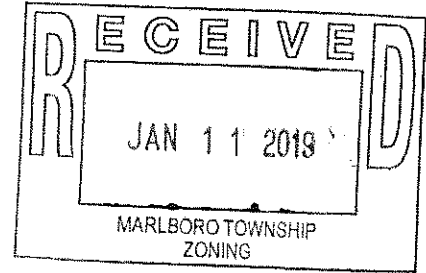




181 WEST HIGH STREET
SOMERVILLE, NJ 08876

908 927 0100p
908 927 0181f

A-36



November 19, 2018

Marlboro Township
Zoning Board of Adjustment
1979 Township Drive
Marlboro, NJ 07746

Re: Proposed Carwash
Block 122, Lot 33
Route 79 & Tennent Road
Marlboro, Monmouth County

Dear Board Members:

A use variance and site plan application has been filed by Posh Carwash & Lube to construct a carwash with two express lube bays along Tennent Road, just east of the intersection with Route 79 in Marlboro Township, Monmouth County, New Jersey (Figure 1). The subject property while currently vacant was previously approved for an approximate 8,500 square-foot office building.

This site is situated between a drive-in bank to the east and an office building to the west. Other uses surrounding the site are primarily commercial, except for two single-family homes directly opposite the site on Tennent Road.

As part of the application, this traffic impact assessment has been commissioned specifically to examine traffic conditions surrounding the site and evaluate the site suitability for the proposed use. Site access is proposed via one full-movement driveway on Tennent Road with a 6-foot wide concrete median to separate inbound and outbound traffic.

Familiarity with other carwashes offers significant insight into the projected operations of the proposed facility. Through a traffic evaluation of the proposed carwash, this analysis concludes that there will be no negative effects on traffic conditions along Tennent Road with the proposal to develop a carwash with lube facility. In addition, the site design has been reviewed to ensure the project can operate safely and efficiently with adequate on-site staging area to prevent any potential for queuing onto the public streets.

EXISTING ROADWAY CONDITIONS

As previously mentioned, the site is located east of the Route 79 intersection with Tennent Road, and is designated as Lot 33 in Block 122 of Marlboro Township, Monmouth County. Currently the site is vacant; adjacent land uses include the Garden State Community Bank located to the east, and an office building housing the Strand Insurance Finance Company as well as the Leneve School of Art to the west.

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Tennent Road is designated as Monmouth County Route 3 and has a general north/south orientation, however turns east just before intersecting Route 79. Therefore, for the purpose of this analysis Tennent Road will be considered to run in an east/west direction. Within vicinity of the site, the roadway provides one lane of travel in each direction with a posted speed limit of 35 miles per hour.

Route 79 is a State roadway under New Jersey Department of Transportation jurisdiction and has a general north/south orientation. The roadway generally provides one lane of travel in each direction with left and right turn lanes at major intersections. The posted speed limit is 45 miles per hour.

Route 79 & Tennent Road meet at a signalized "T-type" intersection, where the eastbound Tennent Road approach to the intersection provides for left and right turning movements via a single lane. On the southbound approach to the intersection, a right turn only lane is provided for movements onto westbound Tennent Road.

EXISTING TRAFFIC VOLUMES

To review the existing traffic conditions surrounding the property in question, manual turning movement counts were conducted during peak times of street activity that could be impacted by the proposed carwash facility. In particular, ambient "street" traffic activity is usually highest during morning and evening "rush" commuter hours. However minimal carwash activity typically occurs during morning peak hours.

In terms of potential site development, the proposed use and unique operating characteristics of this particular facility, represents one of the lower traffic commercial generators that would create limited peak hour traffic impacts on the adjacent roadway system. Compared to permitted uses in the C-2 Zone, the proposed carwash has lower traffic generation – not inconsistent with the approved office use - which lessens the potential traffic impacts on the surrounding area.

To first evaluate ambient traffic conditions at the site, manual traffic counts were conducted at the Tennent Road and Route 79 intersection during the following periods; appended Figure 2 shows the existing weekday evening and Saturday peak hour traffic volumes at the subject intersection:

- Saturday, October 20, 2018 from 11:00 a.m. to 2:00 p.m.
- Tuesday, October 23, 2018 from 4:00 p.m. to 6:30 p.m.

Experience has shown that during the typical weekday commuter peak hours when most traffic activity is typically "home-to-work" and "work-to-home" trips, motorists seldom make a special trip to a carwash. Particularly during the peak carwash winter season, it is usually dark during PM peak hours, and carwashes are often not open (or do very little business). Rather, motorists are more likely to visit a carwash during non- (or "off") peak hours, when on-street traffic volumes are significantly lower, for example at lunch-time on weekdays or on weekends.

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From a land use planning/traffic engineering perspective, land uses that do not by nature generate typical (commuter) peak hour trips, allow a more efficient use of available roadway capacity. In contrast, a typical residential or commercial/office use typically generates maximum traffic activity during those time periods when roadway capacity is most restricted. The proposed carwash use affords an added benefit in the minimal impact on peak hour capacity by generating the majority of site related traffic during "off peak" hours.

ANALYSIS OF EXISTING TRAFFIC VOLUMES

Traffic activity was observed to flow along Route 79 without any significant queuing or unexpected delays during both peak hours. Queuing was observed along Tennent Road on its approach to Route 79, this queuing occurred more so during the evening peak hour where vehicle queues infrequently reached the location of the proposed site driveway. While these queues were observed to reach the location of the proposed site driveway, the portion of Tennent Road fronting the site would clear with every superseding green phase, minimizing potential blockage time. These conditions would affect any use of the site and are endemic to the location, not any particular use.

A volume-capacity/level of service analysis was conducted for the existing traffic volumes at the signalized Route 79 intersection with Tennent Road using the Highway Capacity Manual (HCM) Software and based on the current NJDOT traffic signal timing plan. This type of analysis is performed to assess intersection operations and to identify any areas of excessive delay or congestion.

Figure 3 illustrates the existing peak Levels of Service at the Route 79 intersection with Tennent Road. As shown, during the critical evening peak hour all movements operate at a Level of Service "D" or better. Similarly, during the Saturday peak hour, northbound & southbound movements at the signalized intersection operate at more favorable Levels of Service "B" & "A" respectfully, with eastbound movements operating at Level of Service "D".

TRAFFIC CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

Trip generation characteristics of any use are directly related to the type, size, and characteristics of the use. Estimates of peak hourly traffic demands for a proposed project are typically prepared utilizing research estimates as compiled by the Institute of Transportation Engineers in the Trip Generation Manual. The associated land use categories for the proposed development are 941 "Quick Lubrication Vehicle Stop" and 948 "Automated Carwash."

Obviously, with certain types of land uses, such as residential or commercial buildings, peak hour traffic generation is relatively uniform and consistent. For carwashes, traffic can fluctuate by season and by day for example, during periods of inclement weather, carwash activity is significantly reduced.

