Memorandum

TO: Mr. Wilhelm Kreuzer
TRG Acquisitions, LLC

FROM: Stephen B. Corcoran, P.E., PTOE
Director of Traffic Engineering

DATE: October 31, 2018

RE: Culver's and Circle K
Traffic Study
Naperville, Illinois

This memorandum summarizes a traffic study conducted for a Culver's restaurant and a Circle K gas station with a convenience store/car wash in Naperville, Illinois. The site is located between Naper Boulevard and Naperville-Warrenville Road north of the former Fair Oaks car dealership and south of the Bueno Beef restaurant. Culver's will have a 4,459 square foot restaurant with a drive-thru window. The Circle K gas station will have 20 fueling positions, a 4,435 square foot convenience store, and a car wash. Access to the development will be provided by one access drive on Naper Boulevard and one drive on Naperville-Warrenville Road. The purpose of the study was to observe the existing traffic patterns in the area of the site, estimate the traffic generated by the changes in the site plan, and then identify strategies to eliminate any traffic issues.

EXISTING CONDITIONS

Site Location and Area Land-Use

The subject site was formerly occupied by the Great Lake Credit Union and its building will be demolished as part of the plan. Retail shopping centers are located east and west of the site and a Bueno Beef fast food restaurant is located to the north. The vacant Fair Oaks car dealership is located to the south. **Figure 1** illustrates the site and the surrounding land-uses and roads. (Note: all figures are located at the end of the report).

Roadway Characteristics

The subject property benefits from two existing full access points on the following roadways:

Naperville-Warrenville Road (DuPage Route 23) is a north-south Major Collector extending south from Naper Boulevard to Old Plank Road. Along the site frontage, it has two through lanes in each direction with no median. An existing full access drive serves the site from Naperville-Warrenville Road. It is under the jurisdiction of the City of Naperville with a 40 mph posted speed limit.

Naper Boulevard (DuPage Route 23) is a north-south Other Principal Arterial with two travel lanes in each direction. At its signalized intersection with Tower Plaza (the retail center to the east) and the subject property, it has a shared thru/right-turn lane, a thru lane, and a separate left-turn lane on the north approach and a separate right-turn lane, two thru lanes, and a separate left-turn lane on the south approach. The current signalized access to the site for the closed credit union is temporarily blocked. It is under the jurisdiction of DuPage Division of Transportation and has a 40 mph posted speed limit.

Existing Traffic Volumes

Weekday morning (7:00 to 9:00 AM), midday (11:30 AM-1:30 PM) and afternoon (4:00 to 6:00 PM) traffic counts were conducted at the Naper Boulevard at the Tower Crossing access (traffic signal) and at Naperville-Warrenville Road at the Ogden Mall and Minuteman Plaza service drives. These counts showed the peak-hours of traffic occurring from 7:00 to 8:00 AM, 12:00 to 1:00 PM, and 4:30 to 5:30 PM on a weekday. Naper Boulevard carries a high volume of two-way traffic with 1,800 to 2,700 vehicles per hour (vph). Naperville-Warrenville Road next to the site carries 800 and 1,200 vph during the peak hours.

There was minimal traffic using the Minuteman Plaza driveway. The existing traffic volumes are shown in **Figure 2** and included in the **Appendix**.

SITE TRAFFIC CHARACTERISTICS

Trip Generation

The additional traffic generated by the development was estimated from data in the Institute of Transportation Engineer's Trip Generation 10th Ed. manual which contains trip generation surveys of fast food restaurants and gas stations with convenience stores/car washes. The resulting site traffic volumes are shown in **Table 1.** The ITE Trip Generation 10th Ed. manual also notes than many of the trips to a gas station and restaurant are drawn from vehicles traveling past the site today. These pass-by trips are existing vehicles that would stop and then continue on with their original trip to work or home which minimizes any increase the overall traffic on the road system.

Table 1
Site Traffic Volumes

Use	Size	Morning Peak			Midday Peak			Evening Peak		
		In	Out	Total	In	Out	Total	In	Out	Total
Culver's[1] Restaurant	4,459 sq. ft.	-	-	-	110	110	220	70	70	140
Circle K[2] Gas Station With C-Store and Car Wash	20 fueling positions	280	280	560	210	210	420	230	230	460
	Total Trips	**280**	**280**	**560**	**320**	**320**	**640**	**300**	**300**	**600**

(1) ITE Land Use Code 934 – Fat Food with Drive Thru
(2) ITE Land Use Code 960 – Super Convenience Market/Gas Station

Trip Distribution

The trip distribution for any gas station is based on a combination of the existing traffic volumes going by the site and the road network. The existing traffic flows heavily influenced the distribution of site traffic. The trip distribution for the site is shown on **Table 2** and **Figure 3**.

Table 2
Directional Distribution

Approach Route	Percentage
From the North on Naper Boulevard	30%
From the South on Naper Boulevard	25%
From the East from Tower Plaza	5%
From the North on Naperville-Warrenville Road	20%
From the South on Naperville-Warrenville Road	20%
Total	**100%**

Trip Assignment

The future vehicular trips generated by the development were distributed to the area roadways based on the directional distribution analysis and the proposed site plan. **Figure 4** displays the trip assignment for the Culver's restaurant system. **Figure 5** shows the new site volumes for the Circle K gas station.

Projected Traffic Volumes

Total traffic volumes are a combination of the existing traffic volumes, projected non-site growth in those volumes, and the site traffic. Construction and opening of the restaurant and gas station is planned to be completed in 2019. The total traffic volumes are estimated for a period five years after the projected opening which is the Year 2024. Data provided by the Chicago Metropolitan Agency for Planning shows a growth rate on both roads of 0.4% per year. A copy of the CMAP letter is included in the **Appendix**. This growth rate was applied to the existing traffic volumes to obtain the base 2024 volumes without the development (see **Figure 6**). The volumes from Figure 6 were combined with the site traffic volumes (Figures 4 and 5) to generate the Year 2024 total traffic volumes with the development which are shown on **Figure 7**.

ANALYSES

Future Traffic Conditions

In order to determine the operation of study area intersections and access drives, intersection capacity analyses were conducted with the proposed and nearby developments included. An intersection's ability to accommodate traffic flow is based on the average control delay experienced by vehicles passing through the intersection. The intersection and individual traffic movements are assigned a level of service (LOS), ranging from A to F based on the control delay created by a traffic signal or stop sign. Control delay consists of the initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS A has the best traffic flow and least delay. LOS E represents saturated or at capacity conditions. LOS F experiences oversaturated conditions and extensive delays. The Highway Capacity Manual definitions for levels of service and the corresponding control delay for both signalized and unsignalized intersections are shown in **Table 3**.

Table 3
Level of Service Criteria for Intersections

Level of Service	Description	Control Delay (seconds/vehicle)	
		Signals	Stop Signs
A	Minimal delay and few stops	<10	<10
B	Low delay with more stops	>10-20	>10-15
C	Light congestion	>20-35	>15-25
D	Congestion is more noticeable with longer delays	>35-55	>25-35
E	High delays and number of stops	>55-80	>35-50
F	Unacceptable delays and over capacity	>80	>50

The existing and total traffic volumes were applied to the proposed access system and capacity analyses were completed to determine the existing and future operating conditions with the gas station and restaurant. **Table 4** summarizes the results of those analyses.

Western Internal Drives on East-West Circulation Road

The western drives to the Circle K (north) and the Culvers (south) are located 80 feet east of Naperville-Wheaton Road. Both drives are two-way and 31 feet wide for Circle K and 26 feet wide for Culver's. Outbound traffic is controlled by a stop sign with good levels of service (A or B) during the peak-hours of operation.

Eastern Internal Drives on East-West Access Road

The eastern drives to the Circle K (north) and the Culver's (south) are located 80 feet west of Naper Boulevard. The Circle K driveway is 31 feet wide and two-way. The Culver's drive is 26 feet wide and only permits outbound movements. This will prevent vehicles from the east from stopping to make left-turn into this drive and potentially blocking inbound vehicle from Naper Boulevard. Do Not Enter signs should be added at the Culver's driveway. Outbound traffic is controlled by a stop sign with good levels of service (A or B) during the peak-hours of operation. If traffic queues from Naper Boulevard back up near this entrance, exiting traffic has the option of using the west driveways.

Table 4
Intersection Level of Service and Delay (seconds)

Intersection	Movement	Morning Peak		Midday Peak		Evening Peak	
		Existing (2018)	Future (2024)	Existing (2018)	Future (2024)	Existing (2018)	Future (2025)
Naper Boulevard at Tower Crossing/ Site Access (Traffic Signal)	All	A – 3.5	A – 8.7	B – 11.0	B - 16.5	A – 3.6	B - 10.9
Naperville-Wheaton Road at Ogden Plaza /Site Access (Stop Controlled)	EB Approach	B - 13.6	C – 20.7	C - 16.2	D – 28.4	C -15.5	C – 20.5
	WB Approach		D – 29.0		E – 36.6		C – 22.3
	NB Left	A - 8.0	A – 8.0	A - 9.1	A – 9.1	A - 9.0	A 9.0
	SB Left		A – 9.5		A – 9.1		A-8.6
East Drives on East-West Circulation Road (Stop Controlled)	EB Left		A – 7.7		A – 7.7		A – 7.7
	NB Approach		A – 9.6		B – 10.4		B – 10.3
	SB Approach		B – 11.3		B – 10.9		B – 11.1
West Drives on East-West Circulation Road (Stop Controlled)	EB Left		A – 7.5		A – 7.5		A – 7.5
	WB Left		A – 7.3		A – 7.5		A – 7.4
	NB Approach		B – 10.5		B – 11.3		B – 10.6
	SB Approach		B – 11.0		B – 11.7		B – 11.5

Ogden Plaza/ Site Access on Naperville-Wheaton Road

A full access driveway is proposed on Naperville-Wheaton Road opposite the Ogden Plaza service drive. It will be 27 feet wide with a 25 foot turning radius. There will be one inbound lane and one outbound lane under stop sign control.

The capacity analyses show the left-turn movements working well at levels-of-service A. The outbound traffic will work at a level-of-service C, D, and E which is not unusual for unsignalized driveways on arterial roadways during rush hour. The expected volume is low and the outbound queue would be two or three vehicles. There would be no impact on Naperville-Wheaton Road traffic conditions. No additional recommendations are required.

Tower Crossing/ Site Access on Naper Boulevard

Naper Boulevard is heavily travelled during the peak-hours. Traffic from the existing Tower Crossing shopping center and the proposed site are relatively low. Overall, the most of the green time at the traffic signal is dedicated to moving Naper Boulevard traffic and is operating with minimal delays. No additional improvements are required.

