

final report

January 14, 2020

Traffic Impact Study

9922 Brentlinger Lane
Louisville, KY 40059

Prepared for

Louisville Metro Planning Commission



DIANE B. ZIMMERMAN
Traffic Engineering, LLC

12803 High Meadows Pike
Prospect, KY 40059
502-648-1855
diane@dm@att.net



Table of Contents

INTRODUCTION	2
Figure 1. Site Map.....	2
EXISTING CONDITIONS	2
Figure 2. Existing Peak Hour Volumes	3
FUTURE CONDITIONS	3
Figure 3. 2022 No Build Peak Hour Volumes.....	3
TRIP GENERATION	3
Table 1. Peak Hour Trips Generated by Site	4
Figure 4. Trip Distribution Percentages.....	4
Figure 5. Peak Hour Trips Generated by Site.....	5
Figure 6. 2022 Build Peak Hour Volumes	5
ANALYSIS	5
Table 2. Peak Hour Level of Service.....	6
CONCLUSIONS	6
APPENDIX	7

INTRODUCTION

The development plan for 9922 Brentlinger Lane in Louisville, KY shows 116 multi-family units. **Figure 1** displays a map of the site. Access to the development will be from an entrance on Brentlinger Lane and Major Lane. The purpose of this study is to examine the traffic impacts of the development upon the adjacent highway system. For this study, the impact area was defined to be the intersection of Brentlinger Lane with Leaders Lane.

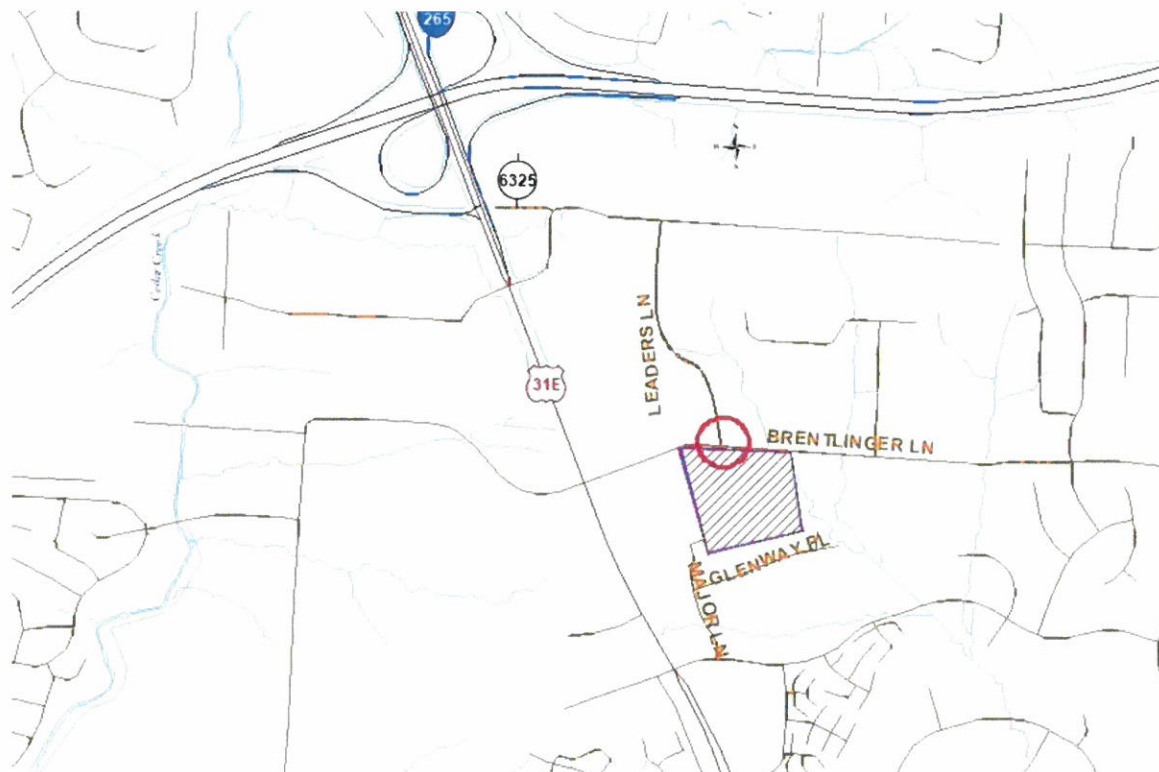


Figure 1. Site Map

EXISTING CONDITIONS

Brentlinger Lane is maintained by Louisville Metro with an estimated 2019 Average Annual Daily Traffic (AADT) volume of 3,200 vehicles per day between Bardstown Road and Broad Run Road, as estimated by the Kentucky Transportation Cabinet count station 318. The road has two lanes of nine feet and one-foot shoulders through study area. The speed limit is 35 mph. There are no sidewalks along the property. There are sidewalks along the adjacent property to the west. The intersection with Leaders Lane is controlled with a stop sign on Leaders Lane.