Experience has shown that carwashes tend to reach maximum demands on days with seasonal weather immediately following inclement conditions that occurred several days prior. Typically, from January through April, (and occasionally into "pollen season") activity at carwashes is at a maximum. The volume of typical

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and seasonal traffic expected to be generated by the proposed carwash during the busiest street peak periods is shown in the following Table I:

TABLE I
 ESTIMATED TRIP GENERATION
 PROPOSED CARWASH & QUICK LUBE FACILITY

Land Use	Size	Evening Peak Hour		Saturday Peak Hour	
		Enter	Exit	Enter	Exit
Carwash	2,925 SF	17	17	45	45
Quick Lube	2 Bays	6	6	5	5
Total		23	3	50	50

FUTURE TRAFFIC VOLUMES

It is recognized that traffic routinely fluctuates along various state and county roadways, as well as local streets, and varies not only day-to-day, but also on a monthly and yearly basis. Normal "background" traffic increases regularly occur as attributed to continued regional growth and changes in driver demographics.

There may also be additional traffic generated by other projects that will lead to increased demands on the roadways in the site vicinity (at least to some degree), even if no changes were to occur on the subject property. Traffic has been found to regularly increase as development/redevelopment continues within the Township and neighboring communities.

To establish future conditions the 2018 existing volumes were increased by the NJDOT growth factor for Monmouth County of 1.5% per two years. These "no-build" volumes are illustrated on Figure 5. Site traffic was then added to the "no-build" volumes to create the future 2020 "build" scenario. Appended Figure 6 depicts the evening and Saturday peak hour traffic volumes for the future "build" conditions.

ANALYSIS OF FUTURE TRAFFIC CONDITIONS

Revised volume/capacity Level of Service analyses were conducted for the future "build" traffic conditions. Figure 7 illustrates the projected future Levels of Service. As shown, there will be no significant capacity constraints for movements either entering or exiting the proposed carwash. The site driveway will operate at Level of Service "C" or better during both peak hours. No significant delays are projected for the driveway approaches, and all traffic is expected to be able to readily enter and exit from the site.

With the addition of site traffic "build" levels of service at the Tennent Road intersection with Route 79 will continue to operate under "no-build" conditions. In other words, the addition of site traffic will have a negligible impact on signal operations.

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As a land use that will generate its primary traffic demands during "off-peak" times due to the nature of the proposed, the site development will not create any significant traffic impacts on the existing roadway system, particularly during the critical weekday evening peak period. This analysis has demonstrated that sufficient roadway capacity will exist and that acceptable driveway operations will be provided.

SITE ACCESS AND CIRCULATION

The Site Plan prepared by Cranmer Engineering, PA has been reviewed with specific attention focusing on the provision of safe and efficient access, egress and circulation. Site access is proposed via one full-movement driveway along Tennent Road.

Of particular concern with any carwash operation is the amount of queuing (or vehicular storage) provided on the site. Providing an adequate and well-defined storage area for carwash traffic is particularly critical when queues can, and do, become long on peak, seasonal days. Obviously, to maintain overall safety in the vicinity of the site, waiting vehicles should be stored on private property, clear of driveways and parking so that traffic does not interfere with free movement of traffic on the adjacent street and on-site.

Carwash equipment technology has significantly improved and carwashes now have the capacity to vary the processing speeds allowing more vehicles to be served. This improvement allows the operator to speed up the equipment, thus reducing queuing and improving customer service.

Therefore, in investigating the queuing requirements for a carwash, observations at existing carwash facilities during peak periods are particularly helpful to identify the actual maximum queues. During the seasonal period of peak site activity, from recent observations conducted at full-service, automated conveyor carwash facilities, maximum, seasonal peak hour queues of up to 15 vehicles have been experienced. For queues of this length, subsequent vehicles are unwilling to wait and often return at another time or visit a competing facility. The site design can accommodate at least 20 vehicles, thus adequate stacking has been provided.

Finally, in review of the site plan, it is further concluded that safe and well-defined ingress and egress will be provided to the site. With the provision of a stacking lane adequate for peak seasonal demands, overall site circulation will provide maximum safety and efficiency.

CONCLUSIONS

In summary, it is evident that the proposed carwash will not create a negative impact on external traffic conditions particularly in consideration of the "off-peak" nature of the proposed use.

Based on the anticipated operation of the proposed carwash with most traffic expected to occur outside of the traditional peak hours, the overall impacts of this proposal will be even lower. It is therefore concluded that the proposed development can be permitted without having any negative impact on the adjacent roadway network.

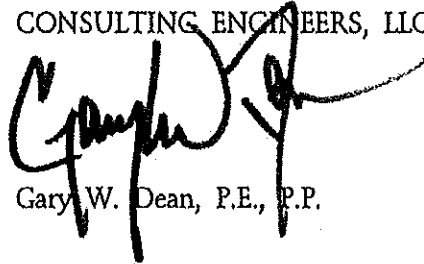
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ROUTE 79 & TENNENT ROAD
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Safe and efficient circulation can be provided throughout the site. The site driveway as well as the parking areas will be designed in accordance with recommended standards.

Very truly yours,

DOLAN & DEAN
CONSULTING ENGINEERS, LLC



Gary W. Dean, P.E., P.P.

EIC/lrc

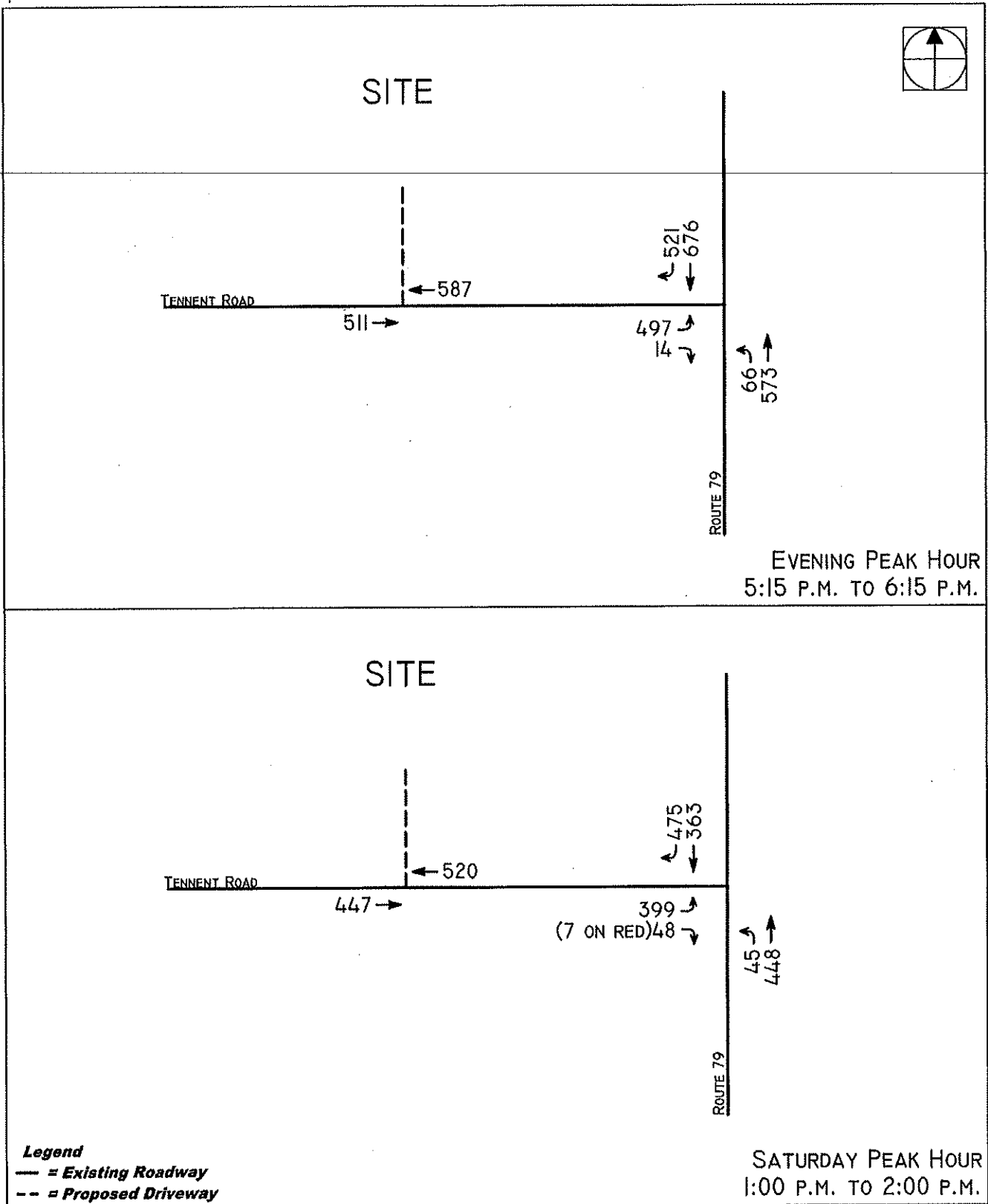
Microsoft Word Document - November 19, 2018

