TRAFFIC ENGINEERING EVALUATION

EL AT MARLBORO 79
TOWNSHIP OF MARLBORO
MONMOUTH COUNTY, NEW JERSEY

PREPARED FOR:

EL AT MARLBORO 79, LLC
2465 Kuser Road
Hamilton, New Jersey 08690

December 3, 2019
BCG File No. 080726-F3-001

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Phone: 973-359-8400

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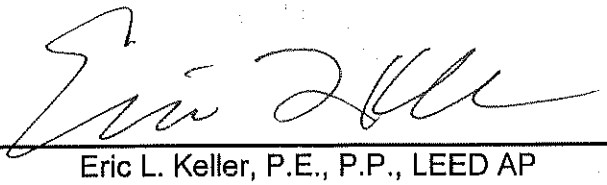

Eric L. Keller, P.E., P.P., LEED AP
Professional Engineer License No. 32054

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EL AT MARLBORO 79
TOWNSHIP OF MARLBORO
MONMOUTH COUNTY, NEW JERSEY

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TOWNSHIP OF MARLBORO
MONMOUTH COUNTY, NEW JERSEY

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Phone: 973-359-8400

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TOWNSHIP OF MARLBORO
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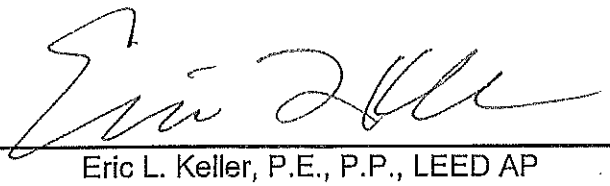

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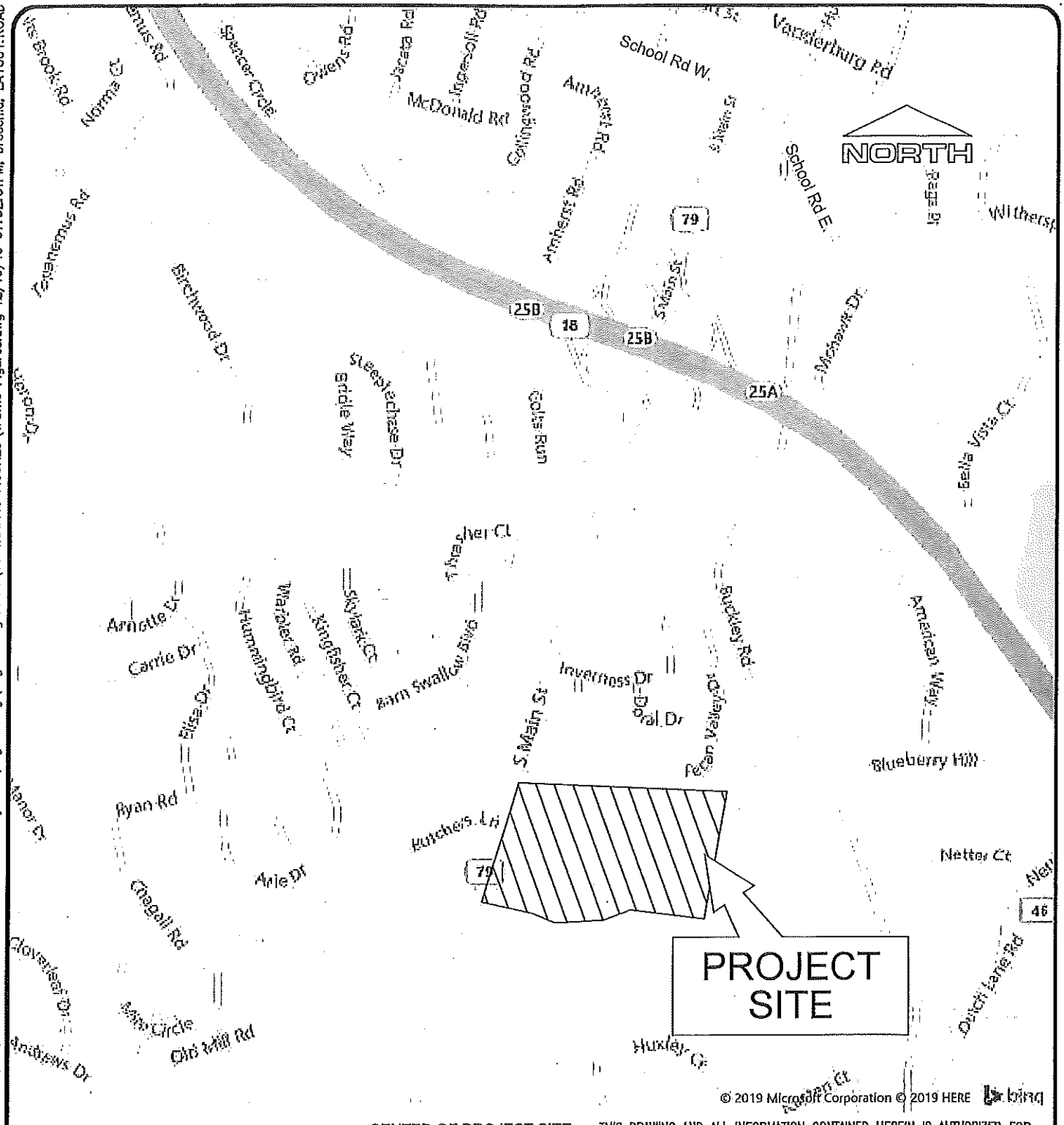
INTRODUCTION

This Traffic Engineering Evaluation was prepared to assess any traffic impacts that may occur from the proposed development of the subject site located on the east side of South Main Street (State Route 79) in the Township of Marlboro, Monmouth County. The project is proposed to contain a total of 280 multi-family dwelling units of which 56 units will be affordable units in two three-story buildings, with the remaining 224 dwelling units being townhouses in 32 buildings. A total of 918 parking spaces are proposed of which 448 spaces are provided in garages, 224 spaces in driveways and the remaining 246 spaces are provided in surface parking lots and on-street parking. The location of the site is illustrated in Figure 1.

The subject property is known on the Township of Marlboro tax maps as Block 415, Lot 22, which contains approximately 34.1 acres with approximately 910 feet of frontage along the east side of South Main Street. The site currently contains a single-family structure with a driveway extending from South Main Street. Access will be provided via a boulevard entrance approximately 90 feet north of the existing driveway.

Primary aspects of this study include the investigation of existing conditions adjacent to the site, the establishment of background traffic volumes for the surrounding streets, estimation of the development related trip generation utilizing known published sources, assignment of the development related volumes to the key intersections serving the proposed development site, and the assessment of intersection performance using established traffic engineering methodologies. The base year for anticipated build-out of the development is 2022.

The ensuing report will detail the existing and proposed conditions, summarize the traffic operations at key locations, and include our findings as to the effects of the proposed development on the existing street network.



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54 Horsehill Road, Suite 100
Cedar Knolls, New Jersey 07927
www.bowmanconsulting.com
E-mail: NJ@BowmanConsulting.com
Phone: 973-359-8400
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FIGURE 1
ROAD LOCATION MAP
LENNAR - MARLBORO
BLOCK 415, LOT 22
TOWNSHIP OF MARLBORO, MONMOUTH CO., N.J.

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EXISTING CONDITIONS

The subject property currently contains a single-family structure, with the remainder of the site a mix of active farm fields and vacant, wooded areas. Access is currently provided via a driveway from South Main Street in the southwestern portion of the site, south of Butchers Lane. Adjacent surrounding land uses are predominantly residential with a mix of single and multi-family dwellings, with some agricultural and commercial uses.

Our assessment of traffic conditions in this area included a study of the following intersections:

1. South Main Street (State Route 79) with School Road (signalized)
2. South Main Street (State Route 79) with Ryan Road/Inverness Drive (signalized)
3. South Main Street (State Route 79) with Old Mill Road (unsignalized)

Field observations were made of the existing traffic control devices at the studied intersections. The following subsections include a brief description of key routes in the adjacent roadway system:

Study Roadways

South Main Street (State Route 79)

South Main Street (State Route 79) serves as an urban principal arterial extending in a north-south direction. It begins to the south at U.S. Route 9 in Freehold Township, near its interchange with State Route 33 and terminates at State Route 34 to the north in Matawan Borough. It is under State jurisdiction and also provides connections with State Route 33 Business, State Route 18 and a number of County highways.

South Main Street in the vicinity of the site provides one travel lane in each direction with narrow paved shoulders. The posted speed limit is 50 MPH. No parking is permitted along either side of the street. There are no sidewalks on either side of the street within the vicinity of the subject property.

School Road East and School Road West

School Road East serves as an urban local street extending in a generally north-south direction extending from County Route 537 to the south with South Main Street (State Route 79) to the northwest. School Road West serves as an urban major collector also extending in a generally north-south direction extending from South Main Street to Wyncrest Road.

South of South Main Street, it contains one travel lane in each direction with a narrow cartway width of approximately 20 feet with narrow paved shoulders and no sidewalks. North of South Main Street, it contains one travel lane in each direction with sidewalks along both sides of the street. The Marlboro Fire Company is located on the north side

of School Street West, just west of its intersection with South Main Street. School Road East has a posted speed limit of 35 MPH, while School Road West has a posted speed limit of 25 MPH.

Ryan Road

Ryan Road serves as an urban major collector extending in an east-west direction extending from U.S. Route 9 to the west and South Main Street (State Route 79) to the east. Ryan Road conveys local traffic oriented to and from the adjacent land uses as well as regional traffic seeking accessibility to the highway network. The posted speed limit is 35 MPH in the vicinity of its intersection with South Main Street.

Ryan Road, from South Main Street to the shopping center driveway, is striped for one travel lane in each direction with paved shoulders and no sidewalks. West of the shopping center driveway there is a sidewalk along the north side of the street. East of South Main Street, Inverness Drive extends from the terminus of Ryan Road into a single family neighborhood and connects with Buckley Road.

Old Mill Road

Old Mill Road serves as an urban local street extending in a generally east-west direction between Robertsville Road (County Route 520) and South Main Street (State Route 79). Old Mill Road conveys local traffic oriented to and from the adjacent land uses with the arterial road network. The posted speed limit is 25 MPH in the vicinity of its intersection with Bonnie Burn Road.

Studied Intersections

The intersection of South Main Street (State Route 79) with School Road is controlled by a three-phase, semi-actuated traffic signal operating on a variable cycle length between 63 and 120 seconds. There are lead left indications for both approaches of South Main Street. Both South Main Street approaches provide one shared through/right turn lane and an exclusive left turn lane. The westbound School Road approach is provided with a single lane accommodating left turn, through and right turn movements. The eastbound School Road approach is not striped for two lanes but operates as such with the right turns accommodated in the curb lane and the left turn/through movements accommodated in the left lane. There is also a fire pre-emption phase associated with this signal as the Marlboro Fire Company is located in the northwest quadrant of the intersection.