Peak hour traffic counts for the intersections were obtained on Thursday, October 17, 2019. The a.m. peak hour occurred between 8:00 and 9:00 and the p.m. peak hour was 4:45 to 5:45. **Figure 2** illustrates the existing a.m. and p.m. peak hour traffic volumes. The Appendix contains the full count data for the intersection.

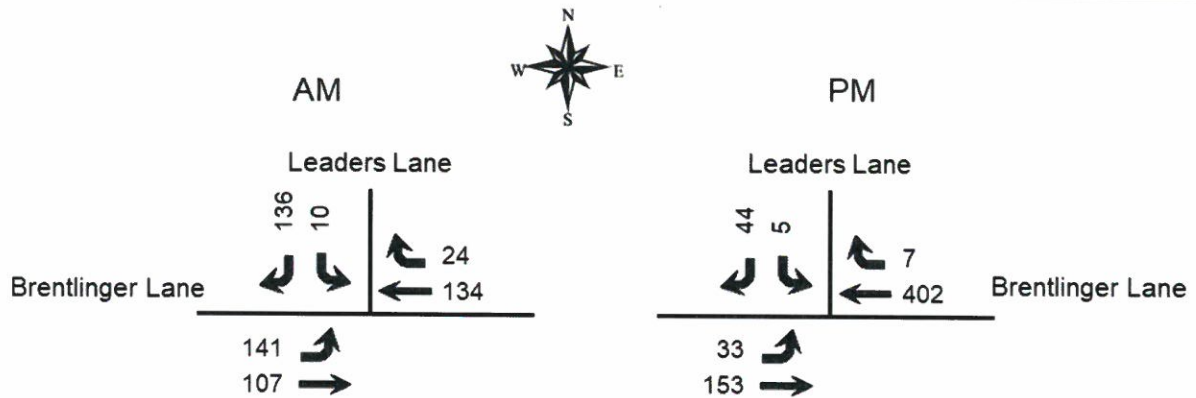


Figure 2. Existing Peak Hour Volumes

FUTURE CONDITIONS

The project completion date is 2022. An annual growth rate of 2.0 percent was applied to the through volumes on Brentlinger Lane. The trips generated by the proposed Southpointe Commons from their traffic study were included on Leaders Lane. A left-turn lane on eastbound Brentlinger Lane is currently in the design phase. **Figure 3** displays the 2022 No Build peak hour volumes.

