February 13, 2022

John Moorehead, PE
City of Gahanna
200 S. Hamilton Road
Gahanna, OH 43230

RE: Results of the Morse Road Multifamily Traffic Access Study

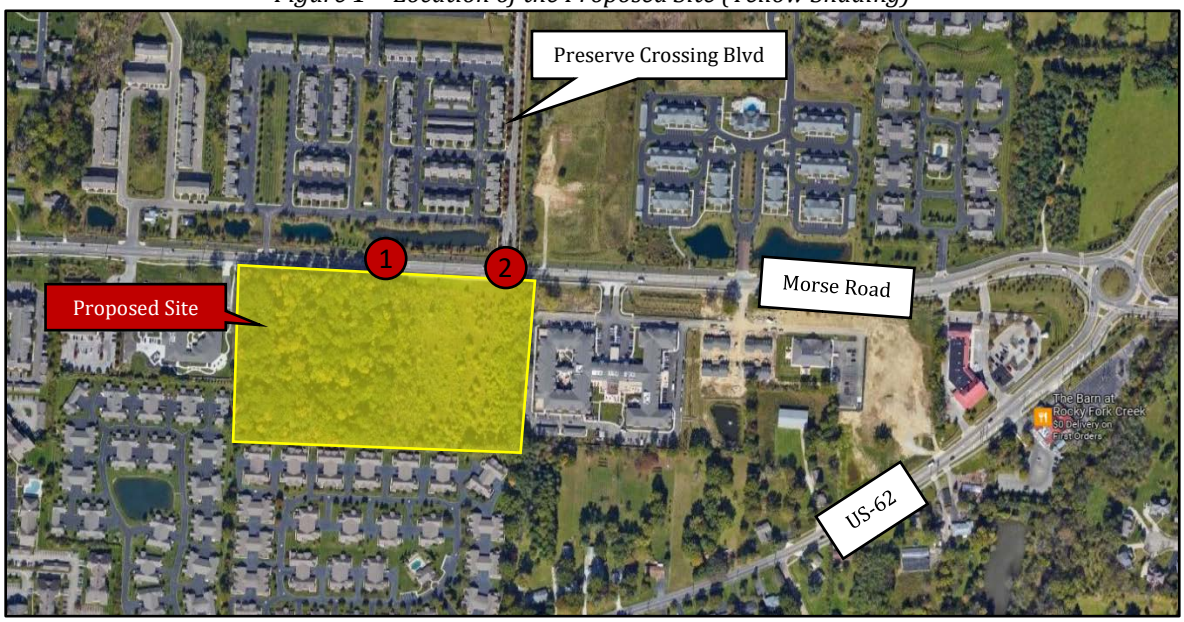
Mr. Moorehead,

We have completed a traffic access study for the proposed Morse Road Multifamily development site. The site is located along Morse Road in Gahanna, OH. The methods and results of this analysis are summarized below.

Background

The proposed site is located along Morse Road west of US-62. **Figure 1** shows the location of the proposed site.

Figure 1—Location of the Proposed Site (Yellow Shading)



The site is currently undeveloped and is proposed to include 252 multifamily units. Proposed access includes one full access point along Morse Road aligned with Preserve Crossing Boulevard (Site Access 1) and one right-in/right-out/left-out access point along Morse Road (Site Access 2). The site concept plan can be found in **Attachment A**.

The purpose of this traffic study is to analyze the site access points and determine if roadway improvements are required as a result of the site development.

6612 Singletree Drive Columbus, Ohio 43229 ▪ 614.656.2424 ▪ www.cmtran.com

Projected Traffic

In order to conduct analysis for the proposed site access, Opening Year (2023) and Horizon Year (2043) traffic volumes were developed. Peak hour, turning movement count data at the Preserve Crossing Boulevard & Morse Road intersection was obtained by Carpenter Marty Transportation on January 20, 2022. Count data can be found in **Attachment B**.

A linear, annual growth rate of 1.0% was obtained from the Ohio Department of Transportation (ODOT) Transportation Data Management System. The growth rate was applied to the Morse Road through volumes to create the Background, or No Build, traffic for the Opening (2023) and Horizon (2043) Years. Growth rate data can be found in **Attachment B**.

Trips for the proposed site were generated based on Institute of Transportation Engineers (ITE) practices and the Trip Generation Manual, 11th edition. Land use code (LUC) *220 – Multifamily Housing (Low-Rise)* was utilized to generate trips for the proposed development. **Table 1** shows the trip generation of the expected entering/exiting trips for the AM and PM peaks. The full trip generation reports can be seen in **Attachment C**.

Table 1- Site Trip Generation Summary

Land Use	Size	AM Peak		PM Peak	
		Entry	Exit	Entry	Exit
220 – Multifamily Housing (Low Rise)	252 Units	24	77	81	48

Site traffic was distributed to/from the site based on the existing distribution of through volumes along Morse Road, knowledge of the surrounding area, and engineering judgment. Site traffic was added to the No Build traffic to produce Build traffic for the Opening and Horizon Years. The full volume calculations can be found in **Attachment D.**

Analysis

A turn lane warrant analysis was conducted at the site access points using methodologies located in the ODOT Location & Design Manual (L&D). If a turn lane was warranted in any scenario, the required length was calculated using ODOT criteria.

The Highway Capacity Manual module of Synchro 11 software was used to analyze capacity at the site access points. A minimum Level-of-Service (LOS) of D for the overall intersection and for each individual movement during peak traffic hours was considered acceptable. If an intersection fell below these criteria, mitigation strategies were developed to bring each movement back to an acceptable LOS.

An intersection sight distance analysis was conducted at the proposed site access points based on ODOT methodologies. This was completed to determine if adequate sight distance is provided for vehicles turning from the site onto Morse Road.

Results & Conclusions

The turn lane warrant analysis shows that a 225' eastbound right turn lane, inclusive of a 50' diverging taper, meets warrants at Site Access 1. Additionally, a 225' westbound left turn lane, inclusive of a 50' diverging taper, meets warrants at Site Access 2. The full turn lane warrant analysis can be found in **Attachment E**.

Table 2 below summarizes stop control capacity analysis results for all approaches/movements which experience delay. The full capacity analysis can be found in **Attachment F.**

Table 2- Capacity Analysis Summary (LOS/Delay)

Intersection	Approach/ Movement	Opening Year				Horizon Year			
		AM No Build	AM Build	PM No Build	PM Build	AM No Build	AM Build	PM No Build	PM Build
Morse Road & Site Access 1	NB	---	C/16.5	---	D/30.0	---	C/19.6	---	E/43.0
Morse Road & Site Access 2 / Preserve Crossing Boulevard	EB Left	A/8.6	A/8.6	A/9.5	A/9.5	A/8.9	A/8.9	B/10.0	B/10.0
	WB Left	---	A/7.9	---	A/9.3	---	A/8.1	---	A/9.9
	NB	---	C/16.0	---	E/39.0	---	C/19.2	---	F/61.1
	SB	C/16.2	C/19.1	D/25.8	E/41.5	C/19.5	C/24.6	E/38.2	F/76.2

As shown in **Table 2**, the northbound and southbound approaches of the Morse Road and Site Access 2/Preserve Crossing Boulevard exceed acceptable delay in the PM Build scenarios and Horizon Year PM No Build scenario. Additionally, the northbound approach of the Morse Road & Site Access 1 intersection exceeds acceptable delay. However, this is common for traffic turning from site drives onto arterial roadways. These approaches/movements are considered acceptable for the following reasons:

- LOS/delay for these approaches barely exceed acceptable standards.
- Volume to capacity ratio for each approach/movement exceeding acceptable delay is under 1.0.
- The longest, calculated 95th percentile queue length for the Horizon Year PM Build scenario is 2.8 vehicles for the southbound left turn movement at the Morse Road & Site Access 2/Preserve Crossing Boulevard intersection. 95th percentile queue lengths for the proposed site access points do not exceed one vehicle.

Intersection sight distance exhibits for the proposed site accesses can be found in **Attachment G**. Morse Road has a posted speed limit of 45 mph in the study area. A design speed of 45 mph was utilized for the sight distance analyses. A sight distance of 500' is required for left turning vehicles looking right and 430' is required for right turning vehicles looking left. There are no apparent sight distance obstructions within the sight triangles.

Based on the results of this traffic study herein, it is recommended that 225' eastbound right turn lane be installed at Site Access 1. It is also recommended that a 225' westbound left turn

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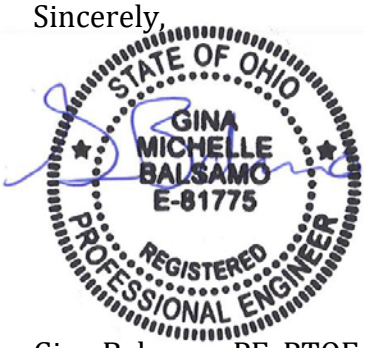
lane at Site Access 2. Both turn lanes would be installed as Build improvements for the proposed site access points to Morse Road. The left turn lane can be installed via restriping the existing two-way left turn lane along Morse Road. All turn lane lengths are inclusive of a 50' diverging taper.

If I can help in any way, do not hesitate to contact me at gbalsamo@cmtran.com or 614.656.2429 anytime.

Sincerely,



Gina Balsamo, PE, PTOE
Project Manager
Carpenter Marty Transportation

Attachment A
Site Plan

CARPENTER MARTY transportation

Attachment A

MORSE ROAD

S86° 49' 25"E 984.11'

N03° 49' 58"E 618.97'

S03° 32' 54"W 618.94'

N86° 49' 25"W 987.18'

30' SETBACK

25' SETBACK

3-STORY ~ 12 UNITS
1 BEDROOM

PROP.
POND

3-STORY ~ 24 UNITS
2 BEDROOM AND 1
BEDROOM

PROP. GARAGE
9 SPACES

PROP. GARAGE
7 SPACES

PROP.
MAIL

PROP.
CLUBHOUSE

PROP.
POOL

MONICA MORGAN WHITEHEAD
14 AC.
INSTR. 201405050054990

PROP.
POND

3-STORY ~ 6 UNITS
3 BEDROOM

3-STORY ~ 23 UNITS
2 BEDROOM AND 3
BEDROOM

PROP. COMP. CONT.

Ex. C & G Inlet
TC 957.80
12" CPP W 952.70
12" CPP E 952.65
12" CPP S 952.70

Ex. 2' Sq. C.B.
TC 954.82
12" CPP N
(Full of debris)

Ex. C & G Inlet
TC 957.38
12" CPP W 951.13
12" CPP E 951.03
12" CPP S 952.53

Ex. C & G Inlet
TC 955.47
12" CPP W 949.57
12" CPP E 949.05
12" CPP S 950.57

Ex. Tele. M.H.
TC 952.46
Bottom = 939.96

Ex. C & G Inlet
TC 951.98
12" CPP W 947.93
15" CPP E 947.88
12" CPP S 947.78

Ex. C & G Inlet
TC 952.05
12" CPP NW 950.05
(Half full of ice/debris)

Ex. C & G Inlet
TC 951.91
(Full of ice/debris)

Ex. C & G Inlet
TC 951.96
12" CPP W 950.06
12" CPP E 950.11

Ex. C & G Inlet
TC 950.51
12" CPP SW 946.66

Ex. 2' Stm. M.H.
TC 950.29

Ex. C & G Inlet
TC 950.76
15" CPP W 947.49
15" CPP SE 947.64

Ex. 2' Sq. C.B.
TC 956.15
12" CPP N
(Full of debris)

Ex. 2' Sq. C.B.
TC 953.99
12" CPP N
(Full of debris)

Ex. 12" CPP
Inv. = 950.63

Ex. 12" CPP
Inv. = 949.86

Ex. 2' Sq. C.B.
TC 948.97
12" CPP N 947.41

PARKING CALCULATIONS		
AREA	TOTAL PARKING PROVIDED	PARKING RATIO
UNCOVERED PARKING (335 UNITS)	421 SPACES (12 HANDICAP)	1.26 SPACES / UNIT
OUTDOOR GARAGE PARKING	50 SPACES	0.20 SPACES / UNIT
TOTAL PARKING TARGET	**XXX**	**X.XX SPACES / UNIT**
TOTAL PARKING PROVIDED	**471**	**1.40 SPACES / UNIT**

SCALE: 1" = 40'

0 40 80 120

GRAPHIC SCALE

REVISIONS

NO.	DATE	DESCRIPTION

ORIGINAL ISSUE DATE: OIDATE

NO.	DATE	DESCRIPTION

PROJECT NO.: 211084
PROJECT MANAGER: AAG
DESIGNED BY: AAG
DRAWN BY: RJB
OH

CONCEPT PLAN

MORSE ROAD

S03

COLUMBUS

3500 Snouffer Road,
Suite 225
Columbus, OH 43235
614.761.1661 phone
www.v3co.com

DRAWING NO.

