



# BOLTON & MENK, INC.<sup>®</sup>

## Consulting Engineers & Surveyors

12224 Nicollet Avenue • Burnsville, MN 55337  
Phone (952) 890-0509 • Fax (952) 890-8065  
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### MEMORANDUM

**Date:** July 24, 2014  
**To:** Kirk Roberts, P.E.  
Jennifer Desrude, P.E.  
City of Bloomington  
**From:** Bryan Nemeth, P.E., PTOE  
Molly Stewart, P.E.  
**Subject:** Dwan Estate Subdivision Traffic Study  
Bloomington, MN  
**cc:** Marcus Thomas, P.E.

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This document presents the traffic analysis for the proposed Dwan Estate residential Subdivision in Bloomington, Minnesota. This property is located south of Old Shakopee Road, and about 1.75 miles west of I-35W, as shown in Figure 1. The planned development includes the removal of one single family home and the addition of a 13-lot single family residential subdivision. With this development, a new connection on Overlook Drive between Xerxes Avenue and France Avenue is being proposed. A preliminary site plan for the development is included in Appendix A.

Traffic operations were analyzed at two intersections around the development site. These include the intersections of:

1. France Avenue at Overlook Drive
2. Xerxes Avenue at Overlook Drive

The purpose of this investigation was to analyze how the new connection on Overlook Drive between Xerxes Avenue and France Avenue will affect traffic conditions for nearby residents. In addition, the investigation will determine how well the existing roadways, lane layout, and traffic control handle the current and future traffic loads with the addition of the new development.

#### **Existing Conditions**

Overlook Drive forms two dead end segments between France Avenue and Xerxes Avenue. East of Xerxes Avenue, Overlook Drive is a minor collector. West of France Avenue, Overlook Drive is a major collector. The proposed connection of Overlook Drive would create a through street between France Avenue and Xerxes Avenue. France Avenue is a major collector at this location and Xerxes Avenue is a minor collector. The France Avenue & Overlook Drive intersection is side street stop-controlled with free movements on France Avenue. The Xerxes Avenue & Overlook Drive intersection is a T-intersection, so by design the southbound approach of Xerxes Avenue yields to the east/west traffic on



Overlook Drive. There is also a yield sign on the southbound Xerxes Avenue approach which provides further clarification of vehicle right of way. The studied intersections do not include turn lanes and the speed limit at all approaches is 30 mph.

A.M. and P.M. peak hour turning movement counts were collected on July 8, 2014 at the two study intersections. Figure 2 shows these turning movement counts along with the existing lanes and traffic control for each intersection. Additionally, 24-hour AADT counts were also collected at the following three locations: France Avenue between Overlook Drive and 110<sup>th</sup> Street, Xerxes Avenue between Overlook Drive and 110<sup>th</sup> Street, and Thomas Avenue between Overlook Drive and 110<sup>th</sup> Street. AADT volumes were also obtained or calculated for other key roadway segments and are shown along with the collected AADT volumes in Figure 5.

**Traffic Forecasts**

The Build year for the proposed development is 2015. The Build Scenario assumes that the connection on Overlook Drive is complete, one single family home is removed, and 13 new single family housing units are constructed.

Trip generation for the site was determined using the Trip Generation Manual, 8<sup>th</sup> Edition, Institute of Transportation Engineers, 2008. Trip generation rates were evaluated for the site use, using data for Single Family Detached Housing (210). This rate was applied to the proposed site development. The proposed trip generation was added to the 2014 traffic counts. The site currently has one single family housing unit on it, which will be removed with the proposed development. The trip generation from the existing single family house being removed, the trip generation for the proposed development and net trips generated are shown in Table 1, Table 2 and Table 3 respectively.

**Table 1: Trip Generation for Existing Single Family House Being Removed**

Land Use	Use Size		AM Peak Hour						PM Peak Hour						Daily	
			ITE Trip Rate	Total	Enter	Exit	Enter	Exit	ITE Trip Rate	Total	Enter	Exit	Enter	Exit	ITE Trip Rate	Total
Single-Family Housing	1	Unit	0.77	1	26%	74%	0	1	1.02	1	64%	36%	1	0	9.57	10

**Table 2: Trip Generation for Proposed Development**

Land Use	Use Size		AM Peak Hour						PM Peak Hour						Daily	
			ITE Trip Rate	Total	Enter	Exit	Enter	Exit	ITE Trip Rate	Total	Enter	Exit	Enter	Exit	ITE Trip Rate	Total
Single-Family Housing	13	Units	0.77	10	26%	74%	3	7	1.02	13	64%	36%	8	5	9.57	124

**Table 3: Net Trips Generated**

Land Use	Use Size		AM Peak		PM Peak		Daily
			Enter	Exit	Enter	Exit	Total
Single-Family Housing	12	Units	3	6	7	5	114

The distribution of the generated trips was based on the current traffic pattern in the area. The majority of traffic generally heads east/west on Old Shakopee Road. The trip generation volumes were distributed to the intersections being analyzed and followed the general pattern of current traffic.