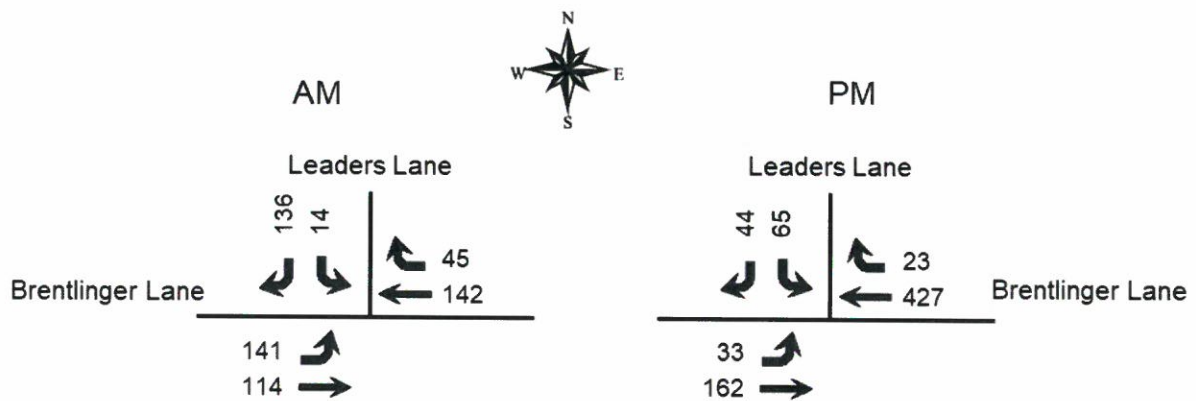


Figure 3. 2022 No Build Peak Hour Volumes

TRIP GENERATION

The Institute of Transportation Engineers Trip Generation Manual, 10th Edition contains trip generation rates for a wide range of developments. The land uses of “Multi-Family (Low-Rise) (220)” was reviewed and determined to be the best match. The trip generation results are listed in **Table 1**. The trips were assigned to the highway network with the percentages shown in **Figure 4**. **Figure 5** shows the trips generated by this development and distributed throughout the road network during the peak hours. **Figure 6** displays the individual turning movements for the peak hours when the development is completed.

Table 1. Peak Hour Trips Generated by Site

Land Use	A.M. Peak Hour			P.M. Peak Hour		
	Trips	In	Out	Trips	In	Out
Multi-Family (116 units)	55	13	42	67	42	35