cc: Marc Markowitz poshcarwash@optonline.net



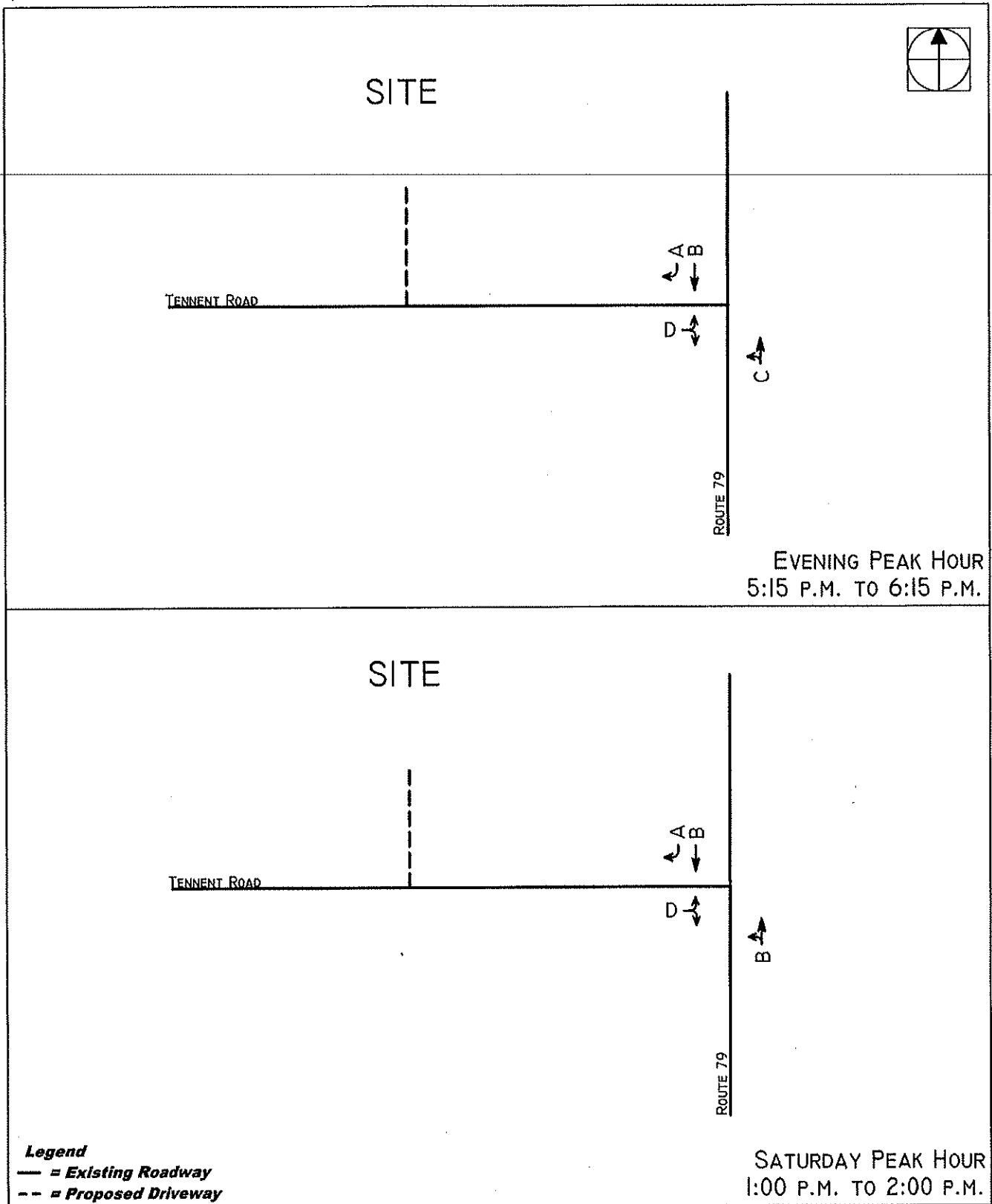
PROPOSED CARWASH WITH QUICK LUBRICATION
 TOWNSHIP OF MARLBORO
 MONMOUTH COUNTY, NEW JERSEY

FIGURE I



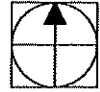
PROPOSED CARWASH WITH QUICK LUBRICATION
 TOWNSHIP OF MARLBORO
 MONMOUTH COUNTY, NEW JERSEY