The intersection of South Main Street (State Route 79) with Ryan Road/Inverness Drive is controlled by a four-phase, semi-actuated traffic signal operating on a variable cycle length. The cycle length during the weekday PM peak hour varies between 109 and 136 seconds; and all other days and times it varies between 74 and 90 seconds. The northbound South Main Street approach provides an exclusive left turn lane and a shared through/right turn lane. The southbound South Main Street approach is provided with a single exclusive left turn lane, an exclusive through lane and an

exclusive right turn lane. The eastbound Ryan Road approach and the westbound Inverness Drive approach are both provided with exclusive left turn lanes and shared through/right turn lanes. There is also a jughandle in the southeast quadrant that is signed for U-turn movements along South Main Street.

The intersection of South Main Street (State Route 79) with Old Mill Road is controlled by a "STOP" sign on the eastbound Old Mill Road approach. All approaches are provided with a single travel lane which accommodate all traffic movements. There are wide shoulders along South Main Street which permits through traffic to bypass left turning traffic to Old Mill Road; and to permit southbound right turns to move out of the through lane of traffic.

Traffic Volumes

Manual intersection traffic turning movement counts were performed at the following intersections on Wednesday, June 12, 2019:

1. South Main Street (State Route 79) with School Road (signalized)
2. South Main Street (State Route 79) with Ryan Road/Inverness Drive (signalized)
3. South Main Street (State Route 79) with Old Mill Road (unsignalized)

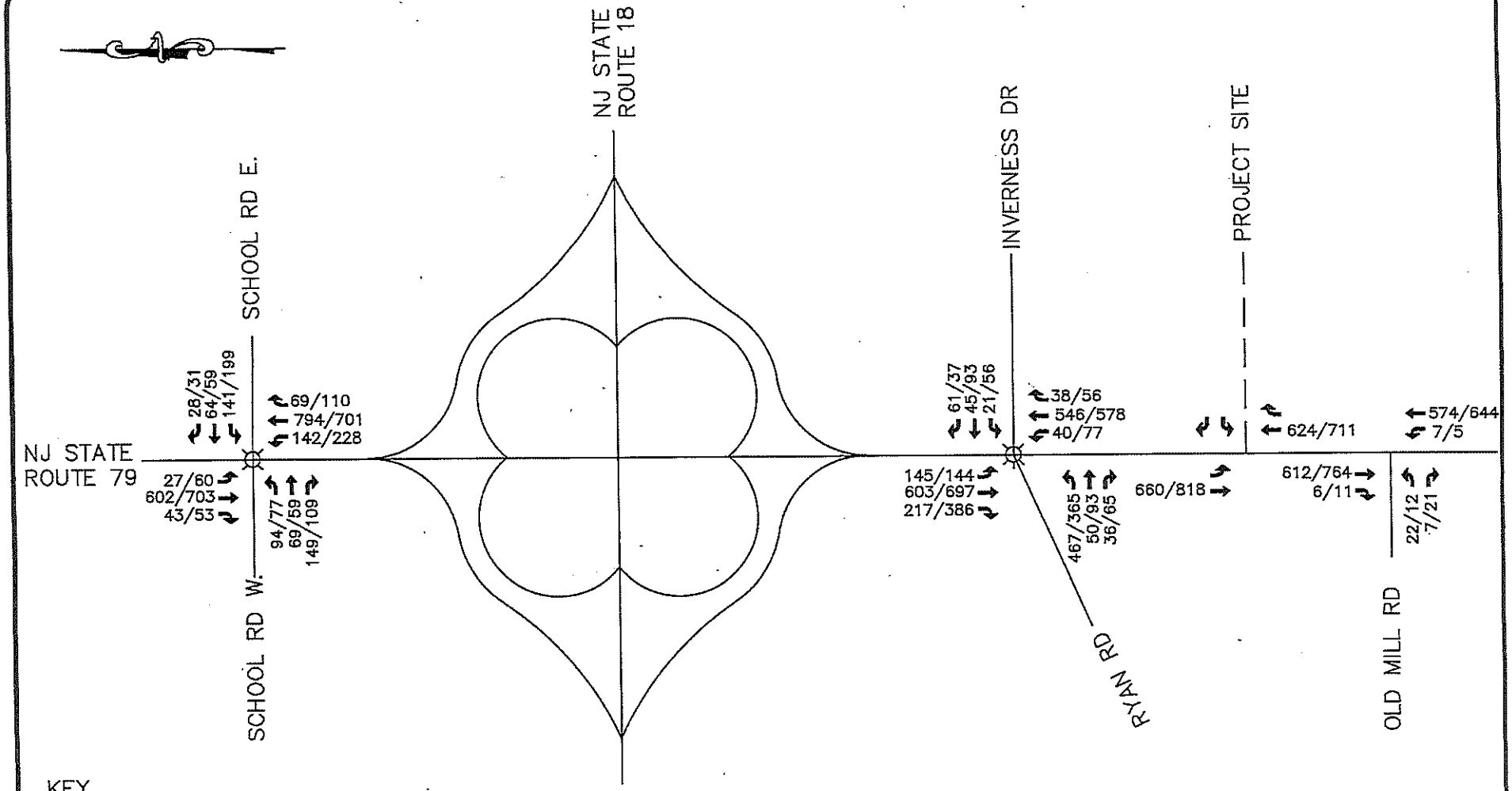
These counts were performed while school was still in session and the weather was clear. These counts included the morning peak period from 7:00 AM to 9:00 AM and the evening peak period from 4:00 PM to 6:00 PM.

Based on the manual traffic turning movement counts, the AM weekday peak hour at the individual intersections varied between 7:30/8:30 AM and 8:00/9:00 AM. For analysis purposes we used the peak hours at each studied intersection. The PM weekday peak hour also varied by individual intersection between 4:30/5:30 PM and 5:00/6:00 PM. Again, for analysis purposes, we used the peak hours at each studied intersection.

Existing volumes at the studied locations for the weekday AM peak hour and PM peak hour are illustrated in Figure 2. We also performed a classification count to calculate the actual truck percentages for each peak hour at the three studied intersections. These existing traffic volume data were used as the basis for this traffic engineering evaluation. Appendix III contains the AM and PM peak period traffic turning movement counts.

Capacity Analyses

The existing AM and PM peak hour intersection traffic volumes were analyzed to evaluate the quality of operation at the studied intersections. The methodologies presented in 2010 Highway Capacity Manual, Chapter 18 entitled "Signalized Intersections" and Chapter 19 entitled "Two-Way Stop-Controlled Intersections" were used in these analyses. Intersection capacity calculations were completed using the



KEY

←00/00 – AM PEAK/PM PEAK HOUR VOLUMES

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Bowman Consulting Group, Ltd.
54 Horsehill Road, Suite 100
Cedar Knolls, New Jersey 07927
www.bowmanconsulting.com
E-mail: NJ@BowmanConsulting.com
Phone: 973-359-8400
FAX: 973-359-8455
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FIGURE 2
LENNAR - MARLBORO
EXISTING (2019) TRAFFIC VOLUMES
TOWNSHIP OF MARLBORO, MONMOUTH COUNTY, NEW JERSEY

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Highway Capacity Software, version 7.7. Definitions of Levels of Service for stop- and signal-controlled intersections are provided in Appendix I.

The methodology addresses two measurements of an intersection's effectiveness in accommodating conflicting traffic movements; capacity and level of service (LOS). Capacity is defined for each approach as a maximum number of vehicles that may pass through the intersection given the prevailing roadway and traffic control conditions. The capacity is evaluated in terms of the ratio of actual traffic flow to capacity (v/c ratio). The second measure of effectiveness is average stopped delay per vehicle (seconds/vehicle), which determines the Level of Service.

Table 1 presents the levels of service for the AM and PM peak hours at the studied intersections. As shown in Table 1, under 2019 Existing Conditions, all movements at the studied intersections operate at acceptable LOS D or better during both peak hours, except for the side street movements of Ryan Road and Inverness Drive. The current signal timing, as provided by the NJDOT, results in the eastbound Ryan Road left turn movement operating at LOS F and the westbound Inverness Drive through/right movement operating at LOS E during the AM peak hour. During the PM peak hour, the westbound Inverness Drive through/right movement is calculated to operate at LOS F.

PROPOSED CONDITIONS

The proposed development program will contain 280 multi-family dwelling units of which 56 units will be affordable units in two three-story buildings, with the remaining 224 dwelling units being townhouses in 32 buildings. A total of 918 parking spaces are proposed of which 448 spaces are provided in garages, 224 spaces in driveways and the remaining 246 spaces are provided in surface parking lots and on-street parking. This exceeds the parking requirement of 784 spaces as set forth in the Residential Site Improvement Standards (RSIS) based upon the mix of unit types and number of bedrooms.

The Year 2022 has been selected as the future analysis year for full occupancy of the proposed development. We have analyzed conditions for the Year 2022 without the project (No-Build) and with the project (Build).