1

N:\2021\211084\Drawings\ACAD\LD\S03\Sheet Drawings\C-CONCEPT3.dwg 4/15/2022

Attachment B
Count Data and Growth Rate

CARPENTER MARTY transportation

Attachment B

Morse Road & Preserve Crossing Blvd - TMC

Provided by: Carpenter Marty (CM) Transportation Inc.
6612 Singletree Drive, Columbus, OH, 43229, US

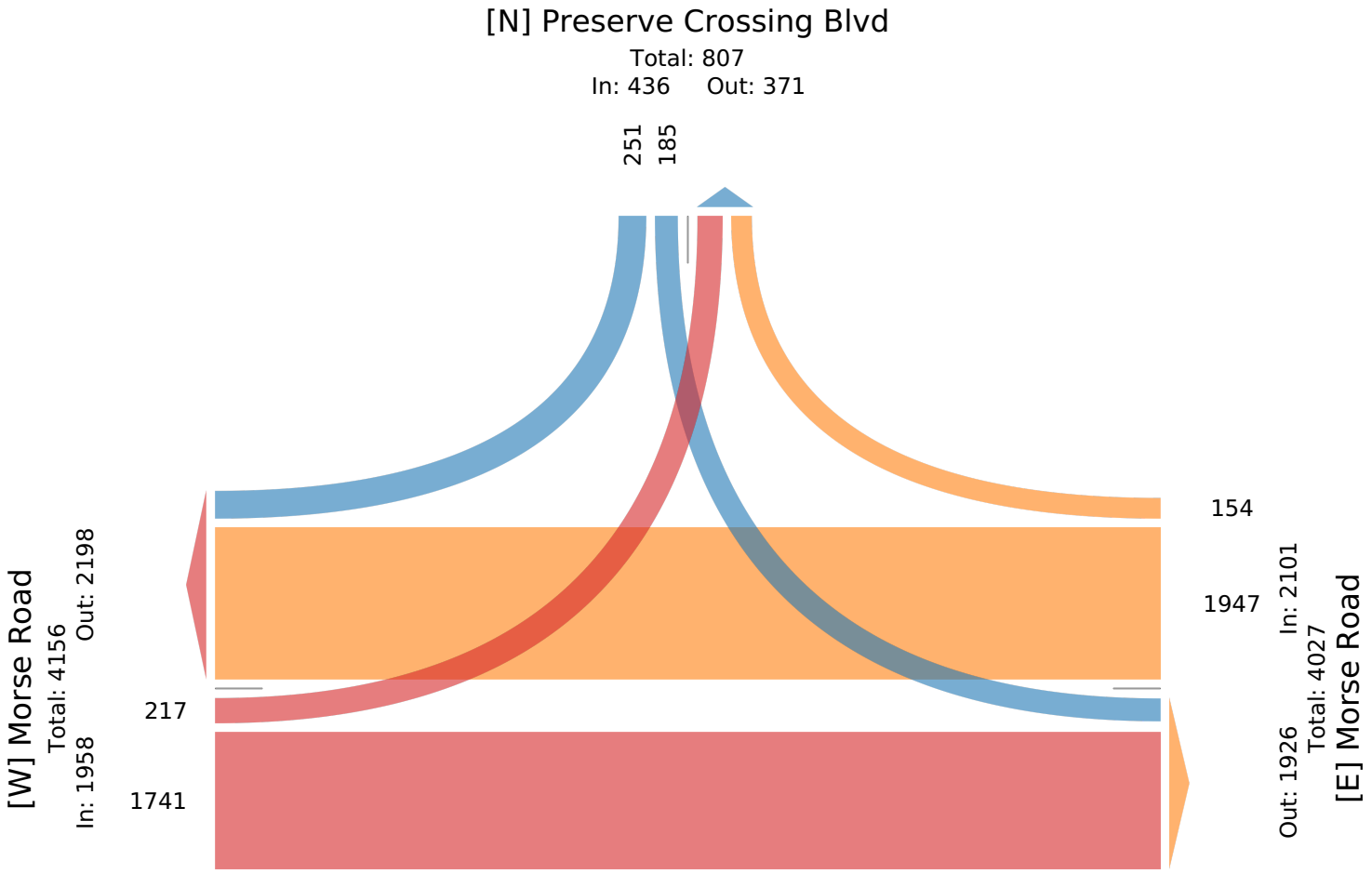
Thu Jan 20, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 916911, Location: 40.054709, -82.849453

Leg	Morse Road				Morse Road				Preserve Crossing Blvd				
Direction	Eastbound				Westbound				Southbound				
Time	L	T	U	**App**	T	R	U	**App**	L	R	U	**App**	**Int**
2022-01-20 7:00AM	5	46	0	**51**	99	1	0	**100**	19	29	0	**48**	**199**
7:15AM	4	60	0	**64**	98	4	0	**102**	14	18	0	**32**	**198**
7:30AM	7	58	0	**65**	137	4	0	**141**	19	26	0	**45**	**251**
7:45AM	5	73	0	**78**	145	4	0	**149**	19	15	0	**34**	**261**
Hourly Total	21	237	0	**258**	479	13	0	**492**	71	88	0	**159**	**909**
8:00AM	9	77	0	**86**	106	8	0	**114**	14	15	0	**29**	**229**
8:15AM	4	82	0	**86**	88	3	0	**91**	10	22	0	**32**	**209**
8:30AM	4	69	0	**73**	106	2	0	**108**	14	13	0	**27**	**208**
8:45AM	4	66	0	**70**	114	2	0	**116**	11	6	0	**17**	**203**
Hourly Total	21	294	0	**315**	414	15	0	**429**	49	56	0	**105**	**849**
4:00PM	15	136	0	**151**	106	12	0	**118**	8	12	0	**20**	**289**
4:15PM	18	158	0	**176**	121	12	0	**133**	9	10	0	**19**	**328**
4:30PM	16	126	0	**142**	138	21	0	**159**	14	7	0	**21**	**322**
4:45PM	28	142	0	**170**	120	21	0	**141**	8	12	0	**20**	**331**
Hourly Total	77	562	0	**639**	485	66	0	**551**	39	41	0	**80**	**1270**
5:00PM	16	168	0	**184**	128	14	0	**142**	4	19	0	**23**	**349**
5:15PM	24	178	0	**202**	161	12	0	**173**	6	19	0	**25**	**400**
5:30PM	31	166	0	**197**	145	18	0	**163**	11	16	0	**27**	**387**
5:45PM	27	136	0	**163**	135	16	0	**151**	5	12	0	**17**	**331**
Hourly Total	98	648	0	**746**	569	60	0	**629**	26	66	0	**92**	**1467**
Total	217	1741	0	**1958**	1947	154	0	**2101**	185	251	0	**436**	**4495**
% Approach	11.1%	88.9%	0%	**-**	92.7%	7.3%	0%	**-**	42.4%	57.6%	0%	**-**	-
% Total	4.8%	38.7%	0%	**43.6%**	43.3%	3.4%	0%	**46.7%**	4.1%	5.6%	0%	**9.7%**	-
Lights	214	1714	0	**1928**	1930	151	0	**2081**	180	247	0	**427**	4436
% Lights	98.6%	98.4%	0%	**98.5%**	99.1%	98.1%	0%	**99.0%**	97.3%	98.4%	0%	**97.9%**	98.7%
Articulated Trucks	0	2	0	**2**	2	0	0	**2**	0	0	0	**0**	4
% Articulated Trucks	0%	0.1%	0%	**0.1%**	0.1%	0%	0%	**0.1%**	0%	0%	0%	**0%**	0.1%
Buses and Single-Unit Trucks	3	25	0	**28**	15	3	0	**18**	5	4	0	**9**	55
% Buses and Single-Unit Trucks	1.4%	1.4%	0%	**1.4%**	0.8%	1.9%	0%	**0.9%**	2.7%	1.6%	0%	**2.1%**	1.2%

*L: Left, R: Right, T: Thru, U: U-Turn

Morse Road & Preserve Crossing Blvd - TMC
Thu Jan 20, 2022
Full Length (7 AM-9 AM, 4 PM-6 PM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 916911, Location: 40.054709, -82.849453

Provided by: Carpenter Marty (CM) Transportation Inc.
6612 Singletree Drive, Columbus, OH, 43229, US



Morse Road & Preserve Crossing Blvd - TMC

Thu Jan 20, 2022
AM Peak (7:30 AM - 8:30 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 916911, Location: 40.054709, -82.849453

Provided by: Carpenter Marty (CM) Transportation Inc.
6612 Singletree Drive, Columbus, OH, 43229, US

Leg Direction	Morse Road Eastbound				Morse Road Westbound				Preserve Crossing Blvd Southbound				
Time	L	T	U	**App**	T	R	U	**App**	L	R	U	**App**	**Int**
2022-01-20 7:30AM	7	58	0	**65**	137	4	0	**141**	19	26	0	**45**	**251**
7:45AM	5	73	0	**78**	145	4	0	**149**	19	15	0	**34**	**261**
8:00AM	9	77	0	**86**	106	8	0	**114**	14	15	0	**29**	**229**
8:15AM	4	82	0	**86**	88	3	0	**91**	10	22	0	**32**	**209**
Total	25	290	0	**315**	476	19	0	**495**	62	78	0	**140**	**950**
% Approach	7.9%	92.1%	0%	**-**	96.2%	3.8%	0%	**-**	44.3%	55.7%	0%	**-**	-
% Total	2.6%	30.5%	0%	**33.2%**	50.1%	2.0%	0%	**52.1%**	6.5%	8.2%	0%	**14.7%**	-
PHF	0.694	0.884	-	**0.916**	0.821	0.594	-	**0.831**	0.816	0.750	-	**0.778**	0.910
Lights	24	276	0	**300**	468	18	0	**486**	60	77	0	**137**	923
% Lights	96.0%	95.2%	0%	**95.2%**	98.3%	94.7%	0%	**98.2%**	96.8%	98.7%	0%	**97.9%**	97.2%
Articulated Trucks	0	0	0	**0**	1	0	0	**1**	0	0	0	**0**	1
% Articulated Trucks	0%	0%	0%	**0%**	0.2%	0%	0%	**0.2%**	0%	0%	0%	**0%**	0.1%
Buses and Single-Unit Trucks	1	14	0	**15**	7	1	0	**8**	2	1	0	**3**	26
% Buses and Single-Unit Trucks	4.0%	4.8%	0%	**4.8%**	1.5%	5.3%	0%	**1.6%**	3.2%	1.3%	0%	**2.1%**	2.7%

*L: Left, R: Right, T: Thru, U: U-Turn

Morse Road & Preserve Crossing Blvd - TMC
Thu Jan 20, 2022
AM Peak (7:30 AM - 8:30 AM)
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 916911, Location: 40.054709, -82.849453