The new development trips were added to the forecasted volumes to create the build volumes. The 2015 build volumes are shown in Figure 3 and the 2015 build AADT volumes are shown in Figure 5.

**Future Traffic Considerations**

Analysis was also completed for the intersections for a future year of 2025 for the build scenario. Background traffic was grown at the rate 1.0% per year. This growth is likely throughout the area within the next 10 years. The 2025 future build volumes are shown in Figure 4 and the 2025 future build AADT volumes are shown in Figure 5. It should be noted that the AADT shown on Figure 5 assume that a small amount of cut through traffic will occur on Overlook Drive. See the Additional Considerations section below for further discussion of this cut through traffic and potential measures that could be used to reduce it.

**Traffic Operations Analysis**

Analysis was completed at the intersections of France Avenue & Overlook Drive and Xerxes Avenue & Overlook Drive for scenarios considering the AM and PM peak hours for the 2014 existing conditions, 2015 Build condition, and 2025 Future Build condition. The analysis was performed using the methodology of the 2010 Highway Capacity Manual through Synchro, a traffic analysis software program by Trafficware. Results of the analysis are displayed as measures of effectiveness. Measures of effectiveness display quantitative information about the performance of an intersection. The primary measures that are used in this study are level of service and delay.

**Level of Service**

The operational analysis results are described as a Level of Service (LOS) ranging from A to F and these letters serve to describe a range of operating conditions for different types of facilities. Levels of Service are calculated based on the 2010 Highway Capacity Manual, which defines the level of service, based on control delay. Control delay is the delay experienced by vehicles slowing down for a stop sign and the wait time at stop sign. Level of Service D is commonly taken as an acceptable design year LOS. The level of service and its associated intersection delay for an unsignalized intersection is presented below.

**Table 4: Related LOS to Control Delay**

	Unsignalized Intersection
	<b>Control Delay per Vehicle (sec.)</b>
A	≤ 10
B	>10 and ≤ 15
C	>15 and ≤ 25
D	>25 and ≤ 35
E	>35 and ≤ 50
F	>50

**Volume to Capacity Ratios**

Volume to capacity ratio is the proportion of the actual traffic utilizing the facility to the facility’s physical ability to carry a specific maximum volume. This is calculated by dividing the total traffic using



the facility by the capacity of the facility. This can then determine if a facility is sufficient to handle the traffic that is expected to be traveling on it. A ratio greater than 1.00 predicts that the facility will be unable to discharge all of the demand arriving on it. Such a situation would result in long queues and extensive delays, or diversion to alternate routes.

Analysis

The two study intersections were analyzed based on the criteria listed above. Table 5 details the operational results for the France Avenue & Overlook Drive intersection and Table 6 details the operational results for the Xerxes Avenue & Overlook Drive intersection.

**Table 5: Operational Analysis – France Avenue & Overlook Drive**

Intersection and Traffic Control	Peak Hour	Intersection Delay*	Maximum Delay-LOS-v/c**
2014	AM	1	9-A-0.03
	PM	1	9-A-0.02
2015 Build Scenario	AM	3	9-A-0.03
	PM	2	9-A-0.02
2025 Build Scenario	AM	3	9-A-0.03
	PM	2	9-A-0.03

\*Delay in seconds per vehicle \*\*Maximum delay, LOS, and v/c ratio on any approach and/or movement

**Table 6: Operational Analysis – Xerxes Avenue & Overlook Drive**

Intersection and Traffic Control	Peak Hour	Intersection Delay*	Maximum Delay-LOS-v/c**
2014	AM	3	8-A-0.01
	PM	5	9-A-0.02
2015 Build Scenario	AM	4	8-A-0.01
	PM	6	9-A-0.02
2025 Build Scenario	AM	4	8-A-0.02
	PM	6	9-A-0.03

\*Delay in seconds per vehicle \*\*Maximum delay, LOS, and v/c ratio on any approach and/or movement

The traffic operations at the two unsignalized intersection requires no mitigation through all scenarios. With the addition of traffic due to the Development, operations will continue within acceptable levels through 2025. There are minimal delays and volume-to-capacity ratios are also consistently very low. No change in traffic control or additional capacity is needed.



## **Additional Considerations**

### **Travel Times**

Existing travel times were measured from Old Shakopee Road to the proposed development along multiple routes to assess the impacts the proposed development would have on the existing area. The measured travel times were used as a baseline and then were compared to 2015 Build travel times which were calculated taking into account the new trips generated by the proposed development.

The existing and 2015 Build travel times for each route measured are shown in Figure 6. As shown by the figure, the additional 13 housing units will have a minimal effect on average travel times.