FIGURE 2

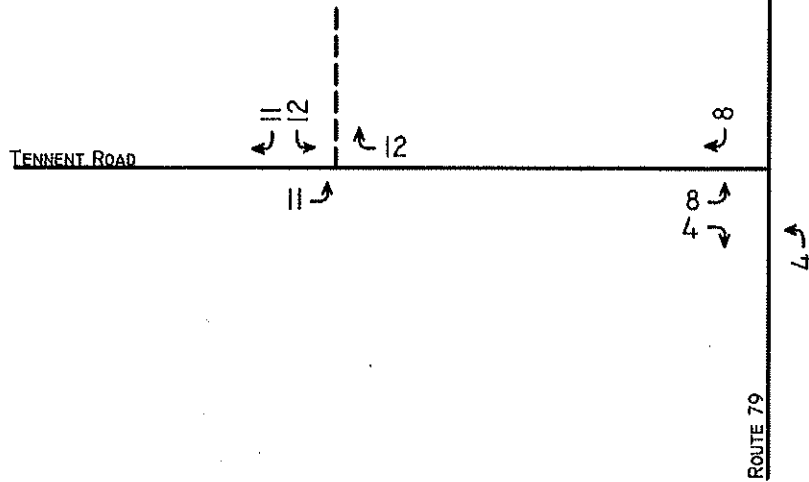


PROPOSED CARWASH WITH QUICK LUBRICATION
 TOWNSHIP OF MARLBORO
 MONMOUTH COUNTY, NEW JERSEY

FIGURE 3

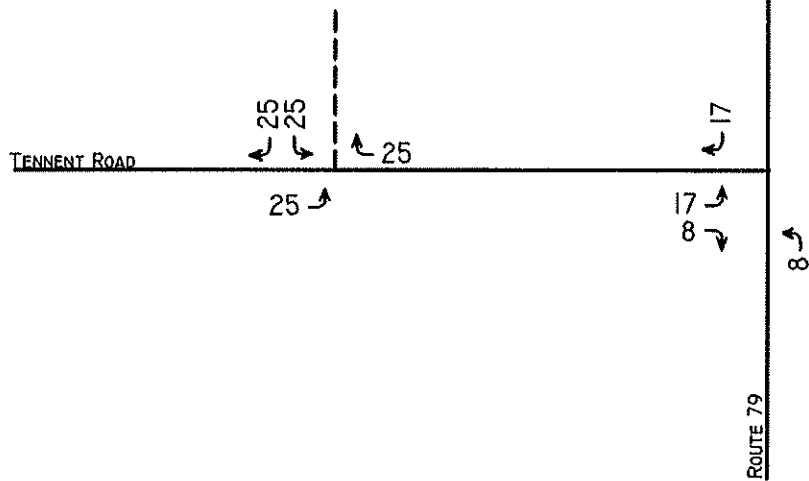


SITE
 ENTER 23 EXIT 23



EVENING PEAK HOUR
 5:15 P.M. TO 6:15 P.M.

SITE
 ENTER 50 EXIT 50



SATURDAY PEAK HOUR
 1:00 P.M. TO 2:00 P.M.

Legend

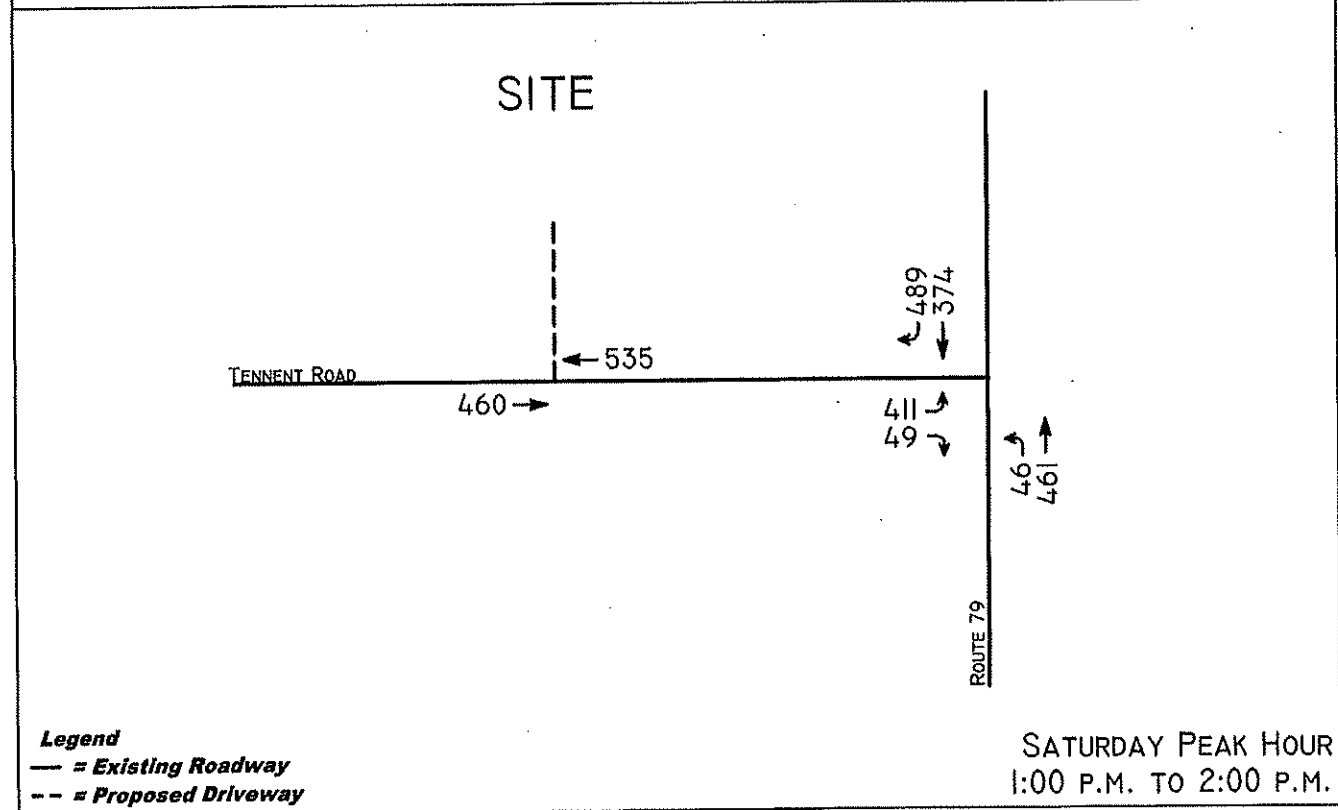
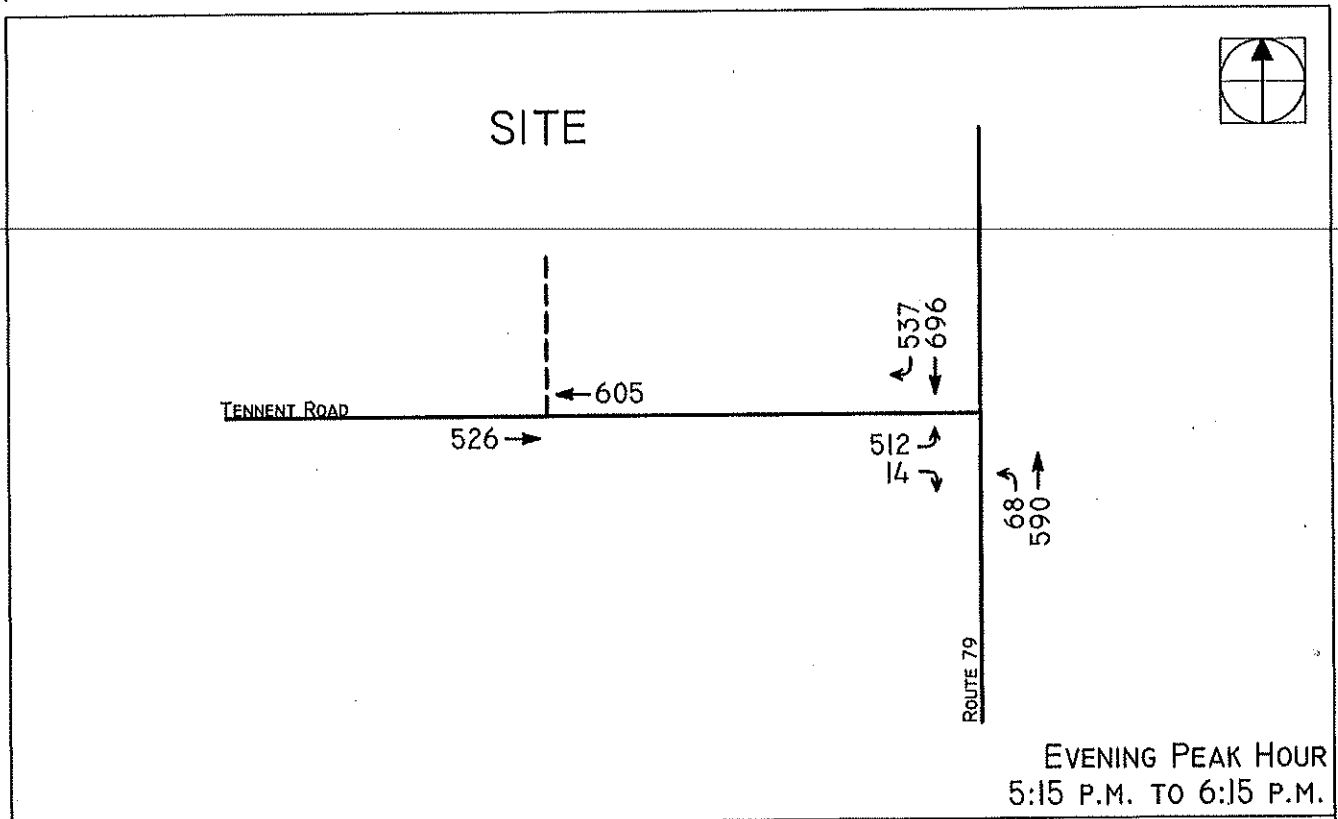
- = Existing Roadway
- = Proposed Driveway

