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PRINCIPALS
Robert J. Michaud, P.E.
Daniel J. Mills, P.E., PTOE

MEMORANDUM

DATE: May 5, 2022

TO: Mr. Matthew Stevens
Trask Development
30 Turnpike Road, Suite 8
Southborough, MA 01772

FROM: Robert J. Michaud, P.E. – Managing Principal
Daniel A. Dumais, P.E. – Senior Project Manager

RE: **Proposed Mixed-Use Multi-Family Housing Development**
510 Pond Street, Ashland, Massachusetts

MDM Transportation Consultants, Inc. (MDM) has conducted this traffic impact assessment (TIA) for a proposed mixed-use housing development to be located at 510 Pond Street in Ashland, Massachusetts. The location of the site relative to the adjacent roadway network is shown in **Figure 1.** This TIA provides a primary summary of the baseline traffic conditions at the Site and adjacent roadways/ intersections, evaluates historical and projected trip generation, site access/egress, and provides an operational analysis of project impact.

Key findings of the assessment are as follows:

- *Baseline Traffic Volumes.* Pond Street carries approximately 11,536 vehicles per day (vpd) on weekdays. Peak hour traffic flow in the area is approximately 6 to 9 percent of the daily flow. Directional flow is slightly skewed northbound during the weekday morning peak hour and slightly skewed southbound during the weekday evening peak hour along Pond Street. The travel patterns are highly consistent with commuter related travel patterns.

- *Safety Characteristics*. A review of the crash data indicated that no immediate safety countermeasures are warranted based on the crash history at the study intersections. Likewise, available sight lines at the site driveway intersections with Pond Street exceed the sight line requirements published by AASHTO.

- *Trip Generation.* Based on a review of ITE trip generation methodology the proposed development is estimated to generate approximately 54 vehicle trips during the weekday morning peak hour, 68 vehicle trips during the weekday evening peak hour, and approximately 730 vehicle trips on a daily basis. This result in a nominal increase of less than 1 vehicle trip per minute during the peak periods.

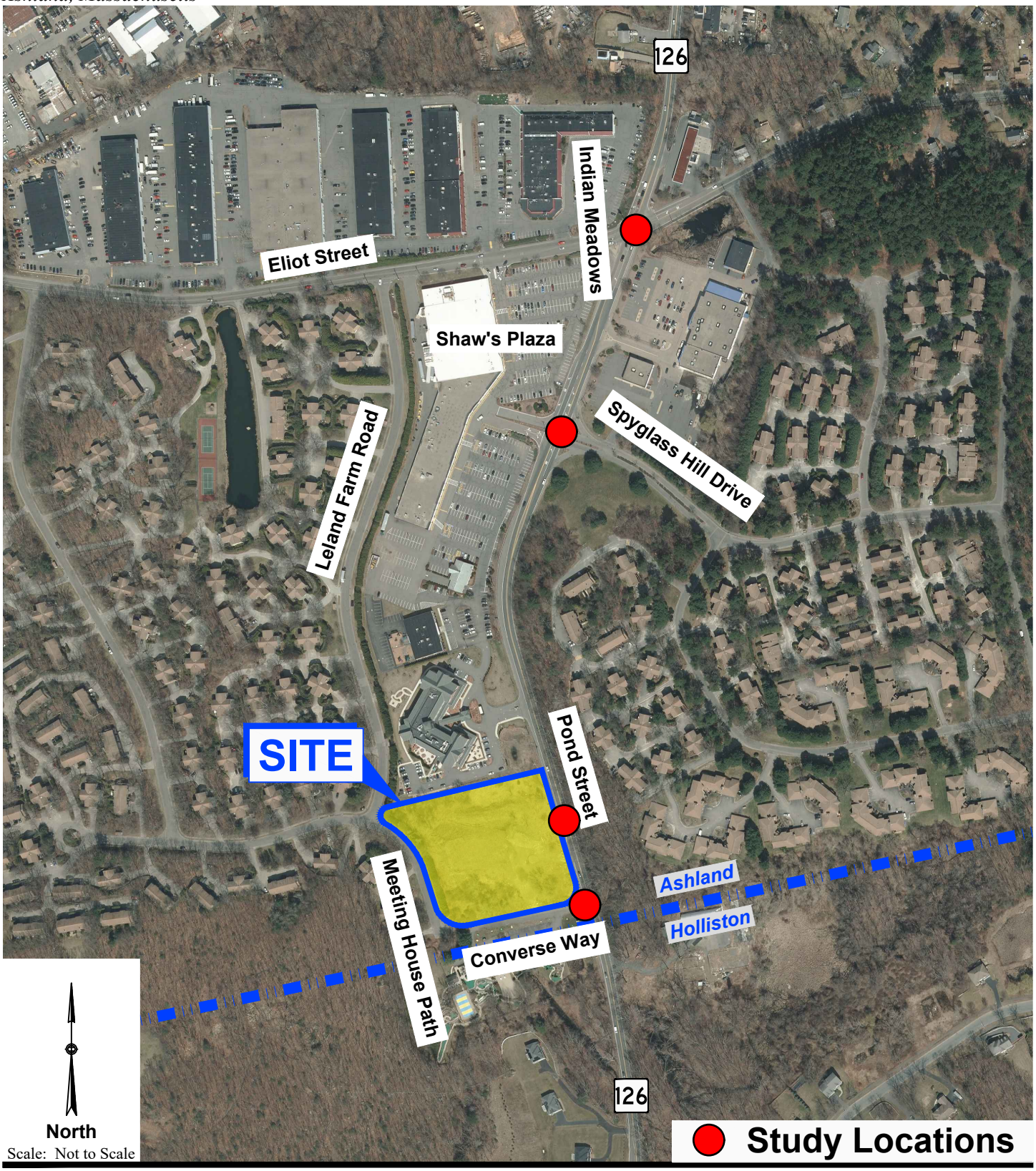

Figure 1

Site Location

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- *Adequate Roadway Capacity*. The proposed development is expected to have minimal impact on the study area intersection and will not result in any notable changes in traffic operations in the study area relative to No-Build conditions. With the project in place, the defacto site driveway "Converse Way" approach to Pond Street will continue to operate at LOS C or better during the peak hours.

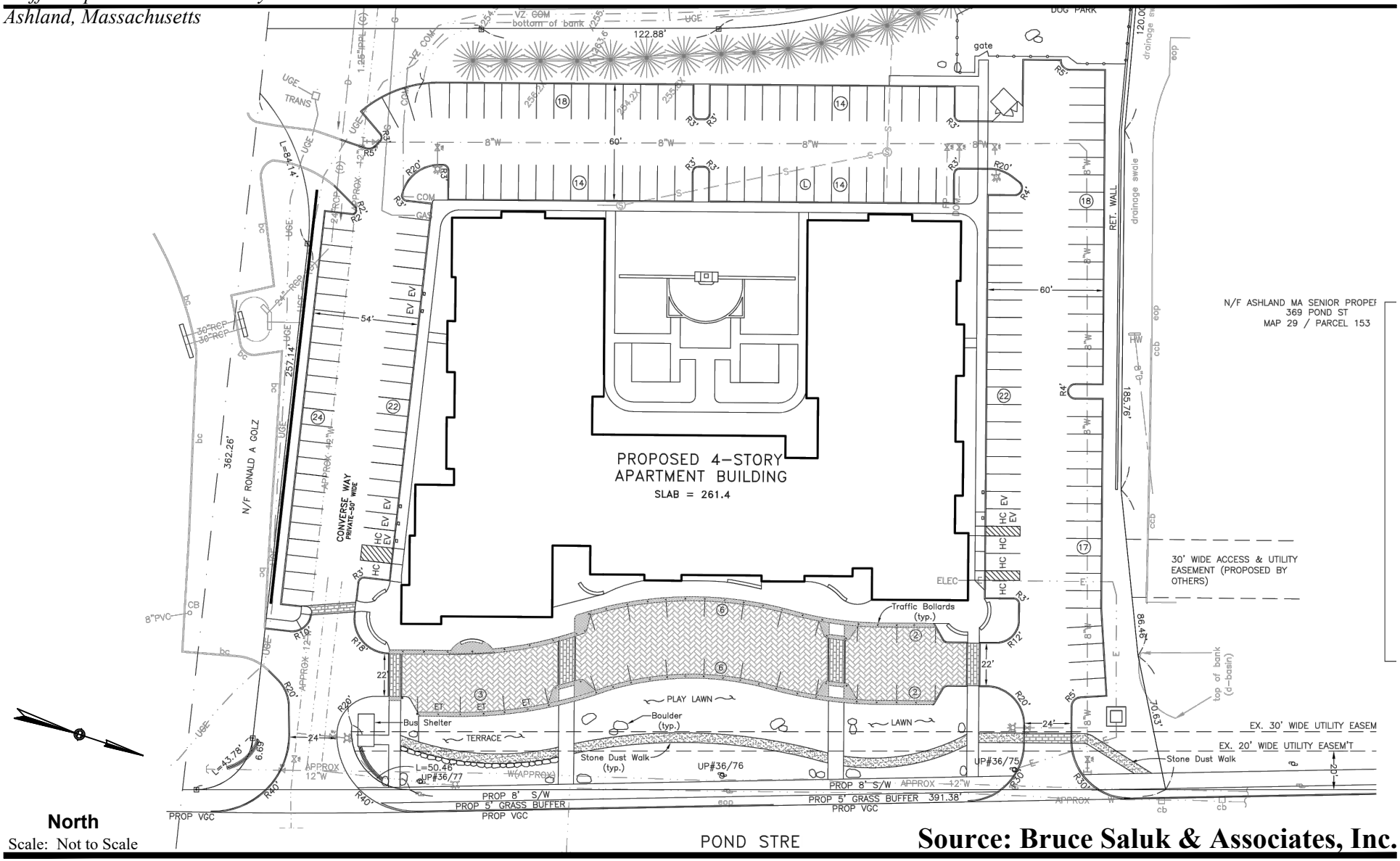
- *Adequate Site Circulation*. The proposed Site driveways have been designed to accommodate delivery vehicles and the Town's ladder truck. The analysis indicates that Site access/egress, circulation aisles and parking layout provide adequate maneuvering area for the design vehicles.