Year 2022 No-Build Conditions

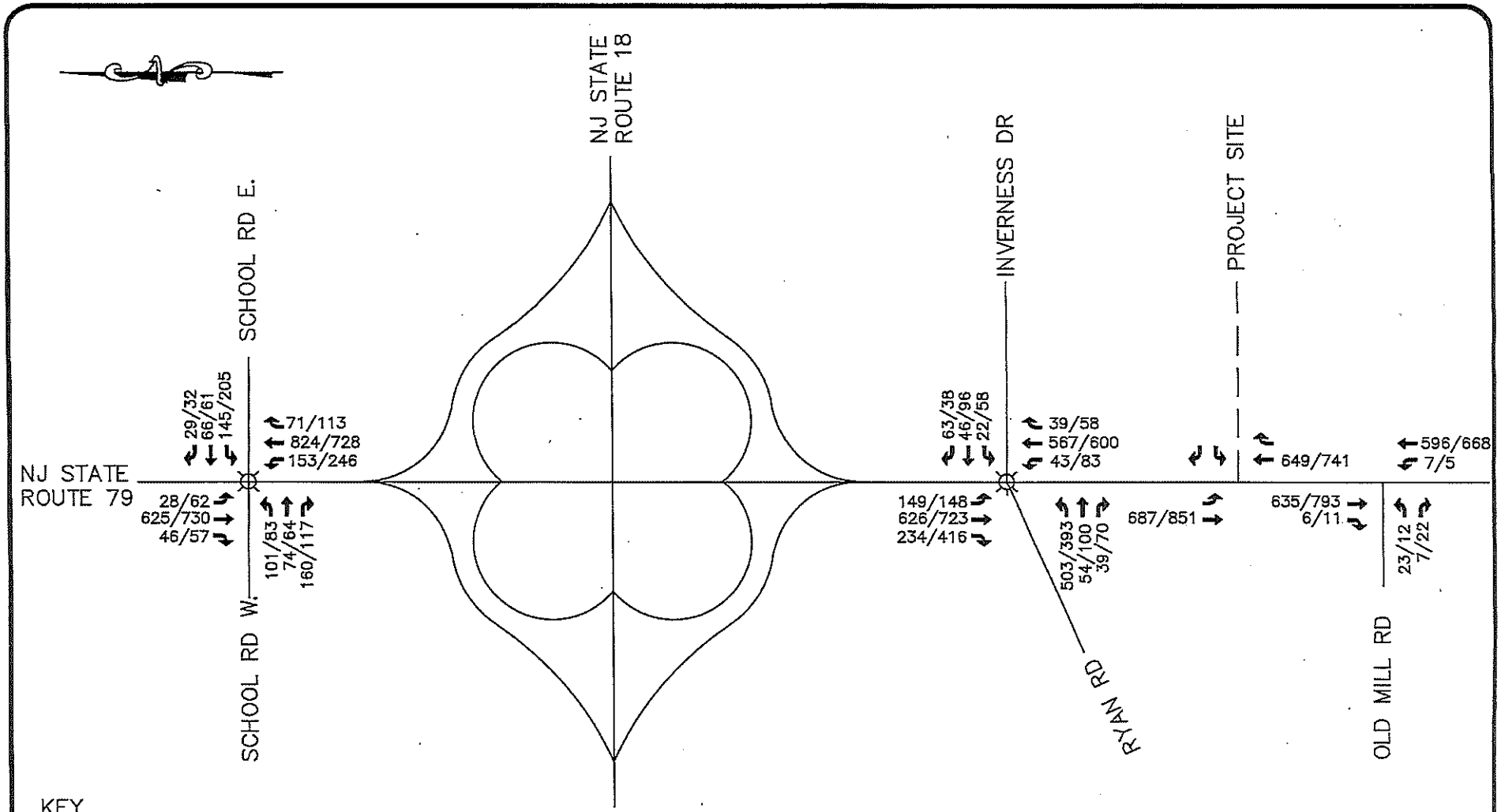
The proposed development is planned for construction and full occupancy in 2022. This year will be used as a basis for estimating background traffic growth on the surrounding street system. The annual growth rate published by the NJDOT in the April 2019 – April 2021 NJDOT Access Permit Table on Annual Background Growth Rates. Based upon the data contained in this table for urban conditions in Monmouth County, the growth rates for each roadway classification are as follows:

1. Principal Arterial (S. Main Street) – 1.25 percent per year
2. Collector Streets (Ryan Road/School Road West) – 2.5 percent per year
3. Local Streets (all others) – 1.0 percent per year

These growth rates are compounded over the three year analysis period to determine 2022 No Build traffic volumes. We also contacted the Planning Departments in Marlboro Township and Freehold Township to identify any other approved projects or those under construction that would generate significant traffic that would impact the studied intersections. Both municipalities indicated that there were no other projects within the vicinity that would impact the studied intersections.

Year 2022 No-Build traffic volumes are presented in Figure 3 for the AM and PM peak hours. These traffic volumes were used to evaluate future operations without the addition of the proposed development at the studied intersections.

The resulting levels of service for 2022 No-Build conditions at the studied intersections are summarized in Table 1. The results of the capacity analyses indicate that under future Year 2022 No-Build conditions, the levels of service for the studied intersections would remain generally the same as the Existing 2019 levels of service during the AM and PM peak hours on each approach with nominal increases in the average delay. The levels of service on these approaches will remain at acceptable LOS D or better for both peak hours.



KEY

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www.bowmanconsulting.com
E-mail: NJ@BowmanConsulting.com
Phone: 973-359-8400
FAX: 973-359-8455
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FIGURE 3
LENNAR MARLBORO
PROPOSED 2022 FUTURE NO BUILD TRAFFIC VOLUMES
TOWNSHIP OF MARLBORO, MONMOUTH COUNTY, NEW JERSEY

The eastbound Ryan Road left turn movement will continue to operate at a LOS F and the westbound Inverness Drive through/right movement will continue to operate at LOS E during the AM peak hour. During the PM peak hour, the westbound Inverness Drive through/right movement is calculated to continue to operate at LOS F, although the average delay will increase. These operating conditions are reflective of background growth on the network and are exclusive of traffic from the proposed development.

Site Trip Generation and Distribution

The trip generation for the proposed 280 multi-family, low-rise multi-family dwelling units is based upon data compiled in the Trip Generation Manual, 10th Edition published by the Institute of Transportation Engineers (ITE) using Land Use Code (LUC) 220. Table 2 illustrates the trip generation calculations for the proposed development of the subject site.

The peak hour trips from the proposed multi-family residential dwellings are likely to coincide temporally with the peak hour commuter trips on the surrounding roadway system. The trip assignment for the proposed development is based on observed traffic patterns of the predominant traffic flows along South Main Street (Route 79), which have been considered to be representative of the traffic distribution associated with the proposed development. The distribution also takes into consideration the accessibility to the regional highway network including U.S. Route 9, State Route 18 and the Garden State Parkway.

The trip distribution is graphically presented in Figure 4. Applying the site trip distribution to the trip generation values presented in Table 2 resulted in the site trip assignment for the AM and PM peak hours shown in Figure 5.

Year 2022 Build Conditions

The site generated traffic volumes presented in Figure 5 were added to Year 2022 No-Build traffic volumes presented in Figure 3 to yield the AM and PM peak hour Year 2022 Build conditions, which are presented in Figure 6. These traffic volumes are used to analyze future operating conditions including the traffic from the proposed development.

The resulting levels of service for 2022 Build conditions at the studied intersections are summarized in Table 1. The results of the analyses indicate that under future Year 2022 Build conditions, the levels of service for the traffic movements at the studied intersections would remain at LOS D or better during the AM and PM peak hours, with the exceptions noted under No Build conditions with no further degradation in the levels of service or average delay.

The proposed intersection of the site access driveway with South Main Street (State Route 79) will be provided with "STOP" control on the westbound driveway approach. The calculated levels of service at this proposed intersection are presented in Table 3, which indicates that the site driveway approach will operate at LOS D during the AM

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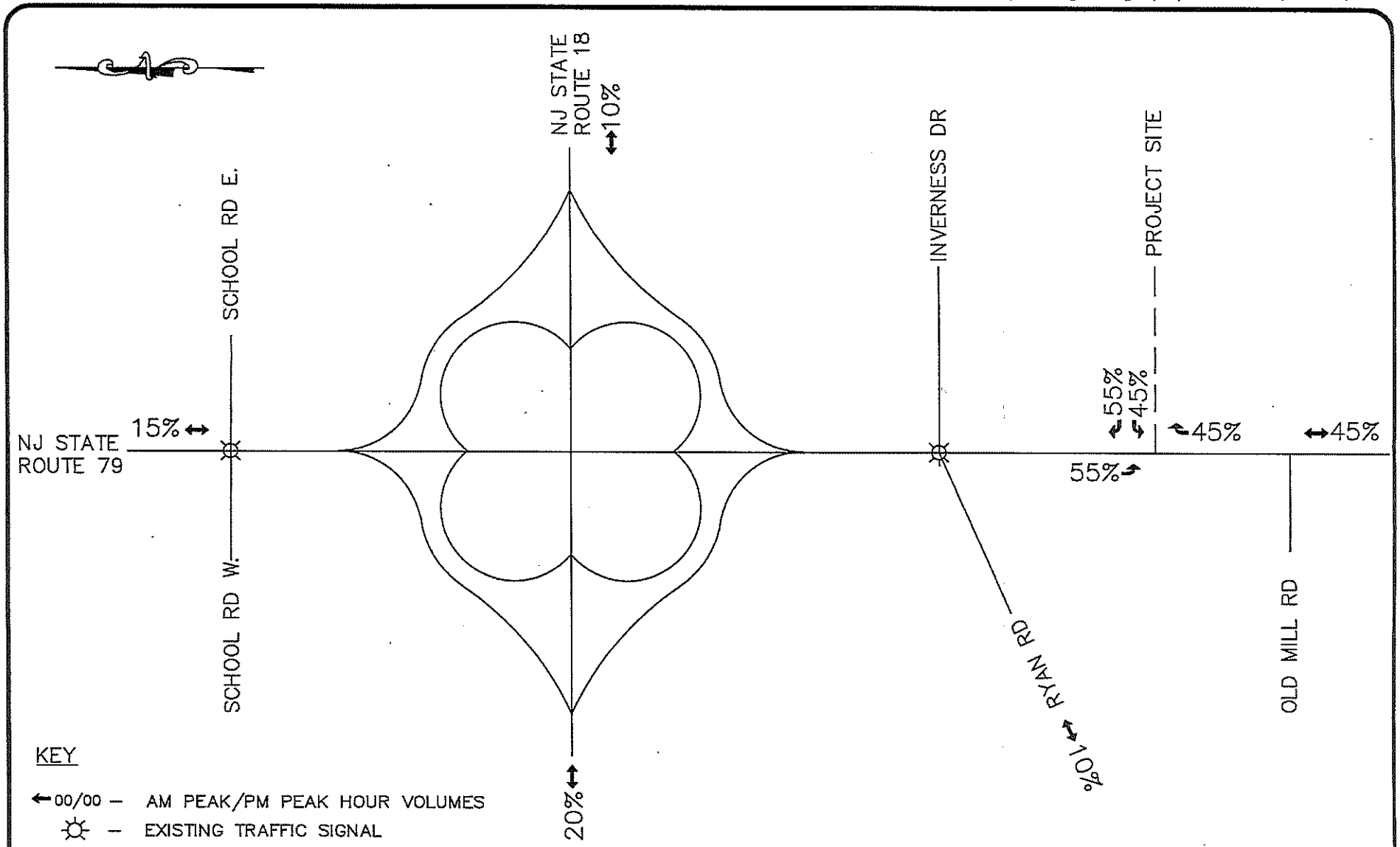

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54 Horsehill Road, Suite 100
Cedar Knolls, New Jersey 07927
www.bowmanconsulting.com
E-mail: NJ@BowmanConsulting.com
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FIGURE 4
LENNAR - MARLBORO
SITE TRIP DISTRIBUTION

