructure improvements are in place, it would logically make 66th Street and 71st Avenue equally attractive to through truck movements as is either State Street or Centennial Road. However, the truck attractiveness of the 71st Avenue and 66th Street corridor would be influenced by other factors as well:

US 83 Travel Times

As US 83 becomes more congested, regional truck trips may consider driving the additional miles to access the 66th Street and 71st Avenue corridor as it may be less overall travel time than on the shorter US 83 route.

Development along 66th Street

The potential exists for additional commercial and industrial development along 66th Street near Interstate 94. This development could create new truck trips as well as divert existing truck trips at US 83 and Centennial Road. However, future projected LOS issues south of Century Avenue on 66th Street could negate its future potential benefit as a truck reliever route.

Industrialization and Development of Western North Dakota (I.e. Oil Development)

The amount of truck traffic utilizing a fully completed 66th Street and 71st Avenue would be sensitive to the traffic generated based on the industrialization of western North Dakota. Continue oil production and urbanization of Western North Dakota would increase the number of trucks traveling between US 83 and Interstate 94.

Designation of 66th Street and 71st Avenue Truck Route

Quite possibly the largest influence on potential regional trip attractiveness would come from the designation of the 66th Street and 71st Avenue as a truck route. If the route was designated as the truck route, the non-local drivers would more readily utilize the route. If the route was not designated as an official truck route, the only trucks that would utilize the route would be ones with local knowledge. Technological improvements could also increase the amount of traffic using 66th Street and 71st Avenue, since online way finding maps (GPS, smartphones, etc.) may list the 66th Street interchange as a faster route between Interstate 94 and US 83 than the Centennial Road interchange or State Street interchange.

Future Truck Traffic on 66th Street (North of 43rd Avenue) & 71st Avenue

Assuming the 66th Street and 71st Avenue corridors were constructed today, and assuming a redistribution of existing through truck movements along both State Street and Centennial Road to the Northeast Subarea of Bismarck, new daily through truck volumes along 66th Street and 71st Avenue would be approximately 302 per day. This uses the updated assumptions for through movement truck data on State Street and Centennial Road used in **Table 4.2**.

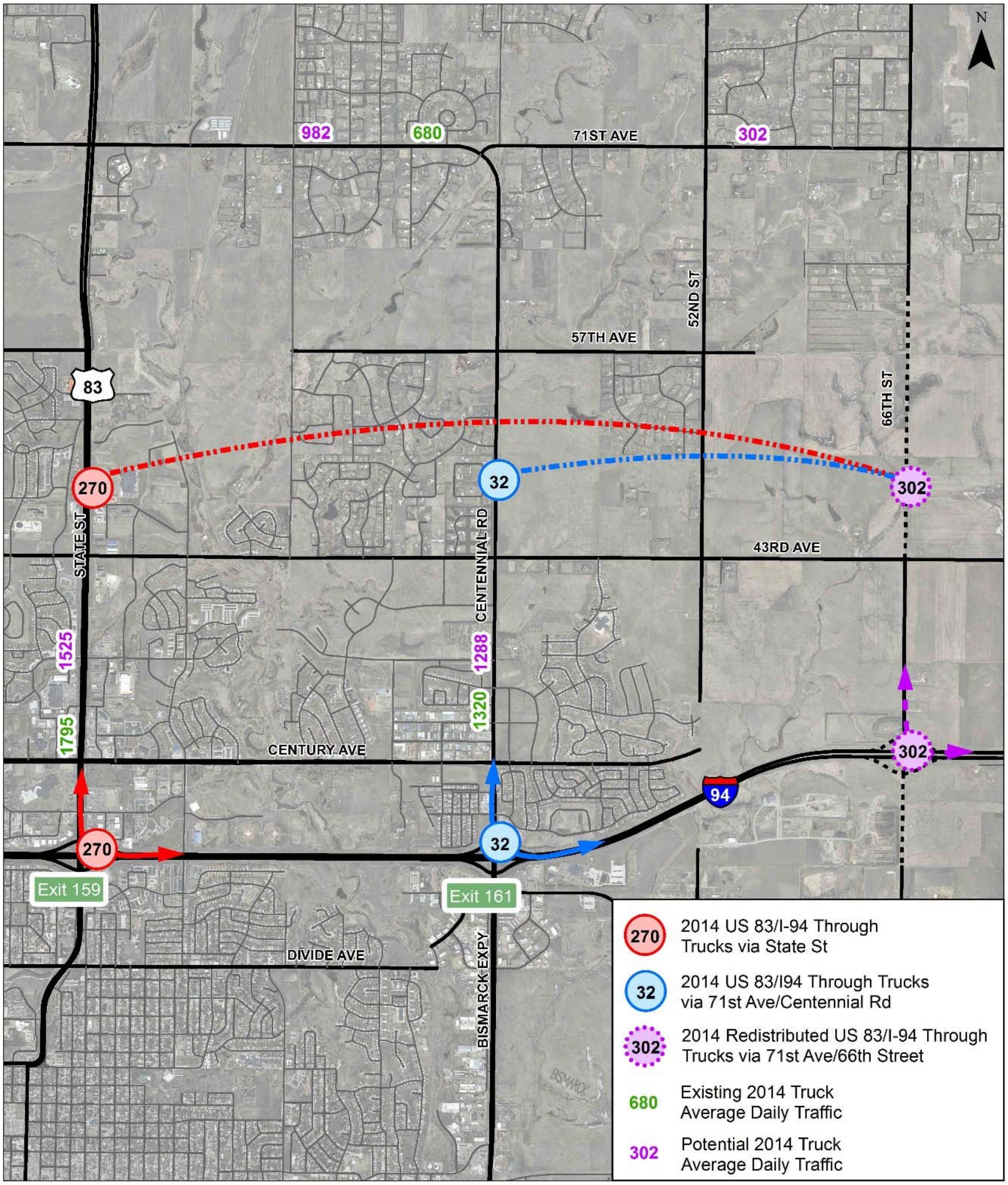
Figure 4.4 illustrates how the 2014 truck volume would potentially be redistributed to 66th Street and 71st Avenue. This assumes the rapid increase in truck traffic experienced between 2008 and 2014.

Truck Traffic Relief to State Street and Centennial Road

Based on the updated 2014 truck volumes on State Street and Centennial Road, plus updated current O/D through movements on both corridors, **Table 4.3** shows the potential net reductions in truck movements on both corridors if redistributed to 66th Street/71st Avenue. If built in the current condition, the 66th Street and 71st Avenue corridors would reduce truck traffic on State Street and Centennial by a total of nearly 10%. The largest benefit would be on State Street. Again, this only assumes the redistribution of through movements, and not internal truck traffic.

Table 4.3 – Truck Diversion Reduction to State Street & Centennial Road

Corridor	Existing Truck Volumes (2014)	Potential Distribution to 66th Street/71st Avenue	% Change	Adjusted Volume
State Street/US 83	1795	270	15.0%	1525
Centennial Road	1320	32	2.4%	1288
Total	3115	302	9.7%	2813



Northeast Bismarck Subarea Study

Figure 4.4
Assumed Truck Volumes with 66th Street Interchange (2014 Base Condition)

CHAPTER 5: ACCESS

INTRODUCTION & PURPOSE

This chapter is composed to analyze the access management within the study area to determine the recommended access configuration. By planning future access onto the arterials now, future development can occur within the recommended access configuration and minimize access points along the arterial roadways, which will increase the safety and flow of the principal arterials.

The Bismarck-Mandan MPO "Fringe Area Road Master Plan" (2014) developed roadway fabric at the collector street level. There have also been two corridor studies performed within the study area; one studied 71st Avenue/Centennial Road and one studied 43rd Avenue. The access management recommendations for these corridors were evaluated against the "Fringe Area Road Master Plan", and new access management recommendations were established for other key corridors in the study area.

FUNCTIONALLY CLASSIFIED ROADWAY NETWORK

The functionally classified roadway network consists of collector, minor arterial, principal arterial and interstate routes. Each functional classification is intended to serve different roles in the overall transportation system and are built to different design standards to facilitate this. Collectors are intended to move traffic from local streets to higher capacity arterial routes and are also intended to provide some access to properties. Arterial routes emphasize area-wide mobility over direct property access, with the interstate system being a special type of arterial where no access to property is permitted.

In addition to defining the role that roadway network elements are intended to serve, routes on the functional classification also determine eligibility for certain types of federal roadways. As discussed earlier, roads inside the BMMPO UZA and classified as collector or higher are eligible for funding through the NDDOT Urban Roads Program. Portions of Century Avenue and 43rd Avenue are currently functionally classified; however, neither are classified as Urban Roads by NDDOT. Roads designated as County Major Collector (CMC) roadways are also eligible for receipt of federal funds through the NDDOT County Road Program. The only Burleigh County CMC in the study area is Centennial Road (north of 43rd Avenue).

There are currently few existing functionally classified corridors in the study area; however, the Bismarck-Mandan Envision 2040 plan and the Fringe Road Master Plan provide framework for the future functionally classified network in the Northeast Bismarck Subarea. This future network can be seen in **Figure 5**.1 as proposed by the Fringe Road Master Plan.

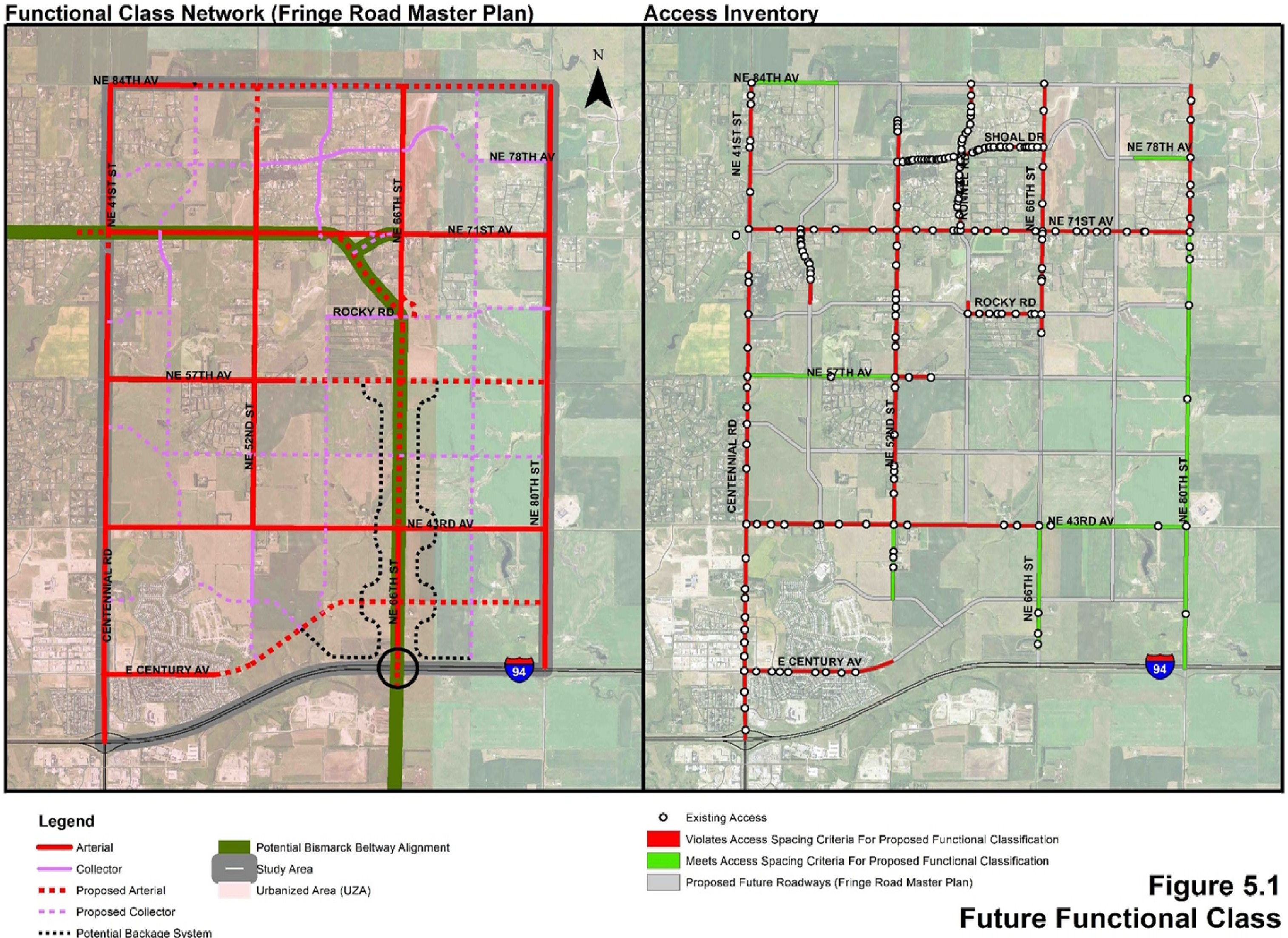


Figure 5.1
Future Functional Class
(Fringe Road Master Plan)

An arterial beltway in northeast Bismarck has been the focus of multiple past studies, and is considered in the BMMPO Envision 2040 LRTP. Through previous studies, it has been determined the most technically feasible beltway alignment would connect to I-94 at 66th Street, follow 66th Street and 71st Avenue, where it would cross US 83/State Street east of the study area and continue west. The proposed beltway alignment and the impacts it would have on the area transportation network will be a critical aspect of the access management strategy developed as part of the Northeast Bismarck Subarea Study.

EXISTING ACCESS POINTS

The number of access points on a roadway greatly influences traffic operations and safety. NCHRP 420 indicates that each additional access point on a roadway reduces travel speeds by approximately 0.25 mph and increases crash potential by approximately four percent.

To maintain mobility and safety without an undue impact on property access, it is important to make sure that appropriate access spacing is provided on roadways based on the function they are intended to serve.

The following access spacing criteria were set forth and adopted in the BMMPO Fringe Road Master Plan, and will also be used in this plan:

- Arterials (principal or minor arterials): Five access points per mile
- Collectors: Nine access points per mile

Existing accesses throughout the study area can be seen in **Figure 5.1**. **Figure 5.1** also shows whether each study roadway currently meets or violates the access spacing criteria described above. This analysis was performed assuming that existing and proposed study area roadways are functionally classified as recommended in the Fringe Road Master Plan.

PROCESS FOR MANAGING ACCESS POINTS

Burleigh County has not adopted a formal policy for access management, but procedures for granting access to both unplatted and platted areas are in place. Access management within the County's jurisdiction is managed through requests for Access Permits. Access may be granted at the discretion of the County Engineer and/or the County Board of Commissioners.

Access management within the City's jurisdiction is managed through the platting process, in accordance with Bismarck's 2005 Access Management Policy. The policy's primary purpose is to establish standards for spacing between access points, which vary depending on type of roadway and surrounding land use. Since 2005, and expected in the future, the City's access management will be enforced through the platting process.

Each jurisdiction retains the ability to make decisions on a case by case basis, approving access they feel is in the best interest of the current and future development. In the case that an access is not recommended by staff, waivers or appeals can be requested by developers and may be approved by the appropriate City or County Commission. It has not been the practice of the City or County to remove access points without plat revision or land development.

It is evident that some roadways within the study area do not meet the standards of the Fringe Road Master Plan. Many non-conforming access points were granted prior to the City's 2005 policy adoption and 2014 Fringe Road Master Plan adoption. Still it is important for the City and County to maintain appropriate access on collector and arterial roadways. Efforts should be made to continue controlling the locations of access point in the future to facilitate orderly development.

The majority of the study area includes either undeveloped or rural residential development areas. The existing access points are either private drives serving one to four residences or public streets serving existing rural residential neighborhoods. Ideally all access points would be reconfigured to fit within the ¼ or ½ mile spacing recommendations. However, it would be difficult to relocate some of these residential road accesses from their current location without substantial cost. As a guiding principal, an isolated access point serving a single home does not present substantial negative impact on the roadway. If and when this land is redeveloped, consideration should be given to reassigning access to a nearby collector or local road and removing it from the arterial roadway.

Many of the recommendations shown would provide reconfigured access to the single family homes. In regions where a single family home was located near the arterial without space for future development nearby, the access remained since the traffic impacts would be limited. However, in locations where future development may occur near an existing single family home, the access was reconfigured to a location that would better accommodate both existing and future development. Redevelopment will be the primary driver for the access changes. The access issue becomes more critical once traffic volumes increase but traffic volumes will not increase until the land is redeveloped. These recommendations represent a best case scenario for access modifications along the arterials. The viability and implementation of the recommendations will depend heavily on the redevelopment potential, adjacent infrastructure development and the landowners' sentiments.

Access modifications and recommendations were made by moving existing access points to a nearby future or existing collector when possible. Proposed access points were based off of the fringe area road plan where proposed roads would intersect the studied corridor. Proposed access points were also placed if a removed access point could be relocated to a collector or local road. As new access points are created on the arterial, they should be placed away from existing public roads in order to minimize the overall number of access points on the arterial.

ACCESS MANAGEMENT PLAN

REVIEW OF PREVIOUS CORRIDOR STUDY ACCESS PLANS

There were three recent area wide or corridor studies within the project area: Centennial Road/71st Avenue, 43rd Avenue and the Fringe Area Road Master Plan. The access management component of these corridor studies was reviewed to determine if previous recommendations are still applicable or if revisions are required.

Bismarck Mandan Fringe Road Master Plan (September 2014)

The adopted 2014 Fringe Road Master Plan establishes guidelines for the collector and arterial roadway networks within the BMMPO area, which are outside the corporate limits of the cities of Bismarck, Lincoln, and Mandan. The plan focuses on identifying the location of future collector and arterial roadways and further outlines minimum standards for access control and spacing. The plan recommends (typically) collectors on the 1/4 and 1/2 mile (section) lines and arterials on the one mile (section) lines. The plan recommends access along arterials be one per 1/4 mile and collectors at one per 1/8 mile. The recommended future roadway network and functional class designations from the Fringe Road Master Plan were shown previously in **Figure 5.1**.

Centennial Road/71st Avenue Corridor Study

The 2008 Centennial Road/71st Avenue Corridor study stated that the recommended guidelines for access spacing were a maximum of 5 access points per mile per side. It was recommended to consolidate field access and private accesses once the development of the street network occurred so that there was approximately ¼ mile spacing between access points. The study proposed a frontage/backage road system along Centennial Road to consolidate access points.

The 2014 Fringe Area Road Master Plan has been modified since the Centennial Road/71st Avenue study was drafted in 2008. The Centennial Road corridor was reviewed with the updated proposed roads. Two notable changes in recommendations were made in this Northeast Bismarck Subarea Study. The Centennial Road/71st Avenue Corridor study evaluated field accesses, whereas this study did not study field access, since the traffic volume is low and its use temporary. The other variation is that this study recommends 5 total access points per mile instead of 5 access points per side per mile as recommended by the previous corridor study. By keeping 5 total access points per mile, the number of three legged intersections is reduced and access to future development would be restricted to be across from current three legged intersections.

43rd Avenue Corridor Study

The 43rd Avenue Corridor Study assessed the existing access points along 43rd Avenue to see how it conformed to the City of Bismarck's "Access Management Policy." The study recommended to develop a frontage/backage road system to consolidate access points, however, since 66th Street is also recommended to have a frontage/backage road system, only one roadway would be able to maintain the system at the intersection of these two roadways. 43rd Avenue would likely need to yield to 66th Street since 66th Street is the proposed beltway corridor.

43rd Avenue east of 66th Street was previously evaluated as a minor arterial in a low density residential zone. For the purposes of this study, it was assumed that 43rd Avenue would be treated like a principal arterial consistent with the future land use plan. As a principal arterial in a commercial or high density residential area, 43rd Avenue would have ¼ mile spacing between access points from Centennial Road to 80th Street. The 43rd Avenue corridor was reviewed with the updated proposed roads and with 66th Street evaluated as a beltway corridor.

STUDY AREA CORRIDORS

The primary corridors in the study area were reviewed to highlight opportunities for access modification/preservation for future development. The accesses were analyzed along the following primary corridors:

- Century Avenue
- 43rd Avenue
- 71st Avenue
- Centennial Road
- 66th Street
- 80th Street

The access management within the study area was analyzed by inventorying the existing access points and adding the proposed access points from the existing studies. ¼ mile access spacing is preferred for all arterial roadways within the study area. ½ mile spacing is proposed when feasible along the 66th Street-71st Avenue beltway to preserve the functionality of the beltway corridor. See **Table 5.1** for a summary of the recommended access spacing for each corridor. **Figure 5.2** and **Figure 5.3** show the access recommendations for the study area.

Table 5.1- Recommended Access Spacing by Corridor

Corridor		Access Spacing	
		1/4 Mile	1/2 Mile
Century Ave		X	
43rd Ave		X	
71st Ave	Beltway		X
	Non-Beltway	X	
Centennial Rd		X	
66th St	Beltway		X
	Non-Beltway	X	
80th St		X	

CENTURY AVENUE (CENTENNIAL ROAD TO 66TH STREET)

Century Avenue currently ends at Sumter Drive, about ¾ miles east of Centennial Road. As Century Avenue is extended east, it would be recommended to limit access to ¼ mile spacing along the Century Avenue corridor. Between Centennial Road and Sumter Drive, there are currently 9 access points within ¾ miles. That is approximately twice as many access points than what would be recommended through this section. However, these intersections are developed local roads that would be costly and difficult to consolidate. Six of the intersections are three legged intersections that would have been reduced to 3 intersections if the intersections had been aligned across Century Avenue into four legged intersections.

43RD AVENUE (CENTENNIAL ROAD TO 80TH STREET)

The majority of the public accesses onto 43rd Avenue between Centennial Road and 80th Street are spaced ¼ mile or further apart. The private accesses along 43rd Avenue would be recommended to be consolidated to an existing or proposed collector or local road where possible.

The frontage/backage road system recommended in the 43rd Avenue corridor study was added where feasible along the 43rd Avenue corridor. The frontage/backage road system was not added in areas that are currently developed as medium to high density residential along 43rd Avenue. The 43rd Avenue frontage/backage road system would yield to the 66th Street frontage/backage road system if they intersected.

71ST AVENUE (CENTENNIAL RD TO 80TH STREET)

71st Avenue has been identified as the beltway corridor. The existing access was analyzed against a preferred ½ mile spacing along the corridor. However, there are already developed access points that are closer than ½ mile apart. It would be recommended that private drives be consolidated or relocated to a collector or another local roadway. Some of the higher developed residential drives would not be able to be moved, however future development can be consolidated to the existing/proposed collector and local road system. 71st Avenue from 66th Street to 80th Street was not analyzed as the need for access consolidation would be less for this segment of roadway.

CENTENNIAL ROAD (INTERSTATE 94 TO 71ST AVENUE)

The access recommendations on Centennial Road were revised from the previous corridor study as the BMMPO Fringe Area Road Master Plan has been modified since the Corridor Study was completed in 2008.

Centennial Road currently has many developed access points south of 43rd Avenue. These should be consolidated where possible during redevelopment. Further, it would be recommended that accesses into future developments would be built at an existing access point.

66TH STREET (INTERSTATE 94 TO 71ST AVENUE)

66th Street has been identified as the beltway corridor. The existing access was analyzed against a preferred ½ mile spacing along the corridor. Currently, 66th Street does not have many existing access points. The majority of the access points are private drives that would be modified with the redevelopment of the property.

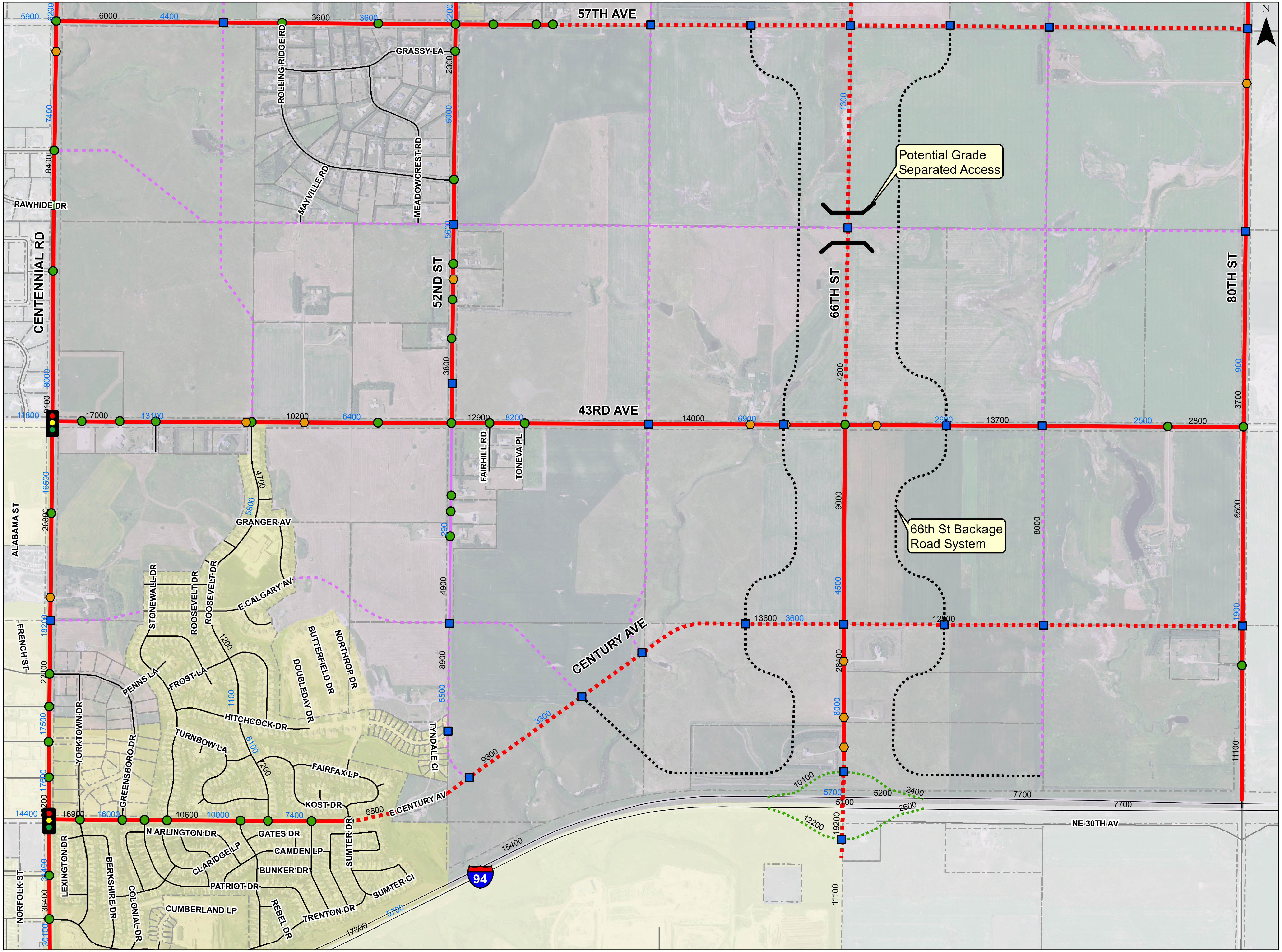
The access points between the I-94 interchange and Century Avenue would need to be removed before the construction of the interchange is completed. A frontage/backage road system would be recommended with access onto 66th Street every ½ mile so that vehicles could access developments along 66th Street without impacting the traffic flow on 66th Street. It is critical to maintain the ½ mile access spacing to preserve the functionality of the beltway. The access at 57th Street may potentially be grade separated to keep the continuous flow on 66th Street as a beltway.

The 43rd Avenue Corridor study recommended a frontage/backage road system for 43rd Avenue, however, 66th Street would have the priority for the frontage/backage road system since it has been identified as the beltway corridor.

80TH STREET (INTERSTATE 94 TO 80TH STREET)

There are few existing accesses onto 80th Street. It would be recommended that the existing accesses on to private drives be consolidated onto the proposed collector and local road system. Also, it would be recommended to manage the access onto 80th Street with future expansion to ensure that future access points are spaced ¼ mile apart.

Figure 5.2 South Study Area Access Recommendations



Roadway Legend

- Existing Arterial
- Existing Collector
- Existing Local
- Proposed Removal
- Proposed Arterial
- Proposed Collector
- Potential Backage System
- 2000 — 2025 ADT
- 5700 — 2040 ADT

Access Legend

- To Remain
- Potential Access
- Relocate or Combine Upon Redevelopment

Northeast Bismarck Subarea Study

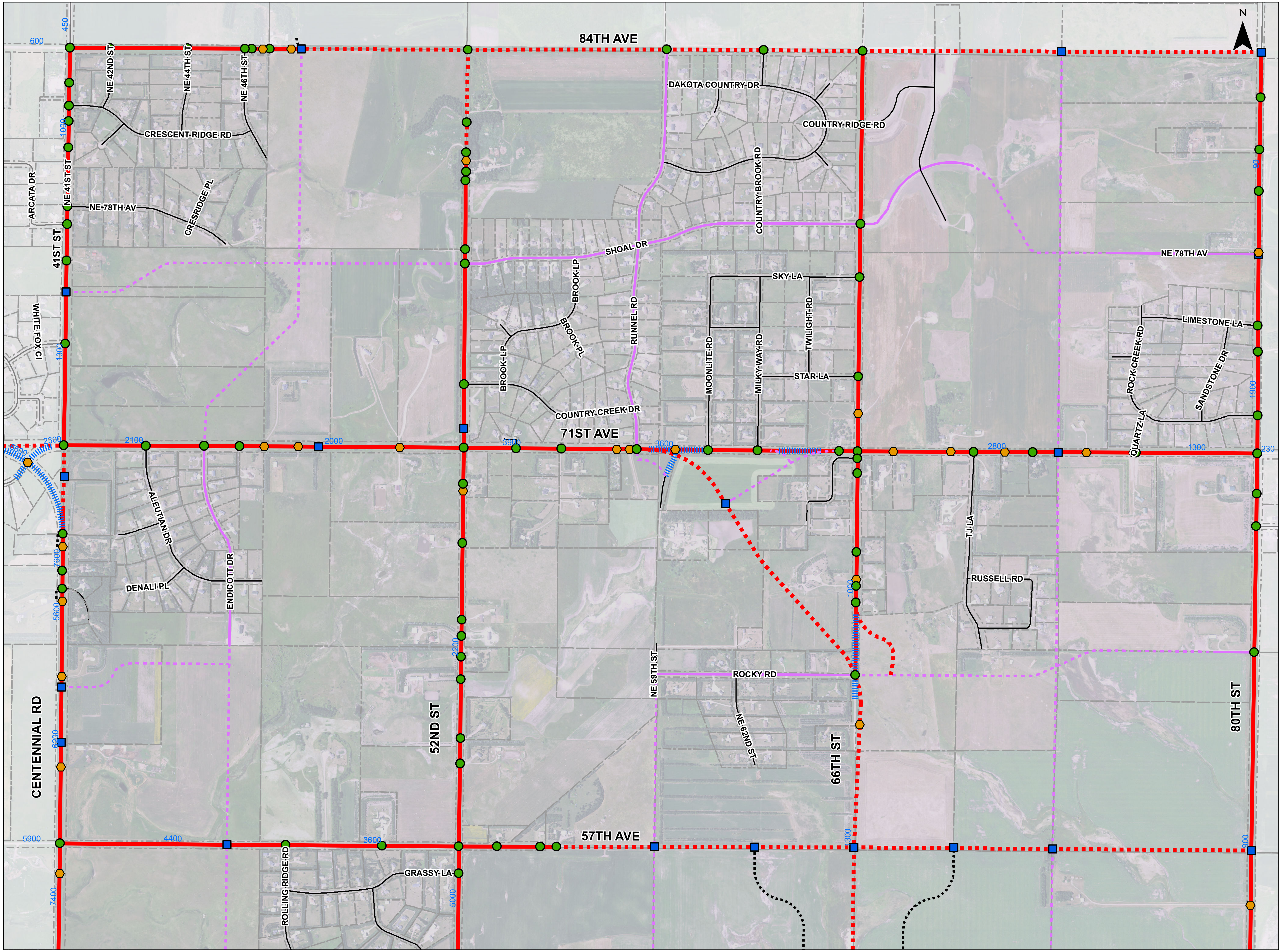
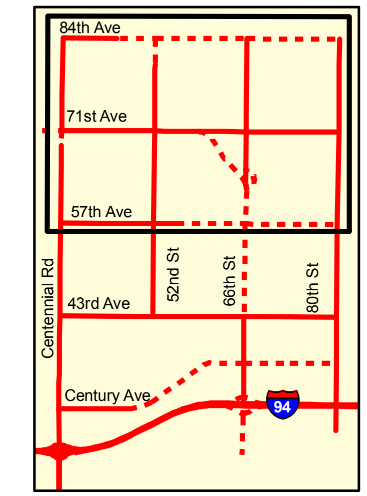


Figure 5.3 North Study Area Access Recommendations



Roadway Legend

- Existing Arterial
- Existing Collector
- Existing Local
- Proposed Removal
- Proposed Arterial
- Proposed Collector
- Potential Backage System
- 2000 2025 ADT
- 5700 2040 ADT

Access Legend

- To Remain
- Potential Access
- Relocate or Combine Upon Redevelopment

Northeast Bismarck Subarea Study

CHAPTER 6: NON-MOTORIZED USE

INTRODUCTION

A recommended Bike, Pedestrian and Recreational element for the Northeast Bismarck Subarea Study was developed in consultation with public and stakeholder comments. As part of developing the Northeast Bismarck Subarea Study the project study team reviewed recently completed corridor studies and other area wide plans relevant to the study area and the BMMPO area. A number of recently completed BMMPO corridor studies and area wide plans have made corridor specific recommendations for the development of bicycle and pedestrian facilities within the Northeast Bismarck Subarea.

As noted as part of the Existing Conditions Summary the only existing shared use facility in the study area runs east along Century Avenue between Centennial Road and Stonewall Drive. Most of the Northeast Bismarck Subarea is currently undeveloped or in the process of being urbanized. The implementation of the future bicycle and pedestrian system will be staged over a period of years, roughly in tandem with other roadway infrastructure investments.

Figure 6.1 shows the recommended future share use path and trail system within the Northeast Bismarck Subarea. The Bismarck Growth Management Plan establishes the framework for future Conservation Areas which have traditionally formed the foundation for the development of parks and trail facilities. To a large degree the proposed future bicycle and pedestrian system follows existing or future road right of way. In other instances future Conservation Areas, as outlined in the Bismarck Growth Management Plan, are used to integrate a future trail system.

The Northeast Bismarck Subarea Study integrates the recommendations from the current Bismarck Park District Comprehensive Plan regarding the need to site new neighborhood and District Park facilities in proximity with future residential developments. Based on the current park District Plan, the following principles should be used when siting future park facilities:

- Mini Park – 1/3 Mile Radius of Residential Areas;
- Neighborhood Park – ½ Mile Radius of Residential areas;
- District Park – 2 mile radius of residential areas.

In consultation with recent planning efforts done by the Bismarck Park District three additional future potential park locations are shown as part of **Figure 6.1**. These reflect recent efforts of the Bismarck Park District to coordinate with existing property owners to set aside land for future green space and recreational facilities. These potential future park areas are buffered by ½ mile to reflect their future potential service area as possible neighborhood parks.

Given that the Northeast Bismarck Subarea is currently rural and undeveloped, the Park District would classify most of the Northeast Subarea as Park Search Area for a District/Community Park.

The current 2010 Bismarck Park District Comprehensive Plan develops future park facility and trail needs based on existing conditions (acres and trails/1000 residents) and fairly dated population projections. An updated population based need estimate was developed for the Northeast Bismarck Subarea to reflect current and projected population trends for the year 2025 and 2040.

Future park types and trail facilities needs for the Northeast Bismarck Subarea are shown in **Table 6.1.**

Table 6.1 - Future Park and Trails Need Estimate for Northeast Subarea

Park Type	Need by 2025 (Acres)*	Need by 2040 (Acres)*	New Parks Needed by 2040**
Mini Parks	4.73	0.946	1
Neighborhoods Parks	20.46	4.092	2
District Park	105.27	21.054	1
Trail Type	Need by 2025***	Need by 2040***	Total Need
Multi Use Trail	8.91	1.782	10.692
Mountain Bike Trails	1.76	0.352	2.112
Total Need	**10.67**	**2.134**	**12.804**

* Acre need based on existing acres/1000 x future Study Area population (by type)

** Total park need based on acre needs/avg. existing park size (by type)

*** Mile need based on existing miles/1000 residents x future study area population

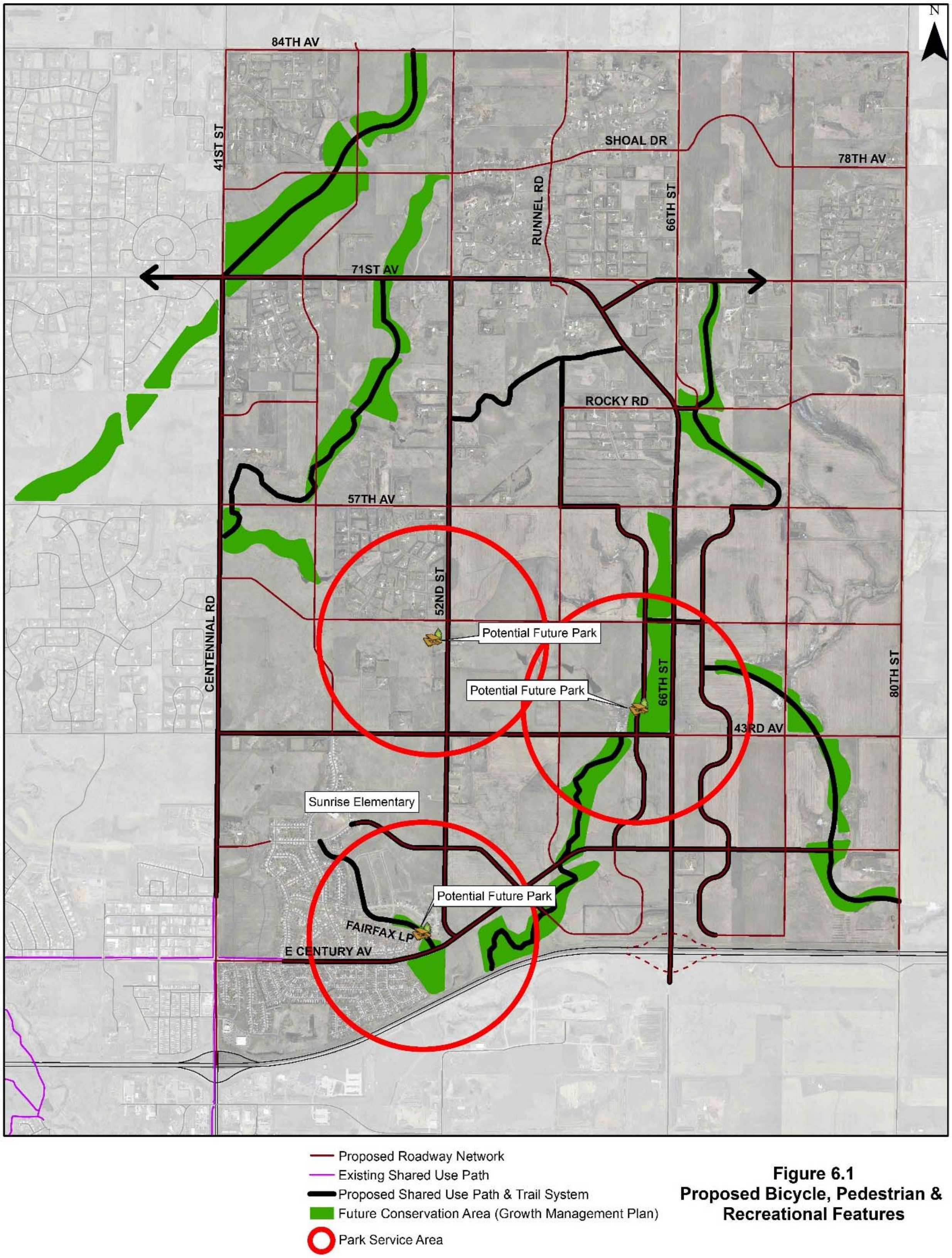


Figure 6.1
Proposed Bicycle, Pedestrian & Recreational Features

CHAPTER 7: IMPLEMENTATION PLAN & FINAL ISSUES ANALYSIS

INTRODUCTION

A 2025 and 2040 Implementation Plan for the Northeast Bismarck Subarea Study was developed based on anticipated needs for future roadway development to meet future project residential and employment growth. The development of the 2025 and 2040 Implementation Plan is premised on several recently completed efforts:

- A review the Burleigh County and City of Bismarck Capital Improvement Program (CIP);
- A review of the projected corridor and intersection level of service (LOS) analysis completed as part of the Traffic Technical Memorandum developed earlier in the study process;
- A review of project grouping and phasing of both constrained and unconstrained elements of the Envision 2040 LRTP.

This section also reflects a synthesis of issues and considerations regarding critical infrastructure implementation within the Northeast Bismarck Subarea. This section of the study also includes considerations and recommendations on how to continue to plan for development of improvements to both the 66th Street and 71st Avenue corridors as critical parts of the beltway through northeast Bismarck.

Developing Cost Estimates

Construction costs for the road improvements in the study area were estimated by one of two methods, either by major construction item costs or by average cost per mile or lane-mile. In the case of arterial streets where conceptual profiles and typical sections have been developed, quantities for construction items such as earthwork, aggregate base course, bituminous paving, seeding, striping, etc. were estimated for both rural and urban sections. Curb and gutter quantities were also calculated for urban sections. Average construction bid prices for these items were researched for 2014 NDDOT projects and then used along with the quantities to determine a base cost. Contingency percentages were then applied to the base cost to cover other items where no quantities could be determined as well as other miscellaneous items. Base plus contingency costs were used as anticipated 2015 construction costs and inflated at 4% annually to determine costs at the implementation date.

In the case of collectors and local roads where no conceptual designs were completed, recent NDDOT construction projects were researched for costs and scope of construction. Average costs per mile for 2 lane rural, 3 lane rural and urban and 4 lane urban sections were determined using this data. Average costs per lane-mile were also determined. These costs were applied to the lengths of collector and local roads in the study area based on the appropriate cross section to determine 2015 construction costs and inflated at 4% annually to determine construction costs at the implementation date.

Some projects and their associated total costs listed in the LRTP, Envision 2040, were calculated on a per mile cost and compared to the per mile costs developed by the methods described above. This was done to verify a reasonable level of consistency of costs between the two studies. The costs used for the per mile calculation based on the analysis described above are summarized below.

Table 7.1 – Planning Level Cost Estimates

Typical Section	2015 Construction Cost/Mile
2 Lane Rural	$2,000,000.00
3 Lane Rural	$2,300,000.00
3 Lane Urban	$2,600,000.00
4 Lane Urban	$3,000,000.00

IMPLEMENTATION PLAN

The Northeast Bismarck Subarea Implementation Plan (Figures 7.1, 7.2 and 7.3) demonstrates the recommendation for implementation of needed improvements to meet anticipated traffic needs within the study area. Included are tables which define a project description including project termini. Projects have been grouped into three time bands:

Table 7.2 – 2025 implementation recommendations;

Table 7.3 – 2040 implementation recommendations;

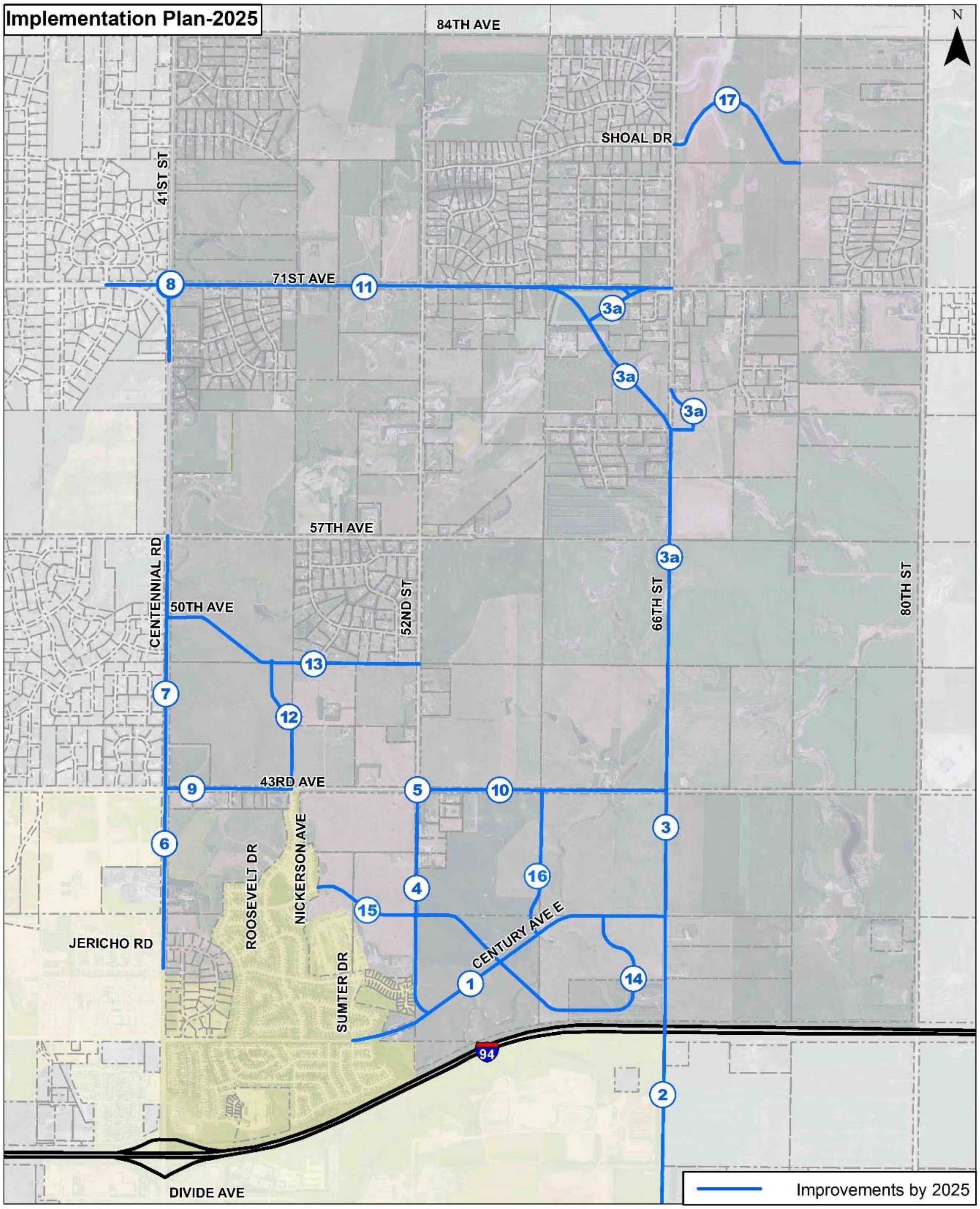
Table 7.3 – Implementation needs beyond the year 2040.

Existing projects from the Envision 2040 LRTP are broken apart into what might be considered more logical project segments. The segmentation of larger projects respond to fiscal constraint issues with the Envision 2040 LRTP and provide the flexibility required to address needs which are likely to arise based on projected development in the study area. Each table list the status of each recommended project from Envision 2040. As noted, most of the projects are not currently included in Envision 2040's fiscally constrained element.

Future Collector roadways are show as part of the Implementation Plan if they were identified in the Fringe Area Road Plan or more illustratively outlined in the Bismarck Growth Management Plan. The demonstrated phasing of future collector roadways is premised on the need to show them in support of other arterial roadways and projected development within the Northeast Subarea. The preliminary Implementation plan does call out the identified need for a system of backage/frontage roads on both sides of the 66th Street corridor between I-94 and 57th Avenue.

Table 7.2 Year 2025 Implementation Projects

Year 2025 - Shorterm Corridor Improvements						
#	**Corridor**	**Project Description**	**Termini**	**Termini**	**Cost**	**LRTP Phase**
1	**Century Avenue**	Construct New Three Lane	Sumter Drive	66th Street	$17,100,000	***2019-2023***
2	**66th Street**	Construct Two lane + Grade Separation	Divide Avenue	Centruy Avenue Extension	$8,500,000	***2019-2023***
3	**66th Street**	Construct Three lane	43rd Avenue	Century Avenue Extension	$1,400,000	***2019-2023***
3a	**66th Street**	Construct Three lane (including curve)	43rd Avenue	Top of Curve	$11,120,000	***2019-2023***
4	**52nd Street**	Construct Three Lane	Century Avenue	43rd Avenue	$2,500,000	***Not listed***
5	**43rd Avenue /52nd Street**	Reconstruct Intersection	×	×	Incl. in #10	***Illustrative***
6	**Centennial Road**	Widen to Five Lanes	Jericho Road	43rd Avenue	$3,100,000	***Not Listed***
7	**Centennial Road**	Widen to Three Lanes	43rd Avenue	57th Avenue	$1,200,000	***2024-2032***
8	**Centennial Road/71st Avenue**	Reconstruct & Realign Intersection	1/4 mile S of 71st Avenue	1/4 mile W of 41st Street	$580,000	***2024-2032***
9	**43rd Avenue**	Reconstruct & Widen to Three Lanes	Centennial Road	Roosevelt Drive	$1,400,000	***Illustrative***
10	**43rd Avenue**	Reconstruct as Three Lane	52nd Street	66th Street	$3,250,000	***Illustrative***
11	**71st Avenue**	Reconstruct as Two/Three Lane	Centennial Road	66th Street	$4,000,000	***2019-2023***
12	**Roosevelt Drive**	Construct New Two Lane	43rd Avenue	50th Avenue	$1,200,000	***Not Listed***
13	**50th Avenue**	Construct New Two lane	Centennial Road	52nd Street	$2,450,000	**Not Listed**
14	**New Frontage/Backage Road**	0.5 miles of New Frontage/Backage Road	S of Century Avenue/W of 66th Street		$1,200,000	***Not Listed***
15	**Calgary Avenue**	Construct New Two Lane	Nickerson Avenue	66th Street Frontage/Backage Road	$3,200,000	***Not Listed***
16	**New Collector**	0.7 miles of New Collector	Calgary Avenue Extension	43rd Avenue	$1,700,000	***Not Listed***
17	**Shoal Drive**	Construct New Two Lane	66th Street	1/2 mile E of 66th Street	$1,700,000	***Not Listed***



Northeast Bismarck
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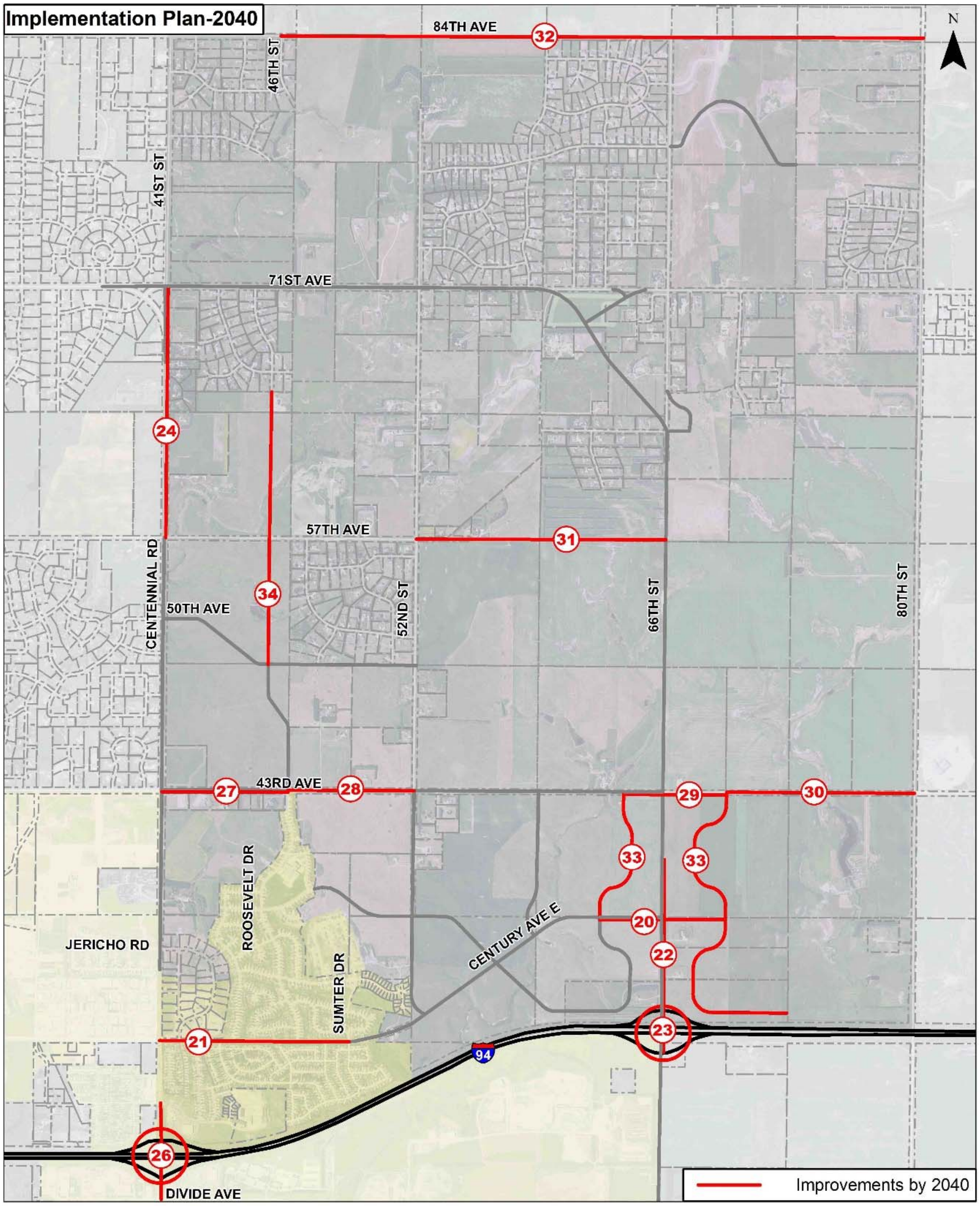
Figure 7.1
2025 Implementation Map

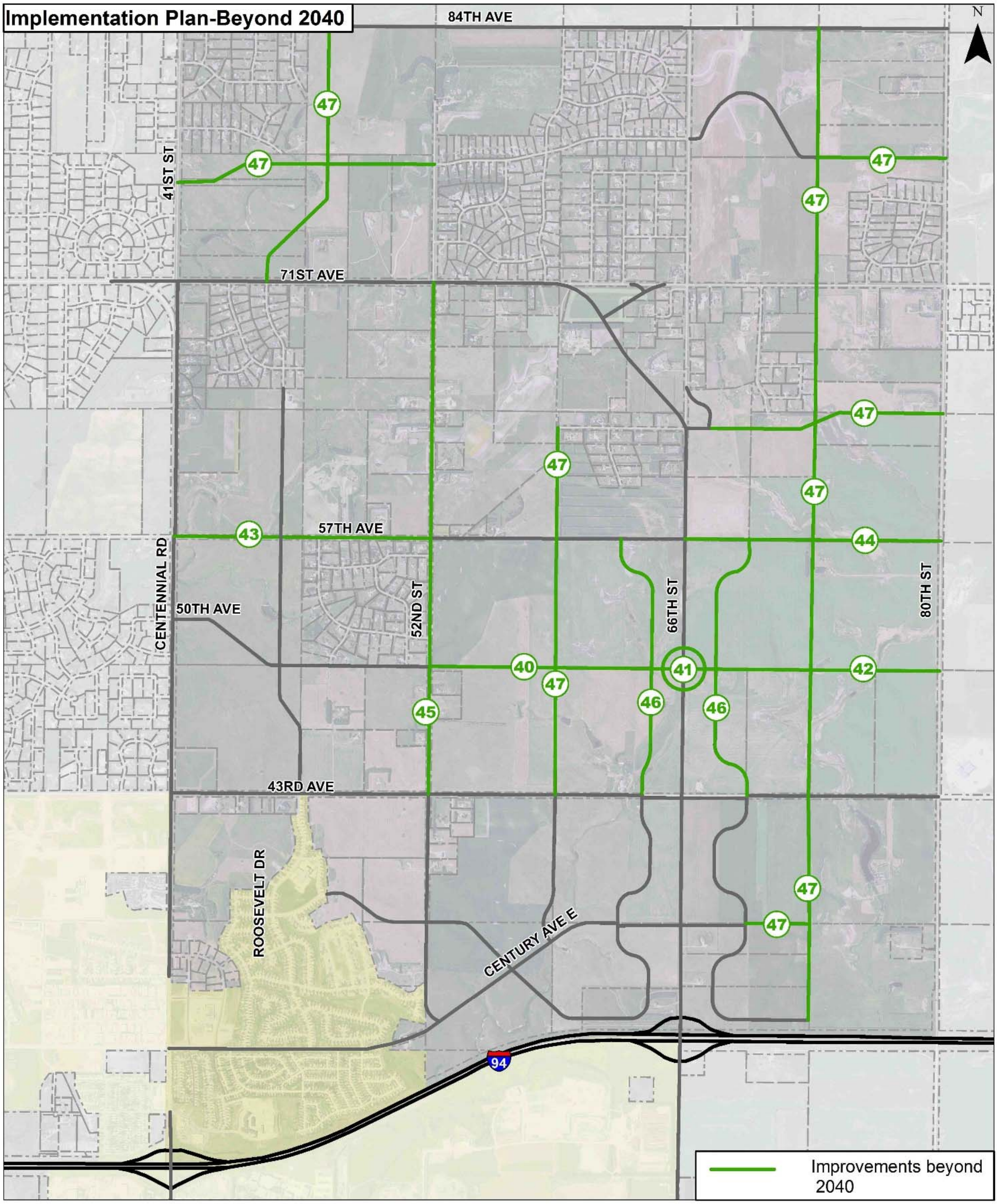
Table 7.3 Year 2040 & Beyond 2040 Implementation Projects

#	Corridor	Project Description	Termini	Termini	Cost	LRTP Phase
	Year 2040 Long Term Corridor Improvements					
20	**Century Avenue**	Widen to Five Lanes	1/4 mile W of 66th Street	1/4 mile E of 66th Street	$3,650,000.00	***Not Listed***
21	**Century Avenue**	Reconstruct as Five Lanes	Centennial Road	Sumter Drive	$5,850,000.00	***Not Listed***
22	**66th Street**	Reconstruct as Five Lane	I-94 South Ramps	1/4 mile N of Century Avenue	$5,850,000.00	***Illustrative***
23	**66th Street Interchange**	Construct Interchange	x	x	$28,250,000.00	***2024-2032***
24	**Centennial Road**	Widen to Three Lanes	57th Avenue	71st Avenue	$2,050,000.00	***2032-2040***
26	**Centennial Road/Expressway**	Reconstruct Interchange & Reconstruct to Six Lanes	Divide Avenue	500' South of Century Avenue	$36,000,000.00	***Illustrative***
27	**43rd Avenue**	Widen to Five Lane	Centennial Road	Roosevelt Drive	$2,500,000.00	***Illustrative***
28	**43rd Avenue**	Reconstruct as Three Lane	Roosevelt Drive	52nd Street	$2,650,000.00	***Illustrative***
29	**43rd Avenue**	Reconstruct as Five Lane	1/4 mile W of 66th Street	1/4 mile E of 66th Street	$3,650,000.00	***Illustrative***
30	**43rd Avenue**	Reconstruct Three Lane	1/4 mile E of 66th Street	80th Street	$3,300,000.00	***Illustrative***
31	**57th Avenue**	Construct Two Lane	52nd Street	66th Street	$4,100,000.00	***Not Listed***
32	**84th Avenue**	Construct Two Lane	46th Street	80th Street	$10,150,000.00	***Not Listed***
33	**New Frontage/Backage Road**	2.0 miles of New Frontage/Backage Roads	Between Century Avenue & 43rd Avenue, W of 66th Street Between I-94 and 43rd Avenue, E of 66th Street		$8,100,000.00	***Not Listed***
34	**Roosevelt Drive**	Construct Two Lane	50th Avenue	1/2 mile N of 57th Avenue	$4,100,000.00	***Not Listed***
	Long Term Corridor Improvements (Beyond 2040)					
40	**50th Avenue**	Construct Two Lane	52nd Street	66th Street	$6,500,000.00	***Not Listed***
41	**50th Avenue**	Grade Seperation (overpass) @ 66th Street	x	x	$11,350,000.00	***Not Listed***
42	**50th Avenue**	Construct Two Lane	66th Street	80th Street	$6,500,000.00	***Not Listed***
43	**57th Avenue**	Reconstruct Two Lane	Centennial Road	52nd Street	$6,500,000.00	***Not Listed***
44	**57th Avenue**	Construct New Two Lane	66th Street	80th Street	$6,500,000.00	***Not Listed***
45	**52nd Street**	Reconstruct Two Lane	43rd Avenue	71st Avenue	$6,500,000.00	***Not Listed***
46	**New Frontage/Backage Road**	2.2 miles of New Frontage/Backage Road	N of 43rd Avenue, E and W of 66th Street		$14,300,000.00	***Not Listed***
47	**New Collectors**	9.2 miles of New Two Lane Collectors	x	x	$59,700,000.00	***Not Listed***



Northeast Bismarck
Subarea Study

Figure 7.2
2040 Implementation Map



Northeast Bismarck
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Figure 7.3
Beyond 2040 Implementation Map

UPDATED 2025 AND 2040 TRAVEL DEMAND MODEL

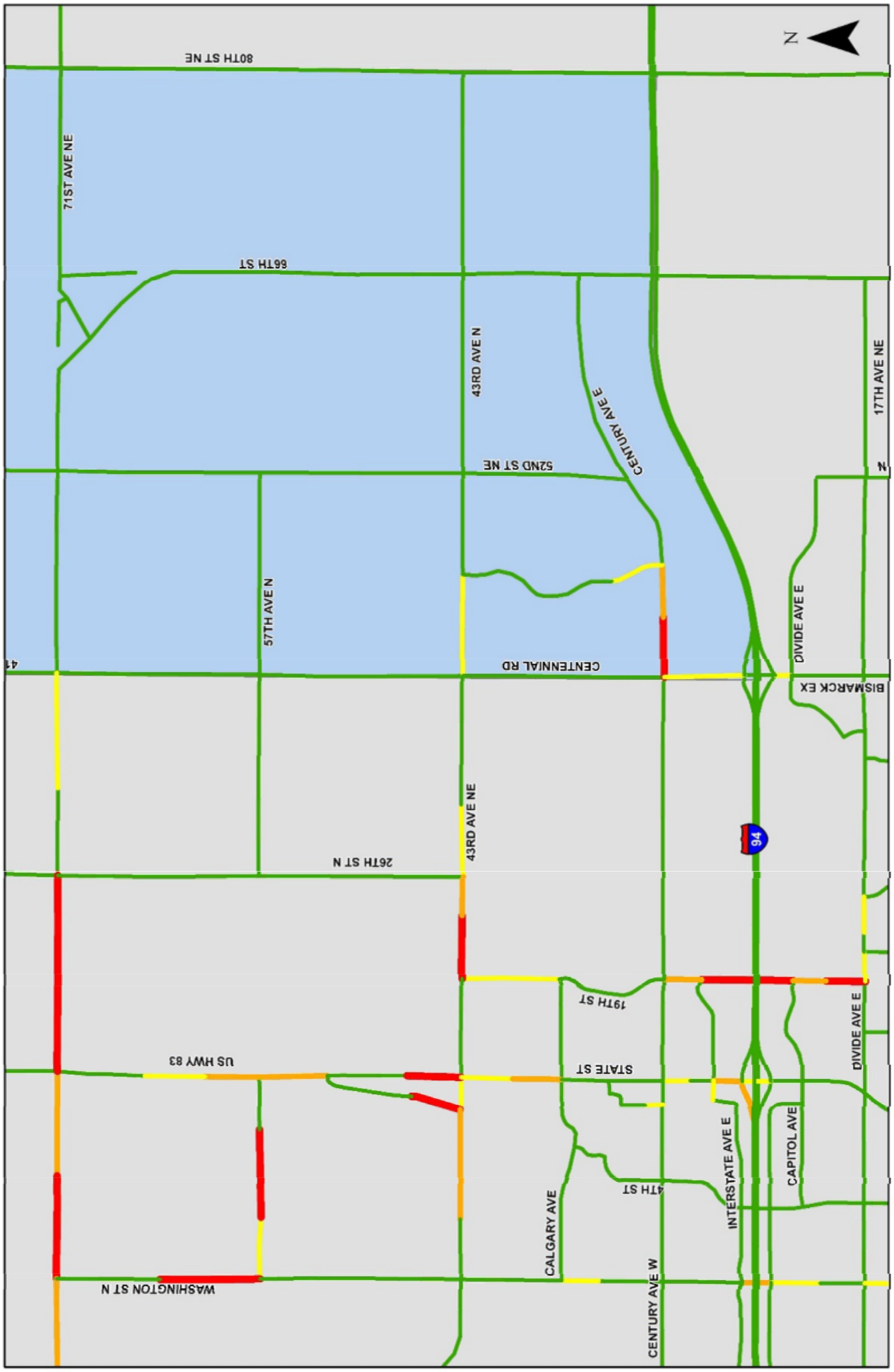
The projects included within the Northeast Bismarck Subarea Study Implementation Plan are not fiscally constrained. Rather they show a subarea transportation vision plan related to needed investments within the study area to meet projected household and employment growth in the BMMPO area. *As noted earlier, substantial investment in the local and urban system is needed well beyond those constrained and unfunded needs listed in the Envision 2040 LRTP. The implementation plan included herein is the first step to understanding this larger range of system needs for the Northeast Subarea.*

Following concurrence of the 2025 and 2040 Implementation Plan developed for the Northeast Bismarck Subarea Study, the Advance Traffic Analysis Center (ATAC) ran both an updated 2025 and 2040 travel demand model. **Figure 7.4** and **Figure 7.5** show the resulting corridor LOS. It should be noted, that none of the improvements identified beyond 2040 were modeled. Further, additional collector roadways added in either the 2025 or 2040 Implementation Plan which were not currently part of the existing Envision 2040 model were not added, however centroid connections which replicate these collector roadways were verified.