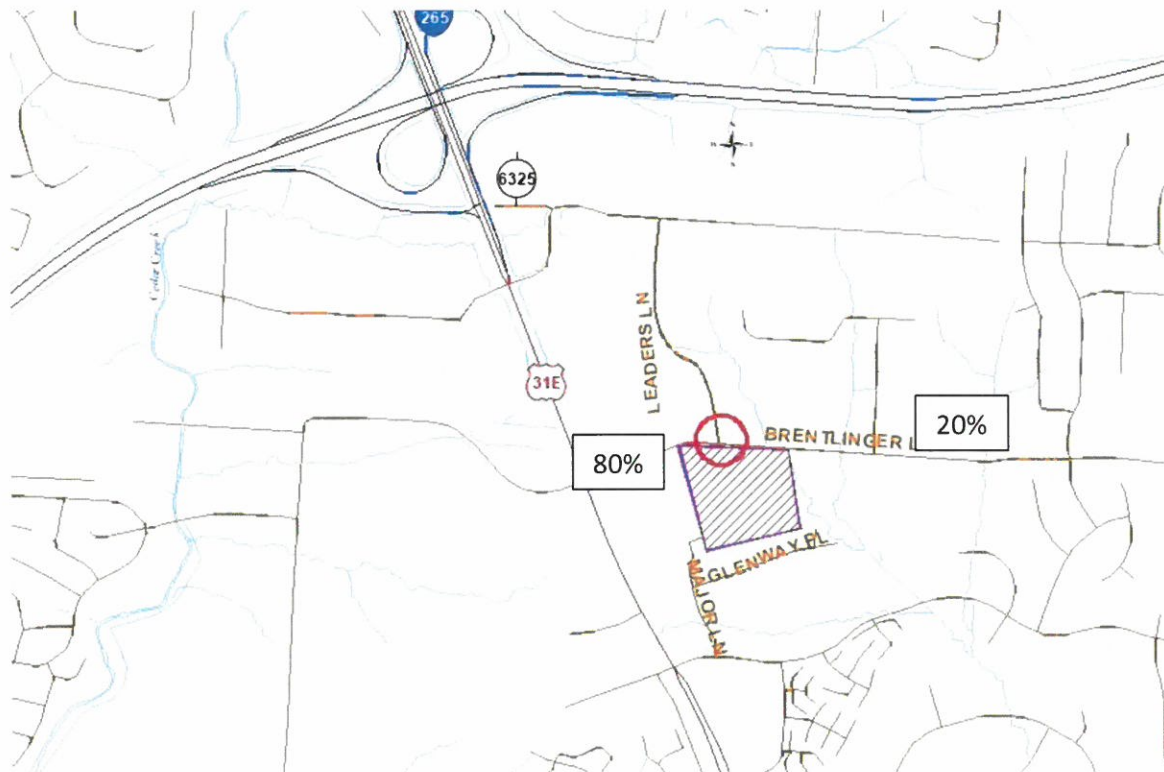


Figure 4. Trip Distribution Percentages

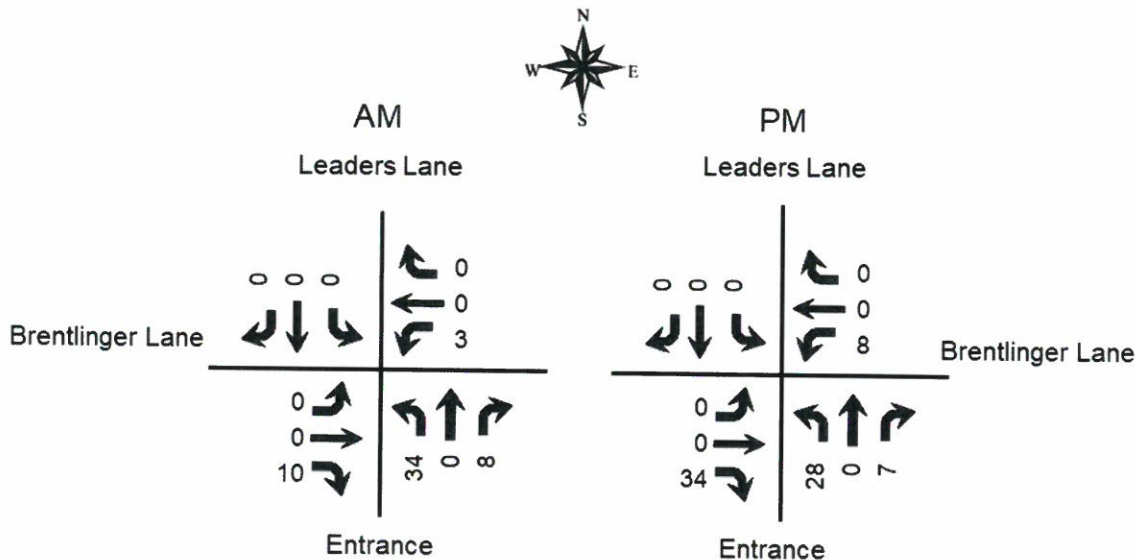


Figure 5. Peak Hour Trips Generated by Site

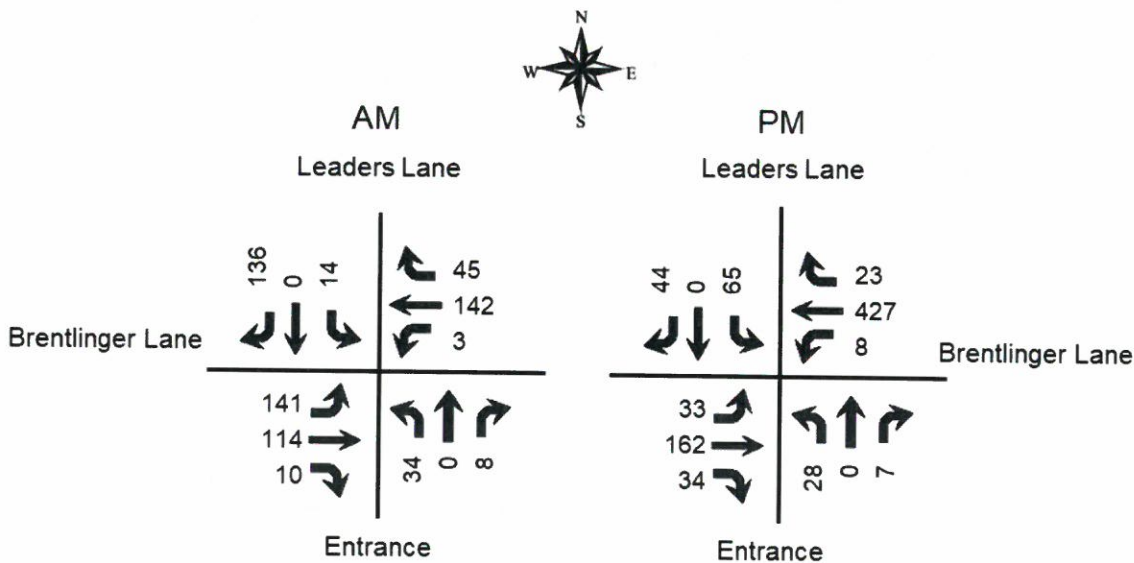


Figure 6. 2022 Build Peak Hour Volumes

ANALYSIS

The qualitative measure of operation for a roadway facility or intersection is evaluated by assigning a "Level of Service". Level of Service is a ranking scale from A through F, "A" is the best operating condition and "F" is the worst. Level of Service results depend upon the facility that is analyzed. In this case, the Level of Service is based upon the total delay experienced for lanes at stop-controlled intersections.