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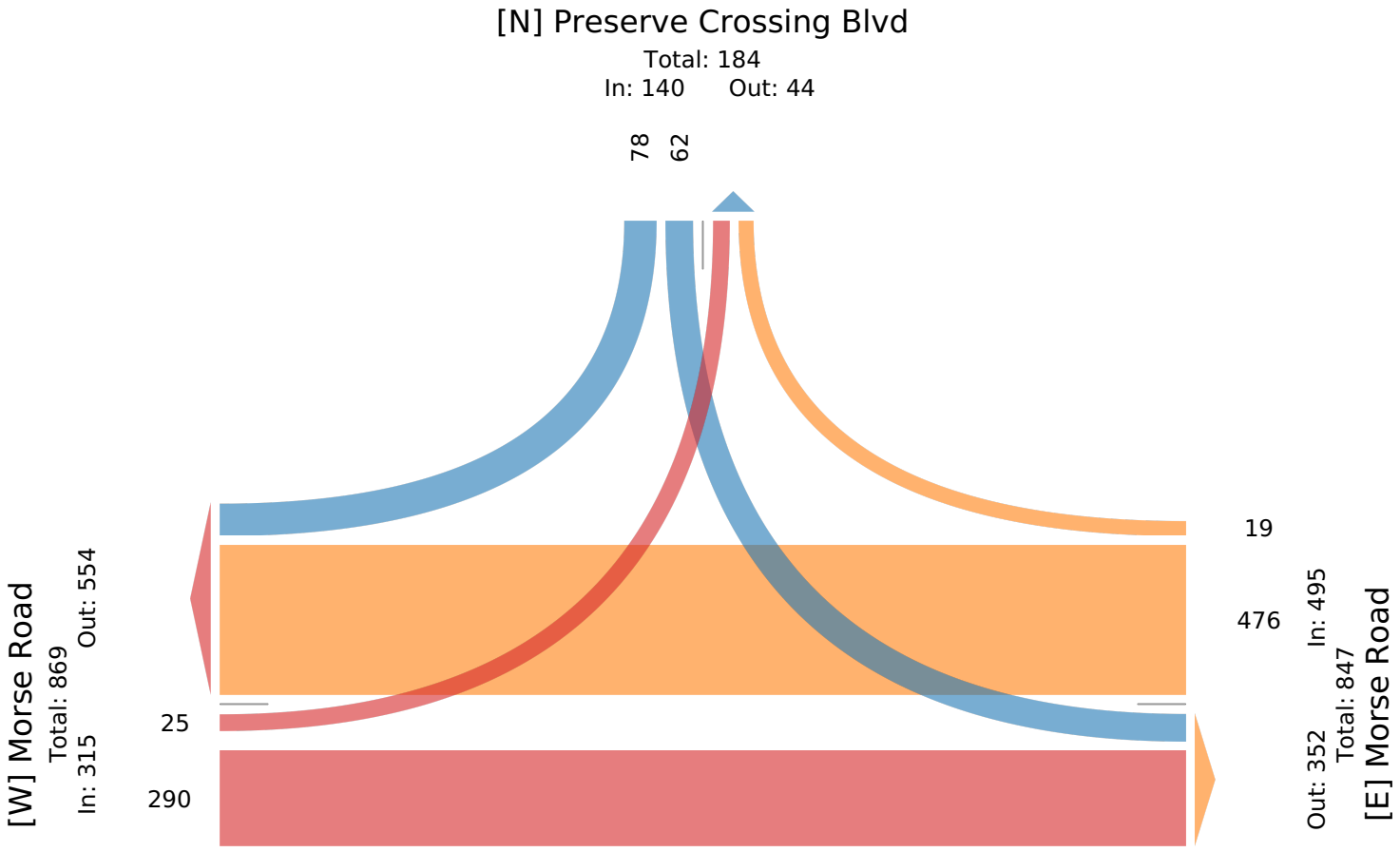

Morse Road & Preserve Crossing Blvd - TMC

Provided by: Carpenter Marty (CM) Transportation Inc.
6612 Singletree Drive, Columbus, OH, 43229, US

Thu Jan 20, 2022
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 916911, Location: 40.054709, -82.849453

Leg	Morse Road				Morse Road				Preserve Crossing Blvd				
Direction	Eastbound				Westbound				Southbound				
Time	L	T	U	**App**	T	R	U	**App**	L	R	U	**App**	**Int**
2022-01-20 4:45PM	28	142	0	**170**	120	21	0	**141**	8	12	0	**20**	**331**
5:00PM	16	168	0	**184**	128	14	0	**142**	4	19	0	**23**	**349**
5:15PM	24	178	0	**202**	161	12	0	**173**	6	19	0	**25**	**400**
5:30PM	31	166	0	**197**	145	18	0	**163**	11	16	0	**27**	**387**
Total	99	654	0	**753**	554	65	0	**619**	29	66	0	**95**	**1467**
% Approach	13.1%	86.9%	0%	**-**	89.5%	10.5%	0%	**-**	30.5%	69.5%	0%	**-**	-
% Total	6.7%	44.6%	0%	**51.3%**	37.8%	4.4%	0%	**42.2%**	2.0%	4.5%	0%	**6.5%**	-
PHF	0.798	0.919	-	**0.932**	0.860	0.774	-	**0.895**	0.659	0.868	-	**0.880**	0.917
Lights	98	652	0	**750**	552	64	0	**616**	28	65	0	**93**	1459
% Lights	99.0%	99.7%	0%	**99.6%**	99.6%	98.5%	0%	**99.5%**	96.6%	98.5%	0%	**97.9%**	99.5%
Articulated Trucks	0	1	0	**1**	0	0	0	**0**	0	0	0	**0**	1
% Articulated Trucks	0%	0.2%	0%	**0.1%**	0%	0%	0%	**0%**	0%	0%	0%	**0%**	0.1%
Buses and Single-Unit Trucks	1	1	0	**2**	2	1	0	**3**	1	1	0	**2**	7
% Buses and Single-Unit Trucks	1.0%	0.2%	0%	**0.3%**	0.4%	1.5%	0%	**0.5%**	3.4%	1.5%	0%	**2.1%**	0.5%

*L: Left, R: Right, T: Thru, U: U-Turn

Morse Road & Preserve Crossing Blvd - TMC
Thu Jan 20, 2022
PM Peak (4:45 PM - 5:45 PM) - Overall Peak Hour
All Classes (Lights, Articulated Trucks, Buses and Single-Unit Trucks)
All Movements
ID: 916911, Location: 40.054709, -82.849453

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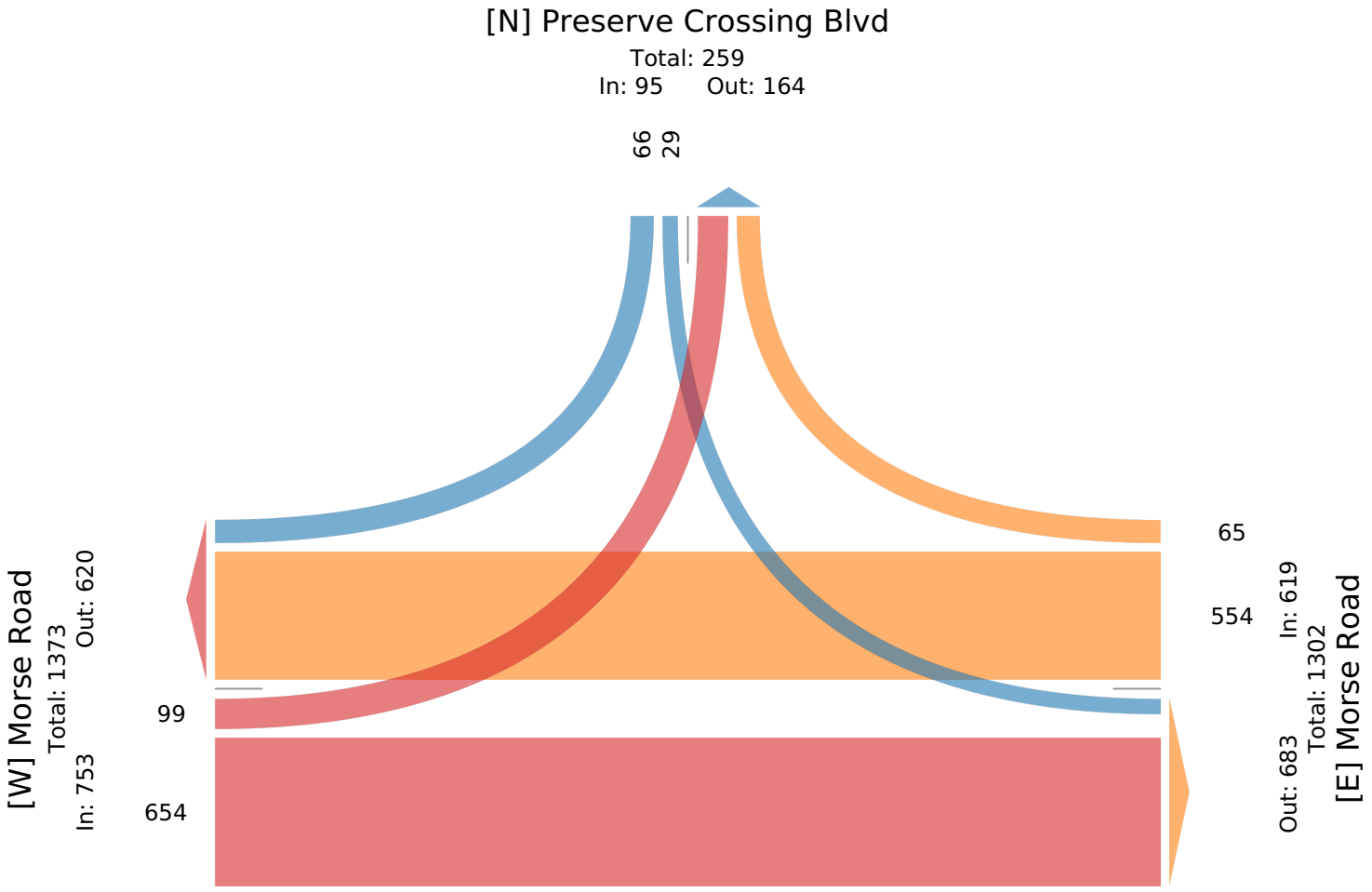


OHIO DEPARTMENT OF TRANSPORTATION

MS2 Transportation Data Management System

List View | All DIRs

Record 1 of 1 Goto Record go

Location ID	108225	**MPO ID**	
Type	SPOT	**HPMS ID**	
On NHS		**On HPMS**	
LRS ID	SFRAUS00062*GC	**LRS Loc Pt.**	0.019
SF Group	Urban Minor Arterial (4);Collector(5-6);Local(7)	**Route Type**	US
AF Group	URBAN_MINOR_ARTERIAL	**Route**	00062
GF Group	URBAN_MINOR_ARTERIAL	**Active**	Yes
Class Dist Grp		**Category**	State Program
Seas Clss Grp	Urban Minor Arterial (4);Collector(5-6);Local(7)		
WIM Group			
QC Group	Default		
Fnct'l Class	Minor Arterial	**Milepost**	
Located On	JOHNSTOWN RD		
Loc On Alias			
	US62 DA3 W OF US62, SW OF NEW ALBANY		

More Detail

STATION DATA

Directions: 2-WAY | EB | WB

AADT

Year	AADT	DHV-30	K %	D %	PA	BC	Src
2020	8,411[3]		11	52	8,115 (96%)	296 (4%)	Grown from 2019
2019	9,083[3]		11	52	8,763 (96%)	320 (4%)	Grown from 2018
2018	9,020[3]		11	52	8,702 (96%)	318 (4%)	Grown from 2017
2017	8,940[3]		11	52	8,625 (96%)	315 (4%)	Grown from 2016
2016	8,705	930	11	52	8,398 (96%)	307 (4%)	

|<< < > >>| 1-5 of 10

Travel Demand Model

	Model Year	Model AADT	AM PHV	AM PPV	MD PHV	MD PPV	PM PHV	PM PPV	NT PHV	NT PPV

VOLUME COUNT

	Date	Int	Total
	Mon 11/28/2016	15	9,760
	Wed 7/10/2013	60	9,843

VOLUME TREND

Year	Annual Growth
2020	-7%
2019	1%
2018	1%
2017	3%
2016	-5%
2015	1%
2014	-3%
2013	25%
2010	0%