Automobile Laundry Stacking

A tunnel automobile laundry is located on the west side of the site running in a northbound direction. Cars pull into the south side of the wash, enter a wash code, have their car pulled thru and washed, and then exit on the north side. Queuing is provided at the car wash accommodating 12 vehicles and will not adversely impact the circulation around the gas station. Studies of car washes at a gas station indicate that the typical maximum queue is six vehicles not including the vehicles in the car wash building. EEA's experience at other gas stations with car washes supports the study's findings. Ten vehicle stacking is required by the zoning code.

Fuel Tanker Routing

The fuel tanks are located south of the fuel pump canopy. A tanker can pull into the site from Naperville-Wheaton Road up to the tanks. After fueling, it would exit eastbound to the Naper Boulevard. **Figure 8** shows the fuel tanker travel path.

CONCLUSIONS

The preceding traffic analysis analyzed the proposed Culver's restaurant and a Circle K gas station with a convenience store/car wash and developed the following conclusions:

- The development will not adversely impact the level-of-service of study area intersections.
- Two proposed driveways will adequately serve the site.
    - Naperville-Wheaton Road full access driveway under stop sign control
    - Naper Boulevard full access driveway under traffic signal control
    - Both of these driveways are existed previously for the credit union
- The majority of the gas station traffic will come from existing traffic volumes driving by the site, stopping, and then continuing on with their journey.
- Stacking for the car wash exceeds the zoning requirement of 10 spaces and will not interfere with on-site traffic flow.

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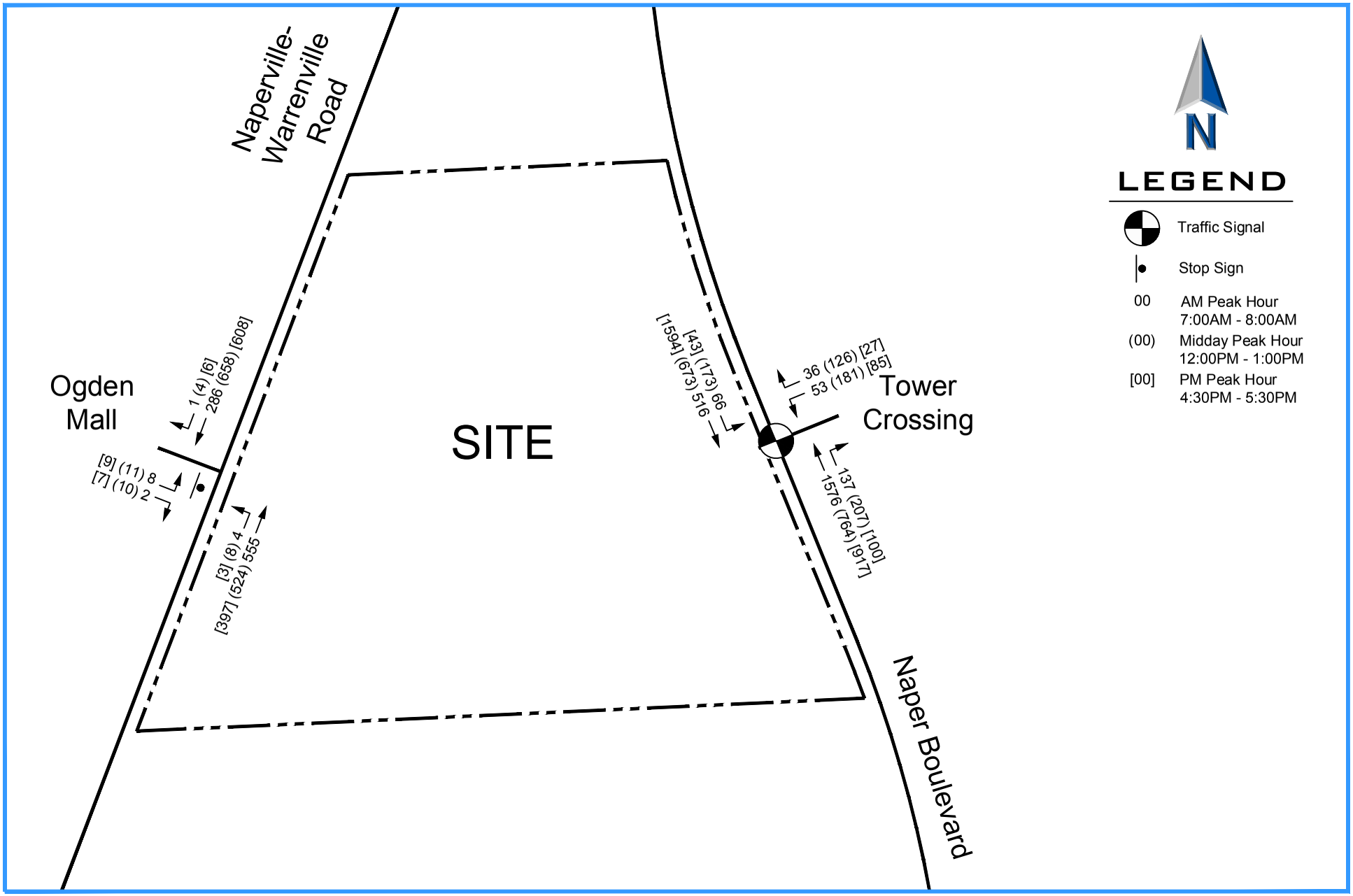
Site Location & Area Roadways

Figure 1



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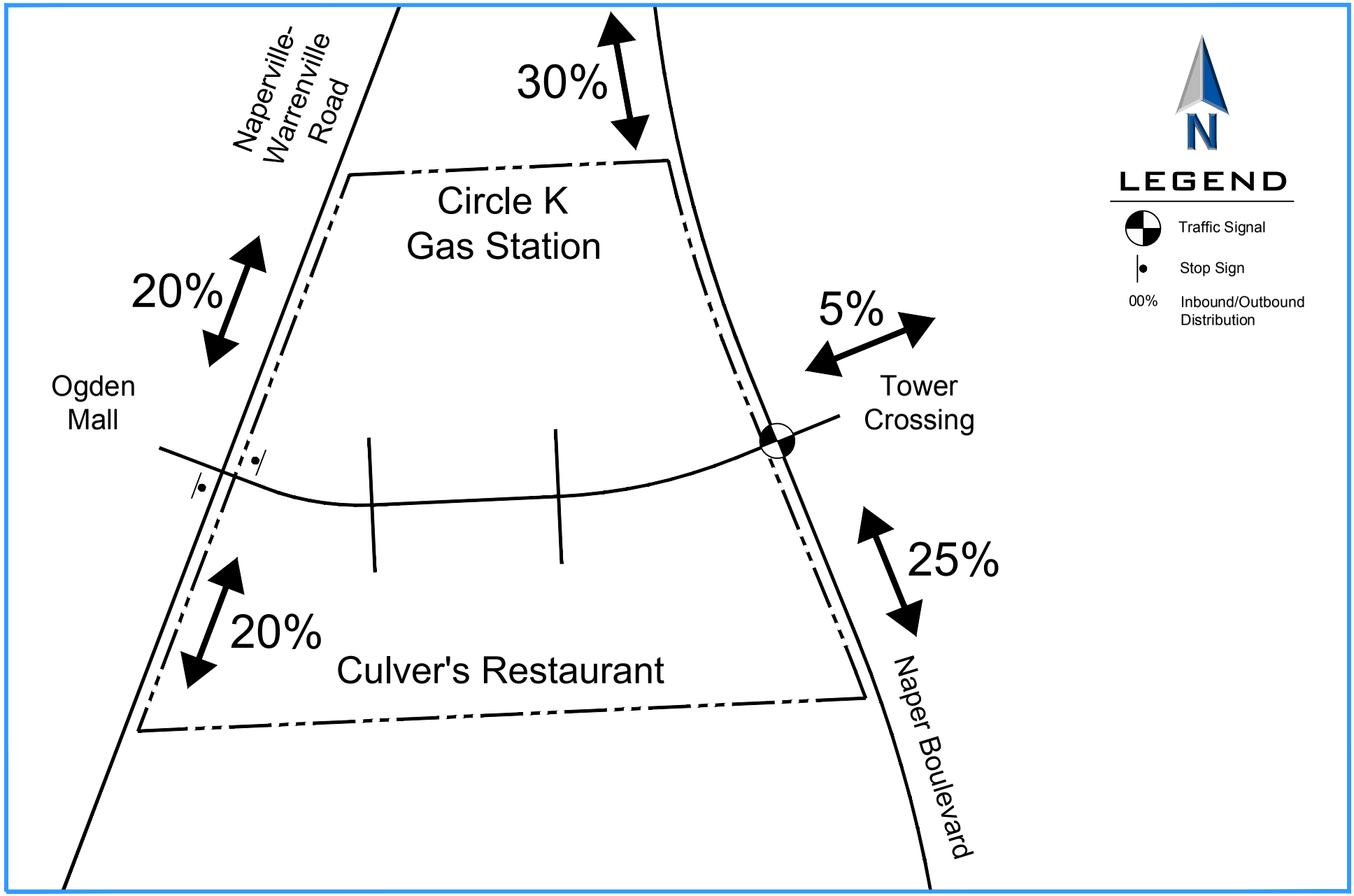
Existing Traffic Volumes