To evaluate the impact of the proposed development, the vehicle delays at the intersections were determined using procedures detailed in the Highway Capacity Manual, 6th edition. Future delays and Level of Service were determined

for the intersections using the HCS Streets (version 7.8.5) software. The delays and Level of Service are summarized in **Table 2**.

Table 2. Peak Hour Level of Service

Approach	A.M.			P.M.		
	2019 Existing	2022 No Build	2022 Build	2019 Existing	2022 No Build	2022 Build
Brentlinger Lane at Leaders Lane						
Brentlinger Lane Eastbound (Left turn)	A 8.1	A 8.3	A 8.3	A 8.3	A 8.4	A 8.4
Brentlinger Lane Westbound (Left turn)			A 7.6			A 7.6
Entrance Northbound			C 21.5			B 14.3
Leaders Lane Southbound	B 11.7	B 12.6	B 12.2	B 11.7	C 15.8	B 14.9

Key: Level of Service, Delay in seconds per vehicle

The intersection of Brentlinger Lane at the entrance was evaluated for turn lanes using the Kentucky Transportation Cabinet Highway Design Guidance Manual dated March, 2017. Using the volumes in Figure 6, no turn lanes will be required for the entrance.

CONCLUSIONS

Based upon the volume of traffic generated by the development and the amount of traffic forecasted for the year 2022, there will be a minor impact to the existing highway network. No improvements are required for this development.

APPENDIX

Brentlinger Lane
Traffic Impact Study

Traffic Counts

Jefferson County, KY
Classified Turn Movement Count



Marr Traffic
Transportation Data Collection

41 Peabody Street, Nashville, TN 37210
10 Glenlake Parkway, Suite 130, Atlanta, GA 30328
555 Fayetteville Street, Suite 201, Raleigh, NC 27601
1229 South Shelby Street, Louisville, KY 40203
6565 North MacArthur Boulevard, Suite 225, Dallas, TX 75039

Site 1 of 1
Local Access
Brentlinger Ln (East)

hello@marrtraffic.com
www.marrtraffic.com

Brentlinger Ln (West)

Lat/Long
38.134886°, -85.576344°

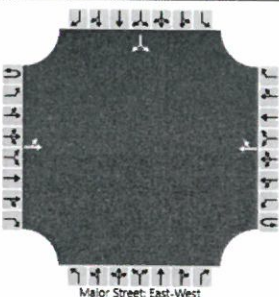
Date
Thursday, October 17, 2019

Weather
Fair
51°F

1 (800) 615-3765

	Southbound					Westbound					Eastbound					Int
	Local Access					Brentlinger Ln (East)					Brentlinger Ln (West)					
	U-Turn	Left	Right	Peds	App	U-Turn	Thru	Right	Peds	App	U-Turn	Left	Thru	Peds	App	
0700 - 0715	0	0	8	0	8	0	47	1	0	48	0	2	27	0	29	85
0715 - 0730	0	0	5	0	5	0	43	2	0	45	0	5	36	0	41	91
0730 - 0745	0	1	2	0	3	0	47	0	0	47	0	5	57	0	62	112
0745 - 0800	0	1	3	0	4	0	40	1	0	41	0	1	64	0	65	110
0800 - 0815	0	1	2	0	3	0	39	3	0	42	0	5	31	0	36	81
0815 - 0830	0	1	5	0	6	0	27	1	0	28	0	23	31	0	54	88
0830 - 0845	0	3	64	0	67	0	36	9	0	45	0	50	24	0	74	186
0845 - 0900	0	5	65	0	70	0	32	11	0	43	0	63	21	0	84	197
1530 - 1545	0	1	2	0	3	0	45	2	0	47	0	17	33	0	50	100
1545 - 1600	0	2	49	0	51	0	49	4	0	53	0	20	35	0	55	159
1600 - 1615	0	6	42	0	48	0	60	1	0	61	0	15	36	0	51	160
1615 - 1630	0	1	9	0	10	0	71	2	0	73	0	8	23	0	31	114
1630 - 1645	0	1	4	0	5	0	75	1	0	76	0	9	32	0	41	122
1645 - 1700	0	0	5	0	5	0	85	3	0	88	0	13	29	0	42	135
1700 - 1715	0	4	25	0	29	0	94	3	0	97	0	9	38	0	47	173
1715 - 1730	0	0	8	0	8	0	109	0	0	109	0	3	42	0	45	162
1730 - 1745	0	1	6	0	7	0	114	1	0	115	0	8	44	0	52	174
1745 - 1800	0	0	5	0	5	0	87	0	0	87	0	2	38	0	40	132
0800 - 0815	0	1	2	0	3	0	39	3	0	42	0	5	31	0	36	81
0815 - 0830	0	1	5	0	6	0	27	1	0	28	0	23	31	0	54	88
0830 - 0845	0	3	64	0	67	0	36	9	0	45	0	50	24	0	74	186
0845 - 0900	0	5	65	0	70	0	32	11	0	43	0	63	21	0	84	197
AM PEAK TOTAL	0	10	136	0	146	0	134	24	0	158	0	141	107	0	248	552
1645 - 1700	0	0	5	0	5	0	85	3	0	88	0	13	29	0	42	135
1700 - 1715	0	4	25	0	29	0	94	3	0	97	0	9	38	0	47	173
1715 - 1730	0	0	8	0	8	0	109	0	0	109	0	3	42	0	45	162
1730 - 1745	0	1	6	0	7	0	114	1	0	115	0	8	44	0	52	174
PM PEAK TOTAL	0	5	44	0	49	0	402	7	0	409	0	33	153	0	186	644