With the connection on Overlook Drive, there may be potential for cut through traffic on Overlook Drive between France Avenue and Xerxes Avenue. Figures 7 and 8 show calculated travel times along different routes for northbound and southbound traffic assuming the proposed development and roadway connection on Overlook Drive are constructed. For southbound vehicles the shortest route is route C which travels southbound on Xerxes to the new Overlook Drive connection. Taking into account the current vehicle travel behaviors in the area, it is assumed that approximately 100 additional vehicles per day will use route C instead of route A or B as shown on Figure 8. This equates to an increase from one car every two minutes during the peak hour to one car every minute and a half on Overlook Drive. On Xerxes Avenue this equates to an increase from one car every minute and 15 seconds during the peak hour to one car every minute. As can be seen, the cut through traffic is not anticipated to be significant on Xerxes Avenue or Overlook Drive. Traffic calming measures may be needed to help deter cut through traffic further since the travel times on the various neighborhood routes are so similar.

### **Traffic Calming Measures**

To further reduce the potential for cut through traffic, traffic calming measures could be implemented on Overlook Drive. The proposed roadway connection is shown with curvature which will help to slow traffic down along the roadway. Landscaping along the roadway would also help to create a more residential feel and slow vehicles down. In addition, the measures shown on Figure 9 could also be implemented on Overlook Drive and would be anticipated to deter cut through traffic potential.

## **Summary and Conclusions**

The proposed development is estimated to consist of 13 single family detached housing units and a roadway connection between Xerxes Avenue and France Avenue on Overlook Drive. Based on the traffic analysis provided, our recommendations and conclusions are:

1. Both studied intersections will operate at an acceptable LOS if the new development and roadway connection are implemented. The trips generated from the development are not anticipated to have a significant impact on traffic operations at the nearby intersections.
2. The new connection does not provide a faster route for residents to reach Old Shakopee Road in most cases, therefore cut through traffic is not anticipated to be significant on Overlook Drive between France Avenue and Xerxes Avenue.
3. Existing traffic control should remain at both study intersections, unless traffic calming measures are implemented.
4. Traffic calming measures may be appropriate to keep traffic speeds low and reduce the potential for cut through trips.



## **Figures**

Figure 1: Location Map

Figure 2: 2014 Existing Turning Movements

Figure 3: 2015 Build Turning Movements

Figure 4: 2025 Future Build Turning Movements

Figure 5: 2014 Existing, 2015 Build and 2025 Future Build AADT Volumes

Figure 6: 2014 Existing and 2015 Build Travel Times

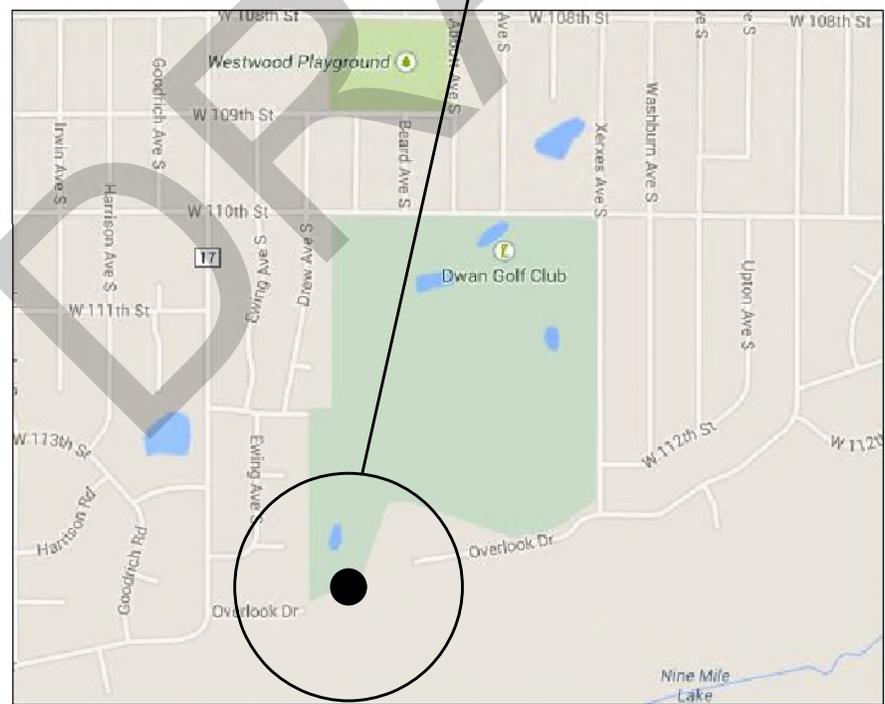
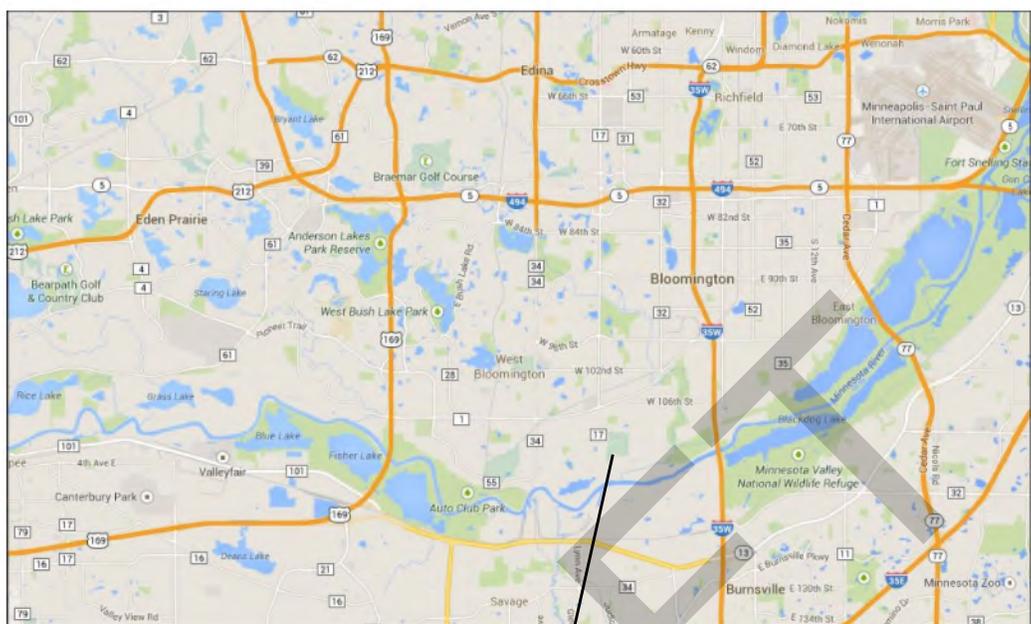
Figure 7: Potential Routes For Future Neighborhood Connection (Northbound)