Figure 2



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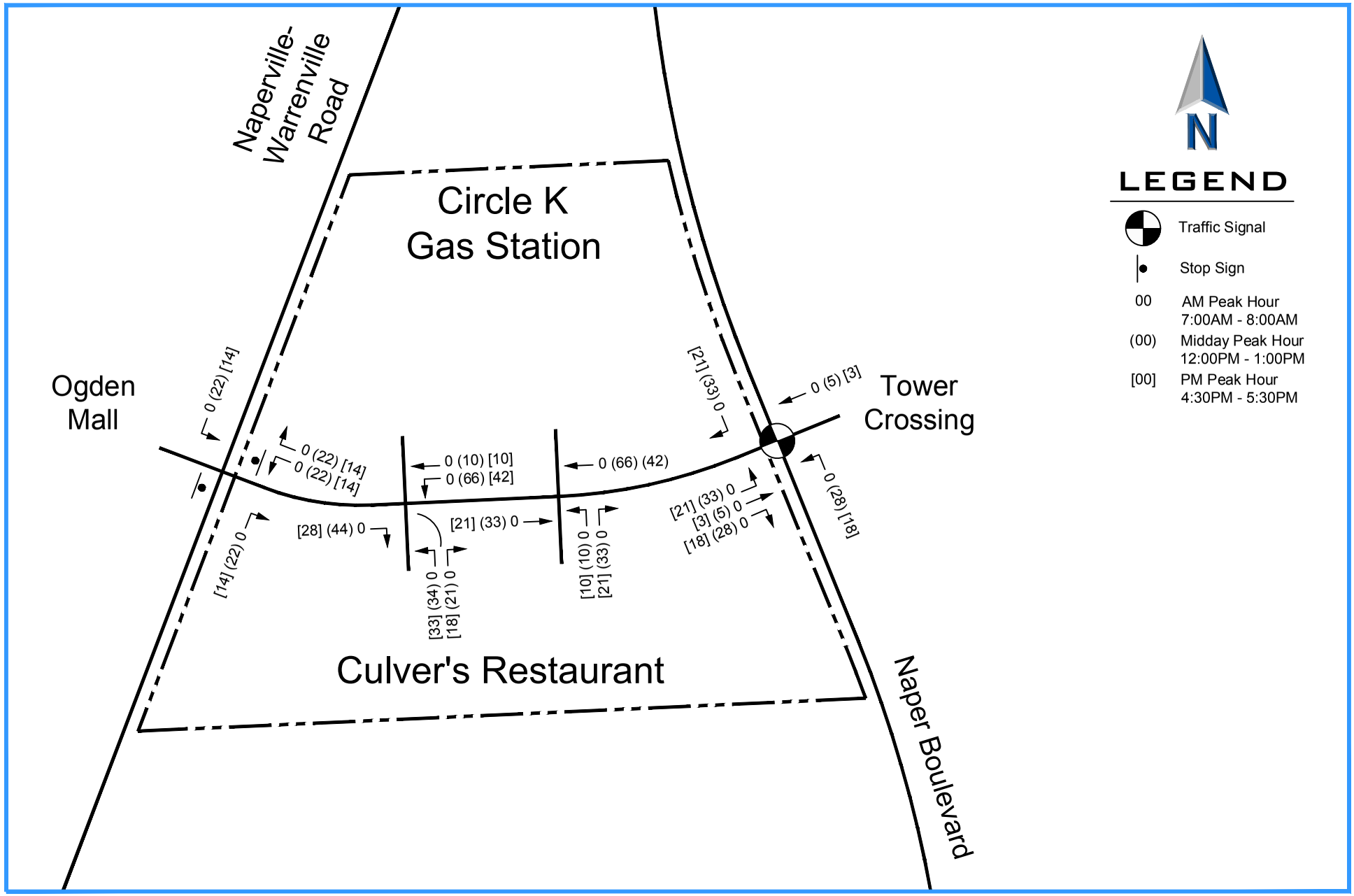
Directional Distribution

Figure 3



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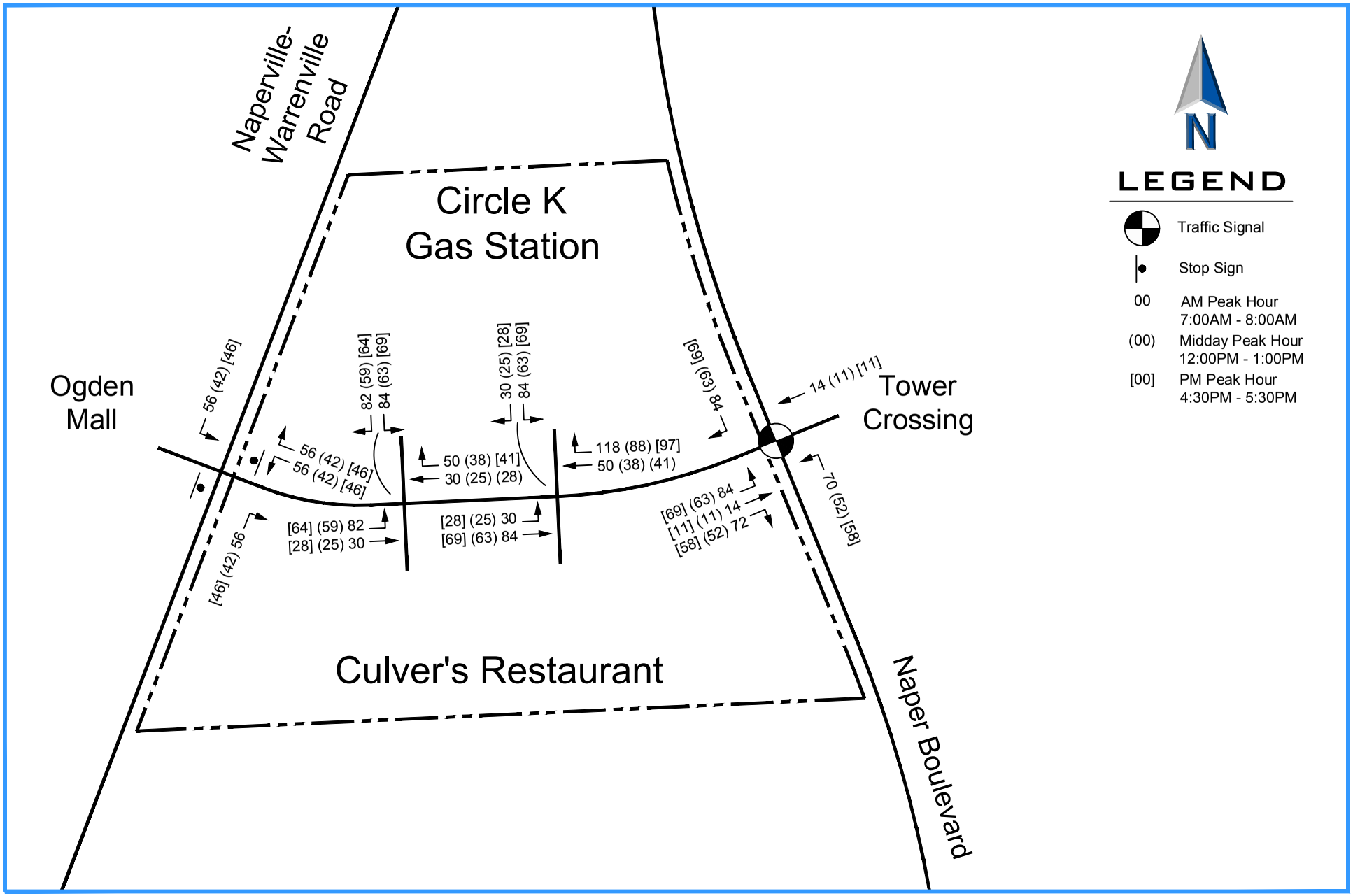
Culver's Site Traffic Volumes

Figure 4



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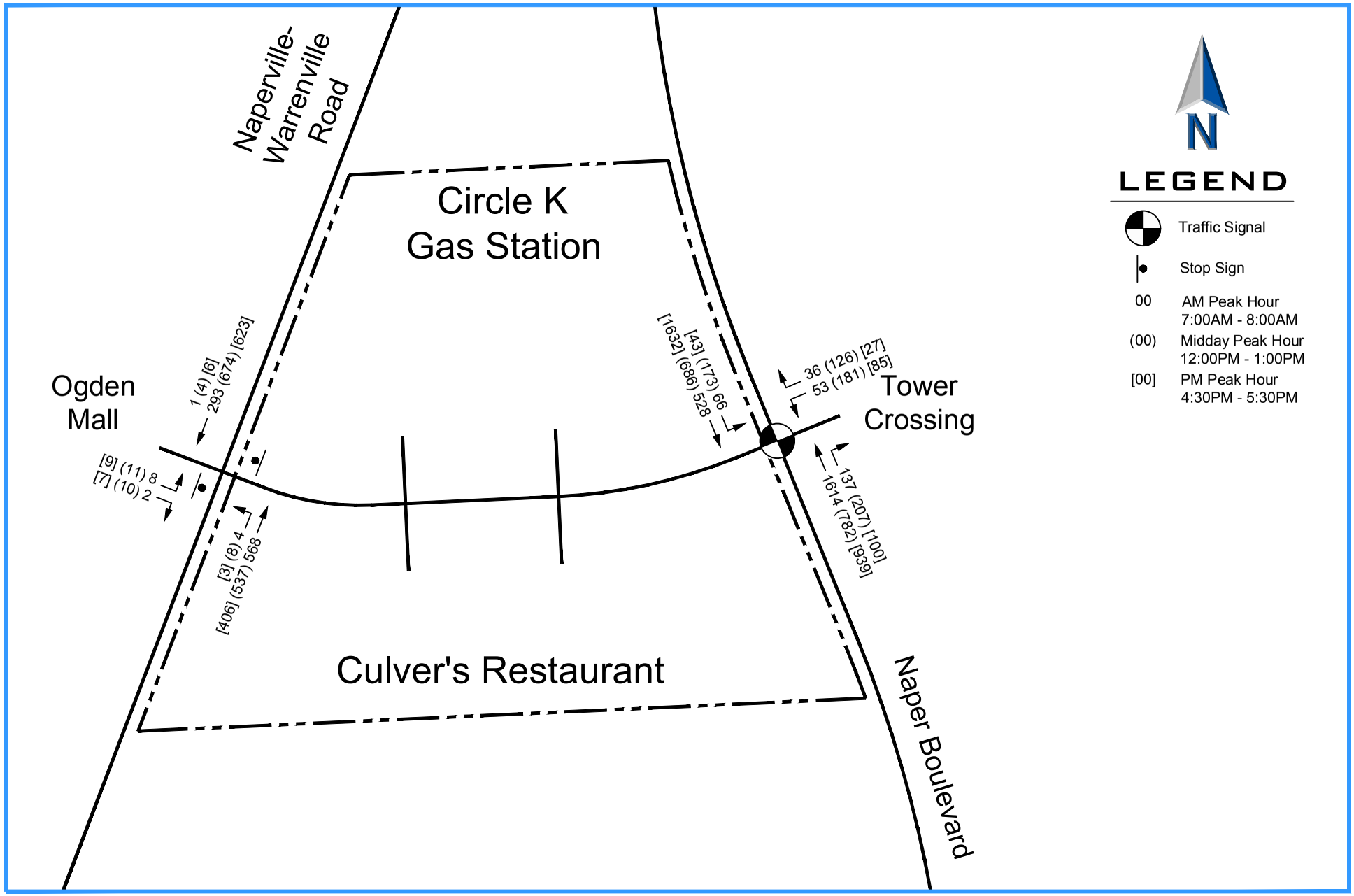
Circle K Site Traffic Volumes