In summary, the projected traffic increases due to the proposed development will be nominal in the immediate study area (1 vehicle or less per minute during the peak periods) and adequate capacity is available under 2028 Build conditions along Pond Street to accommodate the proposed site use. The project is not projected to materially change any reported operating levels compared to 2028 No-Build conditions. The study intersections exhibit average or below-average crash rates based on historic crash data; safety countermeasures are therefore not warranted. Site access and on-site design elements are outlined under *Recommendations and Conclusions* that will provide ample capacity to accommodate site-generated traffic while enhancing safety and capacity and promoting alternative modes of transportation.

PROJECT DESCRIPTION

The Site consists of approximately 3.35± acres of land located on the southbound side of Pond Street (Route 126) between Converse Way and the Residence at Valley Farm. There is nothing at the existing Site. Access/Egress to the Site is via one curb cut along the westbound side of Converse Way. There is an existing mini-golf business across from the site on Converse Way.

Under the proposed Site programming, a 120-unit, four-story multi-family residential building will be constructed along with 6,800 sf of office space. Access/egress to the Site will be from Pond Street via a connection along the existing Converse Way and a secondary driveway to be constructed along Pond Street in the northern portion of the Site. The Site will be supported by approximately 182 on-site surface parking spaces. The preliminary site layout prepared by Bruce Saluk & Associates; Inc. is presented in **Figure 2.**



North
Scale: Not to Scale

Source: Bruce Saluk & Associates, Inc.

Figure 2

Preliminary Site Plan

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BASELINE TRAFFIC & SAFETY CHARATERISTICS

An overview of roadway classification and geometric characteristics is provided below for the adjacent study roadway.

Pond Street (Route 126)

Pond Street (Route 126) is generally a north-south roadway under state jurisdiction within the study area. Pond Street is classified by the Massachusetts DOT as an Urban Principal Arterial roadway, and it provides a connection between Route 135 to the north and Route 16 to the south. Pond Street provides one travel lane in each direction within the study area with additional turn lanes provided at its major intersections. The posted (regulatory) speed limit on Pond Street in the study area is 45 mph in both travel directions. Land use along Pond Street in the study area is a mix of commercial and residential uses including the Shaw's Plaza, the Residence at Valley Farm, and Ashland KinderCare.

Baseline Traffic Data

Peak Hour Traffic Volumes

Traffic volume data were collected at the area intersections during the weekday morning (7:00 AM - 9:00 AM) and weekday evening (4:00 PM – 6:00 PM) periods to coincide with peak traffic activity of the proposed uses and the adjacent streets. A review of historical traffic data along the Massachusetts Turnpike which should be conservative to this area indicates that peak hour traffic volumes remain below normal average conditions due to the Covid-19 pandemic. Accordingly, the weekday morning traffic volumes have been adjusted by 17%, the weekday evening peak hour have been adjusted by 25%, and the Daily has been adjusted by 20% to represent average traffic volume conditions. Review of MassDOT permanent count station data indicates that August is an above average traffic month; however, to remain conservative, no adjustment (reduction) for seasonal fluctuations was made to the traffic volume data.

The resulting 2021 Baseline weekday morning and weekday evening peak hour traffic volumes for the study intersections are shown in **Figure 3** and **Figure 4**.

Daily Traffic Volumes

Daily traffic volumes along Pond Street, south of the site were obtained for a weekday in August 2021. The results of the counts have been adjusted to reflect pre-Pandemic conditions and are summarized in **Table 1**. Traffic volume data is provided in the **Attachments.**