SPEED

	Date	Int	Pace	85th	Total
No Data					

CLASSIFICATION

	Date	Int	Total
No Data			

WEIGH-IN-MOTION

	Date	Axles	Avg GVW	Total
No Data				

PER VEHICLE

	Date	Axles	85th	Total
No Data				

Attachment C
Trip Generation

CARPENTER MARTY transportation

Attachment C

Scenario - 1

Scenario Name: AM Peak
User Group:
Dev. phase: 1
No. of Years to Project Traffic : 0
Analyst Note:
Warning:

VEHICLE TRIPS BEFORE REDUCTION

Land Use & Data Source	Location	IV	Size	Time Period	Method Rate/Equation	Entry Split%	Exit Split%	Total
220 - Multifamily Housing (Low-Rise) - Not Close to Rail Transit	General Urban/Suburban	Dwelling Units	252	Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 7 and 9 a.m.	Best Fit (LIN)	24	77	101
Data Source: Trip Generation Manual, 11th Ed					T = 0.31(X) + 22.85	24%	76%	

VEHICLE TO PERSON TRIP CONVERSION

BASELINE SITE VEHICLE CHARACTERISTICS:

Land Use	Baseline Site Vehicle Mode Share		Baseline Site Vehicle Occupancy		Baseline Site Vehicle Directional Split	
	Entry (%)	Exit (%)	Entry	Exit	Entry (%)	Exit (%)
220 - Multifamily Housing (Low-Rise) - Not Close to Rail Transit	100	100	1	1	24	76

ESTIMATED BASELINE SITE PERSON TRIPS:

Land Use	Person Trips by Vehicle		Person Trips by Other Modes		Total Baseline Site Person Trips	
	Entry	Exit	Entry	Exit	Entry	Exit
220 - Multifamily Housing (Low-Rise) - Not Close to Rail Transit	24	77	0	0	24	77
	101		0		101	

NEW VEHICLE TRIPS

Land Use	New Vehicle Trips		
	Entry	Exit	Total
220 - Multifamily Housing (Low-Rise) - Not Close to Rail Transit	24	77	101

RESULTS

Site Totals	Entry	Exit	Total
Vehicle Trips Before Reduction	24	77	101
External Vehicle Trips	24	77	101
New Vehicle Trips	24	77	101

Scenario - 2

Scenario Name: PM Peak
User Group:
Dev. phase: 1
No. of Years to Project Traffic : 0
Analyst Note:
Warning:

VEHICLE TRIPS BEFORE REDUCTION

Land Use & Data Source	Location	IV	Size	Time Period	Method Rate/Equation	Entry Split%	Exit Split%	Total
220 - Multifamily Housing (Low-Rise) - Not Close to Rail Transit	General Urban/Suburban	Dwelling Units	252	Weekday, Peak Hour of Adjacent Street Traffic, One Hour Between 4 and 6 p.m.	Best Fit (LIN)	81	48	129
Data Source: Trip Generation Manual, 11th Ed					T = 0.43(X) + 20.55	63%	37%	

VEHICLE TO PERSON TRIP CONVERSION

BASELINE SITE VEHICLE CHARACTERISTICS:

Land Use	Baseline Site Vehicle Mode Share		Baseline Site Vehicle Occupancy		Baseline Site Vehicle Directional Split	
	Entry (%)	Exit (%)	Entry	Exit	Entry (%)	Exit (%)
220 - Multifamily Housing (Low-Rise) - Not Close to Rail Transit	100	100	1	1	63	37

ESTIMATED BASELINE SITE PERSON TRIPS:

Land Use	Person Trips by Vehicle		Person Trips by Other Modes		Total Baseline Site Person Trips	
	Entry	Exit	Entry	Exit	Entry	Exit
220 - Multifamily Housing (Low-Rise) - Not Close to Rail Transit	81	48	0	0	81	48
	129		0		129	

NEW VEHICLE TRIPS

Land Use	New Vehicle Trips		
	Entry	Exit	Total
220 - Multifamily Housing (Low-Rise) - Not Close to Rail Transit	81	48	129

RESULTS

Site Totals	Entry	Exit	Total
Vehicle Trips Before Reduction	81	48	129
External Vehicle Trips	81	48	129
New Vehicle Trips	81	48	129

Attachment D
Volume Calculations

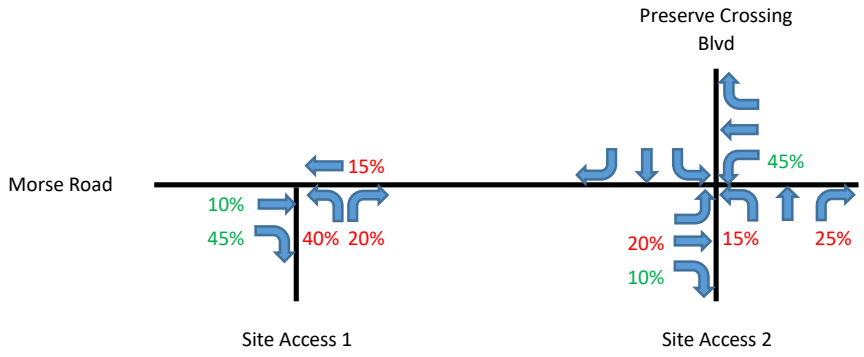
CARPENTER MARTY transportation

Attachment D

CARPENTER MARTY transportation	Year	Period	Scenario	Plate
			Distribution	

^

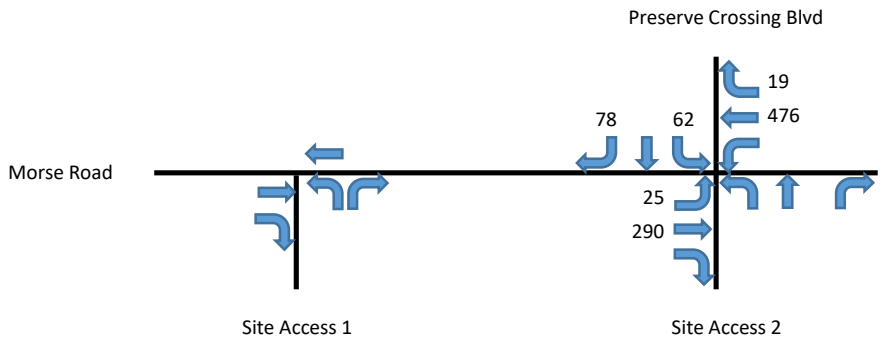
N



CARPENTER MARTY transportation	Year	Period	Scenario	Plate
	2022	AM	Count	

^

N



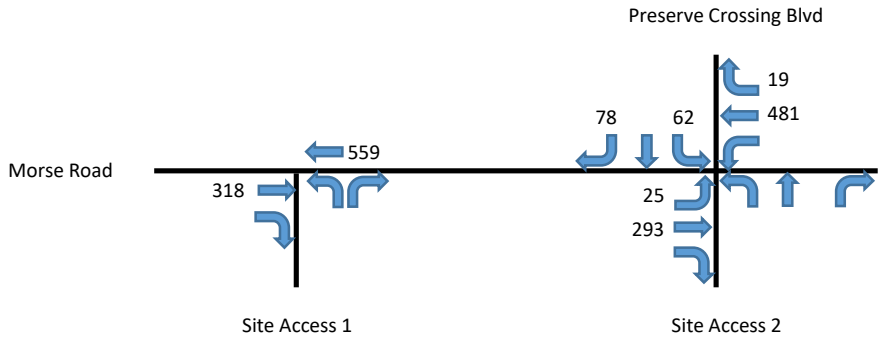
Morse Road Multifamily TAS
Traffic Volume Calculations

CARPENTER MARTY transportation	Year	Period	Scenario	Plate
	2023	AM	No Build	A1

^

N

Growth Rate 1%



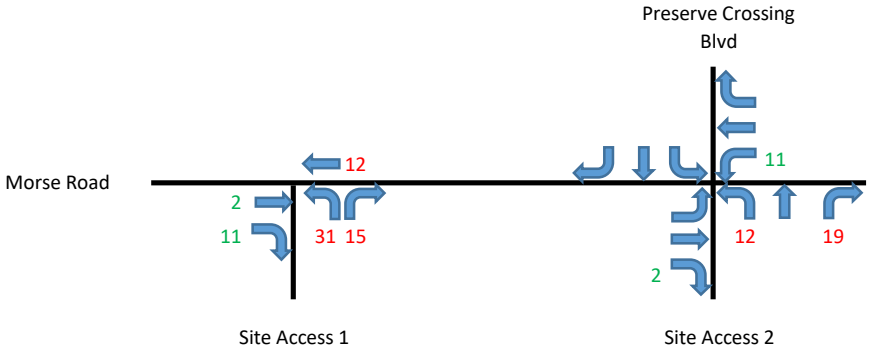
	Year	Period	Scenario	Plate
CARPENTER MARTY transportation		AM	Non-Pass-By Traffic	B1

^

N

Enter 24

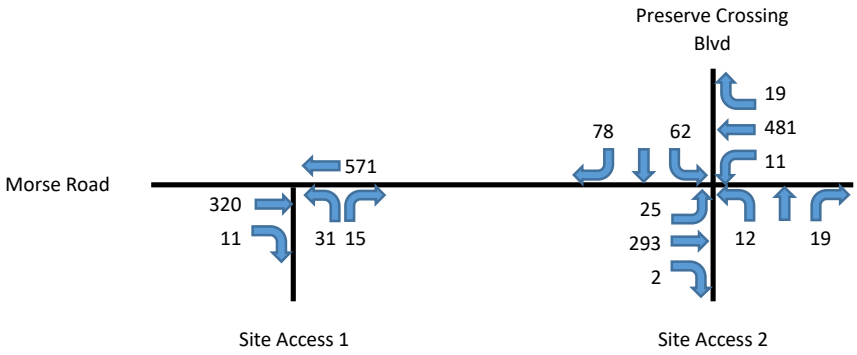
Exit 77



CARPENTER MARTY transportation	Year	Period	Scenario	Plate
	2023	AM	Build	C1 = A1 + B1