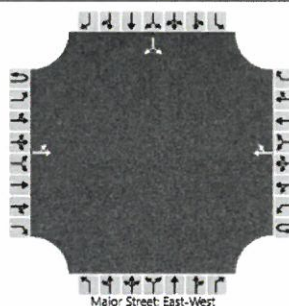
HCS REPORTS

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Brentlinger at Leaders								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	1/13/2020							East/West Street	Brentlinger Lane								
Analysis Year	2019							North/South Street	Leaders Lane								
Time Analyzed	AM Peak							Peak Hour Factor	0.70								
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25								
Project Description	Brentlinger Lane																
Lanes																	
 <p>Major Street: East-West</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0	
Configuration		LT						TR							LR		
Volume (veh/h)		141	107				134	24						10		136	
Percent Heavy Vehicles (%)		0												10		1	
Proportion Time Blocked																	
Percent Grade (%)														0			
Right Turn Channelized																	
Median Type Storage		Undivided															
Critical and Follow-up Headways																	
Base Critical Headway (sec)		4.1												7.1		6.2	
Critical Headway (sec)		4.10												6.50		6.21	
Base Follow-Up Headway (sec)		2.2												3.5		3.3	
Follow-Up Headway (sec)		2.20												3.59		3.31	
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)		201														209	
Capacity, c (veh/h)		1355														744	
v/c Ratio		0.15														0.28	
95% Queue Length, Q ₉₅ (veh)		0.5														1.1	
Control Delay (s/veh)		8.1														11.7	
Level of Service (LOS)		A														B	
Approach Delay (s/veh)		5.2												11.7			
Approach LOS													B				

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Brentlinger at Leaders
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	1/13/2020	East/West Street	Brentlinger Lane
Analysis Year	2022	North/South Street	Leaders Lane
Time Analyzed	AM Peak No Build	Peak Hour Factor	0.70
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Brentlinger Lane		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound					
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R		
Movement	1U	1	2	3	4U	4	5	6			7	8	9			10	11	12
Priority																		
Number of Lanes	0	0	1	0	0	0	1	0			0	0	0			0	1	0
Configuration		LT						TR								LR		
Volume (veh/h)		141	114				142	45								14		136
Percent Heavy Vehicles (%)		0														10		1
Proportion Time Blocked																		
Percent Grade (%)																0		
Right Turn Channelized																		
Median Type Storage	Undivided																	