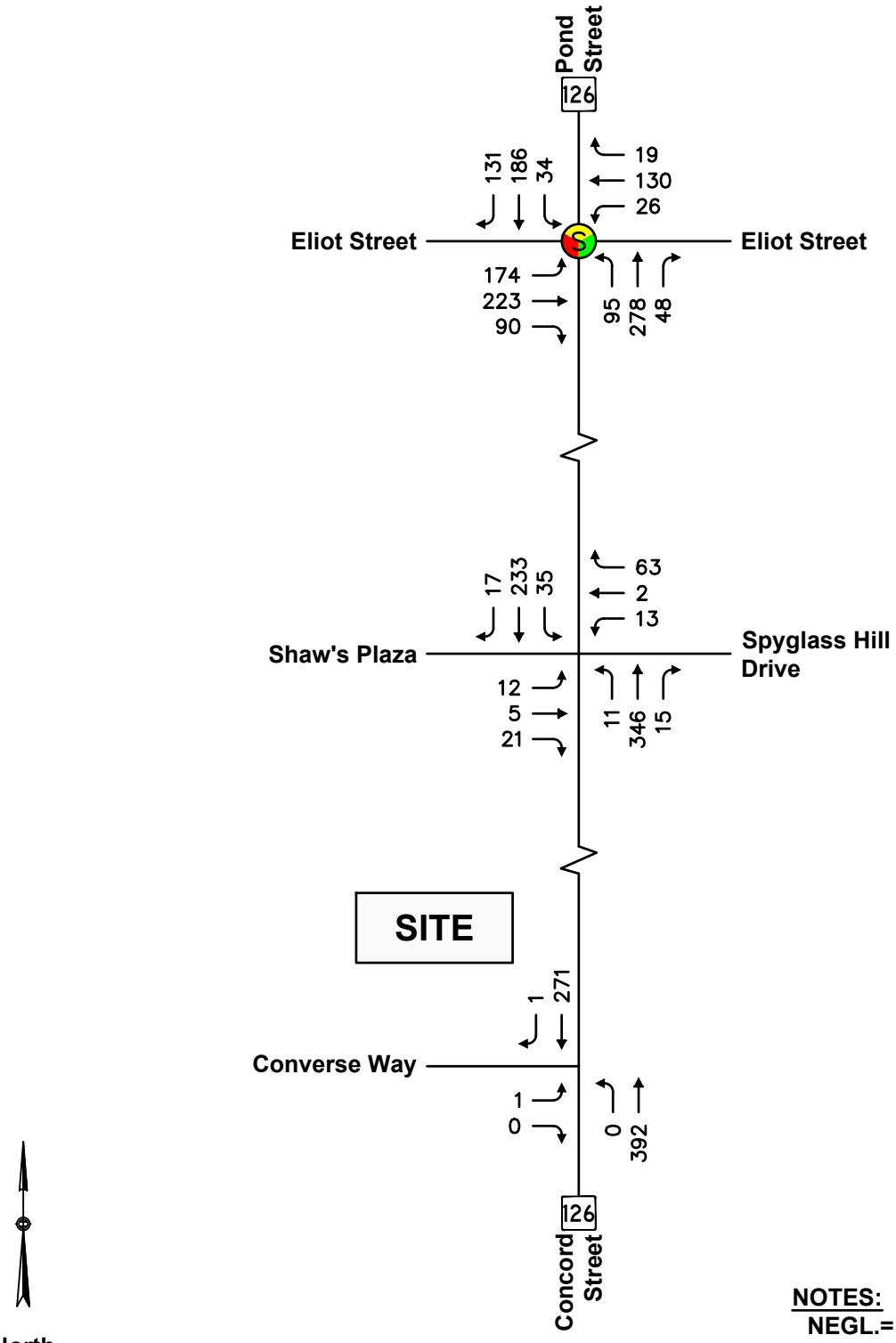

Figure 3

2021 Baseline Conditions
Weekday Morning Peak Hour Volumes

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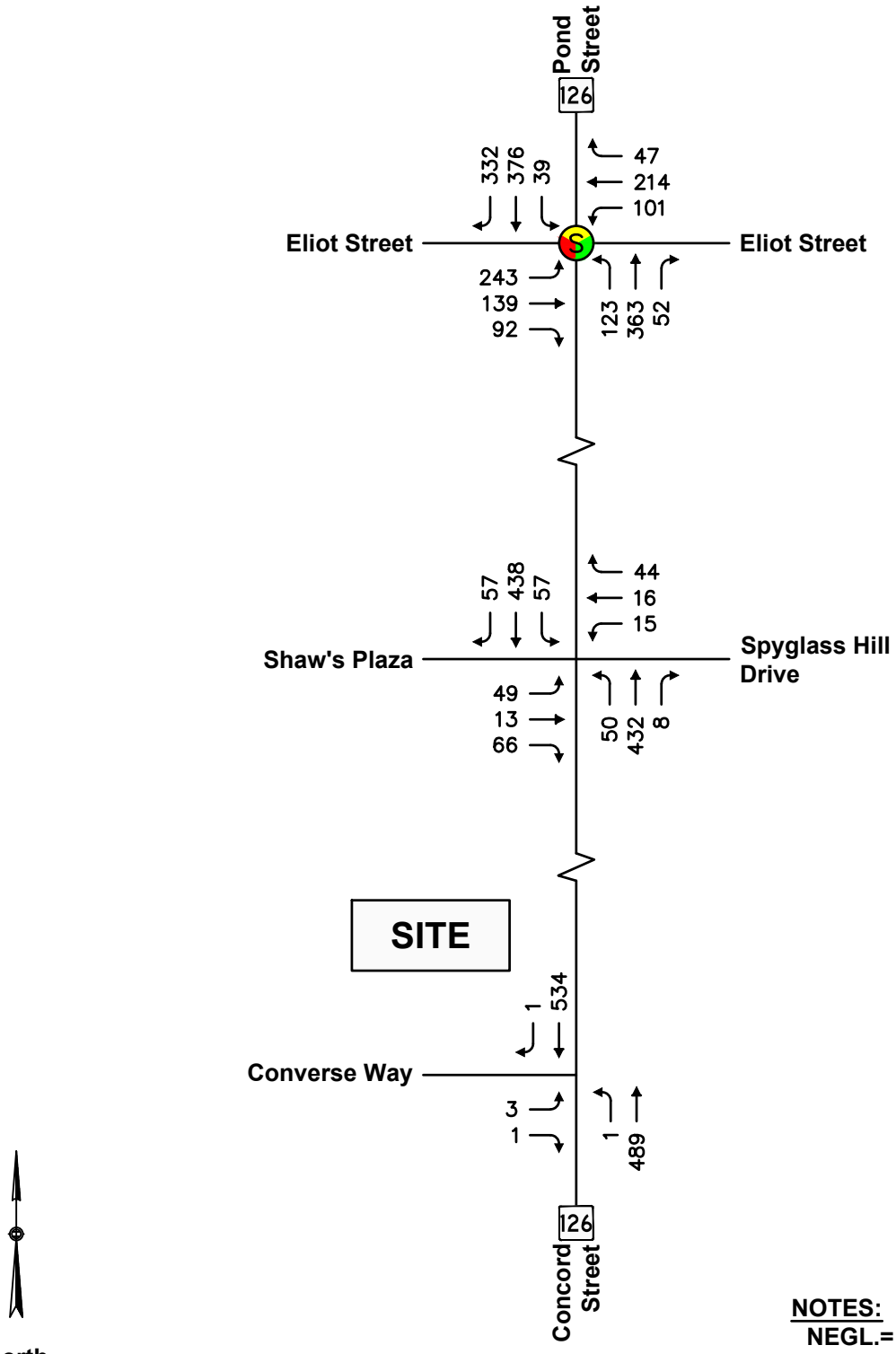

Figure 4

2021 Baseline Conditions
Weekday Evening Peak Hour Volumes

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TABLE 1
BASELINE TRAFFIC VOLUME SUMMARY – POND STREET

Time Period	Daily Volume (vpd)[1]	Percent Daily Traffic[2]	Peak Hour Volume (vph)[3]	Peak Flow Direction[4]	Peak Hour Directional Volume (vph)
Weekday Morning Peak Hour	11,536	6%	672	59% NB	399
Weekday Evening Peak Hour	11,536	9%	1,014	51% SB	518

[1]Two-way daily traffic expressed in vehicles per day without seasonal adjustment but with Pandemic adjustment (Wk AM 17%, Wk PM 25%, and Daily 20%.
[2]The percent of daily traffic that occurs during the peak hour.
[3]Two-way peak-hour volume expressed in vehicles per hour.
[4]NB = Northbound, SB = Southbound

As summarized in **Table 1,** the weekday daily traffic volume on Pond Street south of the Site is approximately 11,536 vehicles per day (vpd) on a weekday. Peak hour traffic flow on Pond Street ranges from approximately 672 to 1,014 vehicles per hour (vph) representing approximately 6 to 9 percent of daily traffic flow. The directional flow skewed northbound during the weekday morning and skewed southbound during the weekday evening peak traffic hours.

Observed Travel Speeds

Vehicle speeds were obtained for the northbound and southbound travel directions on Pond Street to the south of the Site in August 2021 using an Automated Traffic Recorder (ATR) equipped with speed radar. **Table 2** summarizes the average and 85th percentile speeds for the locations and time period studied. Speed data is provided in the **Attachments**.

TABLE 2
SPEED STUDY RESULTS – POND STREET

Travel Direction	Posted Speed Limit (mph)[1]	Observed Travel Speed (mph)	
		Mean[2]	85th Percentile[3]
Northbound	45	39	43
Southbound	45	40	43

[1]Regulatory (posted) speed limit.
[2]Arithmetic mean.
[3]The speed at or below which 85 percent of the vehicles are traveling.

As summarized in **Table 2**, the mean (average) travel speed on Pond Street is 39 mph in the northbound direction and 40 mph in the southbound direction and the 85th percentile travel speed is 43 mph in both the northbound and southbound directions. The speed data is highly consistent with the regulatory speed limits and sets the basis for the sight line evaluation presented in the following section.

Intersection Crash History

In order to identify crash trends and safety characteristics for study area intersections, crash data were obtained from MassDOT for the Town of Ashland for the five-year period covering 2016 through 2020. In addition, review of the MassDOT high crash cluster mapping was conducted to determine locations listed as eligible for Highway Safety Improvement Program (HSIP) evaluation and funding. A summary of the crash data with crash rates for the study intersections with reported crashes is provided in **Table 3** with detailed data provided in the **Attachments.**

Crash rates were calculated for the study intersections as reported in **Table 3**. These rates quantify the number of crashes per million entering vehicles. MassDOT has determined the official District 3 (which includes the Town of Ashland) crash rate to be 0.61 for unsignalized intersections and 0.89 for signalized intersections. This rate represents MassDOT's "average" crash experience for District 3 communities and serves as a basis for comparing reported crash rates for the study intersections. Where calculated crash rates notably exceed the district average, some form of safety countermeasures may be warranted.

TABLE 3
INTERSECTION CRASH SUMMARY — 2016 THROUGH 2020[1]

Data Category	INTERSECTION	
	Pond St at Eliot Street	Pond St at Spyglass Hill Dr/ Shaw's Plaza
Traffic Control	Signalized	Unsignalized
Crash Rate[2]	**0.84**	**0.31**
District 3 Avg.[3]	0.89	0.61
Year:		
2016	8	4
2017	7	1
2018	4	2
2019	11	1
2020	7	0
Total	37	8
Type:		
Angle	12	3
Rear-End	11	4
Head-On	3	0
Sideswipe	8	0
Single Vehicle	2	1
Other/Unknown	1	0
Severity:		
P. Damage Only	29	5
Personal Injury	6	3
Fatality	0	0
Other/Unknown	2	0
Conditions:		
Dry	27	6
Wet	6	2
Snow/Ice	3	0
Other/Unknown	1	0
Time:		
7:00 to 9:00 AM	3	0
4:00 to 6:00 PM	8	2
Rest of Day	26	6

[1] Source: MassDOT Crash Database
[2] Crashes per million entering vehicles
[3] District 3 average = 0.61 for unsignalized intersections and 0.89 for signalized intersections

As summarized in **Table 3**,

- Thirty-seven (37) crashes were reported for the Pond Street at Eliot Street signalized intersection – resulting in a crash rate of 0.84 which is just below the MassDOT average crash rate of 0.89. The reported crashes include twelve (12) angle type crashes, eleven (11) rear-end type crashes, three (3) head-on type crashes, eight (8) sideswipe type crashes, two (2) single vehicle type crashes, and one (1) other type of crash. The majority (73%) of the crashes occurred under dry roadway conditions and in property damage only type collisions (78%). Thirty percent (30%) of the crashes occurred during the weekday morning or weekday evening peak periods.