Figure 5



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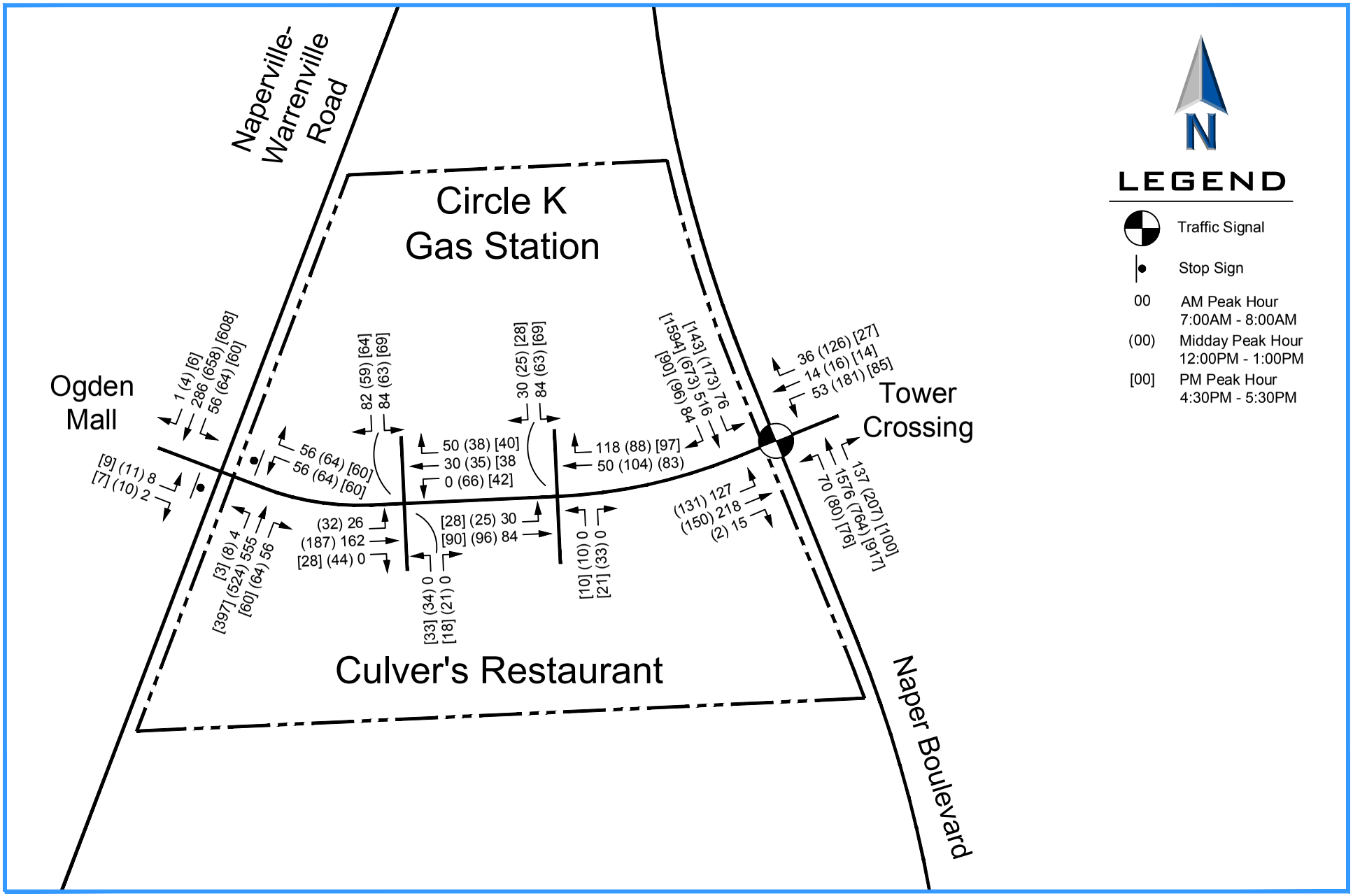
Year 2024 Base Traffic Volumes

Figure 6



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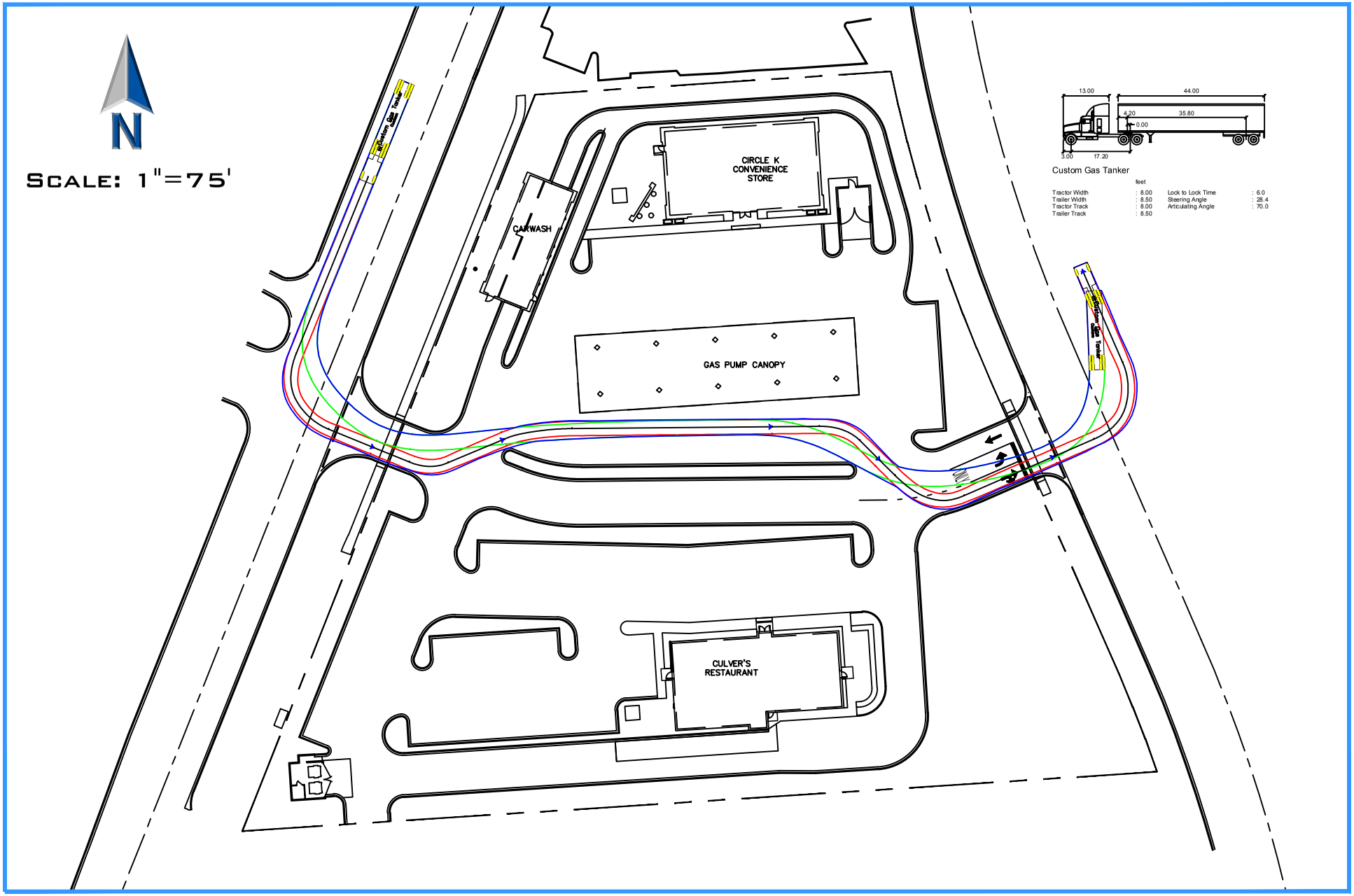
Year 2024 Total Traffic Volumes

Figure 7



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Gas Tanker Turning Exhibit

Figure 8

APPENDIX

- **Existing Traffic Counts**
- **CMAP Letter**
- **Fuel Truck Turning Template**
- **Intersection Capacity Analyses**

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Naperville-Wheaton Road and Ogden Mall Service Drive

Naperville, Illinois												
	Naperville-Wheaton Road Southbound			Naperville-Wheaton Road Northbound			Ogden Mall Eastbound			15 Minute Totals	60 Minute Totals	Peak Hour Factor
Begin Time	Right Turn	Through	Left Turn	Right Turn	Through	Left Turn	Right Turn	Through	Left Turn			
	Thursday October 4, 2018											
7:00 AM	0	47			113	1	0		4	165	856	0.78
7:15 AM	0	71			114	1	1		0	187	910	0.83
7:30 AM	1	85			139	0	1		3	229	**933**	**0.85**
7:45 AM	0	83			189	2	0		1	275	900	0.82
8:00 AM	2	65			148	3	0		1	219	806	0.92
8:15 AM	5	80			122	1	0		2	210		
8:30 AM	1	83			109	1	0		2	196		
8:45 AM	0	71			106	1	1		2	181		
Total	9	585	0	0	1040	10	3	0	15			
7:30-8:30 AM	**1**	**286**	**0**	**0**	**555**	**4**	**2**	**0**	**8**	**856**		
	Thursday October 4, 2018											
11:30 AM	2	143			101	1	2		3	252	1145	0.89
11:45 AM	1	160			111	2	1		4	279	1191	0.93
Noon	2	164			120	0	4		4	294	**1215**	**0.95**
12:15 PM	0	184			126	3	4		3	320	1179	0.92
12:30 PM	1	157			132	3	2		3	298	1115	0.92
12:45 PM	1	153			146	2	0		1	303		
1:00 PM	4	131			123	0	0		0	258		
1:15 PM	0	146			106	3	1		0	256		
Total	11	1238	0	0	965	14	14	0	18			
Noon-1:00 PM	**4**	**658**	**0**	**0**	**524**	**8**	**10**	**0**	**11**	**1215**		
	Thursday October 4, 2018											
4:00 PM	0	97			49	1	0		4	151	852	0.83
4:15 PM	1	121			85	1	2		2	212	955	0.93
4:30 PM	2	160			92	1	1		1	257	**1030**	**0.90**
4:45 PM	1	130			99	0	2		0	232	1011	0.88
5:00 PM	2	149			93	1	3		6	254	988	0.86
5:15 PM	1	169			113	1	1		2	287		
5:30 PM	1	137			99	0	1		0	238		
5:45 PM	4	136			65	2	1		1	209		
Total	12	1099	0	0	695	7	11	0	16			
4:30-5:30 PM	**6**	**608**	**0**	**0**	**397**	**3**	**7**	**0**	**9**	**1030**		

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Naper Boulevard and Tower Crossing Access