Figure 8: Potential Routes For Future Neighborhood Connection (Southbound)

Figure 9: Traffic Calming Measures

## **Appendices**

Appendix A: Preliminary Site Plan



**FIGURE 1: LOCATION MAP**  
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**FIGURE 2: 2014 EXISTING TURNING MOVEMENTS**  
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**FIGURE 3: 2015 BUILD TURNING MOVEMENTS**  
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**FIGURE 4: 2025 FUTURE BUILD TURNING MOVEMENTS**

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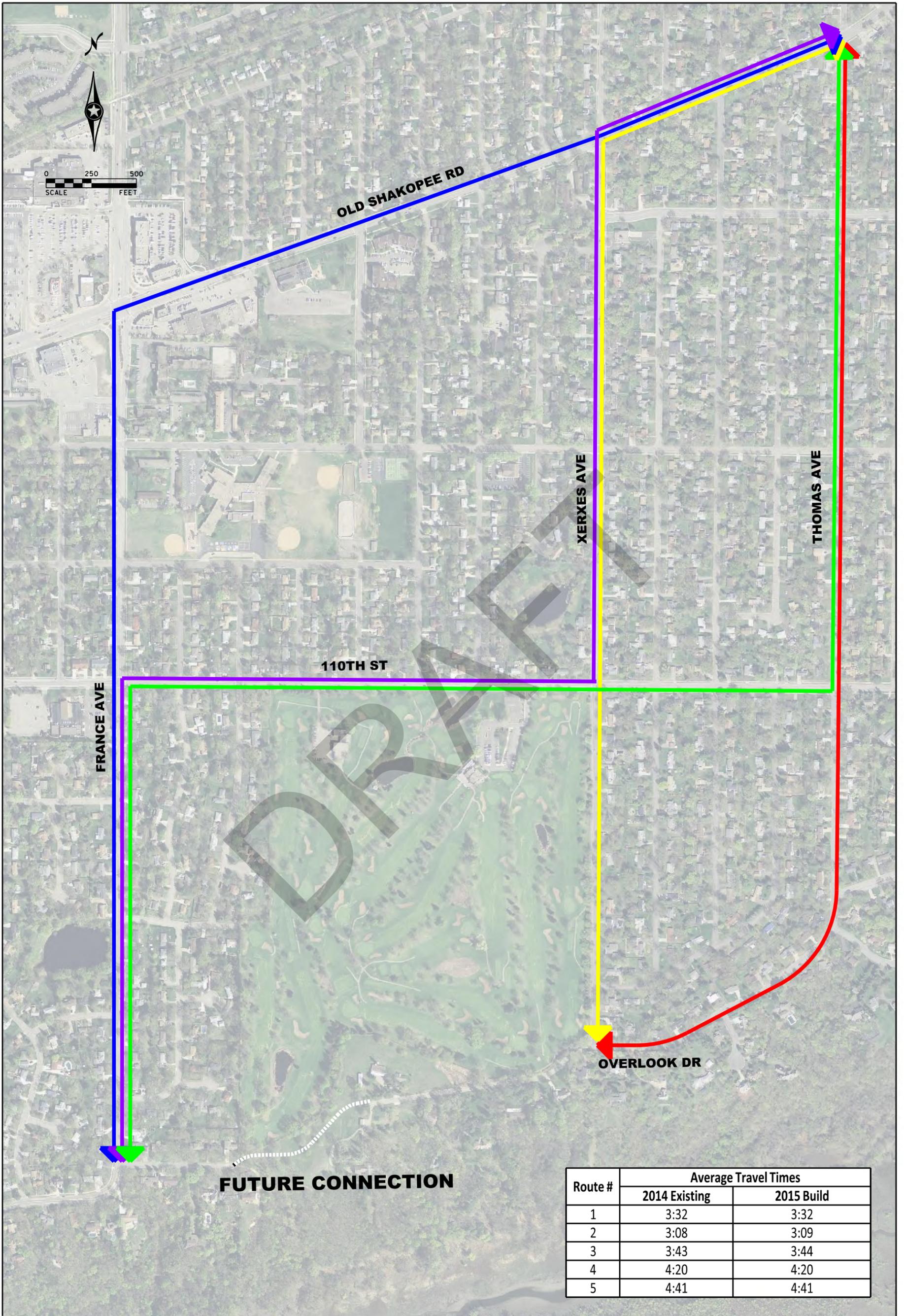