When compared to the projected 2025 and 2040 corridor level of service (LOS) output from the Envision 2040 LRTP, conditions on several existing and future significant corridors improve. As shown in the majority of corridor level LOS issues which remained following the development of the fiscally constrained Envision 2040 LRTP within the Northeast Bismarck Subarea are negated through the implementation of the identified roadways network 2025 and 2040 implementation plan.

While not fiscally constrained the Implementation Plan does apply a logical and realistic implementation of major improvements in the study area. The Envision 2040 LRTP outlined very large arterial widening and construction projects. The Northeast Bismarck Subarea Study Implementation Plan creates more segmented implementation of major improvement projects on Centennial Road, 66th Street, 71st Avenue and 43rd Avenue which in fact respond to the fiscal constraint analysis of the Envision 2040 LRTP or annual updates of the BMMPO TIP.

One major differentiating element of the Northeast Bismarck Subarea Study Implementation Plan is a methodical approach to more cost efficiently improving the 43rd Avenue Corridor between Centennial Road and 66th Street. Building upon the recommendations from the 43rd Avenue Corridor, the 2025 and 2040 Implementation Plan outlines a strategy to upgrade this very significant east-west arterial roadway to meet projected and future demand; also recognizing that funding for this corridor was not included in the Envision 2040 LRTP.



LOS A-C
LOS D
LOS E
LOS F
Study Area

Northeast Bismarck Subarea Study

Figure 7.4
2025 Level of Service With Proposed Improvements

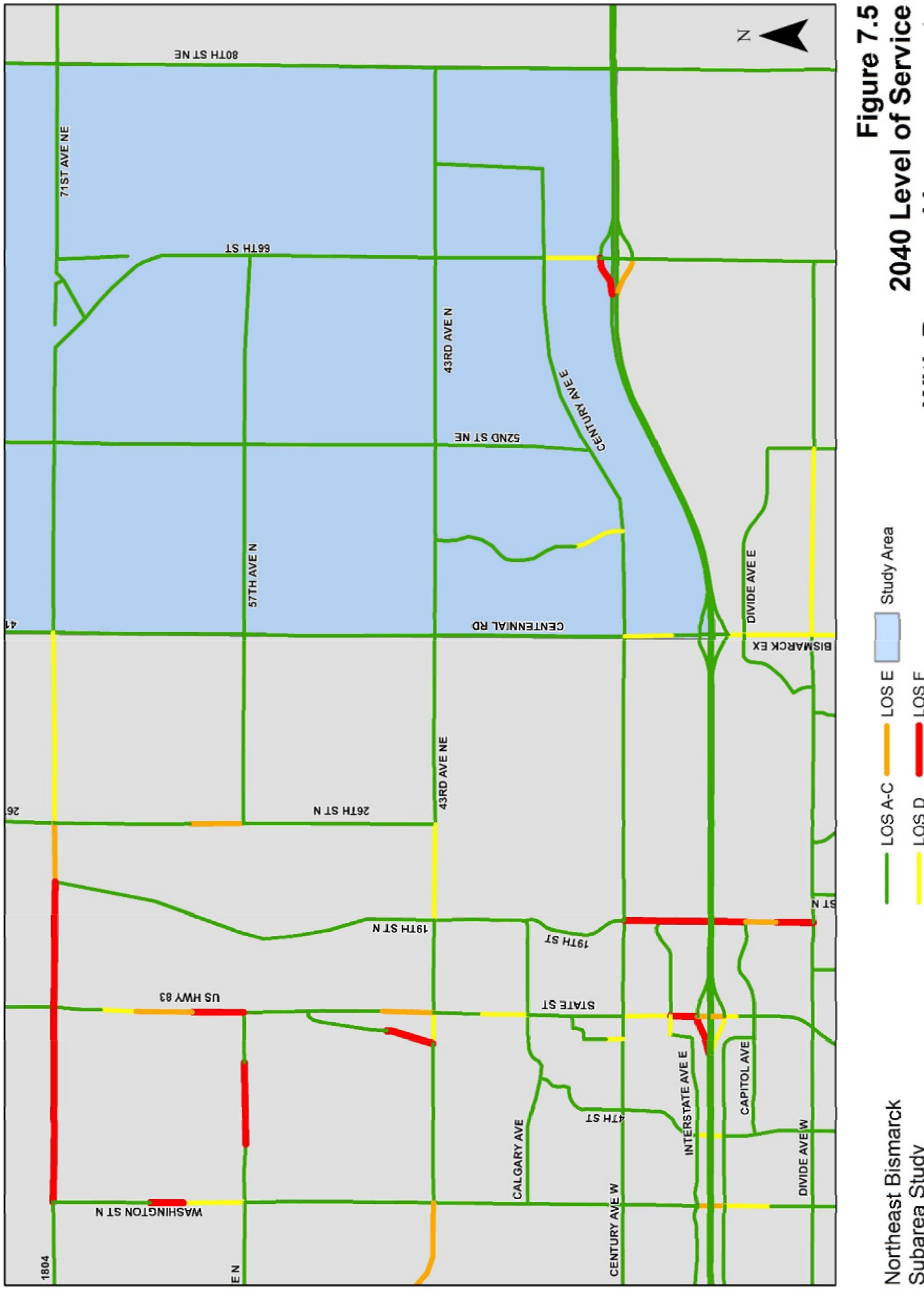


Figure 7.5
2040 Level of Service
With Proposed Improvements

INFRASTRUCTURE PHASING & FISCAL CONSTRAINT

The Bismarck Growth Area Plan establishes the phasing by which municipal infrastructure will be extended into its ETA. As currently developed the majority of the NE Subarea is outside of the Phase I Urban Serve Area Boundary (USAB). Based on the employment and population projections developed as part of Envision 2040, the current Phase 1 and Phase 2 of the USAB roughly conforms to projected growth within the Northeast Bismarck Subarea by 2025 and 2040 respectively.

The City of Bismarck has indicated that it can adjust its USAB to respond to development pressure within the NE Subarea. Traditionally if a request is made for infrastructure extensions into areas not congruent with the USAB, those investments require private/developer funding.

Critical roadway investments will need to be made in a phased approach over the next 25 years. The following four are currently included in the fiscally constrained element of Envision 2040 and are reiterated as part of the Implementation Plan for the Northeast Bismarck Subarea.

- Construct 66th Street from Divide Avenue to 71st Avenue, which includes a grade separation of I-94;
- Reconstruct 71st Avenue as a three lane roadway from 66th Street (curve) to Centennial Road;
- Construct interchange at 66th Street;
- Reconstruct and extend Century Avenue from 52nd Street to 66th Street.

The City of Bismarck is attempting to move up the timing for trying to construct the extension of Century Avenue to match more closely with the development of the 66th Street Corridor. Expedition is also needed on upgrades to the 43rd Avenue Corridor, as well.

The BMMPO also put an *emphasis added* statement behind the need to expedite the development and construction of an interchange at 66th Street and I-94 sooner than is possible under current fiscal constraint limitations of the Envision 2040 LRTP.

As infrastructure builds according to both Envision 2040 and the Bismarck Growth Area Plan, 66th Street could serve as a north-south roadway with little or no opposing intersections/access from conflicting major east-west roadways for several years. This would be a benefit to the future operational utility of 66th Street if it were to be built well in advance of other infrastructure, particularly major east-west conflicting corridors. This would give the roadway corridor an opportunity to develop as a limited access beltway, and would assist in right of way preservation and access control measures in advance of meaningful future development pressure.

However, demonstration of an existing or imminent local roadway network in the Northeast Subarea will be critical to making the case for an I-94 access revision at 66th Street and for the programming of Interstate Maintenance (IM) funds by NDDOT. The development of other local roadways in the Northeast Subarea beyond those identified in Envision 2040 will require the identification of new future funding.

Major unfunded (illustrative) improvements in the Northeast Bismarck Subarea include infrastructure which will be critical to developing a balanced transportation system within the subarea. Roadway improvements within or adjacent to the Northeast Subarea study which are not funded (illustrative) within Envision 2040 but are considered critical components of the overall implementation Plan of the Northeast Bismarck Subarea Study are as follows:

- Reconstructing and widening 43rd Avenue between Centennial Road and 66th Street:
    - Issue: This presents the lack of a significant east-west arterial roadway between Century Avenue and 71st Avenue.
    - Issue: The current Envision 2040 projections for 43rd show ADT's of 14,000 ADT in the area between 52nd and 66th, and which is a current gravel roadway.
- Widening of 66th Street to four lanes between Century Avenue and 43rd Avenue:
    - Issue: This results in LOS "F" between I-94 and Century Avenue;
    - Issue: A critical segment of the beltway is projected to operate poorly soon after it is constructed.
- Improvements to Centennial Road/Expressway, including a reconstruction as a 6 lane roadway and reconstruction of the I-94 Interchange:
    - Issue: This results in an LOS "F" north and south of I-94.

As part of the detailed traffic operations report developed as part of the Northeast Bismarck Subarea Study additional needs were identified above and beyond those identified by Envision 2040. As new identified needs beyond those identified in Envision 2040, these are also considered unconstrained or illustrative projects.

- Widen Century Avenue to four lanes ¼ mile west of 66th Street:
    - Issue: Three lane facility along Century Avenue constrained in Envision 2040 operates at a LOS F in the 2040 condition.
- Widen Centennial Road to four lanes between Jericho Road and 43rd Avenue:
    - Issue: Three lane facility north of Jericho Road operates at a LOS E in 2040 condition as constrained by Envision 2040.

In summary, implementation of the minimum required roadway infrastructure needs in Northeast Bismarck will total over $300,000,000 at full build out. Table 8.4 shows that about 20% of that need is required by the year 2025, with another 40%, or $120,000,000 required between 2025 and 2040. The balance of the subarea needs, or roughly $118,000,000 will not be needed until after the year 2040.

Table 7.4 - Summary of Implementation Costs

Implementation Phase	Cost
2025	$65,600,000
2040	$120,200,000
Beyond 2040	$117,850,000
Sum	$303,650,000

More detailed needs were identified as part of developing the 2025 and 2040 Implementation Plan for the Bismarck Northeast Subarea Study than outlined by the Envision 2040 LRTP. However, no additional revenue streams were analyzed beyond those considered in Envision 2040 to assist in supporting the needs identified with this study. As shown in Table 8.5, a total of $84,250,000 local, state and federal funds were committed to projects in the Northeast Subarea by the Envision 2040 LRTP.

Table 7.5 - Envision 2040 Constrained Revenue

Envision 2040 Constrained Revenue (Northeast Subarea only)	
Short Range (2019-2023)	$20,570,000
Mid & Long Range (2024-2040)	$63,680,000
Total	**$84,250,000**

Anticipated available revenue within the Northeast subarea of Bismarck by the year 2040 represents less than 50% of the total need for future transportation infrastructure. Further, estimated available revenue for transportation in the Northeast subarea over the next 10 years will only be about a 1/3 of estimated need. Between 2025 and 2040, the shortfall in available local, state and federal revenues is estimated at $56,000,000.

Table 7.6 - Transportation Revenue Shortfall Northeast Bismarck Subarea

Revenue Short Fall (Northeast Subarea)	
2025	-$45,030,000
2040	-$56,520,000
Total	**-$101,550,000**

Beyond the Northeast Bismarck Subarea Study, more analysis and eventual action will be needed to ensure transportation infrastructure is provided to the subarea. A detailed funding alternatives analysis was completed as part of the most current 2014 Bismarck Growth Management Plan. However, no clear consensus or recommendations were achieved on how best to address future infrastructure funding needs within Bismarck's growth area. The

Growth Management Plan looked at a number of funding alternatives, and retained the following:

- Formalized Impact Fees/Developer Exactions
- Special Service Districts;
- Local Fuels Tax;
- Sales Tax;
- Property Taxes.

66TH STREET & 71ST AVENUE CORRIDOR – THE BELTWAY

The development of the Northeast Bismarck Subarea Study has again highlighted the desire for the development of major arterial roadway improvements on the periphery of the BMMPO area. As supported by the current Envision 2040 LRTP and as studied in several past planning documents, the Northeast Bismarck Subarea Study again supports the development of the 66th Street and 71st Avenue corridors as future arterial corridors. Several past planning efforts have consistently pointed towards these two corridors as a major link in the future Beltway through the BMMPO area.

A major outcome of the Northeast Subarea Study was the overwhelming concern from residents who were perceived as being directly impacted by improvements to 66th Street and 71st Avenue. Those concerns dealt specifically with questions on how these two corridors together coupled with an interchange at 66th Street would serve to create a de-facto "bypass" of US 83. Those concerns are noted.

66th Street and 71st Avenue are section line corridors and provide a logical connection between I-94 and US 83 (State Street). Continued investment and improvement of these corridors provides the opportunity to relieve traffic demand on other north-south corridors, specifically State Street and Centennial Road. However, this investment doesn't mean these corridors will become a formal bypass of any existing corridors, specifically State Street (US 83).

The Beltway as designated at the planning level is not intended to serve as a future informal or designated bypass of traffic using existing corridors such as Centennial Road or US 83 (State Street). The determination of any future bypass of the BMMPO area would require substantial additional analysis and public input and would likely consider multiple locations both within and outside of the BMMPO area.

Improvements to the 66th Street and 71st Avenue corridors will be weighed against the existing and future nature of the general study area. As future planning for improvements along 66th Street, 71st Avenue and the proposed interchange at 66th Street move forward these concerns will be evaluated at the corridor level.

Next Steps for Coordination of 66th Street & 71st Avenue Beltway Implementation

As part of the Northeast Bismarck Subarea Study, more discussion between the City of Bismarck, Burleigh County and NDDOT took place on the function and design for the 66th Street and 71st Avenue corridors. The City of Bismarck, Burleigh County and NDDOT should build upon existing expectations and perceptions regarding improvements needs to 66th Street and 71st Avenue so as to move towards a coordinated planning and programming framework for their implementation over the next 10 to 12 years. **Table 7.7** provides a summary of existing expectations regarding the Beltway comparing recommendations from the North-South Beltway Study and the synthesis vision as refined as part of the development of the Northeast Bismarck Subarea Study.

Table 7.7 - Beltway Expectations & Perceptions

	Expectation	Function	Access	Ownership & Maintenance	Funding
North-South Beltway Study	Reliever (alternate) route for Centennial Rd. & State Street; commuter traffic and trucks.	55-65 MPH. Provide linkages between community/regional attractions. Address regional barriers (i.e. I-94) which interfere with roadway connectivity.	1/4 mile minimum	Not discussed in Study	Not discussed in Study
Northeast Subarea Study	Reliever (alternate) route for Centennial Rd. & State Street; move interregional commuter traffic and trucks. Beltway around urbanized area. Modify land use plans to mitigate future transportation corridor (noise) impacts.	Limited access rural/urbanizing arterial. Construct as three lane rural. Preserve for five lane urban section. 40-50 MPH southern corridor south of 43rd; 55 MPH northern corridor north of 43rd.	Half mile spacing I-94 to 71st Ave; between 1/4 to 1/2 mile spacing along 71st Ave. Access consolidation will be needed north of 57th Ave and between 66th Street and Centennial Road (Additional consolidation will be need along 71st Avenue between Centennial Road and State Street (outside of current study area).	Significant annexation needed to bring corridor into Bismarck City limits. Construction of 66th St. - 43rd Ave to Rocky Road in Draft Bismarck CIP; Construction of 66th St over I-94 to 71st Ave and Reconstruction of 71st Ave from Centennial Road to 66th St in Burleigh County CIP (Long Range 7 to 30 years).	

As future planning for the 66^{th} Street and 71^{st} Avenue Beltway Corridor continues beyond the Northeast Bismarck Subarea Study there are several major considerations that should be accounted for to ensure the timely and efficient development of these corridors.

- *Benefits to Interregional Mobility* - There is growing concerns about the viability of State Street to continue to carry the volume of traffic projected over the life of the current 2040 planning horizon. The gradual development of both 66^{th} Street and 71^{st} Avenue as three lane arterial roadways (and beyond 2040 as five lane arterial roadways) provides an opportunity to develop a reliever route to State Street. The Envision 2040 LRTP shows that even with widening State Street (US 83) to six lanes from Calgary Avenue to 57^{th} Avenue, an interchange at 66^{th} Street and a two lane beltway around Northeast Bismarck on the 66^{th}/71^{st} Corridor, several segments of State Street will continue to operate at a LOS "D" or worse from I-94 to 71^{st} Avenue. As well, by 2040 most of Centennial Road south of 43^{rd} Avenue will also operate at an LOS E.

- *Jurisdictional Coordination* - While most of the future 66^{th} Street/71^{st} Avenue Corridor is currently in the Bismarck Extraterritorial Area (ETA), Burleigh County would still be responsible for ownership and likely maintenance of the facility until such time as it becomes a City of Bismarck roadway. Consideration of this issue is acknowledged by the City and County, and will be factored in as development of the corridors unfold.

Discussion regarding potential interest in adding the 66th Street and 71st Avenue Corridor to the NDDOT Regional System were initiated at the technical level as part of the Northeast Bismarck Subarea Study. Future discussion with NDDOT is recommended regarding if and under what conditions 66th Street and 71st Avenue could be added as part of the NDDOT Regional System.

- *Public Outreach* – Several concerns were received from residents adjacent to the 71st Avenue corridor regarding the future Beltway along 71st Avenue. Going forward, deliberate and predictable communication is needed between the BMMPO and the residents along 66th Street and 71st Avenue. Efforts should be made to foster a continuous communication mechanism regarding the status of improvements along both 71st Avenue and 66th Street. Adjacent residents should be actively involved in future planning and project development efforts for improvements along both corridors.

- *Land Use Compatibility* – A major consideration for any new or expanded roadway is land use capability. If the 66th Street and 71st Avenue corridors mature into an interregional Beltway, consideration is needed regarding potential impacts to existing and future land uses along the corridor. This is particularly important for the northern portions of the corridor which are developed low density residential; and the areas between 43rd and 71st which are planned as future residential. While current traffic projections north of 43rd Avenue range between 5,000 and 10,000 ADT, advance consideration and residential noise buffering should be considered. Adjacent residential uses are those most subject to concerns regarding noise created by future transportation corridors. ***Future land use planning efforts, including an update to growth management plans for the City and County should closely review land uses along the 66th Street and 71st Avenue corridors to ensure they are the best fit with future transportation needs of the BMMPO area.***

- *Truck Traffic* – As discussed earlier, there is the potential for the completed 66th Street and 71st Avenue corridors to attract measurable future volumes of truck traffic. Based on analysis completed as part of the Northeast Bismarck Subarea Study under current conditions, it would be expected that over 300 trucks would use the 71st Avenue and 66th Street corridors as a direct connection between US 83 and I-94. This estimate is based on current traffic volumes and reflect recent rapid growth in truck movements in the BMMPO area. However it is important to note that both 66th Street and 71st Avenue would have been fully constructed to three lane roadways prior to seeing this volume of truck traffic.

- *Access Management* – As discussed earlier as part of developing a corridor vision for 66th/71st and the beltway concept in general, access management is going to be a large consideration. For the 66th/71st Corridor to succeed as a beltway around the Bismarck area, it will need to demonstrate the potential to operate at a higher level of service than the current US 83 and State Street.

TYPICAL SECTIONS WITH THE NORTHEAST BISMARCK SUBAREA

Typical sections were developed for future arterial roadways within the Northeast Bismarck Subarea. Four standard typical sections were developed based on 150 feet of right of way. Existing and future right of way in the Bismarck Northeast Subarea would vary between 100 and 170 feet depending on the corridor. However, because the Northeast Bismarck Subarea Study didn't get into significant corridor level details, typical sections were developed assuming 150 feet of right of way.

Typical sections shown as part of the Northeast Subarea Study are illustrative in nature. They are developed to discuss considerations regarding future roadway grading, integration of bicycle and pedestrian facilities and potential future property impacts. Given the transitional nature of the Northeast Subarea future grading should be done to respect the fact that some roadways may transition from rural 3 lane to urban 5 lane, or from a rural 3 lane to urban or rural 5 lane sections.

The primary reason for showing a roadway typical section was first to demonstrate future proposed grading recommendations for both an urban and rural 3-lane and urban and rural 5-lane section. Grading along existing and future arterial corridors should be done initially to account for the eventual full build typical sections anticipated for the corridor. Again, these recommendations are generalized at the planning level, however reflect the understanding that longer term efficiencies are achieved if roadway sections are graded out initially to accommodate their eventual full build section.

Secondarily, the intent with the typical sections developed for the Northeast Bismarck Subarea was to demonstrate that typical section development and future grading should be done so as to accommodate future needed bicycle and pedestrian facilities early in the development of each of the arterial and collector roadway corridors. The standard base typical sections developed as part of the Northeast Subarea study involve the four following sections. In each case a discussion as to the methodology used as well as the corridors which appear as a best fit for each typical section.

In the case of corridors such as sections of Century Avenue, they are listed under more than one typical section. This is done to reflect the understanding that it is not yet clear if the proposed 3 lane extension of Century Avenue from Sumter Road to 66th Street would be developed as either an urban or rural section. This would be the same case for Centennial Road north of 43rd Avenue. Based on the findings from the 43rd Avenue Corridor Study, it was assumed this corridor would be reconstructed incrementally between Centennial Road and 66th Street and be built as an urban section.

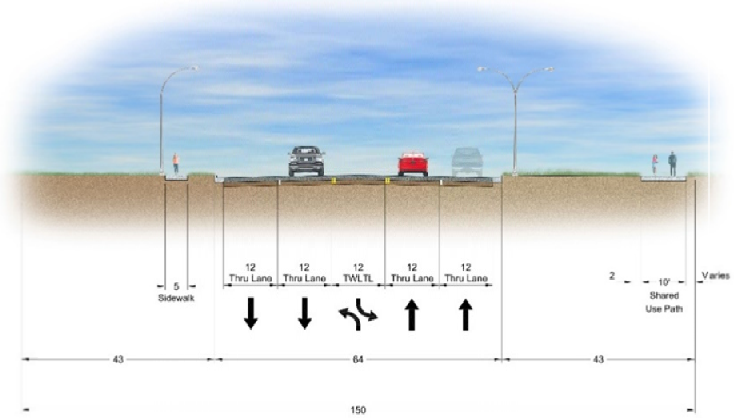
Figure 7.6 shows the recommended typical sections for the four sections discussed as part of the Northeast Bismarck Subarea Study. What follows is a summary of potential typical sections for each arterial roadway within the Northeast Bismarck Subarea.

- **<u>Rural 3-Lane:</u>** Several roadways within the study area will be developed as 3 lane rural roadways. In some cases these corridors may at a future point transition to either an urban or rural 5 lane. The typical sections developed as part of the Northeast Bismarck Subarea Study reflect the desire to account for future grading needs early in the development of the corridor so as to reduce future cost of grading needs if the corridor expands. Corridors with the potential to develop initially or permanently as a three lane rural sections would be as follows:
    - Century Avenue – Sumter Drive to 66th Street (2025);
    - 66th Street – I-94 to 71st Avenue (2025);
    - 71st Avenue – Centennial Road to 66th Street (2025/2040);
    - Centennial Road - 43rd Avenue to 71st Avenue (2025/2040).

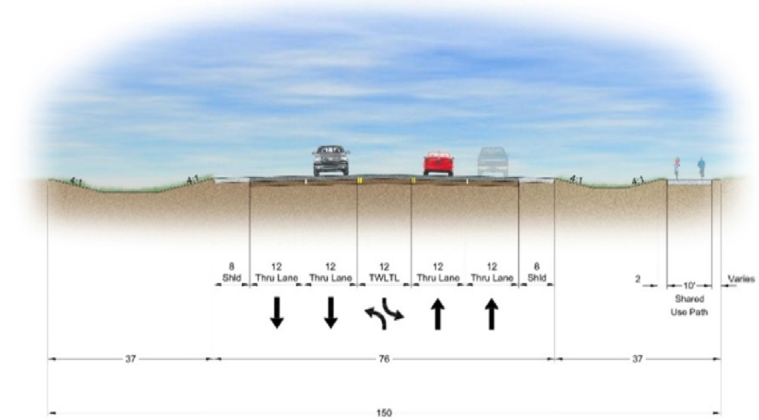
- **<u>Urban 3 – Lane</u>:** Several roadways within the study area will be developed as 3 lane urban sections. While some of these corridors may in fact remain as 3 lane urban sections in perpetuity, others will in fact transition to a 5 lane urban section. Corridors with the potential to develop initially or permanently as a three lane urban sections would be as follows:
    - Century Avenue – Sumter Drive to 66th Street (2025);
    - 43rd Avenue – 52nd Street to 66th Street (2025);
    - 43rd Avenue – Centennial Road to Roosevelt Road (2040);
    - 43rd Avenue – Roosevelt Road to 52nd Street (2040).

- <u>Rural 5 – Lane</u>: All future 5 lane rural sections in the study area will transition from a 3 lane rural section. The 5 lane rural section was developed to be additive from the 3 lane rural section. The existing shared use path would have been developed as part of the 3 lane rural section and would already have been accounted for as the section transitions to a 5 lane facility. Corridors with the potential to develop five lane urban sections would be as follows:
    - Centennial Road – Jericho Road to 43rd Avenue (2025);
    - Century Avenue – ¼ mile east/west of 66th Street (2040);
    - 66th Street – I-94 south ramps to ¼ mile north of Century Avenue (2040).

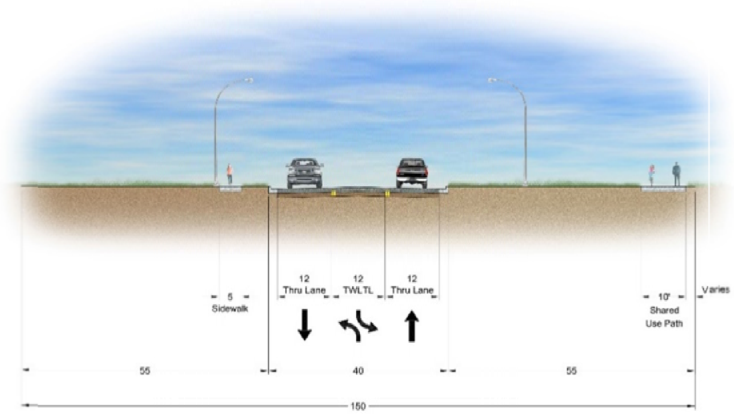
- <u>Urban 5 – Lane</u>: Several sections of roadway within the Northeast Subarea will transition from either 3 lane rural or 3 lane urban section to a 5 lane urban section. Both the 3 lane rural and the 3 lane urban sections were developed to be additive to transition to a 5 lane urban section. The existing shared use path would have been developed as part of the 3 lane section and would already have been accounted for as the section transitions to a 5 lane facility. Corridors with the potential to develop to five lane urban sections would be as follows:
    - Century Avenue – ¼ mile east/west of 66th Street (2040);
    - 43rd Avenue – Centennial Road to Roosevelt Drive (2040);
    - 43rd Avenue – ¼ mile east/west of 66th Street (2040);



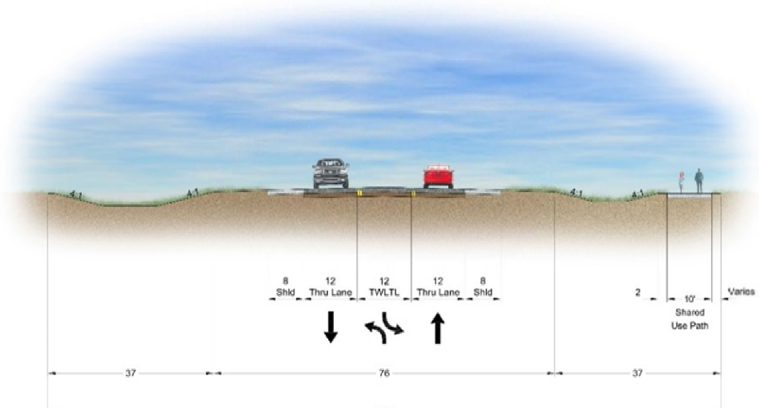
Urban 5-Lane



Rural 5-Lane



Urban 3-Lane



Rural 3-Lane

Figure 7.6
Study Area Typical Sections

Appendix A

2025 and 2040 Intersection Capacity Analysis Worksheets

Appendix A.1

2025 Base Scenario Intersection Capacity Analysis Worksheets

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	150	100	470	535	100	165	470	565	535	165	565	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		250	380		100	225		390	290		100
Storage Lanes	2		1	2		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.419		
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	1583	780	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			123			142			302			177
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		2085			460			3351			1054	
Travel Time (s)		40.6			9.0			57.1			18.0	
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
Adj. Flow (vph)	163	109	511	582	109	179	511	614	582	179	614	163
Shared Lane Traffic (%)												
Lane Group Flow (vph)	163	109	511	582	109	179	511	614	582	179	614	163
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2	6		6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	13.0	9.0	26.0	22.0	18.0	14.0	26.0	35.0	22.0	14.0	23.0	13.0
Total Split (%)	16.3%	11.3%	32.5%	27.5%	22.5%	17.5%	32.5%	43.8%	27.5%	17.5%	28.8%	16.3%
Maximum Green (s)	9.0	5.0	22.0	18.0	14.0	10.0	22.0	31.0	18.0	10.0	19.0	9.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	10.0	5.3	27.2	17.3	12.6	23.4	19.9	34.6	55.9	32.3	23.5	37.5
Actuated g/C Ratio	0.12	0.07	0.34	0.22	0.16	0.29	0.25	0.43	0.70	0.40	0.29	0.47
v/c Ratio	0.38	0.47	0.83	0.78	0.20	0.32	0.60	0.40	0.49	0.42	0.59	0.19
Control Delay	35.8	43.2	29.9	38.0	29.3	7.1	29.4	17.7	4.3	13.6	28.6	2.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	35.8	43.2	29.9	38.0	29.3	7.1	29.4	17.7	4.3	13.6	28.6	2.9
LOS	D	D	C	D	C	A	C	B	A	B	C	A
Approach Delay		32.9			30.6			16.6			21.4	
Approach LOS		C			C			B			C	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 23.5	Intersection LOS: C
Intersection Capacity Utilization 70.0%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 1: Centennial Rd & E Century Av

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	150	100	470	535	100	165	470	565	535	165	565	150
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	163	109	511	582	109	179	511	614	582	179	614	163
Adj No. of Lanes	2	2	1	2	2	1	2	2	1	1	2	1
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	244	221	389	679	668	437	631	1603	1029	402	1263	678
Arrive On Green	0.07	0.06	0.06	0.20	0.19	0.19	0.18	0.45	0.45	0.09	0.36	0.36
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	163	109	511	582	109	179	511	614	582	179	614	163
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1770	1583	1774	1770	1583
Q Serve(g_s), s	3.7	2.4	5.0	13.1	2.1	7.4	11.4	9.2	16.3	5.0	10.8	5.3
Cycle Q Clear(g_c), s	3.7	2.4	5.0	13.1	2.1	7.4	11.4	9.2	16.3	5.0	10.8	5.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	244	221	389	679	668	437	631	1603	1029	402	1263	678
V/C Ratio(X)	0.67	0.49	1.31	0.86	0.16	0.41	0.81	0.38	0.57	0.44	0.49	0.24
Avail Cap(c_a), veh/h	387	221	389	774	668	437	946	1603	1029	469	1263	678
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	36.2	36.3	30.2	31.0	27.2	23.6	31.3	14.5	7.7	13.8	20.0	14.6
Incr Delay (d2), s/veh	3.1	1.7	158.2	8.6	0.1	0.6	3.3	0.7	2.2	0.8	1.3	0.8
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(-26165%),veh/ln	1.9	1.2	25.7	7.0	1.0	3.3	5.7	4.6	7.6	2.5	5.5	2.5
LnGrp Delay(d),s/veh	39.4	38.0	188.3	39.6	27.3	24.3	34.6	15.2	10.0	14.5	21.4	15.4
LnGrp LOS	D	D	F	D	C	C	C	B	A	B	C	B
Approach Vol, veh/h		783			870			1707			956	
Approach Delay, s/veh		136.4			34.9			19.2			19.1	
Approach LOS		F			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	11.0	40.2	19.8	9.0	18.7	32.6	9.7	19.1
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	10.0	31.0	18.0	5.0	22.0	19.0	9.0	14.0
Max Q Clear Time (g_c+I1), s	7.0	18.3	15.1	7.0	13.4	12.8	5.7	9.4
Green Ext Time (p_c), s	0.1	8.3	0.7	0.0	1.3	4.7	0.1	1.8

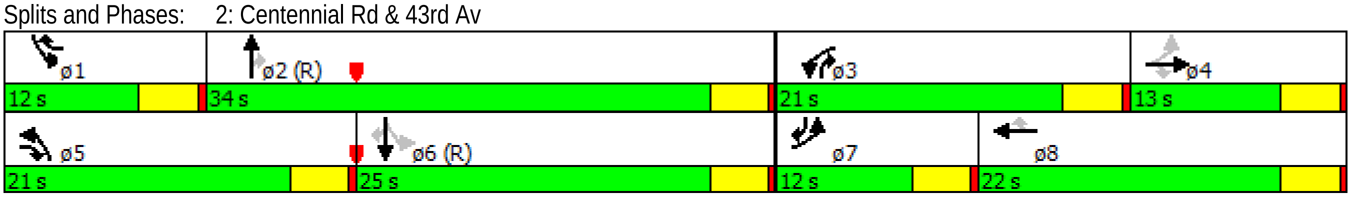
Intersection Summary	
HCM 2010 Ctrl Delay	43.6
HCM 2010 LOS	D

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	185	315	335	185	135	315	175	335	135	175	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	200		200	300		300	250		250
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.626			0.950			0.950			0.638		
Satd. Flow (perm)	1166	3539	1583	3433	3539	1583	3433	1863	1583	1188	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			308			147			313			177
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1886			2624			4233			3577	
Travel Time (s)		28.6			39.8			52.5			44.3	
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
Adj. Flow (vph)	98	201	342	364	201	147	342	190	364	147	190	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	201	342	364	201	147	342	190	364	147	190	98
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4			8			2	6		6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	12.0	13.0	21.0	21.0	22.0	12.0	21.0	34.0	21.0	12.0	25.0	12.0
Total Split (%)	15.0%	16.3%	26.3%	26.3%	27.5%	15.0%	26.3%	42.5%	26.3%	15.0%	31.3%	15.0%
Maximum Green (s)	8.0	9.0	17.0	17.0	18.0	8.0	17.0	30.0	17.0	8.0	21.0	8.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	16.4	8.9	26.3	13.8	17.2	28.9	13.4	33.6	51.4	35.6	27.9	39.4
Actuated g/C Ratio	0.20	0.11	0.33	0.17	0.22	0.36	0.17	0.42	0.64	0.44	0.35	0.49
v/c Ratio	0.33	0.51	0.47	0.62	0.26	0.22	0.59	0.24	0.32	0.25	0.29	0.11
Control Delay	21.8	38.2	5.6	35.0	27.4	4.1	34.8	17.3	2.1	11.2	22.7	0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.8	38.2	5.6	35.0	27.4	4.1	34.8	17.3	2.1	11.2	22.7	0.4
LOS	C	D	A	D	C	A	C	B	A	B	C	A
Approach Delay		18.3			26.5			17.8			13.8	
Approach LOS		B			C			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 19.6	Intersection LOS: B
Intersection Capacity Utilization 48.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 2: Centennial Rd & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	90	185	315	335	185	135	315	175	335	135	175	90
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	98	201	342	364	201	147	342	190	364	147	190	98
Adj No. of Lanes	1	2	1	2	2	1	2	1	1	1	1	1
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	321	398	383	469	649	400	446	898	979	572	786	771
Arrive On Green	0.07	0.11	0.11	0.14	0.18	0.18	0.13	0.48	0.48	0.07	0.42	0.42
Sat Flow, veh/h	1774	3539	1583	3442	3539	1583	3442	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	98	201	342	364	201	147	342	190	364	147	190	98
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1721	1770	1583	1721	1863	1583	1774	1863	1583
Q Serve(g_s), s	3.8	4.3	9.0	8.2	3.9	6.1	7.7	4.7	9.1	3.7	5.3	2.7
Cycle Q Clear(g_c), s	3.8	4.3	9.0	8.2	3.9	6.1	7.7	4.7	9.1	3.7	5.3	2.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	321	398	383	469	649	400	446	898	979	572	786	771
V/C Ratio(X)	0.30	0.50	0.89	0.78	0.31	0.37	0.77	0.21	0.37	0.26	0.24	0.13
Avail Cap(c_a), veh/h	383	398	383	731	796	466	731	898	979	626	786	771
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.6	33.4	29.3	33.4	28.3	24.6	33.7	11.9	7.6	11.3	14.9	11.2
Incr Delay (d2), s/veh	0.5	1.0	22.3	2.8	0.3	0.6	2.8	0.5	1.1	0.2	0.7	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(-26165%),veh/ln	1.9	2.2	9.6	4.1	2.0	2.7	3.8	2.6	4.2	1.8	2.9	1.2
LnGrp Delay(d),s/veh	29.2	34.4	51.6	36.2	28.5	25.2	36.5	12.5	8.6	11.5	15.6	11.6
LnGrp LOS	C	C	D	D	C	C	D	B	A	B	B	B
Approach Vol, veh/h		641			712			896			435	
Approach Delay, s/veh		42.8			31.8			20.1			13.3	
Approach LOS		D			C			C			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.5	42.6	14.9	13.0	14.4	37.8	9.2	18.7
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	8.0	30.0	17.0	9.0	17.0	21.0	8.0	18.0
Max Q Clear Time (g_c+I1), s	5.7	11.1	10.2	11.0	9.7	7.3	5.8	8.1
Green Ext Time (p_c), s	0.1	3.3	0.7	0.0	0.7	3.0	0.0	3.0

Intersection Summary		
HCM 2010 Ctrl Delay		27.5
HCM 2010 LOS		C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	225	5	5	225	180	5	10	5	180	10	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		0	435		0	200		0	200		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.933			0.953			0.865	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1857	0	1770	1738	0	1770	1775	0	1770	1611	0
Flt Permitted	0.172			0.604			0.687			0.747		
Satd. Flow (perm)	320	1857	0	1125	1738	0	1280	1775	0	1391	1611	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3			85			5			98	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2659			5241			3658			5279	
Travel Time (s)		40.3			79.4			55.4			80.0	
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
Adj. Flow (vph)	98	245	5	5	245	196	5	11	5	196	11	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	250	0	5	441	0	5	16	0	196	109	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		8	8		2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	8.0	66.0		58.0	58.0		22.0	22.0		22.0	22.0	
Total Split (%)	9.1%	75.0%		65.9%	65.9%		25.0%	25.0%		25.0%	25.0%	
Maximum Green (s)	4.0	62.0		54.0	54.0		18.0	18.0		18.0	18.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead			Lag	Lag							
Lead-Lag Optimize?	Yes			Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)		5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)		11.0		11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)		0		0	0		0	0		0	0	
Act Effct Green (s)	32.7	32.7		26.3	26.3		47.3	47.3		47.3	47.3	
Actuated g/C Ratio	0.37	0.37		0.30	0.30		0.54	0.54		0.54	0.54	
v/c Ratio	0.53	0.36		0.01	0.76		0.01	0.02		0.26	0.12	
Control Delay	26.0	19.4		17.0	30.3		14.6	11.9		15.2	4.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	26.0	19.4		17.0	30.3		14.6	11.9		15.2	4.7	
LOS	C	B		B	C		B	B		B	A	
Approach Delay		21.2			30.2			12.6			11.5	
Approach LOS		C			C			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 88	
Actuated Cycle Length: 88	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 22.0	Intersection LOS: C
Intersection Capacity Utilization 54.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 6: 52nd St & 43rd Av

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	90	225	5	5	225	180	5	10	5	180	10	90
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	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	98	245	5	5	245	196	5	11	5	196	11	98
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	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	230	727	15	426	296	237	688	618	281	784	83	736
Arrive On Green	0.05	0.40	0.40	0.31	0.31	0.31	0.51	0.51	0.51	0.51	0.51	0.51
Sat Flow, veh/h	1774	1819	37	1125	960	768	1279	1214	552	1392	162	1445
Grp Volume(v), veh/h	98	0	250	5	0	441	5	0	16	196	0	109
Grp Sat Flow(s),veh/h/ln	1774	0	1856	1125	0	1727	1279	0	1765	1392	0	1608
Q Serve(g_s), s	3.2	0.0	8.2	0.3	0.0	20.9	0.2	0.0	0.4	7.1	0.0	3.1
Cycle Q Clear(g_c), s	3.2	0.0	8.2	0.5	0.0	20.9	3.3	0.0	0.4	7.5	0.0	3.1
Prop In Lane	1.00		0.02	1.00		0.44	1.00		0.31	1.00		0.90
Lane Grp Cap(c), veh/h	230	0	742	426	0	533	688	0	899	784	0	819
V/C Ratio(X)	0.43	0.00	0.34	0.01	0.00	0.83	0.01	0.00	0.02	0.25	0.00	0.13
Avail Cap(c_a), veh/h	230	0	1308	769	0	1060	688	0	899	784	0	819
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	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	21.4	0.0	18.3	21.3	0.0	28.2	12.2	0.0	10.7	12.6	0.0	11.4
Incr Delay (d2), s/veh	1.2	0.0	0.3	0.0	0.0	3.3	0.0	0.0	0.0	0.8	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(-26165%),veh/ln	1.6	0.0	4.2	0.1	0.0	10.4	0.1	0.0	0.2	2.9	0.0	1.5
LnGrp Delay(d),s/veh	22.6	0.0	18.6	21.3	0.0	31.6	12.3	0.0	10.7	13.3	0.0	11.7
LnGrp LOS	C		B	C		C	B		B	B		B
Approach Vol, veh/h		348			446			21			305	
Approach Delay, s/veh		19.7			31.5			11.1			12.7	
Approach LOS		B			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6	7	8
Phs Duration (G+Y+Rc), s		48.8		39.2		48.8	8.0	31.2
Change Period (Y+Rc), s		4.0		4.0		4.0	4.0	4.0
Max Green Setting (Gmax), s		18.0		62.0		18.0	4.0	54.0
Max Q Clear Time (g_c+I1), s		5.3		10.2		9.5	5.2	22.9
Green Ext Time (p_c), s		1.0		4.5		0.8	0.0	4.3

Intersection Summary			
HCM 2010 Ctrl Delay			22.3
HCM 2010 LOS			C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	0	175	1	1	1	175	220	0	0	220	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	200		150	435		335	435		335
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850						0.850
Flt Protected	0.950			0.950			0.950					
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	3433	3539	1863	1863	3539	1583
Flt Permitted	0.000			0.950			0.950					
Satd. Flow (perm)	0	3539	1583	3433	3539	1583	3433	3539	1863	1863	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			497			123						123
Link Speed (mph)		35			30			40			55	
Link Distance (ft)		3124			1828			1244			1474	
Travel Time (s)		60.9			41.5			21.2			18.3	
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
Adj. Flow (vph)	5	0	190	1	1	1	190	239	0	0	239	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	0	190	1	1	1	190	239	0	0	239	5
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt		pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4			8			2	6		6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	8.0	8.0	20.0	8.0	8.0	20.0	8.0	8.0	20.0	8.0
Total Split (s)	11.0	23.0	20.0	8.0	20.0	8.0	20.0	41.0	8.0	8.0	29.0	11.0
Total Split (%)	13.8%	28.8%	25.0%	10.0%	25.0%	10.0%	25.0%	51.3%	10.0%	10.0%	36.3%	13.8%
Maximum Green (s)	7.0	19.0	16.0	4.0	16.0	4.0	16.0	37.0	4.0	4.0	25.0	7.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	5.8		9.7	6.4	5.6	7.4	9.7	73.3			58.3	68.1
Actuated g/C Ratio	0.07		0.12	0.08	0.07	0.09	0.12	0.92			0.73	0.85
v/c Ratio	0.04		0.30	0.00	0.00	0.00	0.46	0.07			0.09	0.00
Control Delay	34.8		1.2	30.0	35.0	0.0	35.9	2.5			5.1	0.0
Queue Delay	0.0		0.0	0.0	0.0	0.0	0.0	0.0			0.0	0.0
Total Delay	34.8		1.2	30.0	35.0	0.0	35.9	2.5			5.1	0.0
LOS	C		A	C	C	A	D	A			A	A
Approach Delay					21.7			17.3			5.0	
Approach LOS					C			B			A	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.46
Intersection Signal Delay: 10.4 Intersection LOS: B
Intersection Capacity Utilization 30.3% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 39: 66th St & Century Ave

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	0	175	1	1	1	175	220	0	0	220	5
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	5	0	190	1	1	1	190	239	0	0	239	5
Adj No. of Lanes	1	2	1	2	2	1	2	2	1	1	2	1
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	283	476	343	4	462	127	283	2528	1133	754	2060	930
Arrive On Green	0.01	0.00	0.13	0.00	0.13	0.13	0.08	0.71	0.00	0.00	0.58	0.58
Sat Flow, veh/h	1774	3539	1583	3442	3539	1583	3442	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	5	0	190	1	1	1	190	239	0	0	239	5
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1721	1770	1583	1721	1770	1583	1774	1770	1583
Q Serve(g_s), s	0.2	0.0	8.5	0.0	0.0	4.0	4.3	1.7	0.0	0.0	2.4	0.1
Cycle Q Clear(g_c), s	0.2	0.0	8.5	0.0	0.0	4.0	4.3	1.7	0.0	0.0	2.4	0.1
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	283	476	343	4	462	127	283	2528	1133	754	2060	930
V/C Ratio(X)	0.02	0.00	0.55	0.23	0.00	0.01	0.67	0.09	0.00	0.00	0.12	0.01
Avail Cap(c_a), veh/h	429	841	506	172	708	237	688	2528	1133	840	2060	930
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	0.00	0.00	1.00	1.00
Uniform Delay (d), s/veh	30.0	0.0	27.9	39.9	30.3	6016.0	35.7	3.5	0.0	0.0	7.5	6.8
Incr Delay (d2), s/veh	0.0	0.0	1.4	25.5	0.0	0.0	2.7	0.1	0.0	0.0	0.1	0.0
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(-26165%),veh/ln	0.1	0.0	3.9	0.0	0.0	1.8	2.1	0.8	0.0	0.0	1.2	0.0
LnGrp Delay(d),s/veh	30.0	0.0	29.3	65.4	30.3	6016.0	38.4	3.6	0.0	0.0	7.6	6.8
LnGrp LOS	C		C	E	C	F	D	A			A	A
Approach Vol, veh/h		195			3			429			244	
Approach Delay, s/veh		29.3			2037.2			19.0			7.6	
Approach LOS		C			F			B			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	0.0	61.1	4.1	14.8	10.6	50.6	4.4	14.4
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	4.0	37.0	4.0	19.0	16.0	25.0	7.0	16.0
Max Q Clear Time (g_c+I1), s	0.0	3.7	2.0	10.5	6.3	4.4	2.2	6.0
Green Ext Time (p_c), s	0.0	2.9	0.0	0.4	0.4	2.7	0.0	0.4

Intersection Summary	
HCM 2010 Ctrl Delay	25.1
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	105	195	20	105	5	195	10	20	5	10	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	435		335	435		335	435		335
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		5241			5285			1475			901	
Travel Time (s)		79.4			80.1			18.3			11.2	
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
Adj. Flow (vph)	54	114	212	22	114	5	212	11	22	5	11	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	114	212	22	114	5	212	11	22	5	11	54
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 33.6%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	10.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	50	105	195	20	105	5	195	10	20	5	10	50
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	435	-	335	435	-	335	435	-	335	435	-	335
Veh in Median Storage, #	-	0	-	-	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	54	114	212	22	114	5	212	11	22	5	11	54

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	514	457	11	514	457	11	11	0	0	11	0	0
Stage 1	22	22	-	435	435	-	-	-	-	-	-	-
Stage 2	492	435	-	79	22	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	471	500	1070	471	500	1070	1608	-	-	1608	-	-
Stage 1	996	877	-	600	580	-	-	-	-	-	-	-
Stage 2	558	580	-	930	877	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	336	433	1070	271	433	1070	1608	-	-	1608	-	-
Mov Cap-2 Maneuver	336	433	-	271	433	-	-	-	-	-	-	-
Stage 1	865	874	-	521	504	-	-	-	-	-	-	-
Stage 2	373	504	-	646	874	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.6	16.5	6.6	0.6
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	EBLn3	WBLn1	WBLn2	WBLn3	SBL	SBT	SBR
Capacity (veh/h)	1608	-	-	336	433	1070	271	433	1070	1608	-	-
HCM Lane V/C Ratio	0.132	-	-	0.162	0.264	0.198	0.08	0.264	0.005	0.003	-	-
HCM Control Delay (s)	7.6	-	-	17.8	16.3	9.2	19.4	16.3	8.4	7.2	-	-
HCM Lane LOS	A	-	-	C	C	A	C	C	A	A	-	-
HCM 95th %tile Q(veh)	0.5	-	-	0.6	1	0.7	0.3	1	0	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	0	135	10	0	0	135	180	10	0	180	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.869						0.996			0.997	
Flt Protected		0.998			0.950			0.980				
Satd. Flow (prot)	0	1615	0	0	1770	0	0	1818	0	0	1857	0
Flt Permitted		0.998			0.950			0.980				
Satd. Flow (perm)	0	1615	0	0	1770	0	0	1818	0	0	1857	0
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		5285			2119			7040			5267	
Travel Time (s)		65.5			26.3			87.3			65.3	
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
Adj. Flow (vph)	5	0	147	11	0	0	147	196	11	0	196	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	152	0	0	11	0	0	354	0	0	201	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary		
Area Type:	Other	
Control Type: Unsignalized		
Intersection Capacity Utilization 45.8%		ICU Level of Service A
Analysis Period (min) 15		

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	135	10	0	0	135	180	10	0	180	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	5	0	147	11	0	0	147	196	11	0	196	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	693	698	198	767	696	201	201	0	0	207	0	0
Stage 1	198	198	-	495	495	-	-	-	-	-	-	-
Stage 2	495	500	-	272	201	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	358	364	843	319	365	840	1371	-	-	1364	-	-
Stage 1	804	737	-	556	546	-	-	-	-	-	-	-
Stage 2	556	543	-	734	735	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	325	320	843	239	321	840	1371	-	-	1364	-	-
Mov Cap-2 Maneuver	325	320	-	239	321	-	-	-	-	-	-	-
Stage 1	707	737	-	489	480	-	-	-	-	-	-	-
Stage 2	489	477	-	606	735	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	20.8	3.3	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1371	-	-	798	239	1364	-	-
HCM Lane V/C Ratio	0.107	-	-	0.191	0.045	-	-	-
HCM Control Delay (s)	7.9	0	-	10.6	20.8	0	-	-
HCM Lane LOS	A	A	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	0.7	0.1	0	-	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	240	130	130	35	35	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435			335	200	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.971			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1809	0	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1809	0	1770	1583
Link Speed (mph)		35	35		35	
Link Distance (ft)		1005	2634		1277	
Travel Time (s)		19.6	51.3		24.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	141	141	38	38	261
Shared Lane Traffic (%)						
Lane Group Flow (vph)	261	141	179	0	38	261
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 35.6%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	6.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	240	130	130	35	35	240
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	435	-	-	-	200	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	261	141	141	38	38	261

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	179	0	-	0	823	160
Stage 1	-	-	-	-	160	-
Stage 2	-	-	-	-	663	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1397	-	-	-	343	885
Stage 1	-	-	-	-	869	-
Stage 2	-	-	-	-	512	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1397	-	-	-	279	885
Mov Cap-2 Maneuver	-	-	-	-	279	-
Stage 1	-	-	-	-	869	-
Stage 2	-	-	-	-	416	-

Approach	EB	WB	SB
HCM Control Delay, s	5.3	0	12
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1397	-	-	-	279	885
HCM Lane V/C Ratio	0.187	-	-	-	0.136	0.295
HCM Control Delay (s)	8.2	-	-	-	19.9	10.8
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.7	-	-	-	0.5	1.2

Appendix A.2

2040 Base Scenario Intersection Capacity Analysis Worksheets

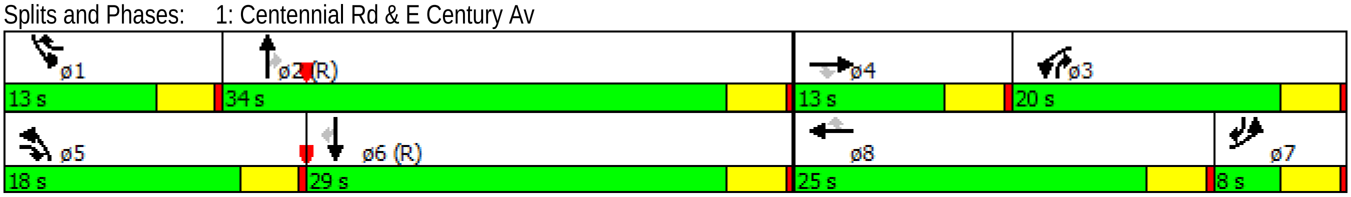
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	280	400	480	280	85	400	940	480	85	940	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		250	380		100	225		390	290		100
Storage Lanes	2		1	2		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			123			123			204			177
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		2085			460			3351			1054	
Travel Time (s)		40.6			9.0			57.1			18.0	
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
Adj. Flow (vph)	92	304	435	522	304	92	435	1022	522	92	1022	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	304	435	522	304	92	435	1022	522	92	1022	92
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	8.0	13.0	18.0	20.0	25.0	13.0	18.0	34.0	20.0	13.0	29.0	8.0
Total Split (%)	10.0%	16.3%	22.5%	25.0%	31.3%	16.3%	22.5%	42.5%	25.0%	16.3%	36.3%	10.0%
Maximum Green (s)	4.0	9.0	14.0	16.0	21.0	9.0	14.0	30.0	16.0	9.0	25.0	4.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lead	Lead	Lag	Lead	Lead	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	10.7	9.0	22.4	15.4	15.6	24.6	13.4	33.4	49.6	8.2	26.2	36.9
Actuated g/C Ratio	0.13	0.11	0.28	0.19	0.20	0.31	0.17	0.42	0.62	0.10	0.33	0.46
v/c Ratio	0.20	0.76	0.82	0.79	0.44	0.16	0.76	0.69	0.49	0.51	0.88	0.11
Control Delay	31.7	48.6	26.0	40.5	31.7	1.9	41.1	23.4	4.6	44.0	36.9	0.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.7	48.6	26.0	40.5	31.7	1.9	41.1	23.4	4.6	44.0	36.9	0.3
LOS	C	D	C	D	C	A	D	C	A	D	D	A
Approach Delay		34.9			33.7			22.3			34.7	
Approach LOS		C			C			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 29.6 Intersection LOS: C
Intersection Capacity Utilization 74.4% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: Centennial Rd & E Century Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	85	280	400	480	280	85	400	940	480	85	940	85
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	92	304	435	522	304	92	435	1022	522	92	1022	92
Adj No. of Lanes	2	2	1	2	2	1	2	2	1	1	2	1
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	559	398	419	614	454	309	524	1566	983	118	1263	822
Arrive On Green	0.16	0.11	0.11	0.18	0.13	0.13	0.15	0.44	0.44	0.07	0.36	0.36
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	92	304	435	522	304	92	435	1022	522	92	1022	92
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1770	1583	1774	1770	1583
Q Serve(g_s), s	1.8	6.7	9.0	11.8	6.6	2.4	9.8	18.1	4.6	4.1	20.9	1.0
Cycle Q Clear(g_c), s	1.8	6.7	9.0	11.8	6.6	2.4	9.8	18.1	4.6	4.1	20.9	1.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	559	398	419	614	454	309	524	1566	983	118	1263	822
V/C Ratio(X)	0.16	0.76	1.04	0.85	0.67	0.30	0.83	0.65	0.53	0.78	0.81	0.11
Avail Cap(c_a), veh/h	559	398	419	688	929	521	602	1566	983	200	1263	822
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.8	34.5	14.2	31.8	33.2	12.2	32.9	17.5	2.4	36.7	23.3	3.1
Incr Delay (d2), s/veh	0.1	8.5	53.9	9.1	1.7	0.5	8.5	2.1	2.1	10.4	5.7	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(-26165%),veh/ln	0.9	3.7	14.3	6.4	3.3	1.1	5.3	9.3	3.2	2.3	11.2	0.5
LnGrp Delay(d),s/veh	29.0	43.0	68.1	41.0	35.0	12.8	41.4	19.6	4.4	47.2	28.9	3.4
LnGrp LOS	C	D	F	D	C	B	D	B	A	D	C	A
Approach Vol, veh/h		831			918			1979			1206	
Approach Delay, s/veh		54.6			36.2			20.4			28.4	
Approach LOS		D			D			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.3	39.4	18.3	13.0	16.2	32.5	17.0	14.3
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	9.0	30.0	16.0	9.0	14.0	25.0	4.0	21.0
Max Q Clear Time (g_c+I1), s	6.1	20.1	13.8	11.0	11.8	22.9	3.8	8.6
Green Ext Time (p_c), s	0.0	8.5	0.5	0.0	0.4	2.0	0.0	1.7