^

N

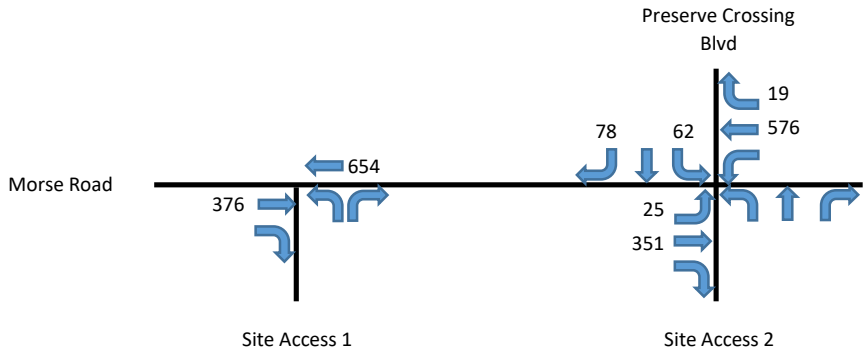


Year	Period	Scenario	Plate
2043	AM	No Build	D1

^

N

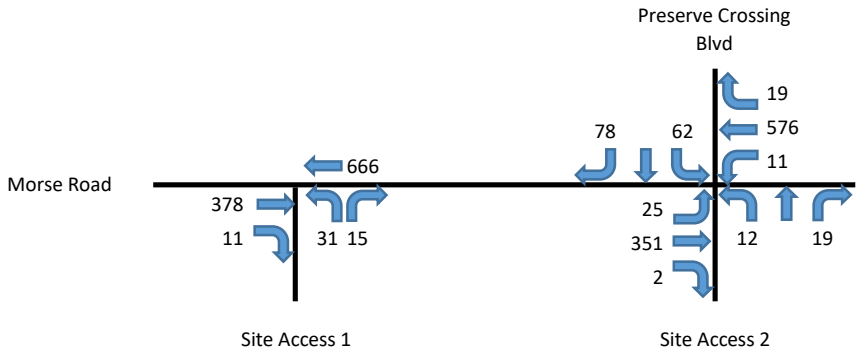
Growth Rate 1%



Year	Period	Scenario	Plate
2043	AM	Build	E1 = B1 + D1

^

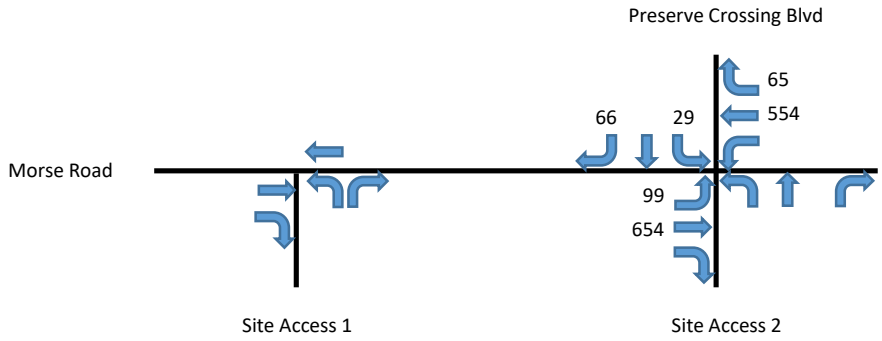
N



CARPENTER MARTY transportation	Year	Period	Scenario	Plate
	2022	PM	Count	

^

N

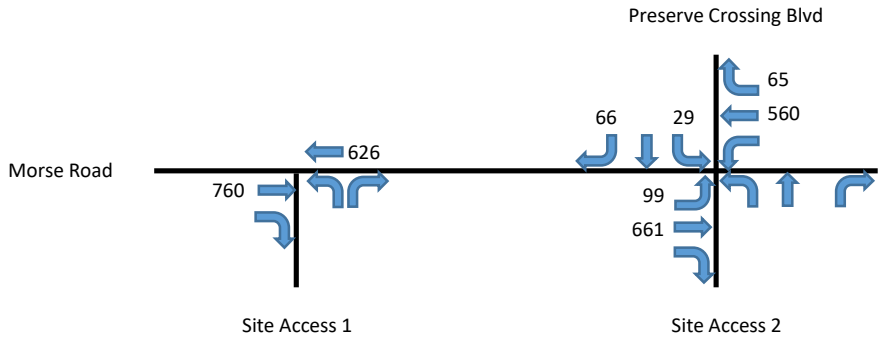


CARPENTER MARTY transportation	Year	Period	Scenario	Plate
	2023	PM	No Build	A2

^

N

Growth Rate 1%

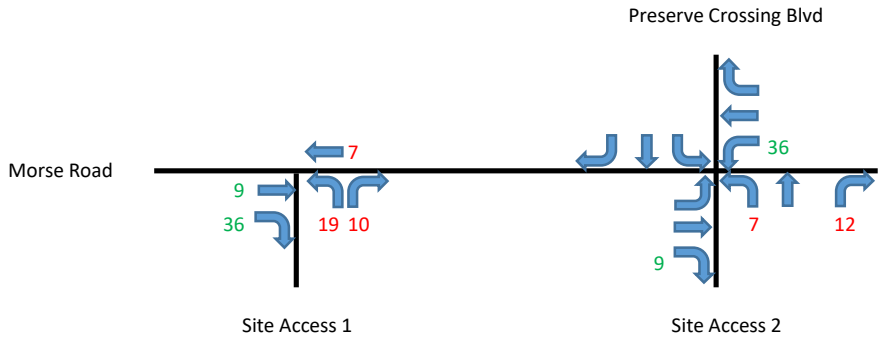


	Year	Period	Scenario	Plate
CARPENTER MARTY transportation		PM	Non-Pass-By Traffic	B2

^

N

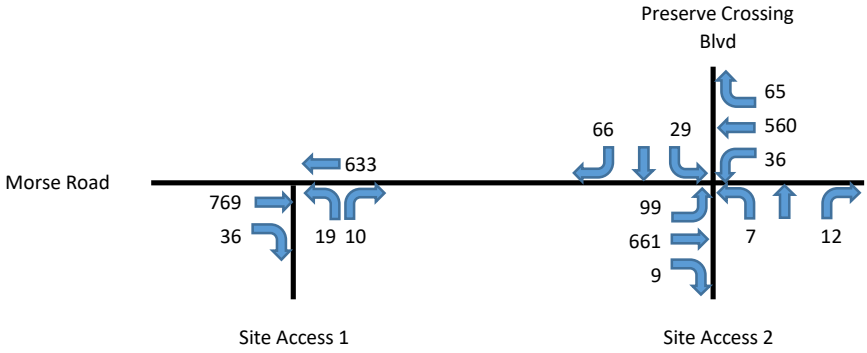
Enter	81
Exit	48



CARPENTER MARTY transportation	Year	Period	Scenario	Plate
	2023	PM	Build	C2 = A2 + B2

^

N

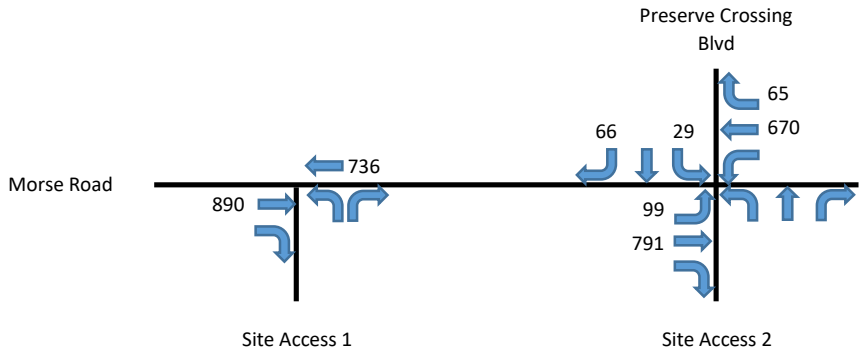


CARPENTER MARTY transportation	Year	Period	Scenario	Plate
	2043	PM	No Build	D2

^

N

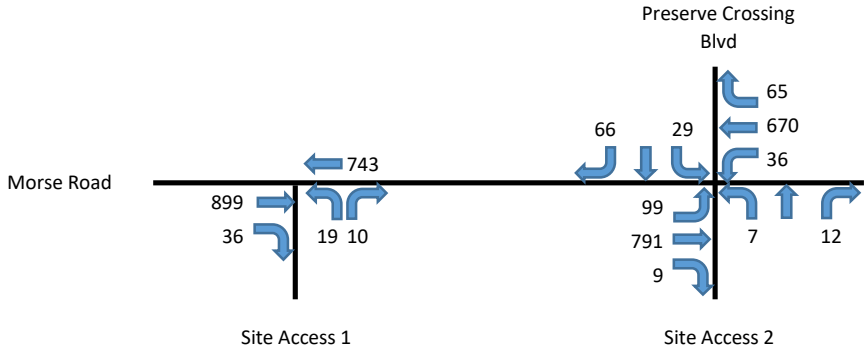
Growth Rate 1%



CARPENTER MARTY transportation	Year	Period	Scenario	Plate
	2043	PM	Build	E2 = B2 + D2

^

N



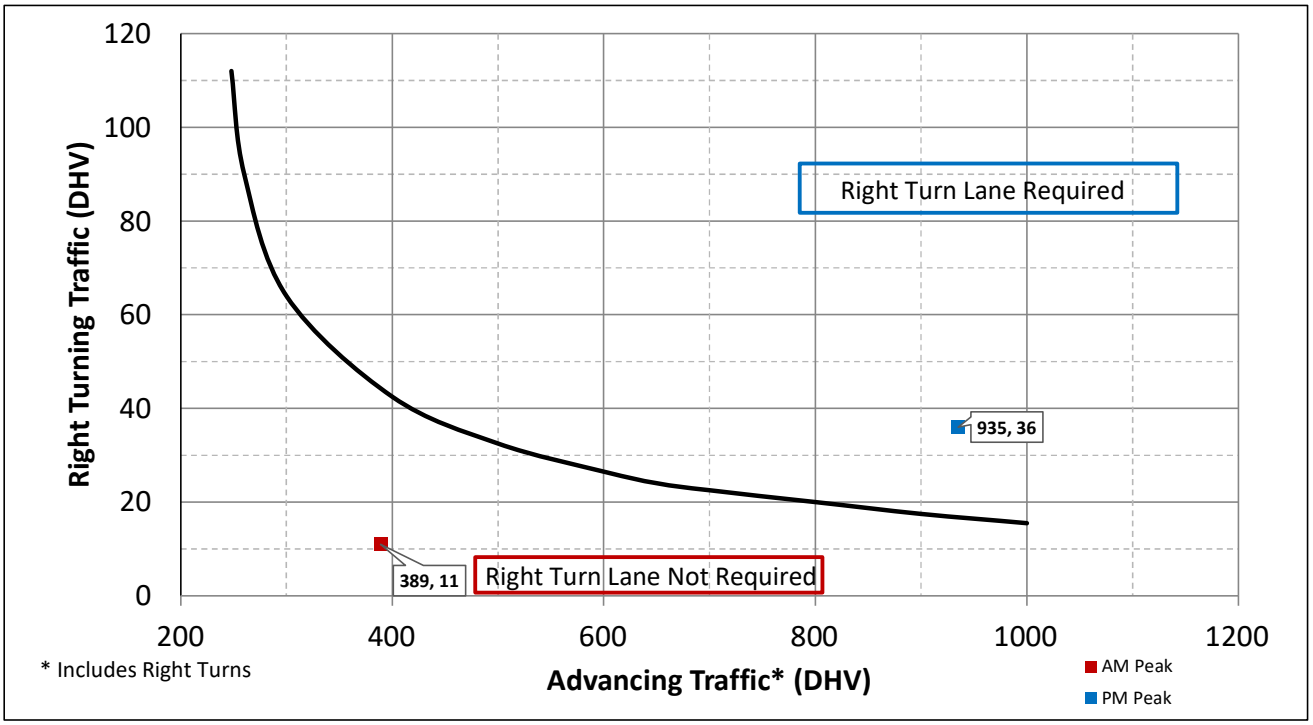
Attachment E
Turn Lane Warrant Analysis

CARPENTER MARTY transportation

Attachment E

2-Lane Highway Right Turn Lane Warrant

(> 40 mph or 70 kph Posted Speed)