**FIGURE 5: 2014 EXISTING, 2015 BUILD AND 2025 FUTURE BUILD AADT VOLUMES**

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mollyst pdf-color.pltcfg bmi.tbl 7/24/2014 4:23:45 PM H:\BLOM\T16108595\CAD\MS\figures\Figure 6\_Existing Routes.dgn



**FUTURE CONNECTION**

Route #	Average Travel Times	
	2014 Existing	2015 Build
1	3:32	3:32
2	3:08	3:09
3	3:43	3:44
4	4:20	4:20
5	4:41	4:41

**LEGEND**

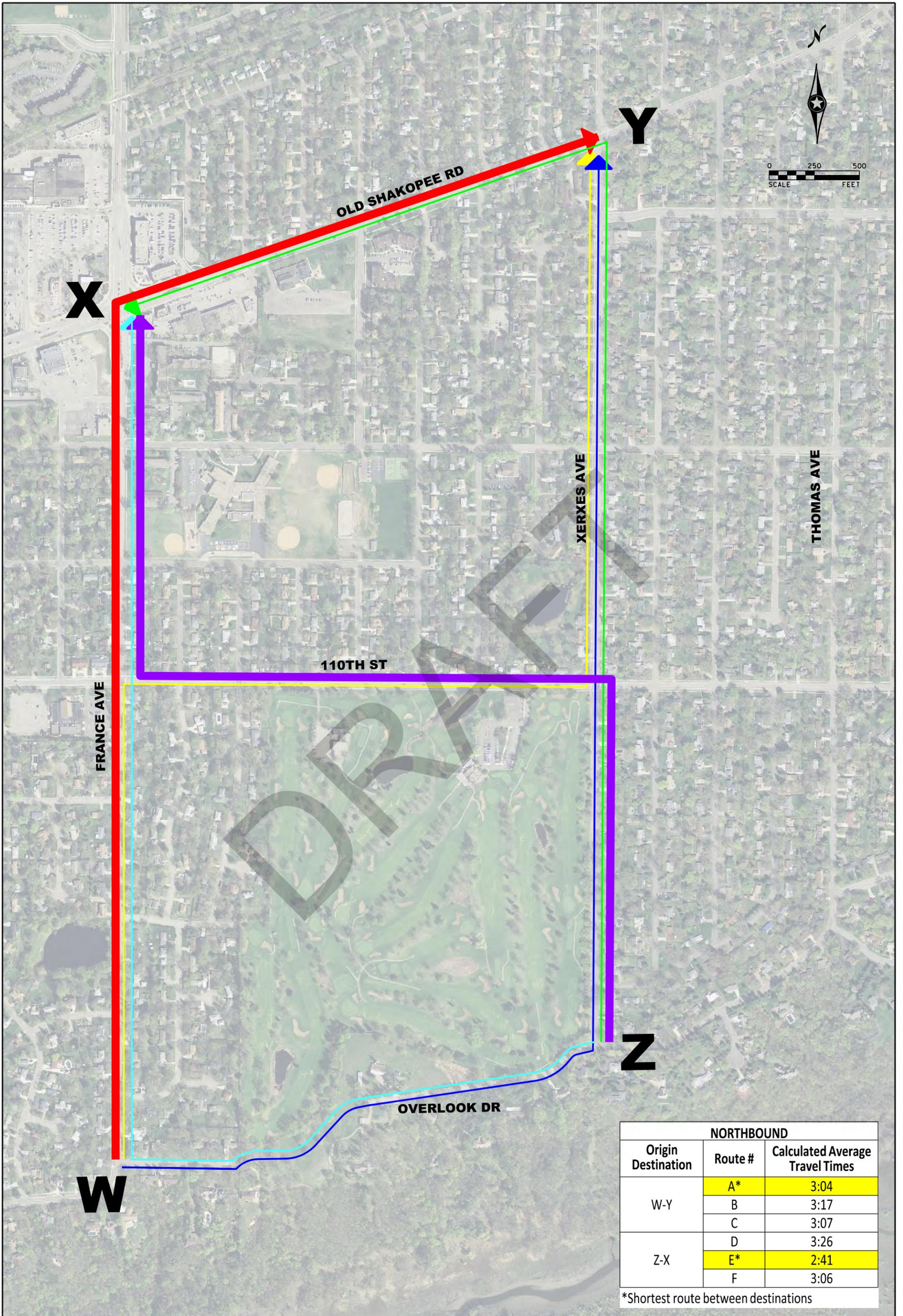
- **ROUTE 1**
- **ROUTE 2**
- **ROUTE 3**
- **ROUTE 4**
- **ROUTE 5**