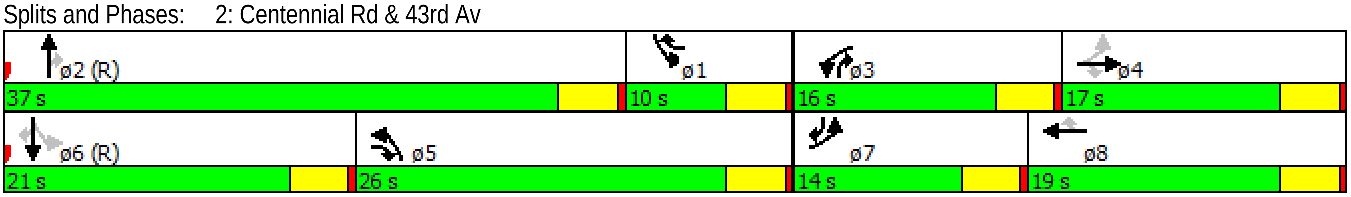
Intersection Summary	
HCM 2010 Ctrl Delay	31.0
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	165	385	555	330	385	135	555	155	330	135	155	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	200		200	300		300	250		250
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.392			0.950			0.950			0.623		
Satd. Flow (perm)	730	3539	1583	3433	3539	1583	3433	1863	1583	1160	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			263			147			165			123
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1886			5283			4233			3577	
Travel Time (s)		28.6			80.0			52.5			44.3	
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
Adj. Flow (vph)	179	418	603	359	418	147	603	168	359	147	168	179
Shared Lane Traffic (%)												
Lane Group Flow (vph)	179	418	603	359	418	147	603	168	359	147	168	179
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4			8			2	6		6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	14.0	17.0	26.0	16.0	19.0	10.0	26.0	37.0	16.0	10.0	21.0	14.0
Total Split (%)	17.5%	21.3%	32.5%	20.0%	23.8%	12.5%	32.5%	46.3%	20.0%	12.5%	26.3%	17.5%
Maximum Green (s)	10.0	13.0	22.0	12.0	15.0	6.0	22.0	33.0	12.0	6.0	17.0	10.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lag	Lead	Lead	Lag	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	22.0	12.6	34.5	11.6	14.7	20.7	22.0	33.9	45.5	23.9	17.9	27.3
Actuated g/C Ratio	0.28	0.16	0.43	0.14	0.18	0.26	0.28	0.42	0.57	0.30	0.22	0.34
v/c Ratio	0.56	0.75	0.72	0.72	0.64	0.28	0.64	0.21	0.37	0.38	0.40	0.29
Control Delay	25.8	41.7	11.0	42.9	27.8	3.9	29.2	15.9	3.7	15.6	30.5	4.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.8	41.7	11.0	42.9	27.8	3.9	29.2	15.9	3.7	15.6	30.5	4.9
LOS	C	D	B	D	C	A	C	B	A	B	C	A
Approach Delay		23.9			29.9			19.1			16.8	
Approach LOS		C			C			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 36 (45%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 23.0	Intersection LOS: C
Intersection Capacity Utilization 61.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Centennial Rd & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	165	385	555	330	385	135	555	155	330	135	155	165
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	179	418	603	359	418	147	603	168	359	147	168	179
Adj No. of Lanes	1	2	1	2	2	1	2	1	1	1	1	1
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	337	551	725	446	633	445	1040	768	858	406	396	505
Arrive On Green	0.11	0.16	0.16	0.13	0.18	0.18	0.30	0.41	0.41	0.10	0.21	0.21
Sat Flow, veh/h	1774	3539	1583	3442	3539	1583	3442	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	179	418	603	359	418	147	603	168	359	147	168	179
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1721	1770	1583	1721	1863	1583	1774	1863	1583
Q Serve(g_s), s	6.6	9.0	8.8	8.1	8.8	1.3	11.9	4.7	4.8	0.0	6.2	2.3
Cycle Q Clear(g_c), s	6.6	9.0	8.8	8.1	8.8	1.3	11.9	4.7	4.8	0.0	6.2	2.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	337	551	725	446	633	445	1040	768	858	406	396	505
V/C Ratio(X)	0.53	0.76	0.83	0.81	0.66	0.33	0.58	0.22	0.42	0.36	0.42	0.35
Avail Cap(c_a), veh/h	370	575	736	516	664	459	1040	768	858	406	396	505
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	1.00	1.00	0.75	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.6	32.3	6.5	33.8	30.6	10.5	23.6	15.2	3.4	26.6	27.3	8.0
Incr Delay (d2), s/veh	1.3	5.6	8.0	6.1	1.7	0.3	0.8	0.7	1.5	0.5	3.3	1.9
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(-26165%),veh/ln	3.3	4.8	7.0	4.2	4.4	1.7	5.7	2.5	2.4	3.0	3.6	1.8
LnGrp Delay(d),s/veh	25.9	37.9	14.5	40.0	32.3	10.8	24.4	15.8	4.9	27.1	30.6	9.9
LnGrp LOS	C	D	B	D	C	B	C	B	A	C	C	A
Approach Vol, veh/h		1200			924			1130			494	
Approach Delay, s/veh		24.3			31.9			16.9			22.1	
Approach LOS		C			C			B			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.2	37.0	14.4	16.5	28.2	21.0	12.5	18.3
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	6.0	33.0	12.0	13.0	22.0	17.0	10.0	15.0
Max Q Clear Time (g_c+I1), s	2.0	6.8	10.1	11.0	13.9	8.2	8.6	10.8
Green Ext Time (p_c), s	1.1	2.0	0.3	1.4	1.8	0.9	0.1	2.8

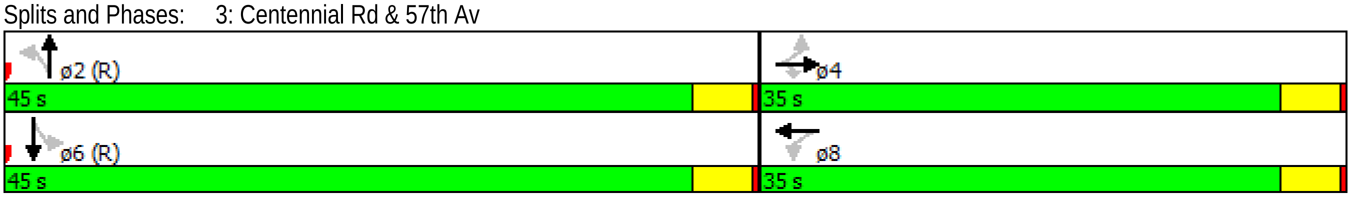
Intersection Summary	
HCM 2010 Ctrl Delay	23.7
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	80	140	130	80	85	140	145	130	85	145	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	435		335	435		0	435		335
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.923			0.929			0.947	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1719	0	1770	1730	0	1770	1764	0
Flt Permitted	0.493			0.701			0.607			0.574		
Satd. Flow (perm)	918	1863	1583	1306	1719	0	1131	1730	0	1069	1764	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			152		78			82			51	
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1838			5295			1723			4521	
Travel Time (s)		27.8			80.2			21.4			56.0	
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
Adj. Flow (vph)	87	87	152	141	87	92	152	158	141	92	158	87
Shared Lane Traffic (%)												
Lane Group Flow (vph)	87	87	152	141	179	0	152	299	0	92	245	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	4	4	4	8	8		2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	35.0	35.0	35.0	35.0	35.0		45.0	45.0		45.0	45.0	
Total Split (%)	43.8%	43.8%	43.8%	43.8%	43.8%		56.3%	56.3%		56.3%	56.3%	
Maximum Green (s)	31.0	31.0	31.0	31.0	31.0		41.0	41.0		41.0	41.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	
Act Effct Green (s)	14.0	14.0	14.0	14.0	14.0		58.0	58.0		58.0	58.0	
Actuated g/C Ratio	0.18	0.18	0.18	0.18	0.18		0.72	0.72		0.72	0.72	
v/c Ratio	0.54	0.27	0.38	0.62	0.49		0.19	0.23		0.12	0.19	
Control Delay	41.3	28.7	7.5	41.2	20.5		5.0	3.7		4.8	3.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	41.3	28.7	7.5	41.2	20.5		5.0	3.7		4.8	3.8	
LOS	D	C	A	D	C		A	A		A	A	
Approach Delay		22.2			29.6			4.2			4.1	
Approach LOS		C			C			A			A	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 40	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.62	
Intersection Signal Delay: 13.9	Intersection LOS: B
Intersection Capacity Utilization 47.5%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 3: Centennial Rd & 57th Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	80	140	130	80	85	140	145	130	85	145	80
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	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	87	87	152	141	87	92	152	158	141	92	158	87
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	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	240	403	343	293	180	190	804	621	554	754	773	425
Arrive On Green	0.22	0.22	0.22	0.22	0.22	0.22	0.68	0.68	0.68	0.68	0.68	0.68
Sat Flow, veh/h	1200	1863	1583	1136	830	878	1130	909	811	1076	1130	622
Grp Volume(v), veh/h	87	87	152	141	0	179	152	0	299	92	0	245
Grp Sat Flow(s),veh/h/ln	1200	1863	1583	1136	0	1708	1130	0	1720	1076	0	1753
Q Serve(g_s), s	5.5	3.1	6.7	9.3	0.0	7.3	4.6	0.0	5.3	2.9	0.0	4.1
Cycle Q Clear(g_c), s	12.8	3.1	6.7	12.4	0.0	7.3	8.7	0.0	5.3	8.2	0.0	4.1
Prop In Lane	1.00		1.00	1.00		0.51	1.00		0.47	1.00		0.36
Lane Grp Cap(c), veh/h	240	403	343	293	0	370	804	0	1175	754	0	1198
V/C Ratio(X)	0.36	0.22	0.44	0.48	0.00	0.48	0.19	0.00	0.25	0.12	0.00	0.20
Avail Cap(c_a), veh/h	445	722	614	487	0	662	804	0	1175	754	0	1198
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	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	33.0	25.8	27.2	30.8	0.0	27.4	6.3	0.0	4.9	6.4	0.0	4.7
Incr Delay (d2), s/veh	0.9	0.3	0.9	1.2	0.0	1.0	0.5	0.0	0.5	0.3	0.0	0.4
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(-26165%),veh/ln	1.9	1.6	3.0	3.0	0.0	3.5	1.5	0.0	2.7	0.9	0.0	2.1
LnGrp Delay(d),s/veh	33.9	26.0	28.1	32.1	0.0	28.4	6.8	0.0	5.4	6.8	0.0	5.0
LnGrp LOS	C	C	C	C		C	A		A	A		A
Approach Vol, veh/h		326			320			451			337	
Approach Delay, s/veh		29.1			30.0			5.8			5.5	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		58.7		21.3		58.7		21.3
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0
Max Green Setting (Gmax), s		41.0		31.0		41.0		31.0
Max Q Clear Time (g_c+I1), s		10.7		14.8		10.2		14.4
Green Ext Time (p_c), s		4.1		2.5		4.1		2.5

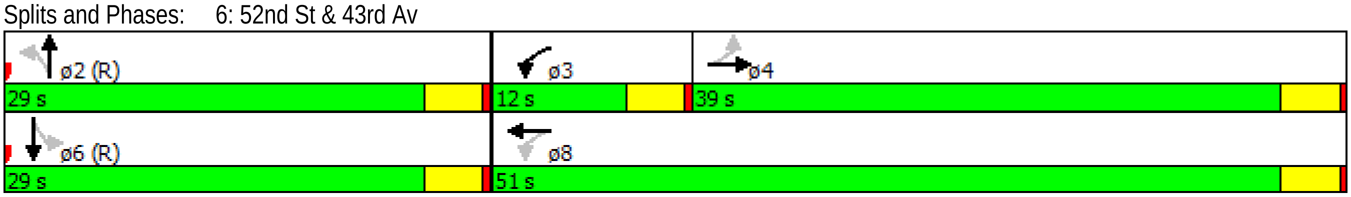
Intersection Summary	
HCM 2010 Ctrl Delay	16.4
HCM 2010 LOS	B

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	430	45	130	430	85	45	70	130	85	70	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		0	435		0	0		0	200		0
Storage Lanes	1		0	1		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.986			0.975			0.928			0.950	
Flt Protected	0.950			0.950				0.991		0.950		
Satd. Flow (prot)	1770	1837	0	1770	1816	0	0	1713	0	1770	1770	0
Flt Permitted	0.414			0.163				0.933		0.544		
Satd. Flow (perm)	771	1837	0	304	1816	0	0	1613	0	1013	1770	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8			21			74			33	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		5283			5241			3658			5279	
Travel Time (s)		80.0			79.4			55.4			80.0	
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
Adj. Flow (vph)	38	467	49	141	467	92	49	76	141	92	76	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	516	0	141	559	0	0	266	0	92	114	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		3	8		2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		8.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	39.0	39.0		12.0	51.0		29.0	29.0		29.0	29.0	
Total Split (%)	48.8%	48.8%		15.0%	63.8%		36.3%	36.3%		36.3%	36.3%	
Maximum Green (s)	35.0	35.0		8.0	47.0		25.0	25.0		25.0	25.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0			4.0		4.0	4.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	5.0	5.0			5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	
Act Effct Green (s)	27.9	27.9		39.6	39.6			32.4		32.4	32.4	
Actuated g/C Ratio	0.35	0.35		0.50	0.50			0.40		0.40	0.40	
v/c Ratio	0.14	0.80		0.48	0.61			0.38		0.22	0.15	
Control Delay	8.3	20.0		10.5	6.1			7.8		20.2	13.7	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	8.3	20.0		10.5	6.1			7.8		20.2	13.7	
LOS	A	B		B	A			A		C	B	
Approach Delay		19.2			7.0			7.8			16.6	
Approach LOS		B			A			A			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 53 (66%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.80	
Intersection Signal Delay: 12.2	Intersection LOS: B
Intersection Capacity Utilization 63.4%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 6: 52nd St & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	430	45	130	430	85	45	70	130	85	70	35
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	1900	1900	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	38	467	49	141	467	92	49	76	141	92	76	38
Adj No. of Lanes	1	1	0	1	1	0	0	1	0	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	286	577	60	296	708	140	148	232	369	564	506	253
Arrive On Green	0.35	0.35	0.35	0.07	0.47	0.47	0.43	0.43	0.43	0.43	0.43	0.43
Sat Flow, veh/h	847	1658	174	1774	1512	298	219	538	854	1160	1173	586
Grp Volume(v), veh/h	38	0	516	141	0	559	266	0	0	92	0	114
Grp Sat Flow(s),veh/h/ln	847	0	1832	1774	0	1810	1611	0	0	1160	0	1759
Q Serve(g_s), s	2.9	0.0	20.5	3.8	0.0	19.0	0.0	0.0	0.0	0.0	0.0	3.2
Cycle Q Clear(g_c), s	12.2	0.0	20.5	3.8	0.0	19.0	8.4	0.0	0.0	5.1	0.0	3.2
Prop In Lane	1.00		0.09	1.00		0.16	0.18		0.53	1.00		0.33
Lane Grp Cap(c), veh/h	286	0	637	296	0	848	749	0	0	564	0	759
V/C Ratio(X)	0.13	0.00	0.81	0.48	0.00	0.66	0.36	0.00	0.00	0.16	0.00	0.15
Avail Cap(c_a), veh/h	362	0	802	348	0	1063	749	0	0	564	0	759
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)	0.82	0.00	0.82	0.75	0.00	0.75	1.00	0.00	0.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	24.8	0.0	23.7	17.2	0.0	16.4	15.3	0.0	0.0	14.4	0.0	13.8
Incr Delay (d2), s/veh	0.2	0.0	4.2	0.9	0.0	0.8	1.3	0.0	0.0	0.6	0.0	0.4
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(-26165%),veh/ln	0.7	0.0	11.1	2.0	0.0	9.7	4.2	0.0	0.0	1.4	0.0	1.6
LnGrp Delay(d),s/veh	24.9	0.0	27.9	18.1	0.0	17.1	16.6	0.0	0.0	15.0	0.0	14.2
LnGrp LOS	C		C	B		B	B			B		B
Approach Vol, veh/h		554			700			266			206	
Approach Delay, s/veh		27.7			17.3			16.6			14.6	
Approach LOS		C			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6		8
Phs Duration (G+Y+Rc), s		38.5	9.7	31.8		38.5		41.5
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0		4.0
Max Green Setting (Gmax), s		25.0	8.0	35.0		25.0		47.0
Max Q Clear Time (g_c+I1), s		10.4	5.8	22.5		7.1		21.0
Green Ext Time (p_c), s		2.1	0.1	5.4		2.3		7.4

Intersection Summary		
HCM 2010 Ctrl Delay		20.2
HCM 2010 LOS		C

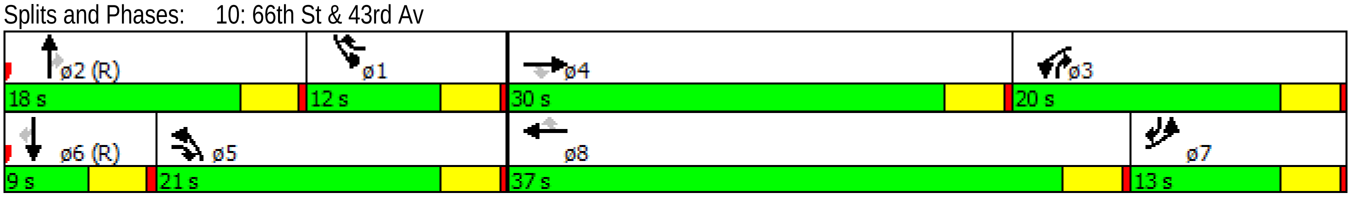
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	405	210	200	405	80	210	40	200	80	40	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	435		335	435		335	435		335
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1770	1863	1583	1770	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			228			123			217			177
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		5241			5285			1115			901	
Travel Time (s)		79.4			80.1			13.8			11.2	
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
Adj. Flow (vph)	92	440	228	217	440	87	228	43	217	87	43	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	440	228	217	440	87	228	43	217	87	43	92
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	13.0	30.0	21.0	20.0	37.0	12.0	21.0	18.0	20.0	12.0	9.0	13.0
Total Split (%)	16.3%	37.5%	26.3%	25.0%	46.3%	15.0%	26.3%	22.5%	25.0%	15.0%	11.3%	16.3%
Maximum Green (s)	9.0	26.0	17.0	16.0	33.0	8.0	17.0	14.0	16.0	8.0	5.0	9.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	11.4	22.7	42.2	13.8	27.1	37.6	15.5	21.9	39.7	7.5	12.0	26.6
Actuated g/C Ratio	0.14	0.28	0.53	0.17	0.34	0.47	0.19	0.27	0.50	0.09	0.15	0.33
v/c Ratio	0.37	0.83	0.24	0.71	0.70	0.11	0.66	0.08	0.24	0.52	0.15	0.14
Control Delay	28.5	31.9	1.8	44.3	29.5	1.1	39.6	27.6	3.0	46.2	36.5	0.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	31.9	1.8	44.3	29.5	1.1	39.6	27.6	3.0	46.2	36.5	0.5
LOS	C	C	A	D	C	A	D	C	A	D	D	A
Approach Delay		22.5			30.5			22.3			25.4	
Approach LOS		C			C			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 65 (81%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 25.4 Intersection LOS: C
Intersection Capacity Utilization 60.7% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 10: 66th St & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	85	405	210	200	405	80	210	40	200	80	40	85
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	92	440	228	217	440	87	228	43	217	87	43	92
Adj No. of Lanes	1	1	1	1	1	1	1	1	1	1	1	1
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	250	506	936	259	516	766	567	326	508	368	116	322
Arrive On Green	0.14	0.27	0.27	0.15	0.28	0.28	0.32	0.17	0.17	0.21	0.06	0.06
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	1774	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	92	440	228	217	440	87	228	43	217	87	43	92
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1774	1863	1583	1774	1863	1583
Q Serve(g_s), s	3.8	18.0	0.0	9.5	17.9	0.0	8.0	1.6	0.0	3.3	1.8	0.0
Cycle Q Clear(g_c), s	3.8	18.0	0.0	9.5	17.9	0.0	8.0	1.6	0.0	3.3	1.8	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	250	506	936	259	516	766	567	326	508	368	116	322
V/C Ratio(X)	0.37	0.87	0.24	0.84	0.85	0.11	0.40	0.13	0.43	0.24	0.37	0.29
Avail Cap(c_a), veh/h	250	605	1021	355	768	981	567	326	508	368	116	322
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)	0.63	0.63	0.63	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	31.1	27.8	7.8	33.2	27.4	11.3	21.2	27.9	21.4	26.4	36.0	26.9
Incr Delay (d2), s/veh	0.6	7.6	0.1	12.0	6.1	0.1	0.5	0.8	2.6	0.3	8.8	2.2
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(-26165%),veh/ln	1.9	10.4	2.4	5.5	10.0	1.0	4.0	0.9	4.1	1.6	1.2	1.9
LnGrp Delay(d),s/veh	31.7	35.4	7.9	45.2	33.5	11.3	21.7	28.7	24.0	26.8	44.8	29.2
LnGrp LOS	C	D	A	D	C	B	C	C	C	C	D	C
Approach Vol, veh/h		760			744			488			222	
Approach Delay, s/veh		26.7			34.3			23.3			31.2	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	20.6	18.0	15.7	25.7	29.6	9.0	15.3	26.1
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	8.0	14.0	16.0	26.0	17.0	5.0	9.0	33.0
Max Q Clear Time (g_c+I1), s	5.3	3.6	11.5	20.0	10.0	3.8	5.8	19.9
Green Ext Time (p_c), s	0.2	0.6	0.3	1.7	0.5	0.0	0.3	2.3

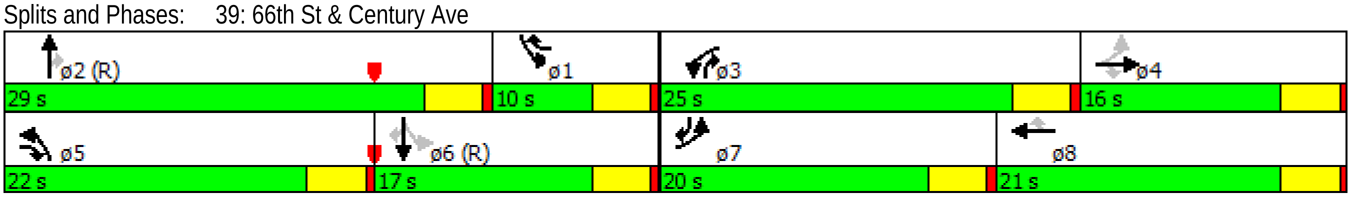
Intersection Summary			
HCM 2010 Ctrl Delay			29.0
HCM 2010 LOS			C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	105	540	505	105	35	540	375	505	35	375	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	200		150	435		335	435		335
Storage Lanes	1		1	2		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.680			0.950			0.950			0.512		
Satd. Flow (perm)	1267	3539	1583	3433	3539	1583	3433	3539	1583	954	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			177			123			517			123
Link Speed (mph)		35			30			40			55	
Link Distance (ft)		3124			1828			1667			1834	
Travel Time (s)		60.9			41.5			28.4			22.7	
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
Adj. Flow (vph)	38	114	587	549	114	38	587	408	549	38	408	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	114	587	549	114	38	587	408	549	38	408	38
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4			8			2	6		6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	1.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	5.0	8.0	8.0	20.0	8.0	8.0	20.0	8.0	8.0	8.0	8.0
Total Split (s)	20.0	16.0	22.0	25.0	21.0	10.0	22.0	29.0	25.0	10.0	17.0	20.0
Total Split (%)	25.0%	20.0%	27.5%	31.3%	26.3%	12.5%	27.5%	36.3%	31.3%	12.5%	21.3%	25.0%
Maximum Green (s)	16.0	12.0	18.0	21.0	17.0	6.0	18.0	25.0	21.0	6.0	13.0	16.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lag	Lead	Lead	Lead	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	13.3	7.9	29.7	18.3	21.6	27.4	19.8	37.7	58.5	20.0	20.0	30.5
Actuated g/C Ratio	0.17	0.10	0.37	0.23	0.27	0.34	0.25	0.47	0.73	0.25	0.25	0.38
v/c Ratio	0.15	0.33	0.84	0.70	0.12	0.06	0.69	0.24	0.42	0.13	0.46	0.06
Control Delay	17.3	35.6	27.1	33.1	21.6	0.2	36.6	12.8	1.9	30.2	30.3	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	35.6	27.1	33.1	21.6	0.2	36.6	12.8	1.9	30.2	30.3	0.1
LOS	B	D	C	C	C	A	D	B	A	C	C	A
Approach Delay		27.9			29.4			18.0			27.9	
Approach LOS		C			C			B			C	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 68 (85%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.84	
Intersection Signal Delay: 23.8	Intersection LOS: C
Intersection Capacity Utilization 68.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 39: 66th St & Century Ave



Min green cannot be less than 2 seconds, (Phase 4).

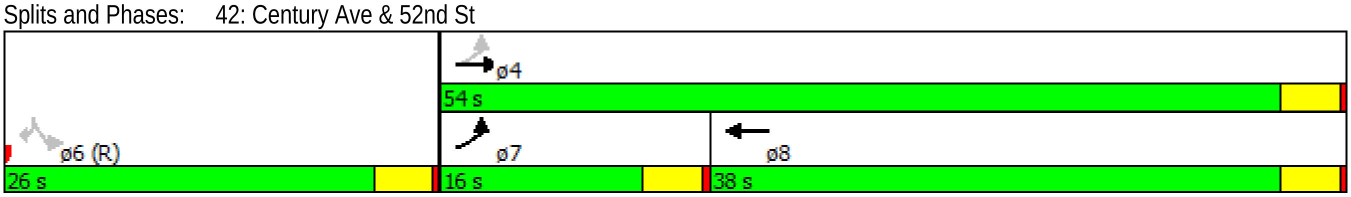
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	190	235	235	255	255	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435			335	200	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.930			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1732	0	1770	1583
Flt Permitted	0.132				0.950	
Satd. Flow (perm)	246	1863	1732	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			85			207
Link Speed (mph)		35	35		35	
Link Distance (ft)		1005	2634		1277	
Travel Time (s)		19.6	51.3		24.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	255	255	277	277	207
Shared Lane Traffic (%)						
Lane Group Flow (vph)	207	255	532	0	277	207
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	4				6	6
Detector Phase	7	4	8		6	6

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	8.0	20.0	20.0		20.0	20.0
Total Split (s)	16.0	54.0	38.0		26.0	26.0
Total Split (%)	20.0%	67.5%	47.5%		32.5%	32.5%
Maximum Green (s)	12.0	50.0	34.0		22.0	22.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Max	C-Max
Act Effct Green (s)	42.3	42.3	27.0		29.7	29.7
Actuated g/C Ratio	0.53	0.53	0.34		0.37	0.37
v/c Ratio	0.60	0.26	0.83		0.42	0.29
Control Delay	18.8	9.9	31.7		24.9	6.2
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	18.8	9.9	31.7		24.9	6.2
LOS	B	A	C		C	A
Approach Delay		13.9	31.7		16.9	
Approach LOS		B	C		B	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 12 (15%), Referenced to phase 2: and 6:SBL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 21.3 — Intersection LOS: C
Intersection Capacity Utilization 62.6% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 42: Century Ave & 52nd St



HCM 2010 Research does not support Non-NEMA phasing.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	100	0	140	65	1335	0	0	420	945
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	300		0	0		300
Storage Lanes	0		0	0		1	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950		0.950					
Satd. Flow (prot)	0	0	0	0	1770	1583	1770	3539	0	0	3539	1583
Flt Permitted					0.950		0.489					
Satd. Flow (perm)	0	0	0	0	1770	1583	911	3539	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						80						1027
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		1062			1032			387			1667	
Travel Time (s)		18.1			17.6			6.6			28.4	
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
Adj. Flow (vph)	0	0	0	109	0	152	71	1451	0	0	457	1027
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	109	152	71	1451	0	0	457	1027
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2	1	1	2			2	1
Detector Template				Left	Thru	Right	Left	Thru			Thru	Right
Leading Detector (ft)				20	100	20	20	100			100	20
Trailing Detector (ft)				0	0	0	0	0			0	0
Detector 1 Position(ft)				0	0	0	0	0			0	0
Detector 1 Size(ft)				20	6	20	20	6			6	20
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0	0.0	0.0			0.0	0.0
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Perm	NA	Perm	Perm	NA			NA	Perm
Protected Phases					8			2			6	
Permitted Phases				8		8	2					6
Detector Phase				8	8	8	2	2			6	6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)				4.0	4.0	4.0	4.0	4.0			4.0	4.0
Minimum Split (s)				8.0	8.0	8.0	8.0	8.0			8.0	8.0
Total Split (s)				17.0	17.0	17.0	63.0	63.0			63.0	63.0
Total Split (%)				21.3%	21.3%	21.3%	78.8%	78.8%			78.8%	78.8%
Maximum Green (s)				13.0	13.0	13.0	59.0	59.0			59.0	59.0
Yellow Time (s)				3.5	3.5	3.5	3.5	3.5			3.5	3.5
All-Red Time (s)				0.5	0.5	0.5	0.5	0.5			0.5	0.5
Lost Time Adjust (s)					0.0	0.0	0.0	0.0			0.0	0.0
Total Lost Time (s)					4.0	4.0	4.0	4.0			4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0	3.0	3.0			3.0	3.0
Recall Mode				None	None	None	C-Max	C-Max			C-Max	C-Max
Act Effct Green (s)					10.0	10.0	62.0	62.0			62.0	62.0
Actuated g/C Ratio					0.12	0.12	0.78	0.78			0.78	0.78
v/c Ratio					0.50	0.57	0.10	0.53			0.17	0.70
Control Delay					39.8	25.0	3.8	9.4			1.9	4.9
Queue Delay					0.0	0.0	0.0	0.0			0.0	0.0
Total Delay					39.8	25.0	3.8	9.4			1.9	4.9
LOS					D	C	A	A			A	A
Approach Delay					31.2			9.2			4.0	
Approach LOS					C			A			A	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 22 (28%), Referenced to phase 2:NBTL and 6:SBT, Start of Green

Natural Cycle: 60

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.70

Intersection Signal Delay: 8.6 Intersection LOS: A

Intersection Capacity Utilization 113.5% ICU Level of Service H

Analysis Period (min) 15

Splits and Phases: 50: 66th St & I94 N Ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	100	0	140	65	1335	0	0	420	945
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1900	1863	1863	1863	1863	0	0	1863	1863
Adj Flow Rate, veh/h				109	0	27	71	1451	0	0	457	0
Adj No. of Lanes				0	1	1	1	2	0	0	2	1
Peak Hour Factor				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	0	0	2	2
Cap, veh/h				149	0	133	850	2888	0	0	2888	1292
Arrive On Green				0.08	0.00	0.08	0.82	0.82	0.00	0.00	1.00	0.00
Sat Flow, veh/h				1774	0	1583	931	3632	0	0	3632	1583
Grp Volume(v), veh/h				109	0	27	71	1451	0	0	457	0
Grp Sat Flow(s),veh/h/ln				1774	0	1583	931	1770	0	0	1770	1583
Q Serve(g_s), s				4.8	0.0	1.3	1.2	10.2	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s				4.8	0.0	1.3	1.2	10.2	0.0	0.0	0.0	0.0
Prop In Lane				1.00		1.00	1.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				149	0	133	850	2888	0	0	2888	1292
V/C Ratio(X)				0.73	0.00	0.20	0.08	0.50	0.00	0.00	0.16	0.00
Avail Cap(c_a), veh/h				288	0	257	850	2888	0	0	2888	1292
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.67	1.67
Upstream Filter(I)				1.00	0.00	1.00	1.00	1.00	0.00	0.00	0.66	0.00
Uniform Delay (d), s/veh				35.8	0.0	34.2	1.5	2.3	0.0	0.0	0.0	0.0
Incr Delay (d2), s/veh				6.8	0.0	0.7	0.2	0.6	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				2.6	0.0	0.6	0.3	5.1	0.0	0.0	0.0	0.0
LnGrp Delay(d),s/veh				42.6	0.0	34.9	1.7	2.9	0.0	0.0	0.1	0.0
LnGrp LOS				D		C	A	A			A	
Approach Vol, veh/h					136			1522			457	
Approach Delay, s/veh					41.0			2.9			0.1	
Approach LOS					D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		69.3				69.3		10.7
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		59.0				59.0		13.0
Max Q Clear Time (g_c+I1), s		12.2				2.0		6.8
Green Ext Time (p_c), s		22.1				23.9		0.3

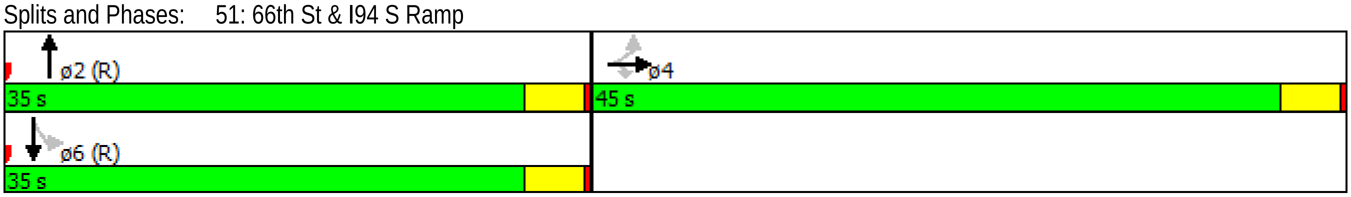
Intersection Summary			
HCM 2010 Ctrl Delay			4.7
HCM 2010 LOS			A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1015	0	205	0	0	0	0	385	130	130	390	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		200	0		0	0		0	300		0
Storage Lanes	1		1	0		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.91	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.994	0.850					0.962				
Flt Protected	0.950	0.954								0.950		
Satd. Flow (prot)	1681	1607	1504	0	0	0	0	3405	0	1770	3539	0
Flt Permitted	0.950	0.954								0.388		
Satd. Flow (perm)	1681	1607	1504	0	0	0	0	3405	0	723	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		14	201					68				
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		1070			1040			3104			434	
Travel Time (s)		18.2			17.7			52.9			7.4	
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
Adj. Flow (vph)	1103	0	223	0	0	0	0	418	141	141	424	0
Shared Lane Traffic (%)	49%		10%									
Lane Group Flow (vph)	563	562	201	0	0	0	0	559	0	141	424	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1					2		1	2	
Detector Template	Left	Thru	Right					Thru		Left	Thru	
Leading Detector (ft)	20	100	20					100		20	100	
Trailing Detector (ft)	0	0	0					0		0	0	
Detector 1 Position(ft)	0	0	0					0		0	0	
Detector 1 Size(ft)	20	6	20					6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex					Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type	Perm	NA	Perm					NA		Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4		4							6		
Detector Phase	4	4	4					2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0					20.0		20.0	20.0	
Total Split (s)	45.0	45.0	45.0					35.0		35.0	35.0	
Total Split (%)	56.3%	56.3%	56.3%					43.8%		43.8%	43.8%	
Maximum Green (s)	41.0	41.0	41.0					31.0		31.0	31.0	
Yellow Time (s)	3.5	3.5	3.5					3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5					0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0					0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0					4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0	3.0					3.0		3.0	3.0	
Recall Mode	None	None	None					C-Max		C-Max	C-Max	
Act Effct Green (s)	35.4	35.4	35.4					36.6		36.6	36.6	
Actuated g/C Ratio	0.44	0.44	0.44					0.46		0.46	0.46	
v/c Ratio	0.76	0.78	0.26					0.35		0.43	0.26	
Control Delay	25.3	26.3	2.6					14.1		16.9	10.7	
Queue Delay	0.0	0.0	0.0					0.0		0.0	0.0	
Total Delay	25.3	26.3	2.6					14.1		16.9	10.7	
LOS	C	C	A					B		B	B	
Approach Delay		22.3						14.1			12.2	
Approach LOS		C						B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 36 (45%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.78	
Intersection Signal Delay: 18.1	Intersection LOS: B
Intersection Capacity Utilization 113.5%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 51: 66th St & I94 S Ramp



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1015	0	205	0	0	0	0	385	130	130	390	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	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
Parking Bus, Adj	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	1863				0	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	1172	0	149				0	418	141	141	424	0
Adj No. of Lanes	2	0	1				0	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2				0	2	2	2	2	0
Cap, veh/h	1375	0	614				0	1337	446	444	1814	0
Arrive On Green	0.39	0.00	0.39				0.00	0.51	0.51	0.51	0.51	0.00
Sat Flow, veh/h	3548	0	1583				0	2701	871	847	3632	0
Grp Volume(v), veh/h	1172	0	149				0	282	277	141	424	0
Grp Sat Flow(s),veh/h/ln	1774	0	1583				0	1770	1709	847	1770	0
Q Serve(g_s), s	24.2	0.0	5.1				0.0	7.4	7.5	9.3	5.3	0.0
Cycle Q Clear(g_c), s	24.2	0.0	5.1				0.0	7.4	7.5	16.8	5.3	0.0
Prop In Lane	1.00		1.00				0.00		0.51	1.00		0.00
Lane Grp Cap(c), veh/h	1375	0	614				0	907	876	444	1814	0
V/C Ratio(X)	0.85	0.00	0.24				0.00	0.31	0.32	0.32	0.23	0.00
Avail Cap(c_a), veh/h	1818	0	811				0	907	876	444	1814	0
HCM Platoon Ratio	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				0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	22.4	0.0	16.6				0.0	11.3	11.3	16.2	10.8	0.0
Incr Delay (d2), s/veh	3.2	0.0	0.2				0.0	0.9	0.9	1.9	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0				0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	12.3	0.0	2.3				0.0	3.8	3.8	2.4	2.7	0.0
LnGrp Delay(d),s/veh	25.6	0.0	16.8				0.0	12.2	12.3	18.1	11.1	0.0
LnGrp LOS	C		B					B	B	B	B	
Approach Vol, veh/h		1321						559			565	
Approach Delay, s/veh		24.6						12.2			12.9	
Approach LOS		C						B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		
Phs Duration (G+Y+Rc), s		45.0		35.0		45.0		
Change Period (Y+Rc), s		4.0		4.0		4.0		
Max Green Setting (Gmax), s		31.0		41.0		31.0		
Max Q Clear Time (g_c+I1), s		9.5		26.2		18.8		
Green Ext Time (p_c), s		7.0		4.8		5.3		

Intersection Summary	
HCM 2010 Ctrl Delay	19.1
HCM 2010 LOS	B

Notes
User approved volume balancing among the lanes for turning movement.

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	155	275	5	20	275	80	5	15	20	80	15	155
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	200		200	0		0	200		200
Storage Lanes	1		0	1		1	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998				0.850		0.931				0.850
Flt Protected	0.950			0.950				0.994			0.959	
Satd. Flow (prot)	1770	1859	0	1770	1863	1583	0	1724	0	0	1786	1583
Flt Permitted	0.950			0.950				0.994			0.959	
Satd. Flow (perm)	1770	1859	0	1770	1863	1583	0	1724	0	0	1786	1583
Link Speed (mph)		55			55			25			55	
Link Distance (ft)		352			701			425			279	
Travel Time (s)		4.4			8.7			11.6			3.5	
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
Adj. Flow (vph)	168	299	5	22	299	87	5	16	22	87	16	168
Shared Lane Traffic (%)												
Lane Group Flow (vph)	168	304	0	22	299	87	0	43	0	0	103	168
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary

Area Type: Other

Control Type: Unsignalized

Intersection Capacity Utilization 44.9% ICU Level of Service A

Analysis Period (min) 15

Intersection	
Int Delay, s/veh	7.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Vol, veh/h	155	275	5	20	275	80	5	15	20	80	15	155
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	165	-	-	200	-	200	-	-	-	-	-	200
Veh in Median Storage, #	-	0	-	-	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	168	299	5	22	299	87	5	16	22	87	16	168

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	299	0	0	304	0	0	990	981	302	1000	983	299
Stage 1	-	-	-	-	-	-	639	639	-	342	342	-
Stage 2	-	-	-	-	-	-	351	342	-	658	641	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1262	-	-	1257	-	-	225	249	738	222	249	741
Stage 1	-	-	-	-	-	-	464	470	-	673	638	-
Stage 2	-	-	-	-	-	-	666	638	-	453	469	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1262	-	-	1257	-	-	145	212	738	180	212	741
Mov Cap-2 Maneuver	-	-	-	-	-	-	145	212	-	180	212	-
Stage 1	-	-	-	-	-	-	402	407	-	583	627	-
Stage 2	-	-	-	-	-	-	492	627	-	366	407	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	3	0.4	18.9	24.9
HCM LOS			C	C

Minor Lane/Major Mvmt	NELn1	NWL	NWT	NWR	SEL	SET	SER	SWLn1	SWLn2
Capacity (veh/h)	302	1257	-	-	1262	-	-	184	741
HCM Lane V/C Ratio	0.144	0.017	-	-	0.134	-	-	0.561	0.227
HCM Control Delay (s)	18.9	7.9	-	-	8.3	-	-	47	11.3
HCM Lane LOS	C	A	-	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0.5	-	-	3	0.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	265	10	50	265	35	10	5	50	35	5	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.986			0.896			0.972	
Flt Protected		0.998			0.993			0.992			0.966	
Satd. Flow (prot)	0	1850	0	0	1824	0	0	1656	0	0	1749	0
Flt Permitted		0.998			0.993			0.992			0.966	
Satd. Flow (perm)	0	1850	0	0	1824	0	0	1656	0	0	1749	0
Link Speed (mph)		55			55			45			45	
Link Distance (ft)		5300			2635			5293			1422	
Travel Time (s)		65.7			32.7			80.2			21.5	
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
Adj. Flow (vph)	11	288	11	54	288	38	11	5	54	38	5	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	310	0	0	380	0	0	70	0	0	54	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 53.3%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	2.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	265	10	50	265	35	10	5	50	35	5	10
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	-	-	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	11	288	11	54	288	38	11	5	54	38	5	11

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	326	0	0	299	0	0	739	750	293	761	737	307
Stage 1	-	-	-	-	-	-	315	315	-	416	416	-
Stage 2	-	-	-	-	-	-	424	435	-	345	321	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1234	-	-	1262	-	-	333	340	746	322	346	733
Stage 1	-	-	-	-	-	-	696	656	-	614	592	-
Stage 2	-	-	-	-	-	-	608	580	-	671	652	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1234	-	-	1262	-	-	308	318	746	280	324	733
Mov Cap-2 Maneuver	-	-	-	-	-	-	308	318	-	280	324	-
Stage 1	-	-	-	-	-	-	688	649	-	607	561	-
Stage 2	-	-	-	-	-	-	562	549	-	610	645	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	1.1	12.3	18.3
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	564	1234	-	-	1262	-	-	325
HCM Lane V/C Ratio	0.125	0.009	-	-	0.043	-	-	0.167
HCM Control Delay (s)	12.3	7.9	0	-	8	0	-	18.3
HCM Lane LOS	B	A	A	-	A	A	-	C
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	0.6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	55	155	125	65	155	25	125	25	65	25	25	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		335	0		0	435		0	0		0
Storage Lanes	0		1	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.986			0.891			0.929	
Flt Protected		0.987			0.987		0.950				0.988	
Satd. Flow (prot)	0	1839	1583	0	1813	0	1770	1660	0	0	1710	0
Flt Permitted		0.987			0.987		0.950				0.988	
Satd. Flow (perm)	0	1839	1583	0	1813	0	1770	1660	0	0	1710	0
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2619			2651			2952			3887	
Travel Time (s)		32.5			32.9			36.6			48.2	
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
Adj. Flow (vph)	60	168	136	71	168	27	136	27	71	27	27	60
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	228	136	0	266	0	136	98	0	0	114	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type:	Other
Control Type: Unsignalized	
Intersection Capacity Utilization 48.1%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	7.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	55	155	125	65	155	25	125	25	65	25	25	55
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	-	-	335	-	-	-	435	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	60	168	136	71	168	27	136	27	71	27	27	60

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	196	0	0	168	0	0	655	625	168	660	611	182
Stage 1	-	-	-	-	-	-	288	288	-	323	323	-
Stage 2	-	-	-	-	-	-	367	337	-	337	288	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1377	-	-	1410	-	-	379	401	876	376	409	861
Stage 1	-	-	-	-	-	-	720	674	-	689	650	-
Stage 2	-	-	-	-	-	-	653	641	-	677	674	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1377	-	-	1410	-	-	306	358	876	299	365	861
Mov Cap-2 Maneuver	-	-	-	-	-	-	306	358	-	299	365	-
Stage 1	-	-	-	-	-	-	682	638	-	652	613	-
Stage 2	-	-	-	-	-	-	548	604	-	564	638	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.3	2	19.9	14.7
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	306	625	1377	-	-	1410	-	-	486
HCM Lane V/C Ratio	0.444	0.157	0.043	-	-	0.05	-	-	0.235
HCM Control Delay (s)	25.8	11.8	7.7	0	-	7.7	0	-	14.7
HCM Lane LOS	D	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	2.2	0.6	0.1	-	-	0.2	-	-	0.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	5	0	135	10	0	0	135	180	10	0	180	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.869						0.996			0.997	
Flt Protected		0.998			0.950			0.980				
Satd. Flow (prot)	0	1615	0	0	1770	0	0	1818	0	0	1857	0
Flt Permitted		0.998			0.950			0.980				
Satd. Flow (perm)	0	1615	0	0	1770	0	0	1818	0	0	1857	0
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		5285			2119			7040			5267	
Travel Time (s)		65.5			26.3			87.3			65.3	
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
Adj. Flow (vph)	5	0	147	11	0	0	147	196	11	0	196	5
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	152	0	0	11	0	0	354	0	0	201	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 45.8%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	4.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	5	0	135	10	0	0	135	180	10	0	180	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	5	0	147	11	0	0	147	196	11	0	196	5

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	693	698	198	767	696	201	201	0	0	207	0	0
Stage 1	198	198	-	495	495	-	-	-	-	-	-	-
Stage 2	495	500	-	272	201	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	358	364	843	319	365	840	1371	-	-	1364	-	-
Stage 1	804	737	-	556	546	-	-	-	-	-	-	-
Stage 2	556	543	-	734	735	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	325	320	843	239	321	840	1371	-	-	1364	-	-
Mov Cap-2 Maneuver	325	320	-	239	321	-	-	-	-	-	-	-
Stage 1	707	737	-	489	480	-	-	-	-	-	-	-
Stage 2	489	477	-	606	735	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.6	20.8	3.3	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1371	-	-	798	239	1364	-	-
HCM Lane V/C Ratio	0.107	-	-	0.191	0.045	-	-	-
HCM Control Delay (s)	7.9	0	-	10.6	20.8	0	-	-
HCM Lane LOS	A	A	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	0.7	0.1	0	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	75	5	80	5	5	5	80	100	5	5	100	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.932			0.955			0.997			0.944	
Flt Protected		0.977			0.984			0.979			0.999	
Satd. Flow (prot)	0	1696	0	0	1750	0	0	1818	0	0	1757	0
Flt Permitted		0.977			0.984			0.979			0.999	
Satd. Flow (perm)	0	1696	0	0	1750	0	0	1818	0	0	1757	0
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		2646			1552			2625			3662	
Travel Time (s)		32.8			19.2			32.5			45.4	
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
Adj. Flow (vph)	82	5	87	5	5	5	87	109	5	5	109	82
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	174	0	0	15	0	0	201	0	0	196	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Free			Free			Stop			Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 44.3%	ICU Level of Service A
Analysis Period (min) 15	

Intersection												
Int Delay, s/veh	10.2											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	75	5	80	5	5	5	80	100	5	5	100	75
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	-	-	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	5	87	5	5	5	87	109	5	5	109	82

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	11	0	0	92	0	0	326	234	49	288	274	8
Stage 1	-	-	-	-	-	-	212	212	-	19	19	-
Stage 2	-	-	-	-	-	-	114	22	-	269	255	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1608	-	-	1503	-	-	627	666	1020	664	633	1074
Stage 1	-	-	-	-	-	-	790	727	-	1000	880	-
Stage 2	-	-	-	-	-	-	891	877	-	737	696	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1608	-	-	1503	-	-	477	628	1020	549	597	1074
Mov Cap-2 Maneuver	-	-	-	-	-	-	477	628	-	549	597	-
Stage 1	-	-	-	-	-	-	747	688	-	946	877	-
Stage 2	-	-	-	-	-	-	719	874	-	584	658	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	3.4	2.5	15.1	11.7
HCM LOS			C	B

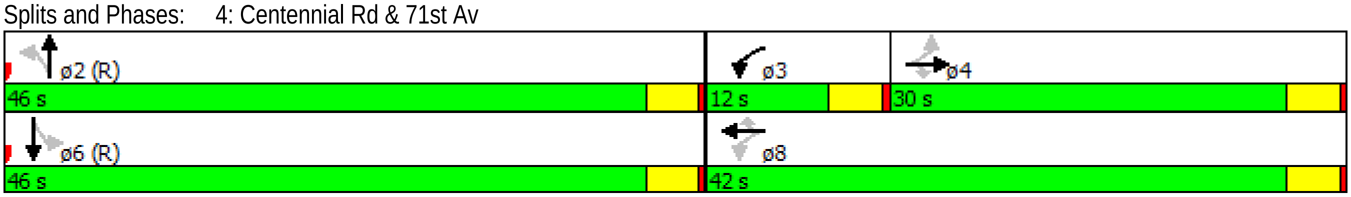
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	557	1608	-	-	1503	-	-	730
HCM Lane V/C Ratio	0.361	0.051	-	-	0.004	-	-	0.268
HCM Control Delay (s)	15.1	7.4	0	-	7.4	0	-	11.7
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.6	0.2	-	-	0	-	-	1.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	50	160	225	95	160	25	225	50	95	25	50	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	200		200	200		200	0		0
Storage Lanes	1		1	1		1	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850		0.902			0.946	
Flt Protected	0.950			0.950			0.950				0.990	
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	1770	1680	0	0	1745	0
Flt Permitted	0.647			0.361			0.700				0.938	
Satd. Flow (perm)	1205	1863	1583	672	1863	1583	1304	1680	0	0	1653	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			245			27		103			52	
Link Speed (mph)		55			55			55			30	
Link Distance (ft)		697			1365			751			2296	
Travel Time (s)		8.6			16.9			9.3			52.2	
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
Adj. Flow (vph)	54	174	245	103	174	27	245	54	103	27	54	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	54	174	245	103	174	27	245	157	0	0	135	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4		4	8		8	2			6		
Detector Phase	4	4	4	3	8	8	2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0	20.0	20.0	20.0		20.0	20.0	
Total Split (s)	30.0	30.0	30.0	12.0	42.0	42.0	46.0	46.0		46.0	46.0	
Total Split (%)	34.1%	34.1%	34.1%	13.6%	47.7%	47.7%	52.3%	52.3%		52.3%	52.3%	
Maximum Green (s)	26.0	26.0	26.0	8.0	38.0	38.0	42.0	42.0		42.0	42.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0			4.0	
Lead/Lag	Lag	Lag	Lag	Lead								
Lead-Lag Optimize?	Yes	Yes	Yes	Yes								
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0	11.0	11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0	0		0	0	0	0		0	0	
Act Effct Green (s)	13.9	13.9	13.9	23.5	23.5	23.5	56.5	56.5			56.5	
Actuated g/C Ratio	0.16	0.16	0.16	0.27	0.27	0.27	0.64	0.64			0.64	
v/c Ratio	0.29	0.59	0.54	0.37	0.35	0.06	0.29	0.14			0.12	
Control Delay	34.9	42.1	8.9	26.4	26.1	7.9	9.8	3.7			5.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			0.0	
Total Delay	34.9	42.1	8.9	26.4	26.1	7.9	9.8	3.7			5.5	
LOS	C	D	A	C	C	A	A	A			A	
Approach Delay		24.1			24.6			7.4			5.5	
Approach LOS		C			C			A			A	

Intersection Summary	
Area Type: Other	
Cycle Length: 88	
Actuated Cycle Length: 88	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 17.2	Intersection LOS: B
Intersection Capacity Utilization 46.6%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 4: Centennial Rd & 71st Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	50	160	225	95	160	25	225	50	95	25	50	50
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	1863	1863	1863	1863	1863	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	54	174	245	103	174	27	245	54	103	27	54	54
Adj No. of Lanes	1	1	1	1	1	1	1	1	0	0	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	311	363	308	300	563	478	875	348	665	213	422	391
Arrive On Green	0.19	0.19	0.19	0.06	0.30	0.30	0.61	0.61	0.61	0.61	0.61	0.61
Sat Flow, veh/h	1177	1863	1583	1774	1863	1583	1280	574	1095	270	695	643
Grp Volume(v), veh/h	54	174	245	103	174	27	245	0	157	135	0	0
Grp Sat Flow(s),veh/h/ln	1177	1863	1583	1774	1863	1583	1280	0	1669	1609	0	0
Q Serve(g_s), s	3.4	7.3	13.0	3.9	6.3	1.1	3.9	0.0	3.6	0.0	0.0	0.0
Cycle Q Clear(g_c), s	3.4	7.3	13.0	3.9	6.3	1.1	6.8	0.0	3.6	2.9	0.0	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.66	0.20		0.40
Lane Grp Cap(c), veh/h	311	363	308	300	563	478	875	0	1013	1025	0	0
V/C Ratio(X)	0.17	0.48	0.80	0.34	0.31	0.06	0.28	0.00	0.15	0.13	0.00	0.00
Avail Cap(c_a), veh/h	429	550	468	351	804	684	875	0	1013	1025	0	0
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	29.9	31.5	33.8	24.8	23.6	21.8	8.0	0.0	7.5	7.4	0.0	0.0
Incr Delay (d2), s/veh	0.3	1.0	5.4	0.7	0.3	0.0	0.8	0.0	0.3	0.3	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	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	1.1	3.9	6.1	1.9	3.3	0.5	3.0	0.0	1.7	1.5	0.0	0.0
LnGrp Delay(d),s/veh	30.2	32.5	39.2	25.5	23.9	21.8	8.8	0.0	7.8	7.6	0.0	0.0
LnGrp LOS	C	C	D	C	C	C	A		A	A		
Approach Vol, veh/h		473			304			402			135	
Approach Delay, s/veh		35.7			24.3			8.4			7.6	
Approach LOS		D			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6		8
Phs Duration (G+Y+Rc), s		57.4	9.5	21.1		57.4		30.6
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0		4.0
Max Green Setting (Gmax), s		42.0	8.0	26.0		42.0		38.0
Max Q Clear Time (g_c+I1), s		8.8	5.9	15.0		4.9		8.3
Green Ext Time (p_c), s		2.5	0.0	2.2		2.5		2.8

Intersection Summary			
HCM 2010 Ctrl Delay			21.8
HCM 2010 LOS			C

Lane Group	SEL	SET	NWT	NWR	SWL	SWR
Lane Configurations						
Volume (vph)	240	115	115	100	100	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435			335	200	200
Storage Lanes	1			1	0	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1770	1863	1863	1583	1770	1583
Link Speed (mph)		30	30		30	
Link Distance (ft)		1402	2054		1237	
Travel Time (s)		31.9	46.7		28.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	261	125	125	109	109	261
Shared Lane Traffic (%)						
Lane Group Flow (vph)	261	125	125	109	109	261
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 32.2%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	7.4

Movement	SEL	SET	NWT	NWR	SWL	SWR
Vol, veh/h	240	115	115	100	100	240
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	435	-	-	335	-	200
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	261	125	125	109	109	261

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	125	0	-	0	772	125
Stage 1	-	-	-	-	125	-
Stage 2	-	-	-	-	647	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1462	-	-	-	368	926
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	521	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1462	-	-	-	302	926
Mov Cap-2 Maneuver	-	-	-	-	302	-
Stage 1	-	-	-	-	901	-
Stage 2	-	-	-	-	428	-

Approach	SE	NW	SW
HCM Control Delay, s	5.4	0	14.3
HCM LOS			B

Minor Lane/Major Mvmt	NWT	NWR	SEL	SET	SWLn1	SWLn2
Capacity (veh/h)	-	-	1462	-	302	926
HCM Lane V/C Ratio	-	-	0.178	-	0.36	0.282
HCM Control Delay (s)	-	-	8	-	23.5	10.4
HCM Lane LOS	-	-	A	-	C	B
HCM 95th %tile Q(veh)	-	-	0.6	-	1.6	1.2

1: 66th St & I94 N Ramp Performance by movement

Movement	WBL	WBR	NBT	NBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.1	0.8	1.1
Total Delay (hr)	1.0	0.7	2.0	0.1	0.3	2.5	6.6

2: 66th St & I94 S Ramp Performance by movement

Movement	EBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.4	0.3	0.1	0.2	0.1	0.9

3: 66th St & S Ramp - EB Off Performance by movement

Movement	WBR	NBT	SBT	All
Denied Delay (hr)	0.6	0.0	0.0	0.6
Total Delay (hr)	4.2	0.1	0.2	4.5

Total Network Performance

Denied Delay (hr)	1.7
Total Delay (hr)	15.3

Arterial Level of Service: NB 66th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
I94 S Ramp	2	2.6	54.8	0.6	39
S Ramp - EB Off	3	0.8	3.6	0.0	34
I94 N Ramp	1	3.6	14.5	0.1	30
Total		7.0	72.8	0.7	37

Arterial Level of Service: SB 66th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
	1	3.0	18.0	0.2	33
S Ramp - EB Off	3	1.6	13.3	0.1	33
I94 S Ramp	2	0.8	3.3	0.0	36
Total		5.4	34.5	0.3	34

Intersection: 1: 66th St & I94 N Ramp

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	T	T	T	T
Maximum Queue (ft)	146	128	115	129	77	38
Average Queue (ft)	61	60	52	59	29	5
95th Queue (ft)	115	107	99	107	65	22
Link Distance (ft)	986		608	608	799	799
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		300				
Storage Blk Time (%)				0		
Queuing Penalty (veh)				0		

Intersection: 2: 66th St & I94 S Ramp

Movement	EB	NB	NB	SB	SB	SB
Directions Served	TR	T	TR	L	T	T
Maximum Queue (ft)	99	65	67	76	47	9
Average Queue (ft)	53	12	12	34	9	1
95th Queue (ft)	84	43	44	64	34	9
Link Distance (ft)	1022	3086	3086		113	113
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)				100		
Storage Blk Time (%)				0		
Queuing Penalty (veh)				0		

Intersection: 3: 66th St & S Ramp - EB Off

Movement	WB
Directions Served	R
Maximum Queue (ft)	592
Average Queue (ft)	204
95th Queue (ft)	456
Link Distance (ft)	653
Upstream Blk Time (%)	2
Queuing Penalty (veh)	0
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

1: 66th St & I94 N Ramp Performance by movement

Movement	WBL	WBR	NBT	NBR	SBT	SBR	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.1	0.8	1.0
Total Delay (hr)	1.0	0.7	1.8	0.1	0.3	2.5	6.3

2: 66th St & I94 S Ramp Performance by movement

Movement	EBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	0.3	0.2	0.1	0.1	0.1	0.9

3: 66th St & S Ramp - EB Off Performance by movement

Movement	WBR	NBT	SBT	All
Denied Delay (hr)	0.3	0.0	0.0	0.3
Total Delay (hr)	2.0	0.1	0.2	2.2

Total Network Performance

Denied Delay (hr)	1.4
Total Delay (hr)	12.7

Arterial Level of Service: NB 66th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
I94 S Ramp	2	2.2	54.8	0.6	39
S Ramp - EB Off	3	0.5	3.3	0.0	36
I94 N Ramp	1	3.8	14.8	0.1	30
Total		6.6	72.9	0.7	37

Arterial Level of Service: SB 66th St

Cross Street	Node	Delay (s/veh)	Travel time (s)	Dist (mi)	Arterial Speed
	1	2.9	17.7	0.2	34
S Ramp - EB Off	3	1.6	13.2	0.1	33
I94 S Ramp	2	0.7	3.2	0.0	37
Total		5.2	34.1	0.3	34

Intersection: 1: 66th St & I94 N Ramp

Movement	WB	WB	NB	NB	SB	SB
Directions Served	LT	R	T	T	T	T
Maximum Queue (ft)	134	122	114	124	91	38
Average Queue (ft)	61	57	49	61	28	4
95th Queue (ft)	114	98	101	105	69	20
Link Distance (ft)	986		608	608	799	799
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		300				
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 2: 66th St & I94 S Ramp

Movement	EB	NB	NB	SB	SB	SB
Directions Served	TR	T	TR	L	T	T
Maximum Queue (ft)	93	47	62	68	76	12
Average Queue (ft)	52	8	10	30	8	1
95th Queue (ft)	78	33	40	62	38	8
Link Distance (ft)	1022	3086	3086		113	113
Upstream Blk Time (%)					0	
Queuing Penalty (veh)					0	
Storage Bay Dist (ft)				100		
Storage Blk Time (%)					0	
Queuing Penalty (veh)					0	

Intersection: 3: 66th St & S Ramp - EB Off

Movement	WB
Directions Served	R
Maximum Queue (ft)	11
Average Queue (ft)	0
95th Queue (ft)	8
Link Distance (ft)	653
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	100	0	140	0	1335	0	0	420	945
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		300	300		0	0		400
Storage Lanes	0		0	0		1	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt						0.850						0.850
Flt Protected					0.950							
Satd. Flow (prot)	0	0	0	0	1770	1583	0	3539	0	0	3539	1583
Flt Permitted					0.950							
Satd. Flow (perm)	0	0	0	0	1770	1583	0	3539	0	0	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						76						1027
Link Speed (mph)		40			40			40			40	
Link Distance (ft)		1062			1032			177			1667	
Travel Time (s)		18.1			17.6			3.0			28.4	
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
Adj. Flow (vph)	0	0	0	109	0	152	0	1451	0	0	457	1027
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	109	152	0	1451	0	0	457	1027
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors				1	2	1		2			2	1
Detector Template				Left	Thru	Right		Thru			Thru	Right
Leading Detector (ft)				20	100	20		100			100	20
Trailing Detector (ft)				0	0	0		0			0	0
Detector 1 Position(ft)				0	0	0		0			0	0
Detector 1 Size(ft)				20	6	20		6			6	20
Detector 1 Type				Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex			Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)				0.0	0.0	0.0		0.0			0.0	0.0
Detector 1 Queue (s)				0.0	0.0	0.0		0.0			0.0	0.0
Detector 1 Delay (s)				0.0	0.0	0.0		0.0			0.0	0.0
Detector 2 Position(ft)					94			94			94	
Detector 2 Size(ft)					6			6			6	
Detector 2 Type					Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)					0.0			0.0			0.0	
Turn Type				Perm	NA	Perm		NA			NA	Perm
Protected Phases					8			2			6	
Permitted Phases				8		8						6
Detector Phase				8	8	8		2			6	6