- Eight (8) crashes were reported for the Pond Street at Spyglass Hill Drive/Shaw's Plaza unsignalized intersection – resulting in a crash rate of 0.31. The reported crashes include three (3) angle type crashes, four (4) rear-end type crashes, and one (1) single vehicle type crash. The majority (75%) of the crashes occurred under dry roadway conditions and in property damage only type collisions (63%). Twenty-five percent (25%) of the crashes occurred during the weekday morning or weekday evening peak periods.

- There were no crashes reported for the Pond Street at Converse Way unsignalized intersection during the study period.

In summary, the study intersections experienced crash rates below the District 3 averages and no immediate safety countermeasures are warranted based on the crash history at the study intersections. None of the intersections are identified as a high crash location and are thus not eligible for HSIP funding. Crash records are provided in the **Attachments**. MDM notes that MassDOT project 604123 is currently being installed along the Pond Street (Route 126) corridor within Ashland between the Holliston Town Line and the Framingham City Line. These improvements include a complete streets roadway improvements project to provide roadway infrastructure, bicycle lanes, continuous sidewalks and enhanced pavement markings.

Sight Line Evaluation

An evaluation of sight lines was conducted at Converse Way and the proposed secondary driveway to ensure that minimum recommended sight lines are available to safely exit onto Pond Street. The evaluation documents existing sight lines for vehicles as they relate to Pond Street with comparison to recommended guidelines for the regulatory speed limit.

The American Association of State Highway and Transportation Officials' (AASHTO) standards[1] reference two types of sight distance which are relevant at the Converse Way intersection on Pond Street: stopping sight distance (SSD) and intersection sight distance (ISD). Sight lines for critical vehicle movements at the intersections with Pond Street were compared to minimum SSD and ISD for the regulatory speed limit in the Site vicinity.

Stopping Sight Distance

Sight distance is the length of roadway visible to the motorist to a fixed object. The minimum sight distance available on a roadway should be sufficiently long enough to enable a below-average operator, traveling at or near a regulatory speed limit, to stop safely before reaching a stationary object in its path, in this case, a vehicle entering or exiting Converse Way onto Pond Street. The SSD criteria are defined by AASHTO based on design and operating speeds, anticipated driver behavior and vehicle performance, as well as physical roadway conditions. SSD includes the length of roadway traveled during the perception and reaction time of a driver to an object, and the distance traveled during brake application on wet level pavement. Adjustment factors are applied to account for roadway grades where applicable.

SSD was estimated in the field using AASHTO standards for driver's eye (3.5 feet) and object height equivalent to the taillight height of a passenger car (2.0 feet) for the northbound and southbound Pond Street approaches to the site driveway intersections. **Table 4** presents a summary of the available SSD for the Pond Street segment approaches to the Converse Way and the proposed secondary driveway and AASHTO's recommended SSD for the regulatory speed limit and observed travel speeds.

[1] *A policy on Geometric Design of Highways and Streets*, American Association of State Highway and Transportation Officials (AASHTO), 2018.

TABLE 4
STOPPING SIGHT DISTANCE SUMMARY
POND STREET APPROACHES TO SITE DRIVEWAYS

Approach/ Travel Direction	Available SSD	AASHTO Recommended[1] Regulatory Speed Limit[2]	AASHTO Recommended[1] Observed 85th Percentile Speed[3]
Pond Street Approaches to Converse Way			
Northbound	>500 Feet	360 Feet	340 Feet
Southbound	>500 Feet	360 Feet	340 Feet
Pond Street Approaches to Proposed Secondary Driveway			
Northbound	>500 Feet	360 Feet	340 Feet
Southbound	>500 Feet	360 Feet	340 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet and adjustments for roadway grade.
[2]Regulatory Speed Limit is 45 mph NB and SB.
[3] 85th Percentile travel speed is 43 mph NB and 43 mph SB on Pond Street.

As summarized in **Table 4** analysis results indicate that the available sight lines exceed AASHTO's recommended SSD criteria for the proposed site driveways based on the regulatory travel speeds along Pond Street.

Intersection Sight Distance

Clear sight lines provide sufficient sight distance for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. As stated under AASHTO's Intersection Sight Distance (ISD) considerations, "…*If the available sight distance for an entering …vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to avoid collisions…To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road*." AASHTO's ISD criteria are defined into several "cases". For the unsignalized driveway approaches, which are under STOP sign control, the ISD in question relates to the ability to turn right or left from Converse Way and the secondary site driveway at its intersections with Pond Street.

Available ISD was estimated in the field using AASHTO standards for driver's eye (3.5 feet), object height (3.5 feet) and decision point (between 8 and 14.5 feet from the edge of the travel way) for the northbound and southbound direction along Pond Street. **Table 5** presents a summary of the available ISD for the departure from the site driveways and AASHTO's minimum and ideal ISD recommendations.

TABLE 5
INTERSECTION SIGHT DISTANCE SUMMARY
SITE DRIVEWAY DEPARTURES TO POND STREET

View Direction	Available ISD	AASHTO Minimum[1] Regulatory Speed Limit[2]	AASHTO Ideal[2] Regulatory Speed Limit[2]
Converse Way Departures to Pond Street			
Looking North	>500 Feet	360 Feet	430 Feet
Looking South	>500 Feet	360 Feet	500 Feet
Proposed Secondary Driveway Departures to Pond Street			
Looking North	>500 Feet	360 Feet	430 Feet
Looking South	>500 Feet	360 Feet	500 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet and an object height of 3.5 feet. Minimum value as noted represents SSD per AASHTO guidance. Adjustments for driveway grade have been made as needed.
[2]Regulatory Speed Limit is 45 mph.

The results of the ISD analysis presented in **Table 5** indicate that with clearing of vegetation within the sight line triangles, the available sight lines looking north and south from the site driveways onto Pond Street will exceed the recommended minimum and ideal sight line criteria from AASHTO. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features to be located within driveway sight lines should also be maintained at a height of 2 feet or less above the adjacent existing roadway grade to ensure unobstructed lines of sight.

PROJECTED FUTURE TRAFFIC CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future baseline analysis condition. This section estimates future roadway and traffic conditions with and without the proposed development. A seven-year planning horizon (year 2028) was selected consistent with industry standard guidelines.

To determine the impact of site-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to a future year condition. Traffic volumes on the roadway network at that time, in the absence of the development (that is, the No-Build condition), includes existing (baseline) traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others that are currently under review at the local and/or state level. Consideration of these factors resulted in the development of No-Build traffic volumes. Anticipated Site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop future Build conditions.

The following sections provide an overview of planned area roadway improvements, future No-Build traffic volumes, and projected Build traffic volumes.

Planned Area Roadway Improvements

Pond Street (Route 126) Corridor Improvement Project

MassDOT is currently constructing roadway improvements as part of project number 604123 along the Pond Street (Route 126) corridor within Ashland between the Holliston Town Line and the Framingham City Line. These improvements include a complete streets roadway improvements project to provide roadway infrastructure, bicycle lanes, continuous sidewalks and enhanced pavement markings. In the immediate study area, a single lane roundabout will be installed at Pond Street intersection with Spyglass Hill Road/ Shaw's Plaza Driveway and traffic signal improvements at the Pond Steet intersection with Eliot Street. These improvements are assumed to be in place under No-Build conditions.

Background Growth

Nearby permanent count station data published by MassDOT indicates an average growth rate of 0.3 percent per year. For purposes of this evaluation, a 1.0-percent compounded annual growth rate was used (7.2 percent increase over a 7-year horizon). This growth rate is higher than historic rates and is also expected to account for any small fluctuation in hourly traffic as may occur from time to time in the study area and traffic associated with other potential small developments or vacancies in the area. MassDOT permanent count station data and background growth calculations are provided in the **Attachments.**

2028 No-Build Traffic Volumes

There are no planned or permitted projects in the immediate study area that would need to be included as site specific projects. Therefore, to account for future traffic growth along the corridor, the 1.0-percent annual growth rate was applied to Baseline traffic volumes over a seven-year period. Future 2028 No-Build traffic volume networks are displayed in **Figure 5** and **Figure 6**.

Trip Generation

The trip generation estimates for the proposed development are provided for the weekday morning and weekday evening, which correspond to the critical analysis periods for the proposed uses and adjacent street traffic flow. New traffic generated by the project was estimated using trip rates published in ITE's *Trip Generation*[2] for the Land Use Code (LUC) 221 – Multifamily Housing (Mid-Rise) and LUC 712 – Small Office Building. **Table 6** presents the trip-generation comparison for the proposed development based on ITE methodology.