Naperville, Illinois												
	Naper Boulevard Southbound			Tower Crossing Westbound			Naper Boulevard Northbound			15	60	Peak
Begin	Right		Left	Right		Left	Right		Left	Minute	Minute	Hour
Time	Turn	Through	Turn	Turn	Through	Turn	Turn	Through	Turn	Totals	Totals	Factor
	Wednesday September 26, 2018											
7:00 AM		111	20	4		13	41	415		604	**2384**	**0.96**
7:15 AM		124	14	7		15	33	427		620	2369	0.96
7:30 AM		133	18	12		12	30	376		581	2303	0.98
7:45 AM		148	14	13		13	33	358		579	2362	0.92
8:00 AM		131	14	5		16	36	387		589	2356	0.92
8:15 AM		119	16	13		10	34	362		554		
8:30 AM		135	17	18		17	43	410		640		
8:45 AM		111	30	7		19	48	358		573		
Total	0	1012	143	79	0	115	298	3093	0			
7:00-8:00 AM	**0**	**516**	**66**	**36**	**0**	**53**	**137**	**1576**	**0**	**2384**		
	Wednesday September 26, 2018											
11:30 AM		154	53	35		40	60	200		542	2116	0.96
11:45 AM		141	50	29		39	42	171		472	2088	0.95
Noon		181	51	36		42	63	178		551	**2124**	**0.96**
12:15 PM		154	42	37		58	56	204		551	2122	0.96
12:30 PM		174	34	26		35	42	203		514	2021	0.92
12:45 PM		164	46	27		46	46	179		508		
1:00 PM		196	53	31		36	42	191		549		
1:15 PM		171	22	17		31	32	177		450		
Total	0	1335	351	238	0	327	383	1503	0			
Noon-1:00 PM	**0**	**673**	**173**	**126**	**0**	**181**	**207**	**764**	**0**	**2124**		
	Wednesday September 26, 2018											
4:00 PM		381	10	13		27	29	230		690	2704	0.96
4:15 PM		344	18	8		25	18	225		638	2697	0.96
4:30 PM		396	13	9		25	26	236		705	**2766**	**0.98**
4:45 PM		389	11	5		26	13	227		671	2723	0.96
5:00 PM		405	10	7		16	31	214		683	2752	0.97
5:15 PM		404	9	6		18	30	240		707		
5:30 PM		361	19	11		39	23	209		662		
5:45 PM		393	21	8		21	29	228		700		
Total	0	3073	111	67	0	197	199	1809	0			
4:30-5:30 PM	**0**	**1594**	**43**	**27**	**0**	**85**	**100**	**917**	**0**	**2766**		

Chicago Metropolitan Agency for Planning

233 South Wacker Drive
Suite 800
Chicago, Illinois 60606

312 454 0400
www.cmap.illinois.gov

September 17, 2018

Stephen B. Corcoran, PE, PTOE
Director of Traffic Engineering
Eriksson Engineering Associates, Ltd.
145 Commerce Drive
Grayslake, IL 60030

Subject: ***Naper Boulevard @ Ridgeland Avenue***
IDOT

Dear Mr. Corcoran:

In response to a request made on your behalf and dated September 14, 2018, we have developed year 2040 average daily traffic (ADT) projections for the subject location.

ROAD SEGMENT	Current Volumes (2016)	Year 2040 ADT
Naperville Rd (North Leg)	50,330	55,600
Naper Blvd (South Leg)	33,100	36,600
Nprvl-Wheaton Rd (West Leg)	17,180	19,000
Ridgeland Ave (East Leg)	3,560	3,930

Traffic projections are developed using existing ADT data provided in the request letter and the results from the March 2018 CMAP Travel Demand Analysis. The regional travel model uses CMAP 2040 socioeconomic projections and assumes the implementation of the GO TO 2040 Comprehensive Regional Plan for the Northeastern Illinois area. The provision of this data in support of your request does not constitute a CMAP endorsement of the proposed development or any subsequent developments.

If you have any questions, please call me at (312) 386-8806.

Sincerely,

Jose Rodriguez, PTP, AICP
Senior Planner, Research & Analysis

cc: Quigley (IDOT)
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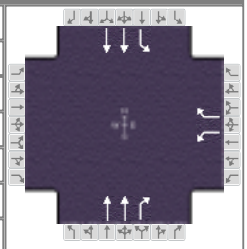
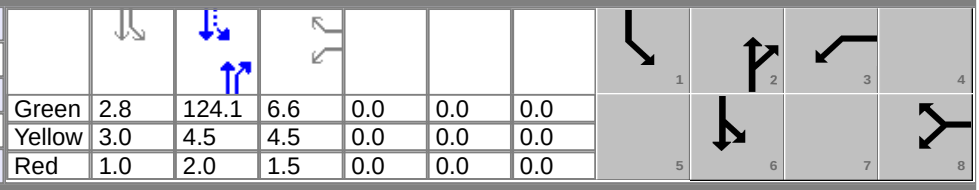
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	EEA			Duration, h	0.25
Analyst	SBC	Analysis Date	10/16/2018	Area Type	Other
Jurisdiction	Naperville	Time Period	AM Peak	PHF	0.96
Urban Street	Naper Boulevard	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Tower Crossing	File Name	Naper 2018 AM.xus		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				53		36		1576	137	66	516	

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	2.8	124.1	6.6	0.0	0.0	0.0						
Yellow	3.0	4.5	4.5	0.0	0.0	0.0						
Red	1.0	2.0	1.5	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				12.6		130.6	6.8	137.4
Change Period, (*Y+R c*), s				6.0		6.5	4.0	6.5
Max Allow Headway (*MAH*), s				3.2		0.0	3.1	0.0
Queue Clearance Time (*g s*), s				6.6			2.9	
Green Extension Time (*g e*), s				0.1		0.0	0.1	0.0
Phase Call Probability				0.98			0.94	
Max Out Probability				0.00			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				55		38		1642	143	69	538	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1767		1572		1766	1572	1767	1766	
Queue Service Time (*g s*), s				4.6		3.5		0.0	2.6	0.9	0.0	
Cycle Queue Clearance Time (*g c*), s				4.6		3.5		0.0	2.6	0.9	0.0	
Green Ratio (*g/C*)				0.04		0.04		0.83	0.83	0.86	0.87	
Capacity (*c*), veh/h				77		69		2923	1301	332	3084	
Volume-to-Capacity Ratio (*X*)				0.714		0.545		0.562	0.110	0.207	0.174	
Back of Queue (*Q*), ft/ln (95 th percentile)				100.9		67.2		14.7	32.1	9.3	2.4	
Back of Queue (*Q*), veh/ln (95 th percentile)				3.9		2.6		0.6	1.3	0.4	0.1	
Queue Storage Ratio (*RQ*) (95 th percentile)				1.01		0.34		0.00	0.32	0.05	0.00	
Uniform Delay (*d 1*), s/veh				70.8		70.3		0.0	2.5	1.6	0.0	
Incremental Delay (*d 2*), s/veh				4.5		2.5		0.8	0.2	0.1	0.1	
Initial Queue Delay (*d 3*), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				75.3		72.7		0.8	2.6	1.7	0.1	
Level of Service (LOS)				E		E		A	A	A	A	
Approach Delay, s/veh / LOS	0.0			74.3		E	0.9		A	0.3		A
Intersection Delay, s/veh / LOS	3.5						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

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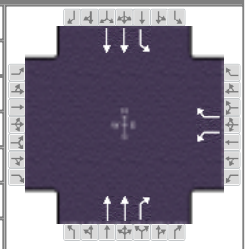
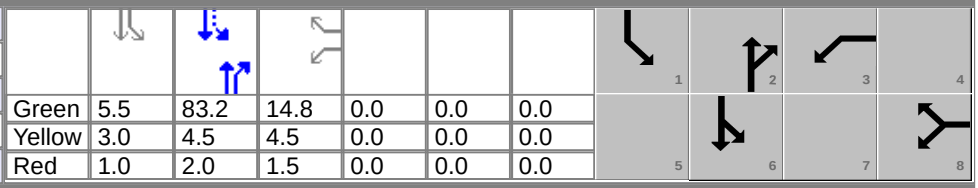
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	EEA			Duration, h	0.25
Analyst	SBC	Analysis Date	10/16/2018	Area Type	Other
Jurisdiction	Naperville	Time Period	Midday Peak	PHF	0.96
Urban Street	Naper Boulevard	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Tower Crossing	File Name	Naper 2018 Mid.xus		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				181		126		764	207	173	673	

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	5.5	83.2	14.8	0.0	0.0	0.0						
Yellow	3.0	4.5	4.5	0.0	0.0	0.0						
Red	1.0	2.0	1.5	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				20.8		89.7	9.5	99.2
Change Period, (*Y+R c*), s				6.0		6.5	4.0	6.5
Max Allow Headway (*MAH*), s				3.2		0.0	3.1	0.0
Queue Clearance Time (*g s*), s				14.6			5.3	
Green Extension Time (*g e*), s				0.2		0.0	0.2	0.0
Phase Call Probability				1.00			1.00	
Max Out Probability				0.85			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				189		131		796	216	180	701	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1767		1572		1766	1572	1767	1766	
Queue Service Time (*g s*), s				12.6		9.6		2.9	5.9	3.3	0.0	
Cycle Queue Clearance Time (*g c*), s				12.6		9.6		2.9	5.9	3.3	0.0	
Green Ratio (*g/C*)				0.12		0.12		0.69	0.69	0.76	0.77	
Capacity (*c*), veh/h				218		194		2449	1090	594	2729	
Volume-to-Capacity Ratio (*X*)				0.865		0.677		0.325	0.198	0.303	0.257	
Back of Queue (*Q*), ft/ln (95 th percentile)				278.6		180.9		39.8	87.4	46.9	4	
Back of Queue (*Q*), veh/ln (95 th percentile)				10.9		7.1		1.6	3.4	1.8	0.2	
Queue Storage Ratio (*RQ*) (95 th percentile)				2.79		0.90		0.00	0.87	0.25	0.00	
Uniform Delay (*d 1*), s/veh				51.6		50.3		1.5	6.5	4.1	0.0	
Incremental Delay (*d 2*), s/veh				18.9		3.5		0.4	0.4	0.1	0.2	
Initial Queue Delay (*d 3*), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				70.5		53.8		1.9	7.0	4.2	0.2	
Level of Service (LOS)				E		D		A	A	A	A	
Approach Delay, s/veh / LOS	0.0			63.6		E	2.9		A	1.0		A
Intersection Delay, s/veh / LOS	11.0						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

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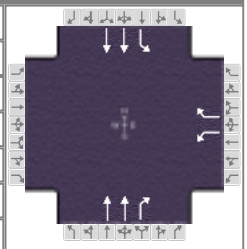
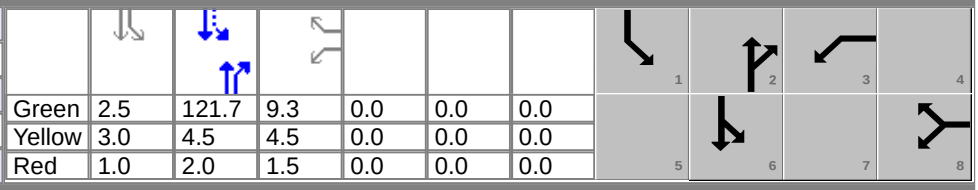
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	EEA			Duration, h	0.25
Analyst	SBC	Analysis Date	10/16/2018	Area Type	Other
Jurisdiction	Naperville	Time Period	PM Peak	PHF	0.98
Urban Street	Naper Boulevard	Analysis Year	2018	Analysis Period	1> 7:00
Intersection	Tower Crossing	File Name	Naper 2018 PM.xus		
Project Description	Existing Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h				85		27		917	100	43	1594	