Critical and Follow-up Headways

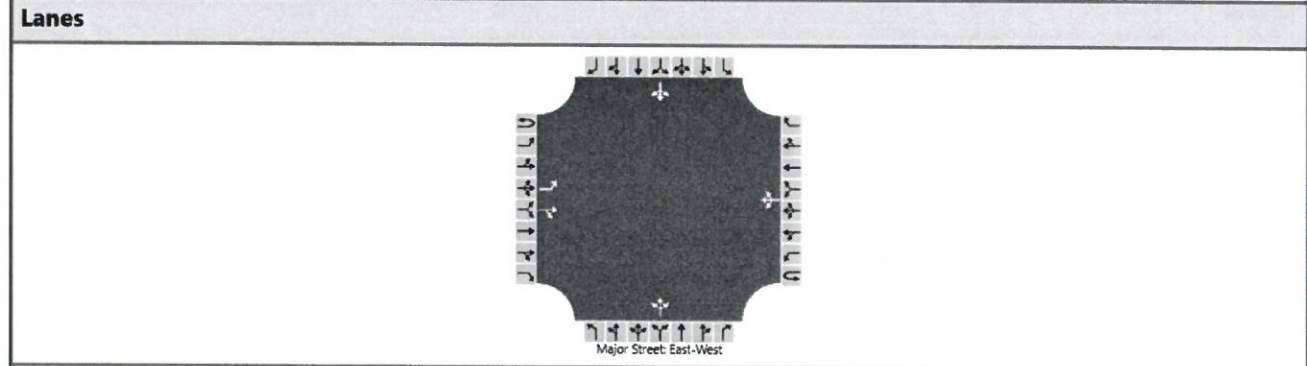
Base Critical Headway (sec)		4.1													7.1		6.2
Critical Headway (sec)		4.10													6.50		6.21
Base Follow-Up Headway (sec)		2.2													3.5		3.3
Follow-Up Headway (sec)		2.20													3.59		3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		201															214	
Capacity, c (veh/h)		1308															689	
v/c Ratio		0.15															0.31	
95% Queue Length, Q ₉₅ (veh)		0.5															1.3	
Control Delay (s/veh)		8.3															12.6	
Level of Service (LOS)		A															B	
Approach Delay (s/veh)		5.2													12.6			
Approach LOS															B			

HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	DBZ	Intersection	Brentlinger at Leaders
Agency/Co.	Diane B Zimmerman Traffic Engineering	Jurisdiction	
Date Performed	1/13/2020	East/West Street	Brentlinger Lane
Analysis Year	2022	North/South Street	Leader/Entrance
Time Analyzed	AM Peak Build	Peak Hour Factor	0.70
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	Brentlinger		



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	1	1	0	0	0	1	0		0	1	0		0	1	0
Configuration		L		TR			LTR				LTR				LTR	
Volume (veh/h)		141	114	10		3	142	45		34	0	8		14	0	136
Percent Heavy Vehicles (%)		0				0				0	0	0		10	0	1
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type Storage					Left Only								1			

Critical and Follow-up Headways

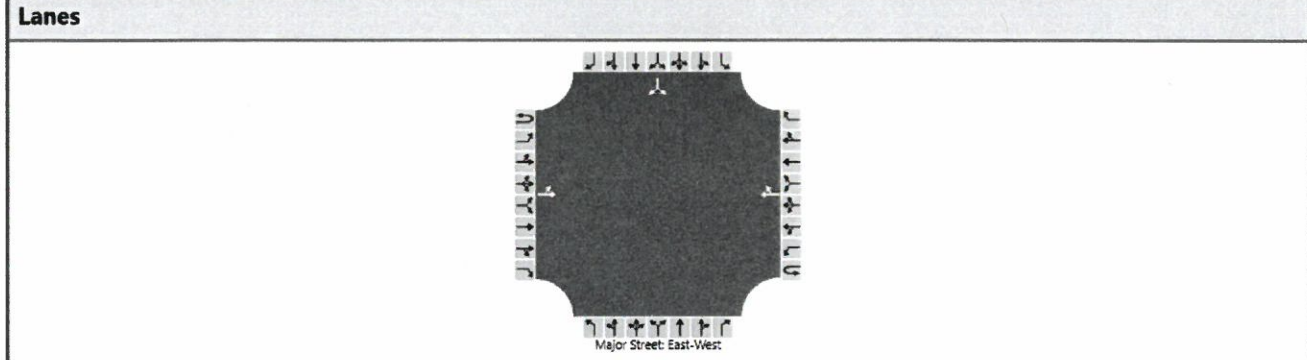
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.20	6.50	6.21
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.59	4.00	3.31

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		201				4					60					214	
Capacity, c (veh/h)		1308				1411					278					712	
v/c Ratio		0.15				0.00					0.22					0.30	
95% Queue Length, Q ₉₅ (veh)		0.5				0.0					0.8					1.3	
Control Delay (s/veh)		8.3				7.6					21.5					12.2	
Level of Service (LOS)		A				A					C					B	
Approach Delay (s/veh)		4.4				0.1				21.5				12.2			
Approach LOS										C				B			