TABLE 6
TRIP-GENERATION SUMMARY

Period/Direction	Apartments (120 Units)[1]	Small Office (6,800 sf)[2]	Total Trips
Weekday Morning Peak Hour:			
Entering	11	9	20
Exiting	32	2	34
Total	43	11	54
Weekday Evening Peak Hour:			
Entering	32	5	37
Exiting	21	10	31
Total	53	15	68
Daily	652	98	750

[1]Based on ITE rates for LUC 221 – Multifamily Housing (Mid-Rise) applied to 120 units.
[2]Based on ITE rates for LUC 712 – Small Office Building applied to 6,800 sf.

As summarized in **Table 6**, the proposed development is estimated to generate approximately 54 vehicle trips (20 entering and 34 exiting) during the weekday morning peak hour and 68 vehicle trips (37 entering and 31 exiting) during the weekday evening peak hour. On a daily basis, the proposed development is estimated to generate approximately 750 vehicle trips. Trip generation calculations are provided in the **Attachments**.

[2]*Trip Generation*, 11 Edition; Institute of Transportation Engineers; Washington, DC; 2021.

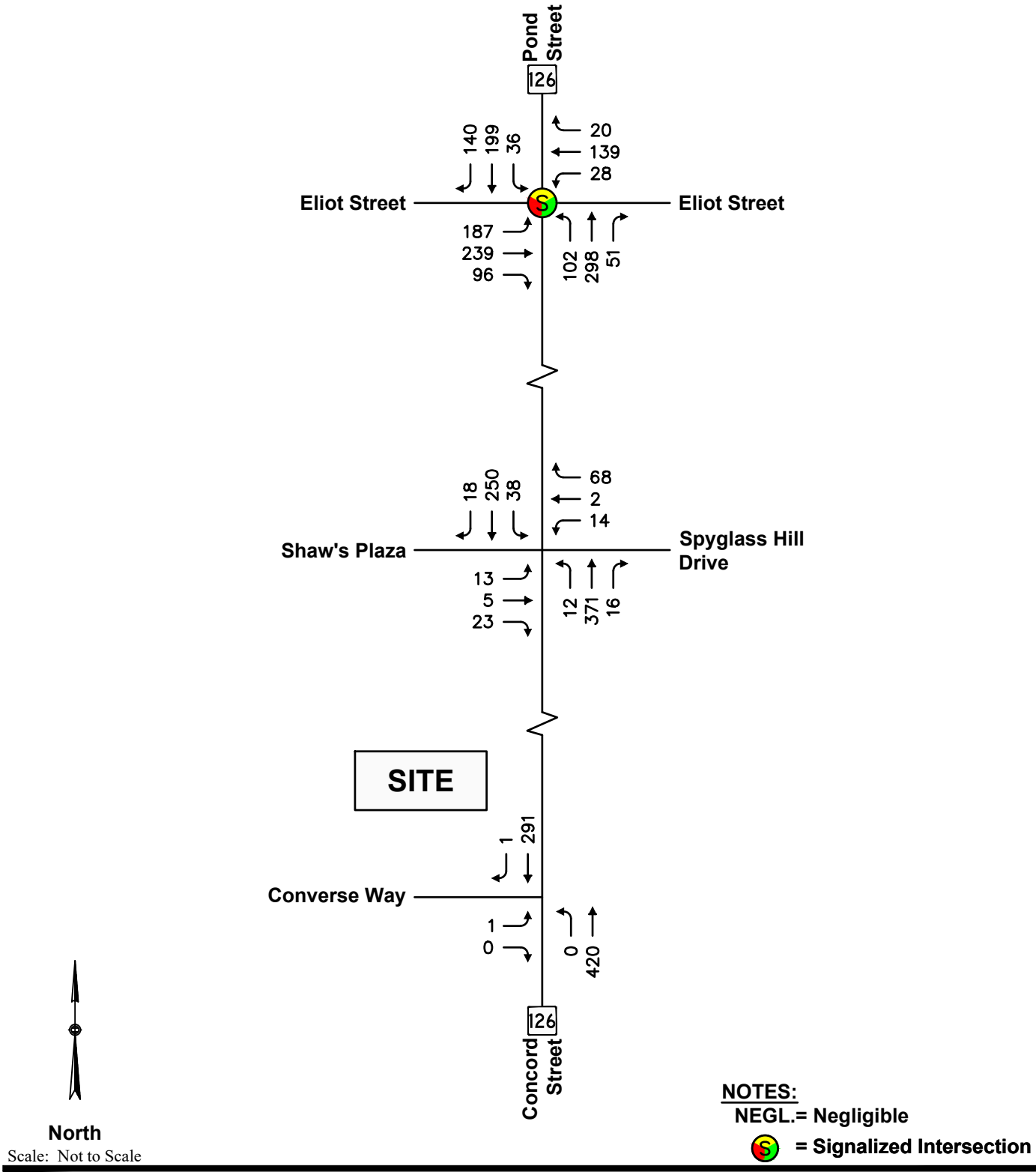

Figure 5

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2028 No-Build Conditions
Weekday Morning Peak Hour Volumes

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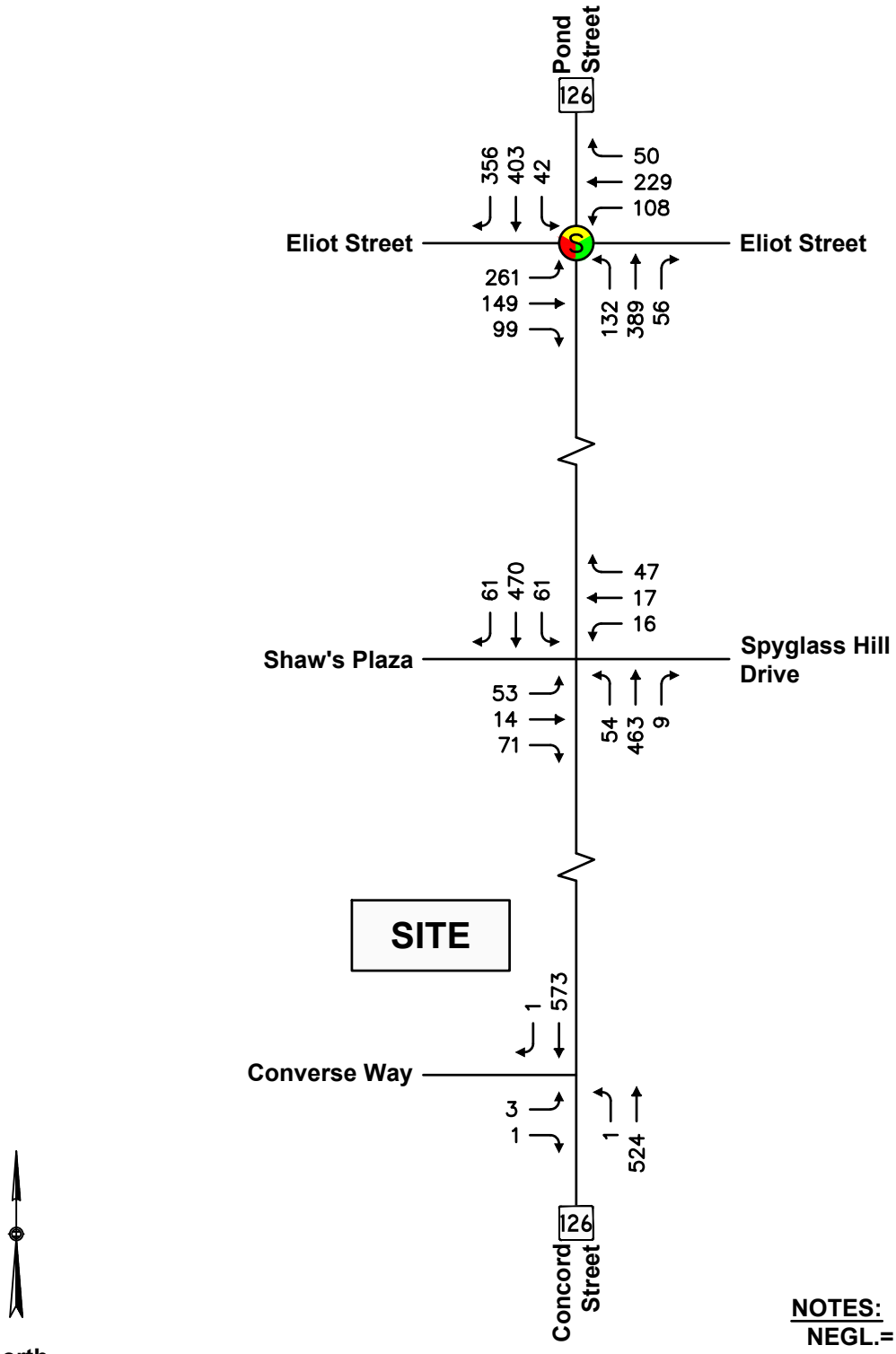

Figure 6

2028 No-Build Conditions
Weekday Evening Peak Hour Volumes

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Trip Distribution

The distribution for projected traffic for the proposed residential portion of the development is based on Journey to Work data and existing travel patterns in the study area while the small office portion of the development is based on existing travel patterns in the study area. The allocation of the site generated trips to the driveways is based on the location of the proposed parking with respect to the driveways. The resulting trip distribution pattern is presented in **Figure 7**.