PROPOSED CARWASH WITH QUICK LUBRICATION
 TOWNSHIP OF MARLBORO
 MONMOUTH COUNTY, NEW JERSEY

FIGURE 4

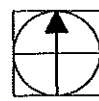


SITE GENERATED TRAFFIC VOLUMES



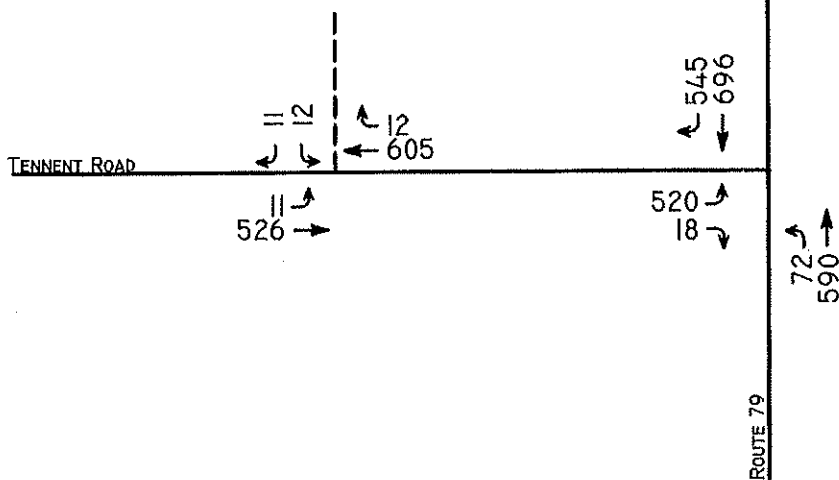
PROPOSED CARWASH WITH QUICK LUBRICATION
 TOWNSHIP OF MARLBORO
 MONMOUTH COUNTY, NEW JERSEY

FIGURE 5



SITE

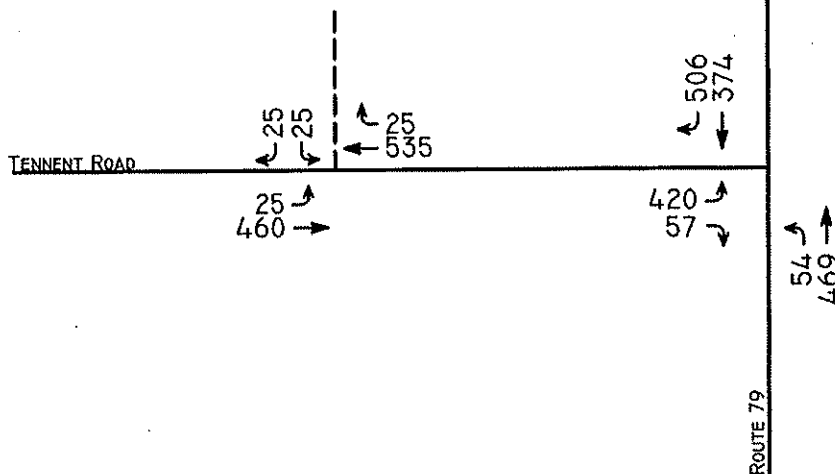
ENTER 23 EXIT 23



EVENING PEAK HOUR
5:15 P.M. TO 6:15 P.M.

SITE

ENTER 50 EXIT 50



SATURDAY PEAK HOUR
1:00 P.M. TO 2:00 P.M.