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	2.5	121.7	9.3	0.0	0.0	0.0						
Yellow	3.0	4.5	4.5	0.0	0.0	0.0						
Red	1.0	2.0	1.5	0.0	0.0	0.0						

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase				8		2	1	6
Case Number				9.0		7.3	1.0	4.0
Phase Duration, s				15.3		128.2	6.5	134.7
Change Period, (*Y+R c*), s				6.0		6.5	4.0	6.5
Max Allow Headway (*MAH*), s				3.2		0.0	3.1	0.0
Queue Clearance Time (*g s*), s				9.3			2.6	
Green Extension Time (*g e*), s				0.1		0.0	0.0	0.0
Phase Call Probability				0.99			0.84	
Max Out Probability				0.04			0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				3		18		2	12	1	6	
Adjusted Flow Rate (*v*), veh/h				87		28		936	102	44	1627	
Adjusted Saturation Flow Rate (*s*), veh/h/ln				1767		1572		1766	1572	1767	1766	
Queue Service Time (*g s*), s				7.3		2.5		0.0	2.0	0.6	0.0	
Cycle Queue Clearance Time (*g c*), s				7.3		2.5		0.0	2.0	0.6	0.0	
Green Ratio (*g/C*)				0.06		0.06		0.81	0.81	0.84	0.85	
Capacity (*c*), veh/h				109		97		2867	1276	559	3020	
Volume-to-Capacity Ratio (*X*)				0.795		0.284		0.326	0.080	0.078	0.539	
Back of Queue (*Q*), ft/ln (95 th percentile)				158		47.2		5.6	25.6	7.3	13.4	
Back of Queue (*Q*), veh/ln (95 th percentile)				6.2		1.8		0.2	1.0	0.3	0.5	
Queue Storage Ratio (*RQ*) (95 th percentile)				1.58		0.24		0.00	0.26	0.04	0.00	
Uniform Delay (*d 1*), s/veh				69.4		67.2		0.0	2.9	1.9	0.0	
Incremental Delay (*d 2*), s/veh				4.9		0.6		0.3	0.1	0.0	0.7	
Initial Queue Delay (*d 3*), s/veh				0.0		0.0		0.0	0.0	0.0	0.0	
Control Delay (*d*), s/veh				74.3		67.8		0.3	3.0	2.0	0.7	
Level of Service (LOS)				E		E		A	A	A	A	
Approach Delay, s/veh / LOS	0.0			72.7		E	0.6		A	0.7		A
Intersection Delay, s/veh / LOS	3.6						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

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HCS7 Two-Way Stop-Control Report

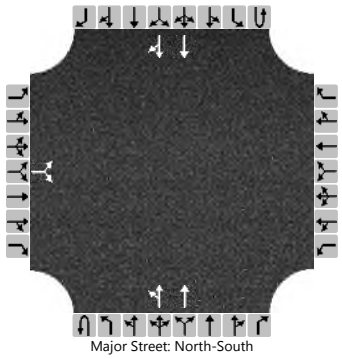
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/16/2018
Analysis Year	2018
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	Future

Site Information

Intersection	N-W Rd/Ogden
Jurisdiction	Naperville
East/West Street	Ogden Mall
North/South Street	N-W Road
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		8		2						4	555				286	1
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			12							5						
Capacity, c (veh/h)			432							1211						
v/c Ratio			0.03							0.00						
95% Queue Length, Q_{95} (veh)			0.1							0.0						
Control Delay (s/veh)			13.6							8.0						
Level of Service (LOS)			B							A						
Approach Delay (s/veh)		13.6								0.1						
Approach LOS		B								B				B		

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HCS7 Two-Way Stop-Control Report

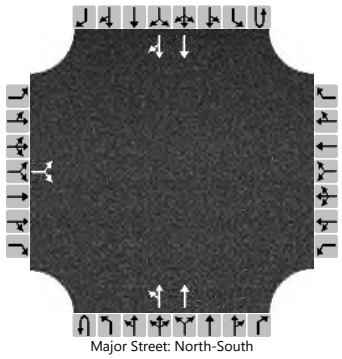
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/16/2018
Analysis Year	2018
Time Analyzed	Midday
Intersection Orientation	North-South
Project Description	Future

Site Information

Intersection	N-W Rd/Ogden
Jurisdiction	Naperville
East/West Street	Ogden Mall
North/South Street	N-W Road
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		11		10						8	524				658	4
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			22							8						
Capacity, c (veh/h)			343							888						
v/c Ratio			0.06							0.01						
95% Queue Length, Q_{95} (veh)			0.2							0.0						
Control Delay (s/veh)			16.2							9.1						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		16.2								0.2						
Approach LOS		C								B				B		

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HCS7 Two-Way Stop-Control Report

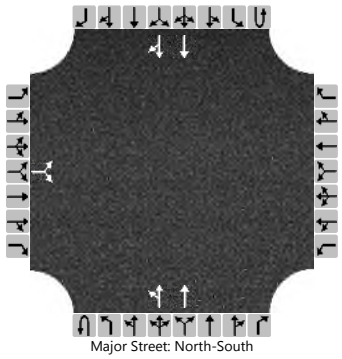
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/16/2018
Analysis Year	2018
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	Future

Site Information

Intersection	N-W Rd/Ogden
Jurisdiction	Naperville
East/West Street	Ogden Mall
North/South Street	N-W Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	0	0	0	0	2	0	0	0	2	0
Configuration			LR							LT	T				T	TR
Volume (veh/h)		9		7						8	397				608	6
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5		6.9						4.1						
Critical Headway (sec)		6.86		6.96						4.16						
Base Follow-Up Headway (sec)		3.5		3.3						2.2						
Follow-Up Headway (sec)		3.53		3.33						2.23						

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			18							9						
Capacity, c (veh/h)			360							900						
v/c Ratio			0.05							0.01						
95% Queue Length, Q_{95} (veh)			0.2							0.0						
Control Delay (s/veh)			15.5							9.0						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		15.5								0.2						
Approach LOS		C								B				B		

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HCS7 Two-Way Stop-Control Report

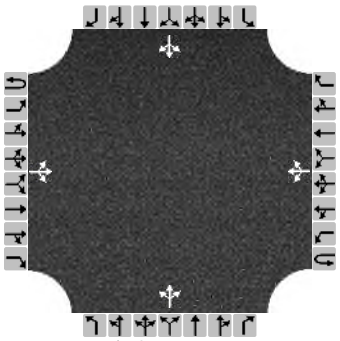
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/25/2018
Analysis Year	2024
Time Analyzed	AM
Intersection Orientation	East-West
Project Description	Future

Site Information

Intersection	Internal/East Drives
Jurisdiction	Naperville
East/West Street	Internal Collector
North/South Street	West Drives
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		82	30	1		1	30	50		1	1	1		84	1	82
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

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)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
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)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		89				1					3				182	
Capacity, c (veh/h)		1503				1571					662				780	
v/c Ratio		0.06				0.00					0.00				0.23	
95% Queue Length, Q_{95} (veh)		0.2				0.0					0.0				0.9	
Control Delay (s/veh)		7.5		0.5		7.3		0.0			10.5				11.0	
Level of Service (LOS)		A		A		A		A			B				B	
Approach Delay (s/veh)	5.6				0.1				10.5				11.0			
Approach LOS									B				B			

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HCS7 Two-Way Stop-Control Report

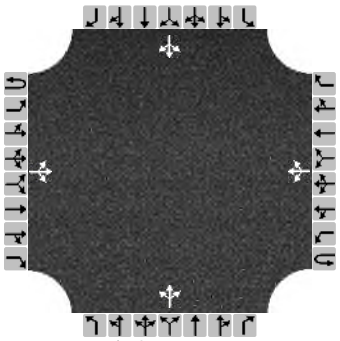
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/23/2018
Analysis Year	2024
Time Analyzed	Midday
Intersection Orientation	East-West
Project Description	Future

Site Information

Intersection	Internal/East Drives
Jurisdiction	Naperville
East/West Street	Internal Collector
North/South Street	West Drives
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		59	25	44		66	25	38		34	1	33		63	1	59
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

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)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
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)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		64				72					74				134	
Capacity, c (veh/h)		1526				1518					648				669	
v/c Ratio		0.04				0.05					0.11				0.20	
95% Queue Length, Q_{95} (veh)		0.1				0.1					0.4				0.7	
Control Delay (s/veh)		7.5		0.3		7.5		0.4			11.3				11.7	
Level of Service (LOS)		A		A		A		A			B				B	
Approach Delay (s/veh)	3.6				4.0				11.3				11.7			
Approach LOS									B				B			

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HCS7 Two-Way Stop-Control Report

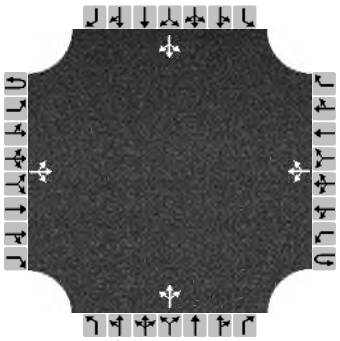
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/23/2018
Analysis Year	2024
Time Analyzed	PM
Intersection Orientation	East-West
Project Description	Future

Site Information

Intersection	Internal/East Drives
Jurisdiction	Naperville
East/West Street	Internal Collector
North/South Street	West Drives
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		64	28	28		42	38	40		18	1	21		69	1	64
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage			Undivided													

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)		4.13				4.13				7.13	6.53	6.23		7.13	6.53	6.23
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)		2.23				2.23				3.53	4.03	3.33		3.53	4.03	3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		70				46					43				146	
Capacity, c (veh/h)		1505				1536					690				702	
v/c Ratio		0.05				0.03					0.06				0.21	
95% Queue Length, Q_{95} (veh)		0.1				0.1					0.2				0.8	
Control Delay (s/veh)		7.5		0.4		7.4		0.2			10.6				11.5	
Level of Service (LOS)		A		A		A		A			B				B	
Approach Delay (s/veh)	4.2				2.7				10.6				11.5			
Approach LOS									B				B			

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HCS7 Two-Way Stop-Control Report

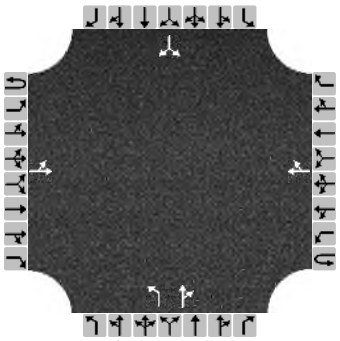
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/23/2018
Analysis Year	2024
Time Analyzed	AM Peak
Intersection Orientation	East-West
Project Description	Future