Development-related trips for the residential development were assigned to the roadway network using the trip-generation estimates shown in **Table 6** and the distribution patterns presented in **Figure 7**. New development-related trips at each intersection approach for the weekday morning and weekday evening peak hours are quantified in **Figure 8** and **Figure 9**. Trip distribution calculations are provided in the **Attachments.**

2028 Build Traffic Conditions

2028 Build condition traffic volumes are derived by adding the incremental traffic increases for the development project at the Site to the 2028 No-Build conditions. **Figure 10** and **Figure 11** present the 2028 Build condition traffic-volume networks for the weekday morning and weekday evening peak hours.

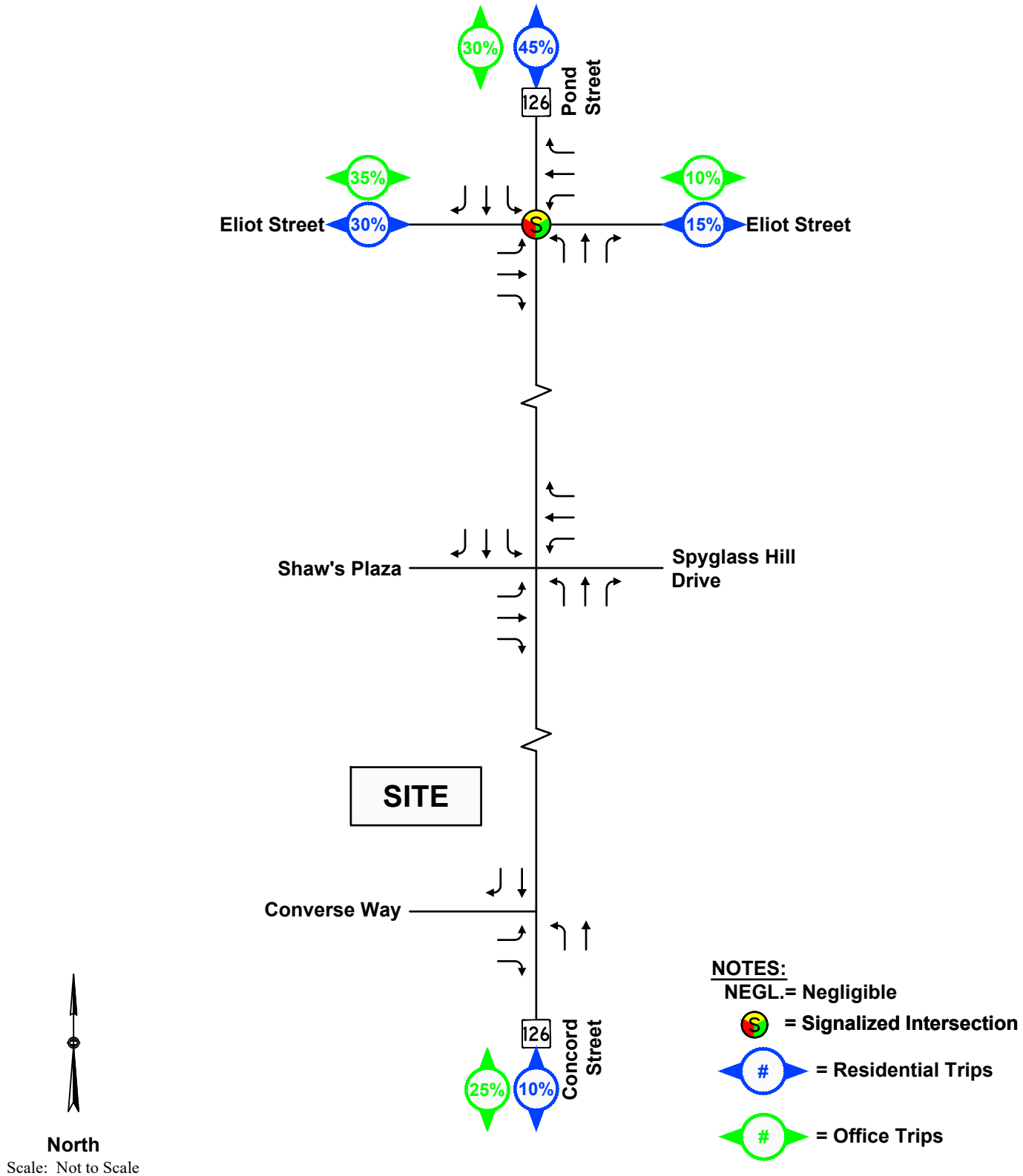

Figure 7

Trip Distribution

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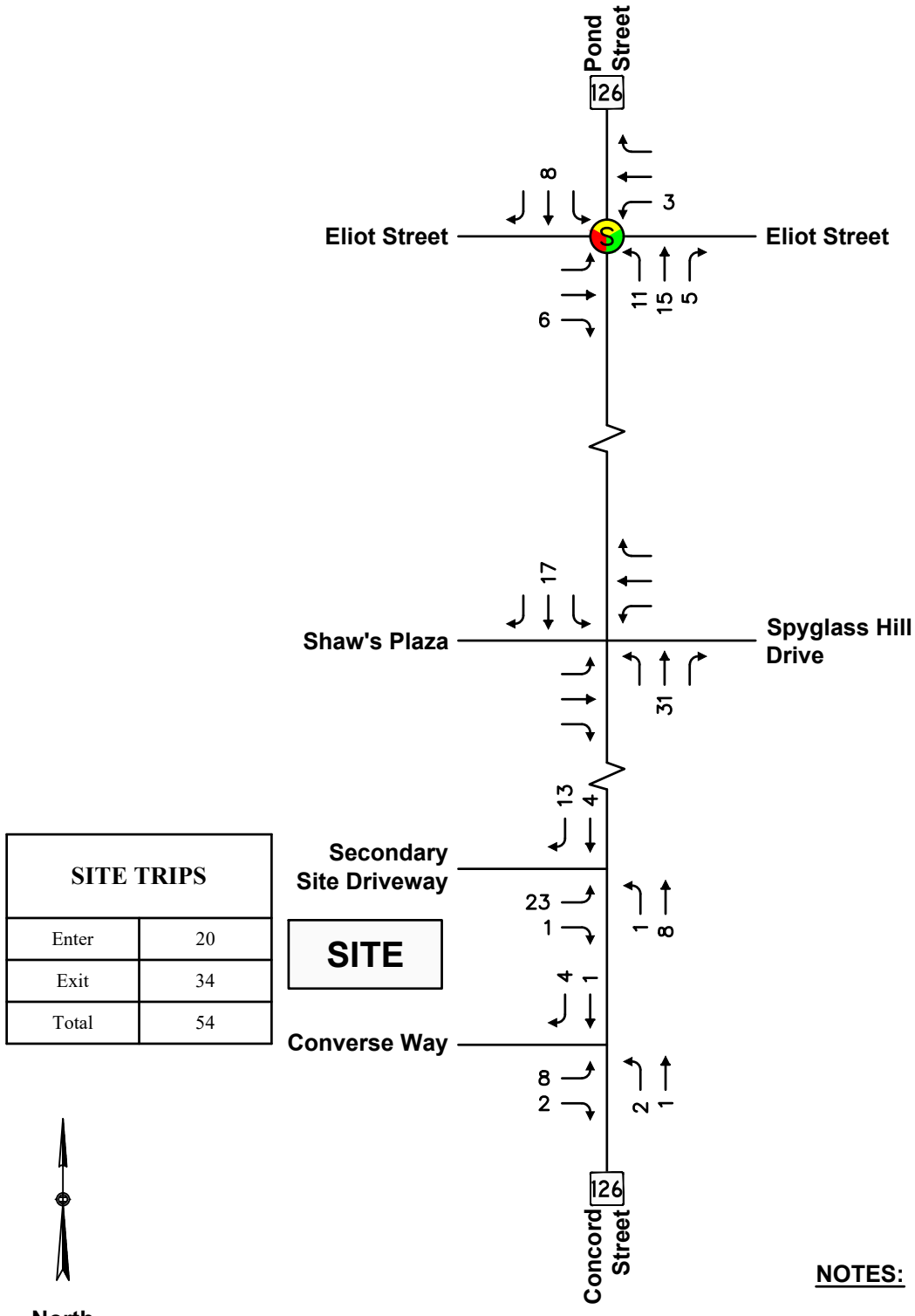

