

MEMO

VIA EMAIL

To: Cynthia Redinger, PE, PTOE, City of Ann Arbor
Lia Michaels, PE, PTOE, Hubbell, Roth & Clark

From: Julie Kroll, PE, PTOE
Michael Labadie, PE
Fleis & VandenBrink Engineering

CC: Brett Lenart, City of Ann Arbor
Alexis DiLeo, City of Ann Arbor
Nick Hutchinson, City of Ann Arbor
Ronald Mucha, Morningside Lower Town, LLC

Date: April 26, 2017

Re: **Morningside Lower Town Development (1140 Broadway Street) – Ann Arbor – Traffic Impact Study Addendum**

Introduction

This memorandum is an addendum to Morningside Development Traffic Impact Study dated March 28, 2017 prepared by Fleis & VandenBrink (F&V). This addendum includes additional analysis of the Broadway Street and Site Driveway intersection alternative operations and cut-through traffic analysis

Broadway Street & Proposed Site Driveway-Intersection Alternatives

This analysis evaluated four different alternatives for traffic control at the proposed Site Driveway intersection at Broadway Street. The alternatives and the results of the operational analysis are summarized herein and in Table 1.

**Table 1: Broadway Street & Site Driveway
Future Conditions Alternatives Analysis**

Peak Period	Approach	STOP (All-Way)		STOP (3-Way)		Roundabout		Signalized	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
AM	EB	8.0	A	Free		3.0	A	9.6	A
	WB	7.6	A	6.6	A	3.2	A	8.8	A
	NB	0**	A	0**	A	3.5	A	0**	A
	SB	<u>7.0</u>	<u>A</u>	<u>3.5</u>	<u>A</u>	<u>3.4</u>	<u>A</u>	<u>8.6</u>	<u>A</u>
	Overall	7.7	A	2.8	A	3.4	A	9.1	A
PM	EB	8.7	A	Free		3.9	A	10.0	A
	WB	7.7	A	3.9	A	3.4	A	8.6	A
	NB	7.9	A	3.3	A	3.3	A	9.6	A
	SB	<u>7.5</u>	<u>A</u>	<u>3.6</u>	<u>A</u>	<u>3.6</u>	<u>A</u>	<u>9.5</u>	<u>A</u>
	Overall	8.2	A	8.2	A	3.7	A	9.6	A

**No demand present on this approach.

In addition, each of the alternatives were evaluated considering “cut-through traffic”. For this evaluation, it was first assumed that ALL possible cut-through traffic (i.e. westbound right-turns on Maiden Lane and southbound left-turns from Plymouth Road to Maiden Lane) were cut-through, and therefore added traffic to the Broadway Street and Site Driveway intersection. Although this scenario is unrealistic, the analysis of this condition demonstrates the extent to which cut-through traffic volumes can be accommodate at the Broadway Street & Site Driveway intersection. Although, these traffic volumes will never be realized, this analysis was performed to see at what point the intersections would exceed capacity. The results showed that is not the case, and even with an extreme volume of cut-through traffic, the Broadway Street & Site Driveway intersection will operate well as summarized below and in Table 2.

**Table 2: Broadway Street & Site Driveway
 Future Conditions Alternatives Analysis (w/ Cut-Through Reassignment)**

Peak Period	Approach	STOP (All-Way)		STOP (3-Way)		Roundabout		Signalized	
		Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
AM	EB	12.5	B	Free		5.7	A	13.9	B
	WB	9.3	A	5.6	A	4.5	A	10.3	B
	NB	0**	A	0**	A	4.2	A	0**	A
	SB	<u>8.2</u>	<u>A</u>	<u>3.3</u>	<u>A</u>	<u>3.8</u>	<u>A</u>	<u>8.6</u>	<u>A</u>
	Overall	11.2	B	2.2	A	5.2	A	12.4	B
PM	EB	12.6	B	Free		5.1	A	14.6	B
	WB	12.4	B	17.0	C	5.9	A	12.7	B
	NB	9.3	A	10.6	B	3.9	A	9.6	A
	SB	<u>9.2</u>	<u>A</u>	<u>11.5</u>	<u>B</u>	<u>5.3</u>	<u>A</u>	<u>9.5</u>	<u>A</u>
	Overall	12.0	B	8.9	A	5.5	A	13.0	B

**No demand present on this approach.

All-Way Stop Control

This analysis evaluated all-way stop control on all four approaches with the addition of the proposed development. The results of the analysis show that the intersection will operate well, at LOS A during the peak periods with the addition of the development. In addition, this intersection will also operate well with minimal delays with the addition of the cut-through traffic.

Three-Way Stop Control

This analysis evaluated stop control on three approaches, with a free-flow movement on the southeastbound Broadway Street approach. The results of the analysis shows that this operation has very little delay at the intersection, and the free flow movement on Broadway Street will be similar to existing conditions at this intersection. In addition, this intersection is also expected to operate well with minimal delays with the addition of the cut-through traffic.

Note: The overall delay decreases at this intersection due to high assumed cut-through traffic volumes, since high volume of through movements has no delay, the overall v/c ratio is lower than with the non-cut through analysis. During the PM peak period, the overall intersection delay is higher with the cut-through alternative since during the peak 15-minutes traffic backs up from the adjacent signalized intersection at Broadway Street & Plymouth Road.