Site Information

Intersection	Internal/East Drives
Jurisdiction	Naperville
East/West Street	Internal Collector
North/South Street	East Drives
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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		1	1	0		0	1	0
Configuration		LT						TR		L		TR			LR	
Volume (veh/h)		30	84				50	118		1	1	1		84		30
Percent Heavy Vehicles (%)		3								3	3	3		3		3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1	6.5	6.2		7.1		6.2
Critical Headway (sec)		4.13								7.13	6.53	6.23		7.13		6.23
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3		3.5		3.3
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33		3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		33								1		2			124	
Capacity, c (veh/h)		1386								624		713			715	
v/c Ratio		0.02								0.00		0.00			0.17	
95% Queue Length, Q_{95} (veh)		0.1								0.0		0.0			0.6	
Control Delay (s/veh)		7.7								10.8		10.1			11.1	
Level of Service (LOS)		A								B		B			B	
Approach Delay (s/veh)		2.2								10.3				11.1		
Approach LOS										B				B		

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HCS7 Two-Way Stop-Control Report

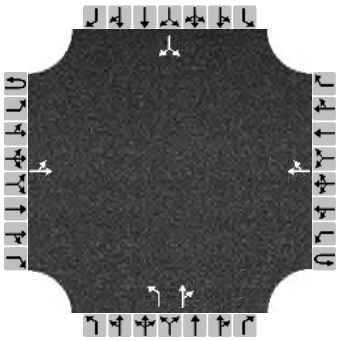
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/25/2018
Analysis Year	2024
Time Analyzed	Midday
Intersection Orientation	East-West
Project Description	Future

Site Information

Intersection	Internal/East Drives
Jurisdiction	Naperville
East/West Street	Internal Collector
North/South Street	East Drives
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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		1	1	0		0	1	0
Configuration		LT						TR		L		TR			LR	
Volume (veh/h)		25	96				104	88		40	1	33		36		25
Percent Heavy Vehicles (%)		3								3	3	3		3		3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1	6.5	6.2		7.1		6.2
Critical Headway (sec)		4.13								7.13	6.53	6.23		7.13		6.23
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3		3.5		3.3
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33		3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		27								43		37			66	
Capacity, c (veh/h)		1356								590		928			675	
v/c Ratio		0.02								0.07		0.04			0.10	
95% Queue Length, Q_{95} (veh)		0.1								0.2		0.1			0.3	
Control Delay (s/veh)		7.7								11.6		9.0			10.9	
Level of Service (LOS)		A								B		A			B	
Approach Delay (s/veh)		1.7								10.4				10.9		
Approach LOS										B				B		

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HCS7 Two-Way Stop-Control Report

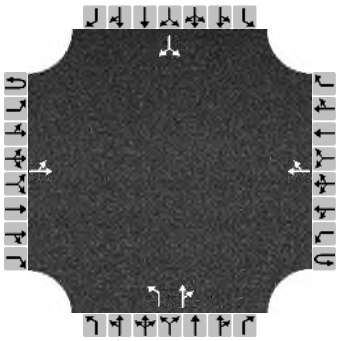
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/25/2018
Analysis Year	2024
Time Analyzed	PM
Intersection Orientation	East-West
Project Description	Future

Site Information

Intersection	Internal/East Drives
Jurisdiction	Naperville
East/West Street	Internal Collector
North/South Street	East Drives
Peak Hour Factor	0.92
Analysis Time Period (hrs)	0.25

Lanes


Major Street: East-West

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		1	1	0		0	1	0
Configuration		LT						TR		L		TR			LR	
Volume (veh/h)		28	90				82	88		10	1	21		69		28
Percent Heavy Vehicles (%)		3								3	3	3		3		3
Proportion Time Blocked																
Percent Grade (%)										0				0		
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1								7.1	6.5	6.2		7.1		6.2
Critical Headway (sec)		4.13								7.13	6.53	6.23		7.13		6.23
Base Follow-Up Headway (sec)		2.2								3.5	4.0	3.3		3.5		3.3
Follow-Up Headway (sec)		2.23								3.53	4.03	3.33		3.53		3.33

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		30								11		24			105	
Capacity, c (veh/h)		1384								607		926			679	
v/c Ratio		0.02								0.02		0.03			0.16	
95% Queue Length, Q_{95} (veh)		0.1								0.1		0.1			0.5	
Control Delay (s/veh)		7.7								11.0		9.0			11.3	
Level of Service (LOS)		A								B		A			B	
Approach Delay (s/veh)		2.0								9.6				11.3		
Approach LOS										A				B		

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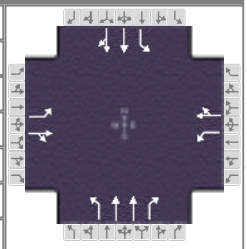
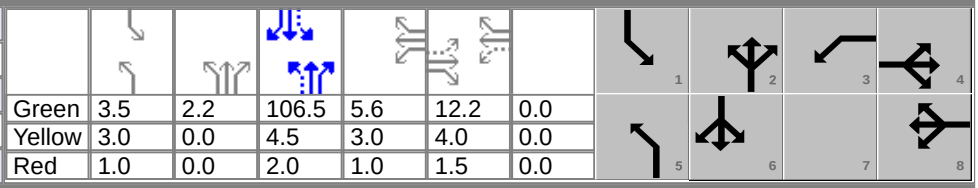
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	EEA			Duration, h	0.25
Analyst	SBC	Analysis Date	10/16/2018	Area Type	Other
Jurisdiction	Naperville	Time Period	AM Peak	PHF	0.96
Urban Street	Naper Boulevard	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Tower Crossing	File Name	Naper 2024 AM.xus		
Project Description	Future Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	84	14	70	53	14	36	70	1576	137	66	516	84

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	3.5	2.2	106.5	5.6	12.2	0.0
Yellow	3.0	0.0	4.5	3.0	4.0	0.0
Red	1.0	0.0	2.0	1.0	1.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4	3	8	5	2	1	6
Case Number		6.3	1.0	4.0	1.1	3.0	1.1	4.0
Phase Duration, s		17.7	9.6	27.3	9.7	115.2	7.5	113.0
Change Period, ($Y+R_c$), s		6.0	4.0	6.0	4.0	6.5	4.0	6.5
Max Allow Headway (*MAH*), s		3.2	3.1	3.2	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		11.4	6.2	6.1	3.6		3.6	
Green Extension Time (g_e), s		0.3	0.0	0.4	0.1	0.0	0.1	0.0
Phase Call Probability		1.00	0.90	1.00	0.95		0.94	
Max Out Probability		0.02	0.77	0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	88	88		55	52		73	1642	143	69	319	306
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1374	1652		1767	1682		1810	1859	1572	1767	1856	1765
Queue Service Time (g_s), s	9.4	7.7		4.2	4.1		1.6	5.4	4.1	1.6	1.8	4.0
Cycle Queue Clearance Time (g_c), s	9.4	7.7		4.2	4.1		1.6	5.4	4.1	1.6	1.8	4.0
Green Ratio (*g/C*)	0.08	0.08		0.13	0.14		0.75	0.72	0.72	0.73	0.71	0.71
Capacity (*c*), veh/h	155	129		148	239		672	2696	1140	294	1318	1253
Volume-to-Capacity Ratio (*X*)	0.565	0.681		0.373	0.218		0.108	0.609	0.125	0.234	0.242	0.244
Back of Queue (*Q*), ft/ln (95 th percentile)	150.9	150.7		88.2	79.5		25.1	58.4	63.6	26.8	32.4	62.7
Back of Queue (*Q*), veh/ln (95 th percentile)	6.0	6.0		3.4	3.2		1.0	2.3	2.5	1.0	1.3	2.5
Queue Storage Ratio (*RQ*) (95 th percentile)	3.02	0.00		0.88	0.00		0.24	0.00	0.64	0.14	0.00	0.00
Uniform Delay (d_1), s/veh	68.1	67.3		59.1	57.0		5.0	0.8	6.2	5.7	1.2	2.9
Incremental Delay (d_2), s/veh	1.2	2.4		0.6	0.2		0.0	1.0	0.2	0.2	0.4	0.5
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	69.3	69.7		59.7	57.2		5.0	1.8	6.5	5.8	1.6	3.3
Level of Service (LOS)	E	E		E	E		A	A	A	A	A	A
Approach Delay, s/veh / LOS	69.5	E		58.5	E		2.3	A		2.8	A	
Intersection Delay, s/veh / LOS	8.7						A					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

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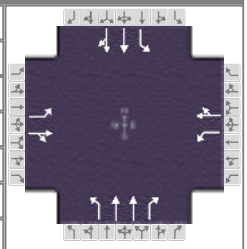
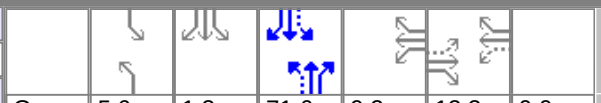
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	EEA			Duration, h	0.25
Analyst	SBC	Analysis Date	10/16/2018	Area Type	Other
Jurisdiction	Naperville	Time Period	Midday Peak	PHF	0.96
Urban Street	Naper Boulevard	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Tower Crossing	File Name	Naper 2024 Mid.xus		
Project Description	Future Conditions				

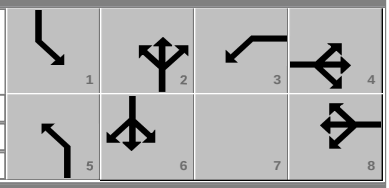


Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	96	16	80	181	16	126	80	764	207	173	673	96

Signal Information			
Cycle, s	120.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	5.6	1.3	71.6	9.2	12.3	0.0						
Yellow	3.0	0.0	4.5	3.0	4.0	0.0						
Red	1.0	0.0	2.0	1.0	1.5	0.0						