Figure 8

Site Generated Trips
Weekday Morning Peak Hour Volumes

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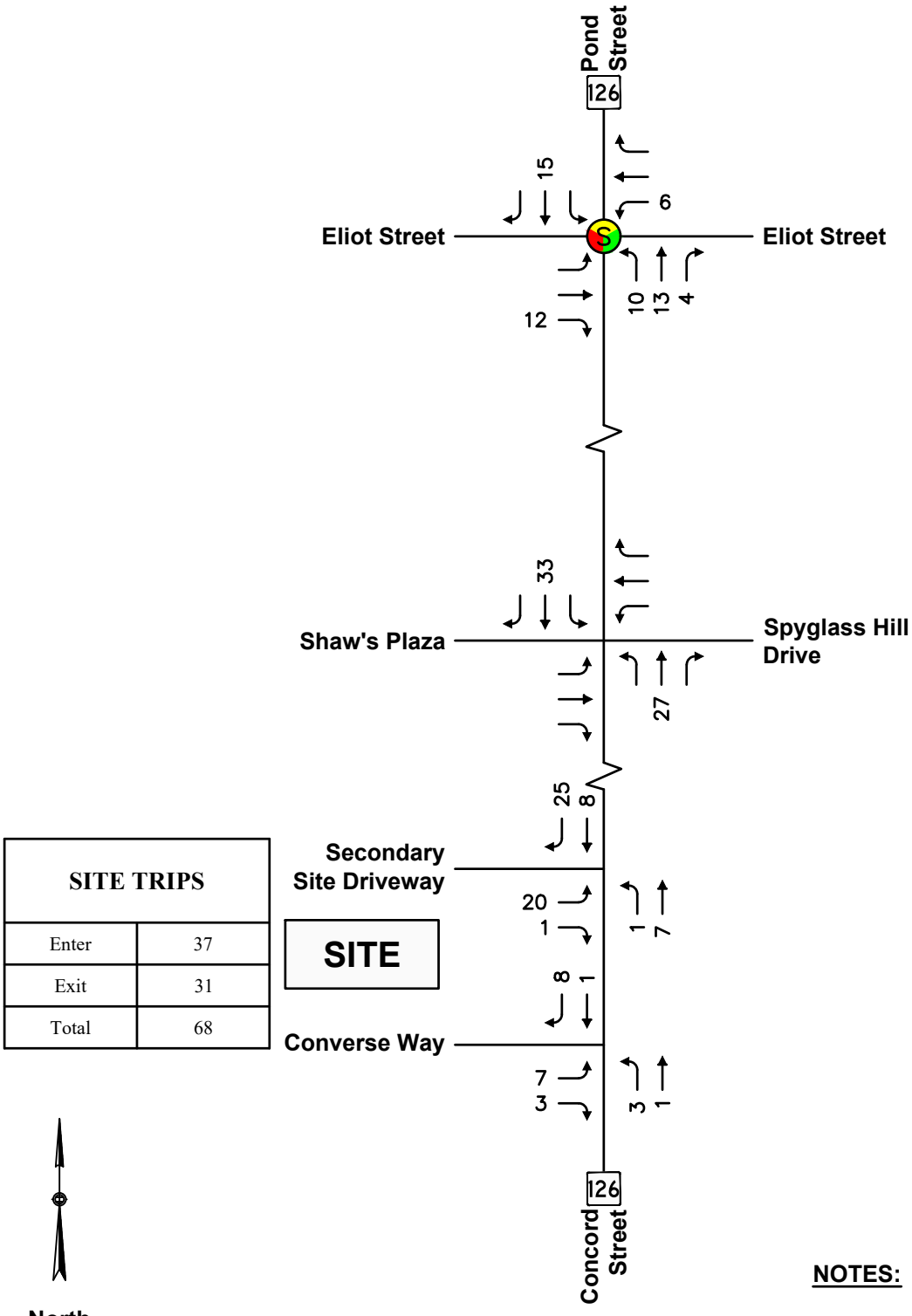

Figure 9

Site Generated Trips
Weekday Evening Peak Hour Volumes

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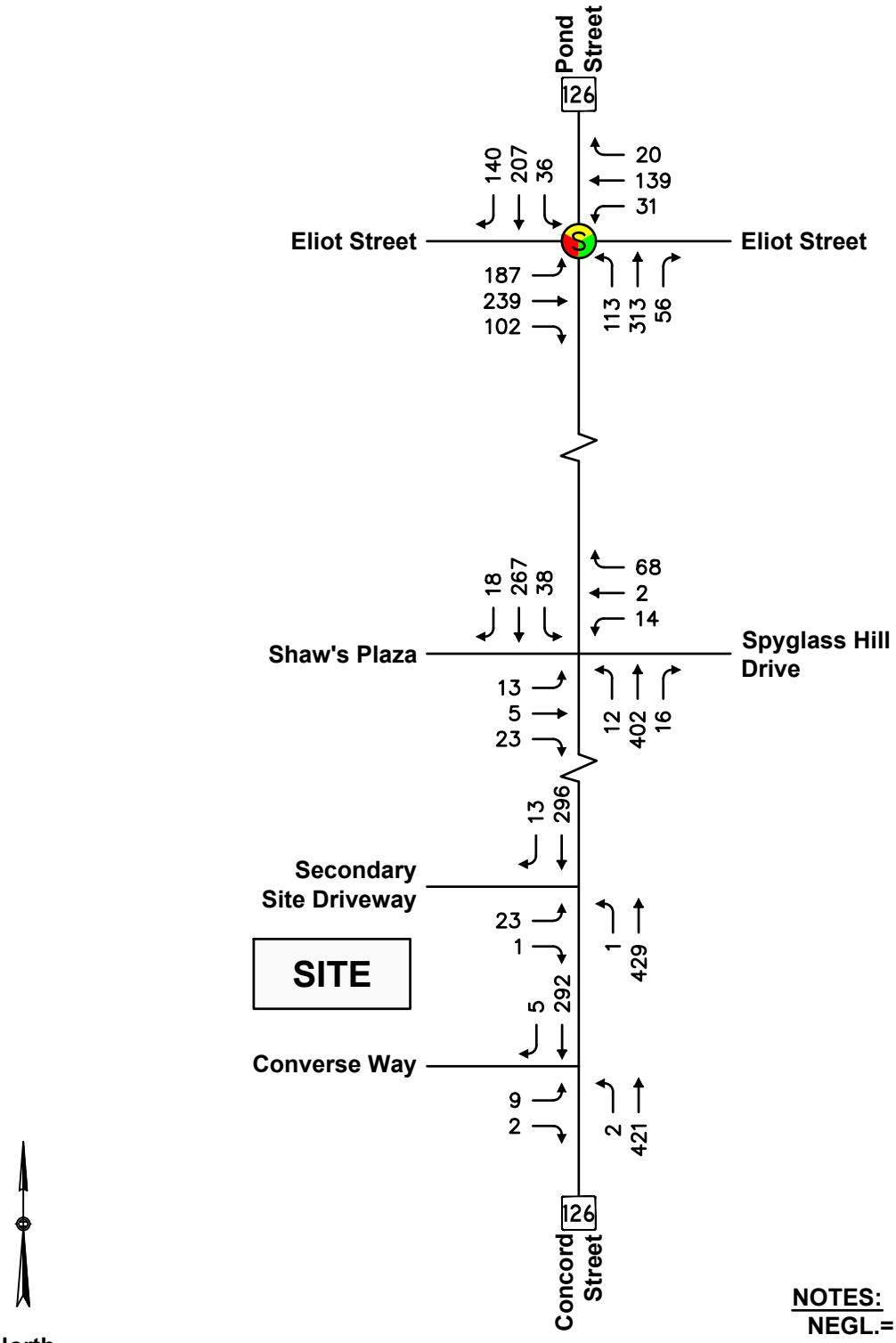