TOWNSHIP OF MARLBORO, MONMOUTH COUNTY, NEW JERSEY

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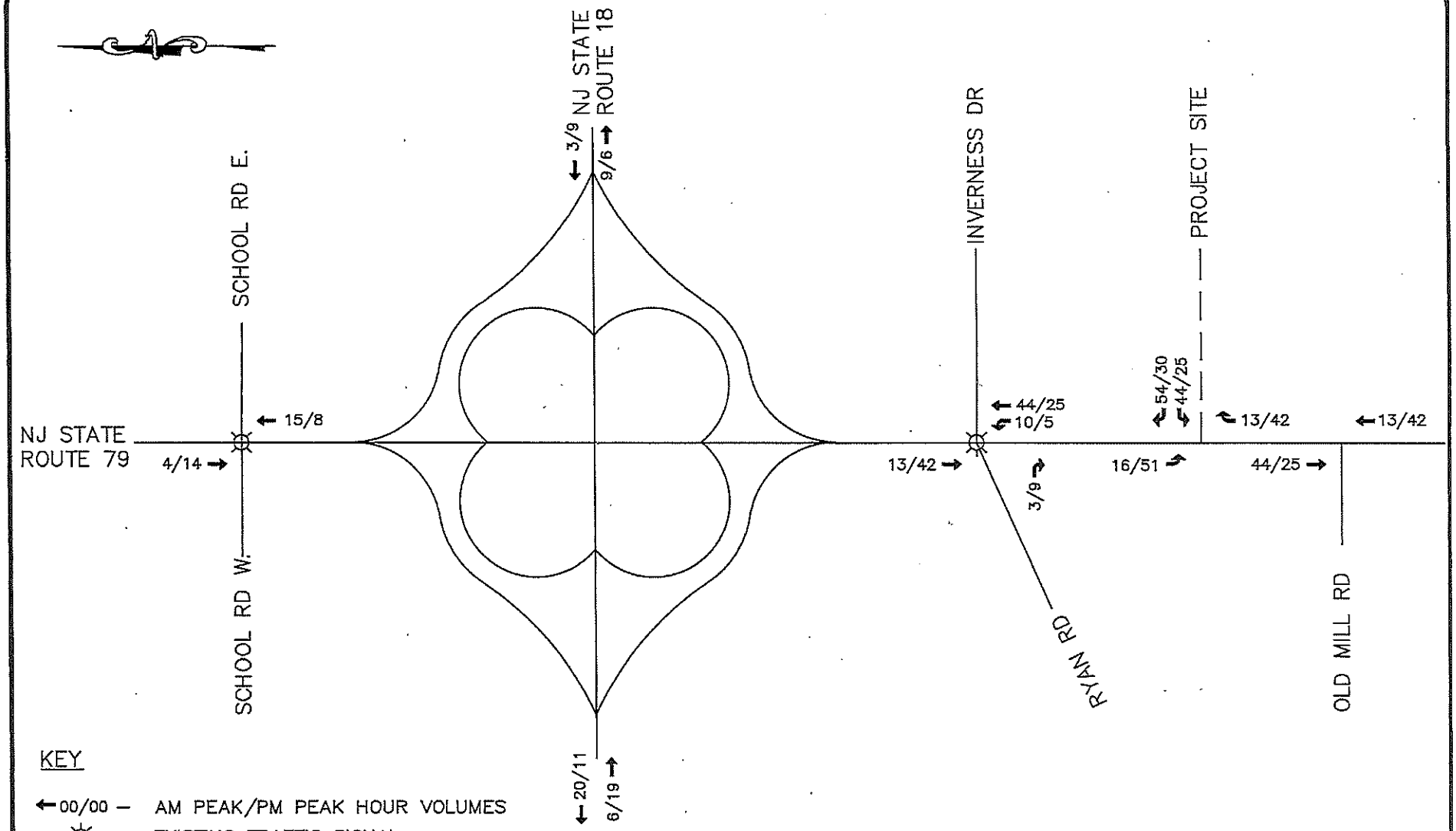

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FIGURE 5
LENNAR - MARLBORO
SITE GENERATED TRAFFIC VOLUMES
BOROUGH OF WATCHUNG, SOMERSET COUNTY, NEW JERSEY

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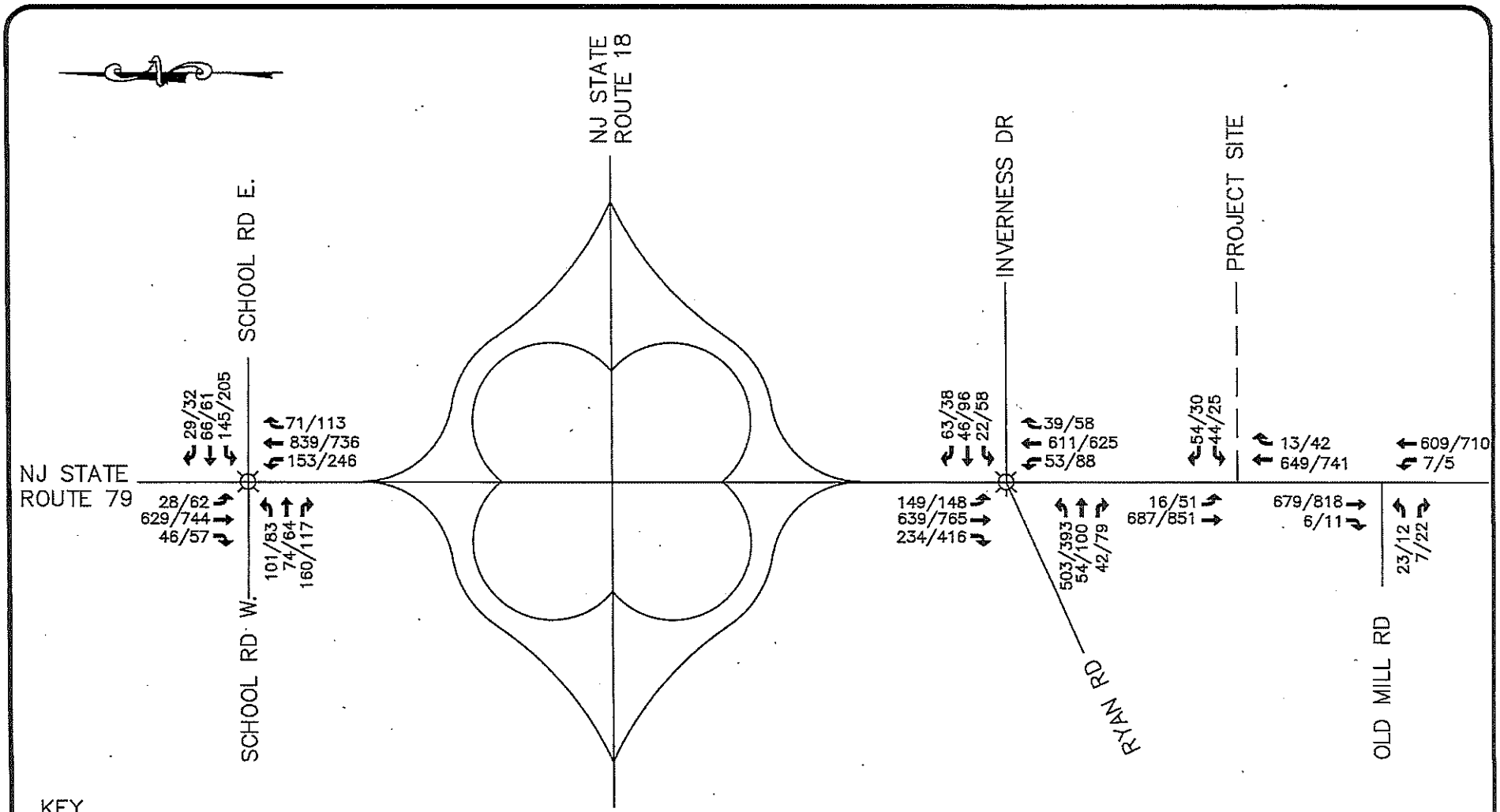

KEY

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54 Horsehill Road, Suite 100
Cedar Knolls, New Jersey 07927
www.bowmanconsulting.com
E-mail: NJ@BowmanConsulting.com
Phone: 973-359-8400
FAX: 973-359-8455
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FIGURE 6
LENNAR - MARLBORO
2022 BUILD
TRAFFIC VOLUMES

TOWNSHIP OF MARLBORO, MONMOUTH COUNTY, NEW JERSEY

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SITE PLAN EVALUATION

The site access will be provided by a boulevard access to South Main Street (State Route 79) approximately 160 feet south of Butchers Lane. This new boulevard access road (Road B) extends in an easterly direction approximately 225 feet to the first intersection with Road 1 that connects with a looped network of internal circulation roads, extending throughout the community. This access and circulation system are compliant with the Residential Site Improvement Standards (RSIS).

The townhouse buildings are provided with garages and adjacent driveways serving each of the units. The affordable units are provided with a surface parking lot proximate to the two buildings containing 113 parking spaces. In addition, there are 117 surface parking spaces distributed throughout the townhouse portion of the site proximate to the various residential buildings. This exceeds the RSIS guest parking requirement of 0.5 spaces per unit, or 112 parking spaces (224 townhouse times 0.5). In addition, there are 16 surface parking spaces proximate to the clubhouse.

The internal sidewalk network is proposed to link all of the residential buildings with the clubhouse and amenity area along one side of the internal streets. Sidewalks extend along the site frontage of South Main Street and then along both sides of Road B from South Main Street to just east of Road 3.

The site plan provides for safe and efficient traffic operations without affecting the quality of traffic flow along area roadways. The internal roadways are proposed at 24 feet wide with perpendicular parking proposed at various locations. The site plan proposes designated crosswalks and STOP lines and STOP signs at the internal intersections. The proposed site plan conforms to applicable standards from a traffic engineering viewpoint. Circulation and access to and from the site, as well as within the property are adequate for residents, visitors, deliveries and emergency services.

Residential Site Improvement Standards require 1.8 parking spaces for one-bedroom units, 2.0 parking spaces for two-bedroom units and 2.1 parking spaces for three-bedroom units in an apartment building and 2.4 parking spaces for a three-bedroom townhouse. The proposed bedroom mix in the COAH apartment buildings is 11 one-bedroom units, 33 two-bedroom units and 12 three-bedroom units and in the townhouses it is 224 three to four bedroom units; a total of 280 dwelling units. The parking requirement is therefore 649 spaces; 111 parking spaces for the COAH units (1.98 spaces per unit) and 538 parking spaces for the townhouse units. A total of 918 spaces (including garages and driveways) are proposed, thereby exceeding the RSIS requirements. There are 448 garage and 224 driveway spaces within the thirty-two (32) buildings, with the remaining 246 parking spaces provided in surface parking areas and on-street parking available for use by all residents. RSIS parking standards require that 112 surface parking spaces (0.5 spaces per unit times 224 units) are available for guest parking for the townhouses and the project exceeds the required amount of surface parking by providing 117 spaces.

peak hour and at LOS E during the PM peak hour. We discussed these levels of service with the NJDOT during our pre-application meeting and they indicated that they would not approve a traffic signal based solely on a peak hour warrant, which is likely the only signal warrant that would be satisfied by this proposed development. The southbound left turn into the project site is calculated to operate at LOS A during both peak hours.

In summary, with the development of the proposed project, the studied intersections would not experience a change in the levels of service on any of the approach movements as a result of site generated traffic. The intersection of South Main Street with the proposed site driveway will operate at LOS D or better during the AM peak hour. During the PM peak hour, the site driveway is calculated to operate at LOS E, which is an acceptable operating condition for a side street approach to a State highway. It is also likely that the actual traffic operations will be better than those calculated as the signal at Ryan Road will create gaps in the flow of traffic along South Main Street. The unsignalized analysis for the PM peak hour also indicates that the queue on the site driveway will be less than two (2) vehicles which will not create a backup within the site.