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)				4.0	4.0	4.0		4.0			4.0	4.0
Minimum Split (s)				15.0	15.0	15.0		20.0			20.0	20.0
Total Split (s)				18.0	18.0	18.0		62.0			62.0	62.0
Total Split (%)				22.5%	22.5%	22.5%		77.5%			77.5%	77.5%
Maximum Green (s)				14.0	14.0	14.0		58.0			58.0	58.0
Yellow Time (s)				3.5	3.5	3.5		3.5			3.5	3.5
All-Red Time (s)				0.5	0.5	0.5		0.5			0.5	0.5
Lost Time Adjust (s)					0.0	0.0		0.0			0.0	0.0
Total Lost Time (s)					4.0	4.0		4.0			4.0	4.0
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)				3.0	3.0	3.0		3.0			3.0	3.0
Recall Mode				None	None	None		C-Max			C-Max	C-Max
Act Effct Green (s)					10.2	10.2		61.8			61.8	61.8
Actuated g/C Ratio					0.13	0.13		0.77			0.77	0.77
v/c Ratio					0.48	0.57		0.53			0.17	0.71
Control Delay					39.0	25.5		4.7			1.7	3.8
Queue Delay					0.0	0.0		0.0			0.0	0.0
Total Delay					39.0	25.5		4.7			1.7	3.8
LOS					D	C		A			A	A
Approach Delay					31.1			4.7			3.2	
Approach LOS					C			A			A	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 75 (94%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 6.1 Intersection LOS: A
Intersection Capacity Utilization 70.7% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 50: 66th St & I94 N Ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	100	0	140	0	1335	0	0	420	945
Number				3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh				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
Parking Bus, Adj				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln				1900	1863	1863	0	1863	0	0	1863	1863
Adj Flow Rate, veh/h				109	0	152	0	1451	0	0	457	0
Adj No. of Lanes				0	1	1	0	2	0	0	2	1
Peak Hour Factor				0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %				2	2	2	0	2	0	0	2	2
Cap, veh/h				218	0	195	0	2750	0	0	2750	1230
Arrive On Green				0.12	0.00	0.12	0.00	0.78	0.00	0.00	0.26	0.00
Sat Flow, veh/h				1774	0	1583	0	3725	0	0	3632	1583
Grp Volume(v), veh/h				109	0	152	0	1451	0	0	457	0
Grp Sat Flow(s),veh/h/ln				1774	0	1583	0	1770	0	0	1770	1583
Q Serve(g_s), s				4.6	0.0	7.5	0.0	12.4	0.0	0.0	8.0	0.0
Cycle Q Clear(g_c), s				4.6	0.0	7.5	0.0	12.4	0.0	0.0	8.0	0.0
Prop In Lane				1.00		1.00	0.00		0.00	0.00		1.00
Lane Grp Cap(c), veh/h				218	0	195	0	2750	0	0	2750	1230
V/C Ratio(X)				0.50	0.00	0.78	0.00	0.53	0.00	0.00	0.17	0.00
Avail Cap(c_a), veh/h				310	0	277	0	2750	0	0	2750	1230
HCM Platoon Ratio				1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.33
Upstream Filter(I)				1.00	0.00	1.00	0.00	1.00	0.00	0.00	0.62	0.00
Uniform Delay (d), s/veh				32.8	0.0	34.0	0.0	3.4	0.0	0.0	9.6	0.0
Incr Delay (d2), s/veh				1.8	0.0	8.8	0.0	0.7	0.0	0.0	0.1	0.0
Initial Q Delay(d3),s/veh				0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln				2.3	0.0	3.7	0.0	6.1	0.0	0.0	4.0	0.0
LnGrp Delay(d),s/veh				34.6	0.0	42.9	0.0	4.1	0.0	0.0	9.7	0.0
LnGrp LOS				C		D		A			A	
Approach Vol, veh/h					261			1451			457	
Approach Delay, s/veh					39.4			4.1			9.7	
Approach LOS					D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		66.2				66.2		13.8
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		58.0				58.0		14.0
Max Q Clear Time (g_c+I1), s		14.4				10.0		9.5
Green Ext Time (p_c), s		20.7				21.5		0.4

Intersection Summary			
HCM 2010 Ctrl Delay			9.5
HCM 2010 LOS			A

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	205	0	0	0	0	385	130	130	390	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	300		200	0		0	0		0	300		0
Storage Lanes	0		0	0		0	0		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00
Frt		0.865						0.962				
Flt Protected										0.950		
Satd. Flow (prot)	0	1611	0	0	0	0	0	3405	0	1770	3539	0
Flt Permitted										0.442		
Satd. Flow (perm)	0	1611	0	0	0	0	0	3405	0	823	3539	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		439						104				
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		1070			1040			3104			272	
Travel Time (s)		24.3			23.6			52.9			4.6	
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
Adj. Flow (vph)	0	0	223	0	0	0	0	418	141	141	424	0
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	223	0	0	0	0	0	559	0	141	424	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors		2						2		1	2	
Detector Template		Thru						Thru		Left	Thru	
Leading Detector (ft)		100						100		20	100	
Trailing Detector (ft)		0						0		0	0	
Detector 1 Position(ft)		0						0		0	0	
Detector 1 Size(ft)		6						6		20	6	
Detector 1 Type		Cl+Ex						Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)		0.0						0.0		0.0	0.0	
Detector 1 Queue (s)		0.0						0.0		0.0	0.0	
Detector 1 Delay (s)		0.0						0.0		0.0	0.0	
Detector 2 Position(ft)		94						94			94	
Detector 2 Size(ft)		6						6			6	
Detector 2 Type		Cl+Ex						Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0						0.0			0.0	
Turn Type		NA						NA		Perm	NA	
Protected Phases		4						2			6	
Permitted Phases										6		
Detector Phase		4						2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)		4.0						4.0		4.0	4.0	
Minimum Split (s)		8.0						8.0		8.0	8.0	
Total Split (s)		28.0						52.0		52.0	52.0	
Total Split (%)		35.0%						65.0%		65.0%	65.0%	
Maximum Green (s)		24.0						48.0		48.0	48.0	
Yellow Time (s)		3.5						3.5		3.5	3.5	
All-Red Time (s)		0.5						0.5		0.5	0.5	
Lost Time Adjust (s)		0.0						0.0		0.0	0.0	
Total Lost Time (s)		4.0						4.0		4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)		3.0						3.0		3.0	3.0	
Recall Mode		None						C-Max		C-Max	C-Max	
Act Effct Green (s)		5.5						66.5		66.5	66.5	
Actuated g/C Ratio		0.07						0.83		0.83	0.83	
v/c Ratio		0.43						0.20		0.21	0.14	
Control Delay		2.6						1.2		2.1	1.4	
Queue Delay		0.0						0.0		0.0	0.0	
Total Delay		2.6						1.2		2.1	1.4	
LOS		A						A		A	A	
Approach Delay		2.6						1.2			1.6	
Approach LOS		A						A			A	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green

Natural Cycle: 40

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.43

Intersection Signal Delay: 1.6 Intersection LOS: A

Intersection Capacity Utilization 72.8% ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 51: 66th St & I94 S Ramp

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	205	0	0	0	0	385	130	130	390	0
Number	7	4	14				5	2	12	1	6	16
Initial Q (Qb), veh	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
Parking Bus, Adj	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	0	1863	1900				0	1863	1900	1863	1863	0
Adj Flow Rate, veh/h	0	0	223				0	418	141	141	424	0
Adj No. of Lanes	0	1	0				0	2	0	1	2	0
Peak Hour Factor	0.92	0.92	0.92				0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	0	2	0				0	2	2	2	2	0
Cap, veh/h	0	0	0				0	2478	827	886	3362	0
Arrive On Green	0.00	0.00	0.00				0.00	0.95	0.95	0.95	0.95	0.00
Sat Flow, veh/h		0					0	2701	871	847	3632	0
Grp Volume(v), veh/h		0.0					0	282	277	141	424	0
Grp Sat Flow(s),veh/h/ln							0	1770	1709	847	1770	0
Q Serve(g_s), s							0.0	0.8	0.8	1.0	0.5	0.0
Cycle Q Clear(g_c), s							0.0	0.8	0.8	1.7	0.5	0.0
Prop In Lane							0.00		0.51	1.00		0.00
Lane Grp Cap(c), veh/h							0	1681	1624	886	3362	0
V/C Ratio(X)							0.00	0.17	0.17	0.16	0.13	0.00
Avail Cap(c_a), veh/h							0	1681	1624	886	3362	0
HCM Platoon Ratio							1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)							0.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh							0.0	0.1	0.1	0.2	0.1	0.0
Incr Delay (d2), s/veh							0.0	0.2	0.2	0.4	0.1	0.0
Initial Q Delay(d3),s/veh							0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln							0.0	0.4	0.4	0.3	0.3	0.0
LnGrp Delay(d),s/veh							0.0	0.3	0.3	0.6	0.2	0.0
LnGrp LOS								A	A	A	A	
Approach Vol, veh/h								559			565	
Approach Delay, s/veh								0.3			0.3	
Approach LOS								A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		
Phs Duration (G+Y+Rc), s		80.0				80.0		
Change Period (Y+Rc), s		4.0				4.0		
Max Green Setting (Gmax), s		48.0				48.0		
Max Q Clear Time (g_c+I1), s		2.8				3.7		
Green Ext Time (p_c), s		8.4				8.3		

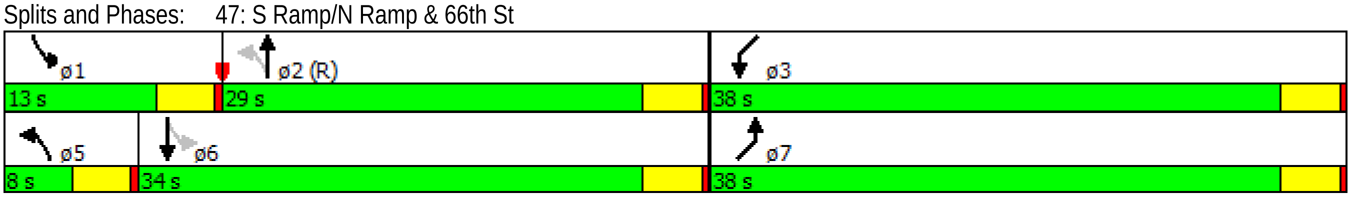
Intersection Summary	
HCM 2010 Ctrl Delay	0.3
HCM 2010 LOS	A

Lane Group	NBL	NBT	NBR2	SBL	SBT	SBR2	NEL	NER	SWL	SWR2
Lane Configurations										
Volume (vph)	65	385	130	130	390	945	1015	205	100	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500			500			500	0	500	
Storage Lanes	1			1			2	1	2	
Taper Length (ft)	25			25			25		25	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	1.00	0.97	1.00
Frt			0.850			0.850		0.850		0.850
Flt Protected	0.950			0.950			0.950		0.950	
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	1583	3433	1583
Flt Permitted	0.505			0.378			0.950		0.950	
Satd. Flow (perm)	941	3539	1583	704	3539	1583	3433	1583	3433	1583
Right Turn on Red			Yes			Yes				Yes
Satd. Flow (RTOR)			177			983				177
Link Speed (mph)		30			30					
Link Distance (ft)		2915			1183					
Travel Time (s)		66.3			26.9					
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	418	141	141	424	1027	1103	223	109	152
Shared Lane Traffic (%)										
Lane Group Flow (vph)	71	418	141	141	424	1027	1103	223	109	152
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Right	Left	Right
Median Width(ft)		12			12					
Link Offset(ft)		0			0					
Crosswalk Width(ft)		16			16					
Two way Left Turn Lane										
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15	9	15	9
Number of Detectors	1	2	1	1	2	1	1	1	1	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Right	Left	Right
Leading Detector (ft)	20	100	20	20	100	20	20	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel										
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94					
Detector 2 Size(ft)		6			6					
Detector 2 Type		Cl+Ex			Cl+Ex					
Detector 2 Channel										
Detector 2 Extend (s)		0.0			0.0					
Turn Type	pm+pt	NA	Free	pm+pt	NA	Free	Prot	Free	Prot	Free
Protected Phases	5!	2!		1	6!		7		3!	
Permitted Phases	2!		Free	6		Free		Free!		Free
Detector Phase	5	2		1	6		7		3	

Lane Group	NBL	NBT	NBR2	SBL	SBT	SBR2	NEL	NER	SWL	SWR2
Switch Phase										
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0		4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		20.0		8.0	
Total Split (s)	8.0	29.0		13.0	34.0		38.0		38.0	
Total Split (%)	10.0%	36.3%		16.3%	42.5%		47.5%		47.5%	
Maximum Green (s)	4.0	25.0		9.0	30.0		34.0		34.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5		3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5		0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0		0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0		4.0	
Lead/Lag	Lead	Lag		Lead	Lag					
Lead-Lag Optimize?	Yes	Yes		Yes	Yes					
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0		3.0	
Recall Mode	None	C-Max		None	Max		Max		None	
Act Effct Green (s)	29.7	25.7	80.0	38.0	31.6	80.0	34.0	80.0	28.4	80.0
Actuated g/C Ratio	0.37	0.32	1.00	0.48	0.40	1.00	0.42	1.00	0.36	1.00
v/c Ratio	0.18	0.37	0.09	0.32	0.30	0.65	0.76	0.14	0.09	0.10
Control Delay	13.3	22.2	0.1	11.3	14.9	3.1	23.6	0.2	14.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.3	22.2	0.1	11.3	14.9	3.1	23.6	0.2	14.7	0.1
LOS	B	C	A	B	B	A	C	A	B	A
Approach Delay		16.3			7.0					
Approach LOS		B			A					

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBTL, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.76	
Intersection Signal Delay: 12.9	Intersection LOS: B
Intersection Capacity Utilization 56.8%	ICU Level of Service B
Analysis Period (min) 15	
! Phase conflict between lane groups.	

Splits and Phases: 47: S Ramp/N Ramp & 66th St



HCM 2010 methodology does not support more than 4 approaches.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	165	385	555	330	385	135	555	155	330	135	155	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	0		200	0		300	250		250
Storage Lanes	0		1	1		1	1		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected		0.985		0.950	0.996		0.950	0.972		0.950	0.996	
Satd. Flow (prot)	0	3486	1583	1681	1763	1583	1681	1720	1583	1681	1763	1583
Flt Permitted		0.985		0.950	0.996		0.950	0.972		0.950	0.996	
Satd. Flow (perm)	0	3486	1583	1681	1763	1583	1681	1720	1583	1681	1763	1583
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1886			2644			4233			1227	
Travel Time (s)		28.6			40.1			52.5			15.2	
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
Adj. Flow (vph)	179	418	603	359	418	147	603	168	359	147	168	179
Shared Lane Traffic (%)				10%			37%			10%		
Lane Group Flow (vph)	0	597	603	323	454	147	380	391	359	132	183	179
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary	
Area Type: Other	
Control Type: Roundabout	
Intersection Capacity Utilization 76.6%	ICU Level of Service D
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	17.7
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1200	924	1130	494
Demand Flow Rate, veh/h	1224	942	1152	504
Vehicles Circulating, veh/h	687	969	759	1407
Vehicles Exiting, veh/h	1041	576	537	354
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	18.0	21.6	15.5	14.9
Approach LOS	C	C	C	B

Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Designated Moves	LT	TR	R	L	LTR	R	L	LTR	R	L	LTR	R
Assumed Moves	LT	TR	R	L	TR	R	L	LTR	R	L	TR	R
RT Channelized			Yield			Yield			Yield			Yield
Lane Util	0.470	0.530		0.462	0.538		0.531	0.469		0.467	0.533	
Critical Headway, s	4.293	4.113		4.293	4.113		4.293	4.113		4.293	4.113	
Entry Flow, veh/h	286	323	615	366	426	150	417	369	366	150	171	183
Cap Entry Lane, veh/h	675	699	776	546	573	882	639	664	755	393	422	545
Entry HV Adj Factor	0.981	0.979	0.980	0.981	0.980	0.980	0.979	0.982	0.980	0.980	0.980	0.980
Flow Entry, veh/h	280	316	603	359	418	147	408	362	359	147	168	179
Cap Entry, veh/h	662	684	761	536	562	865	626	652	740	385	414	535
V/C Ratio	0.424	0.462	0.793	0.670	0.743	0.170	0.652	0.556	0.485	0.381	0.405	0.335
Control Delay, s/veh	11.5	12.0	24.2	22.6	26.3	5.9	19.1	15.0	11.8	16.9	16.5	11.8
LOS	B	B	C	C	D	A	C	B	B	C	C	B
95th %tile Queue, veh	2	2	8	5	6	1	5	3	3	2	2	1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (vph)	80	80	140	130	80	85	140	145	130	85	145	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	435		335	435		0	435		335
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.937			0.961			0.958			0.965	
Flt Protected		0.987			0.978			0.983			0.987	
Satd. Flow (prot)	0	1723	0	0	1751	0	0	1754	0	0	1774	0
Flt Permitted		0.987			0.978			0.983			0.987	
Satd. Flow (perm)	0	1723	0	0	1751	0	0	1754	0	0	1774	0
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1838			5295			1723			4467	
Travel Time (s)		27.8			80.2			21.4			55.4	
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
Adj. Flow (vph)	87	87	152	141	87	92	152	158	141	92	158	87
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	326	0	0	320	0	0	451	0	0	337	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary	
Area Type: Other	
Control Type: Roundabout	
Intersection Capacity Utilization 68.0%	ICU Level of Service C
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	11.1
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	326	320	451	337
Demand Flow Rate, veh/h	333	327	460	344
Vehicles Circulating, veh/h	399	405	272	388
Vehicles Exiting, veh/h	333	327	460	344
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	10.8	10.7	11.7	10.9
Approach LOS	B	B	B	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	333	327	460	344
Cap Entry Lane, veh/h	758	754	861	767
Entry HV Adj Factor	0.980	0.979	0.980	0.979
Flow Entry, veh/h	326	320	451	337
Cap Entry, veh/h	743	738	844	751
V/C Ratio	0.439	0.434	0.534	0.449
Control Delay, s/veh	10.8	10.7	11.7	10.9
LOS	B	B	B	B
95th %tile Queue, veh	2	2	3	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	430	45	130	430	85	45	70	130	85	70	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		0	435		0	0		0	200		0
Storage Lanes	0		0	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.988			0.982			0.928			0.975	
Flt Protected		0.997			0.990			0.991			0.978	
Satd. Flow (prot)	0	1835	0	0	1811	0	0	1713	0	0	1776	0
Flt Permitted		0.997			0.990			0.991			0.978	
Satd. Flow (perm)	0	1835	0	0	1811	0	0	1713	0	0	1776	0
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2639			5241			3658			5279	
Travel Time (s)		40.0			79.4			55.4			80.0	
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
Adj. Flow (vph)	38	467	49	141	467	92	49	76	141	92	76	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	554	0	0	700	0	0	266	0	0	206	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary	
Area Type: Other	
Control Type: Roundabout	
Intersection Capacity Utilization 94.3%	ICU Level of Service F
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	16.1
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	554	700	266	206
Demand Flow Rate, veh/h	565	714	272	211
Vehicles Circulating, veh/h	316	167	609	670
Vehicles Exiting, veh/h	565	714	272	211
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	17.0	18.0	12.9	11.8
Approach LOS	C	C	B	B

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	565	714	272	211
Cap Entry Lane, veh/h	824	956	615	578
Entry HV Adj Factor	0.980	0.980	0.980	0.979
Flow Entry, veh/h	554	700	266	206
Cap Entry, veh/h	807	937	602	566
V/C Ratio	0.686	0.747	0.443	0.365
Control Delay, s/veh	17.0	18.0	12.9	11.8
LOS	C	C	B	B
95th %tile Queue, veh	6	7	2	2

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	405	210	200	405	80	210	40	200	80	40	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	435		335	435		335	435		335
Storage Lanes	0		1	1		0	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.975				0.850			0.850
Flt Protected		0.991		0.950				0.960			0.968	
Satd. Flow (prot)	0	1846	1583	1770	1816	0	0	1788	1583	0	1803	1583
Flt Permitted		0.991		0.950				0.960			0.968	
Satd. Flow (perm)	0	1846	1583	1770	1816	0	0	1788	1583	0	1803	1583
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		5241			5285			1425			901	
Travel Time (s)		79.4			80.1			17.7			11.2	
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
Adj. Flow (vph)	92	440	228	217	440	87	228	43	217	87	43	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	532	228	217	527	0	0	271	217	0	130	92
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary	
Area Type:	Other
Control Type: Roundabout	
Intersection Capacity Utilization 82.6%	ICU Level of Service E
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	11.2
Intersection LOS	B

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	760	744	488	222
Demand Flow Rate, veh/h	776	759	498	227
Vehicles Circulating, veh/h	354	371	632	903
Vehicles Exiting, veh/h	776	759	498	227
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	12.0	11.9	9.8	8.9
Approach LOS	B	B	A	A

Lane	Left	Right	Left	Right	Left	Right	Left	Right
Designated Moves	LT	R	L	TR	LT	R	LT	R
Assumed Moves	LT	R	L	TR	LT	R	LT	R
RT Channelized								
Lane Util	0.700	0.300	0.291	0.709	0.556	0.444	0.586	0.414
Critical Headway, s	4.293	4.113	4.293	4.113	4.293	4.113	4.293	4.113
Entry Flow, veh/h	543	233	221	538	277	221	133	94
Cap Entry Lane, veh/h	866	882	855	872	703	726	574	601
Entry HV Adj Factor	0.980	0.979	0.982	0.980	0.979	0.982	0.978	0.979
Flow Entry, veh/h	532	228	217	527	271	217	130	92
Cap Entry, veh/h	849	863	840	854	689	713	562	588
V/C Ratio	0.627	0.264	0.258	0.617	0.394	0.304	0.232	0.157
Control Delay, s/veh	14.2	7.0	7.1	13.9	10.6	8.8	9.5	8.0
LOS	B	A	A	B	B	A	A	A
95th %tile Queue, veh	5	1	1	4	2	1	1	1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	105	540	505	105	35	540	375	505	35	375	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		0	0		150	435		0	435		0
Storage Lanes	0		1	1		0	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	0.95	0.95	1.00	0.95	0.95	1.00	0.95	0.95	0.95
Frt		0.910	0.850		0.984				0.850		0.988	
Flt Protected		0.995		0.950	0.972		0.950	0.990			0.996	
Satd. Flow (prot)	0	1602	1504	1681	1693	0	1681	1752	1583	0	3483	0
Flt Permitted		0.995		0.950	0.972		0.950	0.990			0.996	
Satd. Flow (perm)	0	1602	1504	1681	1693	0	1681	1752	1583	0	3483	0
Link Speed (mph)		35			30			40			55	
Link Distance (ft)		3124			1292			1667			1524	
Travel Time (s)		60.9			29.4			28.4			18.9	
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
Adj. Flow (vph)	38	114	587	549	114	38	587	408	549	38	408	38
Shared Lane Traffic (%)			39%	36%			17%					
Lane Group Flow (vph)	0	381	358	351	350	0	487	508	549	0	484	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary

Area Type: Other

Control Type: Roundabout

Intersection Capacity Utilization 86.9% ICU Level of Service E

Analysis Period (min) 15

Intersection	
Intersection Delay, s/veh	17.7
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	2	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	739	701	1544	484
Demand Flow Rate, veh/h	754	715	1575	494
Vehicles Circulating, veh/h	1015	1054	194	1275
Vehicles Exiting, veh/h	754	155	1575	494
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	24.5	24.7	10.5	20.5
Approach LOS	C	C	B	C

Lane	Left	Right	Left	Right	Left	Right	Bypass	Left	Right
Designated Moves	LTR	R	L	LTR	L	LTR	R	LT	TR
Assumed Moves	LTR	R	L	LTR	L	LTR	R	LT	TR
RT Channelized							Yield		
Lane Util	0.469	0.531	0.530	0.470	0.530	0.470		0.470	0.530
Critical Headway, s	4.293	4.113	4.293	4.113	4.293	4.113		4.293	4.113
Entry Flow, veh/h	354	400	379	336	538	477	560	232	262
Cap Entry Lane, veh/h	528	555	513	540	977	986	1014	434	463
Entry HV Adj Factor	0.981	0.979	0.980	0.980	0.980	0.980	0.980	0.980	0.979
Flow Entry, veh/h	347	392	371	329	527	468	549	227	256
Cap Entry, veh/h	518	543	502	530	957	967	994	426	453
V/C Ratio	0.671	0.720	0.739	0.622	0.551	0.484	0.552	0.534	0.566
Control Delay, s/veh	23.3	25.4	28.5	20.4	11.0	9.6	10.8	20.4	20.6
LOS	C	D	D	C	B	A	B	C	C
95th %tile Queue, veh	5	6	6	4	3	3	3	3	3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Volume (vph)	50	160	225	95	160	25	225	50	95	25	50	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.930			0.988			0.965			0.946	
Flt Protected		0.994			0.983			0.970			0.990	
Satd. Flow (prot)	0	1722	0	0	1809	0	0	1744	0	0	1745	0
Flt Permitted		0.994			0.983			0.970			0.990	
Satd. Flow (perm)	0	1722	0	0	1809	0	0	1744	0	0	1745	0
Link Speed (mph)		55			55			30			55	
Link Distance (ft)		264			5300			751			5288	
Travel Time (s)		3.3			65.7			17.1			65.6	
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
Adj. Flow (vph)	54	174	245	103	174	27	245	54	103	27	54	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	473	0	0	304	0	0	402	0	0	135	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary	
Area Type: Other	
Control Type: Roundabout	
Intersection Capacity Utilization 68.1%	ICU Level of Service C
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	10.0
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	473	304	402	135
Demand Flow Rate, veh/h	482	310	410	138
Vehicles Circulating, veh/h	188	360	260	532
Vehicles Exiting, veh/h	482	310	410	138
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	10.6	9.6	10.3	8.0
Approach LOS	B	A	B	A

Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	482	310	410	138
Cap Entry Lane, veh/h	936	788	871	664
Entry HV Adj Factor	0.980	0.979	0.980	0.978
Flow Entry, veh/h	473	304	402	135
Cap Entry, veh/h	918	772	854	649
V/C Ratio	0.515	0.393	0.471	0.208
Control Delay, s/veh	10.6	9.6	10.3	8.0
LOS	B	A	B	A
95th %tile Queue, veh	3	2	3	1

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	190	235	235	255	255	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435			335	200	0
Storage Lanes	0			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.930		0.942	
Flt Protected		0.978			0.972	
Satd. Flow (prot)	0	1822	1732	0	1706	0
Flt Permitted		0.978			0.972	
Satd. Flow (perm)	0	1822	1732	0	1706	0
Link Speed (mph)		35	35		35	
Link Distance (ft)		1005	2634		1277	
Travel Time (s)		19.6	51.3		24.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	255	255	277	277	207
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	462	532	0	484	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Yield	Yield		Yield	

Intersection Summary	
Area Type: Other	
Control Type: Roundabout	
Intersection Capacity Utilization 86.6%	ICU Level of Service E
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	12.5
Intersection LOS	B

Approach	EB	WB	SB
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	462	532	484
Demand Flow Rate, veh/h	471	543	494
Vehicles Circulating, veh/h	283	211	260
Vehicles Exiting, veh/h	471	543	494
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	12.3	12.7	12.4
Approach LOS	B	B	B

Lane	Left	Left	Left
Designated Moves	LT	TR	LR
Assumed Moves	LT	TR	LR
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	471	543	494
Cap Entry Lane, veh/h	851	915	871
Entry HV Adj Factor	0.981	0.980	0.980
Flow Entry, veh/h	462	532	484
Cap Entry, veh/h	835	896	854
V/C Ratio	0.553	0.593	0.567
Control Delay, s/veh	12.3	12.7	12.4
LOS	B	B	B
95th %tile Queue, veh	3	4	4

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	100	0	140	65	1335	0	0	420	945
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	300		0	0		500
Storage Lanes	0		0	0		0	0		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	0.95	0.95	0.95	1.00	0.95	0.95	1.00
Frt					0.913							0.850
Flt Protected					0.980			0.998				
Satd. Flow (prot)	0	0	0	0	3167	0	0	3532	0	0	3539	1583
Flt Permitted					0.980			0.998				
Satd. Flow (perm)	0	0	0	0	3167	0	0	3532	0	0	3539	1583
Link Speed (mph)		10			30			40			40	
Link Distance (ft)		1062			1032			387			1667	
Travel Time (s)		72.4			23.5			6.6			28.4	
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
Adj. Flow (vph)	0	0	0	109	0	152	71	1451	0	0	457	1027
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	0	0	0	261	0	0	1522	0	0	457	1027
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		0			0			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary		
Area Type:	Other	
Control Type: Roundabout		
Intersection Capacity Utilization 114.7%		ICU Level of Service H
Analysis Period (min) 15		

Intersection	
Intersection Delay, s/veh	8.6
Intersection LOS	A

Approach	EB	WB	NB	SB
Entry Lanes	0	2	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	0	261	1522	1484
Demand Flow Rate, veh/h	0	266	1552	1514
Vehicles Circulating, veh/h	577	1552	0	183
Vehicles Exiting, veh/h	72	0	577	1635
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	0.0	17.5	13.7	1.9
Approach LOS	-	C	B	A

Lane	Left	Right	Left	Right	Left	Right	Bypass
Designated Moves	LT	R	LT	TR	LT	TR	R
Assumed Moves	LT	R	LT	TR	LT	TR	R
RT Channelized							Free
Lane Util	0.417	0.583	0.470	0.530	0.470	0.530	
Critical Headway, s	4.293	4.113	4.293	4.113	4.293	4.113	
Entry Flow, veh/h	111	155	729	823	219	247	1048
Cap Entry Lane, veh/h	353	381	1130	1130	985	994	1938
Entry HV Adj Factor	0.982	0.981	0.981	0.980	0.980	0.980	0.980
Flow Entry, veh/h	109	152	715	807	215	242	1027
Cap Entry, veh/h	346	374	1109	1107	966	975	1900
V/C Ratio	0.315	0.407	0.645	0.728	0.222	0.248	0.541
Control Delay, s/veh	16.7	18.1	12.2	15.1	5.9	6.2	0.0
LOS	C	C	B	C	A	A	A
95th %tile Queue, veh	1	2	5	7	1	1	3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	1015	0	205	0	0	0	0	385	130	130	390	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	500		500	0		0	0		0	300		0
Storage Lanes	1		1	0		0	0		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.95	0.95	1.00	1.00	1.00	1.00	1.00	0.95	0.95	0.95	0.95	1.00
Frt			0.850					0.962				
Flt Protected	0.950	0.950									0.988	
Satd. Flow (prot)	1681	1681	1583	0	0	0	0	3405	0	0	3497	0
Flt Permitted	0.950	0.950									0.988	
Satd. Flow (perm)	1681	1681	1583	0	0	0	0	3405	0	0	3497	0
Link Speed (mph)		30			30			40			40	
Link Distance (ft)		1070			1040			784			434	
Travel Time (s)		24.3			23.6			13.4			7.4	
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
Adj. Flow (vph)	1103	0	223	0	0	0	0	418	141	141	424	0
Shared Lane Traffic (%)	50%											
Lane Group Flow (vph)	551	552	223	0	0	0	0	559	0	0	565	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Yield			Yield			Yield			Yield	

Intersection Summary

Area Type: Other
Control Type: Roundabout
Intersection Capacity Utilization 67.5% ICU Level of Service C
Analysis Period (min) 15

Intersection	
Intersection Delay, s/veh	18.0
Intersection LOS	C

Approach	EB	WB	NB	SB
Entry Lanes	2	0	2	2
Conflicting Circle Lanes	2	2	2	2
Adj Approach Flow, veh/h	1326	0	559	565
Demand Flow Rate, veh/h	1352	0	570	576
Vehicles Circulating, veh/h	576	1551	1269	0
Vehicles Exiting, veh/h	0	288	432	1551
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	20.5	0.0	24.3	5.6
Approach LOS	C	-	C	A

Lane	Left	Right	Bypass	Left	Right	Left	Right
Designated Moves	L	LTR	R	LT	TR	LT	TR
Assumed Moves	L	LTR	R	LT	TR	LT	TR
RT Channelized			Yield				
Lane Util	0.530	0.470		0.470	0.530	0.470	0.530
Critical Headway, s	4.293	4.113		4.293	4.113	4.293	4.113
Entry Flow, veh/h	596	529	227	268	302	271	305
Cap Entry Lane, veh/h	734	755	835	436	465	1130	1130
Entry HV Adj Factor	0.981	0.980	0.980	0.980	0.980	0.979	0.981
Flow Entry, veh/h	585	518	223	263	296	265	299
Cap Entry, veh/h	720	740	819	427	456	1106	1108
V/C Ratio	0.812	0.701	0.272	0.614	0.650	0.240	0.270
Control Delay, s/veh	27.0	18.9	7.4	24.0	24.6	5.5	5.8
LOS	D	C	A	C	C	A	A
95th %tile Queue, veh	9	6	1	4	5	1	1

Lane Group	SBL	SBR	SEL	SET	NWT	NWR
Lane Configurations						
Volume (vph)	100	240	240	115	115	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.905				0.937	
Flt Protected	0.985			0.967		
Satd. Flow (prot)	1660	0	0	1801	1745	0
Flt Permitted	0.985			0.967		
Satd. Flow (perm)	1660	0	0	1801	1745	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	779			958	1288	
Travel Time (s)	17.7			21.8	29.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	261	261	125	125	109
Shared Lane Traffic (%)						
Lane Group Flow (vph)	370	0	0	386	234	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Sign Control	Yield			Yield	Yield	

Intersection Summary	
Area Type: Other	
Control Type: Roundabout	
Intersection Capacity Utilization 61.8%	ICU Level of Service B
Analysis Period (min) 15	

Intersection	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Approach	SB	SE	NW
Entry Lanes	1	1	1
Conflicting Circle Lanes	1	1	1
Adj Approach Flow, veh/h	370	386	234
Demand Flow Rate, veh/h	377	394	239
Vehicles Circulating, veh/h	127	111	266
Vehicles Exiting, veh/h	377	393	238
Follow-Up Headway, s	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0
Ped Cap Adj	1.000	1.000	1.000
Approach Delay, s/veh	7.8	7.9	7.2
Approach LOS	A	A	A

Lane	Left	Left	Left
Designated Moves	LR	LT	TR
Assumed Moves	LR	LT	TR
RT Channelized			
Lane Util	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193
Entry Flow, veh/h	377	394	239
Cap Entry Lane, veh/h	995	1011	866
Entry HV Adj Factor	0.981	0.981	0.981
Flow Entry, veh/h	370	386	234
Cap Entry, veh/h	977	992	850
V/C Ratio	0.379	0.390	0.276
Control Delay, s/veh	7.8	7.9	7.2
LOS	A	A	A
95th %tile Queue, veh	2	2	1

Appendix A.3

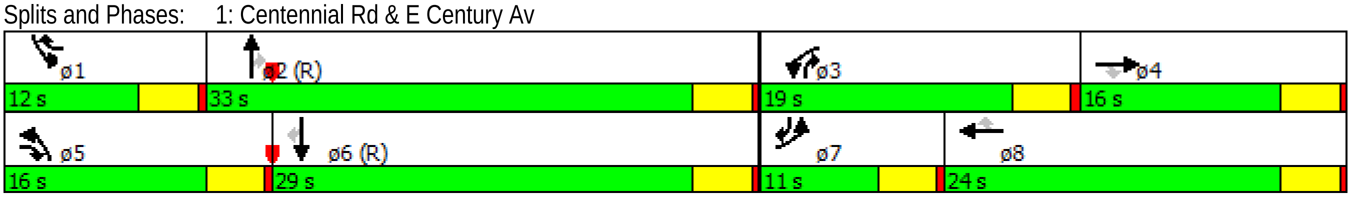
2040 Scenario 1A Intersection Capacity Analysis Worksheets

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	90	335	445	525	335	90	445	915	525	90	915	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		250	380		100	225		390	290		100
Storage Lanes	2		1	2		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			123			76			147			123
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		2085			460			3351			1054	
Travel Time (s)		40.6			9.0			57.1			18.0	
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
Adj. Flow (vph)	98	364	484	571	364	98	484	995	571	98	995	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	364	484	571	364	98	484	995	571	98	995	98
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	11.0	16.0	16.0	19.0	24.0	12.0	16.0	33.0	19.0	12.0	29.0	11.0
Total Split (%)	13.8%	20.0%	20.0%	23.8%	30.0%	15.0%	20.0%	41.3%	23.8%	15.0%	36.3%	13.8%
Maximum Green (s)	7.0	12.0	12.0	15.0	20.0	8.0	12.0	29.0	15.0	8.0	25.0	7.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	6.7	11.5	28.0	15.0	21.7	33.4	12.4	31.9	50.8	7.6	25.1	35.8
Actuated g/C Ratio	0.08	0.14	0.35	0.19	0.27	0.42	0.16	0.40	0.64	0.10	0.31	0.45
v/c Ratio	0.34	0.71	0.76	0.89	0.38	0.14	0.91	0.71	0.54	0.58	0.90	0.13
Control Delay	37.9	41.1	26.5	50.0	25.8	6.2	57.1	24.6	8.8	49.1	38.8	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.9	41.1	26.5	50.0	25.8	6.2	57.1	24.6	8.8	49.1	38.8	2.1
LOS	D	D	C	D	C	A	E	C	A	D	D	A
Approach Delay		33.3			37.3			27.9			36.6	
Approach LOS		C			D			C			D	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 65	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 32.7	Intersection LOS: C
Intersection Capacity Utilization 77.8%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 1: Centennial Rd & E Century Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	90	335	445	525	335	90	445	915	525	90	915	90
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	98	364	484	571	364	98	484	995	571	98	995	98
Adj No. of Lanes	2	2	1	2	2	1	2	2	1	1	2	1
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	164	531	475	643	1024	570	516	1389	917	125	1108	571
Arrive On Green	0.05	0.15	0.15	0.19	0.29	0.29	0.15	0.39	0.39	0.07	0.31	0.31
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	98	364	484	571	364	98	484	995	571	98	995	98
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1770	1583	1774	1770	1583
Q Serve(g_s), s	2.2	7.8	12.0	12.9	6.5	3.4	11.1	19.0	19.0	4.3	21.5	3.4
Cycle Q Clear(g_c), s	2.2	7.8	12.0	12.9	6.5	3.4	11.1	19.0	19.0	4.3	21.5	3.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	164	531	475	643	1024	570	516	1389	917	125	1108	571
V/C Ratio(X)	0.60	0.69	1.02	0.89	0.36	0.17	0.94	0.72	0.62	0.78	0.90	0.17
Avail Cap(c_a), veh/h	301	531	475	645	1024	570	516	1389	917	177	1108	571
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.4	32.2	28.0	31.7	22.5	17.5	33.6	20.5	11.1	36.6	26.3	17.4
Incr Delay (d2), s/veh	3.5	3.7	46.2	14.1	0.2	0.1	25.0	3.2	3.2	13.5	11.5	0.7
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(-26165%),veh/ln	1.1	4.1	16.5	7.4	3.2	1.5	7.0	9.9	9.0	2.6	12.3	1.6
LnGrp Delay(d),s/veh	40.8	35.9	74.2	45.8	22.7	17.6	58.6	23.7	14.2	50.0	37.7	18.1
LnGrp LOS	D	D	F	D	C	B	E	C	B	D	D	B
Approach Vol, veh/h		946			1033			2050			1191	
Approach Delay, s/veh		56.0			35.0			29.3			37.1	
Approach LOS		E			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.7	35.4	19.0	16.0	16.0	29.0	7.8	27.2
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	8.0	29.0	15.0	12.0	12.0	25.0	7.0	20.0
Max Q Clear Time (g_c+I1), s	6.3	21.0	14.9	14.0	13.1	23.5	4.2	8.5
Green Ext Time (p_c), s	0.0	7.0	0.0	0.0	0.0	1.4	0.1	5.3

Intersection Summary	
HCM 2010 Ctrl Delay	37.1
HCM 2010 LOS	D

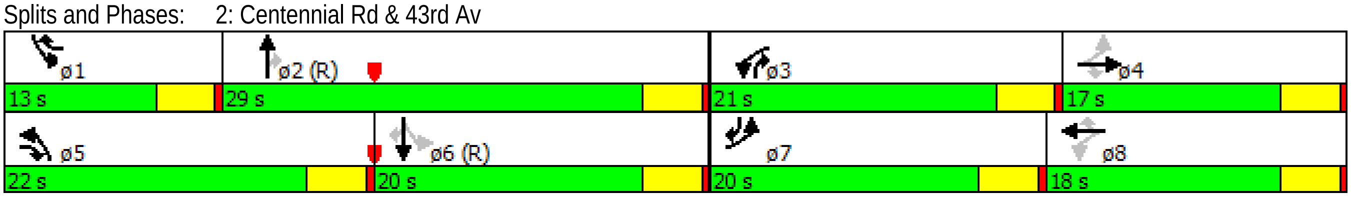
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	235	345	540	290	345	175	540	210	290	175	210	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	200		200	300		0	250		250
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.426			0.303			0.950			0.616		
Satd. Flow (perm)	794	3539	1583	564	3539	1583	3433	1863	1583	1147	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			241			190			191			123
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1886			2634			4233			3577	
Travel Time (s)		28.6			39.9			52.5			44.3	
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
Adj. Flow (vph)	255	375	587	315	375	190	587	228	315	190	228	255
Shared Lane Traffic (%)												
Lane Group Flow (vph)	255	375	587	315	375	190	587	228	315	190	228	255
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8			2	6		6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	20.0	17.0	22.0	21.0	18.0	13.0	22.0	29.0	21.0	13.0	20.0	20.0
Total Split (%)	25.0%	21.3%	27.5%	26.3%	22.5%	16.3%	27.5%	36.3%	26.3%	16.3%	25.0%	25.0%
Maximum Green (s)	16.0	13.0	18.0	17.0	14.0	9.0	18.0	25.0	17.0	9.0	16.0	16.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	25.5	12.3	33.8	29.0	14.1	26.8	17.5	28.1	47.0	27.9	19.2	36.4
Actuated g/C Ratio	0.32	0.15	0.42	0.36	0.18	0.34	0.22	0.35	0.59	0.35	0.24	0.46
v/c Ratio	0.62	0.69	0.73	0.73	0.60	0.29	0.78	0.35	0.31	0.41	0.51	0.32
Control Delay	24.0	39.0	16.7	28.6	34.8	4.4	37.7	22.4	4.3	15.8	32.6	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.0	39.0	16.7	28.6	34.8	4.4	37.7	22.4	4.3	15.8	32.6	8.6
LOS	C	D	B	C	C	A	D	C	A	B	C	A
Approach Delay		25.1			26.0			25.3			18.8	
Approach LOS		C			C			C			B	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.78
Intersection Signal Delay: 24.3 Intersection LOS: C
Intersection Capacity Utilization 70.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Centennial Rd & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	235	345	540	290	345	175	540	210	290	175	210	235
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	255	375	587	315	375	190	587	228	315	190	228	255
Adj No. of Lanes	1	2	1	1	2	1	2	1	1	1	1	1
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	426	575	571	432	672	459	682	681	851	497	498	652
Arrive On Green	0.14	0.16	0.16	0.17	0.19	0.19	0.20	0.37	0.37	0.10	0.27	0.27
Sat Flow, veh/h	1774	3539	1583	1774	3539	1583	3442	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	255	375	587	315	375	190	587	228	315	190	228	255
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1774	1770	1583	1721	1863	1583	1774	1863	1583
Q Serve(g_s), s	9.3	7.9	13.0	11.5	7.7	7.7	13.2	7.1	9.2	6.1	8.2	9.0
Cycle Q Clear(g_c), s	9.3	7.9	13.0	11.5	7.7	7.7	13.2	7.1	9.2	6.1	8.2	9.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	426	575	571	432	672	459	682	681	851	497	498	652
V/C Ratio(X)	0.60	0.65	1.03	0.73	0.56	0.41	0.86	0.33	0.37	0.38	0.46	0.39
Avail Cap(c_a), veh/h	524	575	571	504	672	459	774	681	851	519	498	652
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.7	31.4	25.6	22.2	29.4	22.9	31.0	18.4	10.7	17.9	24.5	16.5
Incr Delay (d2), s/veh	1.4	2.6	45.0	4.5	1.0	0.6	8.9	1.3	1.2	0.5	3.0	1.8
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(-26165%),veh/ln	4.6	4.1	19.7	6.0	3.8	3.4	7.1	3.9	4.2	3.0	4.6	4.2
LnGrp Delay(d),s/veh	24.1	34.0	70.6	26.6	30.4	23.5	39.9	19.7	11.9	18.4	27.5	18.3
LnGrp LOS	C	C	F	C	C	C	D	B	B	B	C	B
Approach Vol, veh/h		1217			880			1130			673	
Approach Delay, s/veh		49.6			27.6			28.0			21.4	
Approach LOS		D			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.0	33.2	17.8	17.0	19.9	25.4	15.6	19.2
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	9.0	25.0	17.0	13.0	18.0	16.0	16.0	14.0
Max Q Clear Time (g_c+I1), s	8.1	11.2	13.5	15.0	15.2	11.0	11.3	9.7
Green Ext Time (p_c), s	0.0	3.6	0.3	0.0	0.7	2.0	0.3	2.7

Intersection Summary		
HCM 2010 Ctrl Delay		33.5
HCM 2010 LOS		C

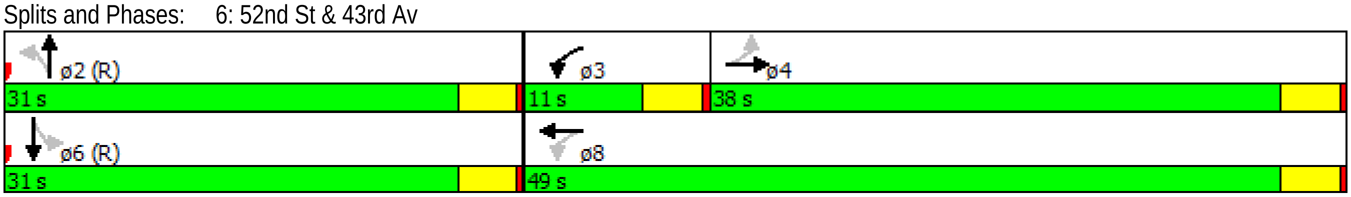
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	440	55	120	440	130	55	140	120	130	140	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		0	435		0	200		0	200		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.983			0.966			0.931			0.943	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1831	0	1770	1799	0	1770	1734	0	1770	1757	0
Flt Permitted	0.309			0.157			0.548			0.505		
Satd. Flow (perm)	576	1831	0	292	1799	0	1021	1734	0	941	1757	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10			30			58			41	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2649			5241			3658			5279	
Travel Time (s)		40.1			79.4			55.4			80.0	
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
Adj. Flow (vph)	92	478	60	130	478	141	60	152	130	141	152	92
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	538	0	130	619	0	60	282	0	141	244	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases		4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		3	8		2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	20.0	20.0		8.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	38.0	38.0		11.0	49.0		31.0	31.0		31.0	31.0	
Total Split (%)	47.5%	47.5%		13.8%	61.3%		38.8%	38.8%		38.8%	38.8%	
Maximum Green (s)	34.0	34.0		7.0	45.0		27.0	27.0		27.0	27.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lag	Lag		Lead								
Lead-Lag Optimize?	Yes	Yes		Yes								
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Walk Time (s)	5.0	5.0			5.0		5.0	5.0		5.0	5.0	
Flash Dont Walk (s)	11.0	11.0			11.0		11.0	11.0		11.0	11.0	
Pedestrian Calls (#/hr)	0	0			0		0	0		0	0	
Act Effct Green (s)	28.9	28.9		37.7	37.7		34.3	34.3		34.3	34.3	
Actuated g/C Ratio	0.36	0.36		0.47	0.47		0.43	0.43		0.43	0.43	
v/c Ratio	0.44	0.81		0.49	0.72		0.14	0.36		0.35	0.31	
Control Delay	25.7	32.4		15.5	17.8		12.7	10.2		21.6	15.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.7	32.4		15.5	17.8		12.7	10.2		21.6	15.9	
LOS	C	C		B	B		B	B		C	B	
Approach Delay		31.4			17.4			10.7			18.0	
Approach LOS		C			B			B			B	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 52 (65%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 20.6 Intersection LOS: C
Intersection Capacity Utilization 71.0% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 6: 52nd St & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	85	440	55	120	440	130	55	140	120	130	140	85
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	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	92	478	60	130	478	141	60	152	130	141	152	92
Adj No. of Lanes	1	1	0	1	1	0	1	1	0	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	249	585	73	286	658	194	464	394	337	431	462	279
Arrive On Green	0.36	0.36	0.36	0.07	0.48	0.48	0.42	0.42	0.42	0.42	0.42	0.42
Sat Flow, veh/h	801	1623	204	1774	1383	408	1131	928	794	1093	1088	659
Grp Volume(v), veh/h	92	0	538	130	0	619	60	0	282	141	0	244
Grp Sat Flow(s),veh/h/ln	801	0	1827	1774	0	1791	1131	0	1723	1093	0	1747
Q Serve(g_s), s	8.3	0.0	21.4	3.5	0.0	22.2	3.0	0.0	9.0	8.2	0.0	7.5
Cycle Q Clear(g_c), s	21.3	0.0	21.4	3.5	0.0	22.2	10.5	0.0	9.0	17.2	0.0	7.5
Prop In Lane	1.00		0.11	1.00		0.23	1.00		0.46	1.00		0.38
Lane Grp Cap(c), veh/h	249	0	659	286	0	852	464	0	731	431	0	741
V/C Ratio(X)	0.37	0.00	0.82	0.45	0.00	0.73	0.13	0.00	0.39	0.33	0.00	0.33
Avail Cap(c_a), veh/h	301	0	776	326	0	1007	464	0	731	431	0	741
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	0.67	0.00	0.67	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.0	0.0	23.2	17.0	0.0	16.8	18.9	0.0	15.9	21.8	0.0	15.4
Incr Delay (d2), s/veh	0.9	0.0	5.9	0.8	0.0	1.5	0.6	0.0	1.5	2.0	0.0	1.2
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(-26165%),veh/ln	1.9	0.0	11.8	1.8	0.0	11.2	1.0	0.0	4.5	2.7	0.0	3.8
LnGrp Delay(d),s/veh	29.9	0.0	29.1	17.8	0.0	18.3	19.5	0.0	17.4	23.8	0.0	16.6
LnGrp LOS	C		C	B		B	B		B	C		B
Approach Vol, veh/h		630			749			342			385	
Approach Delay, s/veh		29.2			18.2			17.8			19.2	
Approach LOS		C			B			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6		8
Phs Duration (G+Y+Rc), s		37.9	9.2	32.8		37.9		42.1
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0		4.0
Max Green Setting (Gmax), s		27.0	7.0	34.0		27.0		45.0
Max Q Clear Time (g_c+I1), s		12.5	5.5	23.4		19.2		24.2
Green Ext Time (p_c), s		3.3	0.0	5.5		2.4		8.0

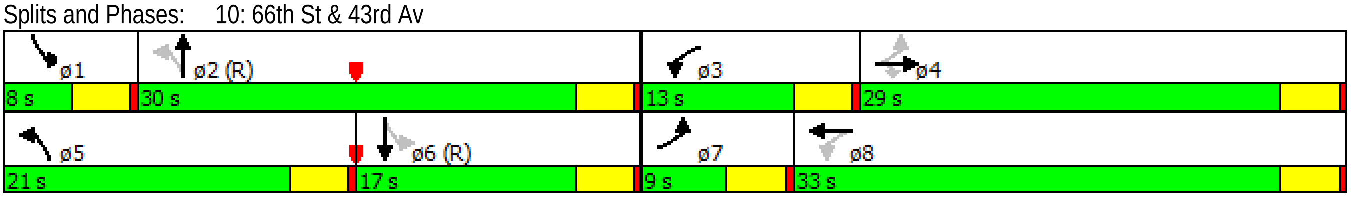
Intersection Summary	
HCM 2010 Ctrl Delay	21.6
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	95	365	340	190	365	55	340	50	190	55	50	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	435		335	435		335	435		335
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.980			0.881			0.902	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1825	0	1770	1641	0	1770	1680	0
Flt Permitted	0.298			0.206			0.476			0.598		
Satd. Flow (perm)	555	1863	1583	384	1825	0	887	1641	0	1114	1680	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			370		11			207			102	
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		5241			5285			2949			901	
Travel Time (s)		79.4			80.1			36.6			11.2	
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
Adj. Flow (vph)	103	397	370	207	397	60	370	54	207	60	54	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	103	397	370	207	457	0	370	261	0	60	157	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	3	8		5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0		8.0	8.0		8.0	8.0	
Total Split (s)	9.0	29.0	29.0	13.0	33.0		21.0	30.0		8.0	17.0	
Total Split (%)	11.3%	36.3%	36.3%	16.3%	41.3%		26.3%	37.5%		10.0%	21.3%	
Maximum Green (s)	5.0	25.0	25.0	9.0	29.0		17.0	26.0		4.0	13.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		None	C-Max		None	C-Max	
Act Effct Green (s)	26.7	21.7	21.7	34.6	27.4		37.4	32.4		23.4	18.4	
Actuated g/C Ratio	0.33	0.27	0.27	0.43	0.34		0.47	0.40		0.29	0.23	
v/c Ratio	0.39	0.79	0.53	0.65	0.72		0.64	0.33		0.16	0.34	
Control Delay	16.9	32.9	5.7	23.9	29.9		16.4	3.5		16.3	14.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.9	32.9	5.7	23.9	29.9		16.4	3.5		16.3	14.5	
LOS	B	C	A	C	C		B	A		B	B	
Approach Delay		19.4			28.1			11.0			15.0	
Approach LOS		B			C			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 60 (75%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 19.2	Intersection LOS: B
Intersection Capacity Utilization 70.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 10: 66th St & 43rd Av



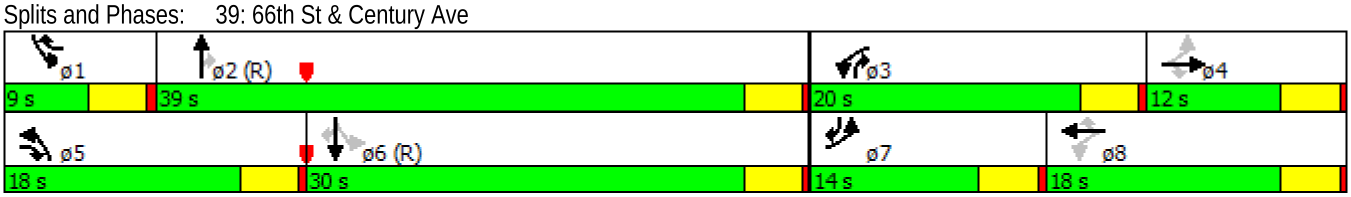
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	95	365	340	190	365	55	340	50	190	55	50	95
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, 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	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	103	397	370	207	397	60	370	54	207	60	54	103
Adj No. of Lanes	1	1	1	1	1	0	1	1	0	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	287	523	444	333	514	78	600	128	491	422	137	262
Arrive On Green	0.06	0.28	0.28	0.10	0.32	0.32	0.18	0.38	0.38	0.04	0.24	0.24
Sat Flow, veh/h	1774	1863	1583	1774	1582	239	1774	338	1296	1774	574	1095
Grp Volume(v), veh/h	103	397	370	207	0	457	370	0	261	60	0	157
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	0	1821	1774	0	1634	1774	0	1669
Q Serve(g_s), s	3.3	15.6	17.5	6.3	0.0	18.1	11.8	0.0	9.4	2.0	0.0	6.3
Cycle Q Clear(g_c), s	3.3	15.6	17.5	6.3	0.0	18.1	11.8	0.0	9.4	2.0	0.0	6.3
Prop In Lane	1.00		1.00	1.00		0.13	1.00		0.79	1.00		0.66
Lane Grp Cap(c), veh/h	287	523	444	333	0	591	600	0	619	422	0	399
V/C Ratio(X)	0.36	0.76	0.83	0.62	0.00	0.77	0.62	0.00	0.42	0.14	0.00	0.39
Avail Cap(c_a), veh/h	293	582	495	349	0	660	663	0	619	445	0	399
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)	0.63	0.63	0.63	1.00	0.00	1.00	0.92	0.00	0.92	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.0	26.3	27.0	18.7	0.0	24.3	16.4	0.0	18.4	21.7	0.0	25.6
Incr Delay (d2), s/veh	0.5	3.4	7.1	3.1	0.0	5.1	1.3	0.0	1.9	0.2	0.0	2.9
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(-26165%),veh/ln	1.6	8.4	8.5	3.3	0.0	9.9	5.9	0.0	4.5	1.0	0.0	3.2
LnGrp Delay(d),s/veh	20.5	29.7	34.1	21.9	0.0	29.4	17.8	0.0	20.3	21.8	0.0	28.4
LnGrp LOS	C	C	C	C		C	B		C	C		C
Approach Vol, veh/h		870			664			631			217	
Approach Delay, s/veh		30.5			27.1			18.8			26.6	
Approach LOS		C			C			B			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.0	34.3	12.3	26.5	18.1	23.1	8.7	30.0				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	4.0	26.0	9.0	25.0	17.0	13.0	5.0	29.0				
Max Q Clear Time (g_c+I1), s	4.0	11.4	8.3	19.5	13.8	8.3	5.3	20.1				
Green Ext Time (p_c), s	0.0	1.9	0.0	2.9	0.4	0.9	0.0	4.1				
Intersection Summary												
HCM 2010 Ctrl Delay			26.1									
HCM 2010 LOS			C									

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	120	200	355	275	200	100	355	360	275	100	360	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	200		150	435		335	435		335
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.616			0.368			0.950			0.519		
Satd. Flow (perm)	1147	3539	1583	685	3539	1583	3433	1863	1583	967	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			231			123			271			177
Link Speed (mph)		35			30			40			55	
Link Distance (ft)		3124			1828			1667			2949	
Travel Time (s)		60.9			41.5			28.4			36.6	
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
Adj. Flow (vph)	130	217	386	299	217	109	386	391	299	109	391	130
Shared Lane Traffic (%)												
Lane Group Flow (vph)	130	217	386	299	217	109	386	391	299	109	391	130
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8			2	6		6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	1.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	14.0	12.0	18.0	20.0	18.0	9.0	18.0	39.0	20.0	9.0	30.0	14.0
Total Split (%)	17.5%	15.0%	22.5%	25.0%	22.5%	11.3%	22.5%	48.8%	25.0%	11.3%	37.5%	17.5%
Maximum Green (s)	10.0	8.0	14.0	16.0	14.0	5.0	14.0	35.0	16.0	5.0	26.0	10.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	17.0	8.1	25.1	26.6	13.7	23.1	13.0	36.0	54.5	33.9	28.4	41.3
Actuated g/C Ratio	0.21	0.10	0.31	0.33	0.17	0.29	0.16	0.45	0.68	0.42	0.36	0.52
v/c Ratio	0.42	0.61	0.59	0.71	0.36	0.20	0.69	0.47	0.26	0.24	0.59	0.14
Control Delay	23.8	42.3	13.0	31.1	31.0	4.7	38.6	18.0	1.4	12.1	26.6	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.8	42.3	13.0	31.1	31.0	4.7	38.6	18.0	1.4	12.1	26.6	1.1
LOS	C	D	B	C	C	A	D	B	A	B	C	A
Approach Delay		23.6			26.4			20.8			18.8	
Approach LOS		C			C			C			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 18 (23%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 22.2	Intersection LOS: C
Intersection Capacity Utilization 66.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 39: 66th St & Century Ave



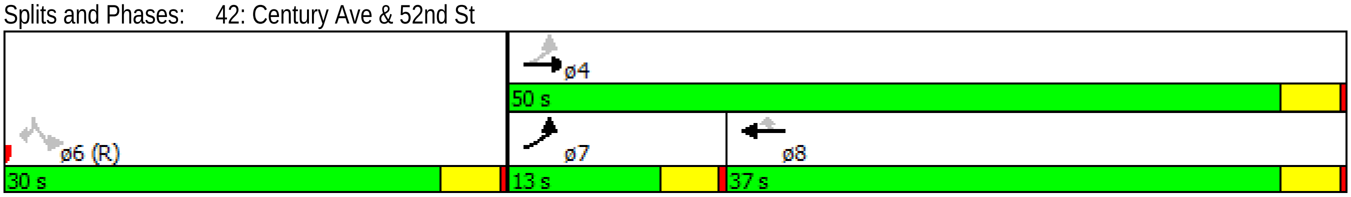
Min green cannot be less than 2 seconds, (Phase 4).