**FIGURE 6: 2014 EXISTING & 2015 BUILD TRAVEL TIMES**

**DWAN ESTATE SUBDIVISION TRAFFIC STUDY**  
**BLOOMINGTON, MN**



mollyst pdf-color.pltcfq bmi.tbl 7/24/2014 4:22:28 PM H:\BLOM\T16108595\CAD\MS\figures\Figure 7\_Future Routes (NB).dgn



NORTHBOUND		
Origin Destination	Route #	Calculated Average Travel Times
W-Y	A*	3:04
	B	3:17
	C	3:07
Z-X	D	3:26
	E*	2:41
	F	3:06

\*Shortest route between destinations

**LEGEND**

- ROUTE A
- ROUTE B
- ROUTE C
- ROUTE D
- ROUTE E
- ROUTE F

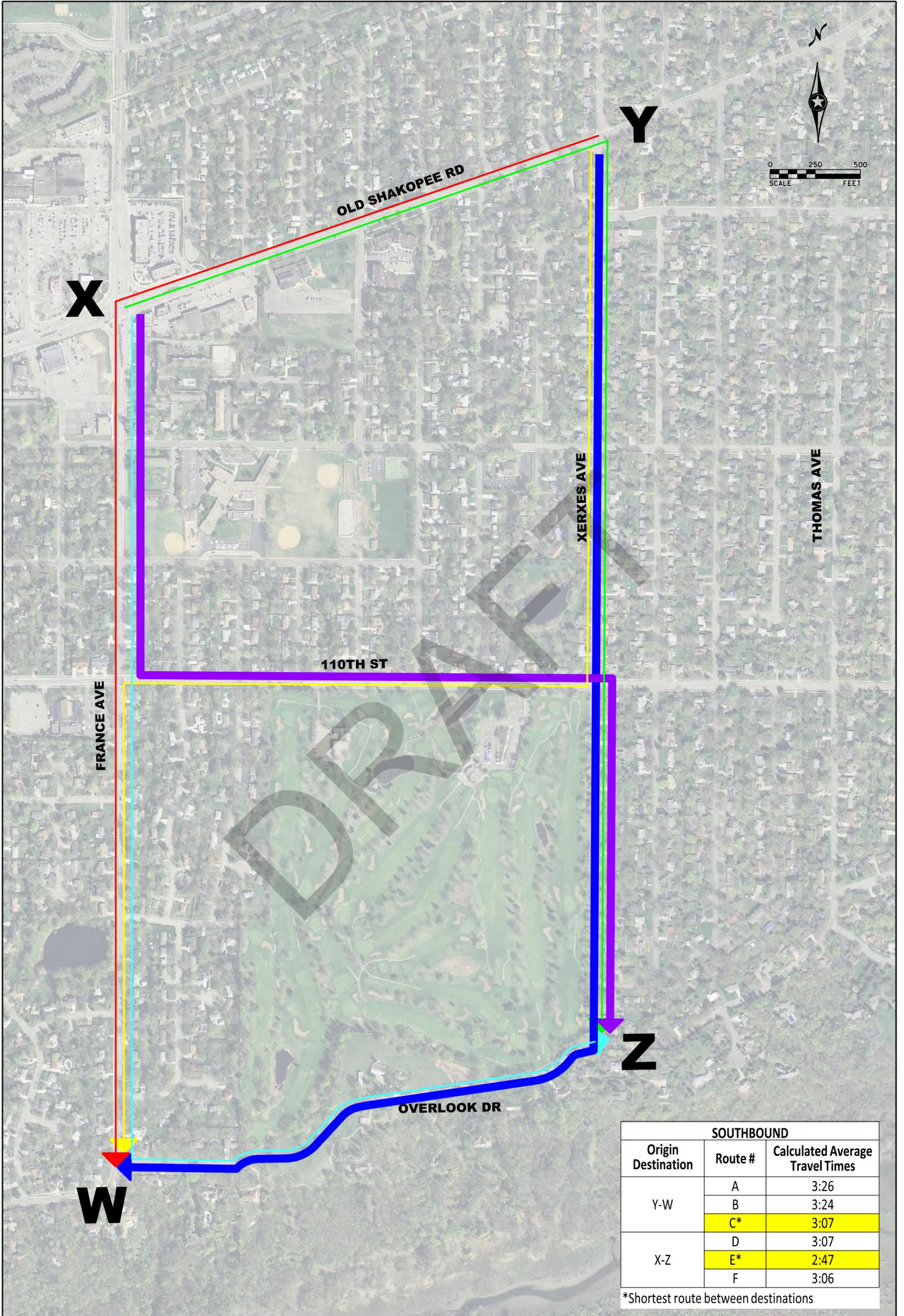
**FIGURE 7: POTENTIAL ROUTES FOR FUTURE NEIGHBORHOOD CONNECTION NORTHBOUND**

**DWAN ESTATE SUBDIVISION TRAFFIC STUDY**

**BLOOMINGTON, MN**



mollyst pdf-color.pltcfq bmi.tbl 7/24/2014 4:14:08 PM H:\BLOM\T16108595\CAD\MS\figures\Figure 8\_Future Routes (SBI).dgn



SOUTHBOUND		
Origin Destination	Route #	Calculated Average Travel Times
Y-W	A	3:26
	B	3:24
	C*	3:07
X-Z	D	3:07
	E*	2:47
	F	3:06