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	DBZ			Intersection	Brentlinger at Leaders		
Agency/Co.	Diane B Zimmerman Traffic Engineering			Jurisdiction			
Date Performed	1/13/2020			East/West Street	Brentlinger Lane		
Analysis Year	2019			North/South Street	Leaders Lane		
Time Analyzed	PM Peak			Peak Hour Factor	0.93		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description	Brentlinger Lane						



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Movement	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Priority																
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR							LR	
Volume (veh/h)		33	153				407	7						5		44
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		35														53
Capacity, c (veh/h)		1126														589
v/c Ratio		0.03														0.09
95% Queue Length, Q ₉₅ (veh)		0.1														0.3
Control Delay (s/veh)		8.3														11.7
Level of Service (LOS)		A														B
Approach Delay (s/veh)		1.7												11.7		
Approach LOS														B		

HCS7 Two-Way Stop-Control Report																
General Information								Site Information								
Analyst	DBZ							Intersection	Brentlinger at Leaders							
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction								
Date Performed	1/13/2020							East/West Street	Brentlinger Lane							
Analysis Year	2022							North/South Street	Leaders Lane							
Time Analyzed	PM Peak No Build							Peak Hour Factor	0.93							
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25							
Project Description	Brentlinger Lane															
Lanes																
<p>Major Street: East-West</p>																
Vehicle Volumes and Adjustments																
Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	0	0	0	1	0		0	0	0		0	1	0
Configuration		LT						TR								LR
Volume (veh/h)		33	162				427	23						65		44
Percent Heavy Vehicles (%)		0												0		0
Proportion Time Blocked																
Percent Grade (%)														0		
Right Turn Channelized																
Median Type Storage	Undivided															
Critical and Follow-up Headways																
Base Critical Headway (sec)		4.1												7.1		6.2
Critical Headway (sec)		4.10												6.40		6.20
Base Follow-Up Headway (sec)		2.2												3.5		3.3
Follow-Up Headway (sec)		2.20												3.50		3.30
Delay, Queue Length, and Level of Service																
Flow Rate, v (veh/h)		35														117
Capacity, c (veh/h)		1089														449
v/c Ratio		0.03														0.26
95% Queue Length, Q ₉₅ (veh)		0.1														1.0
Control Delay (s/veh)		8.4														15.8
Level of Service (LOS)		A														C
Approach Delay (s/veh)	1.7												15.8			
Approach LOS													C			

HCS7 Two-Way Stop-Control Report																	
General Information								Site Information									
Analyst	DBZ							Intersection	Brentlinger at Leaders								
Agency/Co.	Diane B Zimmerman Traffic Engineering							Jurisdiction									
Date Performed	1/13/2020							East/West Street	Brentlinger Lane								
Analysis Year	2022							North/South Street	Leader/Entrance								
Time Analyzed	PM Peak Build							Peak Hour Factor	0.93								
Intersection Orientation	East-West							Analysis Time Period (hrs)	0.25								
Project Description	Brentlinger																
Lanes																	
<p>Major Street: East-West</p>																	
Vehicle Volumes and Adjustments																	
Approach	Eastbound				Westbound				Northbound				Southbound				
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R	
Priority	1U	1	2	3	4U	4	5	6			7	8	9		10	11	12
Number of Lanes	0	1	1	0	0	0	1	0			0	1	0		0	1	0
Configuration		L		TR			LTR				LTR				LTR		
Volume (veh/h)		33	162	34		8	427	23			28	0	7		65	0	44
Percent Heavy Vehicles (%)		0				0					0	0	0		0	0	0
Proportion Time Blocked																	
Percent Grade (%)											0					0	
Right Turn Channelized																	
Median Type Storage					Left Only									1			
Critical and Follow-up Headways																	
Base Critical Headway (sec)		4.1				4.1				7.1	6.5	6.2		7.1	6.5	6.2	
Critical Headway (sec)		4.10				4.10				7.10	6.50	6.20		7.10	6.50	6.20	
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3	
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30	
Delay, Queue Length, and Level of Service																	
Flow Rate, v (veh/h)		35				9					38					117	
Capacity, c (veh/h)		1089				1372					423					480	
v/c Ratio		0.03				0.01					0.09					0.24	
95% Queue Length, Q ₉₅ (veh)		0.1				0.0					0.3					0.9	
Control Delay (s/veh)		8.4				7.6					14.3					14.9	
Level of Service (LOS)		A				A					B					B	
Approach Delay (s/veh)	1.2				0.2				14.3				14.9				
Approach LOS	A				A				B				B				