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	180	410	410	260	260	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435			335	200	0
Storage Lanes	1			1	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1863	1583	1770	1583
Flt Permitted	0.199				0.950	
Satd. Flow (perm)	371	1863	1863	1583	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				283		196
Link Speed (mph)		35	35		35	
Link Distance (ft)		1005	2634		1277	
Travel Time (s)		19.6	51.3		24.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	446	446	283	283	196
Shared Lane Traffic (%)						
Lane Group Flow (vph)	196	446	446	283	283	196
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2	1	1	1
Detector Template	Left	Thru	Thru	Right	Left	Right
Leading Detector (ft)	20	100	100	20	20	20
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	6	20	20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA	Perm	Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	4			8	6	6
Detector Phase	7	4	8	8	6	6

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	20.0	20.0	20.0	20.0	20.0
Total Split (s)	13.0	50.0	37.0	37.0	30.0	30.0
Total Split (%)	16.3%	62.5%	46.3%	46.3%	37.5%	37.5%
Maximum Green (s)	9.0	46.0	33.0	33.0	26.0	26.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead		Lag	Lag		
Lead-Lag Optimize?	Yes		Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	C-Max	C-Max
Act Effct Green (s)	38.5	38.5	25.6	25.6	33.5	33.5
Actuated g/C Ratio	0.48	0.48	0.32	0.32	0.42	0.42
v/c Ratio	0.59	0.50	0.75	0.40	0.38	0.25
Control Delay	18.4	15.4	31.9	4.0	19.6	3.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.4	15.4	31.9	4.0	19.6	3.5
LOS	B	B	C	A	B	A
Approach Delay		16.3	21.1		13.0	
Approach LOS		B	C		B	

Intersection Summary	
Area Type:	Other
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 9 (11%), Referenced to phase 2: and 6:SBL, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 17.3	Intersection LOS: B
Intersection Capacity Utilization 56.0%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 42: Century Ave & 52nd St



HCM 2010 Research does not support Non-NEMA phasing.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	5	75	5	5	5	75	200	5	5	200	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.887			0.955			0.998			0.994	
Flt Protected		0.994			0.984			0.987			0.999	
Satd. Flow (prot)	0	1642	0	0	1750	0	0	1835	0	0	1850	0
Flt Permitted		0.994			0.984			0.987			0.999	
Satd. Flow (perm)	0	1642	0	0	1750	0	0	1835	0	0	1850	0
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		5285			2119			7040			5267	
Travel Time (s)		65.5			26.3			87.3			65.3	
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
Adj. Flow (vph)	11	5	82	5	5	5	82	217	5	5	217	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	98	0	0	15	0	0	304	0	0	233	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 42.2%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	3.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	5	75	5	5	5	75	200	5	5	200	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	11	5	82	5	5	5	82	217	5	5	217	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	623	620	223	660	622	220	228	0	0	223	0	0
Stage 1	234	234	-	383	383	-	-	-	-	-	-	-
Stage 2	389	386	-	277	239	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	398	404	817	376	403	820	1340	-	-	1346	-	-
Stage 1	769	711	-	640	612	-	-	-	-	-	-	-
Stage 2	635	610	-	729	708	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	369	374	817	316	373	820	1340	-	-	1346	-	-
Mov Cap-2 Maneuver	369	374	-	316	373	-	-	-	-	-	-	-
Stage 1	715	708	-	595	569	-	-	-	-	-	-	-
Stage 2	581	567	-	649	705	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.2	13.8	2.1	0.2
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1340	-	-	680	425	1346	-	-
HCM Lane V/C Ratio	0.061	-	-	0.144	0.038	0.004	-	-
HCM Control Delay (s)	7.9	0	-	11.2	13.8	7.7	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.2	-	-	0.5	0.1	0	-	-

Appendix A.4

2040 Scenario 1B Intersection Capacity Analysis Worksheets

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	325	450	535	325	105	450	1130	353	105	1130	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		250	380		100	225		390	290		100
Storage Lanes	2		1	2		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			123			68			124			123
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		2085			460			3351			1054	
Travel Time (s)		40.6			9.0			57.1			18.0	
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
Adj. Flow (vph)	120	353	489	582	353	114	489	1228	384	114	1228	120
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	353	489	582	353	114	489	1228	384	114	1228	120
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	10.0	13.0	16.0	18.0	21.0	12.0	16.0	37.0	18.0	12.0	33.0	10.0
Total Split (%)	12.5%	16.3%	20.0%	22.5%	26.3%	15.0%	20.0%	46.3%	22.5%	15.0%	41.3%	12.5%
Maximum Green (s)	6.0	9.0	12.0	14.0	17.0	8.0	12.0	33.0	14.0	8.0	29.0	6.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	6.0	9.0	25.0	14.0	17.0	28.7	12.0	33.3	51.3	7.7	29.0	39.0
Actuated g/C Ratio	0.08	0.11	0.31	0.18	0.21	0.36	0.15	0.42	0.64	0.10	0.36	0.49
v/c Ratio	0.47	0.89	0.84	0.97	0.47	0.19	0.95	0.83	0.36	0.67	0.96	0.14
Control Delay	41.8	60.9	34.7	64.8	30.0	9.1	65.0	27.4	5.5	55.1	43.2	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.8	60.9	34.7	64.8	30.0	9.1	65.0	27.4	5.5	55.1	43.2	2.7
LOS	D	E	C	E	C	A	E	C	A	E	D	A
Approach Delay		45.2			47.1			32.2			40.8	
Approach LOS		D			D			C			D	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 39.5 Intersection LOS: D
Intersection Capacity Utilization 84.4% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 1: Centennial Rd & E Century Av

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	110	325	450	535	325	105	450	1130	353	105	1130	110
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	120	353	489	582	353	114	489	1228	384	114	1228	120
Adj No. of Lanes	2	2	1	2	2	1	2	2	1	1	2	1
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	191	398	416	602	821	496	516	1526	960	144	1283	662
Arrive On Green	0.06	0.11	0.11	0.17	0.23	0.23	0.15	0.43	0.43	0.08	0.36	0.36
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	120	353	489	582	353	114	489	1228	384	114	1228	120
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1770	1583	1774	1770	1583
Q Serve(g_s), s	2.7	7.9	9.0	13.4	6.8	4.3	11.3	24.2	10.1	5.0	27.1	3.8
Cycle Q Clear(g_c), s	2.7	7.9	9.0	13.4	6.8	4.3	11.3	24.2	10.1	5.0	27.1	3.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	191	398	416	602	821	496	516	1526	960	144	1283	662
V/C Ratio(X)	0.63	0.89	1.18	0.97	0.43	0.23	0.95	0.80	0.40	0.79	0.96	0.18
Avail Cap(c_a), veh/h	258	398	416	602	821	496	516	1526	960	177	1283	662
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.0	35.0	29.5	32.8	26.2	20.3	33.7	19.8	8.2	36.1	24.9	14.7
Incr Delay (d2), s/veh	3.4	20.7	101.9	28.3	0.4	0.2	26.9	4.6	1.2	17.4	16.8	0.6
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(-26165%),veh/ln	1.4	5.0	20.9	8.8	3.4	1.9	7.3	12.7	4.7	3.2	16.1	1.8
LnGrp Delay(d),s/veh	40.4	55.7	131.4	61.1	26.6	20.6	60.6	24.4	9.4	53.5	41.7	15.3
LnGrp LOS	D	E	F	E	C	C	E	C	A	D	D	B
Approach Vol, veh/h		962			1049			2101			1462	
Approach Delay, s/veh		92.3			45.1			30.1			40.4	
Approach LOS		F			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	10.5	38.5	18.0	13.0	16.0	33.0	8.4	22.6
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	8.0	33.0	14.0	9.0	12.0	29.0	6.0	17.0
Max Q Clear Time (g_c+I1), s	7.0	26.2	15.4	11.0	13.3	29.1	4.7	8.8
Green Ext Time (p_c), s	0.0	6.3	0.0	0.0	0.0	0.0	0.0	4.2

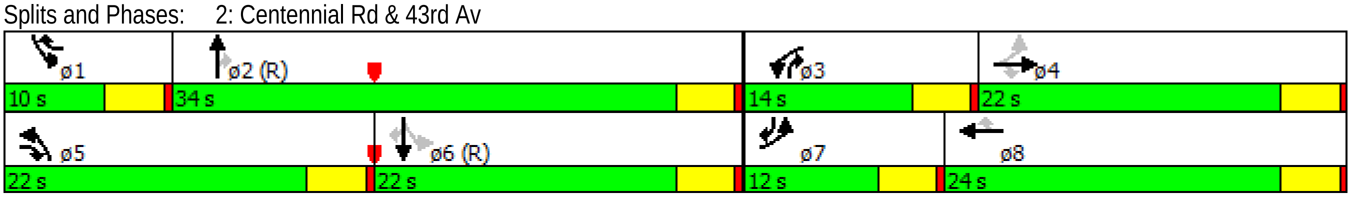
Intersection Summary			
HCM 2010 Ctrl Delay			46.4
HCM 2010 LOS			D

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	145	525	440	220	525	180	440	515	220	180	515	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	200		200	300		200	250		250
Storage Lanes	1		1	2		1	2		1	2		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	3433	3539	1583	3433	3539	1583
Flt Permitted	0.263			0.950			0.950			0.442		
Satd. Flow (perm)	490	3539	1583	3433	3539	1583	3433	3539	1583	1597	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			68			190			92			123
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1886			2634			4233			3577	
Travel Time (s)		28.6			39.9			52.5			44.3	
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
Adj. Flow (vph)	158	571	478	239	571	196	478	560	239	196	560	158
Shared Lane Traffic (%)												
Lane Group Flow (vph)	158	571	478	239	571	196	478	560	239	196	560	158
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4			8			2	6		6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	12.0	22.0	22.0	14.0	24.0	10.0	22.0	34.0	14.0	10.0	22.0	12.0
Total Split (%)	15.0%	27.5%	27.5%	17.5%	30.0%	12.5%	27.5%	42.5%	17.5%	12.5%	27.5%	15.0%
Maximum Green (s)	8.0	18.0	18.0	10.0	20.0	6.0	18.0	30.0	10.0	6.0	18.0	8.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	24.5	16.7	36.8	9.5	18.4	28.7	16.1	31.5	45.0	28.0	21.7	33.5
Actuated g/C Ratio	0.31	0.21	0.46	0.12	0.23	0.36	0.20	0.39	0.56	0.35	0.27	0.42
v/c Ratio	0.57	0.77	0.62	0.59	0.70	0.28	0.69	0.40	0.26	0.28	0.58	0.22
Control Delay	25.7	37.5	17.4	39.6	33.2	4.2	35.1	19.0	6.4	12.9	29.4	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.7	37.5	17.4	39.6	33.2	4.2	35.1	19.0	6.4	12.9	29.4	6.1
LOS	C	D	B	D	C	A	D	B	A	B	C	A
Approach Delay		28.0			29.1			22.7			21.8	
Approach LOS		C			C			C			C	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 25.4	Intersection LOS: C
Intersection Capacity Utilization 62.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 2: Centennial Rd & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	145	525	440	220	525	180	440	515	220	180	515	145
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	158	571	478	239	571	196	478	560	239	196	560	158
Adj No. of Lanes	1	2	1	2	2	1	2	2	1	2	2	1
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	306	796	624	325	814	463	583	1478	811	801	1101	634
Arrive On Green	0.09	0.22	0.22	0.09	0.23	0.23	0.17	0.42	0.42	0.06	0.31	0.31
Sat Flow, veh/h	1774	3539	1583	3442	3539	1583	3442	3539	1583	3442	3539	1583
Grp Volume(v), veh/h	158	571	478	239	571	196	478	560	239	196	560	158
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1721	1770	1583	1721	1770	1583	1721	1770	1583
Q Serve(g_s), s	5.4	11.9	18.0	5.4	11.9	8.0	10.7	8.8	6.9	3.0	10.4	5.3
Cycle Q Clear(g_c), s	5.4	11.9	18.0	5.4	11.9	8.0	10.7	8.8	6.9	3.0	10.4	5.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	306	796	624	325	814	463	583	1478	811	801	1101	634
V/C Ratio(X)	0.52	0.72	0.77	0.73	0.70	0.42	0.82	0.38	0.29	0.24	0.51	0.25
Avail Cap(c_a), veh/h	325	796	624	430	885	495	774	1478	811	843	1101	634
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	21.7	28.6	21.0	35.2	28.3	22.8	32.0	16.1	11.2	16.6	22.6	16.0
Incr Delay (d2), s/veh	1.3	3.1	5.6	4.5	2.3	0.6	5.3	0.7	0.9	0.2	1.7	0.9
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(-26165%),veh/ln	2.7	6.1	10.1	2.8	6.0	3.5	5.5	4.4	3.2	1.4	5.3	2.5
LnGrp Delay(d),s/veh	23.0	31.8	26.7	39.7	30.6	23.5	37.3	16.9	12.1	16.8	24.2	16.9
LnGrp LOS	C	C	C	D	C	C	D	B	B	B	C	B
Approach Vol, veh/h		1207			1006			1277			914	
Approach Delay, s/veh		28.6			31.3			23.6			21.4	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.0	37.4	11.6	22.0	17.5	28.9	11.2	22.4
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	6.0	30.0	10.0	18.0	18.0	18.0	8.0	20.0
Max Q Clear Time (g_c+I1), s	5.0	10.8	7.4	20.0	12.7	12.4	7.4	13.9
Green Ext Time (p_c), s	0.1	7.8	0.2	0.0	0.8	3.5	0.0	4.3

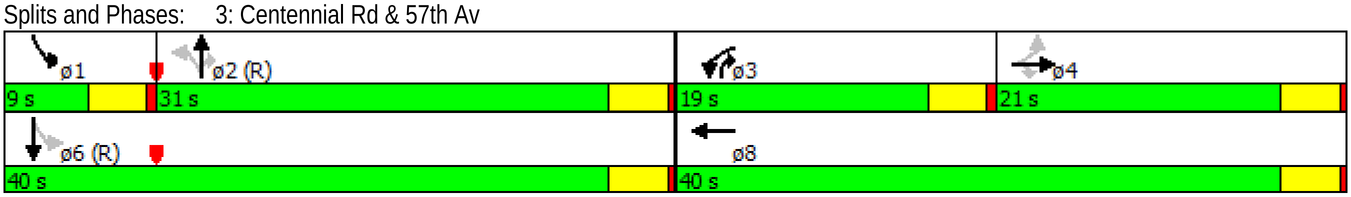
Intersection Summary	
HCM 2010 Ctrl Delay	26.3
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	220	135	370	220	85	135	320	370	85	320	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	435		335	435		0	435		335
Storage Lanes	1		1	2		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.958				0.850		0.985	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3433	1785	0	1770	1863	1583	1770	1835	0
Flt Permitted	0.561			0.950			0.533			0.368		
Satd. Flow (perm)	1045	1863	1583	3433	1785	0	993	1863	1583	685	1835	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			147		31				337		9	
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1838			5295			1723			4521	
Travel Time (s)		27.8			80.2			21.4			56.0	
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
Adj. Flow (vph)	38	239	147	402	239	92	147	348	402	92	348	38
Shared Lane Traffic (%)												
Lane Group Flow (vph)	38	239	147	402	331	0	147	348	402	92	386	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Prot	NA		Perm	NA	pm+ov	pm+pt	NA	
Protected Phases		4		3	8			2	3	1	6	
Permitted Phases	4		4				2		2	6		
Detector Phase	4	4	4	3	8		2	2	3	1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0		20.0	20.0	8.0	8.0	20.0	
Total Split (s)	21.0	21.0	21.0	19.0	40.0		31.0	31.0	19.0	9.0	40.0	
Total Split (%)	26.3%	26.3%	26.3%	23.8%	50.0%		38.8%	38.8%	23.8%	11.3%	50.0%	
Maximum Green (s)	17.0	17.0	17.0	15.0	36.0		27.0	27.0	15.0	5.0	36.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lag	Lead			Lag	Lag	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		C-Max	C-Max	None	None	C-Max	
Walk Time (s)	5.0	5.0	5.0		5.0		5.0	5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0		11.0	11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0		0		0	0			0	
Act Effct Green (s)	14.5	14.5	14.5	13.7	32.2		32.0	32.0	49.7	39.8	39.8	
Actuated g/C Ratio	0.18	0.18	0.18	0.17	0.40		0.40	0.40	0.62	0.50	0.50	
v/c Ratio	0.20	0.71	0.36	0.68	0.45		0.37	0.47	0.36	0.22	0.42	
Control Delay	29.4	42.5	7.8	37.4	17.1		23.1	22.4	2.8	13.5	15.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	29.4	42.5	7.8	37.4	17.1		23.1	22.4	2.8	13.5	15.3	
LOS	C	D	A	D	B		C	C	A	B	B	
Approach Delay		29.3			28.2			13.7			14.9	
Approach LOS		C			C			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 20.8	Intersection LOS: C
Intersection Capacity Utilization 61.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Centennial Rd & 57th Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	220	135	370	220	85	135	320	370	85	320	35
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	1863	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	38	239	147	402	239	92	147	348	402	92	348	38
Adj No. of Lanes	1	1	1	2	1	0	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	267	316	269	499	468	180	498	820	926	391	884	96
Arrive On Green	0.17	0.17	0.17	0.14	0.36	0.36	0.44	0.44	0.44	0.05	0.54	0.54
Sat Flow, veh/h	1045	1863	1583	3442	1282	494	993	1863	1583	1774	1651	180
Grp Volume(v), veh/h	38	239	147	402	0	331	147	348	402	92	0	386
Grp Sat Flow(s),veh/h/ln	1045	1863	1583	1721	0	1776	993	1863	1583	1774	0	1831
Q Serve(g_s), s	2.5	9.8	6.8	9.0	0.0	11.6	8.2	10.3	11.3	2.1	0.0	9.9
Cycle Q Clear(g_c), s	2.5	9.8	6.8	9.0	0.0	11.6	10.5	10.3	11.3	2.1	0.0	9.9
Prop In Lane	1.00		1.00	1.00		0.28	1.00		1.00	1.00		0.10
Lane Grp Cap(c), veh/h	267	316	269	499	0	648	498	820	926	391	0	980
V/C Ratio(X)	0.14	0.76	0.55	0.81	0.00	0.51	0.29	0.42	0.43	0.24	0.00	0.39
Avail Cap(c_a), veh/h	312	396	336	645	0	799	498	820	926	422	0	980
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.6	31.6	30.4	33.1	0.0	19.8	16.3	15.4	9.2	11.2	0.0	10.9
Incr Delay (d2), s/veh	0.2	6.3	1.7	5.7	0.0	0.6	1.5	1.6	1.5	0.3	0.0	1.2
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(-26165%),veh/ln	0.7	5.6	3.1	4.7	0.0	5.8	2.5	5.6	5.2	1.1	0.0	5.3
LnGrp Delay(d),s/veh	28.9	37.9	32.1	38.8	0.0	20.5	17.8	17.0	10.7	11.5	0.0	12.1
LnGrp LOS	C	D	C	D		C	B	B	B	B		B
Approach Vol, veh/h		424			733			897			478	
Approach Delay, s/veh		35.1			30.5			14.3			12.0	
Approach LOS		D			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4		6		8
Phs Duration (G+Y+Rc), s	7.6	39.2	15.6	17.6		46.8		33.2
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0		4.0		4.0
Max Green Setting (Gmax), s	5.0	27.0	15.0	17.0		36.0		36.0
Max Q Clear Time (g_c+I1), s	4.1	13.3	11.0	11.8		11.9		13.6
Green Ext Time (p_c), s	0.0	5.1	0.6	1.8		6.4		3.8

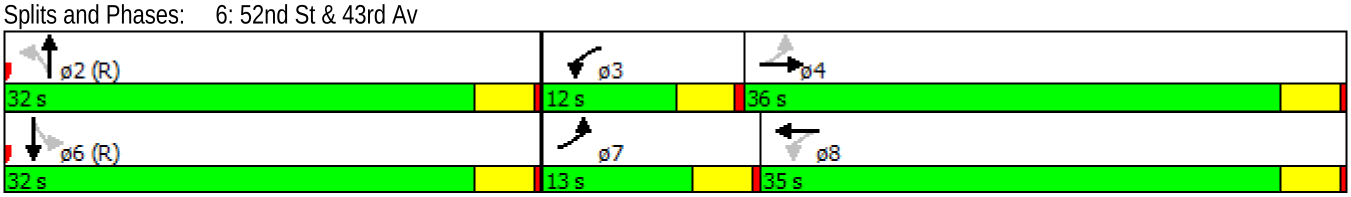
Intersection Summary	
HCM 2010 Ctrl Delay	22.1
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	110	555	85	100	555	100	85	120	100	100	120	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		0	435		0	435		0	200		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.980			0.977			0.932			0.928	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3468	0	1770	3458	0	1770	1736	0	1770	1729	0
Flt Permitted	0.185			0.214			0.563			0.574		
Satd. Flow (perm)	345	3468	0	399	3458	0	1049	1736	0	1069	1729	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		25			30			58			64	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2649			5241			3658			5279	
Travel Time (s)		40.1			79.4			55.4			80.0	
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
Adj. Flow (vph)	120	603	92	109	603	109	92	130	109	109	130	120
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	695	0	109	712	0	92	239	0	109	250	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2		1	2		1	2	
Detector Template	Left	Thru		Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100		20	100		20	100	
Trailing Detector (ft)	0	0		0	0		0	0		0	0	
Detector 1 Position(ft)	0	0		0	0		0	0		0	0	
Detector 1 Size(ft)	20	6		20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	7	4		3	8		2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0		8.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	13.0	36.0		12.0	35.0		32.0	32.0		32.0	32.0	
Total Split (%)	16.3%	45.0%		15.0%	43.8%		40.0%	40.0%		40.0%	40.0%	
Maximum Green (s)	9.0	32.0		8.0	31.0		28.0	28.0		28.0	28.0	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	29.9	22.9		28.7	22.3		39.5	39.5		39.5	39.5	
Actuated g/C Ratio	0.37	0.29		0.36	0.28		0.49	0.49		0.49	0.49	
v/c Ratio	0.44	0.69		0.40	0.72		0.18	0.27		0.21	0.28	
Control Delay	18.0	27.5		11.4	16.3		14.0	10.1		15.9	11.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.0	27.5		11.4	16.3		14.0	10.1		15.9	11.9	
LOS	B	C		B	B		B	B		B	B	
Approach Delay		26.1			15.7			11.2			13.1	
Approach LOS		C			B			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 63 (79%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 18.3	Intersection LOS: B
Intersection Capacity Utilization 55.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 6: 52nd St & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	110	555	85	100	555	100	85	120	100	100	120	110
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	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	120	603	92	109	603	109	92	130	109	109	130	120
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	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	292	913	139	293	872	157	546	461	387	556	439	405
Arrive On Green	0.07	0.30	0.30	0.06	0.29	0.29	0.49	0.49	0.49	0.49	0.49	0.49
Sat Flow, veh/h	1774	3081	469	1774	2996	540	1125	938	786	1136	893	824
Grp Volume(v), veh/h	120	346	349	109	356	356	92	0	239	109	0	250
Grp Sat Flow(s),veh/h/ln	1774	1770	1780	1774	1770	1767	1125	0	1724	1136	0	1717
Q Serve(g_s), s	3.7	13.7	13.7	3.4	14.3	14.3	4.2	0.0	6.5	5.0	0.0	6.9
Cycle Q Clear(g_c), s	3.7	13.7	13.7	3.4	14.3	14.3	11.2	0.0	6.5	11.6	0.0	6.9
Prop In Lane	1.00		0.26	1.00		0.31	1.00		0.46	1.00		0.48
Lane Grp Cap(c), veh/h	292	525	528	293	515	514	546	0	847	556	0	844
V/C Ratio(X)	0.41	0.66	0.66	0.37	0.69	0.69	0.17	0.00	0.28	0.20	0.00	0.30
Avail Cap(c_a), veh/h	372	708	712	361	686	685	546	0	847	556	0	844
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	1.00	1.00	0.73	0.73	0.73	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	19.2	24.6	24.6	19.1	25.2	25.2	15.4	0.0	12.0	15.4	0.0	12.1
Incr Delay (d2), s/veh	0.9	1.4	1.4	0.6	1.4	1.4	0.7	0.0	0.8	0.8	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	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	1.9	6.8	6.9	1.7	7.1	7.1	1.4	0.0	3.3	1.7	0.0	3.5
LnGrp Delay(d),s/veh	20.1	26.0	26.1	19.7	26.5	26.6	16.1	0.0	12.8	16.2	0.0	13.0
LnGrp LOS	C	C	C	B	C	C	B		B	B		B
Approach Vol, veh/h		815			821			331			359	
Approach Delay, s/veh		25.2			25.7			13.7			14.0	
Approach LOS		C			C			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		43.3	9.0	27.7		43.3	9.4	27.3				
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0	4.0	4.0				
Max Green Setting (Gmax), s		28.0	8.0	32.0		28.0	9.0	31.0				
Max Q Clear Time (g_c+I1), s		13.2	5.4	15.7		13.6	5.7	16.3				
Green Ext Time (p_c), s		3.1	0.1	7.4		3.1	0.1	7.0				

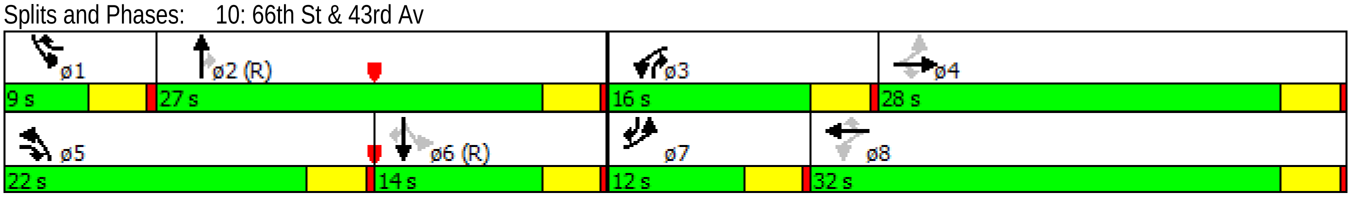
Intersection Summary			
HCM 2010 Ctrl Delay			22.0
HCM 2010 LOS			C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	135	340	485	215	340	60	485	85	215	60	85	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		0	435		335	435		335	435		335
Storage Lanes	1		1	1		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	1863	1583	3433	1863	1583	1770	1863	1583
Flt Permitted	0.348			0.200			0.950			0.697		
Satd. Flow (perm)	648	1863	1583	373	1863	1583	3433	1863	1583	1298	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			358			123			234			147
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		5241			5285			2949			901	
Travel Time (s)		79.4			80.1			36.6			11.2	
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
Adj. Flow (vph)	147	370	527	234	370	65	527	92	234	65	92	147
Shared Lane Traffic (%)												
Lane Group Flow (vph)	147	370	527	234	370	65	527	92	234	65	92	147
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	Prot	NA	pm+ov	pm+pt	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases	4		4	8		8			2	6		6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	12.0	28.0	22.0	16.0	32.0	9.0	22.0	27.0	16.0	9.0	14.0	12.0
Total Split (%)	15.0%	35.0%	27.5%	20.0%	40.0%	11.3%	27.5%	33.8%	20.0%	11.3%	17.5%	15.0%
Maximum Green (s)	8.0	24.0	18.0	12.0	28.0	5.0	18.0	23.0	12.0	5.0	10.0	8.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	27.9	20.2	41.1	34.7	23.6	33.5	16.9	28.7	43.8	21.6	15.7	27.5
Actuated g/C Ratio	0.35	0.25	0.51	0.43	0.30	0.42	0.21	0.36	0.55	0.27	0.20	0.34
v/c Ratio	0.44	0.79	0.53	0.66	0.67	0.09	0.73	0.14	0.24	0.17	0.25	0.23
Control Delay	19.4	38.5	3.2	22.7	30.8	0.6	35.8	24.3	4.1	17.1	32.9	5.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.4	38.5	3.2	22.7	30.8	0.6	35.8	24.3	4.1	17.1	32.9	5.3
LOS	B	D	A	C	C	A	D	C	A	B	C	A
Approach Delay		18.0			25.0			25.9			16.2	
Approach LOS		B			C			C			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 64 (80%), Referenced to phase 2:NBT and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.79	
Intersection Signal Delay: 21.8	Intersection LOS: C
Intersection Capacity Utilization 60.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 10: 66th St & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	135	340	485	215	340	60	485	85	215	60	85	135
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	147	370	527	234	370	65	527	92	234	65	92	147
Adj No. of Lanes	1	1	1	1	1	1	2	1	1	1	1	1
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	387	550	756	368	616	589	629	651	735	381	387	454
Arrive On Green	0.08	0.30	0.30	0.11	0.33	0.33	0.18	0.35	0.35	0.04	0.21	0.21
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	3442	1863	1583	1774	1863	1583
Grp Volume(v), veh/h	147	370	527	234	370	65	527	92	234	65	92	147
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1721	1863	1583	1774	1863	1583
Q Serve(g_s), s	4.5	14.0	20.8	7.0	13.3	2.2	11.8	2.7	7.4	2.3	3.3	5.8
Cycle Q Clear(g_c), s	4.5	14.0	20.8	7.0	13.3	2.2	11.8	2.7	7.4	2.3	3.3	5.8
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	387	550	756	368	616	589	629	651	735	381	387	454
V/C Ratio(X)	0.38	0.67	0.70	0.64	0.60	0.11	0.84	0.14	0.32	0.17	0.24	0.32
Avail Cap(c_a), veh/h	424	559	764	430	652	619	774	651	735	419	387	454
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)	0.75	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.9	24.8	16.4	17.7	22.4	16.5	31.6	17.8	13.5	23.4	26.4	22.4
Incr Delay (d2), s/veh	0.5	2.3	2.1	2.4	1.4	0.1	6.8	0.5	1.1	0.2	1.4	1.9
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(-26165%),veh/ln	2.3	7.5	9.5	3.6	7.0	1.0	6.2	1.5	3.5	1.1	1.8	2.8
LnGrp Delay(d),s/veh	18.3	27.1	18.4	20.1	23.8	16.5	38.3	18.3	14.6	23.7	27.9	24.3
LnGrp LOS	B	C	B	C	C	B	D	B	B	C	C	C
Approach Vol, veh/h		1044			669			853			304	
Approach Delay, s/veh		21.5			21.8			29.7			25.3	
Approach LOS		C			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	7.3	31.9	13.2	27.6	18.6	20.6	10.3	30.5
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	5.0	23.0	12.0	24.0	18.0	10.0	8.0	28.0
Max Q Clear Time (g_c+I1), s	4.3	9.4	9.0	22.8	13.8	7.8	6.5	15.3
Green Ext Time (p_c), s	0.0	1.8	0.2	0.8	0.8	0.5	0.0	5.2

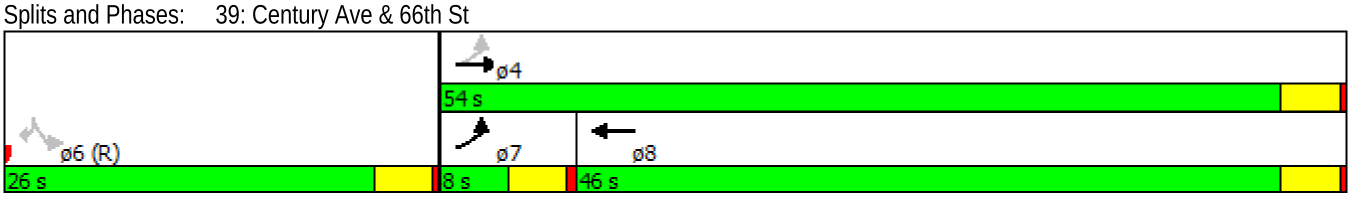
Intersection Summary			
HCM 2010 Ctrl Delay			24.4
HCM 2010 LOS			C

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	20	340	340	140	140	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435			150	435	335
Storage Lanes	1			0	0	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.961			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1790	0	1770	1583
Flt Permitted	0.175				0.950	
Satd. Flow (perm)	326	1863	1790	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			39			22
Link Speed (mph)		35	30		55	
Link Distance (ft)		3124	1828		2949	
Travel Time (s)		60.9	41.5		36.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	370	370	152	152	22
Shared Lane Traffic (%)						
Lane Group Flow (vph)	22	370	522	0	152	22
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		36	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	4				6	6
Detector Phase	7	4	8		6	6

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	8.0	20.0	20.0		20.0	20.0
Total Split (s)	8.0	54.0	46.0		26.0	26.0
Total Split (%)	10.0%	67.5%	57.5%		32.5%	32.5%
Maximum Green (s)	4.0	50.0	42.0		22.0	22.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Max	C-Max
Act Effct Green (s)	32.3	32.3	29.1		39.7	39.7
Actuated g/C Ratio	0.40	0.40	0.36		0.50	0.50
v/c Ratio	0.11	0.49	0.77		0.17	0.03
Control Delay	14.6	21.8	28.1		16.1	9.7
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	14.6	21.8	28.1		16.1	9.7
LOS	B	C	C		B	A
Approach Delay		21.4	28.1		15.3	
Approach LOS		C	C		B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 17 (21%), Referenced to phase 2: and 6:SBL, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 23.7	Intersection LOS: C
Intersection Capacity Utilization 40.8%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 39: Century Ave & 66th St



HCM 2010 Research does not support Non-NEMA phasing.

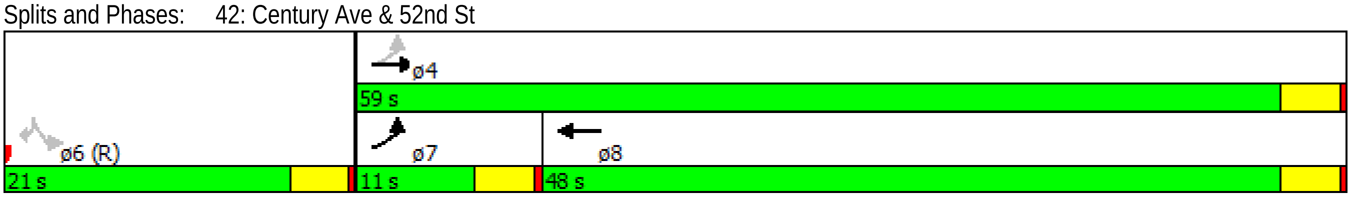
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	140	600	600	140	140	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435			335	200	0
Storage Lanes	1			0	1	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.974			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1814	0	1770	1583
Flt Permitted	0.103				0.950	
Satd. Flow (perm)	192	1863	1814	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			23			152
Link Speed (mph)		35	35		35	
Link Distance (ft)		1005	2634		1277	
Travel Time (s)		19.6	51.3		24.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	652	652	152	152	152
Shared Lane Traffic (%)						
Lane Group Flow (vph)	152	652	804	0	152	152
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	4				6	6
Detector Phase	7	4	8		6	6

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	8.0	20.0	20.0		20.0	20.0
Total Split (s)	11.0	59.0	48.0		21.0	21.0
Total Split (%)	13.8%	73.8%	60.0%		26.3%	26.3%
Maximum Green (s)	7.0	55.0	44.0		17.0	17.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Max	C-Max
Act Effct Green (s)	51.5	51.5	40.5		20.5	20.5
Actuated g/C Ratio	0.64	0.64	0.51		0.26	0.26
v/c Ratio	0.58	0.54	0.87		0.33	0.29
Control Delay	17.1	9.4	19.7		32.1	11.8
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	17.1	9.4	19.7		32.1	11.8
LOS	B	A	B		C	B
Approach Delay		10.8	19.7		21.9	
Approach LOS		B	B		C	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 32 (40%), Referenced to phase 2: and 6:SBL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 16.3 Intersection LOS: B
Intersection Capacity Utilization 65.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 42: Century Ave & 52nd St



HCM 2010 Research does not support Non-NEMA phasing.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	10	5	200	5	5	5	200	230	0	0	230	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.874			0.955						0.994	
Flt Protected		0.998			0.984			0.977				
Satd. Flow (prot)	0	1625	0	0	1750	0	0	1820	0	0	1852	0
Flt Permitted		0.998			0.984			0.977				
Satd. Flow (perm)	0	1625	0	0	1750	0	0	1820	0	0	1852	0
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		5285			2119			7040			5267	
Travel Time (s)		65.5			26.3			87.3			65.3	
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
Adj. Flow (vph)	11	5	217	5	5	5	217	250	0	0	250	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	233	0	0	15	0	0	467	0	0	261	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 59.3%	ICU Level of Service B
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	10	5	200	5	5	5	200	230	0	0	230	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	11	5	217	5	5	5	217	250	0	0	250	11

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	945	940	255	1052	946	250	261	0	0	250	0	0
Stage 1	255	255	-	685	685	-	-	-	-	-	-	-
Stage 2	690	685	-	367	261	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	242	264	784	204	262	789	1303	-	-	1316	-	-
Stage 1	749	696	-	438	448	-	-	-	-	-	-	-
Stage 2	435	448	-	653	692	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	201	213	784	123	211	789	1303	-	-	1316	-	-
Mov Cap-2 Maneuver	201	213	-	123	211	-	-	-	-	-	-	-
Stage 1	604	696	-	353	362	-	-	-	-	-	-	-
Stage 2	343	362	-	468	692	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.5	23.4	3.9	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1303	-	-	655	212	1316	-	-
HCM Lane V/C Ratio	0.167	-	-	0.357	0.077	-	-	-
HCM Control Delay (s)	8.3	0	-	13.5	23.4	0	-	-
HCM Lane LOS	A	A	-	B	C	A	-	-
HCM 95th %tile Q(veh)	0.6	-	-	1.6	0.2	0	-	-

Appendix A.5

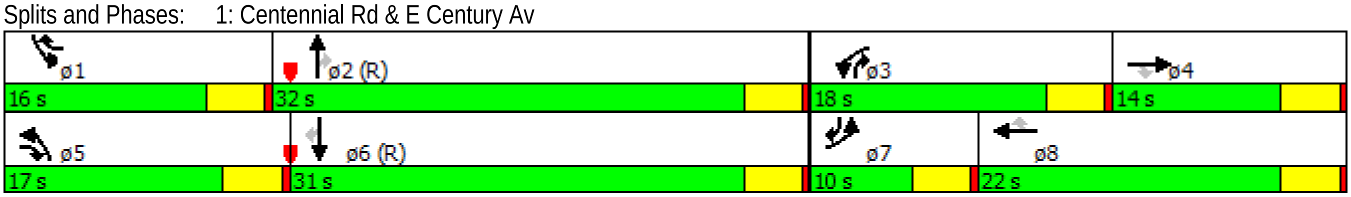
2040 Scenario 2 Intersection Capacity Analysis Worksheets

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	95	315	475	550	315	90	475	1075	550	90	1075	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		250	380		100	225		390	290		100
Storage Lanes	2		1	2		1	2		1	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	1.00	0.95	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	1583	3433	3539	1583	3433	3539	1583	1770	3539	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			123			68			268			123
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		2085			460			3351			1054	
Travel Time (s)		40.6			9.0			57.1			18.0	
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
Adj. Flow (vph)	103	342	516	598	342	98	516	1168	598	98	1168	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	103	342	516	598	342	98	516	1168	598	98	1168	103
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6	20	20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8	1	5	2	3	1	6	7
Permitted Phases			4			8			2			6
Detector Phase	7	4	5	3	8	1	5	2	3	1	6	7

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Total Split (s)	10.0	14.0	17.0	18.0	22.0	16.0	17.0	32.0	18.0	16.0	31.0	10.0
Total Split (%)	12.5%	17.5%	21.3%	22.5%	27.5%	20.0%	21.3%	40.0%	22.5%	20.0%	38.8%	12.5%
Maximum Green (s)	6.0	10.0	13.0	14.0	18.0	12.0	13.0	28.0	14.0	12.0	27.0	6.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	None	None	None	None	None	None	C-Max	None	None	C-Max	None
Act Effct Green (s)	6.0	10.0	27.0	14.0	20.0	33.4	13.0	32.6	50.6	9.4	27.0	37.0
Actuated g/C Ratio	0.08	0.12	0.34	0.18	0.25	0.42	0.16	0.41	0.63	0.12	0.34	0.46
v/c Ratio	0.40	0.78	0.84	1.00	0.39	0.14	0.92	0.81	0.54	0.47	0.98	0.13
Control Delay	40.3	47.6	32.9	71.1	27.4	6.6	58.0	28.4	7.1	39.9	49.1	2.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.3	47.6	32.9	71.1	27.4	6.6	58.0	28.4	7.1	39.9	49.1	2.3
LOS	D	D	C	E	C	A	E	C	A	D	D	A
Approach Delay		38.9			50.6			29.5			44.9	
Approach LOS		D			D			C			D	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green	
Natural Cycle: 80	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 38.7	Intersection LOS: D
Intersection Capacity Utilization 84.8%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: Centennial Rd & E Century Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	95	315	475	550	315	90	475	1075	550	90	1075	95
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	1863	1863	1863	1863	1863	1863	1863	1863	1863	1863
Adj Flow Rate, veh/h	103	342	516	598	342	98	516	1168	598	98	1168	103
Adj No. of Lanes	2	2	1	2	2	1	2	2	1	1	2	1
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	169	442	455	602	887	510	559	1517	956	126	1194	612
Arrive On Green	0.05	0.13	0.13	0.17	0.25	0.25	0.16	0.43	0.43	0.07	0.34	0.34
Sat Flow, veh/h	3442	3539	1583	3442	3539	1583	3442	3539	1583	1774	3539	1583
Grp Volume(v), veh/h	103	342	516	598	342	98	516	1168	598	98	1168	103
Grp Sat Flow(s),veh/h/ln	1721	1770	1583	1721	1770	1583	1721	1770	1583	1774	1770	1583
Q Serve(g_s), s	2.3	7.5	10.0	13.9	6.4	3.6	11.8	22.5	19.2	4.3	26.1	3.4
Cycle Q Clear(g_c), s	2.3	7.5	10.0	13.9	6.4	3.6	11.8	22.5	19.2	4.3	26.1	3.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	169	442	455	602	887	510	559	1517	956	126	1194	612
V/C Ratio(X)	0.61	0.77	1.13	0.99	0.39	0.19	0.92	0.77	0.63	0.77	0.98	0.17
Avail Cap(c_a), veh/h	258	442	455	602	887	510	559	1517	956	266	1194	612
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	37.3	33.9	28.5	33.0	24.9	19.6	33.0	19.5	10.1	36.5	26.2	16.1
Incr Delay (d2), s/veh	3.5	8.3	84.1	34.8	0.3	0.2	21.0	3.8	3.1	9.7	21.2	0.6
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(-26165%),veh/ln	1.2	4.2	20.6	9.5	3.2	1.6	7.2	11.7	9.1	2.5	16.2	1.6
LnGrp Delay(d),s/veh	40.8	42.2	112.6	67.7	25.1	19.8	54.0	23.3	13.2	46.2	47.4	16.7
LnGrp LOS	D	D	F	E	C	B	D	C	B	D	D	B
Approach Vol, veh/h		961			1038			2282			1369	
Approach Delay, s/veh		79.8			49.2			27.6			45.0	
Approach LOS		E			D			C			D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	9.7	38.3	18.0	14.0	17.0	31.0	7.9	24.1
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	12.0	28.0	14.0	10.0	13.0	27.0	6.0	18.0
Max Q Clear Time (g_c+I1), s	6.3	24.5	15.9	12.0	13.8	28.1	4.3	8.4
Green Ext Time (p_c), s	0.1	3.3	0.0	0.0	0.0	0.0	0.0	4.6

Intersection Summary		
HCM 2010 Ctrl Delay		44.7
HCM 2010 LOS		D

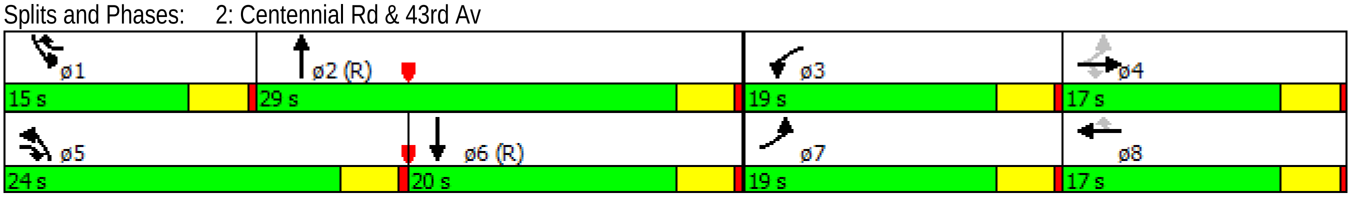
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	355	500	360	355	255	500	285	360	255	285	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		200	200		200	300		300	250		250
Storage Lanes	1		1	2		1	2		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95	0.97	0.95	0.95
Frt			0.850			0.850		0.916			0.928	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	3433	3242	0	3433	3284	0
Flt Permitted	0.327			0.950			0.950			0.950		
Satd. Flow (perm)	609	3539	1583	3433	3539	1583	3433	3242	0	3433	3284	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			105			272		391			261	
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1886			2614			4233			3577	
Travel Time (s)		28.6			39.6			52.5			44.3	
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
Adj. Flow (vph)	288	386	543	391	386	277	543	310	391	277	310	288
Shared Lane Traffic (%)												
Lane Group Flow (vph)	288	386	543	391	386	277	543	701	0	277	598	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2	1	1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100	20	20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0	0	0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6	20	20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pm+ov	Prot	NA	pm+ov	Prot	NA		Prot	NA	
Protected Phases	7	4	5	3	8	1	5	2		1	6	
Permitted Phases	4		4			8						
Detector Phase	7	4	5	3	8	1	5	2		1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0		8.0	8.0	
Total Split (s)	19.0	17.0	24.0	19.0	17.0	15.0	24.0	29.0		15.0	20.0	
Total Split (%)	23.8%	21.3%	30.0%	23.8%	21.3%	18.8%	30.0%	36.3%		18.8%	25.0%	
Maximum Green (s)	15.0	13.0	20.0	15.0	13.0	11.0	20.0	25.0		11.0	16.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None	None	None	C-Max		None	C-Max	
Act Effct Green (s)	26.2	12.5	34.4	13.5	12.4	26.7	17.8	27.6		10.4	20.2	
Actuated g/C Ratio	0.33	0.16	0.43	0.17	0.16	0.33	0.22	0.34		0.13	0.25	
v/c Ratio	0.73	0.70	0.73	0.68	0.71	0.39	0.71	0.51		0.62	0.59	
Control Delay	30.0	39.1	21.3	37.4	39.6	4.5	34.0	10.8		39.5	18.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	30.0	39.1	21.3	37.4	39.6	4.5	34.0	10.8		39.5	18.2	
LOS	C	D	C	D	D	A	C	B		D	B	
Approach Delay		29.0			29.6			20.9			24.9	
Approach LOS		C			C			C			C	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.73
Intersection Signal Delay: 26.0 Intersection LOS: C
Intersection Capacity Utilization 68.5% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 2: Centennial Rd & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	265	355	500	360	355	255	500	285	360	255	285	265
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	1863	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	288	386	543	391	386	277	543	310	391	277	310	288
Adj No. of Lanes	1	2	1	2	2	1	2	2	0	2	2	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	418	635	585	489	575	425	653	659	590	365	511	457
Arrive On Green	0.16	0.18	0.18	0.14	0.16	0.16	0.19	0.37	0.37	0.11	0.29	0.29
Sat Flow, veh/h	1774	3539	1583	3442	3539	1583	3442	1770	1583	3442	1770	1583
Grp Volume(v), veh/h	288	386	543	391	386	277	543	310	391	277	310	288
Grp Sat Flow(s),veh/h/ln	1774	1770	1583	1721	1770	1583	1721	1770	1583	1721	1770	1583
Q Serve(g_s), s	10.5	8.0	14.4	8.8	8.2	12.4	12.1	10.7	16.5	6.3	12.1	12.7
Cycle Q Clear(g_c), s	10.5	8.0	14.4	8.8	8.2	12.4	12.1	10.7	16.5	6.3	12.1	12.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	418	635	585	489	575	425	653	659	590	365	511	457
V/C Ratio(X)	0.69	0.61	0.93	0.80	0.67	0.65	0.83	0.47	0.66	0.76	0.61	0.63
Avail Cap(c_a), veh/h	469	635	585	645	575	425	860	659	590	473	511	457
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	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.7	30.2	24.2	33.2	31.5	25.9	31.2	19.1	20.9	34.8	24.5	24.7
Incr Delay (d2), s/veh	3.7	1.7	21.4	5.3	3.0	3.5	5.3	2.4	5.8	5.2	5.3	6.4
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(-26165%),veh/ln	5.5	4.1	14.9	4.5	4.3	5.8	6.2	5.6	8.1	3.2	6.6	6.3
LnGrp Delay(d),s/veh	26.3	31.9	45.6	38.5	34.5	29.4	36.5	21.5	26.7	39.9	29.8	31.2
LnGrp LOS	C	C	D	D	C	C	D	C	C	D	C	C
Approach Vol, veh/h		1217			1054			1244			875	
Approach Delay, s/veh		36.7			34.7			29.7			33.5	
Approach LOS		D			C			C			C	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4	5	6	7	8
Phs Duration (G+Y+Rc), s	12.5	33.8	15.4	18.4	19.2	27.1	16.7	17.0
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Green Setting (Gmax), s	11.0	25.0	15.0	13.0	20.0	16.0	15.0	13.0
Max Q Clear Time (g_c+I1), s	8.3	18.5	10.8	16.4	14.1	14.7	12.5	14.4
Green Ext Time (p_c), s	0.2	3.7	0.6	0.0	1.0	0.9	0.2	0.0

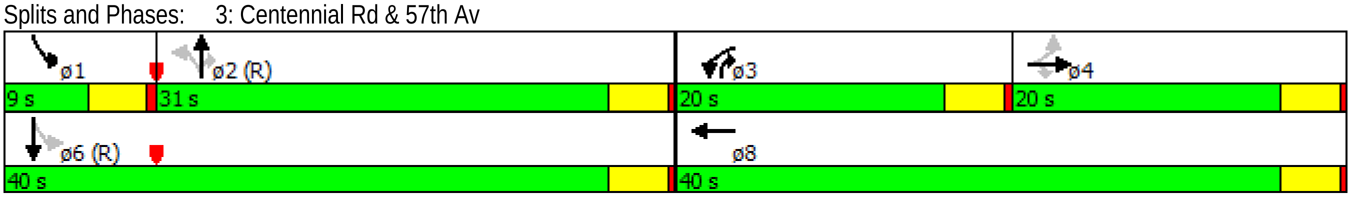
Intersection Summary		
HCM 2010 Ctrl Delay		33.6
HCM 2010 LOS		C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	195	195	430	195	160	195	160	430	160	160	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	435		335	435		0	435		335
Storage Lanes	1		1	2		0	1		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.932				0.850		0.957	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	3433	1736	0	1770	1863	1583	1770	1783	0
Flt Permitted	0.533			0.950			0.607			0.541		
Satd. Flow (perm)	993	1863	1583	3433	1736	0	1131	1863	1583	1008	1783	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			212		67				327		33	
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		1838			5295			1723			4521	
Travel Time (s)		27.8			80.2			21.4			56.0	
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
Adj. Flow (vph)	71	212	212	467	212	174	212	174	467	174	174	71
Shared Lane Traffic (%)												
Lane Group Flow (vph)	71	212	212	467	386	0	212	174	467	174	245	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2	1	1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100	20	20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0	0	0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	Perm	NA	Perm	Prot	NA		Perm	NA	pm+ov	pm+pt	NA	
Protected Phases		4		3	8			2	3	1	6	
Permitted Phases	4		4				2		2	6		
Detector Phase	4	4	4	3	8		2	2	3	1	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	20.0	20.0	20.0	8.0	20.0		20.0	20.0	8.0	8.0	20.0	
Total Split (s)	20.0	20.0	20.0	20.0	40.0		31.0	31.0	20.0	9.0	40.0	
Total Split (%)	25.0%	25.0%	25.0%	25.0%	50.0%		38.8%	38.8%	25.0%	11.3%	50.0%	
Maximum Green (s)	16.0	16.0	16.0	16.0	36.0		27.0	27.0	16.0	5.0	36.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lag	Lag	Lag	Lead			Lag	Lag	Lead	Lead		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes		
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None	None	None	None		C-Max	C-Max	None	None	C-Max	
Walk Time (s)	5.0	5.0	5.0		5.0		5.0	5.0			5.0	
Flash Dont Walk (s)	11.0	11.0	11.0		11.0		11.0	11.0			11.0	
Pedestrian Calls (#/hr)	0	0	0		0		0	0			0	
Act Effct Green (s)	13.5	13.5	13.5	15.0	32.5		29.2	29.2	48.1	39.5	39.5	
Actuated g/C Ratio	0.17	0.17	0.17	0.19	0.41		0.36	0.36	0.60	0.49	0.49	
v/c Ratio	0.43	0.68	0.48	0.73	0.52		0.51	0.26	0.43	0.31	0.27	
Control Delay	37.1	42.1	8.3	37.7	16.6		26.5	20.1	3.9	14.3	12.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	37.1	42.1	8.3	37.7	16.6		26.5	20.1	3.9	14.3	12.1	
LOS	D	D	A	D	B		C	C	A	B	B	
Approach Delay		26.9			28.1			12.9			13.0	
Approach LOS		C			C			B			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 20.5	Intersection LOS: C
Intersection Capacity Utilization 60.2%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 3: Centennial Rd & 57th Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	65	195	195	430	195	160	195	160	430	160	160	65
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	1863	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	71	212	212	467	212	174	212	174	467	174	174	71
Adj No. of Lanes	1	1	1	2	1	0	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	262	323	274	564	367	301	543	746	894	467	646	263
Arrive On Green	0.17	0.17	0.17	0.16	0.39	0.39	0.40	0.40	0.40	0.06	0.51	0.51
Sat Flow, veh/h	993	1863	1583	3442	948	778	1130	1863	1583	1774	1259	514
Grp Volume(v), veh/h	71	212	212	467	0	386	212	174	467	174	0	245
Grp Sat Flow(s),veh/h/ln	993	1863	1583	1721	0	1725	1130	1863	1583	1774	0	1772
Q Serve(g_s), s	5.1	8.5	10.2	10.5	0.0	14.1	11.1	4.9	14.6	4.5	0.0	6.3
Cycle Q Clear(g_c), s	5.1	8.5	10.2	10.5	0.0	14.1	11.1	4.9	14.6	4.5	0.0	6.3
Prop In Lane	1.00		1.00	1.00		0.45	1.00		1.00	1.00		0.29
Lane Grp Cap(c), veh/h	262	323	274	564	0	668	543	746	894	467	0	909
V/C Ratio(X)	0.27	0.66	0.77	0.83	0.00	0.58	0.39	0.23	0.52	0.37	0.00	0.27
Avail Cap(c_a), veh/h	289	373	317	688	0	776	543	746	894	467	0	909
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	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	29.5	30.9	31.6	32.4	0.0	19.4	17.7	15.9	10.8	12.0	0.0	11.0
Incr Delay (d2), s/veh	0.6	3.4	9.8	7.0	0.0	0.8	2.1	0.7	2.2	0.5	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	0.0	0.0	0.0	0.0
%ile BackOfQ(-26165%),veh/ln	1.4	4.7	5.2	5.5	0.0	6.8	3.7	2.7	6.9	2.2	0.0	3.2
LnGrp Delay(d),s/veh	30.0	34.3	41.4	39.3	0.0	20.2	19.8	16.6	13.0	12.5	0.0	11.7
LnGrp LOS	C	C	D	D		C	B	B	B	B		B
Approach Vol, veh/h		495			853			853			419	
Approach Delay, s/veh		36.7			30.7			15.4			12.1	
Approach LOS		D			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2	3	4		6		8
Phs Duration (G+Y+Rc), s	9.0	36.0	17.1	17.9		45.0		35.0
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0		4.0		4.0
Max Green Setting (Gmax), s	5.0	27.0	16.0	16.0		36.0		36.0
Max Q Clear Time (g_c+I1), s	6.5	16.6	12.5	12.2		8.3		16.1
Green Ext Time (p_c), s	0.0	3.5	0.6	1.6		4.9		4.4

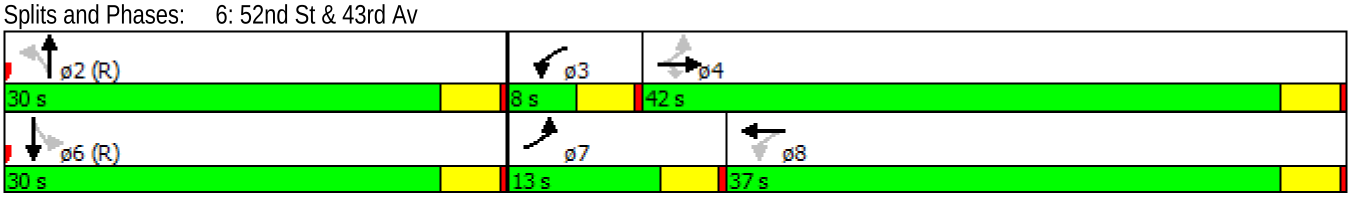
Intersection Summary		
HCM 2010 Ctrl Delay		23.9
HCM 2010 LOS		C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	170	495	65	65	495	125	65	130	65	125	130	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		0	435		335	435		0	200		0
Storage Lanes	1		1	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.970			0.950			0.915	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1863	1583	1770	3433	0	1770	1770	0	1770	1704	0
Flt Permitted	0.212			0.253			0.462			0.586		
Satd. Flow (perm)	395	1863	1583	471	3433	0	861	1770	0	1092	1704	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			71		48			34			87	
Link Speed (mph)		45			45			45			45	
Link Distance (ft)		2669			1041			3658			5279	
Travel Time (s)		40.4			15.8			55.4			80.0	
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
Adj. Flow (vph)	185	538	71	71	538	136	71	141	71	136	141	185
Shared Lane Traffic (%)												
Lane Group Flow (vph)	185	538	71	71	674	0	71	212	0	136	326	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8			2			6		
Detector Phase	7	4	4	3	8		2	2		6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Minimum Split (s)	8.0	20.0	20.0	8.0	20.0		20.0	20.0		20.0	20.0	
Total Split (s)	13.0	42.0	42.0	8.0	37.0		30.0	30.0		30.0	30.0	
Total Split (%)	16.3%	52.5%	52.5%	10.0%	46.3%		37.5%	37.5%		37.5%	37.5%	
Maximum Green (s)	9.0	38.0	38.0	4.0	33.0		26.0	26.0		26.0	26.0	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5		0.5	0.5		0.5	0.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None	None	None	None		C-Max	C-Max		C-Max	C-Max	
Act Effct Green (s)	37.1	30.7	30.7	28.3	24.3		34.9	34.9		34.9	34.9	
Actuated g/C Ratio	0.46	0.38	0.38	0.35	0.30		0.44	0.44		0.44	0.44	
v/c Ratio	0.55	0.75	0.11	0.31	0.63		0.19	0.27		0.29	0.41	
Control Delay	18.1	28.3	3.9	14.0	24.0		9.7	7.1		19.2	14.8	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.1	28.3	3.9	14.0	24.0		9.7	7.1		19.2	14.8	
LOS	B	C	A	B	C		A	A		B	B	
Approach Delay		23.7			23.1			7.8			16.1	
Approach LOS		C			C			A			B	

Intersection Summary	
Area Type: Other	
Cycle Length: 80	
Actuated Cycle Length: 80	
Offset: 64 (80%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.75	
Intersection Signal Delay: 20.0	Intersection LOS: B
Intersection Capacity Utilization 63.8%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 6: 52nd St & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	170	495	65	65	495	125	65	130	65	125	130	170
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	1863	1863	1863	1900	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	185	538	71	71	538	136	71	141	71	136	141	185
Adj No. of Lanes	1	1	1	1	2	0	1	1	0	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	366	679	577	249	882	222	418	520	262	519	326	427
Arrive On Green	0.09	0.36	0.36	0.04	0.31	0.31	0.44	0.44	0.44	0.44	0.44	0.44
Sat Flow, veh/h	1774	1863	1583	1774	2802	706	1050	1170	589	1165	732	961
Grp Volume(v), veh/h	185	538	71	71	339	335	71	0	212	136	0	326
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1770	1738	1050	0	1759	1165	0	1693
Q Serve(g_s), s	5.3	20.7	2.4	2.1	13.0	13.1	4.0	0.0	6.1	6.7	0.0	10.6
Cycle Q Clear(g_c), s	5.3	20.7	2.4	2.1	13.0	13.1	14.6	0.0	6.1	12.8	0.0	10.6
Prop In Lane	1.00		1.00	1.00		0.41	1.00		0.33	1.00		0.57
Lane Grp Cap(c), veh/h	366	679	577	249	557	547	418	0	782	519	0	753
V/C Ratio(X)	0.51	0.79	0.12	0.29	0.61	0.61	0.17	0.00	0.27	0.26	0.00	0.43
Avail Cap(c_a), veh/h	405	885	752	265	730	717	418	0	782	519	0	753
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	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	16.4	22.7	16.9	19.2	23.2	23.3	20.3	0.0	14.0	18.1	0.0	15.3
Incr Delay (d2), s/veh	1.1	3.8	0.1	0.6	1.1	1.1	0.9	0.0	0.9	1.2	0.0	1.8
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(-26165%),veh/ln	2.6	11.3	1.1	1.1	6.5	6.4	1.3	0.0	3.1	2.3	0.0	5.3
LnGrp Delay(d),s/veh	17.5	26.5	17.0	19.8	24.3	24.4	21.2	0.0	14.9	19.3	0.0	17.1
LnGrp LOS	B	C	B	B	C	C	C		B	B		B
Approach Vol, veh/h		794			745			283			462	
Approach Delay, s/veh		23.5			23.9			16.5			17.7	
Approach LOS		C			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2	3	4		6	7	8
Phs Duration (G+Y+Rc), s		39.6	7.3	33.1		39.6	11.3	29.2
Change Period (Y+Rc), s		4.0	4.0	4.0		4.0	4.0	4.0
Max Green Setting (Gmax), s		26.0	4.0	38.0		26.0	9.0	33.0
Max Q Clear Time (g_c+I1), s		16.6	4.1	22.7		14.8	7.3	15.1
Green Ext Time (p_c), s		2.7	0.0	6.5		3.0	0.1	7.0