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4	3	8	5	2	1	6
Case Number		6.3	1.0	4.0	1.1	3.0	1.1	4.0
Phase Duration, s		17.8	13.2	31.0	9.6	78.1	10.9	79.4
Change Period, (*Y+R c*), s		6.0	4.0	6.0	4.0	6.5	4.0	6.5
Max Allow Headway (*MAH*), s		3.3	3.1	3.3	3.1	0.0	3.1	0.0
Queue Clearance Time (*g s*), s		11.3	11.2	11.4	4.1		6.7	
Green Extension Time (*g e*), s		0.5	0.0	0.7	0.1	0.0	0.2	0.0
Phase Call Probability		1.00	1.00	1.00	0.94		1.00	
Max Out Probability		0.10	1.00	0.00	0.00		0.00	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	100	100		189	148		83	796	216	180	409	392
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1259	1652		1767	1638		1810	1859	1572	1767	1856	1774
Queue Service Time (*g s*), s	9.3	7.0		9.2	9.4		2.1	7.4	7.7	4.7	7.1	8.8
Cycle Queue Clearance Time (*g c*), s	9.3	7.0		9.2	9.4		2.1	7.4	7.7	4.7	7.1	8.8
Green Ratio (*g/C*)	0.10	0.10		0.19	0.21		0.64	0.60	0.60	0.65	0.61	0.61
Capacity (*c*), veh/h	184	162		247	341		501	2219	938	524	1127	1078
Volume-to-Capacity Ratio (*X*)	0.544	0.616		0.763	0.434		0.166	0.359	0.230	0.344	0.363	0.364
Back of Queue (*Q*), ft/ln (95 th percentile)	133.9	132		87.8	171.9		34.7	114.4	125.9	78.5	115.3	138.3
Back of Queue (*Q*), veh/ln (95 th percentile)	5.4	5.3		3.4	6.9		1.4	4.5	4.9	3.1	4.5	5.5
Queue Storage Ratio (*RQ*) (95 th percentile)	3.35	0.00		0.88	0.00		0.33	0.00	1.26	0.42	0.00	0.00
Uniform Delay (*d 1*), s/veh	53.0	51.9		46.1	41.3		8.4	5.7	11.3	8.3	5.2	6.8
Incremental Delay (*d 2*), s/veh	0.9	1.4		11.9	0.3		0.1	0.5	0.6	0.1	0.9	1.0
Initial Queue Delay (*d 3*), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	53.9	53.4		58.0	41.7		8.5	6.2	11.9	8.4	6.1	7.7
Level of Service (LOS)	D	D		E	D		A	A	B	A	A	A
Approach Delay, s/veh / LOS	53.6	D		50.8	D		7.5	A		7.2	A	
Intersection Delay, s/veh / LOS	16.5						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

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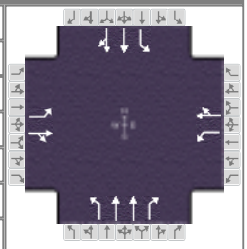
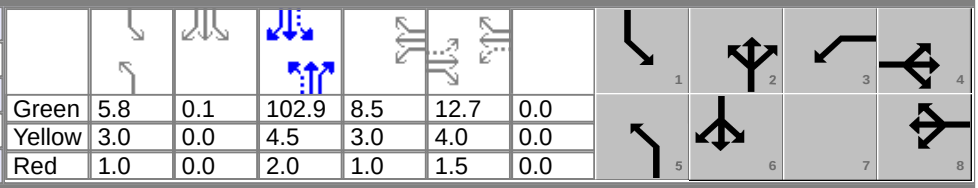
HCS7 Signalized Intersection Results Summary

General Information				Intersection Information	
Agency	EEA			Duration, h	0.25
Analyst	SBC	Analysis Date	10/16/2018	Area Type	Other
Jurisdiction	Naperville	Time Period	PM Peak	PHF	0.96
Urban Street	Naper Boulevard	Analysis Year	2024	Analysis Period	1> 7:00
Intersection	Tower Crossing	File Name	Naper 2024 PM.xus		
Project Description	Future Conditions				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	90	14	76	85	14	27	76	912	100	143	1594	90

Signal Information			
Cycle, s	150.0	Reference Phase	2
Offset, s	0	Reference Point	End
Uncoordinated	No	Simult. Gap E/W	On
Force Mode	Fixed	Simult. Gap N/S	On



Green	5.8	0.1	102.9	8.5	12.7	0.0
Yellow	3.0	0.0	4.5	3.0	4.0	0.0
Red	1.0	0.0	2.0	1.0	1.5	0.0

Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4	3	8	5	2	1	6
Case Number		6.3	1.0	4.0	1.1	3.0	1.1	4.0
Phase Duration, s		18.2	12.5	30.7	9.8	109.4	9.9	109.5
Change Period, ($Y+R_c$), s		6.0	4.0	6.0	4.0	6.5	4.0	6.5
Max Allow Headway (*MAH*), s		3.2	3.1	3.2	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		12.0	8.7	5.2	3.9		5.8	
Green Extension Time (g_e), s		0.2	0.0	0.4	0.1	0.0	0.1	0.0
Phase Call Probability		1.00	0.98	1.00	0.96		1.00	
Max Out Probability		0.50	1.00	0.00	0.00		0.01	

Movement Group Results	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	14	3	8	18	5	2	12	1	6	16
Adjusted Flow Rate (*v*), veh/h	94	94		89	43		79	950	104	149	880	874
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1385	1649		1767	1699		1810	1859	1572	1767	1856	1820
Queue Service Time (g_s), s	10.0	8.3		6.7	3.2		1.9	5.0	3.3	3.8	16.3	20.8
Cycle Queue Clearance Time (g_c), s	10.0	8.3		6.7	3.2		1.9	5.0	3.3	3.8	16.3	20.8
Green Ratio (*g/C*)	0.08	0.08		0.15	0.16		0.72	0.69	0.69	0.73	0.69	0.69
Capacity (*c*), veh/h	160	134		182	279		266	2551	1079	500	1275	1251
Volume-to-Capacity Ratio (*X*)	0.584	0.700		0.488	0.153		0.297	0.372	0.097	0.298	0.690	0.699
Back of Queue (*Q*), ft/ln (95 th percentile)	161.7	164.6		140.1	62.8		31.7	70.4	53.5	62.8	174.3	208
Back of Queue (*Q*), veh/ln (95 th percentile)	6.5	6.6		5.5	2.5		1.3	2.8	2.1	2.5	6.8	8.3
Queue Storage Ratio (*RQ*) (95 th percentile)	4.04	0.00		1.40	0.00		0.30	0.00	0.54	0.34	0.00	0.00
Uniform Delay (d_1), s/veh	67.9	67.1		57.3	53.7		8.3	2.2	7.9	6.3	2.7	3.7
Incremental Delay (d_2), s/veh	1.3	4.3		0.8	0.1		0.2	0.4	0.2	0.1	3.1	3.3
Initial Queue Delay (d_3), s/veh	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (*d*), s/veh	69.2	71.4		58.0	53.8		8.6	2.6	8.1	6.4	5.7	6.9
Level of Service (LOS)	E	E		E	D		A	A	A	A	A	A
Approach Delay, s/veh / LOS	70.3	E		56.6	E		3.6	A		6.3	A	
Intersection Delay, s/veh / LOS	10.9						B					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS								
Bicycle LOS Score / LOS								

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HCS7 Two-Way Stop-Control Report

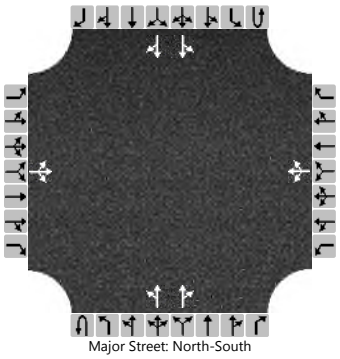
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/16/2018
Analysis Year	2024
Time Analyzed	AM Peak
Intersection Orientation	North-South
Project Description	Future

Site Information

Intersection	N-W Rd/Ogden
Jurisdiction	Naperville
East/West Street	Ogden Mall/Site
North/South Street	N-W Road
Peak Hour Factor	0.85
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	2	0	0	0	2	0
Configuration			LTR				LTR			LT		TR		LT		TR
Volume (veh/h)		8	1	2		56	1	56		4	555	56		56	286	1
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			13				133			5				66		
Capacity, c (veh/h)			249				280			1211				872		
v/c Ratio			0.05				0.47			0.00				0.08		
95% Queue Length, Q_{95} (veh)			0.2				2.4			0.0				0.2		
Control Delay (s/veh)			20.2				29.0			8.0				9.5		
Level of Service (LOS)			C				D			A				A		
Approach Delay (s/veh)		20.2				29.0				0.1				1.8		
Approach LOS		C				D										

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HCS7 Two-Way Stop-Control Report

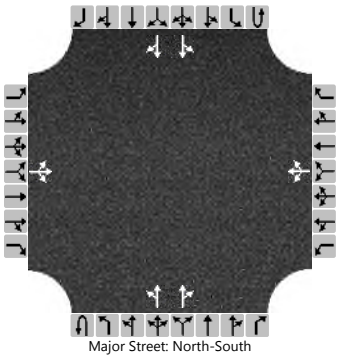
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/16/2018
Analysis Year	2024
Time Analyzed	Midday
Intersection Orientation	North-South
Project Description	Future

Site Information

Intersection	N-W Rd/Ogden
Jurisdiction	Naperville
East/West Street	Ogden Mall/Site
North/South Street	N-W Road
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	2	0	0	0	2	0
Configuration			LTR				LTR			LT		TR		LT		TR
Volume (veh/h)		11	1	6		64	1	64		8	524	64		64	658	4
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			19				136			8				67		
Capacity, c (veh/h)			173				245			888				951		
v/c Ratio			0.11				0.55			0.01				0.07		
95% Queue Length, Q_{95} (veh)			0.4				3.1			0.0				0.2		
Control Delay (s/veh)			28.4				36.6			9.1				9.1		
Level of Service (LOS)			D				E			A				A		
Approach Delay (s/veh)		28.4				36.6				0.2				1.2		
Approach LOS		D				E										

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HCS7 Two-Way Stop-Control Report

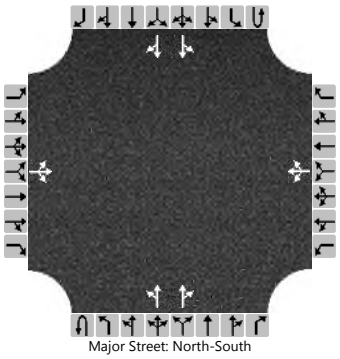
General Information

Analyst	SBC
Agency/Co.	EEA
Date Performed	10/16/2018
Analysis Year	2024
Time Analyzed	PM Peak
Intersection Orientation	North-South
Project Description	Future

Site Information

Intersection	N-W Rd/Ogden
Jurisdiction	Naperville
East/West Street	Ogden Mall/Site
North/South Street	N-W Road
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes


Major Street: North-South

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		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	2	0	0	0	2	0
Configuration			LTR				LTR			LT		TR		LT		TR
Volume (veh/h)		9	1	7		60	1	60		3	397	60		30	608	6
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		0				0										
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.9		7.5	6.5	6.9		4.1				4.1		
Critical Headway (sec)		7.56	6.56	6.96		7.56	6.56	6.96		4.16				4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			19				134			3				33		
Capacity, c (veh/h)			251				340			900				1046		
v/c Ratio			0.08				0.40			0.00				0.03		
95% Queue Length, Q_{95} (veh)			0.2				1.8			0.0				0.1		
Control Delay (s/veh)			20.5				22.3			9.0				8.6		
Level of Service (LOS)			C				C			A				A		
Approach Delay (s/veh)		20.5				22.3				0.1				0.6		
Approach LOS		C				C										

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