Turn Lane Length Calculations

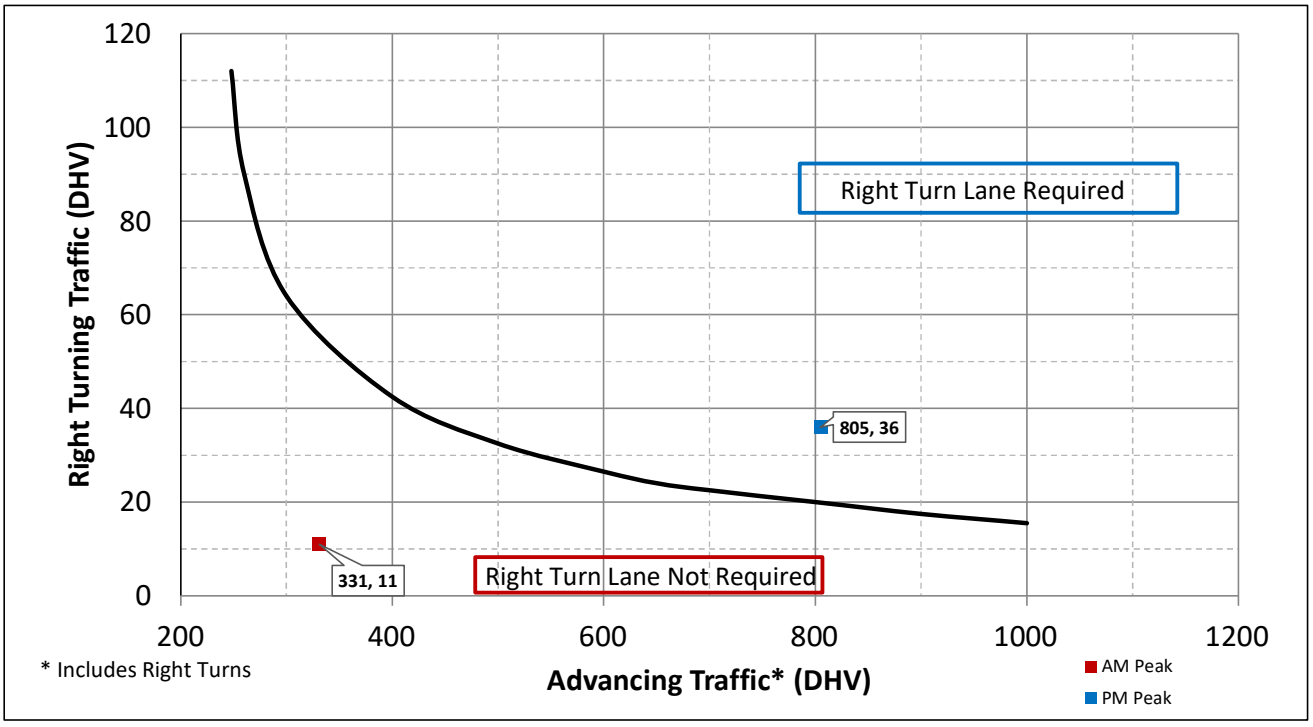
AM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	11	VPH
	Advancing Traffic	389	VPH
	Right Turn Percentage	3%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	
PM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	36	VPH
	Advancing Traffic	935	VPH
	Right Turn Percentage	4%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	
Is Right Turn Warrant Met		Yes	See Above

** Turn Lane Length includes 50 ft diverging taper*

** Turn Lane Length includes 50 ft diverging taper*

2-Lane Highway Right Turn Lane Warrant

(> 40 mph or 70 kph Posted Speed)



Turn Lane Length Calculations

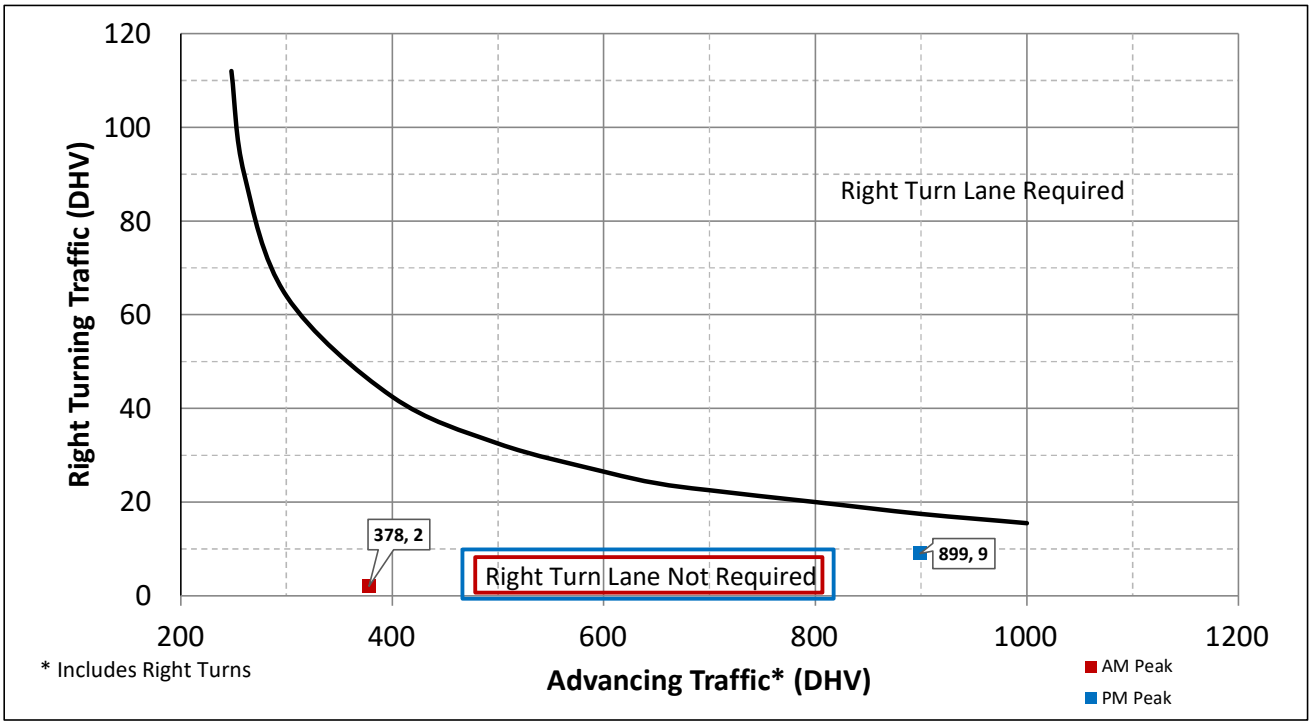
AM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	11	VPH
	Advancing Traffic	331	VPH
	Right Turn Percentage	3%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	
PM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	36	VPH
	Advancing Traffic	805	VPH
	Right Turn Percentage	4%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	
Is Right Turn Warrant Met		Yes	**See Above**

** Turn Lane Length includes 50 ft diverging taper*

** Turn Lane Length includes 50 ft diverging taper*

2-Lane Highway Right Turn Lane Warrant

(> 40 mph or 70 kph Posted Speed)



Turn Lane Length Calculations

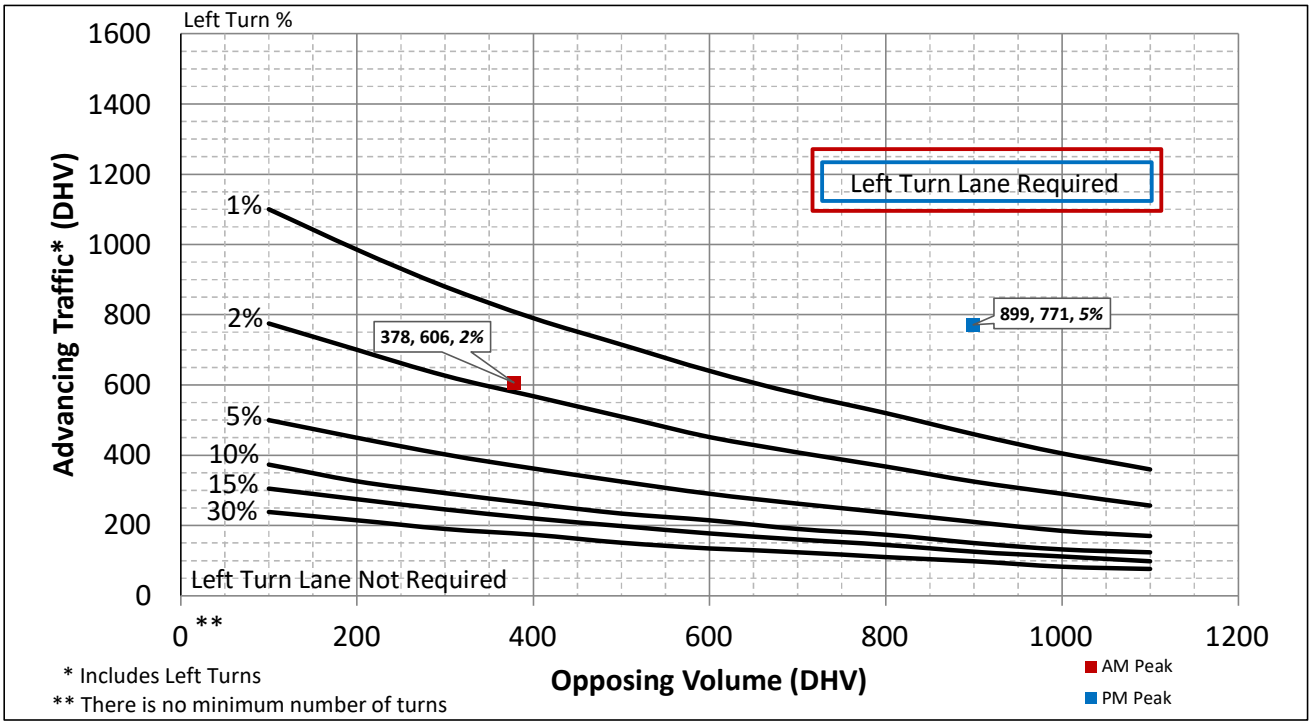
AM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	2	VPH
	Advancing Traffic	378	VPH
	Right Turn Percentage	1%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	
PM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	9	VPH
	Advancing Traffic	899	VPH
	Right Turn Percentage	1%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	
Is Right Turn Warrant Met		No	No Right Turn Lane Required

** Turn Lane Length includes 50 ft diverging taper*

** Turn Lane Length includes 50 ft diverging taper*

2-Lane Highway Left Turn Lane Warrant

(> 40 mph or 70 kph Posted Speed)



Turn Lane Length Calculations

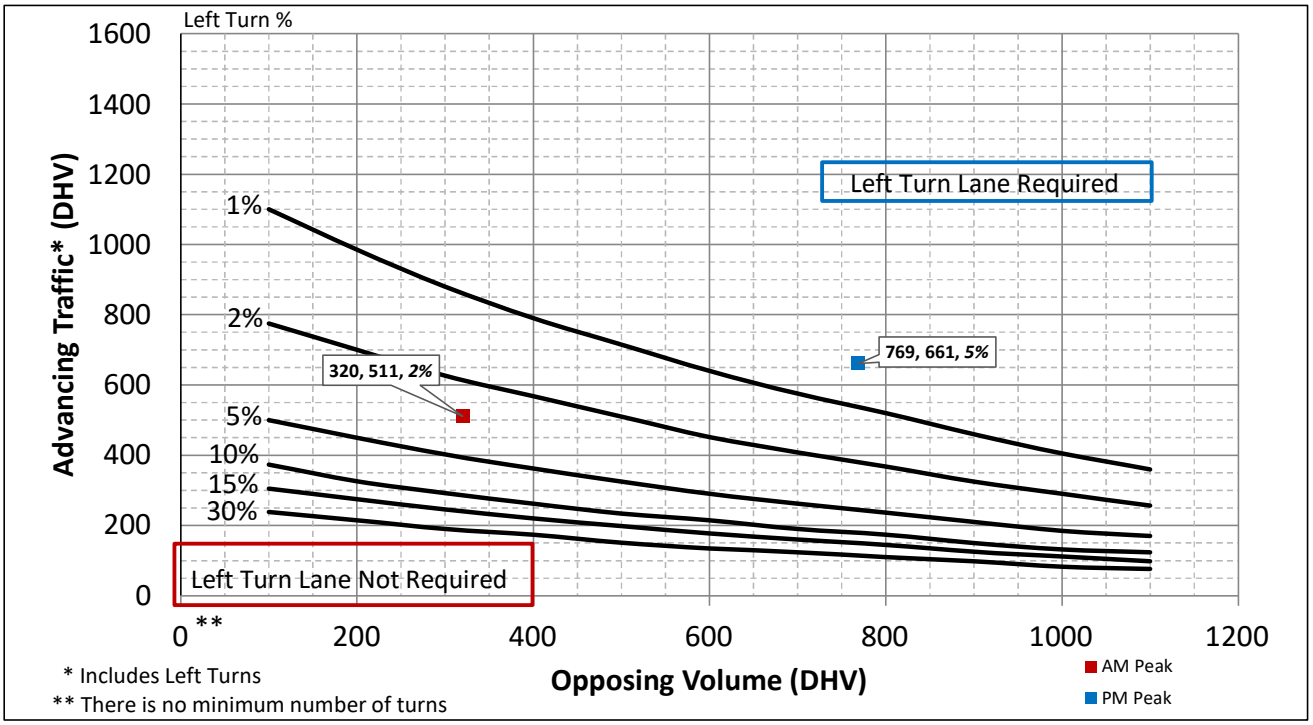
AM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	11	VPH
	Advancing Traffic	606	VPH
	Opposing Volume	378	VPH
	Left Turn Percentage	2%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	
	Offset Width	12	
	Approach Taper	600	
PM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	36	VPH
	Advancing Traffic	771	VPH
	Opposing Volume	899	VPH
	Left Turn Percentage	5%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	
	Offset Width	12	
	Approach Taper	600	
Is Left Turn Warrant Met		Yes	**See Above**