CONCLUSIONS

The proposed development of 280 multi-family dwelling units would have a negligible impact on traffic operations at the studied intersections during the weekday AM and PM peak commuting hours.

The incremental impact of the additional site-generated traffic results in a slight increase in the average delay on the affected approach movements at the studied intersections but would not be noticeable to motorists. Generally, these slight increases in average vehicle delay would generally be less than two (2) seconds and would not materially impact the operations of the study intersections or change the level of service.

The studied intersections would continue to operate at acceptable levels of service, LOS D or better, with the exception of a couple of movements at the intersection of South Main Street with Ryan Road/Inverness Drive which will operate at LOS E or LOS F during the AM and PM peak hours. However, these movements with these levels of service are not impacted by the site generated traffic.

The site access roadway will operate at acceptable levels of service during both peak hours. While the calculated operations for the site roadway are LOS E during the PM peak hour, the queues are quite small and the actual operations are likely to be better as the signal at Ryan Road will provide gaps in the flow of traffic along South Main Street.

It is our professional opinion that, based upon our traffic engineering evaluation, the proposed development will provide for safe and efficient traffic operations without affecting the quality of traffic flow along area roadways.

The proposed site plan conforms to applicable standards from a traffic engineering viewpoint. Circulation and access to and from the site, as well as within the property are adequate. Sufficient parking is provided in accordance with RSIS requirements for the multi-family residential use.

In conclusion, this development project would have a minimal impact on the traffic operations of the existing roadway system and at the studied intersections. The design of the development will adequately serve the needs of this project's residents and guests.

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4105 US Route 1, Suite 10
Monmouth Junction, NJ 08852
Phone: 732.274.9500, Fax: 732.274.9510
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	Route 79 Southbound					School Road Westbound					Route 79 Northbound					School Road Eastbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	9	161						8				214									
08:00 AM	6	149	10	0	165	41	12	7	0	60	40	204	23	0	267	31	20	35	0	86	578
08:15 AM	8	153	18	0	179	44	23	8	0	75	37	187	17	0	241	28	20	32	0	80	575
08:30 AM	4	139	9	0	152	26	11	5	0	42	34	189	16	0	239	24	18	43	0	85	518
Total Volume	27	602	43	0	672	141	64	28	0	233	142	794	69	0	1005	94	69	149	0	312	2222
% App. Total	4	89.6	6.4	0		60.5	27.5	12	0		14.1	79	6.9	0		30.1	22.1	47.8	0		
PHF	.750	.935	.597	.000	.939	.801	.696	.875	.000	.777	.888	.928	.750	.000	.941	.758	.863	.866	.000	.907	.961
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	7	180	15	0	202	57	17	11	0	85	50	163	24	0	237	18	5	27	0	50	574
05:15 PM	14	172	11	0	197	56	16	7	0	79	63	175	23	0	261	27	13	25	0	65	602
05:30 PM	21	174	16	0	211	44	12	6	0	62	62	181	34	0	277	18	17	26	0	61	611
05:45 PM	18	177	11	0	206	42	14	7	0	63	53	182	29	0	264	14	24	31	0	69	602
Total Volume	60	703	53	0	816	199	59	31	0	289	228	701	110	0	1039	77	59	109	0	245	2389
% App. Total	7.4	86.2	6.5	0		68.9	20.4	10.7	0		21.9	67.5	10.6	0		31.4	24.1	44.5	0		
PHF	.714	.976	.828	.000	.967	.873	.868	.705	.000	.850	.905	.963	.809	.000	.938	.713	.615	.879	.000	.888	.977

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4105 US Route 1, Suite 10
Monmouth Junction, NJ 08852
Phone: 732.274.9500, Fax: 732.274.9510
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File Name : 19T1-041-3
Site Code : 19T1-041-3
Start Date : 6/12/2019
Page No : 1

Groups Printed- Cars - Light Trucks - Heavy Trucks

	Route 79 Southbound					School Road Westbound					Route 79 Northbound					School Road Eastbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
07:00 AM	6	103	1	0	110	22	2	10	0	34	32	154	5	0	191	19	10	29	0	58	393
07:15 AM	7	124	4	0	135	36	5	15	0	56	22	162	9	0	193	17	6	27	0	50	434
07:30 AM	6	145	6	0	157	35	10	8	0	53	23	198	12	0	233	18	13	23	0	54	497
07:45 AM	9	161	6	0	176	30	18	8	0	56	31	214	13	0	258	11	11	39	0	61	551
Total	28	533	17	0	578	123	35	41	0	199	108	728	39	0	875	65	40	118	0	223	1875
08:00 AM	6	149	10	0	165	41	12	7	0	60	40	204	23	0	267	31	20	35	0	86	578
08:15 AM	8	153	18	0	179	44	23	8	0	75	37	187	17	0	241	28	20	32	0	80	575
08:30 AM	4	139	9	0	152	26	11	5	0	42	34	189	16	0	239	24	18	43	0	85	518
08:45 AM	7	145	12	0	164	34	14	8	0	56	36	186	19	0	241	33	14	33	0	80	541
Total	25	586	49	0	660	145	60	28	0	233	147	766	75	0	988	116	72	143	0	331	2212
04:00 PM	14	178	15	0	207	49	14	5	0	68	45	172	20	0	237	24	11	34	0	69	581
04:15 PM	12	189	13	0	214	37	14	6	0	57	50	191	14	0	255	19	16	34	0	69	595
04:30 PM	10	179	16	0	205	47	16	10	0	73	59	201	16	0	276	18	12	35	0	65	619
04:45 PM	15	174	13	0	202	47	14	9	0	70	46	163	23	0	232	14	7	29	0	50	554
Total	51	720	57	0	828	180	58	30	0	268	200	727	73	0	1000	75	46	132	0	253	2349
05:00 PM	7	180	15	0	202	57	17	11	0	85	50	163	24	0	237	18	5	27	0	50	574
05:15 PM	14	172	11	0	197	56	16	7	0	79	63	175	23	0	261	27	13	25	0	65	602
05:30 PM	21	174	16	0	211	44	12	6	0	62	62	181	34	0	277	18	17	26	0	61	611
05:45 PM	18	177	11	0	206	42	14	7	0	63	53	182	29	0	264	14	24	31	0	69	602
Total	60	703	53	0	816	199	59	31	0	289	228	701	110	0	1039	77	59	109	0	245	2389
Grand Total	164	2542	176	0	2882	647	212	130	0	989	683	2922	297	0	3902	333	217	502	0	1052	8825
Apprch %	5.7	88.2	6.1	0		65.4	21.4	13.1	0		17.5	74.9	7.6	0		31.7	20.6	47.7	0		
Total %	1.9	28.8	2	0	32.7	7.3	2.4	1.5	0	11.2	7.7	33.1	3.4	0	44.2	3.8	2.5	5.7	0	11.9	
Cars	159	2402	163	0	2724	636	198	123	0	957	660	2812	292	0	3764	307	203	485	0	995	8440
% Cars	97	94.5	92.6	0	94.5	98.3	93.4	94.6	0	96.8	96.6	96.2	98.3	0	96.5	92.2	93.5	96.6	0	94.6	95.6
Light Trucks	4	116	11	0	131	10	14	6	0	30	23	80	5	0	108	22	13	14	0	49	318
% Light Trucks	2.4	4.6	6.2	0	4.5	1.5	6.6	4.6	0	3	3.4	2.7	1.7	0	2.8	6.6	6	2.8	0	4.7	3.6
Heavy Trucks	1	24	2	0	27	1	0	1	0	2	0	30	0	0	30	4	1	3	0	8	67
% Heavy Trucks																					

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Monmouth Junction, NJ 08852
Phone: 732.274.9500, Fax: 732.274.9510
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	Route 79 Southbound				Route 79 Northbound				Old Mill Rd Eastbound				
Start Time	Thru	Right	U-Turn	App. Total	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	151	1	0	152	3	160	0	163	5	1	0	6	321
07:45 AM	132	1	0	133	1	140	0	141	7	4	0	11	285
08:00 AM	164	3	0	167	1	146	0	147	6	2	0	8	322
08:15 AM	165	1	0	166	2	128	0	130	4	0	0	4	300
Total Volume	612	6	0	618	7	574	0	581	22	7	0	29	1228
% App. Total	99	1	0		1.2	98.8	0		75.9	24.1	0		
PHF	.927	.500	.000	.925	.583	.897	.000	.891	.786	.438	.000	.659	.953
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	193	0	0	193	0	156	0	156	2	7	0	9	358
04:45 PM	200	4	0	204	1	161	0	162	0	4	0	4	370
05:00 PM	178	6	0	184	3	148	0	151	8	6	0	14	349
05:15 PM	193	1	0	194	1	179	0	180	2	4	0	6	380
Total Volume	764	11	0	775	5	644	0	649	12	21	0	33	1457
% App. Total	98.6	1.4	0		0.8	99.2	0		36.4	63.6	0		
PHF	.955	.458	.000	.950	.417	.899	.000	.901	.375	.750	.000	.589	.959

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Monmouth Junction, NJ 08852
Phone: 732.274.9500, Fax: 732.274.9510
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File Name : 19T1-041-2
Site Code : 19T1-041-2
Start Date : 6/12/2019
Page No : 1

Groups Printed- Cars - Light Trucks - Heavy Trucks

	Route 79 Southbound				Route 79 Northbound				Old Mill Rd Eastbound				
Start Time	Thru	Right	U-Turn	App. Total	Left	Thru	U-Turn	App. Total	Left	Right	U-Turn	App. Total	Int. Total
07:00 AM	107	3	0	110	3	162	0	165	6	1	0	7	282
07:15 AM	134	2	0	136	1	138	0	139	3	0	0	3	278
07:30 AM	151	1	0	152	3	160	0	163	5	1	0	6	321
07:45 AM	132	1	0	133	1	140	0	141	7	4	0	11	285
Total	524	7	0	531	8	600	0	608	21	6	0	27	1166
08:00 AM	164	3	0	167	1	146	0	147	6	2	0	8	322
08:15 AM	165	1	0	166	2	128	0	130	4	0	0	4	300
08:30 AM	139	1	0	140	0	143	0	143	3	3	0	6	289
08:45 AM	153	3	0	156	2	134	0	136	3	3	0	6	298
Total	621	8	0	629	5	551	0	556	16	8	0	24	1209
04:00 PM	182	3	0	185	2	202	0	204	1	1	0	2	391
04:15 PM	163	4	0	167	2	122	0	124	3	3	0	6	297
04:30 PM	193	0	0	193	0	156	0	156	2	7	0	9	358
04:45 PM	200	4	0	204	1	161	0	162	0	4	0	4	370
Total	738	11	0	749	5	641	0	646	6	15	0	21	1416
05:00 PM	178	6	0	184	3	148	0	151	8	6	0	14	349
05:15 PM	193	1	0	194	1	179	0	180	2	4	0	6	380
05:30 PM	187	4	0	191	1	145	0	146	1	3	0	4	341
05:45 PM	189	2	0	191	1	158	0	159	3	2	0	5	355
Total	747	13	0	760	6	630	0	636	14	15	0	29	1425
Grand Total	2630	39	0	2669	24	2422	0	2446	57	44	0	101	5216
Apprch %	98.5	1.5	0		1	99	0		56.4	43.6	0		
Total %	50.4	0.7	0	51.2	0.5	46.4	0	46.9	1.1	0.8	0	1.9	
Cars	2528	35	0	2563	22	2337	0	2359	53	40	0	93	5015
% Cars	96.1	89.7	0	96	91.7	96.5	0	96.4	93	90.9	0	92.1	96.1
Light Trucks	87	3	0	90	2	73	0	75	3	3	0	6	171
% Light Trucks	3.3	7.7	0	3.4	8.3	3	0	3.1	5.3	6.8	0	5.9	3.3
Heavy Trucks	15	1	0	16	0	12	0	12	1	1	0	2	30
% Heavy Trucks	0.6	2.6	0	0.6	0	0.5	0	0.5	1.8	2.3	0	2	0.6