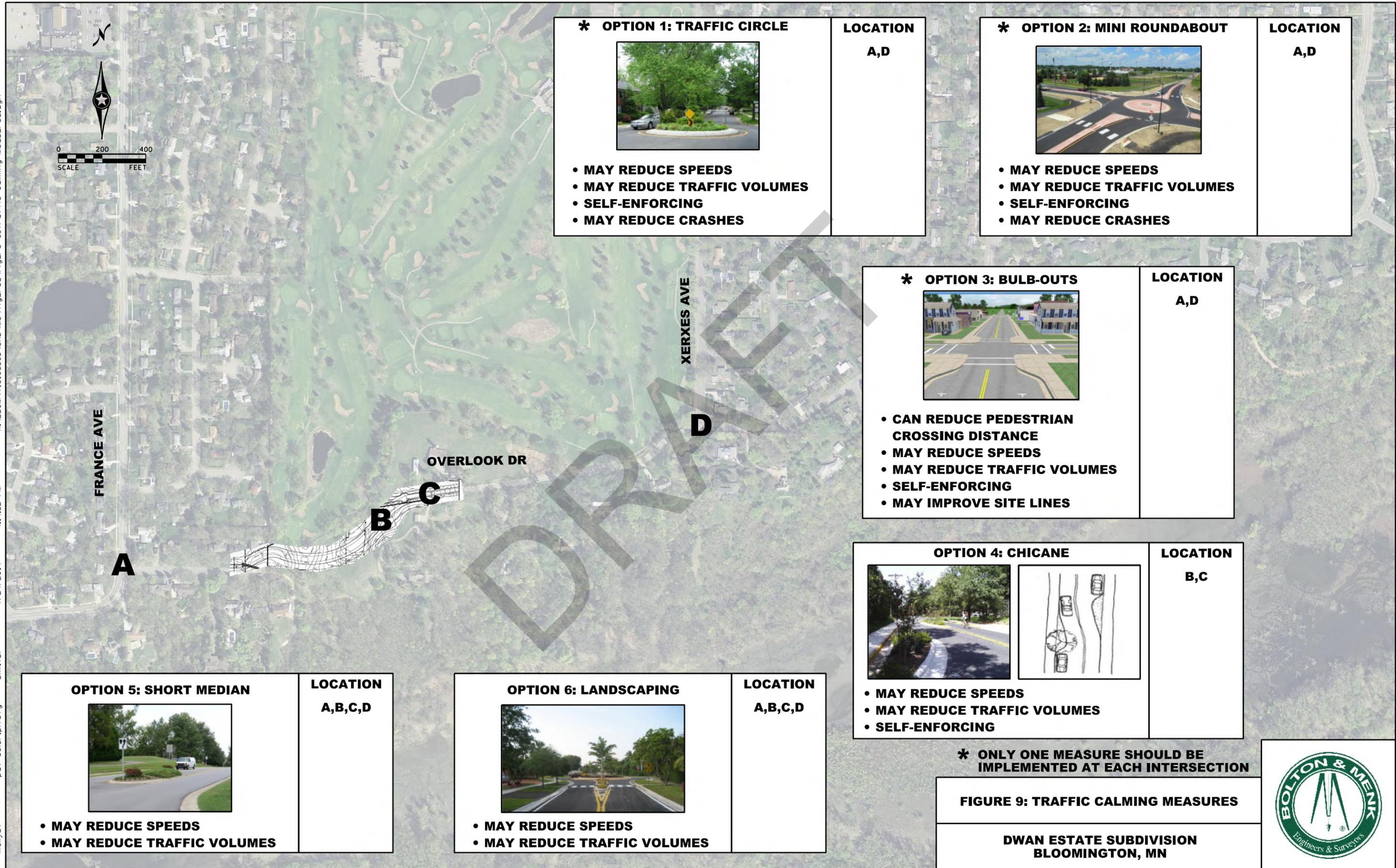
\*Shortest route between destinations

**LEGEND**

- ROUTE A
- ROUTE B
- ROUTE C
- ROUTE D
- ROUTE E
- ROUTE F

**FIGURE 8: POTENTIAL ROUTES FOR FUTURE NEIGHBORHOOD CONNECTION SOUTHBOUND**  
**DWAN ESTATE SUBDIVISION TRAFFIC STUDY**  
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**\* OPTION 1: TRAFFIC CIRCLE**



- MAY REDUCE SPEEDS
- MAY REDUCE TRAFFIC VOLUMES
- SELF-ENFORCING
- MAY REDUCE CRASHES

**LOCATION**  
A,D

**\* OPTION 2: MINI ROUNDABOUT**



- MAY REDUCE SPEEDS
- MAY REDUCE TRAFFIC VOLUMES
- SELF-ENFORCING
- MAY REDUCE CRASHES

**LOCATION**  
A,D

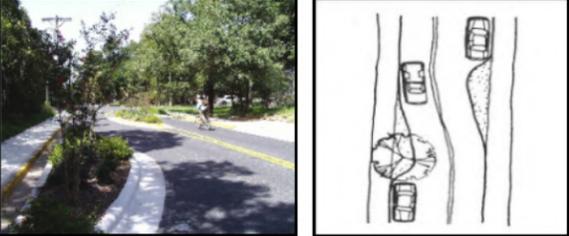
**\* OPTION 3: BULB-OUTS**



- CAN REDUCE PEDESTRIAN CROSSING DISTANCE
- MAY REDUCE SPEEDS
- MAY REDUCE TRAFFIC VOLUMES
- SELF-ENFORCING
- MAY IMPROVE SITE LINES

**LOCATION**  
A,D

**OPTION 4: CHICANE**



- MAY REDUCE SPEEDS
- MAY REDUCE TRAFFIC VOLUMES
- SELF-ENFORCING

**LOCATION**  
B,C

**OPTION 5: SHORT MEDIAN**



- MAY REDUCE SPEEDS
- MAY REDUCE TRAFFIC VOLUMES

**LOCATION**  
A,B,C,D

**OPTION 6: LANDSCAPING**



- MAY REDUCE SPEEDS
- MAY REDUCE TRAFFIC VOLUMES

**LOCATION**  
A,B,C,D