** Turn Lane Length includes 50 ft diverging taper*

** Turn Lane Length includes 50 ft diverging taper*

2-Lane Highway Left Turn Lane Warrant

(> 40 mph or 70 kph Posted Speed)



Turn Lane Length Calculations

AM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	11	VPH
	Advancing Traffic	511	VPH
	Opposing Volume	320	VPH
	Left Turn Percentage	2%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	* Turn Lane Length includes 50 ft diverging taper
	Offset Width	12	
	Approach Taper	600	
PM Peak	Design Speed	50	mph
	Traffic Control	Unsignalized	
	Cycle Length	Unsignalized	
	Cycles Per Hour	60	*Assume 60*
	Turn Lane Volume	36	VPH
	Advancing Traffic	661	VPH
	Opposing Volume	769	VPH
	Left Turn Percentage	5%	
	Location Type	Through Road	
	Condition	B	
	Vehicles/Cycle	1	
	Turn Lane Length	225	* Turn Lane Length includes 50 ft diverging taper
	Offset Width	12	
	Approach Taper	600	
Is Left Turn Warrant Met		Yes	**See Above**

Attachment F
Capacity Analysis

CARPENTER MARTY transportation

Attachment F

Intersection	
Int Delay, s/veh	2.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	293	481	19	62	78
Future Vol, veh/h	25	293	481	19	62	78
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	315	-	-	-	100	-
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	27	318	523	21	67	85

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	544	0	-	0	906	534
Stage 1	-	-	-	-	534	-
Stage 2	-	-	-	-	372	-
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	1025	-	-	-	307	546
Stage 1	-	-	-	-	588	-
Stage 2	-	-	-	-	697	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1025	-	-	-	299	546
Mov Cap-2 Maneuver	-	-	-	-	299	-
Stage 1	-	-	-	-	573	-
Stage 2	-	-	-	-	697	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	16.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1025	-	-	-	299	546
HCM Lane V/C Ratio	0.027	-	-	-	0.225	0.155
HCM Control Delay (s)	8.6	-	-	-	20.5	12.8
HCM Lane LOS	A	-	-	-	C	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.8	0.5

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	293	2	11	481	19	12	0	19	62	0	78
Future Vol, veh/h	25	293	2	11	481	19	12	0	19	62	0	78
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	315	-	-	225	-	-	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	318	2	12	523	21	13	0	21	67	0	85

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	544	0	0	320	0	0	973	941	319	942	932	534
Stage 1	-	-	-	-	-	-	373	373	-	558	558	-
Stage 2	-	-	-	-	-	-	600	568	-	384	374	-
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	1025	-	-	1240	-	-	231	263	722	243	266	546
Stage 1	-	-	-	-	-	-	648	618	-	514	512	-
Stage 2	-	-	-	-	-	-	488	506	-	639	618	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1025	-	-	1240	-	-	190	254	722	230	256	546
Mov Cap-2 Maneuver	-	-	-	-	-	-	190	254	-	230	256	-
Stage 1	-	-	-	-	-	-	631	602	-	501	507	-
Stage 2	-	-	-	-	-	-	408	501	-	604	602	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	0.2	16	19.1
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	190	722	1025	-	-	1240	-	-	230	546
HCM Lane V/C Ratio	0.069	0.029	0.027	-	-	0.01	-	-	0.293	0.155
HCM Control Delay (s)	25.3	10.1	8.6	-	-	7.9	-	-	27	12.8
HCM Lane LOS	D	B	A	-	-	A	-	-	D	B
HCM 95th %tile Q(veh)	0.2	0.1	0.1	-	-	0	-	-	1.2	0.5

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	320	11	0	571	31	15
Future Vol, veh/h	320	11	0	571	31	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	-	-	0	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	348	12	0	621	34	16

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	969	348
Stage 1	-	-	-	-	348	-
Stage 2	-	-	-	-	621	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	0	-	281	695
Stage 1	-	-	0	-	715	-
Stage 2	-	-	0	-	536	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	281	695
Mov Cap-2 Maneuver	-	-	-	-	281	-
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	536	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	16.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBT
Capacity (veh/h)	281	695	-	-	-
HCM Lane V/C Ratio	0.12	0.023	-	-	-
HCM Control Delay (s)	19.5	10.3	-	-	-
HCM Lane LOS	C	B	-	-	-
HCM 95th %tile Q(veh)	0.4	0.1	-	-	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	99	661	560	65	29	66
Future Vol, veh/h	99	661	560	65	29	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	315	-	-	-	100	-
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	108	718	609	71	32	72

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	680	0	-	0	1579	645
Stage 1	-	-	-	-	645	-
Stage 2	-	-	-	-	934	-
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	912	-	-	-	120	472
Stage 1	-	-	-	-	522	-
Stage 2	-	-	-	-	382	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	912	-	-	-	106	472
Mov Cap-2 Maneuver	-	-	-	-	106	-
Stage 1	-	-	-	-	460	-
Stage 2	-	-	-	-	382	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	25.8
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	912	-	-	-	106	472
HCM Lane V/C Ratio	0.118	-	-	-	0.297	0.152
HCM Control Delay (s)	9.5	-	-	-	52.7	14
HCM Lane LOS	A	-	-	-	F	B
HCM 95th %tile Q(veh)	0.4	-	-	-	1.1	0.5

Intersection	
Int Delay, s/veh	3.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	99	661	9	36	560	65	7	0	12	29	0	66
Future Vol, veh/h	99	661	9	36	560	65	7	0	12	29	0	66
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	315	-	-	225	-	-	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	108	718	10	39	609	71	8	0	13	32	0	72

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	680	0	0	728	0	0	1698	1697	723	1669	1667	645
Stage 1	-	-	-	-	-	-	939	939	-	723	723	-
Stage 2	-	-	-	-	-	-	759	758	-	946	944	-
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	912	-	-	876	-	-	73	92	426	76	96	472
Stage 1	-	-	-	-	-	-	317	343	-	417	431	-
Stage 2	-	-	-	-	-	-	399	415	-	314	341	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	912	-	-	876	-	-	54	77	426	65	81	472
Mov Cap-2 Maneuver	-	-	-	-	-	-	54	77	-	65	81	-
Stage 1	-	-	-	-	-	-	280	303	-	368	412	-
Stage 2	-	-	-	-	-	-	323	396	-	268	301	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.2	0.5	39	41.5
HCM LOS			E	E

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	54	426	912	-	-	876	-	-	65	472
HCM Lane V/C Ratio	0.141	0.031	0.118	-	-	0.045	-	-	0.485	0.152
HCM Control Delay (s)	82.3	13.7	9.5	-	-	9.3	-	-	104.2	14
HCM Lane LOS	F	B	A	-	-	A	-	-	F	B
HCM 95th %tile Q(veh)	0.5	0.1	0.4	-	-	0.1	-	-	1.9	0.5

Intersection	
Int Delay, s/veh	0.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	769	36	0	633	19	10
Future Vol, veh/h	769	36	0	633	19	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	-	-	0	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	836	39	0	688	21	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	1524	836
Stage 1	-	-	-	-	836	-
Stage 2	-	-	-	-	688	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	0	-	130	367
Stage 1	-	-	0	-	425	-
Stage 2	-	-	0	-	499	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	130	367
Mov Cap-2 Maneuver	-	-	-	-	130	-
Stage 1	-	-	-	-	425	-
Stage 2	-	-	-	-	499	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	30
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBT
Capacity (veh/h)	130	367	-	-	-
HCM Lane V/C Ratio	0.159	0.03	-	-	-
HCM Control Delay (s)	37.9	15.1	-	-	-
HCM Lane LOS	E	C	-	-	-
HCM 95th %tile Q(veh)	0.5	0.1	-	-	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	25	351	576	19	62	78
Future Vol, veh/h	25	351	576	19	62	78
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	315	-	-	-	100	-
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	27	382	626	21	67	85

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	647	0	-	0	1073	637
Stage 1	-	-	-	-	637	-
Stage 2	-	-	-	-	436	-
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	939	-	-	-	244	477
Stage 1	-	-	-	-	527	-
Stage 2	-	-	-	-	652	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	939	-	-	-	237	477
Mov Cap-2 Maneuver	-	-	-	-	237	-
Stage 1	-	-	-	-	512	-
Stage 2	-	-	-	-	652	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	19.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	939	-	-	-	237	477
HCM Lane V/C Ratio	0.029	-	-	-	0.284	0.178
HCM Control Delay (s)	8.9	-	-	-	26.1	14.2
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1.1	0.6

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	351	2	11	576	19	12	0	19	62	0	78
Future Vol, veh/h	25	351	2	11	576	19	12	0	19	62	0	78
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	315	-	-	225	-	-	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	382	2	12	626	21	13	0	21	67	0	85

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	647	0	0	384	0	0	1140	1108	383	1109	1099	637
Stage 1	-	-	-	-	-	-	437	437	-	661	661	-
Stage 2	-	-	-	-	-	-	703	671	-	448	438	-
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	939	-	-	1174	-	-	178	210	664	187	212	477
Stage 1	-	-	-	-	-	-	598	579	-	452	460	-
Stage 2	-	-	-	-	-	-	428	455	-	590	579	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	939	-	-	1174	-	-	142	202	664	176	204	477
Mov Cap-2 Maneuver	-	-	-	-	-	-	142	202	-	176	204	-
Stage 1	-	-	-	-	-	-	581	562	-	439	455	-
Stage 2	-	-	-	-	-	-	348	450	-	555	562	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.6	0.1	19.2	24.6
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	142	664	939	-	-	1174	-	-	176	477
HCM Lane V/C Ratio	0.092	0.031	0.029	-	-	0.01	-	-	0.383	0.178
HCM Control Delay (s)	32.9	10.6	8.9	-	-	8.1	-	-	37.6	14.2
HCM Lane LOS	D	B	A	-	-	A	-	-	E	B
HCM 95th %tile Q(veh)	0.3	0.1	0.1	-	-	0	-	-	1.7	0.6

Intersection	
Int Delay, s/veh	0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	378	11	0	666	31	15
Future Vol, veh/h	378	11	0	666	31	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	-	-	0	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	411	12	0	724	34	16

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	1135	411
Stage 1	-	-	-	-	411	-
Stage 2	-	-	-	-	724	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	0	-	224	641
Stage 1	-	-	0	-	669	-
Stage 2	-	-	0	-	480	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	224	641
Mov Cap-2 Maneuver	-	-	-	-	224	-
Stage 1	-	-	-	-	669	-
Stage 2	-	-	-	-	480	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	19.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBT
Capacity (veh/h)	224	641	-	-	-
HCM Lane V/C Ratio	0.15	0.025	-	-	-
HCM Control Delay (s)	23.9	10.8	-	-	-
HCM Lane LOS	C	B	-	-	-
HCM 95th %tile Q(veh)	0.5	0.1	-	-	-