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	Route 79 Southbound					Inverness Drive Westbound					Route 79 Northbound					Ryan Rd Eastbound					
Start Time	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Left	Thru	Right	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	37	163	58		258	7		18		35		147									591
08:15 AM	29	147	50	0	226	5	7	17	0	29	6	132	9	0	147	118	16	10	0	144	546
08:30 AM	40	137	56	0	233	6	14	15	0	35	6	131	9	0	146	122	14	9	0	145	559
08:45 AM	39	156	53	0	248	3	14	11	0	28	16	136	15	0	167	107	14	9	0	130	573
Total Volume	145	603	217	0	965	21	45	61	0	127	40	546	38	0	624	467	50	36	0	553	2269
% App. Total	15	62.5	22.5	0		16.5	35.4	48	0		6.4	87.5	6.1	0		84.4	9	6.5	0		
PHF	.906	.925	.935	.000	.935	.750	.804	.847	.000	.907	.625	.929	.633	.000	.934	.957	.781	.900	.000	.953	.960
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	29	172	97	0	298	15	26	11	0	52	23	140	12	0	175	107	19	11	0	137	662
05:15 PM	37	166	102	0	305	6	21	9	0	36	26	144	8	0	178	106	23	22	0	151	670
05:30 PM	35	183	103	0	321	16	20	8	0	44	19	162	11	0	192	71	32	14	0	117	674
05:45 PM	43	176	84	0	303	19	26	9	0	54	9	132	25	0	166	81	19	18	0	118	641
Total Volume	144	697	386	0	1227	56	93	37	0	186	77	578	56	0	711	365	93	65	0	523	2647
% App. Total	11.7	56.8	31.5	0		30.1	50	19.9	0		10.8	81.3	7.9	0		69.8	17.8	12.4	0		
PHF	.837	.952	.937	.000	.956	.737	.894	.841	.000	.861	.740	.892	.560	.000	.926	.853	.727	.739	.000	.866	.982

HCS7 Two-Way Stop-Control Report

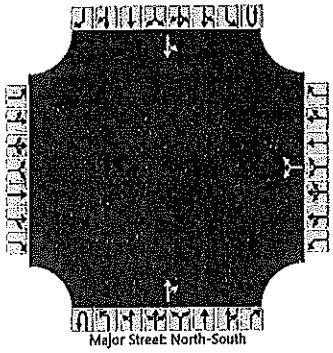
General Information

Analyst	LDK
Agency/Co.	Bowman Consulting
Date Performed	12/1/2019
Analysis Year	2022
Time Analyzed	PM Peak - Build
Intersection Orientation	North-South
Project Description	EL@Marlboro BCG 080726-F3

Site Information

Intersection	S. Main St/Site Dwy
Jurisdiction	State
East/West Street	Site Dwy
North/South Street	S. Main St (Rt 79)
Peak Hour Factor	0.96
Analysis Time Period (hrs)	0.25

Lanes



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	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						25		30			741	42		51	851	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						7.0		6.1						4.1		
Critical Headway (sec)						6.30		6.10						4.10		
Base Follow-Up Headway (sec)						3.3		3.1						2.2		
Follow-Up Headway (sec)						3.30		3.10						2.20		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							57							53		
Capacity, c (veh/h)							151							821		
v/c Ratio							0.38							0.06		
95% Queue Length, Q_{95} (veh)							1.6							0.2		
Control Delay (s/veh)							42.9							9.7		
Level of Service (LOS)							E							A		
Approach Delay (s/veh)					42.9								1.7			
Approach LOS					E											

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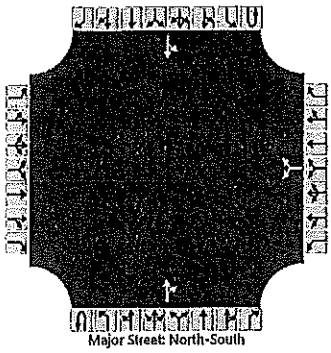
HCS7 Two-Way Stop-Control Report

General Information		Site Information	
Analyst	LDK	Intersection	S. Main St/Site Dwy
Agency/Co.	Bowman Consulting	Jurisdiction	State
Date Performed	12/1/2019	East/West Street	Site Dwy
Analysis Year	2022	North/South Street	S. Main St (Rt 79)
Time Analyzed	AM Peak - Build	Peak Hour Factor	0.95
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	EL@Marlboro BCG 080726-F3		

Lanes



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	0	0		0	1	0	0	0	1	0	0	0	1	0
Configuration							LR					TR		LT		
Volume (veh/h)						44		54			649	13		16	687	
Percent Heavy Vehicles (%)						0		0						0		
Proportion Time Blocked																
Percent Grade (%)						0										
Right Turn Channelized																
Median Type | Storage	Undivided															

Critical and Follow-up Headways

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

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)							103							17		
Capacity, c (veh/h)							228							909		
v/c Ratio							0.45							0.02		
95% Queue Length, Q_{95} (veh)							2.2							0.1		
Control Delay (s/veh)							33.3							9.0		
Level of Service (LOS)							D							A		
Approach Delay (s/veh)					33.3								0.5			
Approach LOS					D											

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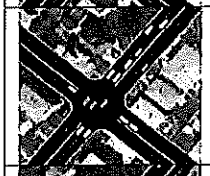
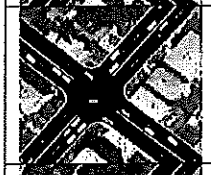
TRAFFIC OPERATIONS

Capacity analysis, a procedure used to estimate the traffic-carrying ability of roadway facilities over a range of defined operating conditions, was performed using the 2010 Highway Capacity Manual (HCM) and 2010 Highway Capacity Software.

For a signalized intersection, Level of Service (LOS) A indicates operations with delay less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 80 seconds per vehicle.

For an unsignalized intersection, LOS A indicates operations with delay less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 50 seconds per vehicle.

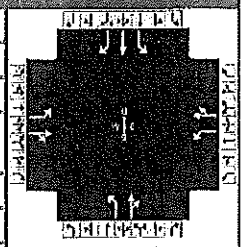
LEVEL OF SERVICE /AVERAGE DELAY CRITERIA*

	Level Of Service (LOS)	Signalized Delay Range (average delay, sec/veh)	Unsignalized Delay Range (average delay in sec/veh)
	A	<=10	<=10
	B	>10 and <=20	>10 and <=15
	C	>20 and <=35	>15 and <=25
	D	>35 and <=55	>25 and <=35
	E	>55 and <=80	>35 and <=50
	F	>80	>50

* *Sources: Highway Capacity Manual (2010 Edition) & SimTraffic Version 5.0*

HCS7 Signalized Intersection Results Summary

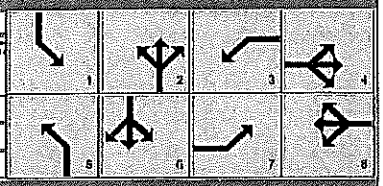
General Information				Intersection Information	
Agency	Bowman Consulting			Duration, h	0.25
Analyst	LDK	Analysis Date	Dec 1, 2019	Area Type	Other
Jurisdiction	State	Time Period	PM Peak - Existing	PHF	0.98
Urban Street	S. Main St (Rt 79)	Analysis Year	2019	Analysis Period	1> 5:00
Intersection	S. Main/Ryan/Inverness	File Name	EX_79_Ryan-Inv_PM.xus		
Project Description	EL@Marlboro BCG 080726-F3				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	365	93	65	56	93	37	77	578	56	144	697	386

Signal Information			
Cycle, s	109.0	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	3.9	1.1	55.0	4.9	14.5	6.5	
Yellow	3.0	0.0	4.0	3.0	3.0	3.0	
Red	0.0	0.0	4.0	0.0	0.0	3.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	25.4	30.1	7.9	12.5	6.9	63.0	8.0	64.1
Change Period, ($Y+R_c$), s	3.0	6.0	3.0	6.0	3.0	8.0	3.0	8.0
Max Allow Headway (MAH), s	3.0	3.0	3.0	3.0	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s	22.2	10.5	5.2	8.5	4.3		6.3	
Green Extension Time (g_e), s	0.2	0.4	0.1	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	0.82	1.00	0.91		0.99	
Max Out Probability	1.00	0.00	0.00	1.00	1.00		1.00	

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	372	161		57	133		79	647		147	711	394
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1769		1810	1807		1810	1870		1810	1900	1610
Queue Service Time (g_s), s	20.2	8.5		3.2	6.5		2.3	28.6		4.3	31.6	17.1
Cycle Queue Clearance Time (g_c), s	20.2	8.5		3.2	6.5		2.3	28.6		4.3	31.6	17.1
Green Ratio (g/C)	0.28	0.22		0.11	0.06		0.54	0.50		0.55	0.51	0.51
Capacity (c), veh/h	439	390		222	108		286	943		342	978	829
Volume-to-Capacity Ratio (X)	0.848	0.413		0.257	1.224		0.275	0.686		0.429	0.727	0.475
Back of Queue (Q), ft/ln (50 th percentile)	244.2	88.6		34.7	190.4		21.2	304.6		39.7	341.7	153.4
Back of Queue (Q), veh/ln (50 th percentile)	9.8	3.5		1.4	7.6		0.8	12.2		1.6	13.7	6.1
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	35.5	36.4		45.1	51.2		17.5	20.5		16.6	20.5	17.0
Incremental Delay (d_2), s/veh	11.5	0.3		0.2	158.6		0.2	4.0		0.3	4.7	1.9
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
Control Delay (d), s/veh	47.0	36.7		45.3	209.8		17.6	24.5		16.9	25.2	18.9
Level of Service (LOS)	D	D		D	F		B	C		B	C	B
Approach Delay, s/veh / LOS	43.9	D		160.3	F		23.8	C		22.3	C	
Intersection Delay, s/veh / LOS	36.6						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.14	B	1.90	B	1.90	B
Bicycle LOS Score / LOS	1.37	A	0.80	A	1.68	B	2.55	C