Intersection Summary	
HCM 2010 Ctrl Delay	21.6
HCM 2010 LOS	C

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	235	330	5	5	330	120	5	5	5	120	5	235
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435		335	435		335	435		335	435		335
Storage Lanes	1		0	1		1	1		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.998				0.850			0.850		0.853	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1859	0	1770	1863	1583	1770	1863	1583	1770	1589	0
Flt Permitted	0.229			0.544			0.530			0.754		
Satd. Flow (perm)	427	1859	0	1013	1863	1583	987	1863	1583	1405	1589	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				130			68		255	
Link Speed (mph)		45			45			55			55	
Link Distance (ft)		4200			5285			2949			901	
Travel Time (s)		63.6			80.1			36.6			11.2	
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
Adj. Flow (vph)	255	359	5	5	359	130	5	5	5	130	5	255
Shared Lane Traffic (%)												
Lane Group Flow (vph)	255	364	0	5	359	130	5	5	5	130	260	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru	Right	Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm	Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8		8	2		2	6		
Detector Phase	7	4		8	8	8	2	2	2	6	6	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Switch Phase												
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	8.0	20.0		20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	
Total Split (s)	18.0	53.0		35.0	35.0	35.0	27.0	27.0	27.0	27.0	27.0	
Total Split (%)	22.5%	66.3%		43.8%	43.8%	43.8%	33.8%	33.8%	33.8%	33.8%	33.8%	
Maximum Green (s)	14.0	49.0		31.0	31.0	31.0	23.0	23.0	23.0	23.0	23.0	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None	None	C-Max	C-Max	C-Max	C-Max	C-Max	
Walk Time (s)		5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Flash Dont Walk (s)		11.0		11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	
Pedestrian Calls (#/hr)		0		0	0	0	0	0	0	0	0	
Act Effct Green (s)	38.4	38.4		21.2	21.2	21.2	33.6	33.6	33.6	33.6	33.6	
Actuated g/C Ratio	0.48	0.48		0.26	0.26	0.26	0.42	0.42	0.42	0.42	0.42	
v/c Ratio	0.60	0.41		0.02	0.73	0.25	0.01	0.01	0.01	0.22	0.32	
Control Delay	17.7	13.9		18.4	34.9	5.0	17.0	16.8	0.0	18.7	4.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	17.7	13.9		18.4	34.9	5.0	17.0	16.8	0.0	18.7	4.2	
LOS	B	B		B	C	A	B	B	A	B	A	
Approach Delay		15.4			26.9			11.3			9.0	
Approach LOS		B			C			B			A	

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 32 (40%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 50

Control Type: Actuated-Coordinated

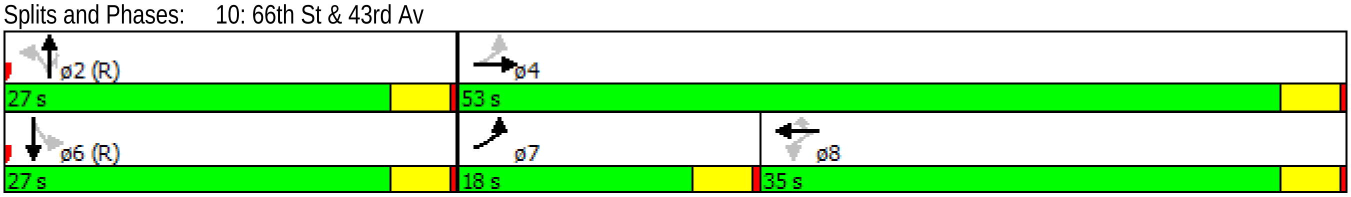
Maximum v/c Ratio: 0.73

Intersection Signal Delay: 17.5 Intersection LOS: B

Intersection Capacity Utilization 55.2% ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 10: 66th St & 43rd Av



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	235	330	5	5	330	120	5	5	5	120	5	235
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	255	359	5	5	359	130	5	5	5	130	5	255
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	383	788	11	346	470	400	498	875	744	745	14	732
Arrive On Green	0.13	0.43	0.43	0.25	0.25	0.25	0.47	0.47	0.47	0.47	0.47	0.47
Sat Flow, veh/h	1774	1833	26	1014	1863	1583	1115	1863	1583	1399	31	1557
Grp Volume(v), veh/h	255	0	364	5	359	130	5	5	5	130	0	260
Grp Sat Flow(s),veh/h/ln	1774	0	1858	1014	1863	1583	1115	1863	1583	1399	0	1588
Q Serve(g_s), s	8.0	0.0	11.1	0.3	14.3	5.3	0.2	0.1	0.1	4.4	0.0	8.3
Cycle Q Clear(g_c), s	8.0	0.0	11.1	0.3	14.3	5.3	8.5	0.1	0.1	4.5	0.0	8.3
Prop In Lane	1.00		0.01	1.00		1.00	1.00		1.00	1.00		0.98
Lane Grp Cap(c), veh/h	383	0	799	346	470	400	498	875	744	745	0	746
V/C Ratio(X)	0.67	0.00	0.46	0.01	0.76	0.33	0.01	0.01	0.01	0.17	0.00	0.35
Avail Cap(c_a), veh/h	467	0	1138	483	722	614	498	875	744	745	0	746
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	18.8	0.0	16.2	22.5	27.7	24.4	16.1	11.3	11.3	12.5	0.0	13.4
Incr Delay (d2), s/veh	2.6	0.0	0.4	0.0	2.6	0.5	0.0	0.0	0.0	0.5	0.0	1.3
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(-26165%),veh/ln	4.1	0.0	5.8	0.1	7.6	2.4	0.1	0.1	0.1	1.8	0.0	3.9
LnGrp Delay(d),s/veh	21.5	0.0	16.6	22.5	30.3	24.8	16.2	11.3	11.3	13.0	0.0	14.7
LnGrp LOS	C		B	C	C	C	B	B	B	B		B
Approach Vol, veh/h		619			494			15			390	
Approach Delay, s/veh		18.6			28.8			12.9			14.1	
Approach LOS		B			C			B			B	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6	7	8
Phs Duration (G+Y+Rc), s		41.6		38.4		41.6	14.2	24.2
Change Period (Y+Rc), s		4.0		4.0		4.0	4.0	4.0
Max Green Setting (Gmax), s		23.0		49.0		23.0	14.0	31.0
Max Q Clear Time (g_c+I1), s		10.5		13.1		10.3	10.0	16.3
Green Ext Time (p_c), s		1.4		4.9		1.5	0.3	3.9

Intersection Summary		
HCM 2010 Ctrl Delay		20.7
HCM 2010 LOS		C

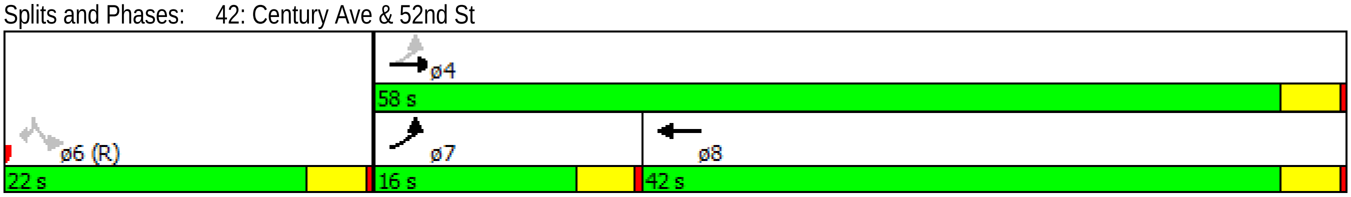
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	215	420	420	105	105	215
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435			335	200	200
Storage Lanes	1			0	0	1
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.973			0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1863	1812	0	1770	1583
Flt Permitted	0.150				0.950	
Satd. Flow (perm)	279	1863	1812	0	1770	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)			21			234
Link Speed (mph)		35	35		35	
Link Distance (ft)		1005	2634		1277	
Travel Time (s)		19.6	51.3		24.9	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	234	457	457	114	114	234
Shared Lane Traffic (%)						
Lane Group Flow (vph)	234	457	571	0	114	234
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Number of Detectors	1	2	2		1	1
Detector Template	Left	Thru	Thru		Left	Right
Leading Detector (ft)	20	100	100		20	20
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	6	6		20	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)		94	94			
Detector 2 Size(ft)		6	6			
Detector 2 Type		Cl+Ex	Cl+Ex			
Detector 2 Channel						
Detector 2 Extend (s)		0.0	0.0			
Turn Type	pm+pt	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases	4				6	6
Detector Phase	7	4	8		6	6

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0		4.0	4.0
Minimum Split (s)	8.0	20.0	20.0		20.0	20.0
Total Split (s)	16.0	58.0	42.0		22.0	22.0
Total Split (%)	20.0%	72.5%	52.5%		27.5%	27.5%
Maximum Green (s)	12.0	54.0	38.0		18.0	18.0
Yellow Time (s)	3.5	3.5	3.5		3.5	3.5
All-Red Time (s)	0.5	0.5	0.5		0.5	0.5
Lost Time Adjust (s)	0.0	0.0	0.0		0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0		4.0	4.0
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Recall Mode	None	None	None		C-Max	C-Max
Act Effct Green (s)	46.0	46.0	30.5		26.0	26.0
Actuated g/C Ratio	0.58	0.58	0.38		0.32	0.32
v/c Ratio	0.63	0.43	0.81		0.20	0.35
Control Delay	17.5	10.1	30.5		22.3	5.4
Queue Delay	0.0	0.0	0.0		0.0	0.0
Total Delay	17.5	10.1	30.5		22.3	5.4
LOS	B	B	C		C	A
Approach Delay		12.6	30.5		10.9	
Approach LOS		B	C		B	

Intersection Summary

Area Type: Other
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 16 (20%), Referenced to phase 2: and 6:SBL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 18.6 Intersection LOS: B
Intersection Capacity Utilization 56.2% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 42: Century Ave & 52nd St



HCM 2010 Research does not support Non-NEMA phasing.

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	5	275	5	5	5	275	90	5	5	90	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		300	0		0	0		0	0		0
Storage Lanes	0		1	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.955			0.993			0.972	
Flt Protected		0.960			0.984		0.950				0.998	
Satd. Flow (prot)	0	1788	1583	0	1750	0	1770	1850	0	0	1807	0
Flt Permitted		0.960			0.984		0.950				0.998	
Satd. Flow (perm)	0	1788	1583	0	1750	0	1770	1850	0	0	1807	0
Link Speed (mph)		55			55			55			55	
Link Distance (ft)		5285			2119			7040			5267	
Travel Time (s)		65.5			26.3			87.3			65.3	
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
Adj. Flow (vph)	27	5	299	5	5	5	299	98	5	5	98	27
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	32	299	0	15	0	299	103	0	0	130	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Sign Control		Stop			Stop			Free			Free	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 36.9%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	7.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	25	5	275	5	5	5	275	90	5	5	90	25
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	300	-	-	-	0	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	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	27	5	299	5	5	5	299	98	5	5	98	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	826	823	111	823	834	101	125	0	0	103	0	0
Stage 1	122	122	-	698	698	-	-	-	-	-	-	-
Stage 2	704	701	-	125	136	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	291	309	942	292	304	954	1462	-	-	1489	-	-
Stage 1	882	795	-	431	442	-	-	-	-	-	-	-
Stage 2	428	441	-	879	784	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	239	245	942	165	241	954	1462	-	-	1489	-	-
Mov Cap-2 Maneuver	239	245	-	165	241	-	-	-	-	-	-	-
Stage 1	702	792	-	343	352	-	-	-	-	-	-	-
Stage 2	333	351	-	594	781	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.8	19.4	6	0.3
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1462	-	-	240	942	266	1489	-	-
HCM Lane V/C Ratio	0.204	-	-	0.136	0.317	0.061	0.004	-	-
HCM Control Delay (s)	8.1	-	-	22.3	10.6	19.4	7.4	0	-
HCM Lane LOS	A	-	-	C	B	C	A	A	-
HCM 95th %tile Q(veh)	0.8	-	-	0.5	1.4	0.2	0	-	-

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	5	290	290	0	5	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	435			150	435	335
Storage Lanes	0			0	0	0
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected		0.999			0.950	
Satd. Flow (prot)	0	1861	1863	0	1770	0
Flt Permitted		0.999			0.950	
Satd. Flow (perm)	0	1861	1863	0	1770	0
Link Speed (mph)		35	30		55	
Link Distance (ft)		3124	1828		2949	
Travel Time (s)		60.9	41.5		36.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	315	315	0	5	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	320	315	0	5	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		0	0		24	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		16	16		16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Sign Control		Free	Free		Stop	

Intersection Summary	
Area Type: Other	
Control Type: Unsignalized	
Intersection Capacity Utilization 29.3%	ICU Level of Service A
Analysis Period (min) 15	

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	5	290	290	0	5	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	315	315	0	5	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	315	0	-	0	641	315
Stage 1	-	-	-	-	315	-
Stage 2	-	-	-	-	326	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1245	-	-	-	439	725
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	731	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1245	-	-	-	437	725
Mov Cap-2 Maneuver	-	-	-	-	437	-
Stage 1	-	-	-	-	740	-
Stage 2	-	-	-	-	727	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	13.3
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1245	-	-	-	437
HCM Lane V/C Ratio	0.004	-	-	-	0.012
HCM Control Delay (s)	7.9	0	-	-	13.3
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Appendix B

Interstate Justification Analysis

Proposed 66th Street Interchange

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INTERSTATE ACCESS ANALYSIS

INTRODUCTION & BACKGROUND

The purpose of this element of the Northeast Bismarck Subarea Study is to outline the process and future technical analysis for requesting a new access to Interstate 94 in Bismarck via a proposed interchange at 66th Street. This element of the Northeast Bismarck Subarea Study is intended to complete the first step of a two-step process for approval of a requested Interstate access revision. The first step as part of the Northeast Bismarck Subarea Study is finding and documenting the operational acceptability of the proposed access revision within completed or approved documents completed by the BMMPO. The subsequent second step is NDDOT approval, and the third and final step is FHWA approval.

The final approval of an access revision at a proposed 66th Street Interchange can only occur as part of a future National Environmental Policy Act (NEPA) process. This future NEPA process would require an evaluation of all feasible alternatives (design, layout, locations, etc.) for an interchange, and will involve a public input process. The intent of this analysis is simply to develop a preliminary understanding of the administrative and technical analysis required for a proposed access revision of I-94 at 66th Street.

FHWA JUSTIFICATION FOR ACCESS REVISION

The I-94 Corridor Study and the Envision 2040 Plan recommend the development of a new interchange on I-94 at 66th Street. While the study, discussion and inclusion of the access revision in both these efforts add merit to future analysis, neither are a singular basis for an access request.

Neither of these efforts have completed an Interstate Justification Report (IJR) to determine if and under what conditions an access revision is justified at 66th Street. The completion of a planning level IJR will be important to determine if an Interchange is justified at 66th Street. IJR criteria need to follow the FHWA policy points/criteria regarding access modifications to the interstate system.

Approval of an access revision on I-94 at 66th Street is at the discretion of the Federal Highway Administration (FHWA) through the development of an IJR. Guidance is provided by the FHWA per the *Interstate System Access Informational Guide*, August 2010. Per this guidance the interstate access justification request may be done through a two-step process to reduce the risk exposure to a state department of transportation (DOT); or local agencies who are pursuing the access revision.

To analyze the operational and engineering acceptability of a new interchange at 66th Street and Interstate 94, this memorandum reviews the eight interstate access policy requirements established by the FHWA that are required to be met prior to a proposed access being considered acceptable.

Analyses from multiple past studies relevant to the 66th Street vicinity will be referenced throughout this memorandum. Recently completed relevant studies include the 2014 Bismarck-Mandan I-94 Corridor Study, the 2014 Bismarck Growth Management Plan, the 2014 Bismarck-Mandan Envision 2040 Long Range Transportation Plan (LRTP) and the Northeast Bismarck Subarea Study.

The first step in the determination of operational acceptability in conformance with the eight policy points established by FHWA. Part of step one would include FHWA and North Dakota Department of Transportation (NDDOT) consensus on the anticipated level of analysis to be completed as part of an operational and engineering analysis. Step one involves coordination between the FHWA Division and the DOT (and likely the local agencies wishing for the access revision). Following agreement on the scope of analysis required related to the access revision, a preliminary access request would be completed and reviewed by the NDDOT. The information included as part of this element of the Northeast Bismarck Subarea Study would provide adequate substantiation to complete step one as outlined herein.

A DOT can provide a finding that the access revision is acceptable based upon the operational and engineering analysis. Following DOT acceptance, the access revision request would be forwarded to the FHWA Division Office. Based on the completed operational and engineering analysis, FHWA can make a determination of acceptability. Note, this would not constitute approval of the access revision. However, it would provide local project partners with the reassurance to guide future local land use and transportation decision making with the understanding that a future formal access request could be positively received once the NEPA phase begins. These preliminary assurances are important to ensure symmetry with future land use and zoning decisions to avoid potential conflicting land use and traffic patterns in the future area of influence of a new interstate access. *However it is critical to remember that no decision is final on an interstate access revision until such time as it has been approved as part of the NEPA phase of projected development.*

FHWA approval of the access revision, which as a Federal Action, requires NEPA procedures be followed. The completion of the operational and engineering acceptability analysis can precede the NEPA process; however the actual access approval would be done as part of the NEPA (project development) phase of the project.

Enough data was collected as part of the Northeast Bismarck Subarea study to complete evaluate the operational acceptability of the access justification process as outlined herein. Formal *NDDOT and FHWA action on the analysis within this report is not anticipated.*

DOT JUSTIFICATION FOR 66TH STREET ACCESS REVISION

Support from NDDOT for an access revision at 66th Street must be based on technical metrics following the eight FHWA Policy Points. Funding for interchange improvements is more clearly discussed in the NDDOT Local Government Manual. Based on past practice, a DOT is typically supportive of new interstate access when the benefit is shown to be regional in nature. NDDOT has been reluctant to invest in new interchange infrastructure when it is perceived to benefit only local traffic. The 66th Street Interchange needs to be proposed as a solution of inter-regional significance, and an investment which mixes with other needs within the overall BMMPO 2040 LRTP.

The benefit of an interstate access at 66th Street could be looked at as benefiting in the short term two other critical north-south corridors, both of which have access to I-94 and are relevant to the NDDOT Primary or Secondary Regional System:

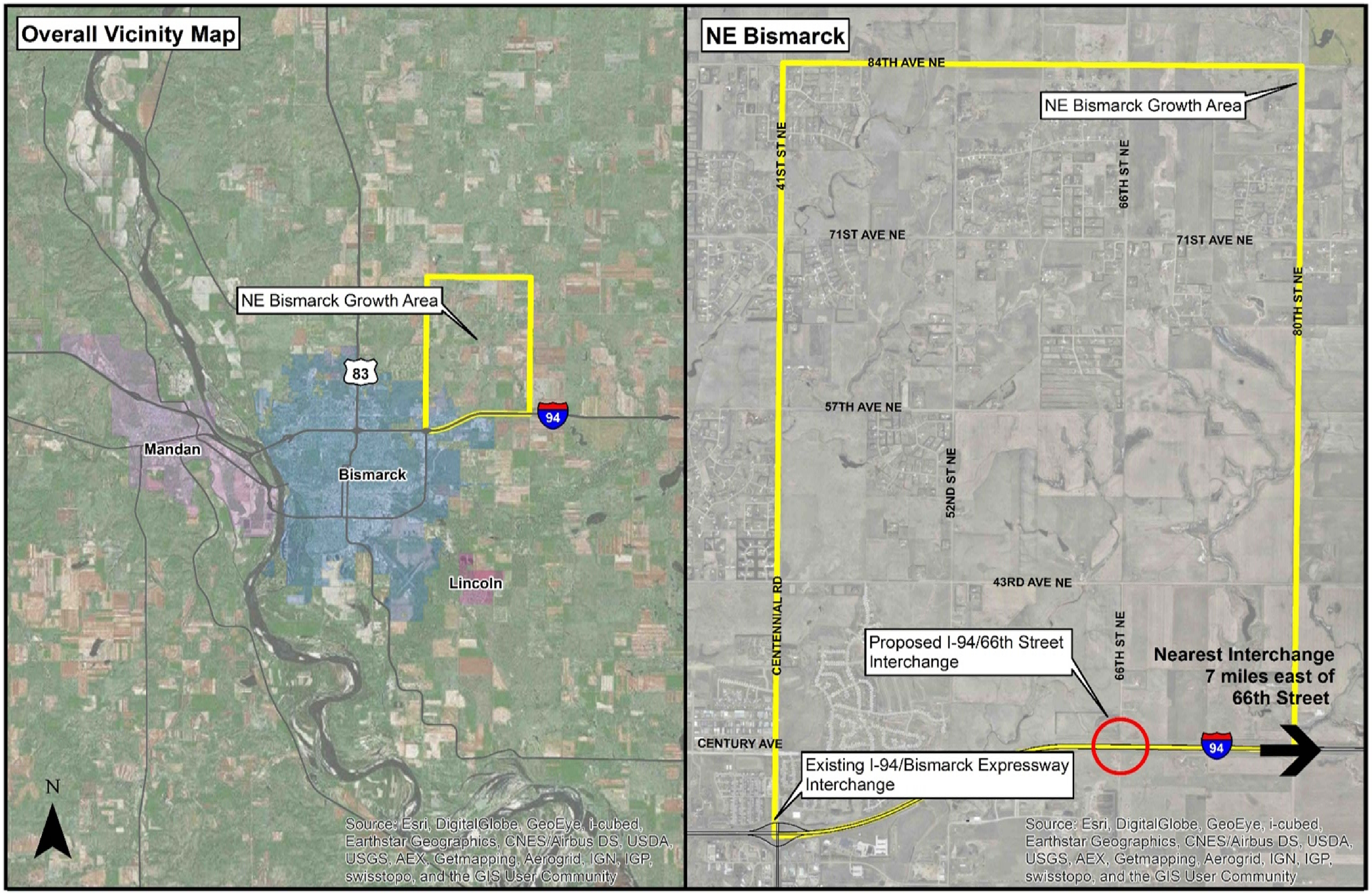
- State Street – Improvements to State Street and the State Street I-94 Interchange appear in the cost constrained Envision 2040 LRTP for the BMMPO. However, even with those investments, the corridor is projected to operate at a LOS D or worse by the year 2040. Potential justification for the 66th Street can delay the amount of these NDDOT investments; or improve operations along State Street.

- Centennial Road/Expressway - Improvements to Centennial Road/Expressway and the Centennial Road I-94 Interchange are not included in the Envision 2040 constrained plan. However improvements have been identified as being needed in these corridors. Quantifying the potential benefit of a 66th Street interchange to the operations at the Centennial Road/Expressway Interchange will be important to demonstrating the benefit of the investment in 66th Street access revision to NDDOT.

PROJECT CONTEXT

A new proposed interchange at 66th Street and Interstate 94 in Bismarck is proposed and fiscally constrained in the current Bismarck-Mandan *Envision 2040* LRTP. The interchange is proposed to better accommodate traffic associated with growth in the northeast portion of the city, which is one of the city's primary growth areas. Based on employment projections from the Envision 2040 LRTP, the 66th Street corridor is planned to be the primary commercial area in the eastern part of the City. 66th Street is two miles east of the nearest interchange at Bismarck Expressway/Centennial Road. The proposed interstate access at 66th Street is envisioned to improve traffic operations at existing interchanges and Regional roadways in Bismarck (I.e. Bismarck Expressway & State Street) over the short to mid-term. *However, in the long term even with a proposed 66th Street interchange, existing Regional roadways will continue to experience decreasing levels of service (LOS).* The proposed interchange location can be seen in **Figure B.1**.

Growth is expected to occur in northeast Bismarck. With this growth, the improvement of the local road network is planned to follow, including the extension of major east-west arterial roadways (E.g. Century Avenue and Divide Avenue). The new developments in northeast Bismarck would draw regional trips. Demographic growth is shown as expressed by the jobs and household data shown in **Figure B.2**, which is from the approved Envision 2040 LRTP for the BMMPO area. **Figure B.2** also expressed the planning and desired roadway network which would be in place to support the future access revision at 66th Street and I-94. Most importantly would be connectivity of east-west arterial roadways on Divide Avenue, Century Avenue and a continuous north-south connection through the requested access revision.



Northeast Bismarck
Subarea Study

Figure B.1
66th Street
Interchange Study Area

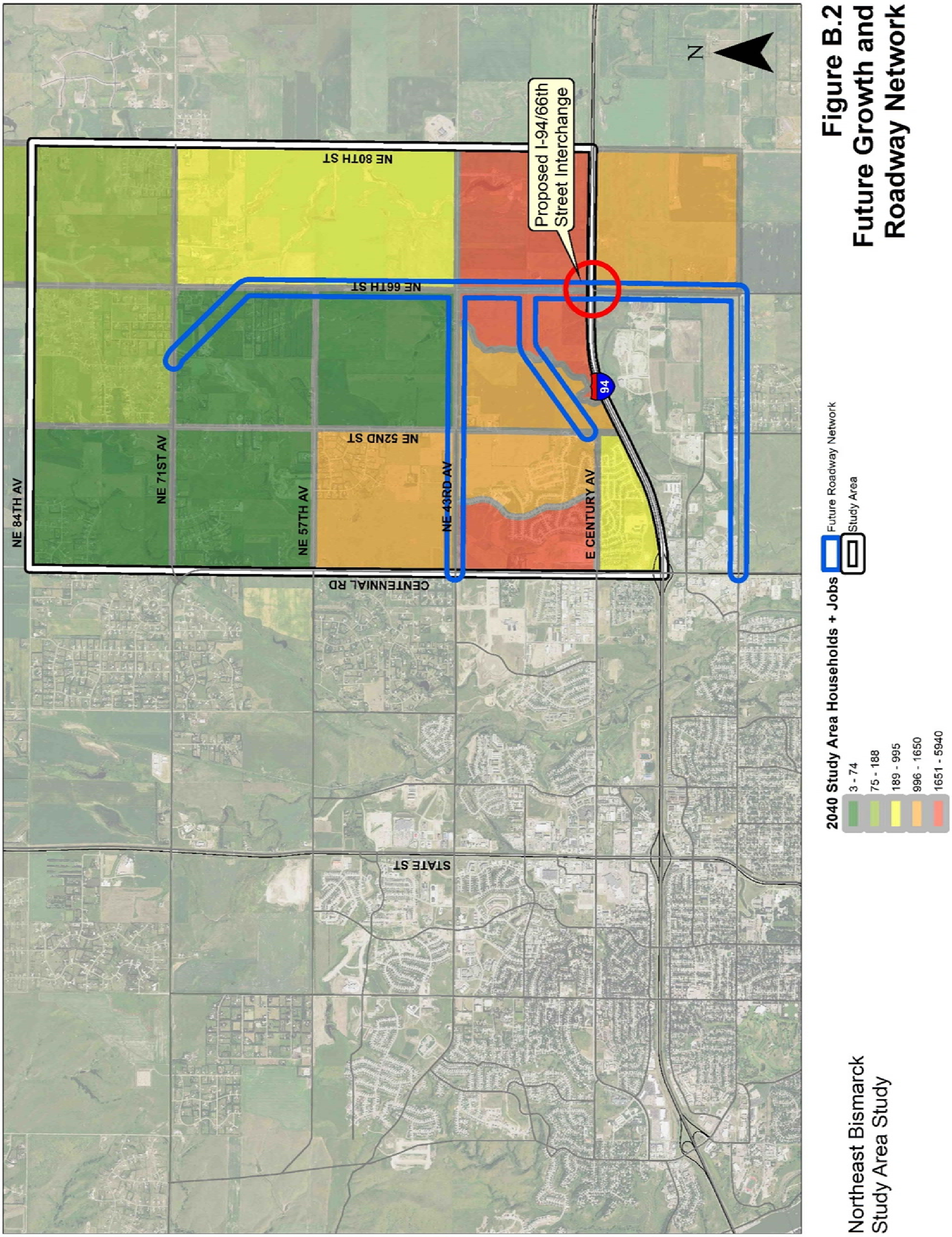


Figure B.2 Future Growth and Roadway Network

PROJECT PURPOSE & NEED

The first step in developing the basis for a new interstate access revision at 66th Street and I-94 in the BMMPO area is the development of the NEPA required project purpose and need statement (PNS). The PNS is used as part of the NEPA process to evaluate a proposed alternative (action) against needs within the general impact area. Based on the work completed as part of developing the Northeast Bismarck Subarea Study the following framework for a PNS has been crafted. It is understood that what follows is only the basis for the development of the eventual PNS which would follow the access revision into the NEPA process. Each FHWA PNS criteria is provided in parenthesis.

Purpose

» Provide I-94 connectivity for a planned north-south arterial roadway (i.e. 66th Street) in the BMMPO area (*Connectivity*);

» Improve projected operational issues at other interchanges at State Street & Centennial Road/Bismarck Expressway (*Capacity*);

» Implement a major infrastructure recommendation of the Envision 2040 LRTP (*Transportation Demand*);

» Supports the objectives of the Bismarck Growth Management Plan (*Social Demands or Economic Development*);

» Provide traffic relief to other major Regional corridors (*Capacity*).

» Maximize other planned/programmed corridor improvements to State Street and Centennial Road (*Transportation Demand*).

Need

» Lack of north-south connectivity within the BMMPO area (*Connectivity*);

» Projected level of service issues (*Capacity*);

» Reduce travel demand on other corridors such as State Street and Bismarck Expressway (*Capacity*);

» Better distribution of interregional truck traffic (*Modal Interrelationships*).

EIGHT POLICY REQUIREMENTS

There are eight policy requirements (**Table B.1**) that need to be addressed in order to provide FHWA with the information necessary to make a decision of the possible consequences of changing the access onto the interstate system. FHWA has established eight policy requirements for proposed interstate access revisions to ensure that the interstate system can continue to operate as intended by not compromising safety or mobility as a result of new or revised access points.

What follows in this section of the *66th Street & I-94 Interstate Justification Analysis* is a comparative planning level summary of the proposed Build vs. No Build in relation to the FHWA Policy Points. What follows is a tabular summary of the eight FHWA Policy Points.

Where comparisons are made between a No-Build and a Build condition, these conditions are defined as follows:

- No-Build: Grade separation, but no interchange at 66th Street and I-94
    - Grade separation is currently listed as a short-term project in the long range transportation plan. Short-term indicates the project should be completed by 2023
- Build condition: Convert 66th Street grade separation to interchange
    - Converting the grade separation to an interchange is listed as a mid-term project in the long range transportation plan. Mid-term indicates the project should be completed in the time frame of 2024-2032.

Table B.1 – FHWA Policy Points

Policy Point	Criteria	Required Analysis
#1	The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands (23 CFR 625.2(a)).	Model No build vs. Build scenario. Build scenario would be with interchange at 66th Street. No Build would be with no interchange. Build and No Build modeled for 2025 and 2040.
#2	The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit, and HOV facilities), geometric design, and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(a)).	There are likely no Transportation System Management (TSM) efforts which can address the requested access revision to I-94. Substantiate how or if HOV, metering, transit can assist with meeting projected mobility needs otherwise provided by the access to I-94. Address if geometric design at other interchanges may assist addressing the need.

Policy Point	Criteria	Required Analysis
#3	An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections.	Model No Build vs. Build (interstate access at 66th Street) to existing and projected (2025/2040) LOS and weaving conditions on I-94. Will require CORSIM (or similar) analysis of the mainline I-94 in the No Build and Build condition. Can also use recent crash data on State and Expressway to support access revision. Use potential benefit to LOS on State and Expressway/Centennial to support access revision.
#4	The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots.	Will need to demonstrate how the proposed access connects with existing and planned roadway network; demonstrate there is a connected local roadway network in place or anticipated to be in place.
#5	The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.	Project supported by Envision 2040 LRTP; Bismarck Growth Management Plan; etc. Would be included in the TIP at such time as Federal aid was programmed; following programming of Federal aid the formal IJR process would initiate; approvals of the IJR typically occur as part of the design/project development/NEPA phase.
#6	In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan	The I-94 Study provides a summary overview for improvement based upon a comprehensive corridor study. At this point no more than one new access revision is being considered along I-94. A future NEPA analysis may require analysis of a reasonable range of alternatives.
#7	When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d)).	Access revision at 66th Street is based on existing and future projected land use and development plans. Demonstrate commitment to new arterial and collector roadways adjacent to 66th Street, including the completion of 66th Street as a continuous north-south corridor with logical termini as well as planned development of east-west corridors (E.g. Century Ave. and Divide Avenue).
#8	The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111).	The access revision would be included as an alternative within the larger environmental document which would accompany the interchange at 66th Street. The IJR would be a standalone document completed in the NEPA phase.

Policy 1

The need being addressed by the request cannot be adequately satisfied by existing interchanges to the Interstate, and/or local roads and streets in the corridor can neither provide the desired access, nor can they be reasonably improved (such as access control along surface streets, improving traffic control, modifying ramp terminals and intersections, adding turn bays or lengthening storage) to satisfactorily accommodate the design-year traffic demands (23 CFR 625.2(a)).

As part of the Northeast Bismarck Subarea Study a sensitivity analysis was performed using the BMMPO regional travel demand model. The sensitivity analysis looked at impacts to the transportation network within the Northeast Subarea as well as at corridors such as State Street to determine impacts of not constructing the 66th Street Interchange. Results of this analysis is shown on **Figure B.3** and **Figure B.4**.

The lack of Interstate access at 66th Street will put substantial pressure on other existing and future planned arterials such as Centennial Road, Century Avenue, 43rd Avenue and 80th Street. The additional capacity required to negate the impacts of not having the access to I-94 at 66th Street far outpaces fiscally constrained improvements for these corridors included in the Envision 2040 LRTP. Further, based on a preliminary analysis, substantial additional investment beyond even unconstrained system needs would be required to make up for the loss of mobility brought about by not having an access revision at I-94.

Policy 2

The need being addressed by the request cannot be adequately satisfied by reasonable transportation system management (such as ramp metering, mass transit and HOV facilities), geometric design and alternative improvements to the Interstate without the proposed change(s) in access (23 CFR 625.2(a)).

As noted, the need for this request is to improve both projected interstate ramp operations and major arterial corridors in the BMMPO area.

Ramp metering, HOV facilities and similar transportation system management practices are not currently implemented in the Bismarck-Mandan area or throughout the I-94 corridor in North Dakota. These practices would not be expected to address the need addressed by the requested access. The Capital Area Transit (CAT) currently serves a majority of the Bismarck-Mandan area. It would be expected that CAT will continue to update their routes to meet the need and location of the population. However, CAT operations are not anticipated to expand to the level needed to provide the transportation demand management (TDM) solutions for project conditions at existing interchanges and along major existing or future roadways in the BMMPO Area.

The Bismarck-Mandan MPO's I-94 Corridor Study evaluates the operations of existing conditions and future 2040 conditions of the interchange ramps through the development of several geometric design improvements to ramps throughout the I-94 corridor. It was found that the I-94 ramps, especially at State Street and Centennial Road, would function at LOS D or worse during the peak hours, having a queue that may back onto the interstate, causing LOS D-F for 3,000 feet of the interstate during the AM peak hour and 9,000 feet of the interstate during the PM peak hour.

The I-94 Corridor Study listed various improvements that would be recommended to improve the functioning of both the ramps and the interstate through the Bismarck-Mandan area. These geometric improvements alone fail to address the projected LOS issues at either location.

While I-94 mainline capacity is not expected to create operational issues through 2040, analysis in the *I-94 Corridor Study* indicates that expected 2040 traffic volumes will create congestion issues at off-ramp intersections with State Street/US 83 and Bismarck Expressway/Centennial Road. Based on the I-94 Corridor Study recommendations, the Bismarck-Mandan MPO's *Envision 2040* LRTP lists a project to improve traffic flow and safety issues at the State Street interchange (Exit 159). However, even with the improvements, congestion issues are still expected. Further, TSM efforts are not anticipated to assist in reducing the projected deficiencies present in the 2040 No Build conditions at either State Street or Centennial Road/Bismarck Expressway.

Policy 3

An operational and safety analysis has concluded that the proposed change in access does not have a significant adverse impact on the safety and operation of the Interstate facility (which includes mainline lanes, existing, new, or modified ramps, ramp intersections with crossroad) or on the local street network based on both the current and the planned future traffic projections. The analysis shall, particularly in urbanized areas, include at least the first adjacent existing or proposed interchange on either side of the proposed change in access (23 CFR 625.2(a), 655.603(d) and 771.111(f)). The crossroads and the local street network, to at least the first major intersection on either side of the proposed change in access, shall be included in this analysis to the extent necessary to fully evaluate the safety and operational impacts that the proposed change in access and other transportation improvements may have on the local street network (23 CFR 625.2(a) and 655.603(d)). Requests for a proposed change in access must include a description and assessment of the impacts and ability of the proposed changes to safely and efficiently collect, distribute and accommodate traffic on the Interstate facility, ramps, intersection of ramps with crossroad and local street network (23 CFR 625.2(a) and 655.603(d)). Each request must also include a conceptual plan of the type and location of the signs proposed to support each design alternative (23 U.S.C. 109(d) and 23 CFR 655.603(d)).

Regional Travel Demand Model

The BMMPO maintains a regional travel demand model that was used to analyze area-wide traffic patterns through 2040. This model developed for the Envision 2040 LRTP was used to analyze the requested access revision at 66th Street and I-94.

The travel demand model was used to estimate and compare traffic patterns between a no-build (no interchange) and a build (with interchange) condition. The analysis for the 2040

Build (2040 Base Scenario) and 2040 No Build (2040 Scenario 1A) are shown in **Figures B.3 and B.4**. As noted earlier, the 2040 Build condition very closely followed the Envision 2040 LRTP. The 2040 No Build scenario assumed similar conditions to the Envision 2040 LRTP. However it removed the proposed 66th Street access to I-94.

Level of service (LOS) conditions on the surface street system within the subarea fluctuate based on the Build and No Build condition. Several network links currently are shown to operate at less than an LOS D (which is considered acceptable based on NDDOT guidance). Some of these projected LOS conditions could potentially be addressed through more detailed intersection analysis. However, that level of analysis was outside the scope of this study.

What is clear from both the Build and No Build condition is that additional local and urban system improvements will be needed to support future projected traffic within the Northeast Subarea with or without a proposed interchange at 66th Street. These local and urban system improvements will need to go beyond those constrained or "unfunded" needs in the Envision 2040 LRTP.

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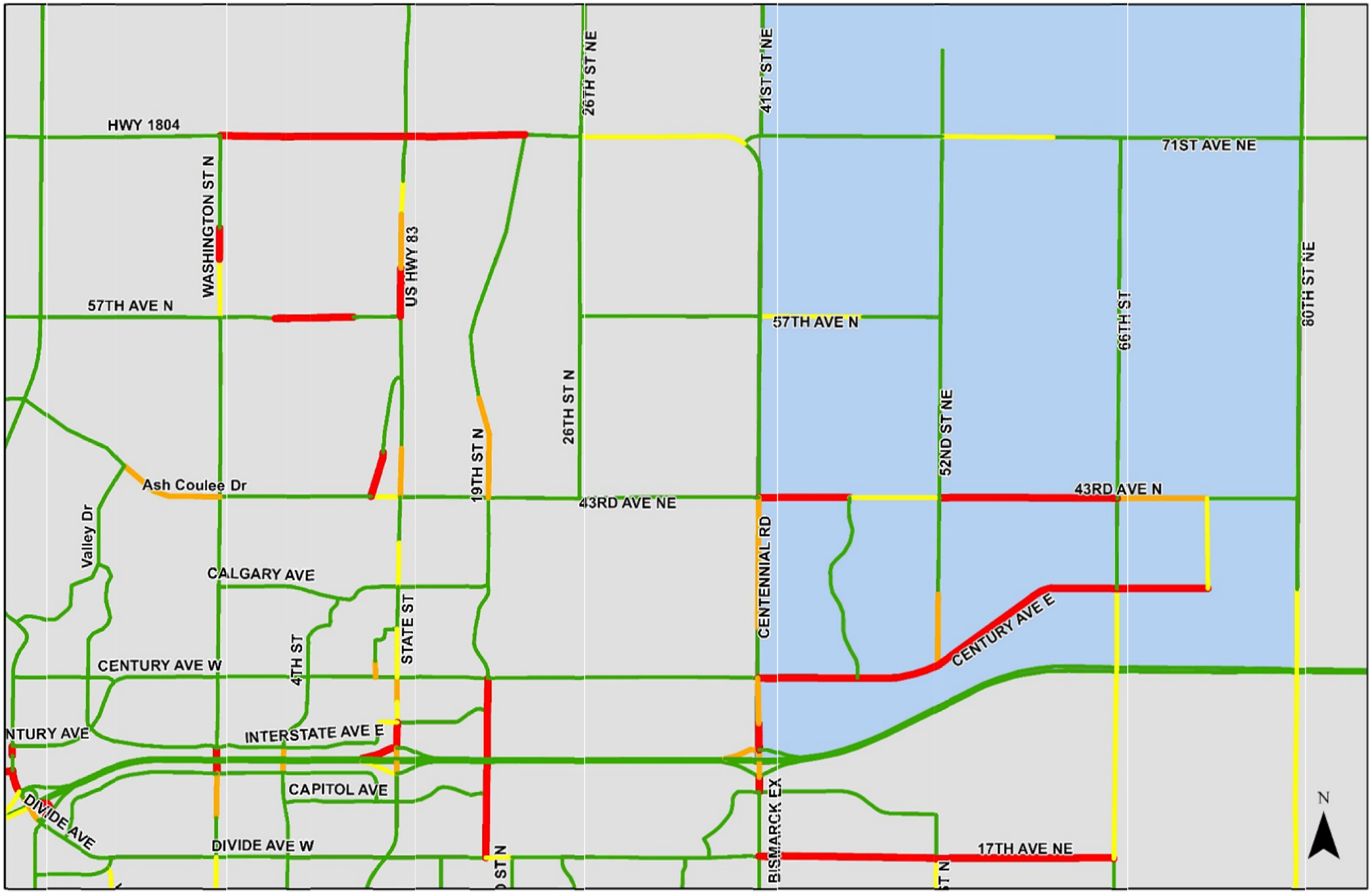

Northeast Bismarck
Subarea Study

LOS A-C
LOS E
Study Area
LOS D
LOS F

Figure B.3
2040 Level of Service
No 66th Street Interchange

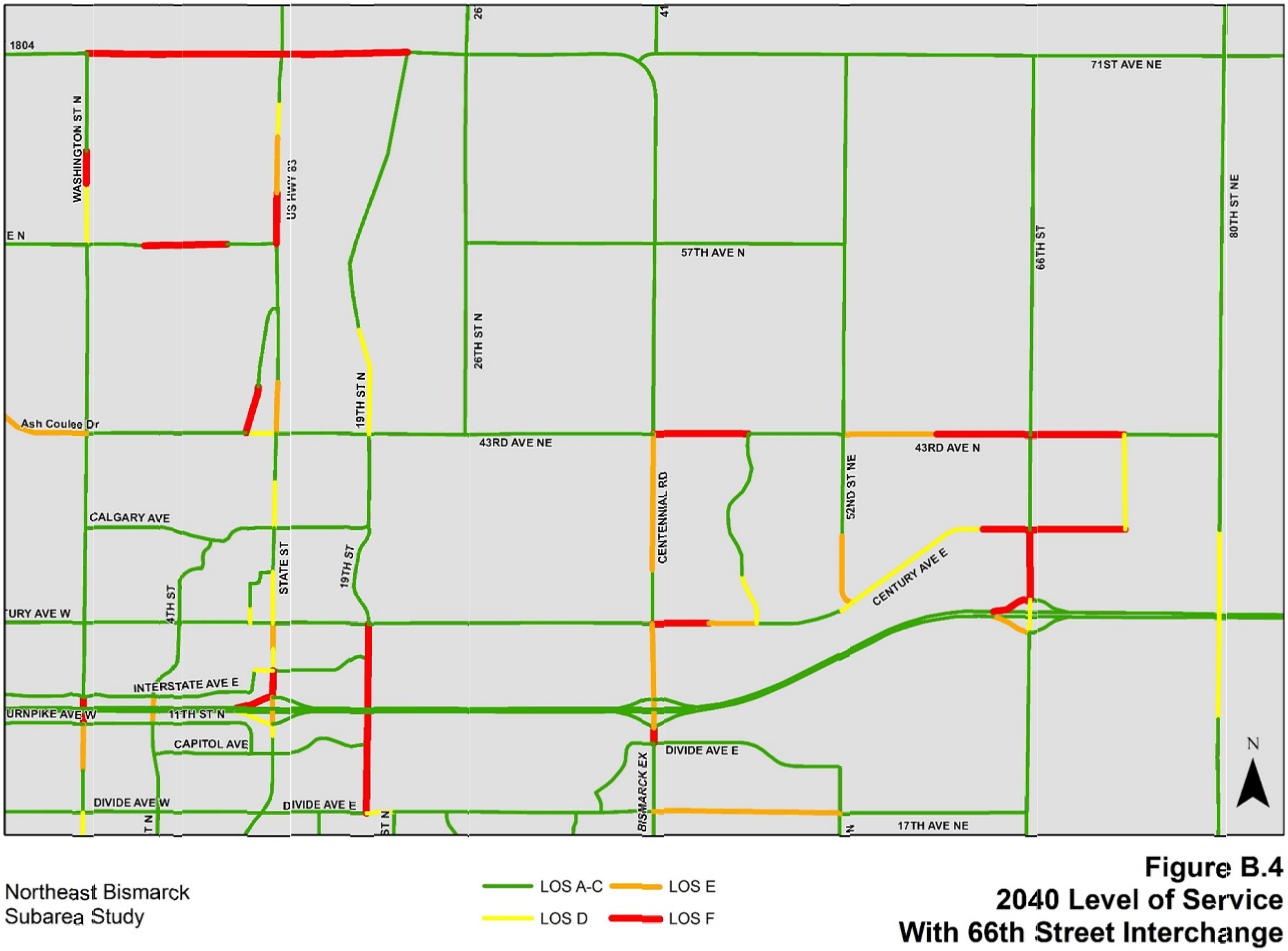

Figure B.4
2040 Level of Service
With 66th Street Interchange

The ADTs along the I-94 mainline are compared in **Table B.2**. The 2040 Build conditions double traffic on the I-94 mainline between Centennial Road and the requested access at 66th Street.

Between Bismarck Expressway/Centennial Road and 66th Street, I-94 volumes are expected to increase by approximately 8,000 - 10,000 vehicles per day in each travel direction in a Build condition (increase from 15,400 bidirectional daily traffic to 32,700 bidirectional daily traffic). This is however well within the existing capacity of the I-94 mainline, with freeway level of service (LOS) “C” expected through 2040 between Bismarck Expressway/Centennial Road and 66th Street in a build condition. Similar freeway LOS are expected west of Centennial Road under a build condition.

Table B.2 - I-94 Main Link ADT Comparison

Mainline Link	ADT		
	2014	2040 No Build	2040 Build
Divide Ave to State St	26,755	39,900	43,400
State St to Centennial Rd	16,740	26,000	34,300
Centennial Rd to 66th St	9,505	15,400	32,700
66th St to Exit 170	9,505	15,400	15,400

Source: BMMPO Travel Demand Model

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Analysis was developed based on ramp volumes extracted from the 2040 regional travel demand model. Analysis of 2040 Build and No Build conditions was developed for the State Street and Centennial Road interchanges. Analysis was limited to these ramps since they were the closest ramps to the proposed 66th Street Ramp; and those likely to benefit from the requested access revision at 66th Street. The SE and NE ramp for both Centennial Road and State Street interchanges increased in the Build Condition. The SW and the NW ramps for both Centennial Road and State Street see a reduction in volume in the build condition. **Table B.3** compares build versus no build 2040 ramp volumes at State Street and Centennial Road.

Table B.3 – I-94 Ramp ADT Comparison

		ADT		
		2014	**2040 Build**	**2040 No Build**
Centennial Rd	SE Ramp	1,770	5,000	3,600
	SW Ramp	5,525	5,300	9,500
	NE Ramp	1,675	4,600	3,600
	NW Ramp	5,500	5,400	8,300
State Street	SE Ramp	3,610	6,200	4,200
	SW Ramp	8,295	10,600	10,800
	NE Ramp	3,805	5,500	3,100
	NW Ramp	7,975	9,900	9,900

Source: BMMPO Travel Demand Model

I-94 Corridor Study Findings

The Bismarck-Mandan MPO's I-94 Corridor Study evaluated the interchanges and surrounding access points from Exit 147 in Mandan to 80th Street, approximately 3 miles east of the Centennial Road interchange in Bismarck. **Table B.4** shows the existing level of service (LOS) at the State Street and Bismarck Expressway/Centennial Road ramps in the existing condition. The links between each of the interchanges were found to operate at LOS A-C throughout the region. On the EB on ramp on State Street there was an approximately 390' queue in the AM peak and a 370' queue in the PM peak. During the PM peak, there was a 290' queue on the EB on ramp at Bismarck Expressway/Centennial Road. These queues currently would not be expected to impact the flow of the interstate.

Table B.4 – Existing Ramp LOS

Intersection	Level of Service/ Delay (seconds)					
	Time	Overall	EB	WB	NB	SB
State St & EB I-94 Ramps	AM Peak	C	D	-	B	B
		20.6	35.6	-	1B.5	15.0
	PM Peak	C	D	-	B	B
		22.9	44.9	-	18.2	1B.9
State St & WB I-94 Ramps	AM Peak	C	-	C	B	C
		20.1	-	32.6	15.2	21.5
	PM Peak	B	-	D	B	C
		17.4	-	3B.4	12.2	21.6
Bismarck Expy & EB I-94 Ramps	AM Peak	B	C	-	B	B
		17.0	28.3	-	11.2	1B.1
	PM Peak	B	C	-	B	B
		19.6	31.7	-	1B.4	1B.9
Bismarck Expy & WB I-94 Ramps	AM Peak	B	-	D	B	B
		12.2	-	3B.6	11.3	11.3
	PM Peak	B	-	C	A	B
		10.9	-	33.2	9.4	10.9

Source: MPO I-94 Corridor Study (August 2014)

The 2040 No Build scenario was studied within the I-94 Corridor study. It was found that most of the intersections would have LOS D or E during the AM and/or PM peak hour. The results for the interchange ramp capacities for the 2040 No Build Scenario from the I-94 Corridor Study are shown in **Table B.5**.

Both the EB and WB ramp on State Street would reach queues of over 1,200' during the AM and PM peak. The WB direction reaches a que length of 1,670' during the PM peak. These queues during the peak hours negatively impact the function of the interstate. From the MPO I-94 Corridor Study, the EB interstate lanes west of the Bismarck Expressway ramp operate at LOS D for 1000' during the AM peak and it would operate at LOS F for 9,000' during the PM peak without any improvements to the system in 2040.

Table B.5 - 2040 No Build I-94 Ramp LOS

Intersection	Level of Service/ Delay (seconds)					
	Time	Overall	EB	WB	NB	SB
State St & EB I-94 Ramps	AM Peak	C	D	-	C	B
		28.1	52.7	-	22.3	1B.3
	PM Peak	E	-	-	-	-
		75.5	-	-	-	-
State St & WB I-94 Ramps	AM Peak	B	-	D	A	B
		15.3	-	49.0	9.4	13.2
	PM Peak	D	-	-	-	-
		37.8	-	-	-	-
Bismarck Expy & EB I-94 Ramps	AM Peak	E	F	-	B	F
		70.5	16B.1	-	14.3	83.9
	PM Peak	F	-	-	-	-
		88.5	-	-	-	-
Bismarck Expy & WB I-94 Ramps	AM Peak	E	-	F	B	F
		68.8	-	452.8	19.7	100.7
	PM Peak	F	-	-	-	-
		125.8	-	-	-	-

Source: MPO I-94 Corridor Study (August 2014)

With the recommended improvements from the MPO I-94 Corridor Study and the addition of the 66th Street interchange, the LOS of the interstate would remain at LOS C or better and the interchanges would operate at an improved LOS. **Table B.6** shows the 2040 Build condition LOS at the State Street and Centennial ramps. It should be noted that these conditions also include improvements to both the State Street and Centennial Road/Bismarck Expressway interchanges.

Table B.6 - 2040 Build I-94 Ramp LOS

Intersection	Level of Service/ Delay (seconds)	
	Time	Overall Delay (second)
State St & EB I-94 Ramps	AM Peak	B
		14.0
	PM Peak	B
		15.4
State St & WB I-94 Ramps	AM Peak	B
		15.2
	PM Peak	B
		13.5
Bismarck Expy & EB I-94 Ramps	AM Peak	B
		19.0
	PM Peak	C
		2B.2
Bismarck Expy & WB I-94 Ramps	AM Peak	B
		14.1
	PM Peak	B
		13.8

Source: MPO I-94 Corridor Study (August 2014)

I-94 mainline operations between the Centennial Road interchange and the proposed 66th Street interchange was evaluated using HCM 2010 to compare how the freeway would act with or without the construction of an interchange on 66th Street. The ADTs from the 2040 No Build and 2040 Build were used. I-94 between 66th Street and 80th Street was evaluated for 2040 Build. The capacity and delay are shown in **Table B.7**.

Table B.7 - I-94 Mainline Capacity Analysis

	LOS Delay (pc/mi/ln)	
	2040 Build	**2040 No Build**
Centennial Rd to 66th St	B	A
	14.2	B.3
66th Street to 80th Street	A	-
	B.3	-

In Bismarck, the current interstate density is an interchange every two miles. The placement of an interchange on 66th Street would maintain the 2 mile spacing that is along the rest of the interstate corridor through Bismarck. The next interstate interchange is Exit 170, approximately 7 miles east of the proposed ramp on 66th Street. Constructing an interchange on 66th Street would not be expected to affect the functioning of the ramp at Exit 170. There is a rest stop approximately 5 miles east of the proposed 66th Street Ramp. The construction of the 66th Street access revision would not be expected to impact the functioning of the rest area.

Policy 4

The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" may be considered on a case-by-case basis for applications requiring special access for managed lanes (e.g., transit, HOVs, HOT lanes) or park and ride lots. The proposed access will be designed to meet or exceed current standards (23 CFR 625.2(a), 625.4(a)(2) and 655.603(d)).

The proposed interchange on 66th Street would service all traffic movements. Currently, 66th Street is a rural two lane gravel road. Prior to, or in tandem with the construction of the proposed 66th Street interchange the local road network (Century Avenue, 43rd Avenue, East Divide Avenue, etc.) are planned to be built out to the necessary lane configuration to support the interchange and the forecasted demand on the roadway network.

Policy 5

The proposal considers and is consistent with local and regional land use and transportation plans. Prior to receiving final approval, all requests for new or revised access must be included in an adopted Metropolitan Transportation Plan, in the adopted Statewide or Metropolitan Transportation Improvement Program (STIP or TIP), and the Congestion

Management Process within transportation management areas, as appropriate, and as specified in 23 CFR part 450, and the transportation conformity requirements of 40 CFR parts 51 and 93.

The proposed access revision at 66th Street is included in the Bismarck-Mandan MPO's *Envision 2040* LRTP. The interchange would be included in the BMMPO TIP at which time Federal aid is programmed. Once Federal aid has been programmed, a formal IJR process would be initiated with the approval of the IJR as part of the design/project development/NEPA phase. Prior to the inclusion of a 66th Street interchange in the Envision 2040 LRTP, 66th Street was identified as a desirable beltway corridor in the 2009 *Bismarck-Mandan Regional North South Beltway Corridor Study.*

As part of the North South Beltway Corridor Study two sites were evaluated for an interchange east of Bismarck: 66th Street and 80th Street. Because 66th Street does not currently have an overpass over I-94 and the poor condition of the 80th Street overpass, the study concluded that at either location a new structure would need to be built across I-94. 66th Street is a connection to Lincoln with fewer expected lineal feet of wetlands and floodplain crossed. 66th Street is also 2 miles east of the existing interchange at Centennial Road, which would keep the 2 mile spacing between ramps, which is typical within the BMMPO area.

Further support and refinement for the 66th Street corridor and the I-94 Interchange were developed through the 2013 Bismarck Growth Management Plan and the 2014 BMMPO Fringe Road Master Plan. These two studies served to refine several previous LRTPs and subarea or corridor level analysis which considered a proposed 66th Street access revision at I-94.

Policy 6

In corridors where the potential exists for future multiple interchange additions, a comprehensive corridor or network study must accompany all requests for new or revised access with recommendations that address all of the proposed and desired access changes within the context of a longer-range system or network plan (23 U.S.C. 109(d), 23 CFR 625.2(a), 655.603(d) and 771.111).

The BMMPO I-94 Corridor Study evaluated the I-94 corridor from Exit 147 in Mandan through 80th Street in Bismarck. The *I-94 Corridor Study* was a comprehensive study of the I-94 corridor through Bismarck-Mandan, and also studied intersecting surface streets with existing interchanges with I-94. This study evaluated existing and projected 2040 traffic conditions, with recommendations being based on results from detailed traffic analysis, including traffic microsimulation analysis.

The MPO's I-94 Corridor Study identified deficiencies in the current interchanges and developed an interchange improvement plan through 2040. These recommended improvements can be seen in **Table B.8**. There are no additional interchanges recommended in the area other than the 66th Street interchange. *It is emphasized that the I-94 Corridor*

Study was not fiscally constrained. Rather it shows corridor level investment needs along I-94 in the BMMPO area.

There are plans to reconstruct the Bismarck Expressway/Centennial Road interchange, which is the nearest interchange to 66th Street. Since the Bismarck Expressway/Centennial Road interchange is two miles west of 66th Street, geometric requirements for each interchange will not interfere with each other.

Table B.8 - Planned/Proposed Interchange Revisions in Bismarck-Mandan Through 2040

Interchange	Improvement	Timeframe
Divide Avenue	Partial reconstruction of WB entrance ramp	2015-2017
	Lengthen entrance loop acceleration lane	
	Restripe tapers for EB entrance ramp and exit loop	
State Street/US 83	Restripe WB entrance taper	2015-2017
Sunset Drive (Mandan)	Reconstruct interchange	2018-2025
	Restripe WB entrance taper	
Mandan Avenue (Mandan)	Reconstruct interchange	2018-2025
	Restripe WB entrance taper	
66th Street	Construct interchange	2018-2025
State Street/US 83	Reconstruct interchange	2026-2040
Bismarck Expressway/Centennial Road	Reconstruct interchange	2026-2040

Source: I-94 Corridor Study

Policy 7

When a new or revised access point is due to a new, expanded, or substantial change in current or planned future development or land use, requests must demonstrate appropriate coordination has occurred between the development and any proposed transportation system improvements (23 CFR 625.2(a) and 655.603(d)). The request must describe the commitments agreed upon to assure adequate collection and dispersion of the traffic resulting from the development with the adjoining local street network and Interstate access point (23 CFR 625.2(a) and 655.603(d)).

The 66th Street interchange has been proposed and included in the *Envision 2040* LRTP based on analysis and development assumptions that are consistent with future land use established and documented by the City of Bismarck and Burleigh County planning departments. The imminent request for an access revision at 66th Street and I-94 is based upon the anticipated logical and pre-determined growth pattern agreed to between Bismarck and Burleigh County. Both the City and County continue to refine local capital improvement programs (CIPs) to provide the required local and urban system to support a proposed interchange at 66th Street.

Policy 8

The proposal can be expected to be included as an alternative in the required environmental evaluation, review and processing. The proposal should include supporting information and current status of the environmental processing (23 CFR 771.111).

The NEPA process has not been started. The purpose of this preliminary interchange access justification request can be move directly into a future NEPA process.

Appendix C
Northeast Bismarck Subarea Study
Public Input Summary

Public Input Meeting #1

Public Notice

NORTHEAST BISMARCK SUB AREA STUDY

WHY?

The intent of the Northeast Bismarck Subarea Study is to develop a more detailed plan for future investment in transportation infrastructure in the Northeast Bismarck Subarea. The Study will build on the recently completed Envision 2040 Long Range Transportation Plan and other subarea plans and studies completed in the general vicinity. The Study will result in the following features:

- Traffic Operations and Access Management plan for key corridors in the NE Subarea (Centennial Road, Century Avenue, 71st Avenue, 66th Street and 80th Street).
- Review of FHWA Interstate Justification Report (IJR) criteria relative to the planned 66th Street/Interstate 94 interchange.
- Roadway development concepts for all major arterials within the subarea.
- Implementation plan with recommended short-term, mid-term and long-term improvements for all major corridors within the NE Subarea.

Preliminary information regarding the development of the Northeast Bismarck Subarea Study will be available for review and comment at the meeting. More information regarding the study is available online at www.nebismarckstudy.com.

WHEN?

March 16, 2015
Formal Presentation: 5:30 p.m. to 5:45 p.m.
Open House: 5:00 p.m. to 7:00 p.m.

WHERE?

Sunrise Elementary School
3800 Nickerson Avenue
Bismarck, ND

OPEN HOUSE CONDUCTED BY

Bismarck-Mandan Metropolitan Planning Organization (MPO) and KLJ.

Representatives from the Bismarck-Mandan MPO, City of Bismarck, Burleigh County, and KLJ will be on hand to answer your questions and discuss your concerns.

Written comments about this project should be mailed by March 26, 2015, to Wade Kline; KLJ Project Manager; KLJ, P.O. Box 1157, Bismarck, ND 58501. Comments can also be directed through the project webpage at www.nebismarckstudy.com.