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	99	791	670	65	29	66
Future Vol, veh/h	99	791	670	65	29	66
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	315	-	-	-	100	-
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	108	860	728	71	32	72

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	799	0	-	0	1840	764
Stage 1	-	-	-	-	764	-
Stage 2	-	-	-	-	1076	-
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	824	-	-	-	83	404
Stage 1	-	-	-	-	460	-
Stage 2	-	-	-	-	327	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	824	-	-	-	72	404
Mov Cap-2 Maneuver	-	-	-	-	72	-
Stage 1	-	-	-	-	400	-
Stage 2	-	-	-	-	327	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	38.2
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	824	-	-	-	72	404
HCM Lane V/C Ratio	0.131	-	-	-	0.438	0.178
HCM Control Delay (s)	10	-	-	-	89.3	15.8
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.4	-	-	-	1.7	0.6

Intersection	
Int Delay, s/veh	5.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	99	791	9	36	670	65	7	0	12	29	0	66
Future Vol, veh/h	99	791	9	36	670	65	7	0	12	29	0	66
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	315	-	-	225	-	-	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	108	860	10	39	728	71	8	0	13	32	0	72

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	799	0	0	870	0	0	1959	1958	865	1930	1928	764
Stage 1	-	-	-	-	-	-	1081	1081	-	842	842	-
Stage 2	-	-	-	-	-	-	878	877	-	1088	1086	-
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	824	-	-	775	-	-	48	64	353	50	66	404
Stage 1	-	-	-	-	-	-	264	294	-	359	380	-
Stage 2	-	-	-	-	-	-	343	366	-	261	292	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	824	-	-	775	-	-	34	53	353	42	55	404
Mov Cap-2 Maneuver	-	-	-	-	-	-	34	53	-	42	55	-
Stage 1	-	-	-	-	-	-	229	255	-	312	361	-
Stage 2	-	-	-	-	-	-	268	348	-	218	254	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0.5	61.1	76.2
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	34	353	824	-	-	775	-	-	42	404
HCM Lane V/C Ratio	0.224	0.037	0.131	-	-	0.05	-	-	0.751	0.178
HCM Control Delay (s)	139.1	15.6	10	-	-	9.9	-	-	213.7	15.8
HCM Lane LOS	F	C	B	-	-	A	-	-	F	C
HCM 95th %tile Q(veh)	0.7	0.1	0.4	-	-	0.2	-	-	2.8	0.6

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	899	36	0	743	19	10
Future Vol, veh/h	899	36	0	743	19	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	225	-	-	0	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	977	39	0	808	21	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	1785	977
Stage 1	-	-	-	-	977	-
Stage 2	-	-	-	-	808	-
Critical Hdwy	-	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	0	-	90	304
Stage 1	-	-	0	-	365	-
Stage 2	-	-	0	-	438	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	90	304
Mov Cap-2 Maneuver	-	-	-	-	90	-
Stage 1	-	-	-	-	365	-
Stage 2	-	-	-	-	438	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	43
HCM LOS			E

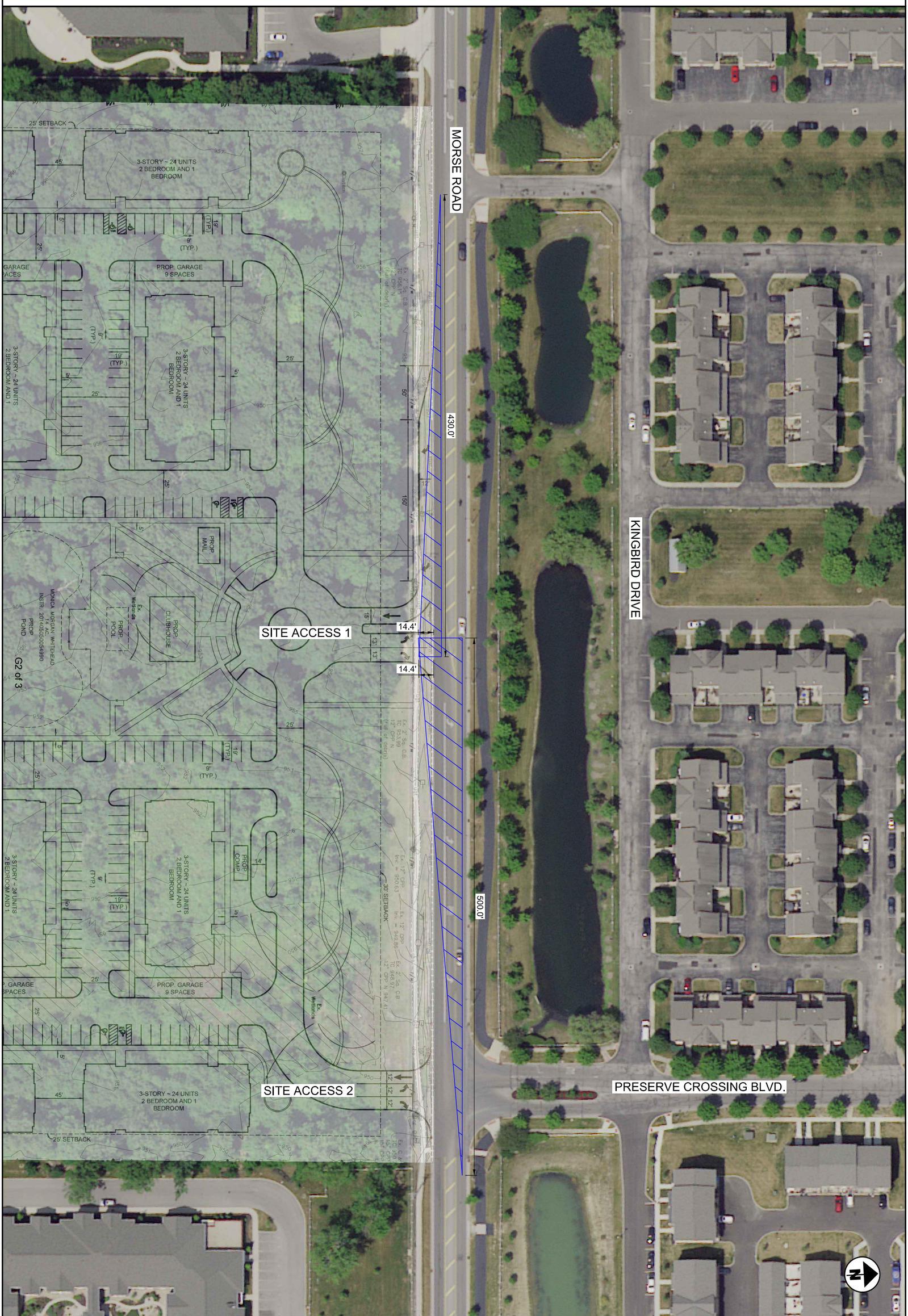
Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBT
Capacity (veh/h)	90	304	-	-	-
HCM Lane V/C Ratio	0.229	0.036	-	-	-
HCM Control Delay (s)	56.5	17.3	-	-	-
HCM Lane LOS	F	C	-	-	-
HCM 95th %tile Q(veh)	0.8	0.1	-	-	-

Attachment G
Sight Distance Analysis

CARPENTER MARTY transportation

Attachment G

CTY-RTE-SECTION



SHEET	TOTAL
P.1	2

PROJECT ID: 0

REVIEWER: AML 02-11-22

DESIGNER: LRY

DESIGN AGENCY: CARPENTER MARTY transportation

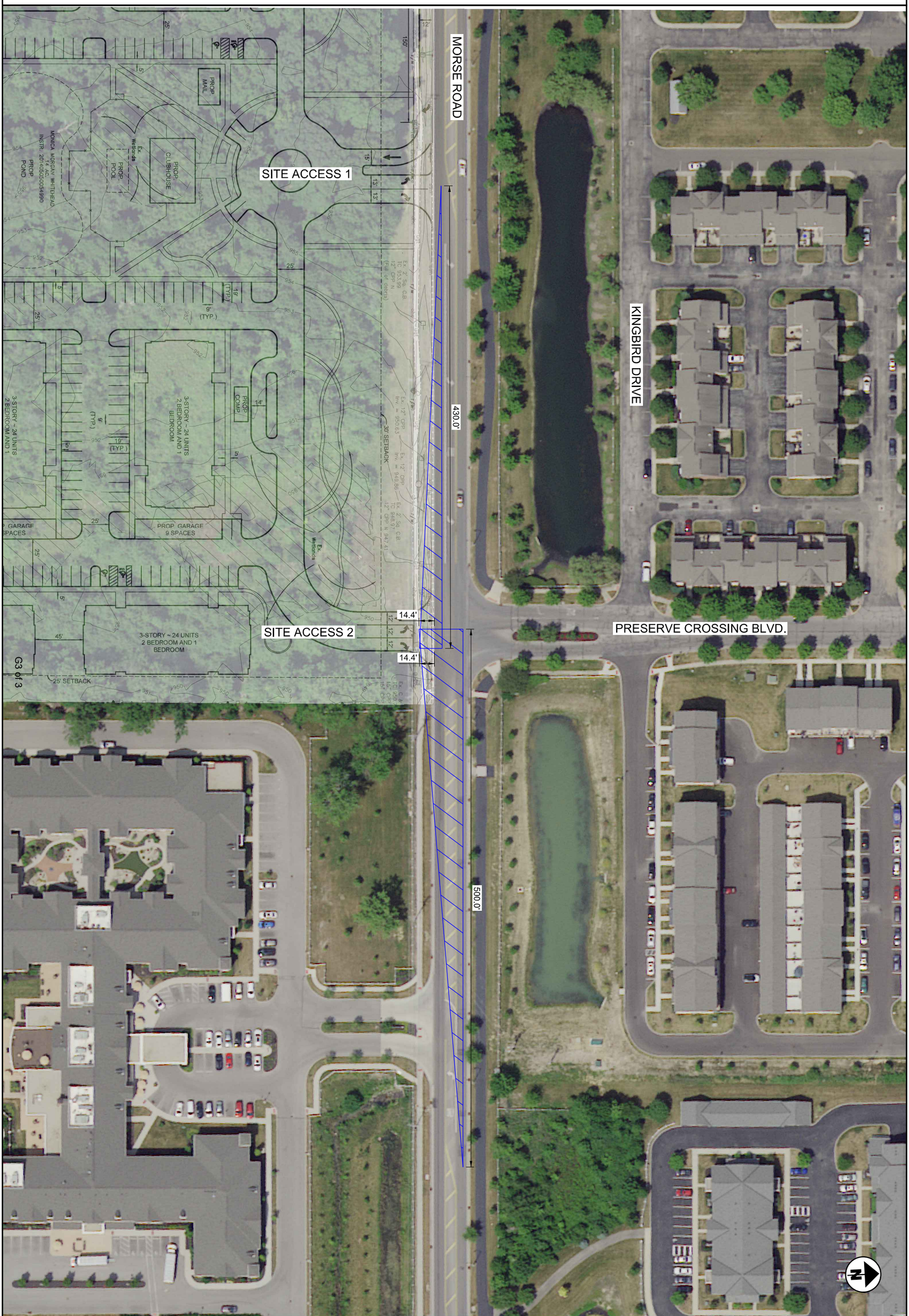
MORSE ROAD MULTIFAMILY TAS
SITE ACCESS 1 & MORSE ROAD SIGHT DISTANCE EXHIBIT

HORIZONTAL SCALE IN FEET

0 20

0 40

CTY-RTE-SECTION



SHEET	TOTAL
P 2	2

PROJECT ID: 0

REVIEWER: AML 02-11-22

DESIGNER: LRY

DESIGN AGENCY: CARPENTER MARTY transportation

MORSE ROAD MULTIFAMILY TAS
SITE ACCESS 2 & MORSE ROAD SIGHT DISTANCE EXHIBIT

HORIZONTAL SCALE IN FEET

0 20

0 40