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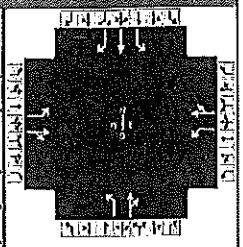
HCS7 Signalized Intersection Results Summary

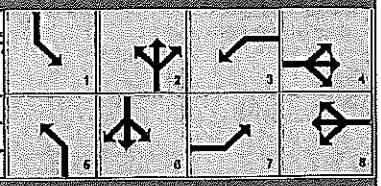
General Information				Intersection Information	
Agency	Bowman Consulting			Duration, h	0.25
Analyst	LDK	Analysis Date	Dec 1, 2019	Area Type	Other
Jurisdiction	State	Time Period	AM Peak - Existing	PHF	0.96
Urban Street	S. Main St (Rt 79)	Analysis Year	2019	Analysis Period	1> 8:00
Intersection	S. Main/Ryan/Inverness	File Name	EX_79_Ryan-Inv_AM.xus		
Project Description	EL@Marlboro BCG 080726-F3				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	467	50	36	21	45	61	40	546	38	145	603	217

Signal Information			
Cycle, s	74.0	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	1.7	2.3	31.0	2.2	7.8	6.0	
Yellow	3.0	0.0	4.0	3.0	3.0	3.0	
Red	0.0	0.0	4.0	0.0	0.0	3.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	16.0	22.8	5.2	12.0	4.7	39.0	7.0	41.3
Change Period, (*Y+R c*), s	3.0	6.0	3.0	6.0	3.0	8.0	3.0	8.0
Max Allow Headway (*MAH*), s	3.0	3.1	3.0	3.1	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s	15.0	5.1	2.8	6.7	3.0		5.4	
Green Extension Time (g_e), s	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	0.36	0.99	0.58		0.96	
Max Out Probability	1.00	0.00	0.00	1.00	1.00		1.00	

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	486	90		22	110		42	608		151	628	226
Adjusted Saturation Flow Rate (*s*), veh/h/ln	1810	1767		1810	1722		1810	1878		1810	1900	1610
Queue Service Time (g_s), s	13.0	3.1		0.8	4.7		1.0	20.6		3.4	20.1	6.7
Cycle Queue Clearance Time (g_c), s	13.0	3.1		0.8	4.7		1.0	20.6		3.4	20.1	6.7
Green Ratio (*g/C*)	0.28	0.23		0.11	0.08		0.44	0.42		0.49	0.45	0.45
Capacity (*c*), veh/h	439	402		258	140		262	787		311	854	724
Volume-to-Capacity Ratio (*X*)	1.109	0.223		0.085	0.791		0.159	0.773		0.486	0.735	0.312
Back of Queue (*Q*), ft/ln (50 th percentile)	389.9	28.8		8.1	67.7		8.3	222.7		28.3	210.3	55.1
Back of Queue (*Q*), veh/ln (50 th percentile)	15.6	1.2		0.3	2.7		0.3	8.9		1.1	8.4	2.2
Queue Storage Ratio (*RQ*) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	26.5	23.3		29.6	33.4		14.6	18.5		14.5	16.7	13.0
Incremental Delay (d_2), s/veh	75.9	0.1		0.1	23.9		0.1	7.3		0.4	5.6	1.1
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
Control Delay (*d*), s/veh	102.3	23.4		29.7	57.3		14.7	25.8		14.9	22.3	14.2
Level of Service (LOS)	F	C		C	E		B	C		B	C	B
Approach Delay, s/veh / LOS	90.0	F		52.7	D		25.1	C		19.4	B	
Intersection Delay, s/veh / LOS	40.0						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.92	B	2.13	B	1.90	B	1.89	B
Bicycle LOS Score / LOS	1.44	A	0.71	A	1.56	B	2.15	B

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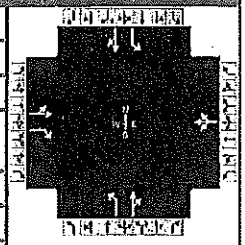
HCS7 Signalized Intersection Results Summary

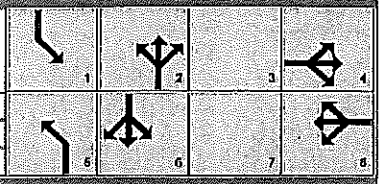
General Information				Intersection Information	
Agency	Bowman Consulting			Duration, h	0.25
Analyst	LDK	Analysis Date	12/1/2019	Area Type	Other
Jurisdiction	State	Time Period	PM Peak - Existing	PHF	0.98
Urban Street	S. Main St (Rt 79)	Analysis Year	2019	Analysis Period	1> 5:00
Intersection	S. Main/School Rd	File Name	EX_79_School_PM.xus		
Project Description	EL@Marlboro BCG 080726-F3				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	77	59	109	199	59	31	228	701	110	60	703	53

Signal Information			
Cycle, s	107.0	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	5.0	2.6	60.0	23.4	0.0	0.0	
Yellow	3.0	0.0	5.0	4.0	0.0	0.0	
Red	0.0	0.0	2.0	2.0	0.0	0.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		7.0		8.0	1.1	4.0	1.1	4.0
Phase Duration, s		29.4		29.4	10.6	69.6	8.0	67.0
Change Period, ($Y+R_c$), s		6.0		6.0	3.0	7.0	3.0	7.0
Max Allow Headway (*MAH*), s		3.1		3.1	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		10.0		23.3	7.6		3.5	
Green Extension Time (g_e), s		0.9		0.1	0.0	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	1.00		0.84	
Max Out Probability		0.00		1.00	1.00		0.18	

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		139	111		295		233	828		61	771	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1541	1610		1455		1810	1855		1810	1876	
Queue Service Time (g_s), s		0.0	6.2		13.3		5.6	35.8		1.5	32.8	
Cycle Queue Clearance Time (g_c), s		8.0	6.2		21.3		5.6	35.8		1.5	32.8	
Green Ratio (*g/C*)		0.22	0.22		0.22		0.65	0.58		0.61	0.56	
Capacity (*c*), veh/h		390	352		375		376	1085		308	1052	
Volume-to-Capacity Ratio (*X*)		0.356	0.316		0.786		0.619	0.763		0.199	0.733	
Back of Queue (*Q*), ft/ln (50 th percentile)		76	59.8		208.1		59.6	375.2		13.3	351.3	
Back of Queue (*Q*), veh/ln (50 th percentile)		3.0	2.4		8.3		2.4	15.0		0.5	14.1	
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00		0.00		0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh		35.7	35.1		41.1		15.9	16.7		14.9	17.5	
Incremental Delay (d_2), s/veh		0.2	0.2		9.3		2.3	5.1		0.1	4.5	
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh		35.9	35.3		50.3		18.2	21.8		15.0	22.0	
Level of Service (LOS)		D	D		D		B	C		B	C	
Approach Delay, s/veh / LOS	35.6	D		50.3	D		21.0	C		21.5	C	
Intersection Delay, s/veh / LOS	26.2						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	1.94	B	1.66	B	1.89	B
Bicycle LOS Score / LOS	0.90	A	0.97	A	2.24	B	1.86	B

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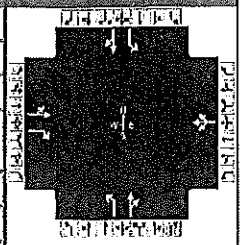
HCS7 Signalized Intersection Results Summary

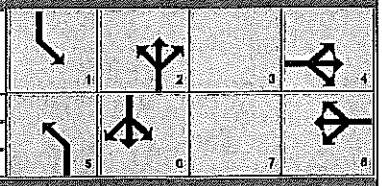
General Information				Intersection Information	
Agency	Bowman Consulting			Duration, h	0.25
Analyst	LDK	Analysis Date	12/1/2019	Area Type	Other
Jurisdiction	State	Time Period	AM Peak - Existing	PHF	0.96
Urban Street	S. Main St (Rt 79)	Analysis Year	2019	Analysis Period	1> 7:45
Intersection	S. Main/School Rd	File Name	EX_79_School_AM.xus		
Project Description	EL@Marlboro BCG 080726-F3				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (*v*), veh/h	94	69	149	141	64	28	142	794	69	27	602	43

Signal Information			
Cycle, s	115.0	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	3.6	2.4	71.1	21.9	0.0	0.0
Yellow	3.0	0.0	5.0	4.0	0.0	0.0
Red	0.0	0.0	2.0	2.0	0.0	0.0



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase		4		8	5	2	1	6
Case Number		7.0		8.0	1.1	4.0	1.1	4.0
Phase Duration, s		27.9		27.9	8.9	80.5	6.6	78.1
Change Period, ($Y+R_c$), s		6.0		6.0	3.0	7.0	3.0	7.0
Max Allow Headway (*MAH*), s		3.2		3.2	3.1	0.0	3.1	0.0
Queue Clearance Time (g_s), s		14.5		21.2	5.3		2.6	
Green Extension Time (g_e), s		1.0		0.8	0.1	0.0	0.0	0.0
Phase Call Probability		1.00		1.00	0.99		0.59	
Max Out Probability		0.00		0.14	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		170	155		243		148	899		28	672	
Adjusted Saturation Flow Rate (*s*), veh/h/ln		1428	1610		1430		1810	1873		1810	1877	
Queue Service Time (g_s), s		0.0	9.9		6.6		3.3	38.3		0.6	24.5	
Cycle Queue Clearance Time (g_c), s		12.5	9.9		19.2		3.3	38.3		0.6	24.5	
Green Ratio (*g/C*)		0.19	0.19		0.19		0.68	0.64		0.65	0.62	
Capacity (*c*), veh/h		322	307		323		472	1197		300	1161	
Volume-to-Capacity Ratio (*X*)		0.528	0.505		0.751		0.314	0.751		0.094	0.579	
Back of Queue (*Q*), ft/ln (50 th percentile)		109.5	97.7		174.9		27.8	391.5		5.7	248.4	
Back of Queue (*Q*), veh/ln (50 th percentile)		4.4	3.9		7.0		1.1	15.7		0.2	9.9	
Queue Storage Ratio (*RQ*) (50 th percentile)		0.00	0.00		0.00		0.00	0.00		0.00	0.00	
Uniform Delay (d_1), s/veh		42.6	41.7		45.6		9.9	14.4		13.7	13.0	
Incremental Delay (d_2), s/veh		0.5	0.5		4.4		0.1	4.4		0.0	2.1	
Initial Queue Delay (d_3), s/veh		0.0	0.0		0.0		0.0	0.0		0.0	0.0	
Control Delay (*d*), s/veh		43.1	42.1		50.0		10.1	18.8		13.8	15.2	
Level of Service (LOS)		D	D		D		B	B		B	B	
Approach Delay, s/veh / LOS	42.6	D		50.0	D		17.5	B		15.1	B	
Intersection Delay, s/veh / LOS	23.7						C					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	1.94	B	1.65	B	1.88	B
Bicycle LOS Score / LOS	1.02	A	0.89	A	2.21	B	1.64	B