Any individual requiring a special accommodation to allow access or participation at the meeting is asked to notify Rachel Drewlow, Transportation Planner, Bismarck-Mandan MPO at (701) 355-1852 of his/her needs five (5) days in advance of the meeting. Also, materials can be provided in alternate formats: large print, braille, cassette tape or on computer disk for people with disabilities or with limited English proficiency (LEP) by contacting the MPO at least give (5) days prior to the meeting at the number listed above.

Bismarck Tribune
February 25, 2015

Public Input Meeting #1
Comments Received

March 20, 2015

Dear Mr. Kline

Thank you for taking the time to listen to my concerns regarding the proposed east street of Granger which would pass through Sara-Huber Gross' lot and her father (and my brother's) Tom Huber lot, cut through 1/3 of my sister's lot, (Bonnie Schantz) and THEN continue to curve to cut right (possibly) in front of the home our daughter will be building this spring (2015) on land that was just purchased last year from N. Silbernagel! I beg of you to reconsider this proposed street. It is "chopping" up the land our father gave us, plus the new land we just purchased. We also just spent alot of money building a new road to the land we just purchased. Our daughter named the road after her grandparents Tony & Eva Huber: Toneva Place is the name of the new street.

We all know that progress is coming. We are a family who have enjoyed walking to each other homes not having to worry about crossing streets and feel that this can still be that way (see enclosed map) without hurting the progress of N. Silbernagel or Sattler Homes.

We feel we (brothers & sisters) have alot of "skin" in the "game". My sister Kathy and husband Harlan and us built Fairhill Road AND paid for it even though you consider it a county road. We also paved it at our cost. We paid for the pavement, plus also the (partial cost) pavement from 52nd Street to Fairhill Road. Just letting you know.

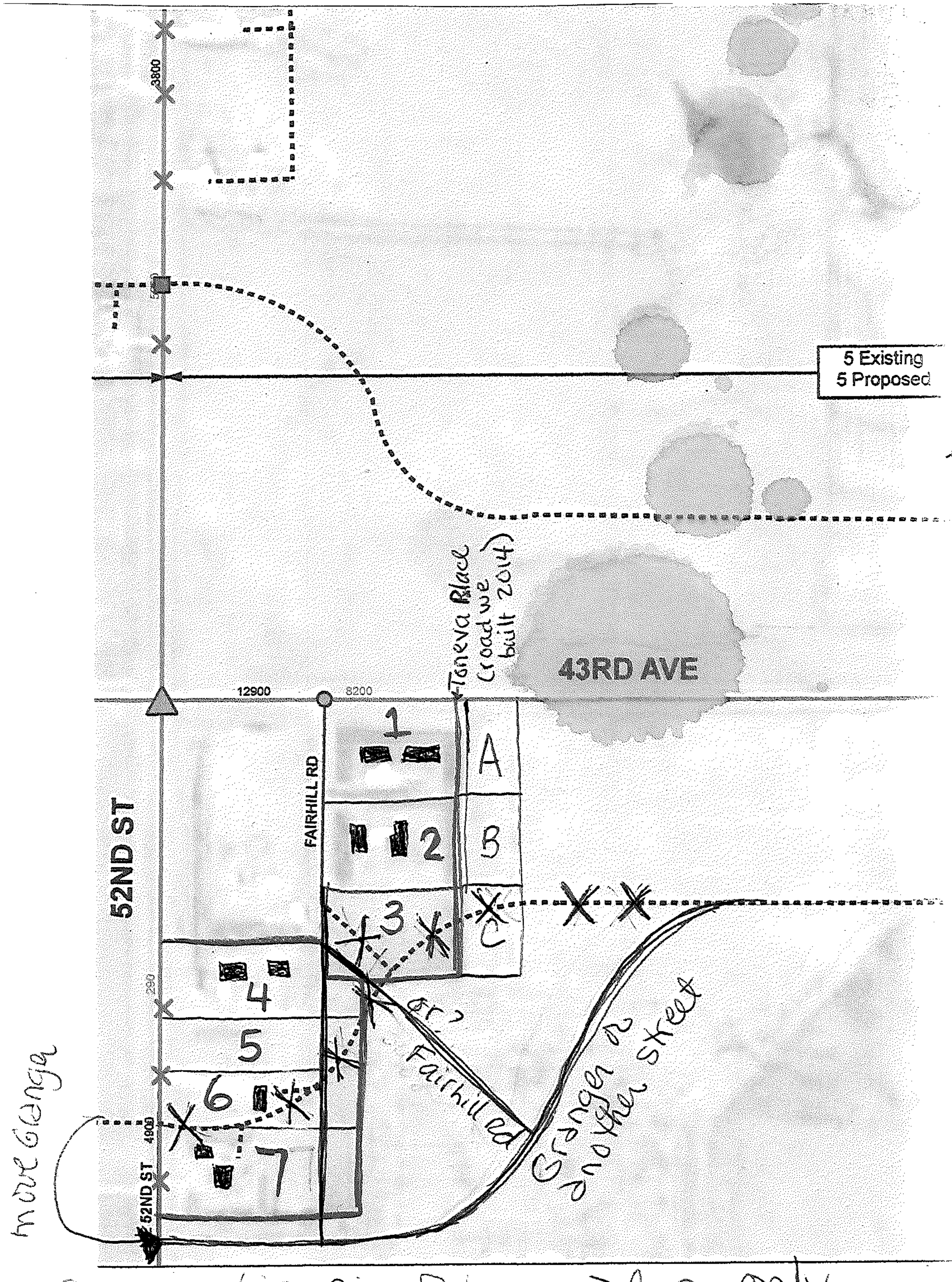
If Fairhill Road needs to go south how about straight? or at a less of an angle so my sister does not loose so much land? But wondering why even extend it? Is it necessary?

In closing, it just breaks my heart that this proposed Granger Street is "cutting" up all our land that was given to us by our mother and father. A father who served this community very proudly: 40 years as Gibbs Township Clerk, 12 years Rural Fire Dept., Election Board (too many years to count), Burleigh Water Users Assn., plus many church and school boards all since the early 1950's!

Please look at the enclosed map and suggestions and let's work on a good solution for all.

Thank you so much

Mary (Huber) Lloyd Deringer.



Suggestions in Blue - also only extend Fairhill Road straight (only if needed.)

Huber SubDivision

Lots #1 - 7 given to us children in 1972 from our parents: Tony & Eva Huber

Sisters:

#1 - Kathy/Harlan Ternes
5335 Fairhill Road (Built since 1979)

#2 - Mary/Lloyd Deringer
5315 Fairhill Road (Built since 1980)

#3 - Bonnie/Chester Schantz

Brothers:

#4 Steve/Patti Huber
4101 52nd St. NE (1972 Built)

#5 owned by Steve
purchased from bro. Anthony

#6 Sara Huber-Gross
daughter to Tom 4005 52nd (Built 2013)

#7 Thomas & Char Huber
3915 52nd St. NE (1973 Built)

Lots A-C (Huber SubDivision 2)
Lots (land) Lloyd & Mary Deringer just purchased from N. Sibernagel in 2014. We also built and paid for the private road Toneva Place this past summer/fall.

Lot C - our daughter & son-in-law will start building a new home - 2015

Mary Deringer
5315 Fairhill Rd.
Bismarck, ND 58503-8019

BISMARCK ND 585
25 MAR 2015 PM 1 1

Wade Kline
c/o KLJ
P.O. BOX 1157
Bismarck, ND 58502-1157

585021157

Wade Kline

From: Kathy Ternes <kternes@yahoo.com>
Sent: Thursday, March 26, 2015 11:34 AM
To: Wade Kline
Subject: NE Bismarck Study

Respond

Hello Wade,

I live at 5335 Fairhill Rd., Bismarck. Our home borders along 43rd Ave.NE. I have studied the maps and talked to my sister about the 66th St. backage road system that is proposed in our area. It appears rather "awkward" for lack of another word. Two roads will cut into my other sister's lot and then into my niece's. What happens then? Does the county purchase this land from her or is it just taken? I also noticed it runs right through the farm to the east of us - the farm I grew up on.

From what I read, I could not find a definite time frame for this project. It appeared it could be 15 - 20 years. Is that correct?

I found it disturbing that the projected increase of households in our zone in 10 years is from 6 to 1340! Did I read this correctly? My understanding is that a sale to Sattler is in the works for the land to the east and south of us so perhaps that is true.

In the 43rd Ave Corridor Study which is an older study, it showed backage roads along 43rd Ave. On page 130 of that study it shows a blue line indicating the road right up against the north side of our house. Is this still a feasible project?
If so, what happens to our house?

I know you must be getting many questions about this so I understand if you cannot reply immediately but I would appreciate a reply. If you would rather call or write, here is my other contact information.

Thanks for your time.

Kathy Ternes
5335 Fairhill Rd.
Bismarck, ND 58503
701-220-3870

NE Bismarck Sub-Area Study Comments

In regards to the planned 66th St and 71st Ave "Beltway":

The need for the beltway is stated as reducing truck traffic on State Street and Centennial Rd. State St, or US Hwy 85, is a National Highway system interregional corridor whose primary goal is to move people and freight throughout the region. Why would a local road, and local public agency want to remove truck traffic from a US Hwy? And then take that truck traffic from a commercially zoned area and route it through and adjacent to residential neighborhoods. What are the social impacts of such a proposal?

The current beltway (Centennial Rd and 71st Ave), as it was originally billed and marketed is now regarded as a residential road that trucks need to be removed from? How did this turn of events take place? It would seem that the follow up years of poor urban planning and uncontrolled zoning now make for a mess of the transportation network plan.

The significant changes to the economic environment of North Dakota, due to a booming agriculture industry and oil & gas development, would make traffic operation studies such as the 2007 origin-destination study completely obsolete and out of touch with the current conditions.

The purpose of the beltway is stated as providing an additional north-south arterial roadway in the Bismarck-Mandan MPO area and addressing a major regional barrier (I-94). A grade separation at 66th St would meet the requirements of the purpose and need as stated, and move local traffic around the Bismarck-Mandan area.

The purpose and need <u>absolutely do not</u> support the Beltway as an Interregional Corridor idea. Incorporating an interchange at 66th St for interstate traffic to use the beltway, pulling truck traffic into residential neighborhoods to travel 55 to 65 mph is a non-compatible use. Especially when most of the paved county roads in the area have 45 mph speed limits even when there is not adjacent development.

I do not agree that a clear consensus has been reached on the idea of a beltway, and the project purpose and need does not support the planned project, which begs the question of what ulterior motives are driving this proposal.

Matt Linneman
5607 71st Ave NE
Bismarck, NE 58503

Wade Kline

From: Brenda Jorgenson <brenda.jorgenson@doosan.com>
Sent: Thursday, March 26, 2015 8:53 PM
To: Wade Kline
Subject: NE study

Hi Wade,

I live in the NE area. I took a drive around and I agree with 66th - it adds an addition road for all to use. 71st could be ok if we were just talking about traffic in the area, but for a beltway around the city, I think we should go farther north-84th or even farther north. Has this been looked at?

Best regards,
Brenda Jorgenson

Northeast Bismarck Subarea Study
Public Meeting No. 1
March 16, 2015

Questions for BMMPO and consultants
Aaron and Megan Carranza
6501 and 6605 66th Street NE

1. At what point would private takings for transportation changes occur?
    a. Would it coincide with sub-development or ownership change?
    b. Does the BMMPO have quick take authority?
2. Are the proposed transportation improvement going to be specially assessed to cover the local sponsor's portion of the project?
3. Is a priority-driven list of proposed transportation improvements available?
4. Specific transportation change at 6501 and 6605 66th Street NE (as shown on 66th Street access recommendations on Page 9 of Public Meeting No. 1 Maps)
    a. Why is access to 66th Street NE being removed for Lots 2-4 of TJ Ranch Estates 2nd (6707 and 6501 66th Street NE)?
    b. Would new access right-of-way on east side of property be taken from current residential properties (Lots 2-4 of TJ Ranch Estates 2nd) or would entirety of new ROW be taken from Lot 2 of NW ¼ of Section 8, Gibbs TWP
    c. Proposed driveway to 6501 66th Street NE
        i. Impacts to existing drain field
        ii. Impacts to existing propane service
        iii. Impacts to existing access to attached garage
    d. There currently is no access shown for Lot 3 (6605 66th Street NE)
        i. There currently exists an access from 66th Street NE
    e. Garage for 6501 66th Street NE is attached and faces west
        i. Proposed access comes from east
        ii. What remedy do we have as landowners when our driveway is proposed to be in our backyard?
    f. Would ROW increase along 66th Street?
        i. If so, to what distance?

Wade Kline

From:	Aaron Carranza <ajcarranza@gmail.com>
Sent:	Thursday, March 26, 2015 4:38 PM
To:	Wade Kline
Subject:	Comments on the NE Bismarck Subarea Study
Attachments:	comments_NEbismark.docx

Wade Klein
Project Manager
KLJ

RE: Northeast Bismarck Subarea Study

March 26, 2015

Dear Mr. Klein,

We are opposed to the proposed project. As impacted landowners along the route of the proposed beltway and a young family in rural NE Bismarck, we feel that the proposed alignment will adversely impact the transportation connectivity and safety of the long-established residential areas that were allowed to be constructed along 66th Street NE and 71st Avenue.

The penalties as result of the lack of proper planning to mitigate residential access and encroachment of 71st Avenue and 66th Street should be not now be passed on to the families who have chosen to live and thrive in rural NE Bismarck.

As a North Dakota State Water Commission Commissioner, Harley Swenson, stated during the March 16, 2015, public meeting, there are numerous alternative routes that could be explored east and north of 66th Street and 71st Avenue, respectively. These alternative routes would not have nearly as much impacts to established residential developments. This level of project begs deviation from the NDDOT 2-mile interchange spacing and requires the BMMPO to consider alternative beltway routing.

As mentioned by a truck driver during the public meeting, truck traffic will voluntarily take the path of least resistance to avoid excessive residential and non-through traffic, even if that means exiting I-94 3 miles east of Bismarck and traveling 5 miles north to avoid potential issues.

In closing, the attempt to shoehorn this massive rural NE Bismarck life-altering/property value-decreasing transportation project through a traditionally platted residential area of rural NE Bismarck wrongly places the burden of poor platting and zoning decisions on the shoulders of families living in the area.

Attached are a list of questions based upon the materials available at the March 16, 2015, public meeting.

Sincerely,

Aaron and Megan Carranza
6501 and 6605 66th Street NE
Bismarck, ND 58503

Wade Kline

From:	sethandrewthompson@gmail.com
Sent:	Thursday, March 26, 2015 5:59 PM
To:	Wade Kline
Subject:	Website Contact

First Name	Seth
Last Name	Thompson
Email	sethandrewthompson@gmail.com

Comments

I am writing to comment on the proposed "beltway" project, as explained at the March 16, 2015, open house. I am a homeowner in the northeast Bismarck Study area.

I understand that our infrastructure needs to be updated to accommodate our growing population; however, updates should not be done in a manner that unnecessarily burden citizens. Specifically, the location of the proposed beltway is not appropriate. Designing a truck and freight bypass next to the numerous housing developments already established along 71st is a very bad idea.

In concept, a truck bypass is a good idea. I think we can all agree that keeping trucks off State Street is beneficial. However, not designing the truck bypass far enough east and north of the existing developments is a major design flaw. Consider the recent bypasses in Watford City, Alexander, and Williston. They were built sufficiently far enough away from town and existing developments so as to not cause problems with existing developments.

Why are we not employing the same strategy here?

Another flaw is that the proposal relies on 2007 data to determine how much truck traffic will be diverted to the beltway. It is 2015. We are not being told the real picture regarding just how much truck traffic will be careening down the beltway and through our back yards. I do not disagree we need to look at a bypass. Just do it correctly.

The Bismarck Tribune had an article on March 25, 2015, regarding the beltway. First, Steven Zaun of Puklich Chevrolet indicated the 2013 traffic study does not accurately capture the volume of traffic he sees daily on State Street. If a 2013 study is not accurate projecting our traffic, I am amazed to think the 2007 data would suffice. Second, Mayor Seminary's comments in the article give me great concern. He is seeking to fast track the project, yet we don't even know what the traffic impacts will be. This is not responsible.

I find it interesting that this presentation discusses the beltway as a bypass that travels through a rural area. http://www.bismarcknd.gov/DocumentCenter/View/22644 There are multiple housing developments right along this corridor that will be negatively impacted by the volume of truck traffic being funneled through our back yards. I realize it can be argued that certain developments along 71st already have truck traffic bypassing their homes. That may be true, but the beltway seeks to increase the speed and volume of truck traffic.

Please reconsider this ill-advised route for the beltway. The receptiveness of this proposal at the

March 16 meeting should give decision makers significant pause before charting this course.

I thank Commissioner Steve Marquardt for attending and listening to our concerns. Why more elected officials not present at this meeting?

Seth Thompson

6300 Star Lane
Bismarck, ND 58503

Wade Kline

From: Jessica Mann <jessicabmann@yahoo.com>
Sent: Thursday, March 26, 2015 8:18 AM
To: Wade Kline
Subject: NE Bismarck Study

Dear Mr. Kline,
I was in attendance of the public meeting this month (NE Bismarck Study) and found that while this planning has gone on for many years the data you are using from 2007 seem irrelevant at this point in the planning stages. We did not move to the area until 2011 and since that time multiple neighborhoods have been established in the study area making a more recent traffic study a necessity for planning purposes. Since moving to Bismarck I have noticed the haphazard planning and zoning of the community. Schools built on major intersections/roadways (example Liberty built on Washington), neighborhoods being surrounded by commercial industries, poor access to schools, neighborhoods and businesses. This is an example of a poorly designed plan to "improve traffic flow". Moving traffic of heavy trucks and semis through established neighborhoods where children play only continues to develop a poorly designed city. If this plan has been in the making since 2008 zoning of the area should not have included the continuation of residential housing. More recently the Mayor of Bismarck has decided to attempt to make the beltway a priority. A beltway already exists from Centennial to 71st, here is another poor example of planning-spending money on a beltway and then diverting traffic to another beltway. Mayor cited his reasons of needing to remove traffic from the centennial/71st beltway because 2 schools were built. The beltway existed before the schools, another case of poor planning and zoning. When the 66th/71st beltway has a school built on it (which considering the population growth will likely happen) will the next Mayor request an additional beltway to be built?

State Highway 83 is that-a state highway made to carry commercial trucks. While I understand that hwy 83 has the city name of State Street, it is still highway 83 a commercial truck route that the city of Bismarck poorly planned multiple accesses to/from businesses and residential neighborhoods. The state Highway is meant to be a commercial route, directing traffic to a noncommercial route such as a county road seems like the city of Bismarck believes that state highway 83 was built to move city traffic only. It is clear to the ND DOT that improvements for safety reasons need to be addresses on highway 83 and it appears the project is funded through federal, state (some city for the southern part of highway 83). Routing commercial traffic through a county road in residential neighborhoods creates significant safety concerns that are not being addressed. The idea that stopping safety improvements on a state highway that funding has already been allocated and planned to find alternate funding to "fast track" a belt way brings double the safety concerns for motorists, pedestrians, families and businesses. My concerns also surround access to interstate 94 from 66th. Access does not exist at this point on 94 and it is my understating that ND DOT as well as the federal highway would need to be included in this and currently federal funding is very limited which means that "alternate funding" would come in the form of increase in taxes. I cannot imagine increase in taxes being a favorable decision and in turn could delay the necessary safety concerns on State Highway 83. The ND DOT as well as the state of ND should place priorities on the fatal crashes in the oil fields and not on the minor rear end, traffic delays of Bismarck. Bismarck could start by enacting planning and zoning ordinances so that schools do not continue to be built on major intersections or roadways preventing children from safely walking to school or building multiple residential neighborhoods with poor access to city streets creating back up during high traffic times, or routing commercial truck traffic through residential neighborhoods.

Wade Kline

From: Niemuth <niemuth@bektel.com>
Sent: Wednesday, March 25, 2015 9:07 PM
To: Wade Kline
Subject: NE Bismarck study

Hi Wade,

Thank you for handling comments on the NE Bismarck Subarea Study. We presently live just east of the subarea, but previously lived inside the boundary and travel through it several times each day. We have a couple of points we would like you to consider.

1) In many ways, 71st Avenue NE serves as a de facto bypass for many people on the northeast side of Bismarck. 71st Avenue carries a surprising amount of traffic (often at surprising speeds) east to the Menoken exit, and traffic volume will only increase as population in the subarea grows. 71st Avenue needs paving beyond the present extent, and the intersection of 71st Avenue and 106th Street is poorly designed and confusingly marked. Personnel at the county shop have commented on the need to fix that intersection and we see many near-misses there, but nothing has been done. Also, several hills on 71st Avenue between 80th Street and Centennial desperately need to be cut down (with or without the bypass), as the road is narrow and visibility is poor.

2) The subarea should be provided with ample parks and bike paths. Central Bismarck has many parks, but the north and east portions of town, with much development and many families with small children, have nothing. Green space, including drainages and low-lying areas, is important, but so are developed parks. Finally, biking/hiking paths add greatly to quality of life, provide a safe place for children to ride, and enable safe bicycle commuting to town. The growing population of northeast Bismarck deserves bike paths such as those enjoyed by people in northwest and south Bismarck.

3) As we understand the plans, the proposed bypass will be three lanes. That might be sufficient for the short term, but for increased safety and to handle future traffic volumes we would prefer to see four lanes. Judging from what we read in the newspaper, a primary desire of the Bismarck city fathers is for the bypass is to keep truck traffic out of Bismarck. Those of us living northeast of Bismarck don't want to shoulder Bismarck's problems without adequate infrastructure.

4) All-terrain vehicles and dirt bikes are a problem for many people in the subarea, causing erosion and unsafe conditions as many young people ride in ditches, cross roads, and drive across lawns. The problem will only get worse as more people move into the area.

Thank you for considering our comments. If you have questions, we can be reached at 527-8531.

Neal and Leanne Niemuth

Wade Kline

From: bill.massey@me.com
Sent: Wednesday, March 25, 2015 8:54 PM
To: Wade Kline
Subject: Website Contact

First Name	William
Last Name	Massey
Email	bill.massey@me.com
Comments	I think it is a crazy idea to put more traffic on 71st especially truck traffic . 71st already has plenty of traffic. If you want a bi-pass go further North and further West through undeveloped areas. That way the bi-pass will draw traffic away from the developed area and not into it.

Wade Kline

From:	jasond321@hotmail.com
Sent:	Tuesday, March 24, 2015 1:31 PM
To:	Wade Kline
Subject:	Website Contact

First Name	Tammy
Last Name	DeWitt
Email	jasond321@hotmail.com
Comments	I attended the Open House and was not exactly excited about the proposed traffic solution (I live on Dakota Country Dr off 66th), but I AM glad to see there is a study being looked into. The traffic congestion in our area continues to get worse and will only continue to get worse as new developments are being approved. The new development on 66th St and the continued rapid development just east of 80th and 71st will greatly increase traffic as several people want to live in the areas that feed the new high school. 71st Street is TOO narrow and continues to deteriorate. At this point, I am happy to support any of the options that come out of this study just to help alleviate and offer more options of getting into the city of Bismarck. Please consider making 84th a through street all the way to Hwy 83 - thing of the traffic that would alleviate off 71st. Our development (Country Creek) and the new development on 66th would certainly benefit from 84th being made a through street. Again, I greatly appreciate you looking into the traffic in the NE area.

Wade Kline

From:	bkrants@hotmail.com
Sent:	Tuesday, March 24, 2015 7:57 PM
To:	Wade Kline
Subject:	Website Contact

First Name	Brian
Last Name	Rants
Email	bkrants@hotmail.com
Comments	I have two main concerns: First of all, it is hard enough raising children on this road, now allow large amounts of truck traffic and see what kind of mess we have. Secondly, I have a beautiful piece of property, and I can imagine how property values will plummet, and if that's the case, property taxes should also go down instead of going up for something that we don't even want. Please consider everyone's comments, and reevaluate placement of the bypass by moving it farther north in a less developed area. Thank you.

Wade Kline

From:	stecklermm@bepc.com
Sent:	Tuesday, March 24, 2015 2:39 PM
To:	Wade Kline
Subject:	Website Contact

First Name	Myron
Last Name	Steckler
Email	stecklermm@bepc.com
Comments	I was not able to attend the meeting. Is a report available that describes the preliminary information that was presented at the meeting. I have 70 plus acres within this study area and would like to understand what the potential limitations I will have in utilizing my property. Would there be an oppertunity to sit down with someone to discuss the study? Thanks

Wade Kline

From:	mderinger@hotmail.com
Sent:	Tuesday, March 24, 2015 3:48 PM
To:	Wade Kline
Subject:	Website Contact

First Name	Mary
Last Name	(Huber) Deringer
Email	mderinger@hotmail.com
Comments	I am the gal that talked to you on March 17 in regards to Granger Street going east and crossing 52nd and cutting into property my brothers and sisters and I have owned since 1972. I have sent you a detailed letter and a map for suggestions. I hope you can take the time and care to listen and look at our concerns in this regard. Thanks again for taking my call and listening to my concerns. I believe there can be a solution that can make all parties happy. Mary (Huber) Deringer 5315 Fairhill Road Bismarck, ND 58503

Wade Kline

From: wendyfay32@msn.com
Sent: Tuesday, March 24, 2015 12:46 PM
To: Wade Kline
Subject: Website Contact

First Name	Wendy
Last Name	Schumacher
Email	wendyfay32@msn.com
Comments	we moved from MPLS to get away from all the traffic and a nearby highway. 71st/Centennial is busy enough and there are days when it takes some time to get onto Centennial from 71st. What would you be doing to ease this congestion as the truck traffic would obviously increase. This is mainly residential areas, so you would be putting greater risk to children and families who live in the area. Widening 43rd would also be right in the middle of residential neighborhoods. Go further north of 84th - expand the search!!!

Wade Kline

From: Wade Kline
Sent: Tuesday, March 24, 2015 11:59 AM
To: 'Aaron Larsen'
Subject: RE: NE Bismarck study/beltway

Aaron,

Thank your for the inquiry. In 2009 the MPO approved the North-South Beltway Study.

http://www.bismarcknd.gov/index.aspx?nid=1546

a lot of concerns were raised a that time regarding the selection of 66th and 71st, versus say 80th and 84th.

Please take a look at pages 22 – 24 of that report. Those pages, plus later sections offer a bit more history on why 66th and 71st were selected. Those efforts predate our work on the Northeast subarea study. We have not been asked as part of this study to reevaluate the decision for 66th and 71st. However, as a public process, I would encourage you to fully express your input and concerns on this or other issues you identify with; as those will be documented transmitted back to the MPO.

Feel free to contact by phone, too, sometimes that is easier than email.

Thanks

Wade Kline
KLJ
701-271-5009 Direct
728 East Beaton Dr. Suite 101
West Fargo, ND 58078
kljeng.com

From: Aaron Larsen [mailto:aaronlarsen27@gmail.com]
Sent: Tuesday, March 24, 2015 11:06 AM
To: Wade Kline
Subject: NE Bismarck study/beltway

Dear Mr Kline,

Could you please explain why the preferred route of the proposed NE Bismarck beltway is on 66th St.?

It seems that 80th St. would be a good option as well. With the existing overpass at the I-94 junction, it seems that adding an off ramp there would be a cheaper option than completely constructing a new one on 66th. Also, since 80th has recently been paved, that could save some $$ there as well.

Thanks for your time.

Aaron

Rachel

I'm writing to voice my concern regarding the proposed beltway in northeast Bismarck. This is a residential area where my friends live. If this new roadway is constructed our children will no longer be able to ride bike or play outside in their yard. This would propose a safety risk with the roadway being placed in this area. I appreciate your time.

Sincerely
Heather Kautz

Public Comments

Amber Bossert
Voice message Received 3-18-2015
Concerning NE Study PIM #1
Concerned about the placement of the Beltway

Retuned Ambers call 3-19-2015
Concerns/Comments:

- Amber lives along 71st Ave, east of Centennial Road
- She thought that the PIM #1 would allow for discussion of the placement of the beltway, but had read an article in the Tribune on March 18th indicating the placement had been set. Amber was upset that she couldn't voice her displeasure with the placement at 71st.
- Concerned about traffic along 71st Ave, peculiarly at Centennial Rd and 71st Ave
- Indicated that there is already high congestion at Centennial Rd and 71St Ave, and she believed increased traffic will make the congestion worse.
- She already waits 2-5 minutes to access 71st Ave from her house (during peak hours), and doesn't want to have a longer wait.
- Feels that the beltway will increase traffic along 71st and this will cause safety issues for the families in that area.
- There are many young families in that area, especially Foxen Haven *(outside the study area)* and they currently have only two choices for elementary schools—Sunrise – and another near Rosser *(Saxvig?)*. Families and children must travel across 71st Ave to access the schools. Increase traffic will make this more difficult and dangerous.
- Amber was alarmed that she didn't know about the proposed beltway and stated that her neighbors did not receive the mail out.

Rachel Drewlow
Transportation Planner
Recorded 3-18-2015

Wade Kline

From: Kim R. Fettig <kfettig@cityofmandan.com>
Sent: Thursday, March 19, 2015 4:06 PM
To: Wade Kline
Subject: ne bismarck study

Wade,
My husband Tom and I talked with you briefly at the public input meeting on Monday night. Our concerns were with the showing of Rocky Road continuing on to the west across 52 Street and then on to Centennial Road. This proposed road shows to be running right through our 5 rows of trees on the North side of our property (6200 52nd Street NE – west side Of 52 Street). Our neighbors to the north (Heidi Johnson) house is very close to the location of this road too. To the west edge of our property and continuing on west it is all low wet land (water ways) that run through this area which makes it very costly to even think about running a road thru there. The area is wet all year long, you can't drive thru any of it unless the ground is frozen therefore making it impossible for development of this property. Across the road to the east of us is Vonda and Larry Hochhalter home. If Rocky road were to continue to 52nd Street their three stall detached garage would have to come down and their house is very close too. To the north of them a new home was built close to the edge of that property, I do not see this new home on your maps. The city of Bismarck just allowed them to build and now would be close to the location of the road too. We believe you need to talk with these property owners and actually go out and look at our situations and see what we are talking about with the low wet areas. My husband and myself would gladly meet with you and show you what we are referring too. You can reach me at 701-400-7947 or you can call me at my work number below.
Thanks,

Kim Fettig
Engineering Project Manager
City of Mandan
205 2nd Ave. NW
Mandan, ND 58554
701-667-3228
Kfettig@cityofmandan.com

Wade Kline

From:	nichols_hi_d@hotmail.com
Sent:	Wednesday, March 18, 2015 9:09 PM
To:	Wade Kline
Subject:	Website Contact

First Name	Heidi
Last Name	Nichols-Johnson
Email	nichols_hi_d@hotmail.com
Comments	I reject the proposed extension of Rocky Road from it's current location to the west to meet up with Centennial Rd. The proposed location would be too close to my home & outbuildings located at 6438 52nd St. NE. The area to the west of our house has a creek that runs through it & is usually wet throughout the summer. There is a new home across 52nd to the east & a new home located straight west that do not appear on this map. I would like to strongly request the portion of the expansion to NE Bismarck concerning Rocky Rd to Centennial be abolished. I recommend acquiring accurate maps with current home locations prior to the public meeting in May should Rocky Road expansion still be on the map. There is are major E-W roads .5 miles north (71st) & .5 miles south (57th) which would surely provide adequate routes for traffic.

Wade Kline

From:	Judy Carlen <jcarlen60@gmail.com>
Sent:	Wednesday, March 18, 2015 9:19 AM
To:	Wade Kline
Subject:	I94/66th St interchange beltway

Good morning Wade,
My name is Judy Carlen and my husband and I own the property that is along I94/66th st. My driveway is 66th St. We own the big White House with wrap around front porch.
Its my understanding that this interchange is final for 66 th st ? It will be there and I am told it's in legislature hands if they allow funding for this project now ? Otherwise if they deny funding this session ....nothing will be happening with this project at this point !? Would you be able to clarify any of the details for me ? I would appreciate any info you could give me ! I don't envy you dealing with angry people about roads and their property ! I personally was excited about this I94/66th beltway from the beginning !! I hated winters out there and was looking forward to easier n safer access to work !!
Thank you very much Wade !! Have a beautiful day !!

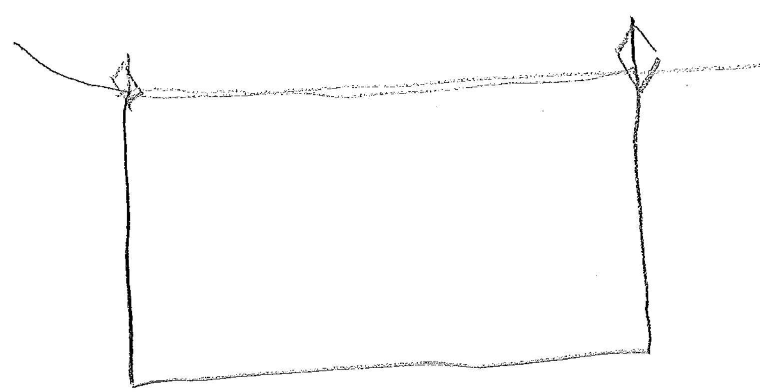
Judy Carlen
(my precious daughter works at KLJ as well)
Casey Carlen Orgaard 😊.

--
Jlynn

Wade Kline

From: adbossert@yahoo.com
Sent: Tuesday, March 17, 2015 5:47 PM
To: Wade Kline
Subject: Website Contact

First Name	amber
Last Name	bossert
Email	adbossert@yahoo.com
Comments	I have multiple concerns for the safety of our children with 71st becoming a bypass region. We have a high population of young families in that region. The school of Sunrise and Rita murphy were divided directly on 71st which increases the amount of bus routes and amount of people required to head to the south. my home sits directly on 71st and I changed plans to have my daughter ride bus to school as the bus stops on 71st (there is no other way to get into or out of our cul-de-sac) the curve connecting 71st to centennial in my mind is the most dangerous intersection in Bismarck and I avoid driving it specifically in the winter. As 71st continues to the west toward 83 this contest to be a residential area. Please reconsider....



Wade Kline

From: bmeckle@bepc.com
Sent: Tuesday, March 10, 2015 5:29 AM
To: Wade Kline
Subject: Website Contact

First Name	Bob
Last Name	Meckle
Email	bmeckle@bepc.com
Comments	What sized lots are considered low density residential vs high density residential? Looking at the map I am a stake holder in some property considered low density residential. Also how agressive (time table) is the plan to develop the infrastructure out to 52 Ave North of 43rd?

Wade Kline

From: rdonreuter@bis.midco.net
Sent: Tuesday, March 10, 2015 4:22 PM
To: Wade Kline
Subject: Website Contact

First Name	Don
Last Name	Reuter
Email	rdonreuter@bis.midco.net
Comments	Need someone from KJL to contact us on the develpment of this area!!1-701-226-4763

Wade Kline

From:	jliechty5@yahoo.com
Sent:	Monday, March 16, 2015 8:27 AM
To:	Wade Kline
Subject:	Website Contact

First Name	Jeff
Last Name	Liechty
Email	jliechty5@yahoo.com
Comments	Regarding the potential interchange at I-94 and 66th St, would this interchange just give access north and south on 66th St, or would there also be planned roads to the west, tying into Century Ave? As an owner of Century Park, the manufactured housing development, I possibly could have some concern if a main artery dumped exiting traffic onto Century Ave directly past our development. Not sure if that's good or bad - just curious.

Wade Kline

From: helbling_d@msn.com
Sent: Tuesday, March 17, 2015 12:30 PM
To: Wade Kline
Subject: Website Contact

First Name	Deb
Last Name	Helbling
Email	helbling_d@msn.com
Comments	Have you considered placing the interchange off of I94 at 80th street? There is already an overpass there and 80th street is paved from 71st Ave to Hwy 10. Wouldn't that cost less and give pretty much the same result as your current proposal? Thank you for letting me give my input.

Wade Kline

From: cjbott5@hotmail.com
Sent: Monday, March 16, 2015 8:00 PM
To: Wade Kline
Subject: Website Contact

First Name	Chris and Julie
Last Name	Bott
Email	cjbott5@hotmail.com
Comments	We like the idea of the 66th street interchange, but we do NOT support the idea of 66th to 71st Truck Route! We believe a better solution to truck traffic is an 80th street interchange with a route that would funnel trucks farther north than 71st to 83.

Wade Kline

From: Aaron Carranza <ajcarranza@gmail.com>
Sent: Monday, March 16, 2015 8:08 PM
To: Wade Kline
Subject: Re: Website Contact

Wade,

I attended the public meeting this evening. I think you did a good job of mediating the beginning of an ill-tempered mob. I think for the 2nd meeting having county and city commissioners present to field historic planning questions would satisfy the need to vent at those responsible.

While I live on 66th in the path of the byway, I know an alternative is needed to the already-taxed centennial/state street corridors. I would love to see a more rural alternative, but understand that if this is the best we can do, so be it.

One of the potential issues I saw this evening was how the story behind the project was being told. It sounded like the project's focus to make it easier for truck/freight traffic. If more focus is given to how more viable N-S and E-W connectivity would benefit the current resident's, perhaps a different reception would be had.

Either way, thanks for presenting the study and fielding the many questions about the future transportation needs in NE Bismarck.

Aaron and Megan Carranza
6501 66th Street NE

On Mon, Mar 16, 2015 at 1:58 PM, Wade Kline <Wade.Kline@kljeng.com> wrote:

> Sounds good. Got you on our list. You can follow the website for future updates.
>
> http://www.nebismarckstudy.com/
>
> Wade Kline
>
> **KLJ**
> 701-271-5009 Direct
> 728 East Beaton Dr. Suite 101
> West Fargo, ND 58078
> kljeng.com

From: ajcarranza@gmail.com [mailto:ajcarranza@gmail.com]
Sent: Monday, March 16, 2015 1:16 PM
To: Wade Kline
Subject: Website Contact

First Name	Aaron
Last Name	Carranza
Email	ajcarranza@gmail.com
Comments	Please consider this a request for email notifications. Thank you.

COMMENTS

HoustonEngineering Inc.

MABU KLJ

Northeast Bismarck Subarea Study

www.nebismarckstudy.com

Monday, March 16, 2015 – Sunrise Elementary School – 5:00 - 7:00 pm

Please use the space below to provide comments regarding the NE Bismarck Subarea Study.

PLEASE PRINT

Name: RICHARD JORGENSON

Address: 4713 HITCHCOCK DR.

—THIS SPACE OFFICE USE ONLY—

GLAD TO SEE THE THOUGHT GOING INTO THIS.
CENTURY NEEDS TO BE WIDEN W/TURN LANES
WILL EXISTING HOMES BE LEVELED SPECIALS TO HELP PAY FOR
THIS? WILL DEVELOPERS WORK TO INCORPORATE SMOOTH
TRAFFIC FLOW THROUGH THEIR AREAS?

Please leave comments with meeting conductors or mail comments to:

Wade Kline
KLJ
4585 Coleman Street, PO Box 1157
Bismarck, ND 58502-1157
Email: wade.kline@kljeng.com

Note "NE Bismarck Subarea Study" in the e-mail subject heading

Public Input Meeting #1

Sign-In Sheets

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	Public Input Meeting	3-16-15
Project Number		PCN
Project Description: NE Bismarck Subarea Study PIM #1		

ADA: Yes

1

Name (Please print)			Title/Representing
Gabe Schell			KLJ
Address			
City: Bismarck	State	Zip code	Email: gabe.schell@kljeng.com

2

Name (Please print)			Title/Representing
Jon Kelsch			
Address: 2730 Berkshire Dr.			
City: Bismarck	State: ND	Zip code: 58503	Email

3

Name (Please print)			Title/Representing
RICHARD JORGENSON			
Address: 4713 HITCHCOCK DR			
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4

Name (Please print)			Title/Representing
Aaron Jahner			
Address: 5500 Shoal Dr			
City: Bismarck	State: ND	Zip code: 58503	Email: finallyhome_1@msn.com

5

Name (Please print)			Title/Representing
Ben Turnbow			
Address: 5100 Hitchcock Dr			
City: Bismarck	State: ND	Zip code: 58503	Email: Ben@Insulationnd.com

6

Name (Please print)			Title/Representing
Megan Belland			
Address: 5100 Hitchcock Dr			
City: Bismarck	State: ND	Zip code: 58503	Email

7

Name (Please print)			Title/Representing
Bob Meckle			
Address: 4507 Frost LN			
City: Bismarck	State: ND	Zip code: 58503	Email: bmeckle@bepc.com

SIGN-IN SHEET

Bismarck·Mandan

METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	PIM # 1	3-16-15
Project Number		PCN

Project Description: NE Subarea Study PIM # 1

ADA Accessible: yes

8

Name (Please print)	Title/Representing		
LYNN Buri			
Address: 9103 71ST AVE NE			
City: BISMARCK	State: ND	Zip code: 58503	Email: LYNNBURI@Bis.midco.NET

9

Name (Please print)	Title/Representing		
Amanda Grosz	KLJ		
Address			
City: Bismarck	State	Zip code	Email: amanda.grosz@kljeng.com

10

Name (Please print)	Title/Representing		
Emma McFall	HEI		
Address: 1401 ½ N 13th St			
City: Bismarck	State: ND	Zip code: 58501	Email: emcfall@houstoneng.com

11

Name (Please print)	Title/Representing		
Troy Ripplinger			
Address: 3535 Foxden Lp			
City: Bismarck	State: ND	Zip code: 58503	Email: troy.ripplinger@kljeng.com

12 #13

Name (Please print)	Title/Representing		
DeAnn + Craig Kuntz			
Address: 7502 Moonlite Rd			
City: Bismarck	State: ND	Zip code: 58503	Email: deannkuntz@midco.net

14

Name (Please print)	Title/Representing		
Ken Nysether			
Address: 4830 E Roundup Rd			
City: Bismarck	State: ND	Zip code: 58503	Email: Knysether@sehinc.com

5

Name (Please print)	Title/Representing		
Jeff Heintz	Bismarck Public Works - Serv. Ops		
Address			
City	State	Zip code	Email

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck·Mandan

METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	Public Input Meeting	3-16-15
Project Number		PCN
Project Description: NE Bismarck Subarea Study PIM #1		

ADA : Yes

16

Name (Please print): Toni Haider		Title/Representing: SEH - Engineer	
Address: 925 Basin Ave Suite 1			
City: Bismarck	State: ND	Zip code: 58503	Email: THaider@SEHinc.com

17

Name (Please print): Steve Saunders		Title/Representing: MPO	
Address: 221 N 5th St.			
City: Bismarck	State: ND	Zip code: 58506	Email: ssaunders@bismarcknd.gov

18

Name (Please print): April Meckle		Title/Representing:	
Address: 4507 Frost Ln			
City: Bismarck	State: ND	Zip code: 58503	Email: april_volo@hotmail.com

19

Name (Please print): LOREN DEWITZ		Title/Representing: SELF	
Address: 5300 STREAM PL			
City: BISMARCK	State: N.D	Zip code: 58503	Email:

20

Name (Please print): Julie Jeske		Title/Representing: Park District	
Address: 531 Daytona Dr			
City: Bismarck	State: ND	Zip code: 58503	Email:

21

Name (Please print): Gary Chepulis		Title/Representing:	
Address: 7827 Runnel Rd			
City: Bismarck	State: ND	Zip code: 58503	Email:

22

Name (Please print): Jerry Wuitz		Title/Representing:	
Address: 5935 Shoal Dr.			
City: Bismarck	State: ND.	Zip code: 58503	Email:

Bismarck·Mandan

METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	Public Input Meeting	3-16-15
Project Number		PCN
Project Description		
NE Subarea Study PIM #1		

23

Name (Please print)			Title/Representing
Tom Volochenko			Owner
Address			
1919 4th Ave NW			
City	State	Zip code	Email
Butte	ND	58723	TomV@SRT.com

24

Name (Please print)			Title/Representing
Alan Olson			Self
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7000 Endicott Dr			
City	State	Zip code	Email
Bis	ND	58503	alolson@midco.com

25

Name (Please print)			Title/Representing
Don Reuter			Self
Address			
901 Mouton Av.			
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26

Name (Please print)			Title/Representing
Kim Fettig			
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6200 52 St. NE			
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27

Name (Please print)			Title/Representing
MICHAEL JOHNSON			NDDOT - LG
Address			
608 E. BOULEVARD AVE			
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28

Name (Please print)			Title/Representing
Tim Staloch			
Address			
6650 66th St NE			
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29

Name (Please print)			Title/Representing
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Bismarck·Mandan

METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementry School	PIM #1	3-16-15
Project Number		**PCN**
Project Description		
NE Bismarck Sub Area Study		

30

Name (Please print)			Title/Representing
James Miller			
Address			
2901 71st Ave NE			
City	**State**	**Zip code**	**Email**
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31

Name (Please print)			Title/Representing
Sheri Lares			FHWA
Address			
4503 Coleman St			
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Bismarck	ND	58503	sheri.lares@dot.gov

32

Name (Please print)			Title/Representing
Darell Baisch			
Address			
6010 62Nd ST NE			
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33

Name (Please print)			Title/Representing
John Hauck			Gibbs township
Address			
6420 TJ LN			
City	**State**	**Zip code**	**Email**
Bis	ND	58503	

34

Name (Please print)			Title/Representing
Sheldon Sivek			
Address			
7115 30th Ave NE			
City	**State**	**Zip code**	**Email**
Bismarck	ND	58501	sheldons@bis.midco.net

35

Name (Please print)			Title/Representing
Aaron Carranza			
Address			
6501 66th St. NE			
City	**State**	**Zip code**	**Email**
Bismarck	ND	58503	ajcarranza@gmail.com

36

Name (Please print)			Title/Representing
Dave Silbernagel			Silver Ranch
Address			
6350 43rd Ave NE			
City	**State**	**Zip code**	**Email**
Bismarck	ND	58503	ds74grandam@gmail.com

SIGN-IN SHEET

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location: Sunrise Elementary School	Meeting Type: PIM #1	Meeting Date: 3-16-15
Project Number:		PCN:
Project Description: NE Bismarck Subarea Study		

37 Name (Please print): Brian Kiter		Title/Representing: BMDA		
Address: PO Box 2015				
City: Bismarck	State: ND	Zip code: 58502	Email: bkiter@bmda.org	
38 Name (Please print): Robert Gibbons		Title/Representing:		
Address: 6707 66th St NE				
City: BISMARCK	State: ND	Zip code: 58503	Email:	
39 Name (Please print): Tim Langerud		Title/Representing:		
Address: 4915 Rolling Ridge Rd				
City: Bismarck	State: ND	Zip code: 58503	Email: tlangerud@swensonhagen.com	
40 Name (Please print): Jay Schlenker		Title/Representing:		
Address: 4300 Denali Pl.				
City: Bismarck	State: ND	Zip code: 58503	Email: schlenk@midco.net	
41 Name (Please print): Mary Jane Sailer		Title/Representing:		
Address: 6209 Rocky Road				
City: Bis	State: ND	Zip code: 58503	Email:	
42 & 43 Name (Please print): Ken & Emily Silbernagel		Title/Representing: Farmer		
Address: 2720 Mercury Ln.				
City: Bismarck	State: ND	Zip code: 58503	Email:	
44 & 45 Name (Please print): Randy & Deb Diede		Title/Representing: Landowner		
Address: 5825 71st Ave NE				
City: Bismarck	State: ND	Zip code: 58503	Email: ddiede@bis.midco.net	

Bismarck·Mandan

METROPOLITAN PLANNING ORGANIZATION

Meeting Location: Sunrise Elementary School	Meeting Type: PIM #1	Meeting Date: 3-16-15
Project Number:		PCN:
Project Description: NE Subarea Study PIM #1		

46	Name (Please print): Randy Bina			Title/Representing: Executive Director, Bis Parks & Recreation
	Address:			
	City: Bismarck	State:	Zip code:	Email: rbina@bisparks.org
47	Name (Please print): Eleanor Stroh			Title/Representing:
	Address: 3428 Roosevelt Dr			
	City: Bismarck	State: ND	Zip code: 58503	Email:
48	Name (Please print): DeEtta Gibbons			Title/Representing:
	Address: 6707 66 St NE			
	City: Bismarck	State: ND	Zip code: 58503	Email:
49	Name (Please print): Anthony Welder			Title/Representing:
	Address: 3345 Northrop Dr			
	City: Bismarck	State: ND	Zip code: 58503	Email: ajwelder@gmail.com
50	Name (Please print): HARLEY SWENSON			Title/Representing:
	Address: 8301 Hwy 1804 S			
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51	Name (Please print): Paul Lies			Title/Representing:
	Address: 4935 Rolling Ridge Rd.			
	City: Bismarck	State: ND	Zip code: 58503	Email: pdlies@midco.net
52	Name (Please print): Sheri Langerud			Title/Representing:
	Address: 4915 Rolling Ridge Rd			
	City: Bis	State: ND	Zip code: 58503	Email:

Bismarck·Mandan

METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	PIM #1	3-16-15
Project Number		**PCN**
Project Description		
NE Bismarck Subarea Study		

53

Name (Please print)			Title/Representing
Donna Fricke			
Address			
918 Senate Dr			
City	**State**	**Zip code**	**Email**
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54

Name (Please print)			Title/Representing
Thomas M Lawler			
Address			
7020 Aleutian Drive			
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55

Name (Please print)			Title/Representing
Norma Dooley			
Address			
4419 Turnbow Ln			
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56

Name (Please print)			Title/Representing
Brandon Hass			
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7

Name (Please print)			Title/Representing
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58

Name (Please print)			Title/Representing
BRETT GURHOLT			KLJ
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59

Name (Please print)			Title/Representing
Dale Haman			
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6505 Rocky Rd			
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SIGN-IN SHEET

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location: Sunrise Elementary School	Meeting Type: PIM #1	Meeting Date: 3-16-15
Project Number:		PCN:
Project Description:		

	Name (Please print)	Title/Representing	Address	City	State	Zip code	Email
60	Jaime Lawler		7020 Aleutian Dr.	Bismarck	ND	58503	lawler.jaime@gmail.com
61-62	Dianna &Roland Mikulka		7603 Twilight Rd	Bismarck	ND	58503	dianna@safetytek.net
63-64	Hero & Candace Barth		3510 80th St. NE	Bismarck	ND	58503	Barth5@bektel.com
65	Kevin Hahne		5585 71ST AVE NE	Bismarck	ND	58503	hyper13man@yahoo.com
66	PAUL BENNING	NDDOT	608 E BLVD AVE	BISMARCK ND		58505	pbenning@nd.gov
67	KELLEY KUNNANZ		7211 MOONLITE RD	BISMARCK	ND	58503	KELLEY.KUNNANZ@NSC.COOP
68	MARK GRIFFIN		4352 78 AV NE	BIS	ND	58503	DAKRATTLER@MIDCO.NET

SIGN-IN SHEET

Bismarck·Mandan

METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary		

Project Number	PCN

Project Description

69

Name (Please print)			Title/Representing
Steve Marquardt			
Address: 3020 Roosevelt Dr			
City: Bismarck	State: ND	Zip code: 58503	Email: marquardtsteve1@yahoo.com

70

Name (Please print)			Title/Representing
Joe Schafer			
Address: 4728 43 Ave NE			
City: Bismarck	State: ND	Zip code: 58503	Email: JSchafer99@Hotmail.com

71

Name (Please print)			Title/Representing
Bryan Turnbow			
Address: 4424 Chamberlain Dr			
City: Bis	State: ND	Zip code: 58503	Email: turnbow.bryan@gmail.com

72

Name (Please print)			Title/Representing
John Devney			
Address: 5575 71st Ave NE			
City: Bismarck	State: ND	Zip code: 58503	Email: jdevney@deltawaterfowl.org

73

Name (Please print)			Title/Representing
Brian Rosin			
Address: 5041 Meadowcrest Rd.			
City: Bismarck	State: ND	Zip code: 58503	Email: brosin@nd.gov

74

Name (Please print)			Title/Representing
Ben Crawford			
Address: 5500 Roosevelt Dr			
City: Bismarck	State: ND	Zip code: 58503	Email: bencrawford@gmail.com

75

Name (Please print)			Title/Representing
Diane Chepulis			
Address: 1827 Quinnel Rd			
City: Bismarck	State: ND	Zip code: 58503	Email: chepulis@ge.com

	Name	Address	City, State	Email
76	Jan Leonard Corwin	7908 Belmont Ln	Bismarck ND	
77	Justin Schlosser	4506 E Calgary Ave	Bismarck, ND	
78 & 79	Matt + Jessica Lenneman	5607 71st Ave NE	Bismarck ND	
80	Dan Thiel	7020 Endicott Dr.	Bismarck	
81	Becky Thiel	7020 Endicott Dr.	Bismarck, ND	
82	JOAN MILLNER	1315 N 3RD ST	BISMARCK	
83	Matt Millner	1315 North 3rd St.	Bismarck ND	
84	Darin Scherr	Bis Pub Schools	Bismarck	
85	Gerald Millner	6455 ? LN	Bismarck	
86	Seth Thompson	6300 Star LN	Bismarck	
87	Derek Shaffer	3505 66th St. N.E.	Bismarck	
88	Armon Weiss	6550 66th St NE	Bis.	
89	Rachel Drewlow		MPO	rdrewlow@bismarcknd.gov
90	Jenny Wollmuth		Bismarck City Planning	jwollmuth@bismarcknd.gov

Updated Frequently Ask Questions (FAQ) for Project Website

Posted 5/12/2014 to Response to PIM #1 Comments

FREQUENTLY ASKED QUESTIONS

Question: What is the Bismarck-Mandan Metropolitan Planning Organization?

Answer: The Bismarck-Mandan Metropolitan Planning Organization is a federally funded organization that provides transportation planning activities in the area. All urbanized areas with a population greater than 50,000 are required to have a Metropolitan Planning Organization in order to be eligible for receiving federal funding for transportation projects such as transit operations and road construction. The Bismarck-Mandan Metropolitan Planning Organization is funded with 80% federal funding by the federal Transportation/Highway Trust Fund, with revenues generated from federal fuel and excise taxes provided specifically to the Bismarck-Mandan area for transportation planning purposes. The remaining 20% is locally funded by the local member jurisdictions of Bismarck, Mandan, Lincoln, Burleigh County and Morton County. The federal transportation planning funding is administered by the North Dakota Department of Transportation through the Bismarck-Mandan Metropolitan Planning Organization.

Question: Where is the funding for this study coming from?

Answer: The study is funded with approximately 80% federal funding by the federal Transportation/Highway Trust Fund, with revenues generated from federal fuel and excise taxes provided specifically to the Bismarck-Mandan area for transportation planning purposes. The remaining 20% is locally funded by Burleigh County and the City of Bismarck. The federal funds are administered by the North Dakota Department of Transportation through the Bismarck-Mandan Metropolitan Planning Organization.

Question: What is the project description?

Answer: The study area is comprised of over twelve (12) square miles located in and northeast of Bismarck, ND. Portions of the study area are outside Bismarck city limits in Burleigh County, where the zoning authority is with Burleigh County or within the extra-territorial (ET) limits of Bismarck where Bismarck has planning and zoning jurisdiction. The study will consider arterial and collector roadways and trails in the area bounded to the north by 84th Avenue, to the west by Centennial Road, to the south by Interstate 94, and to the east by 80th Street.

Question: Why is this study needed?

Answer: There are a number of issues that Burleigh County, the City of Bismarck and the NDDOT would like to address with a future plan for the area. The study area is experiencing rapid growth of urban residential and commercial land uses, as well as rural residential land uses. The rapid growth has resulted in increased traffic growth on the rural two-lane roadways, and on the urban streets. The study area is forecast to be a high growth area between now and year 2040. The growing traffic is forced to use the limited number of travel routes in the area today, limiting the transportation options for everyone.

Question: What does the Study hope to accomplish?

Answer: The purpose of the NE Bismarck Sub Area Study is to develop and evaluate cost effective alternatives for providing improved mobility for both motorized and non-motorized transportation in the study area. The intent is to develop recommendations, cost estimates, funding alternatives and implementation strategies for future transportation facility needs in the area.

Question: Who is doing the study and who will make the decisions?

Answer: The study is sponsored by Burleigh County, the City of Bismarck, and the Bismarck-Mandan Metropolitan Planning Organization (BMMPO). The draft and final corridor study reports will be presented to the Burleigh County and Bismarck Planning and Zoning Commissions, the Burleigh County Commission and the Bismarck City Commission for their approval, and then to the BMMPO for their approval after County and City comments have been addressed. A consulting team has been hired to complete the study, consisting of KLJ; Houston Engineering, and Agency MABU.

Question: When will the study be completed?

Answer: A draft report is anticipated to be presented to the public in June 2015, with a final report scheduled to be completed for adoption by the local jurisdictions by August 2015.

Question: Will the public have any input during the course of the project?

Answer: Yes. There will be two public input meetings and several progress updates, with additional public meetings involving the Burleigh County Commission, Bismarck City Commission and the Burleigh County and City of Bismarck Planning and Zoning Commissions; as well as BMMPO meetings where the public is welcome to attend. Project updates will be provided periodically to the project website throughout the duration of this project. As the study progresses, the study team will also be meeting face-to-face with major stakeholders in the study area. The first public meeting was held on March 16, 2015. The second and final public meeting will be held in June of 2015.

Question: Will this study result in any road or other construction in the area?

Answer: There is no construction funding dedicated at this time for any immediate improvements. The study will identify cost estimates and recommended project implementation for the years 2025 and 2040, and will list out needs beyond 2040. For the most part needs with in the study area are not likely to be addressed with new roadway construction before the year 2019. The decision to develop a construction project after this study will be determined after the study is complete, if transportation construction funding can be identified. The areas with the most imminent new roadway needs are along Century Avenue and the construction of 66th Street (including a grade separation of I-94) from south of the study area to connect with a future Century Avenue extension.

Question: A number of roadway project needs were shown as part of the public meeting #1, how will these be paid for?

Answer: At this point major construction projects in the study area are not likely to occur until after 2019. Future funding for projects in the study area are likely to be a mix of local (city and county), state, and Federal funds. Specific project level cost funding details will not be determined as part of the Northeast Bismarck Subarea Study. However, it is assumed that past practices would be deployed regarding future roadway funding within the Northeast Subarea.

Question: How does the 66th Street/71st Avenue Beltway Concept fit into the Northeast Subarea?

Answer: The Beltway corridor along 66th Street and 71st Avenue has been supported through several past BMMPO planning studies, which all involved public input opportunities. The decision to locate a future arterial roadway along 66th Street and 71st Avenue was decided upon with the 2009 North-South Beltway Corridor Study and was reconfirmed with the recently approved Envision 2040 Long Range Transportation Plan (LRTP) for the BMMPO. Previous analysis determined 66th Street and 71st Avenue to be the most technically feasible location for a Beltway within the Northeast Subarea. It is not anticipated that the current Northeast Bismarck Subarea Study will go back on past analysis. However concerns presented by residents regarding the Beltway location along 66th Street and 71st Avenue are being integrated into the study and will be shared with decisions makers at the BMMPO, the City of Bismarck and Burleigh County.

Question: Why was the term "interregional" used to describe the future beltway alignment along 66th Street and 71st Avenue?

Answer: The term "interregional" was used to reflect the fact that future connectivity between I-94 and US 83 along 66th Street and 71st Avenue would have the potential to move interregional traffic around the Bismarck area.

Question: Should I be concerned about future traffic volumes and truck traffic along 71st Avenue based on future projections in the Study Area?

Answer: Current daily traffic volumes along 71st Avenue are 2,500. Which includes both passenger vehicles and truck traffic. By the year 2040 daily traffic volumes along 71st Avenue are projected to increase to between 6,700 and 5,700. These volumes assume the development of an interchange at 66th Street and I-94. How much of this future traffic would be trucks is not yet known. KLJ and the BMMPO are currently updating 2008 truck movement data based on 2014 traffic counts to determine an updated forecast for future truck volumes along the 71st Avenue corridor given its future connectivity between US 83 and I-94.

Question: Will my property along 71st Avenue be negatively impacted by future plans to widen 71st Avenue?

Answer: Based on future traffic projections along 71st Avenue, the corridor between 66th Street and Centennial Road will need to be widened to a three lane rural section (no sidewalks or curb and gutter). This widening is expected to be needed between 2019 and

2032. The three lane rural roadway would be able to fit within current right-of-way without negatively impacting adjacent properties. The current BMMPO LRTP recommends preserving enough right of way along 71st Avenue to widen the corridor to five lanes. However the five lane roadway is not projected to be needed until after 2040. Regardless of its designation as part of the Beltway, 71st Avenue is a mile line corridor roadway, and would undoubtedly develop as a major east-west arterial corridor.

Question: Should I be concerned about impacts to my property based on the Access Consolidation concepts discussed at the first public meeting in March of 2015?

Answer: No. Based on the feedback we received directly from residents as part of public meeting #1 in the Northeast Subarea, access consolidation concepts will be modified so as not to directly affect existing or pending residential development patterns. The concepts shown at the March public meeting were illustrative in nature and are being modified to reflect existing private property.

Public Input Meeting #2

Public Notice

Northeast Bismarck Sub Area Study

Why?

The intent of the Northeast Bismarck Subarea Study is to develop a more detailed plan for future investment in transportation infrastructure in the Northeast Bismarck Subarea. The Study will build on the recently completed Envision 2040 Long Range Transportation Plan and other subarea plans and studies completed in the general vicinity. The Study will result in the following features:

- Traffic Operations and Access Management plan for key corridors in the NE Subarea (Centennial Road, Century Avenue, 71st Avenue, 66th Street and 80th Street).
- Review of FHWA Interstate Justification Report (IJR) criteria relative to the planned 66th Street/Interstate 94 interchange.
- Roadway development concepts for all major arterials within the subarea.
- Implementation plan with recommended short-term, mid-term and long-term improvements for all major corridors within the NE Subarea.