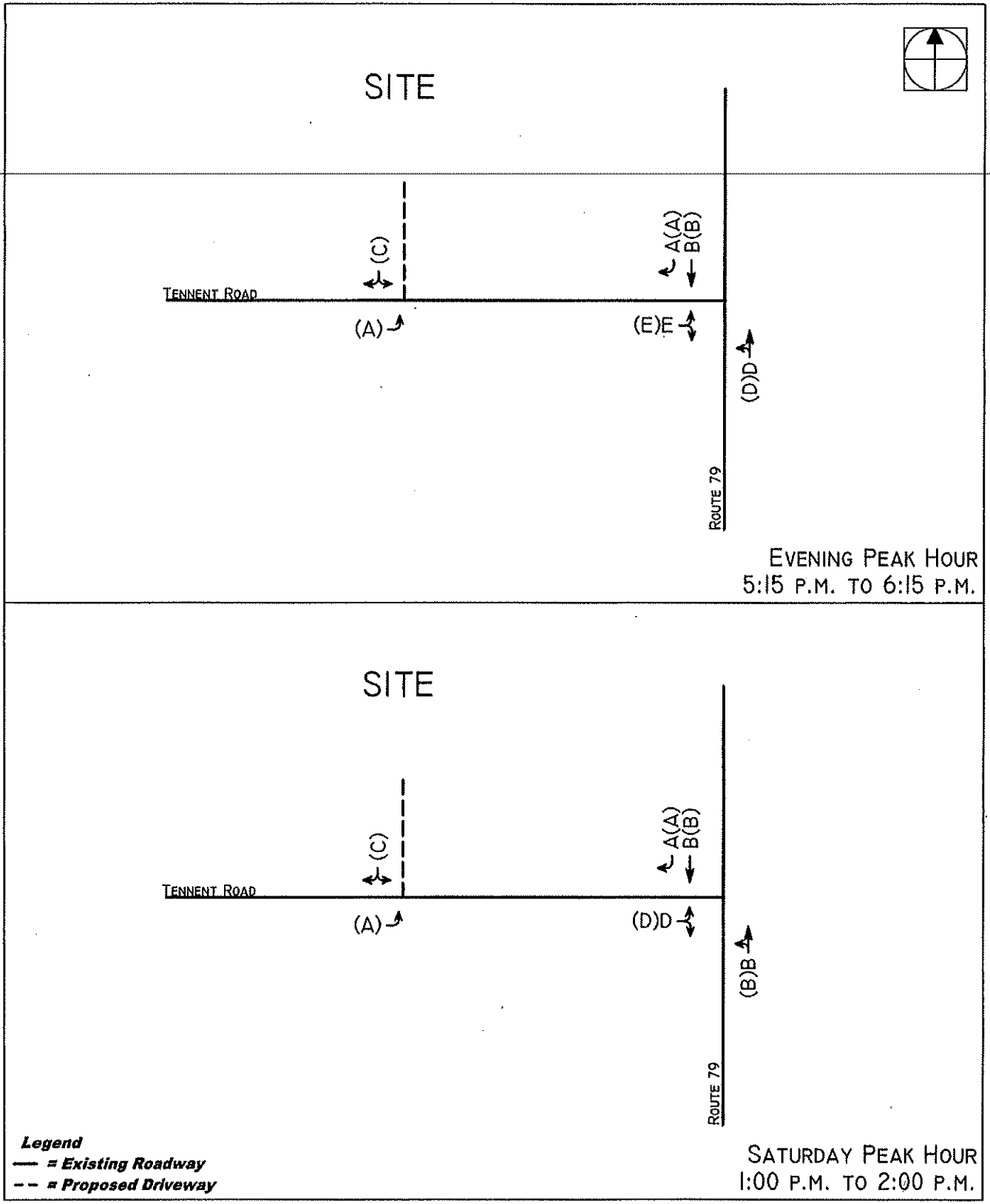
Legend

- = Existing Roadway
- - = Proposed Driveway

PROPOSED CARWASH WITH QUICK LUBRICATION
TOWNSHIP OF MARLBORO
MONMOUTH COUNTY, NEW JERSEY

FIGURE 6





PROPOSED CARWASH WITH QUICK LUBRICATION
 TOWNSHIP OF MARLBORO
 MONMOUTH COUNTY, NEW JERSEY

FIGURE 7



NO-BUILD (BUILD) LEVELS OF SERVICE

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency		Analysis Date	10/31/2018	Duration, h	0.25		
Analyst		Time Period		Area Type	Other		
Jurisdiction		Analysis Year	2018	PHF	0.96		
Urban Street		File Name	Route 79 & Tennent Pm Existing.xus	Analysis Period	1 > 7:00		
Intersection	Route 79 & Tennent Road						
Project Description	Pm Existing						

Demand Information	EB			WB			NB			SB				
	L	T	R	L	T	R	L	T	R	L	T	R		
Approach Movement														
Demand (v) Veh/h	297	10	11				66	573					676	521

Signal Information				Diagram											
Cycle, s	90.0	Reference Phase	2'												
Offsets, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Control Mode	Fixed	Simult. Gap N/S	On												
Green	50.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Yellow	5.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Red	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Timer Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Phase			4						2			6
Gate Number			120						80			70
Phase Duration, s			34.0						56.0			56.0
Change Period (Y/R/C), s			6.0						6.0			6.0
Max Allow Headway (MAH), s			3.1						0.0			0.0
Queue Clearance Time (QCT), s			27.2									
Green Extension Time (g _e), s			0.2						0.0			0.0
Phase Call Probability			1.00									
Max Out Probability			1.00									

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	2	13				5	2		6	16	16
Adjusted Flow Rate (v), veh/h		532						666			704	543
Adjusted Saturation Flow Rate (s _f), veh/h/in		1846						1319			1870	1586
Queue Service Time (g _s), s		25.1						19.5			24.2	6.2
Cycle Queue Clearance Time (C _q), s		25.1						13.6			24.2	6.2
Green Ratio (g/C)		0.31						0.56			0.56	0.87
Capacity (c _v), veh/h		674						777			1089	1374
Volume-to-Capacity Ratio (X)		0.927						0.857			0.678	0.395
Back of Queue (Q ₁), ft/in (50th percentile)		382.7						388.6			255.7	28.8
Back of Queue (Q), veh/in (50th percentile)		13.9						14.4			10.0	0.5
Queue Storage Ratio (QRS), (50th percentile)		0.00						0.00			0.00	0.00
Uniform Delay (d ₁), s/veh		30.0						18.7			14.3	1.2
Incremental Delay (d ₂), s/veh		2.10						1.17			1.6	0.9
Initial Queue Delay (d ₃), s/veh		0.0						0.0			0.0	0.0
Control Delay (d), s/veh		5.10						30.7			17.9	2.1
Level of Service (LOS)		D						C			B	A
Approach Delay (s/veh) / LOS		5.10	D					30.7	C		17.9	B
Intersection Delay, s/veh / LOS	25.0						C					

Multimodal Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Pedestrian LOS Score / LOS	1.73		B	1.95		B	1.37		A	1.66		B
Bicyclist LOS Score / LOS	1.67		A				1.69		B	2.61		C

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information					
Agency		Duration, h	0.25						
Analyst		Analysis Date	10/31/2018					Area Type	Other
Jurisdiction		Time Period						PHF	0.96
Urban Street		Analysis Year	2018					Analysis Period	1 > 7:00
Intersection	Route 79 & Tennent Road	File Name	Route 79 & Tennent Pm NoBuild.xus						
Project Description	Pm NoBuild								

Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v) veh/h	512	0	74				68	590			696	137

Signal Information												
Cycle, s	90.0	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	50.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	5.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Timer Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Phase		4						2				6
Phase Number		120						60				70
Phase Duration, s		34.0						56.0				56.0
Change Period (Y/R), s		6.0						6.0				6.0
Max Allow Headway (MAH), s		3.1						0.0				0.0
Queue Clearance Time (g _c), s		28.2										
Green Extension Time (g _e), s		0.0						0.0				0.0
Phase Call Probability		1.00										
Max Out Probability		1.00										

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	4	4				5	2		6		16
Adjusted Flow Rate (v) veh/h		548						685			725	559
Adjusted Saturation Flow Rate (s) Veh/h/ln		1846						1265			1870	1685
Queue Service Time (g _s), s		26.2						23.0			25.3	6.5
Cycle Queue Clearance Time (d _{cc}), s		26.2						48.3			25.3	6.5
Green Ratio (g/C)		0.31						0.56			0.56	0.87
Capacity (c) veh/h		574						747			1039	1374
Volume-to-Capacity Ratio (X)		0.954						0.917			0.698	0.407
Back of Queue (Q) (ft) (50th percentile)		65.3						427.7			268.9	18.4
Back of Queue (Q) (ft) (50th percentile)		15.2						16.8			10.6	0.5
Queue Storage Ratio (RSQ) (50th percentile)		0.00						0.00			0.00	0.00
Uniform Delay (d ₁), s/veh		30.4						20.4			14.5	1.2
Incremental Delay (d ₂), s/veh		26.2						18.0			3.9	0.9
Initial Queue Delay (d ₃), s/veh		0.0						0.0			0.0	0.0
Control Delay (d _c), s/veh		56.6						68.4			9.4	2.1
Level of Service (LOS)		E						D			B	A
Approach Delay, s/veh / LOS	68.6	E		0.0			38.4	D		11.3		B
Intersection Delay, s/veh / LOS	28.5						C					

Multimodal Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Pedestrian LOS Score / LOS	1.73	B		1.95	B		1.37	A		1.66	B	
Bicyclist LOS Score / LOS	1.39	A					1.62	B		2.61	C	

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency		Duration, h	0.25				
Analyst		Analysis Date	10/31/2018				
Jurisdiction		Time Period					
Urban Street		Analysis Year	2018				
Intersection	Route 79 & Tennent Road	File Name	Route 79 & Tennent Pm Build.xus				
Project Description	Pm Build						

Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v) veh/h	620	0	18				72	690				

Signal Information				Signal Phases												
Cycle, s	90.0	Reference Phase	2													
Offset, s	0	Reference Point	End													
Uncoordinated	No	Simult. Gap EW	On													
Force Mode	Fixed	Simult. Gap N/S	On													
Green	50.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	5.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Timer Results	EBL			EBT			WBL			WBT			NBL			NBT			SBL			SBT					
	Assigned Phase				4												2									6	
Case Number				120												80									70		
Phase Duration, s				34.0												56.0									56.0		
Change Period (Y+R), s				6.0												6.0									6.0		
Max Allow Headway (MAH), s				3.1												0.0									0.0		
Queue Clearance Time (g _s), s				29.1																							
Green Extension Time (g _e), s				0.0												0.0									0.0		
Phase Call Probability				1.00																							
Max Out Probability				1.00																							

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Assigned Movement	7	4	1				6	2		6	1	16
Adjusted Flow Rate (v), veh/h		560						690			725	568
Adjusted Saturation Flow Rate (s) veh/h/ln		1945						1236			1870	1686
Queue Service Time (g _s), s		27.1						24.7			25.3	6.7
Cycle Queue Clearance Time (Q _c), s		27.1						50.0			25.3	6.7
Green Ratio (g/C)		0.31						0.56			0.56	0.87
Capacity (c) veh/h/ln		674						731			1039	1374
Volume-to-Capacity Ratio (X)		0.976						0.944			0.698	0.413
Back of Queue (Q _b) ft/ln (50th percentile)		415.3						457.7			258.9	137.7
Back of Queue (Q), veh/ln (50th percentile)		16.4						18.0			10.6	0.5
Queue Storage Ratio (RQ) (50th percentile)		0.00						0.00			0.00	0.00
Uniform Delay (d ₁), s/veh		30.7						21.3			14.5	1.2
Incremental Delay (d ₂), s/veh		3.74						22.0			3.9	0.9
Initial Queue Delay (d ₃), s/veh		0.0						0.0			0.0	0.0
Control Delay (d), s/veh		62.1						43.4			18.4	2.2
Level of Service (LOS)		E						D			B	A
Approach Delay, s/veh / LOS	62.1	E		0.0			43.4	D		18.4	B	
Intersection Delay, s/veh / LOS	31.2						C					

Multimodal Results	EB			WB			NB			SB		
	Pedestrian LOS Score / LOS	1.73	B		1.95	B		1.37	A		1.66	B
Bicycle LOS Score / LOS	1.41	A					1.63	B		2.02	C	

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency		Duration, h	0.25				
Analyst		Analysis Date	10/31/2018				
Jurisdiction		Time Period					
Urban Street		Analysis Year	2018				
Intersection	Route 79 & Tennent Road	File Name	Route 79 & Tennent Sat Existing.xus				
Project Description	Sat Existing						

Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v) veh/h	399	0	48				45	448		363	476	

Signal Information															
Cycle, s	90.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap EW	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	50.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Yellow	5.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			
Red	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0			

Timer Results	EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
	Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration	Phase	Duration
Assigned Phase			4						2						6	
Phase Number			12.0						8.0						7.0	
Phase Duration, s			34.0						56.0						56.0	
Change Period (Y/R) s			8.0						6.0						6.0	
Max Allow Headway (MAH), s			3.1						0.0						0.0	
Queue Clearance Time (g/s) s			23.0													
Green Extension Time (g _e) s			0.5						0.0						0.0	
Phase Call Probability			1.00													
Max Out Probability			0.38													

Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	1	1				6	2		6	1	
Adjusted Flow Rate (v) veh/h		471						519			382	500
Adjusted Saturation Flow Rate (s) veh/h/s		1843						1794			1885	1598
Queue Service Time (g _s) s		21.3						0.0			10.2	5.5
Cycle Queue Clearance Time (g _c) s		21.3						16.2			10.2	16.5
Green Ratio (g/C)		0.31						0.56			0.56	0.87
Capacity (c) veh/h		576						1041			1047	1385
Volume-to-Capacity Ratio (X)		0.821						0.499			0.365	0.361
Back of Queue (Q _b) ft/h (50th percentile)		259.5						66.7			109.8	111
Back of Queue (Q) veh/h (50th percentile)		10.3						6.2			4.1	0.4
Queue Storage Ratio (R/Q) (50th percentile)		0.00						0.00			0.00	0.00
Uniform Delay (d ₁) s/veh		28.7						12.3			11.1	1.2
Incremental Delay (d ₂) s/veh		3.7						3.7			0	0.7
Initial Queue Delay (d ₃) s/veh		0.0						0.0			0.0	0.0
Control Delay (d) s/veh		37.4						14.0			12.1	1.9
Level of Service (LOS)		D						B			B	A
Approach Delay, s/veh / LOS	37.4	D		0.0			14.0	B		6.3		A
Intersection Delay, s/veh / LOS	16.3						B					

Multimodal Results	EB			WB			NB			SB		
	Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS	Score	LOS
Pedestrian LOS Score / LOS	1.73	B	1.95	B	1.37	A	1.66	B				
Bicycle LOS Score / LOS	1.26	A			1.84	A	1.94	B				

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information																							
Agency				Duration, h		0.25																					
Analyst		Analysis Date		10/31/2018		Area Type						Other															
Jurisdiction		Time Period				PHF						0.95															
Urban Street		Analysis Year		2018		Analysis Period						1 > 7:00															
Intersection		Route 79 & Tennent Road		File Name		Route 79 & Tennent Sat NoBuild.xus																					
Project Description		Sat NoBuild																									
Demand Information				EB			WB			NB			SB														
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R												
Demand (v), Veh/h				411	0	49				46	46		374	489													
Signal Information																											
Cycle, s		90.0										Reference Phase		2													
Offset, s		0										Reference Point		End													
Uncoordinated		No										Simult. Gap E/W		On													
Force Mode		Fixed										Simult. Gap N/S		On													
Timer Results				EBL			EBT			WBL			WBT			NBL			NBT			SBL			SBT		
Assigned Phase							4									2			6								
Case Number							2.0						6.0			7.0											
Phase Duration, s							34.0						56.0			56.0											
Change Period (Y+R), s							6.0						6.0			6.0											
Max Allow Headway (MAH), s							3.1						0.0			0.0											
Queue Clearance Time (g ₀), s							24.1																				
Green Extension Time (g _e), s							0.5						0.0			0.0											
Phase Call Probability							1.00																				
Max Out Probability							0.64																				
Movement Group Results				EB			WB			NB			SB														
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R												
Assigned Movement				7	2	14				5	2		6	16													
Adjusted Flow Rate (v), veh/h				484						534			394 515														
Adjusted Saturation Flow Rate (s) veh/h/in				1843						1792			1885 1698														
Queue Service Time (g _s), s				22.1						0.0			10.6 5.7														
Cycle Queue Clearance Time (g _c), s				22.1						15.0			10.6 6.7														
Green Ratio (g/C)				0.31						0.56			0.56 0.87														
Capacity (c), veh/h				573						1039			1047 1385														
Volume-to-Capacity Ratio (X)				0.845						0.513			0.376 0.372														
Back of Queue (Q ₀), ft/in (50th percentile)				276						163			107.9 11.4														
Back of Queue (Q), veh/in (50th percentile)				11.0						6.5			4.3 0.5														
Queue Storage Ratio (URQ), (50th percentile)				0.00						0.00			0.00 0.00														
Uniform Delay (d ₁), s/veh				29.0						12.4			11.2 1.2														
Incremental Delay (d ₂), s/veh				10.6						1.8			1.0 0.6														
Initial Queue Delay (d ₃), s/veh				0.0						0.0			0.0 0.0														
Control Delay (d _c), s/veh				39.6						14.2			12.6 1.9														
Level of Service (LOS)				D						B			B A														
Approach Delay, s/veh / LOS				39.5			D			14.2			B			6.4											
Intersection Delay, s/veh / LOS							16.9						B														
Multimodal Results				EB			WB			NB			SB														
Pedestrian LOS Score / LOS				1.73			B			1.95			B			1.37			A			1.66			B		
Bicycle LOS Score / LOS				1.29			A									1.37			A			1.99			B		