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HCS7 Two-Way Stop-Control Report

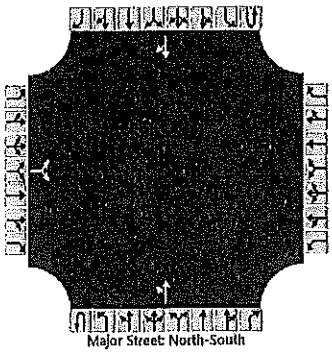
General Information

Analyst	LDK
Agency/Co.	Bowman Consulting
Date Performed	12/1/2019
Analysis Year	2019
Time Analyzed	PM Peak - Existing
Intersection Orientation	North-South
Project Description	EL@Marlboro BCG 080726-F3

Site Information

Intersection	S. Main (Rt 79)/Old Mill
Jurisdiction	State
East/West Street	Old Mill Rd
North/South Street	S. Main St (Rt 79)
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



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	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		12		21						5	644				764	11
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

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

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			35							5						
Capacity, c (veh/h)			229							821						
v/c Ratio			0.15							0.01						
95% Queue Length, Q_{95} (veh)			0.5							0.0						
Control Delay (s/veh)			23.5							9.4						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		23.5								0.2						
Approach LOS		C														

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HCS7 Two-Way Stop-Control Report

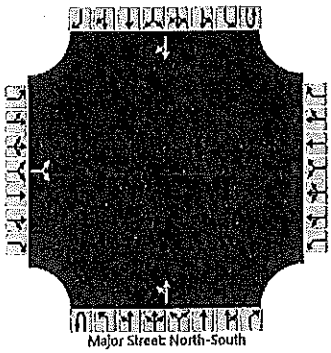
General Information

Analyst	LDK
Agency/Co.	Bowman Consulting
Date Performed	12/1/2019
Analysis Year	2019
Time Analyzed	AM Peak - Existing
Intersection Orientation	North-South
Project Description	EL@Marlboro BCG 080726-F3

Site Information

Intersection	S. Main (Rt 79)/Old Mill
Jurisdiction	State
East/West Street	Old Mill Rd
North/South Street	S. Main St (Rt 79)
Peak Hour Factor	0.95
Analysis Time Period (hrs)	0.25

Lanes



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	1	0	0	0	1	0
Configuration			LR							LT						TR
Volume (veh/h)		22		7						7	574				612	6
Percent Heavy Vehicles (%)		0		0						0						
Proportion Time Blocked																
Percent Grade (%)		0														
Right Turn Channelized																
Median Type | Storage		Undivided														

Critical and Follow-up Headways

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

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			31							7						
Capacity, c (veh/h)			218							945						
v/c Ratio			0.14							0.01						
95% Queue Length, Q_{95} (veh)			0.5							0.0						
Control Delay (s/veh)			24.2							8.8						
Level of Service (LOS)			C							A						
Approach Delay (s/veh)		24.2								0.2						
Approach LOS		C														

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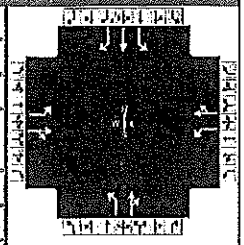
HCS7 Signalized Intersection Results Summary

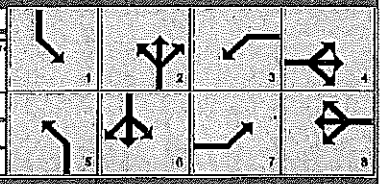
General Information				Intersection Information	
Agency	Bowman Consulting			Duration, h	0.25
Analyst	LDK	Analysis Date	Dec 1, 2019	Area Type	Other
Jurisdiction	State	Time Period	PM Peak - No Build	PHF	0.98
Urban Street	S. Main St (Rt 79)	Analysis Year	2022	Analysis Period	1> 5:00
Intersection	S. Main/Ryan/Inverness	File Name	NB_79_Ryan-Inv_PM.xus		
Project Description	EL@Marlboro BCG 080726-F3				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	393	100	70	58	96	38	83	600	58	148	723	416

Signal Information			
Cycle, s	109.0	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	4.1	0.9	55.0	5.0	16.3	4.7	
Yellow	3.0	0.0	4.0	3.0	3.0	3.0	
Red	0.0	0.0	4.0	0.0	0.0	3.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	27.3	30.0	8.0	10.7	7.1	63.0	8.0	63.9
Change Period, ($Y+R_c$), s	3.0	6.0	3.0	6.0	3.0	8.0	3.0	8.0
Max Allow Headway (MAH), s	3.0	3.0	3.0	3.0	3.0	0.0	3.0	0.0
Queue Clearance Time (g_s), s	24.2	11.2	5.4	6.7	4.5		6.5	
Green Extension Time (g_e), s	0.1	0.4	0.1	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	0.83	1.00	0.92		0.99	
Max Out Probability	1.00	0.00	0.00	1.00	1.00		1.00	

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	401	173		59	137		85	671		151	738	424
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1769		1810	1808		1810	1870		1810	1900	1610
Queue Service Time (g_s), s	22.2	9.2		3.4	4.7		2.5	30.2		4.5	33.7	19.0
Cycle Queue Clearance Time (g_c), s	22.2	9.2		3.4	4.7		2.5	30.2		4.5	33.7	19.0
Green Ratio (g/C)	0.28	0.22		0.09	0.04		0.54	0.50		0.55	0.51	0.51
Capacity (c), veh/h	469	389		202	78		270	944		326	974	826
Volume-to-Capacity Ratio (X)	0.854	0.446		0.293	1.754		0.314	0.712		0.463	0.757	0.514
Back of Queue (Q), ft/ln (50 th percentile)	272.4	96.2		36.7	260.4		22.7	324		41.2	368.6	171.1
Back of Queue (Q), veh/ln (50 th percentile)	10.9	3.8		1.5	10.4		0.9	13.0		1.6	14.7	6.8
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d_1), s/veh	36.1	36.8		46.8	52.1		18.3	20.9		17.2	21.1	17.6
Incremental Delay (d_2), s/veh	13.0	0.3		0.3	386.3		0.2	4.5		0.4	5.5	2.3
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
Control Delay (d), s/veh	49.1	37.0		47.1	438.5		18.5	25.4		17.6	26.6	19.9
Level of Service (LOS)	D	D		D	F		B	C		B	C	B
Approach Delay, s/veh / LOS	45.4	D		320.2	F		24.6	C		23.4	C	
Intersection Delay, s/veh / LOS	48.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.94	B	2.15	B	1.90	B	1.90	B
Bicycle LOS Score / LOS	1.44	A	0.81	A	1.74	B	2.65	C

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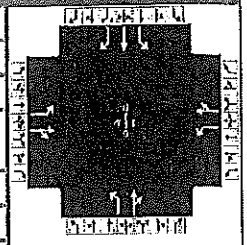
HCS7 Signalized Intersection Results Summary

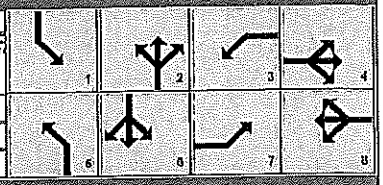
General Information				Intersection Information	
Agency	Bowman Consulting			Duration, h	0.25
Analyst	LDK	Analysis Date	Dec 1, 2019	Area Type	Other
Jurisdiction	State	Time Period	AM Peak - No Build	PHF	0.96
Urban Street	S. Main St (Rt 79)	Analysis Year	2022	Analysis Period	1> 8:00
Intersection	S. Main/Ryan/Inverness	File Name	NB_79_Ryan-Inv_AM.xus		
Project Description	EL@Marlboro BCG 080726-F3				



Demand Information	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	503	54	39	22	46	63	43	567	39	149	626	234

Signal Information			
Cycle, s	74.0	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	1.8	2.2	31.0	2.3	7.7	6.0	
Yellow	3.0	0.0	4.0	3.0	3.0	3.0	
Red	0.0	0.0	4.0	0.0	0.0	3.0	



Timer Results	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	7	4	3	8	5	2	1	6
Case Number	1.1	4.0	1.1	4.0	1.1	4.0	1.1	3.0
Phase Duration, s	16.0	22.7	5.3	12.0	4.8	39.0	7.0	41.2
Change Period, (Y+R c), s	3.0	6.0	3.0	6.0	3.0	8.0	3.0	8.0
Max Allow Headway (MAH), s	3.0	3.1	3.0	3.1	3.0	0.0	3.0	0.0
Queue Clearance Time (g s), s	15.0	5.3	2.8	6.8	3.0		5.5	
Green Extension Time (g e), s	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Phase Call Probability	1.00	1.00	0.38	0.99	0.60		0.96	
Max Out Probability	1.00	0.00	0.00	1.00	1.00		1.00	

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	524	97		23	114		45	631		155	652	244
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1767		1810	1721		1810	1878		1810	1900	1610
Queue Service Time (g s), s	13.0	3.3		0.8	4.8		1.0	21.8		3.5	21.3	7.3
Cycle Queue Clearance Time (g c), s	13.0	3.3		0.8	4.8		1.0	21.8		3.5	21.3	7.3
Green Ratio (g/C)	0.28	0.23		0.11	0.08		0.44	0.42		0.49	0.45	0.45
Capacity (c), veh/h	436	400		259	140		247	787		296	852	722
Volume-to-Capacity Ratio (X)	1.201	0.242		0.088	0.814		0.181	0.802		0.525	0.766	0.338
Back of Queue (Q), ft/ln (50 th percentile)	493.4	31.4		8.5	72.8		9	240.1		30.1	226	60.5
Back of Queue (Q), veh/ln (50 th percentile)	19.7	1.3		0.3	2.9		0.4	9.6		1.2	9.0	2.4
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	0.00
Uniform Delay (d 1), s/veh	26.4	23.4		29.6	33.5		15.0	18.8		15.0	17.2	13.3
Incremental Delay (d 2), s/veh	110.7	0.1		0.1	27.8		0.1	8.5		0.8	6.5	1.3
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
Control Delay (d), s/veh	137.1	23.5		29.6	61.2		15.1	27.3		15.8	23.7	14.5
Level of Service (LOS)	F	C		C	E		B	C		B	C	B
Approach Delay, s/veh / LOS	119.4	F		55.9	E		26.5	C		20.4	C	
Intersection Delay, s/veh / LOS	48.7						D					

Multimodal Results	EB		WB		NB		SB	
Pedestrian LOS Score / LOS	1.92	B	2.13	B	1.90	B	1.89	B
Bicycle LOS Score / LOS	1.51	B	0.71	A	1.60	B	2.22	B

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