Information regarding the development of the Draft Northeast Bismarck Subarea Study will be available for review and comment at the meeting. More information regarding the study is available online at www.nebismarckstudy.com.

When?

June 30, 2015
Formal Presentation 5:30 p.m. to 6:00 p.m.
Open House: 5:00 p.m. to 7:00 p.m.

Where?

Sunrise Elementary School
3800 Nickerson Avenue
Bismarck, ND

OPEN HOUSE CONDUCTED BY

Bismarck-Mandan Metropolitan Planning Organization (MPO) and KLJ

Representatives from the Bismarck-Mandan MPO, City of Bismarck, Burleigh County, and KLJ will be on hand to answer your questions and discuss your concerns.

Written comments about this project should be received by July 7, 2015, to Wade Kline; KLJ Project Manager; KLJ, P.O. Box 1157, Bismarck, ND 58501.Comments can also be directed through the project webpage at www.nebismarckstudy.com.

Any individual requiring a special accommodation to allow access or participation at the meeting is asked to notify Rachel Drewlow, Transportation Planner, Bismarck-Mandan MPO at (701) 355-1852 of his/her needs five (5) days in advance of the meeting. Also, materials can be provided in alternate formats: large print, braille, cassette tape or on computer disk for people with disabilities or with limited English proficiency (LEP) by contacting the MPO at least give (5) days prior to the meeting at the number listed above.

Public Input Meeting #2
Comments Received

RECEIVED
JUL 13 2015
By [signature]

.10 July 2015

6110 62nd St. ND
Bismarck, ND 58503

KLJ
Wade Kline
728 East Beaton Dr., Suite 101
West Fargo, ND 58078

Dear Mr. Kline:

Thank you to you and your team for giving additional time to respond to the NE Bismarck Subarea Study. It concerns me and many of the local residents greatly.

One, and most importantly, there are bobolinks in the fields along the lane that is currently 66th St., just south of 71st Ave. NE. Sixty-sixth is a tad more than ½ mile of gravel south of 71st Avenue. Just beyond that traveled area of 66th St. the bobolinks seem to call home. They have been here for the 10 years that we have been here. I have not seen them along 80th where traffic is common and speed increases. They don't adjust to industry and destruction of habitat and prefer fields and farmlands away from traffic areas. Bobolinks are an endangered species of bird and it is increasingly rare to find them.

I don't recall that there were State Game & Fish people introduced at the meetings. Due to the bobolinks and habitat involved, it would be good to have Game & Fish involved in this.

Two, I have considerable difficulty sleeping unless it is quiet and dark. City and/or night lights reduce my ability to sleep well. That is why we moved away from town and into a farming area. A main road along 66th will divert more than car traffic. It will encourage truck traffic that wants to avoid the Hwy. 83 traffic lights, as well. Truck traffic will shift numerous times from a slow turn off at the interstate unto any road going north. It will shift continuously up that hill, creating considerably more noise, all night long. I already hear the traffic from Centennial when the wind is right, and that is two miles from us.

I believe a truck route/road can be built further out along 80th or even further east. *Build a road and industry will follow it.* Don't intrude on existing housing areas. Please, don't allow those fumes, noise, and lights, nor industry and accompanying retail to intrude in our yards and homes.

Further, I understand there is a possible truck stop in the works for the corner of 71st Avenue and Hwy 83 North. If it is built there, that encourages trucks to use 66th St. NE and 71st Avenue NE. Why does it have to be approved so close to town? Plan it for further north, *away from current housing*, and build a bypass from Hwy. 83 East to 80th, or preferably, even further east and south. The Menoken turn off might be a good location for Interstate traffic diversion. It would not affect current housing.

If 71st Avenue must be updated, consider keeping it at 40 mph and build a walking/biking path alongside it. A path could be continued west to Centennial and allow students to bike to the new schools, Legacy and Sunrise. It would encourage healthy use of the area, not speed and trucks.

If you truly only want a road on 66th and 71st to accommodate local travel, build it only for car traffic. Don't build it for truck weight. Don't allow truck traffic on it AND REDUCE SPEEDS accordingly.

Would you like a *highway* just down the block from your home? Would you have purchased a home if you had any inkling that a major road would be built just down the block?? Noise, fumes and lights are detrimental to health. It is not good for the bobolinks OR for the people involved.

"Progress" isn't just building, it must include consideration for all those affected.

Thank you for allowing me to have some input.

Sincerely,

Karen Bonnet

Karen Bonnet
701-221-2774

Cc: Rachel Drewlow, Transportation Planner
Bismarck-Mandan Metropolitan Planning Organization

Wade Kline

From: Mamie Havelka <mamie.havelka@icloud.com>
Sent: Friday, July 10, 2015 9:53 AM
To: Wade Kline

Subject: MPO Public Comment Period

Wade,
Hopefully it is ok to send you my comments per your e-mail, the spot on the Website is really small and I can't edit my comments easily.

I have many concerns about the project.

The project mostly relates to traffic. It is true the road systems need to be attended to earlier rather than later for a plethora of reasons. Your study covered the traffic conditions very well and the truck traffic was studied as well.

A project this size needs more than a traffic and road study. Some items of my concern were addressed, but not all important items were addressed.

1. Population: dense vs less dense. Not addressed: Lot size vs acreage. All of the residents in my area paid 100s of thousands of dollars for peace and privacy. Our interests were not addressed.

2. Environmental Protection Act. Was anything done with that? It may not be necessary, but do we really know.

3. Environmental: The construction and buildup in the area has created additional water flow in the creeks and brooks around here. At times they are streams or more. The study addressed the 100 year flood but did not say in regards to what. Therefore how can one know what this means. Also there did not seem to be a bridge or anything to help address this concern.

4. Quality of life: North Dakota states it is "Legendary". The news often says this mean that quality of life is important to all the residents of North Dakota, no pockets of population ignored. This concerned is not addressed.

5. The curve at 71st and Centennial: The study indicates the danger there and wants to straighten the curve. Didn't see a stop sign or stop and go lights there.Yes it is dangerous there. Now the study shows a new curve on 66th and 71st. No sense or logic here. The study shows: Get rid of one and create one. Hmmmm

6. Relocation of houses: The study has been going on for years! Yet building permits were given and building commenced. The study and indication of this project were not known by many of the population during this time frame. This SHOULD have been disclosed. By continuing the new permits and the build up of the area, the creation of these concerns and more shows a negligence on the part of the planners in this area.

7. Safety: The safety of vehicles were in the study. A populated area needs to consider the safety of pedestrians, horseback riders, bicyclists etc. We should be able to go across the street safely, but how and where. Walking paths were shown for the further in the future, how about sooner rather than later. With the population size we have, has the handicapped been considered.

The study was made with one objective for the area. The people doing the study were not given the opportunity to show options to the plan.

8. Beltway. It was mentioned 61 times in the study. The concerns above and many more concerns show this is NOT the way to go. The planners and the people giving permits made the Beltway not feasible.

Often times when there are concerns an option should be given.

1. No Beltway
2. Stop signs or stop and go lights.
3. Speed limits of 35 or 45 mph.
4. No curve at 66th and 71st.
5. Round about. I don't like them because drivers don't know how to use them, but that doesn't mean they aren't a good thing.

Thank you for the opportunity to voice my concerns. I have more, but my emotions stop me from voicing them. They would come across as whiney.

Mamie Havelka
5319 Country Creek Drive

Wade Kline

From:	nichols_hi_d@hotmail.com
Sent:	Monday, July 06, 2015 9:48 PM
To:	Wade Kline
Subject:	Website Contact

First Name	Heidi
Last Name	Nichols-Johnson
Email	nichols_hi_d@hotmail.com
Comments	I agree there needs to be an improvement to the traffic movement in the NE area especially with all the residential development occurring. I don't think that creating a "beltway" to do this will solve the problem. I think creating a "beltway" on 71st & 66th, will encourage traffic (trucks & cars alike) to use it as a bypass. I think a concurrent plan to redo the bypass must be studied as well. I propose that 66th be utilized as a corridor between north & south Bismarck only. It should not have access to Interstate 94. I believe the access to I94 should be at 80th street. And that this access should be designed as the "bypass" tying into Hwy 83 via a road north of 84th Ave. 71st does not provide 150 ft. right-of-ways due to the developments present, so I propose the establishment of a beltway with these requirements be done further north where these right-of-ways are more likely to be available.

Wade Kline

Sent: Monday, July 06, 2015 8:02 PM
To: Wade Kline
Subject: Website Contact

First Name	Amber
Last Name	Bossert
Email	adbossert@yahoo.com
Comments	I am writing in regards to connecting interstate to 6th and 71st to route commercial vehicles around bismarck. I think this would be a deviating mistake for our neighborhood. I have lived on 71st for 8 yrs and noted the increase in residential traffic. I feel it would be extremely dangerous to allow semi traffic of that level through an area that is developed and continues to grow. I do feel the road needs to be improved (71st) and widened as it currently does not support the amount of traffic at the current speed and is dangerous. When trucks and busses are headed in opposite directions there is no shoulder room. There is also no option for busses picking up children safely. I was going to put my daughter on the bus route this past school year but when I found out they couldn't come into our cul-de-sac and the bus would stop to let her on directly on 71st I opted out and drive her myself. I think a better option of out tax dollar use at this point would be to utilize either 80th or 66th for north south route and go further north to an undeveloped area to lead around to 83. I am excited about the growth in and around bismarck but this would be a mistake that would affect us for a long term. It was mentioned at the public input meeting g that this road would look something like expressway. Can you imagine expressway with residential housing along both sides? Terrible planning on our part and this would be a terrible combination of residential homes with high level commercial vehicles attempting to be on their way. The entire traffic of 71st has become busy and adding truck traffic will be dangerous and impact bismarck for years to come. I urge planning to complete an east to west route further north in an undeveloped neighborhood. Thank you.

Wade Kline

From: lindawidicker@daktel.com
Sent: Wednesday, July 08, 2015 3:27 PM
To: Wade Kline
Subject: Website Contact

First Name	Linda
Last Name	Widicker
Email	lindawidicker@daktel.com
Comments	I am very concerned about this project as our daughter and her family would be greatly affected by it. Their home on Flickertail Drive is already very close to 71st St. and a 5-lane highway could have a devastating effect on their property and cause major changes in their lives. Please carefully consider what will happen to the many families who may end up having to make costly changes and life-altering decisions. Thank you for considering my thoughts on this matter. Sincerely, Linda Widicker, Bowdon, ND Concerned Mother and Grandmother

Wade Kline

From: Scott J. Staudinger <sjstaudinger@umary.edu>
Sent: Wednesday, July 08, 2015 10:56 AM
To: Wade Kline
Cc: staudin@midco.net

Subject: RE: Public Comment Period Extended on Northeast Bismarck Subarea Study
Attachments: Master road plan Idea.pdf

Wade, I enjoyed the meeting the other day at Sunrise, but I truly believe that a larger "Master" Plan is really what is required. I heard many owners that are just totally livid on the fact that the scale is so short-sited. Granted, money is always the issue, but I tend to agree with many of the points. I also heard terminology like beltway, arterial road, freeway, expressway, truck bypass, main artery, etc., all being used incorrectly by the individuals conducting the presentation. That has to be corrected, or your teams credibility is going to continue to be attacked by owners. I would suggest getting a game plan together on what to call each main road that is within the scope of the project and put specific emphasis on each one.

Here is that list of some of the words with the correct definition.

1. **Arterial road**: is a high-capacity urban road. The primary function of an arterial road is to deliver traffic from collector roads to freeways or expressways, and between urban Centre's at the highest level of service possible. As such, many arteries are limited-access roads, or feature restrictions on private access. *(As an example, 71st could be considered this type of road.)*
2. **Arterial thoroughfare**: is a high-capacity urban road. The primary function of an arterial road is to deliver traffic from collector roads to freeways or expressways, and between urban Centre's at the highest level of service possible. As such, many arteries are limited-access roads, or feature restrictions on private access.
3. **Beltway** : a highway that goes around a city, a highway skirting an urban area. *(As an example, 71st can never be a "Beltway" because it is dead-center in the middle of an "Urban" area.)*
4. **Bypass:** is a road or highway that avoids or "bypasses" a built-up area, town, or village, to let through traffic flow without interference from local traffic, to reduce congestion in the built-up area, and to improve road safety. A bypass specifically designated for trucks may be called a truck route.
5. **Collector road:** is a low-to-moderate-capacity road which serves to move traffic from local streets to arterial roads. Unlike arterials, collector roads are designed to provide access to residential properties. Rarely, jurisdictions differentiate major and minor collector roads, the former being generally wider and busier.
6. **Controlled-access highway**: is a type of highway which has been designed for high-speed vehicular traffic, with all traffic flow and ingress/egress regulated. A controlled-access highway provides an unhindered flow of traffic, with no traffic signals, intersections or property access. They are free of any at-grade crossings with other roads, railways, or pedestrian paths, which are instead carried by overpasses and underpasses across the highway.
7. **Corridor**: A route designated for a specific purpose: *a hazardous material corridor; a land corridor for shipping; a trucking corridor.* Can also be a route through a thickly populated strip of land connecting two or more urban areas.
8. **Distributor road:** is a low-to-moderate-capacity road which serves to move traffic from local streets to arterial roads. Unlike arterials, collector roads are designed to provide access to residential properties. Rarely, jurisdictions differentiate major and minor collector roads, the former being generally wider and busier.
9. **Expressway:** is a highway or arterial road for high-speed traffic which has many or most characteristics of a controlled-access highway (freeway or motorway), including limited or no access to adjacent property, some degree of separation of opposing traffic flow, use of grade separated interchanges to some extent, prohibition of some modes of transport such as bicycles or horses and very few or no intersecting cross-streets.
10. **Freeway:** is a highway or arterial road for high-speed traffic which has many or most characteristics of a controlled-access highway (freeway or motorway), including limited or no access to adjacent property, some

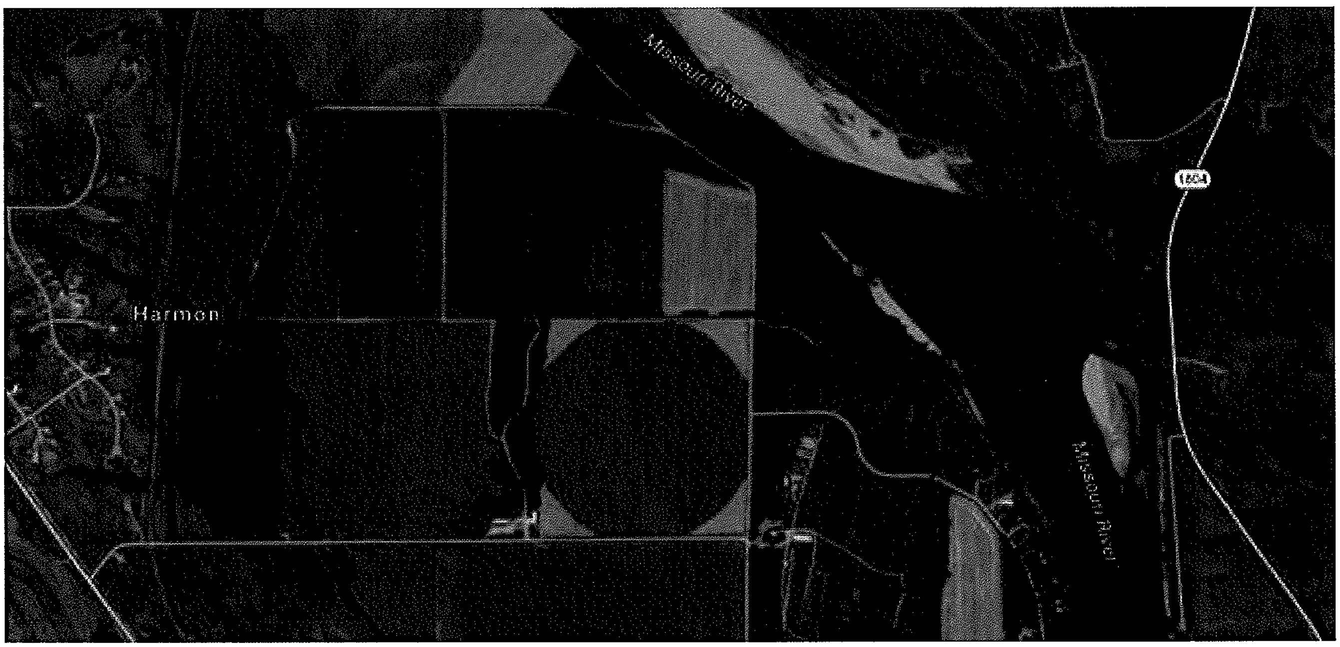
degree of separation of opposing traffic flow, use of grade separated interchanges to some extent, prohibition of some modes of transport such as bicycles or horses and very few or no intersecting cross-streets.

11. **Motorway:** is a highway or arterial road for high-speed traffic which has many or most characteristics of a controlled-access highway (freeway or motorway), including limited or no access to adjacent property, some degree of separation of opposing traffic flow, use of grade separated interchanges to some extent, prohibition of some modes of transport such as bicycles or horses and very few or no intersecting cross-streets.
12. **Parkway:** is a broad, landscaped highway thoroughfare. The term is particularly used for a roadway in a park or connecting to a park from which trucks and other heavy vehicles are excluded. Many parkways originally intended for scenic, recreational driving have evolved into major urban and commuter routes.
13. **Transport corridor:** is a generally linear area that is defined by one or more modes of transportation like highways, railroads or public transit which share a common course. Development often occurs around transportation corridors because they carry so many people, creating linear agglomerations like the Las Vegas Strip or the linear form of many neighborhood retail areas
14. **Truck route:** is a way over certain streets, as designated by a map. A router in which trucks must navigate over and along while coming into and/or going out of a city and cannot be deviated from (must operate solely on this route).

Ok, now the meat and potatoes portion of this email. I would suspect that KLJ was given a very small area of focus which is unfortunate. The issue at hand is not that the plan you have right now is bad, but it seems very short-sited.
Here are a few of my concerns:

1. The new Legacy High School combined with Sunrise Elementary is going to jamb-up and create huge safety concerns on Centennial, 43rd, 71st and Century and that is even if you push all the east and west bound roads over to the new 66th Ramp.
2. The ground purchased by the School District on 71st for a new middle school is extremely concerning. Granted, the School Board told you they didn't think they would build on it, and it was an investment, I would be highly concerned that if the board was all-wet and a decision was made (in the next couple years) to have Simle and this new school feed Legacy which has the capacity to handle (1500) students. You already know that all the middle schools are over capacity, there is an addition going on to the new elementary school because they are over capacity in one year, so how long do you think it will be before a new middle school is built up north? You place all that traffic on an already congested road and you will have another safety and traffic flow issue.
3. Apartments on 43rd. Who the heck is paying attention in the city planning office? When all of those apartments are fully occupied, 43rd in the morning is going to be a death trap. High-school kid coming in and worker-bees heading out.. Crazy.. That mess is going to push onto Centennial and over to 83 no matter what you do. That is going to be a monster of a mess.
4. Sanford Medical North Campus: The intent is to create a massive north campus completed by 2019 on the corner of 83/1804 and 71st. So, now we add 600 medical personnel, ambulances, first-responders and then you combine that with the truck, school, residential, farming, and construction traffic and jamb it all on 71st???? Not a good plan at all.
5. Sports Complex: I know that this died away a couple of years ago, but just because the City in all their infinite wisdom, went ahead and spend a ton of tax payer money on the Civic Center, I honestly still see a large complex being built up north. With Mandan passing the tax on their project, Bismarck is not far behind. That means multiple hockey fields, swimming pools, basketball courts, possible dome, football fields and motels and restaurants. Again, right on the 71st and 83 intersection.
6. The current 71st and Centennial intersection is a death trap. We they added the turn lane in to the sub-divisions to the south they added a 4th lane on a road that was built for three max. So what happens is that large vehicles cannot transverse the corner without crossing into the east bound turn lane. How are you going to make that whole intersection safe, transparent and still allow traffic flow when you have so many different factors at play? I honestly think that by placing the main focus on 71st you are opening up Pandora's box. Do I think it should be an arterial road? Yes. But an Expressway or by-pass? No.

7. New subdivision popping up all over the place around 71st, this will continue and again you are placing additional "residential" traffic onto a road which is really being turned into a by-pass. Not a very safe or responsible forecasting model Im afraid.
8. The new 66th Ramp. I think this is a great idea. What I think is short sighted is that you also need to look at 106th. 106th needs to be the second phase of ramp construction. This intersection will then be what I call the commercial area for Bismarck/Burleigh county expansion. This is where they can place a truck stop, this is where the concrete and construction organizations can place their businesses, plants, warehouses and whatever.
9. 80th is fine (I would re-categorize this road as a "parkway") but the north and south portion need to have access to 201st, 162nd, 136th, 110th, 71st, 43rd and Century, County 10, Highway 10, and 22nd Ave SE. to make this work right.
10. 106th again needs a new ramp also. Currently it only runs up to 123rd Avenue, so that road need to be extended to 201st and this would become your main truck-by-pass route with a curve right below that farmers place on 201st. Also, you will need to connect 162nd, 136th, 110th, 71st, 43rd and Century, County 10, Highway 10, and 22nd Ave SE all to it as well. Now you have room for 60 years of expansion.
11. New bridge across the Missouri. 136th needs to be the main artery for this traffic and hear is why. 1st of all 136th is way above the majority of residential housing developments and can easily extended over to 1804 and the new bridge. This is one of the shortest spans across the river and if you crossed and tied into 22nd on the Mandan side you have it made. 22nd runs south, You could connect to Harmon to the West, then onto 140 and over to highway 25 or 26th avenue, or even all the way west to 33rd avenue or County 83. Plus there is another unnamed road to the south of Harmon that becomes another artery to 1804 and you can go north to another unnamed road that connect to 1804 north. Now we are talking a grid everyone can be happy with.



12. I believe that once this Grid is in place, then both counties will need fewer "Big" roads, can easily tie into the grid as the population expands and will provide the flexibility to handle anything that expansion will throw at you.

That's the "big" picture from my prospective.
Thanks.
Scott

Scott J. Staudinger
Director
Office of Institutional Research and Data Management
University of Mary

The University of Mary exists to serve the religious, academic, and cultural needs of the people in our region and beyond. It is Christian, it is Catholic, and it is Benedictine.

7500 University Drive • Bismarck, ND 58504 • 701-355-8096
website | about U-Mary | newsroom | sjstaudinger@umary.edu

From: Scott Staudinger [mailto:staudin@midco.net]
Sent: Monday, July 06, 2015 6:02 PM
To: Scott J. Staudinger
Subject: FW: Public Comment Period Extended on Northeast Bismarck Subarea Study
Importance: High

From: Wade Kline [mailto:Wade.Kline@kljeng.com]
Sent: Thursday, July 2, 2015 9:11 AM
To: Wade Kline
Subject: Public Comment Period Extended on Northeast Bismarck Subarea Study
Importance: High

Interested Persons,

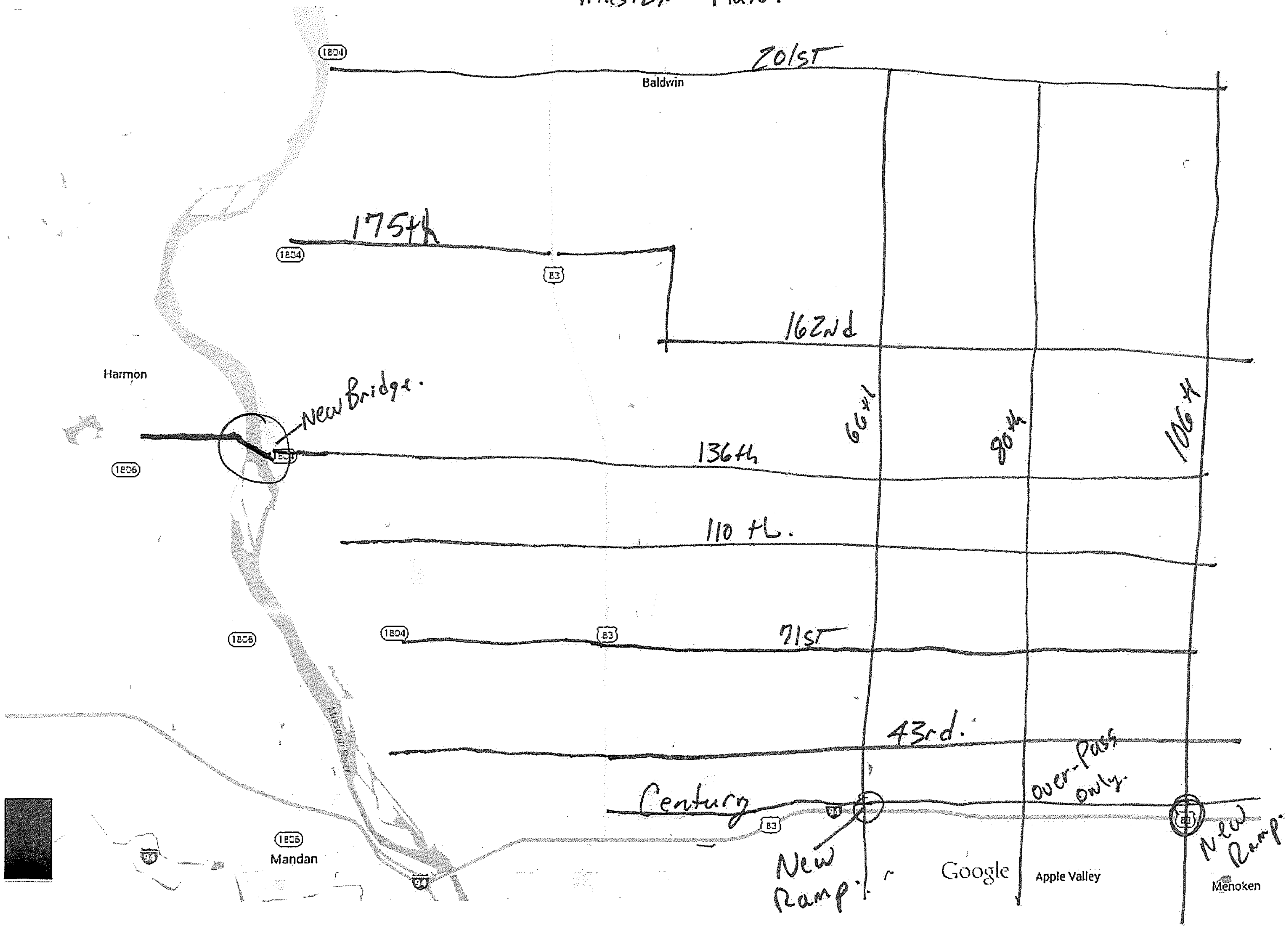
The comment period on the Draft Northeast Bismarck Subarea Study has been **extended** to **July 10th, 2015**.

Comments can be provided in writing or directly through the project web page at www.nebismarckstudy.com.

Thanks

Wade Kline
KLJ
701-271-5009 Direct
728 East Beaton Dr. Suite 101
West Fargo, ND 58078
kljeng.com

Master Plan.



201st
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over-pass only.
New Ramp.
New Ramp.
Mandan
Google
Apple Valley
Menoken

Wade Kline

From: Sherry Helbling <sherryhelbling@gmail.com>
Sent: Saturday, July 04, 2015 11:16 AM
To: Wade Kline
Subject: NE Bismarck Subarea Study

This email is to express my comments regarding the proposed Beltway from 66th street to 71st Avenue.

We moved to Country Creek Estates almost 10 years ago from the city of Bismarck. Our house was one of the first five or six houses in this development when we moved here and I fell in love with the "country feel," knowing full well that it would not be long until more houses would be built and therefore we would have increased traffic. I have become accustomed to the traffic as the our development has grown and other developments have begun and I am fine with the residential traffic because of the growth. I feel that since we have lived here for quite some time and have seen the growth around us; part of that growing was us becoming used to the traffic and being able to adjust to it. That being said, if the beltway does go through, we will start to experience truck traffic basically across the road from us. As I stated, we have become accustomed to the residential traffic and the occasional construction type of trucks, but with the proposed beltway, I do not think I can become accustomed to the increased truck traffic and noise related to that traffic going through my neighbor's backyards. I am especially uneasy with the rumors that there could be a truck stop at 71st and Hwy 83, because I know that if that is the case and the truck is coming from the East and headed to Minot, Watford City, or Williston, these trucks are going to take this new path to get to their destination, especially if that truck stop goes in. So, the proposed truck traffic of 302 trucks per day will only go up. I personally don't what to listen to or see more than 302 trucks rumble in front of my house daily. My "country feel" for this house and property will be gone. I become even more uneasy with the talk of a bridge going over to Mandan from 71st, because I am sure that this will cause even more traffic and this traffic will not be only for residents.

My second reason for opposing the beltway is regarding property taxes and property values. I can only see my property value going down and property taxes going up. We currently live in an area where current sellers are receiving prime money for their property. Our plans were to stay at this current house until retirement, sell the property for what is it worth without a beltway in front of it, and be able to take the profits from this property to buy a house and not have to worry about a house payment in our retirement years. If the beltway goes through, I have concerns that we will not receive the "prime" value for our house, which in turn could mean that we will have to continue to have a house payment in our retirement years, which could potentially mean that we may have to work way past "normal" retirement age. Not only do I have concerns about the value, I have concerns if we would even be able to sell the house at all. At the public input meeting on June 30, 2015, when presenters were asked about property values and taxes; the response was "there is no supporting data to say that this will happen." My questions to this are: "Would you buy a house knowing full well that there may be a beltway in front of it?"

I am in complete opposition to the where proposed beltway is currently being planned for. I think that if a beltway is needed, it needs to be further out, where there is not residences already built. I think that 80th Street and 84th Avenue should be looked at. I don't think that the NE Subarea study reflects what our development and other developments look like today, because this beltway is going right through my neighbor's backyards, where their children pay.

I hope you take my comments and those of all of my neighbors into consideration before making a final decision on the proposed beltway.

Sherry Helbling
5612 Country Creek Drive
Bismarck, ND 58503

Wade Kline

From:	duckszymanski@gmail.com
Sent:	Saturday, July 04, 2015 3:58 PM
To:	Wade Kline
Subject:	Website Contact

First Name	Mike
Last Name	Szymanski
Email	duckszymanski@gmail.com
Comments	I just want to start with saying that I support improving roads and traffic capacity in NE rural Bismarck. However, the biggest concerns of area residents revolve around high speed limits and increased semi-truck traffic (i.e., safety, noise, ease of travel). By developing industrial/commercial areas around the interchange of 66-ST/I94 and upgrading (east) 71st Ave and 66th St, you will increase truck traffic. I think a lot of concerns by residents would go away and maybe even turn into letters of support if a plan to explicitly deal with truck traffic was being developed in tandem with plans to improve roads in northeast rural Bismarck. The 71st corridor has too many people that live along, or north of it to be a major trucking thoroughfare.

Wade Kline

From: Myron Steckler <stecklermm@bepc.com>
Sent: Thursday, July 02, 2015 1:51 PM
To: Wade Kline
Subject: RE: Public Comment Period Extended on Northeast Bismarck Subarea Study

Wade,

First off, I wanted to thank you and the others that presented the study on Tuesday. My general thoughts are these changes cannot happen soon enough. A New Interstate access at 66th Street would greatly improve traffic in this study area but also the congestion coming into Bismarck from the Southeast.
For every person in the meeting that felt these changes would negatively impact them, there is likely a hundred that are negatively impacted if these changes do not move forward.

I live along 52nd Street South of 71st. Traffic has increased over the years with the increased development NE of me but not significantly until recently. The first jump was when 52nd Street was finished South to 43rd ave. and paved. The second , when the lights were added on 43 ave. and Centennial. I did not anticipate this latest jump but it makes sense. People are looking for a better route to town that is safe and quick. Instead of trying to get onto Centennial from 71st, which can be a long wait and dangerous, folks are coming South on 52nd to 43rd Ave and then to Centennial where they can have a safe controlled access onto Centennial with the new traffic lights. These folks are also in a hurry. I believe the plan and design of 52nd was not for a main corridor.

I believe the county engineer asked for recommendations of what to do with limited funds. The big plan that was laid out is a good one but I am concerned with near term problems. Until the bigger plan can be implemented the following three things would greatly help.

1. Finish paving 43rd through to 80th with shoulders and turning lanes on 80th and 52nd. This would provide an alternative route to Centennial for all folks from 80th and East. Folks now avoid because of the gravel.
2. Improve 71st from Centennial east to 80th with three lane and shoulders. Currently a very dangerous high traveled road.
3. Add lights at the 71st and Centennial intersection or other method to improve safety. Not sure if anything can be done to improve short of doing a divided road. Leave that to the road engineers.

Myron,

From: Wade Kline [mailto:Wade.Kline@kljeng.com]
Sent: Thursday, July 02, 2015 9:11 AM
To: Wade Kline
Subject: Public Comment Period Extended on Northeast Bismarck Subarea Study
Importance: High

Interested Persons,

The comment period on the Draft Northeast Bismarck Subarea Study has been **extended** to **July 10th, 2015**.

Comments can be provided in writing or directly through the project web page at www.nebismarckstudy.com.

Thanks

Wade Kline

From: cjbott5@hotmail.com
Sent: Tuesday, June 30, 2015 7:16 PM
To: Wade Kline
Subject: Website Contact

First Name	Chris and Julie
Last Name	Bott
Email	cjbott5@hotmail.com
Comments	Thank you for revisiting the truck traffic issues at the June 30 meeting. Our initial concern with 71st St. had to do with the notion of creating a truck bypass. Now that we have a better understanding that it would handle normal vehicular and truck traffic we agree improvements are needed for safety and better traffic flow. We would also be greatly in favor of a multiuse path which would connect us to the Bismarck trail system. Thank you.

Wade Kline

From: mamie.havelka@icloud.com
Sent: Monday, June 29, 2015 8:57 AM
To: Wade Kline
Subject: Website Contact

First Name	Mamie
Last Name	Havelka
Email	mamie.havelka@icloud.com
Comments	First of all. Thanks for the info. I can barely read the map. But from what I can tell, the maps do not accurately depict the growth and population in the NE zones; therefore it would negate some of the proposals the map identification symbols show for transportation improvements. From what I can tell the population growth with family dynamics does not come into consideration with the type of roadway which indicates a speed zone higher than the community could withstand.

Wade Kline

From: John Devney <jdevney@deltawaterfowl.org>
Sent: Monday, June 22, 2015 11:35 AM
To: Wade Kline
Subject: Northeast Area Study

Wade,
Thank you for affording the opportunity to comment. While I believe most people in the area of proposed development understand the need for additional roads and enhancements to our existing roads to carry the additional residential. I believe the discussion of the 66th/71st beltway as a heavy truck bypass is unsafe and unwise. These types of bypasses in other communities are far away from the existing or even potential residential development. While I know many people are struggling to find solutions to the congestion on State Street and Centennial to accommodate increased through truck, routing this through well-established residential areas is simply not sound planning. As was stated over and over again at the last public meeting, the potentially impacted citizens are overwhelmingly opposed to the proposal. I would urge the planners and ultimate decision makers to find a more suitable site for the bypass far east and north of the existing residential areas. Thank you for your consideration.
John

John L. Devney
Vice President, U.S. Policy
1312 Basin Avenue
Bismarck, ND 58504
Office Phone: 701-222-8857 EXT 218
Mobile Phone:701-471-4235
jdevney@deltawaterfowl.org
www.deltawaterfowl.org

DELTA WATERFOWL.

Wade Kline

From:	jonellamy@gmail.com
Sent:	Tuesday, June 23, 2015 2:30 PM
To:	Wade Kline
Subject:	Website Contact

First Name	Amy
Last Name	Thom
Email	jonellamy@gmail.com
Comments	Hello, My family will be unable to attend the open house at the end of this month so I wanted to take the time and just share my concerns regarding this project. My understanding is that the 71st may be turned into a 5 lane highway connecting to the interstate, and then the bi-pass traffic would pass by on 71st. This concerns my family greatly as we moved out of town to be in the rural area and have a safe home to raise our children in. If 71st becomes a major highway it will be right in our backyard as we lie right on 71st currently. At it is already, traffic seems to be heavy on this road but I can only imagine semi traffic and how much more dangerous this will make it. We moved out of town to have a quite an simple life but am very concerned about how this would negatively impact our lives and our safety. Turning out can already be difficult as our property lies by a hill, especially during the school year with the bus system. I am sure that this project will transpire but wanted to let you know how against and concerned my personal family is regarding this project. I truly hope and pray that 71st does not become the bi-pass as it would very negatively impact my families quality of life. We moved north of town because it is rural, quite, safe, and less traffic however if this corridor is completed it will change the safety and quietness of our home. Thank you for your time and understanding!

COMMENTS

HoustonEngineering Inc.

MABU

KLJ

Northeast Bismarck Subarea Study

www.nebismarckstudy.com

Tuesday, June 30, 2015 – Sunrise Elementary School – 5:00 - 7:00 pm

Please use the space below to provide comments regarding the NE Bismarck Subarea Study.

PLEASE PRINT

Name: RICHARD JORGENSON

Address: 4713 HITCHCOCK DR.

—THIS SPACE OFFICE USE ONLY—

I CAN'T UNDERSTAND WHY THE CITY BUILDS ROADS OR REBUILDS ROADS ONLY TO COME BACK IN A FEW YEARS + DO IT OVER. WHY ARE THEY MORE PROACTIVE + BUILD THEM THE WAY THEY SHOULD BE. SEEMS TO BE A WASTE OF TAXPAYERS MONEY. DEVELOPERS SEEM TO DICTATE TO THE CITY. IT SHOULD BE THE OTHER WAY AROUND. ALSO, I NOTICE THEY CAN'T SEEM TO BUILD STRAIGHT STREETS. IT APPEARS EVERYTHING NEEDS CURVES. IT ALSO SEEMS THAT IN THE PAST THERE WAS LITTLE THOUGHT PUT INTO TRAFFIC FLOW. NOW THEY ARE PAYING THE PRICE.

Please leave comments with meeting conductors or mail comments by July 7, 2015 to:

Wade Kline
KLJ
PO Box 1157
Bismarck, ND 58502-1157
Email: wade.kline@kljeng.com
Note "NE Bismarck Subarea Study" in the e-mail subject heading

Public Input Meeting #2

Sign-In Sheets

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	PIM	6-30-15
Project Number		PCN
Project Description: NE Bismarck Subarea Study PIM #2		

Name (Please print)	Title/Representing	Address	City	State	Zip code	Email
Amanda Grosz	KLJ - Bismarck					amanda.grosz@kljeng.com
Will Hutchings	MPO	155 Stuttgart Dr #3	Bismarck	ND	58504	
Jenny Wollmuth	City of Bismarck - Community development	221 N 5th St	BSD	ND	58501	
Sherry Helbling		5612 Country Creek Dr	Bismarck	ND	58503	shelbling@midco.net
Myron Ranum		5301 Country Creek DR	Bismarck	ND	58503	mkranum@msn.com
Howard Harmon		7215 71st Ave NE	Bismarck	ND	58503	
Chuck Peter		17850-28 St. NW	~~Bism~~ Baldwin	ND		

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location: Sunrise Elementary School	Meeting Type: Public Input	Meeting Date: 6-30-15
Project Number:		PCN:
Project Description: NE Bismarck Subarea Study PIM # 2		

Name (Please print): Dale Helbling		Title/Representing:	
Address: 5612 Country Creek Dr.			
City: Bismarck	State: ND	Zip code: 58503	Email: DHelbling@Live.Com

Name (Please print): Karen Bonnet		Title/Representing:	
Address: 6110 62nd St NE			
City: Bismarck	State: ND	Zip code: 58503	Email: klbonnet@centurylink.net

Name (Please print): Arnie Havelka		Title/Representing: Home Owner	
Address: 5319 Country Cr Dr			
City: Bis	State: ND	Zip code: 58503	Email: ajhavelka@yahoo.com

Name (Please print): Nadeane Silbernagel		Title/Representing: Self	
Address: 1117 N 3rd			
City: Bismarck	State: ND	Zip code: 58501	Email:

Name (Please print): Loren DeWitz		Title/Representing:	
Address: 5300 Stream Pl			
City: Bismarck	State: ND	Zip code: 58503	Email: lldewitz@bektel.com

Name (Please print): Tim Staloch		Title/Representing:	
Address: 6650 66th St NE			
City: Bismarck	State: ND	Zip code: 58503	Email:

Name (Please print): Robert Gibbons		Title/Representing:	
Address: 6707 66th St NE			
City: Bismarck	State: ND	Zip code: 58503	Email: bgibbons@bektel.com

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	PIM	6-30-15
Project Number		PCN
Project Description		
NE Bismarck Subarea Study PIM #2		

Name (Please print)			Title/Representing
Darin M. Scher			Bismarck Public Schools
Address: 806 N Washington St.			
City: Bismarck	State: ND	Zip code: 58501	Email: darin_scher@bismarckschools.org

Name (Please print)			Title/Representing
Dan Thiel			
Address: 7020 Endicott Dr			
City: Bismarck	State: ND	Zip code: 58503	Email:

Name (Please print)			Title/Representing
Ehlie Kroh			
Address: 3428 Roosevelt Dr			
City: Bis	State: ND	Zip code: 58503	Email:

Name (Please print)			Title/Representing
Brenda Jorgenson			
Address: 8072 Wildkye Pl			
City: Bismarck	State: ND	Zip code: 58503	Email:

Name (Please print)			Title/Representing
Greg Meidinger			Diversity Homes
Address: 3313 Bayshore Bend SE			
City: Mandan	State: ND	Zip code: 58554	Email:

Name (Please print)			Title/Representing
Chris & Julie Bott			
Address: 7416 Runnel Rd			
City: Bismarck	State: ND	Zip code: 58503	Email: cjbott5@hotmail.com

Name (Please print)			Title/Representing
Amber Bossert			
Address: 5400 Stream Pl			
City: Bismarck	State: ND	Zip code: 58503	Email: adbossert@yahoo.com

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	PIM	6-30-15
Project Number		PCN
Project Description: NE Bismarck Subarea study PIM #2		

Name (Please print)	Title/Representing	Address	City	State	Zip code	Email
RICHARD JORGENSON	Home owner	4713 HITCHCOCK DR	BISMARCK	ND	58503	
Jim BONNET		6110 62ND ST NE	BIS			
David Durgan		5915 Dakota Country Dr	Bismarck	ND	58503	davidjdsr@yahoo.com
JOAN SILBERNAGEL	LANDOWNER	1315 N 3RD STREET	BISMARCK	ND	58501	
Kim Fettig	landowner	6200 52 St. NE	Bismarck	ND	58503	tnkranch@bektel.com
Mark Bey	Citize	7591 Northwood Dr	Bismark	ND	58503	
Ben Britz	landowner	6111 62nd ST SE	Bismarck	ND	58503	Benjamin.Britz@gmail.com

SIGN-IN SHEET

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	PIM	6-30-15
Project Number		**PCN**
Project Description		
NE Bismarck Subarea Study PIM #2		

Name (Please print)			Title/Representing
Mamie Havelka			
Address			
5319 Country Creek Drive			
City	**State**	**Zip code**	**Email**
Bismarck	ND	58503	mamie.havelka@outlook.com

Name (Please print)			Title/Representing
Myron Steckler			Self
Address			
5971 52 St NE			
City	**State**	**Zip code**	**Email**
Bismarck	ND	58503	stecklermm@bepc.com

Name (Please print)			Title/Representing
Brandon Hass			
Address			
7231 Russell Road			
City	**State**	**Zip code**	**Email**
Bismarck	ND	58503	ffbighass@yahoo.com

Name (Please print)			Title/Representing
Doug Schonert			Burleigh County
Address			
14600 201st Ave NE			
City	**State**	**Zip code**	**Email**
Baldwin	ND	58521	

Name (Please print)			Title/Representing
Marcus J. Hall			Burleigh County
Address			
City	**State**	**Zip code**	**Email**
Bismarck			mahall@nd.gov

Name (Please print)			Title/Representing
Mark Griffin			Self
Address			
4352 78 AV NE			
City	**State**	**Zip code**	**Email**
BIS	ND	58503	

Name (Please print)			Title/Representing
Paul Ryba			
Address			
2541 Berkshire Drive			
City	**State**	**Zip code**	**Email**

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	PIM	6-30-15
Project Number		PCN
Project Description: NE Bismarck Subarea Study PIM #2		

Name (Please print)	Title/Representing	Address	City	State	Zip code	Email
DeEtta Gibbons		6707 66th St NE	Bismarck	ND		
Mary Deringer		5315 Fairhill Rd	Bis		58503	
Mary Jane & Keith Sailer		6205 Rocky Road	Bismarck	ND	58503	
Deb & Randy Diede		5825 71st Ave NE	Bismarck	ND	58503	
Lucille Van Dame		7650 80th St NE	Bismarck	ND	58503	
John Devney		5575 71st Ave NE	Bismarck	ND	58503	jdevney@deltawaterfowl.org
Rachel Drewlow	MPO		Bismarck			

SIGN-IN SHEET

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	Public Input	6-30-15
Project Number		PCN
Project Description: NE Bismarck Subarea Study PIM #2		

Name (Please print)	Title/Representing	Address	City	State	Zip code	Email
Scott STAUDINGER	MY Self	4411 Denali Place	Bis.		58503	staudin@midco.net
JANICE HARMON		7215 71ST AVE NE	BISMARCK	ND	58503	
LYNN Buri		7103 71ST AVE NE	BISMARCK	ND	58503	
Sheri Lares	FHWA		Bismarch	ND	58503	sheri.lares@dot.gov
Ken/Evelyn Silbernagel		2720 Mercury Ln.	Bismarck	ND	58503	

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Sunrise Elementary School	PIM	6-30-15
Project Number		**PCN**
Project Description		
NE Bismarck Subarea Study PIM #2		

Name (Please print)			Title/Representing
Kellie Erhardt			
Address			
4750 Rolling Ridge Rd			
City	**State**	**Zip code**	**Email**
Bismarck	ND	58503	tkerhardt@midco.net

Name (Please print)			Title/Representing
Gabe Schell			KLJ
Address			
City	**State**	**Zip code**	**Email**
Bismarck	ND	58503	gabe.schell@kljeng.com

Name (Please print)			Title/Representing
Address			
City	**State**	**Zip code**	**Email**

Name (Please print)			Title/Representing
Address			
City	**State**	**Zip code**	**Email**

Name (Please print)			Title/Representing
Address			
City	**State**	**Zip code**	**Email**

Name (Please print)			Title/Representing
Address			
City	**State**	**Zip code**	**Email**

Name (Please print)			Title/Representing
Address			
City	**State**	**Zip code**	**Email**

Sign In Sheets

Local Approvals Process

Bismarck

SIGN-IN SHEET

City of Bismarck
(Rev. 03-2015)

Meeting Location: Tom Baker Mtg Room	Meeting Type: City Commission	Meeting Date: 10/13/2015
Project Number		PCN
Project Description		

Name (Please print)	Title/Representing	Address	City	State	Zip code	Email
LOREN HAUGEN	Self + Horizons Heights	5201 Sunlight Drive	Bismarck	ND		lhaugen@midco.net
TRACI Hilsabeck	Eagle crest	1309 Golden Eagle Lane	Bismarck	ND	58503	traci@hilsabecks.com
LANDON NIEMILLER		901 BASIN AVE	BISMARCK	ND	58502	
Joe + Laura Mastel	Horizon Heights resident	4904 Cornice Drive	Bismarck	ND	58503	
Rachel Drewlow	Bis Man MPO					rdrewlow@bismarcknd.gov
MEL Lippert		1240 Ash Coulee Dr.	Bismarck			
Kelvin Williams		915 Medora Avenue	Bismarck	ND		

Bismarck

SIGN-IN SHEET

City of Bismarck
(Rev. 03-2015)

Meeting Location Tom Baker Meeting Room	Meeting Type City Commission	Meeting Date 10/13/2015
Project Number		PCN
Project Description		

Name (Please print) Don Maste/		Title/Representing	
Address 5117 Mellowson Dr			
City BIS	State ND	Zip code 58503	Email

Name (Please print) Wayne Munson		Title/Representing	
Address 2043 W. 2nd St			
City Bismarck	State ND	Zip code 58501	Email

Name (Please print) Roy Rickert		Title/Representing Exec. Director / Bisman Transit	
Address			
City	State	Zip code	Email

Name (Please print) Jeremy Smith		Title/Representing	
Address 1412 Talon Rd			
City Bismarck	State ND	Zip code 58503	Email

Name (Please print) Kim Hagel / Duane Hagel		Title/Representing	
Address 9401 Plainview DR.			
City Bismarck ND 58503	State	Zip code	Email

Name (Please print) Carl Jorgenson		Title/Representing	
Address 5067 Butte Dr			
City Bismarck	State ND	Zip code 58503	Email

Name (Please print) Terry A. Richter		Title/Representing	
Address			
City	State	Zip code	Email

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Tom Baker Room		10-13-15
Project Number		PCN
Project Description: NE Bismarck Subarea Study - City Commission		

ADA: Yes

Name (Please print)			Title/Representing
Kristi Sogsveen			
Address: 1277 Eagle Crest Loop			
City: Bis.	State	Zip code	Email

Name (Please print)			Title/Representing
Jordan Hauck			Here's your sign "owner"
Address: 3028 Percheron Drive			
City: Mandan	State: ND	Zip code: 58554	Email

Name (Please print)			Title/Representing
Shawn and Delrita Klaenzil			Home own
Address: 1316 Golden Eagle Lane			
City: Bismarck	State	Zip code: 58503	Email

Name (Please print)			Title/Representing
CALE BOLINGER			LONGHORN STEAKHOUSE
Address: 1045 TACOMA AVE #106			
City: BISMARCK	State: ND	Zip code: 58504	Email: CALEBOLINGER@LIVE.COM

Name (Please print)			Title/Representing
Deana Mack			Business office Director
Address: 3205 Bitteroot Ave			
City: Bism	State: ND	Zip code: 58501	Email

Name (Please print)			Title/Representing
Bill TROTTER			PROIMAL 50
Address			
City: KILLDEER	State: ND	Zip code: 58640	Email

Name (Please print)			Title/Representing
Address			
City	State	Zip code	Email

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Tom Baker Meeting Room	City Commission	10/13/2015
Project Number		PCN
Project Description		

Name (Please print)	Title/Representing	Address	City	State	Zip code	Email
TJ Stewart		1276 Gagle Crest Loop	Bismarch	ND	58503	
LeAnn Eckroth	Bismarck Tribune					
Bob Wetzld	USNS City of Bismarck					
MERIBETH CORNFORTH		5016 CORNICE DR	BIS	ND	58503	
LeRoy Kloppadt	Self	417 W. Apollo Ave	Bismark	ND	58503	

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck·Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Tom Baker Room		9-23-15
Project Number		PCN
Project Description: NE Bismarck Subarea Study - City Planning Commission		

ADA: Yes

Name (Please print)	Title/Representing	Address	City	State	Zip code	Email
Chris Williams	SEH	3001 Hwy 1804 S.	Bismarck	ND	58504	
Johnny Myrnaltauek		6420 T J lane	Bis			
BRIAN	CIVIL ENGINEER // WENCK ASSOCIATES	301 N 1ST STREET, STE 202	MANDAN, ~~ND~~	ND	58554	
DAVID PATIENCE	SWENSON HAGEN & CO	909 BASIN AVE	BIS			
Wade Moser		105 W Burleigh Av	Bismarck		58504	
Greg Feser	Bartlett & West	3456 E. Century Ave	Bismarck	ND	58503	
Carl Hokenstad	Community Development Dept.	P.O. Box 5503	Bismarck,	ND	58506	chokenstad@bismarcknd.gov

SIGN-IN SHEET

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Meeting Location	Meeting Type	Meeting Date
Tom Baker Room		9-23-15
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Project Description		
NE Bismarck Subarea-Study - Bismarck City Planning Commission		

Name (Please print)	Title/Representing		
Luke Seidling	University of Mary		
Address			
7500 University Dr.			
City	**State**	**Zip code**	**Email**

Name (Please print)	Title/Representing		
John Petrik	JMac Research		
Address			
417 24th St NW			
City	**State**	**Zip code**	**Email**
Mint		58703	

Name (Please print)	Title/Representing		
Address			
City	**State**	**Zip code**	**Email**

Name (Please print)	Title/Representing		
Address			
City	**State**	**Zip code**	**Email**

Name (Please print)	Title/Representing		
Address			
City	**State**	**Zip code**	**Email**

Name (Please print)	Title/Representing		
Address			
City	**State**	**Zip code**	**Email**

Name (Please print)	Title/Representing		
Address			
City	**State**	**Zip code**	**Email**

SIGN-IN SHEET

(Rev. 03-2012)

Bismarck-Mandan
METROPOLITAN PLANNING ORGANIZATION

Meeting Location	Meeting Type	Meeting Date
Tom Baker Room		10-~~19~~15
Project Number		PCN

Project Description: NE Bismarck Subarea Study - ~~to~~ Burleigh County Commission.

ADA - Yes

Name (Please print)	Title/Representing	Address	City	State	Zip code	Email
GREG LARSON	BCWRD	2525 LARSON RD.	BISMARCK	ND	58504	glarson@century21morrison.com
Rachel Drewlow	MPO					rdrewlow@bismarcknd.gov
Marcus J. Hall						mahall@nd.gov
JOAN MILNER		1315 N 3RD ST	BISMARCK	ND	58501	—
Amanda Humann, SN	Student Nurse @ NDSU @ Sanford	5101 Hwy 83	Wilton	ND	58579	—
SHANE A. NASLUND	Leash Law info	5625 FALCONER DR	Bismarck	ND	58504	Polaris1980@gmail.com
JOHN O. Spitzer						

Burleigh County Planning Commission Meeting
September 9, 2015
Attendees

Name (Please print so name is spelled correctly on minutes)	Address	Signature
Steve Saunders	221 N 5th St, Bismarck ND 58501	Steve Saunders
Dorene Strom	2930 Stetson Dr. Bis. ND 58503	Dorene Strom
James + Amber Krause	6255 Eckerly Lane Lincoln, ND 58504	[illegible]
Pat Dandell	1410 15th St. NW. Bis. 58503	Pat Dandell
Troy & Melody Karlberg	411 Shady Ln, Bismarck ND 58501	Melody Karlberg
Kirk Wiper	1910 Highland Ave 58501	[illegible]
Brenda Hewitt	4201 Carter Circle Mandan 58554	Brenda Hewitt
Steven Wahler		Steve Wahler
ED JASZKOWIAK	11100 5TH AVE NE MENOKEN 58558	[illegible]
Wes Winkler	10701 Hwy #10 Bis	[illegible]

Name (Please print so name is spelled correctly on minutes)	Address	Signature
Brad McCamy	3205 E. Calgary Ave., Bismarck, ND 58503	[illegible]
Jim Van Eckhart	1718 N 8th St. Bismarck ND. 58502	[illegible]
Kellie Job	810 N. 1st St.	Kellie Job
Jody Isaac	13832 Saddlehorn Dr	[illegible]
Aaron Isaak	13832 Saddlehorn Dr.	[illegible]
Jackie Andahl	17001 15th St NW, Baldwin	Jackie Andahl
Heather Steffl	7302 Hightop Lane Bismarck	[illegible]
Jim + Mardy Koch	2207 east ave E Bis	[illegible]
Lisa Aiken	3409 Ridgecrest Dr Bismarck	[illegible]
Chad Monroe	" "	Chad Monroe
Peggy S. [illegible]	3718 Greensboro Drive	[illegible]
[illegible]	3718 Greensboro Drive	[illegible]

Articles from Bismarck Tribune

Bismarck planners accept Northeast Subarea Study

SEPTEMBER 24, 2015 5:30 PM • BY LEANN ECKROTH

The final draft of a transportation guide for one of the fastest growing areas in metro Bismarck was accepted Wednesday by the Bismarck Planning and Zoning Commission.

Bismarck and Burleigh County partnered with the Bismarck-Mandan Planning Organization to create the Northeast Subarea Study for the 12-mile area bordered by 84th Avenue to the north, Interstate 94 to the south, Centennial Road to the west and by 80th Street to the east.

Wade Kline, of KLJ, said planning must be conducted for a 66th Street corridor, with an interchange spinning out from Interstate 94.

The study finds it's best to avoid too many signals and too many access points that might delay traffic, according to Kline.

"Because people are interested in developing 66th Street as a major north-south corridor, we did develop a backage/frontage road system that would allow for less access directly onto 66th Street," Kline said.

The study also includes a modest, but strategic plan for a 43rd Avenue corridor that includes paving gravel portions, he said.

Rural development residents already have expressed concern about higher traffic and truck volumes if the 66th Street interchange and 71st Avenue is used as a corridor to move I-94 traffic away from State Street.

According to the study, no serious increase in truck traffic would be seen until a 66th Street interchange is completed and 71st Avenue is improved to three lanes.

The study must still be accepted by the Bismarck City Commission and the Burleigh County Commission.

For more information about the study, visit www.nebismarckstudy.com.

Road projects

A number of road projects were identified as being key over the next 25 years.

• Reconstruct and widen 43rd Avenue between Centennial Road and 66th Street.

• Widen 66th Street to four lanes from Century Avenue and 71st Avenue.

• Widen Century Avenue to four lanes 1/4 mile west of 66th Street.

• Widen Centennial Road to four lanes between Jericho Road and 43rd Avenue.

• Construct 66th Street from Divide Avenue to 71st Avenue.

• Reconstruct 71st Avenue as a three-lane roadway from Centennial Road to 66th Street.

• Construct an interchange at 66th Street.

66th Street bypass may not divert trucks

OCTOBER 20, 2015 5:30 PM • BY LEANN ECKROTH

A proposed truck bypass at 66th Street and 71st Avenue from Interstate 94 would do little to ease traffic swelling State Street, according to a truck traffic report conducted as part of the Bismarck Northeast SubArea Study.

The study, sponsored by the Bismarck Mandan Metropolitan Planning Organization, shows trucks with local destinations in mind are the primary source of the bottleneck on State Street and Highway 83, according to a report presented by Gabe Schell of KLJ at this week's Burleigh County Commission meeting.

The study focuses on a 12-mile border: I-94 to the south, Centennial Road to the west, 80th Street to the east and 84th Avenue to the north.

"The trucks that would use this would be those coming from Fargo or Jamestown," said Schell, adding that industrial development and a truck stop could encourage more truck traffic at a 66th Street interchange.

The study finds the trucks on Centennial Road are continuing south on Bismarck Expressway.

"If an interchange was put in today as a truck-reliever route, they would recommend looking at other locations for the interchange," Schell said, noting 80th Street was a possibility.

Burleigh County Commissioner Jerry Woodcox said he favors 80th Street as a possible truck bypass, where it would impact the rural subdivision residents less.

"We had a lot of concerns by residents on 66th Street and 71st Avenue, primarily that they don't want a truck bypass. And the intent of this MPO study is they keep talking about a truck bypass. But the study indicates there isn't enough truck traffic really that goes to State Street and turns north to Minot," he said.

Whether a truck bypass or not, Mayor Mike Seminary said the proposed 66th Street interchange remains a high priority for the city.

"No one disputes there needs to be an interchange at 66th," he said.

Varied opinions

Rachel Drewlow, planner for the MPO, echoed that a 66th Street bypass would ease local traffic congestion because much of Bismarck's growth is happening in the northeast.

John Hauk, chairman of Gibbs Township, said the 66th Street bypass makes no sense.

"We already made our official comment and the comment was 'no we do not want it .... It cuts everything up," he said.

Sue Alexander, 74, of TJ Lane, abutting 71st Avenue and east of 66th Street, said she had no problem with the beltway project.

"It would be nice to have an overpass on 66th Street. It couldn't be any worse than the current traffic to Highway 83. That's a scary place to be when the trucks come. I don't see how we would have anymore trouble than we have now. Anytime you take traffic away from the town, it's good for the town."

More discussion needed on bypass

OCTOBER 23, 2015 2:00 AM

The most recent study on a bypass at 66th Street and 71st Avenue from Interstate 94 points to the need for more discussion and possibly another study.

The study, sponsored by the Bismarck Mandan Metropolitan Planning Organization, doesn't expect a 66th Street bypass to do much to relieve truck traffic on State Street. Instead, it finds most of the truck traffic has local destinations and won't want to go around the city. Bismarck has been looking for ways to ease congestion on State Street and for a number of years has focused on a 66th Street bypass. The timetable for completing the project has been an issue. To get the desired funding sources the project wouldn't be completed until 2023. Bismarck Mayor Mike Seminary wants to find a way to fast-track the project for a 2019 completion.

Not everyone is sold on the location for the bypass, with Burleigh County Commissioner Jerry Woodcox favoring an 80th Street location. He notes that residents in the 66th Street and 71st Avenue area oppose the bypass. John Hauck, chairman of Gibbs Township, said the township has been against the 66th Street bypass, saying, "It cuts everything up."

Gabe Schell of KLJ, who did the study for the MPO, says industrial development and a truck stop at 66th would encourage traffic to use the bypass. At the same time, he says if an interchange was put in now as a truck-reliever route the study suggests other locations should be considered. The study mentions 80th Street as an alternative.

The study looked at a 12-mile border: I-94 to the south, Centennial Road to the west, 80th Street to the east and 84th Avenue to the north.

While planning ahead for traffic flow makes sense, it's also important to get it right. Such a large investment shouldn't be for a temporary fix. No matter what site is selected for a bypass there will be opposition since the increase in traffic and construction will change the neighborhood. The area along 71st Avenue has seen a lot of growth over the last few years with many young families building homes seeking a blend of rural and city life. A bypass could result in a change in lifestyle for those residents.

The Tribune feels more time should be taken to review the options. The 66th Street location doesn't make sense if 10 or 15 years down the road another bypass will be needed. Planning ahead is valuable only if the best outcome is reached. We need to do it right.