**\* ONLY ONE MEASURE SHOULD BE IMPLEMENTED AT EACH INTERSECTION**

**FIGURE 9: TRAFFIC CALMING MEASURES**

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## Appendix A: Preliminary Site Plan

DRAFT

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SITE DATA:

GROSS AREA: ±15 ACRES

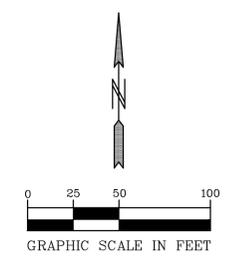
PROPOSED UNITS: 13  
GROSS DENSITY: 0.87 UNITS/ACRE

EXISTING ZONING: R1  
COMP GUIDE PLAN: LOW DENSITY (0-5 U/A)

R1 STANDARDS:  
AREA: 11,000 SF  
LOT WIDTH: 80'  
FRONT SETBACK: 30'  
SIDE YARD: 10'  
REAR YARD: 30'

SOUTH END OF SITE IN BLUFF OVERLAY DISTRICT

SITE PLAN BASED ON AVAILABLE DATA  
WETLANDS HAVE NOT BEEN DELINEATED



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I hereby certify that this plan was prepared by me or under my direct supervision and that I am a duly Licensed Landscape Architect under the laws of the State of Minnesota.  
Name: XXXX  
Reg. No.: XXX Date: XXXX

Revisions

Date: 6-2-14  
Designed: JLT  
Drawn: JLT

**CONCEPT PLAN 2**

**PETER JARVIS**  
6109 BLUE CIRCLE DRIVE SUITE 2000  
MINNETONKA, MINNESOTA 55343

**BLOOMINGTON PROPERTY**  
BLOOMINGTON, MINNESOTA

1 OF 1