Compact Urban Roundabout

This analysis evaluated the operations of a compact urban or mini-roundabout control at the intersection with the addition of the proposed development. The results of the analysis show that the intersection will have slightly more delay than the three-way stop control operations, but will operate well at LOS A during the peak periods with the addition of the development. In addition, this intersection will also operate well with minimal delays with the addition of the cut-through traffic

Signalization

A traffic signal warrant analysis was performed with the site generated traffic and with the cut-through traffic volumes. The intersection *does not meet* the either the traffic volume or pedestrian volume signal warrants at this intersection. Although a signal is not warranted or recommended at this location, this alternative was evaluated to determine the projected operations with a signal. The results of the analysis shows that the intersection will operation well, at LOS A and PM during the AM and PM peak periods respectively. However, this alternative does have the most delay of any of the alternatives.

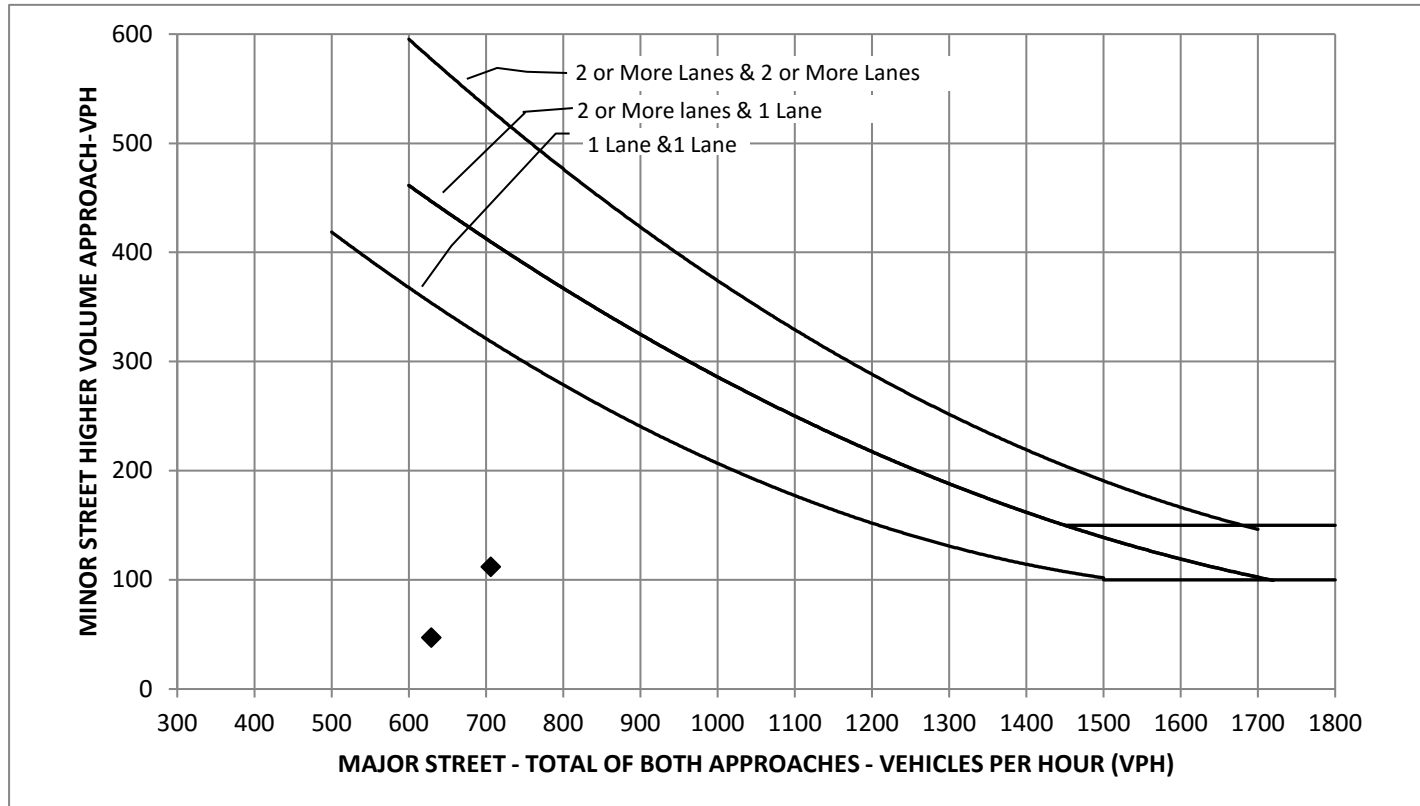
Any questions related to this memorandum, analyses, and results should be addressed to Fleis & VandenBrink.

JMK:rsm:jmk

**Michigan Manual of Uniform Traffic Control Devices
Worksheet for Signal Warrants (Section 4C)
WARRANT 3 B(100%): Peak-Hour Vehicular Volume**

Spot Number:	0		
Intersection:	E. Site Drive @ Broadway Street		
Date	1/0/1900	by	F&V

1	: No. of Lanes on Major St.
1	: No. of Lanes on Minor St.
25	: Speed limit or 85th Percentile? (MPH)
NO	: Is the intersection within an Isolated community?
0	: What is the of the population isolated community?



How Many Hours Are Met	0
Is Warrant 3 B (100%) Met?	NO