HCS7 Signalized Intersection Results Summary

General Information				Intersection Information			
Agency		Analysis Date	10/31/2018	Duration, h	0.25		
Analyst		Time Period		Area Type	Other		
Jurisdiction		Analysis Year	2018	PHF	0.95		
Urban Street		File Name	Route 79 & Tennent Sat Build.xus	Analysis Period	1> 7:00		
Intersection	Route 79 & Tennent Road						
Project Description	Sat Build						

Demand Information	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Approach Movement												
Demand (v) veh/h	720	10	57				54	469		374		506

Signal Information				Signal Timing Diagram								
Cycle, s	90.0	Reference Phase	2									
Offset, s	0.0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On									
Force Mode	Fixed	Simult. Gap N/S	On									
Green	50.0	28.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	5.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Red	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Time Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Phase			4						2			6
Phase Duration, s			34.0						56.0			56.0
Change Period (Y/R) s			6.0						6.0			6.0
Max Allow Headway (MAH), s			3.2						0.0			0.0
Queue Clearance Time (c) s			25.0									
Green Extension Time (g _e), s			0.4						0.0			0.0
Phase Call Probability			1.00									
Max Out Probability			1.00									

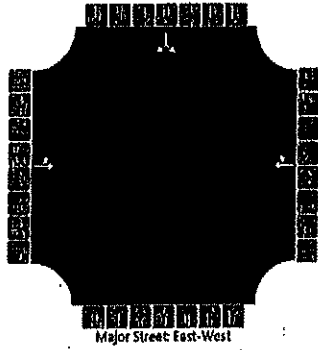
Movement Group Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	7	1	12				5	2		6		6
Adjusted Flow Rate (v), veh/h		502						551			394	533
Adjusted Saturation Flow Rate (s) veh/h		1840						1775			1885	1598
Queue Service Time (g _s), s		23.3						1.5			10.8	6.0
Cycle Queue Clearance Time (c) s		23.3						16.7			10.5	6.0
Green Ratio (g/C)		0.31						0.56			0.56	0.87
Capacity (c) veh/h		1572						1080			1047	1385
Volume-to-Capacity Ratio (X)		0.877						0.534			0.376	0.386
Back of Queue (Q) (60th percentile) ft		301						703			1079	123
Back of Queue (Q), veh/h (50th percentile)		11.9						6.8			4.3	0.5
Queue Storage Ratio (R _Q) (50th percentile)		1.00						1.00			1.00	1.00
Uniform Delay (d ₁), s/veh		29.4						12.6			11.2	1.2
Incremental Delay (d ₂), s/veh		8.6						2.0			1.0	0.6
Initial Queue Delay (d ₃), s/veh		0.0						0.0			0.0	0.0
Control Delay (d _c), s/veh		43.8						15.5			12.0	2.0
Level of Service (LOS)		D						B			B	A
Approach Delay (s/veh) / LOS	43.8			0.0			15.5			12.0		
Intersection Delay, s/veh / LOS	18.0						B					

Multimodal Results	EB			WB			NB			SB		
	L	T	R	L	T	R	L	T	R	L	T	R
Pedestrian LOS Score / LOS	1.73		B	1.95		B	1.37		A	1.66		B
Bicyclist LOS Score / LOS	1.62		A				1.40		A	2.02		B

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	EIC			Intersection	Tennent Road & Site Drive		
Agency/Co.	DD			City/Town	Tennent Road		
Date Performed	11/7/2018			East/West Street	Tennent Road		
Analysis Year	2018			North/South Street	Site Drive		
Time Analyzed	Pm Build			Peak Hour Factor	0.95		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description							

Lane



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound			Southbound		
	1U	1	2	3	4U	4	5	6	7	8	9	10	11	12
Movement	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Priority	10	1	2	3	4U	4	5	6	7	8	9	10	11	12
Number of Phases	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Configuration		LT						TR					LR	
Volume (veh)		11	526			808	27					12		10
Percent Heavy Vehicles (%)		2										2		2
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)		2.2										6.2		3.3
Base Follow-Up Headway (sec)		2.2										3.5		3.3
Follow-Up Headway (sec)		2.2										3.5		3.3

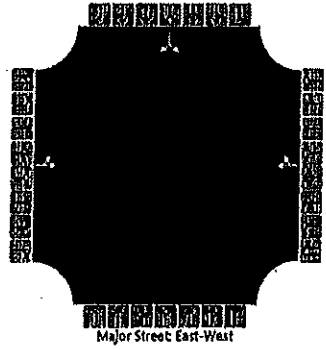
Delay, Queue Length and Level of Service

Flow Rate, v (veh/h)		12												24
Capacity, c (veh/h)		317												272
v/c Ratio		0.01												0.09
95% Queue Length, Q ₉₅ (veh)		0.0												0.5
Control Delay (s/veh)		8.9												19.5
Level of Service (LOS)		A												C
Approach Delay (s/veh)		0.3										19.5		
Approach LOS		A										C		

HCS7 Two-Way Stop-Control Report

General Information				Site Information			
Analyst	EIC			Intersection	Tennent Road & Site Drive		
Agency/co.	DD			Jurisdiction			
Date Performed	11/7/2018			East/West Street	Tennent Road		
Analysis Year	2018			North/South Street	Site Driveway		
Time Analyzed	Sat Build			Peak Hour Factor	0.96		
Intersection Orientation	East-West			Analysis Time Period (hrs)	0.25		
Project Description							

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
Priority	1U	1	2	3	4U	4	5	6	7	8	9		10	11	12	
Number of Lanes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Configuration	LT								TR				LR			
Volume (veh/h)		25	260				535	25					25		25	
Percent Heavy Vehicles (%)		1											1		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)		4.1											6.1		6.2	
Base Follow-Up Headway (sec)		2.2											3.5		3.3	
Follow-Up Headway (sec)		2.2											3.5		3.3	

Delay, Queue Length and Level of Service

Flow Rate, v (veh/h)		26													52	
Capacity, c (veh/h)		996													917	
v/c Ratio		0.03													0.16	
95% Queue Length, Q ₉₅ (veh)		0.1													0.6	
Control Delay (s/veh)		8.7													18.6	
Level of Service (LOS)		A													C	
Approach Delay (s/veh)	0.7												18.6			
Approach LOS	A												C			