Figure 10

2028 Build Conditions
Weekday Morning Peak Hour Volumes

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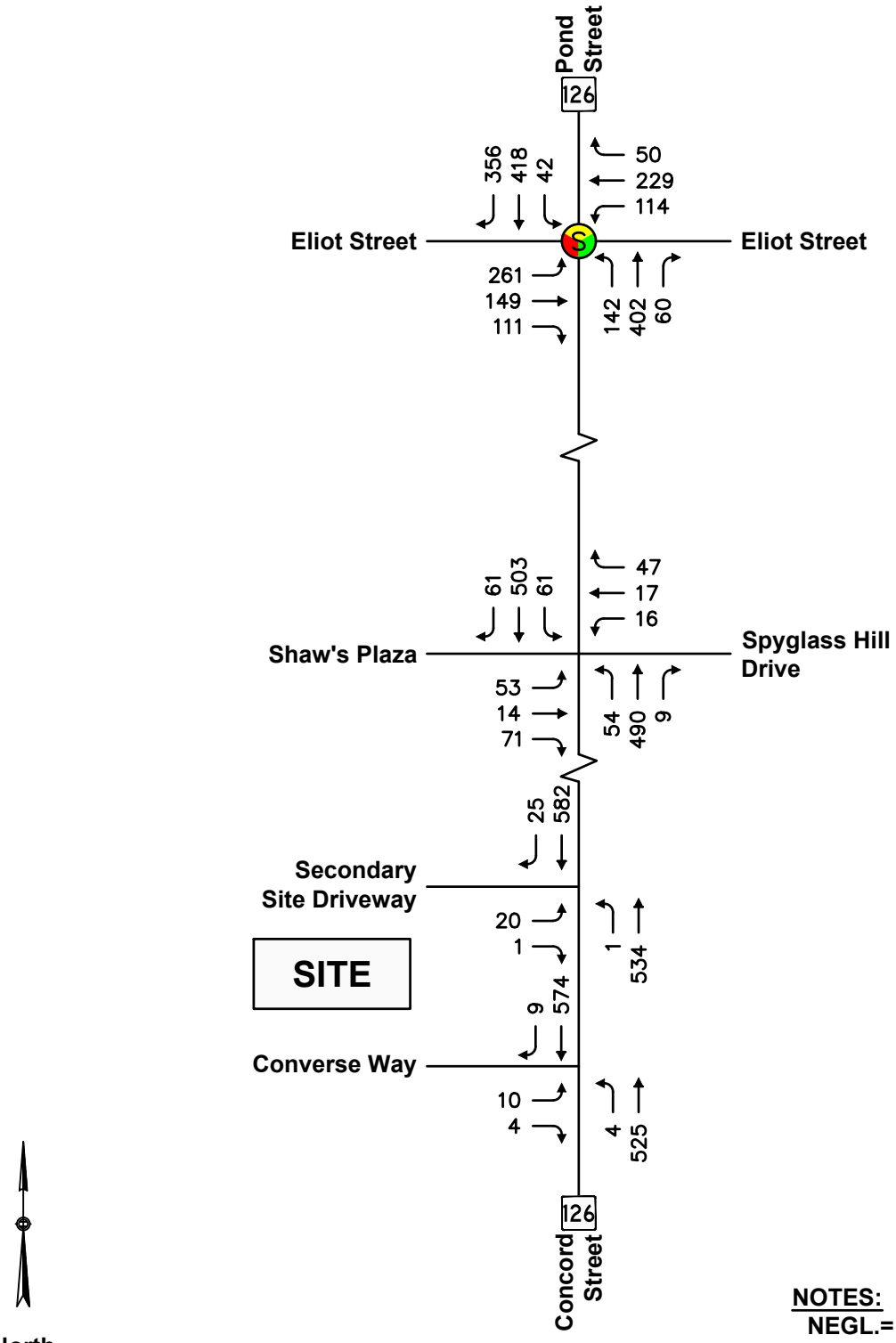

Figure 11

2028 Build Conditions
Weekday Evening Peak Hour Volumes

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TRAFFIC OPERATIONS ANALYSIS

This section provides an overview of operational analysis methodology, an assessment of driveway operations under Existing (Baseline) and projected future No-Build and Build conditions.

Analysis Methodology

Intersection capacity analyses are presented in this section for the Existing, No-Build, and Build traffic-volume conditions. Capacity analyses, conducted in accordance with EEA/MassDOT guidelines, provide an index of how well the roadway facilities serve the traffic demands placed upon them. The operational results provide the basis for recommended access and roadway improvements in the following section.

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the Highway Capacity Manual 6th Edition (HCM6). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements). The specific control delays and associated LOS designations are presented in the **Attachments**.

Analysis Results

Level-of-Service (LOS) analyses were conducted for the Baseline, No-Build, and Build conditions for the study intersections. The results of the intersection capacity are summarized below in **Table 7** and **Table 8**. Detailed analysis results are presented in the **Attachments**.

TABLE 7
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY MORNING PEAK HOUR

		2021 Baseline			2028 No-Build			2028 Build		
Intersection	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Pond Street at	Eastbound	0.38	10	B	0.42	20	C	0.45	23	C
Eliot Street	Westbound	0.23	9	A	0.63	42	D	0.62	42	D
	Northbound	0.47	12	B	0.63	29	C	0.64	29	C
	Southbound	0.36	8	A	0.58	23	C	0.59	23	C
	OVERALL	**0.47**	**10**	**B**	**0.63**	**26**	**C**	**0.64**	**27**	**C**
Pond Street at	Eastbound	0.06	14	B	0.06	6	A	0.07	6	A
Spyglass Hill Drive/	Westbound	0.10	12	B	0.13	7	A	0.14	7	A
Shaw's Plaza Driveway	Northbound	0.01	<5	A	0.45	9	A	0.48	10	A
	Southbound	0.03	<5	A	0.33	7	A	0.35	7	A
Pond Street at	EB Exit	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.07	16	C
Secondary Driveway	Northbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
	Southbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
Pond Street at	EB Exit	0.00	14	B	0.00	15	B	0.03	15	B
Converse Way	Northbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
	Southbound	0.00	<5	A	0.00	<5	A	0.00	<5	A

[1] Volume-to-capacity ratio
[2] Average control delay per vehicle (in seconds)
[3] Level of service
[4] n/a = not applicable

TABLE 8
INTERSECTION CAPACITY ANALYSIS RESULTS
WEEKDAY EVENING PEAK HOUR

		2021 Baseline			2028 No-Build			2028 Build		
Intersection	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Pond Street at	Eastbound	0.60	13	B	0.86	40	D	0.88	41	D
Eliot Street	Westbound	0.39	11	B	0.82	50	D	0.82	50	D
	Northbound	0.56	14	B	0.63	29	C	0.64	30	C
	Southbound	0.62	10	B	0.50	27	C	0.81	28	C
	OVERALL	**0.62**	**12**	**B**	**0.86**	**34**	**C**	**0.88**	**35**	**D**
Pond Street at	Eastbound	0.48	32	D	0.25	9	A	0.26	10	A
Spyglass Hill Drive/	Westbound	0.25	23	C	0.15	8	A	0.15	8	A
Shaw's Plaza Driveway	Northbound	0.05	<5	A	0.60	12	B	0.63	13	B
	Southbound	0.06	<5	A	0.65	13	B	0.68	14	B
Pond Street at	EB Exit	n/a[4]	n/a	n/a	n/a	n/a	n/a	0.11	25	D
Secondary Driveway	Northbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
	Southbound	n/a	n/a	n/a	n/a	n/a	n/a	0.00	<5	A
Pond Street at	EB Exit	0.02	18	C	0.02	20	C	0.06	20	C
Converse Way	Northbound	0.00	<5	A	0.00	<5	A	0.00	<5	A
	Southbound	0.00	<5	A	0.00	<5	A	0.00	<5	A

[1] Volume-to-capacity ratio
[2] Average control delay per vehicle (in seconds)
[3] Level of service
[4] n/a = not applicable

As summarized in **Table 7** and **Table 8**:

- *Pond Street at Grove Street.* Under future No-Build conditions, the signalized intersection will operate well below capacity at level of service (LOS) D or better during the peak hours. With the project in place under Build conditions, the signalized intersection will continue to operate at LOS D or better with only nominal changes in delay compared to No-Build conditions.

- *Pond Street at Spyglass Hill Drive/Shaw's Plaza.* Under the future No-Build and Build scenarios the intersection of Pond Street at Spyglass Hill Drive and Shaw's Plaza will be replaced with a single lane roundabout intersection. All approaches will operate below capacity at LOS B or better during the peak hours under both No-Build and Build conditions.

- *Pond Street at Secondary Driveway.* Under Build conditions, the Converse Way approach to Pond Street will continue to operate at LOS D or better during the peak hours. Mainline traffic along Pond Street will continue to operate unimpeded with minimal delay (LOS A) under all analysis scenarios.

- *Pond Street at Converse Way.* Under Build conditions, the Converse Way approach to Pond Street will continue to operate at LOS C or better during the peak hours. Mainline traffic along Pond Street will continue to operate unimpeded with minimal delay (LOS A) under all analysis scenarios.

In summary, incremental traffic increases at the study intersections due to the proposed development generally result in inconsequential changes in intersection operations compared to No-Build conditions. Therefore, no additional roadway improvements are warranted to accommodate the project.

SITE CIRCULATION

The Site has been designed to accommodate the largest anticipated delivery vehicle and should accommodate trash removal operations, delivery operations, and ladder truck vehicle types. North of Converse Way, an emergency access/egress driveway has been designed to ensure larger emergency vehicles can circulate the Site safely. AutoTurn® analysis has been conducted for a single unit (SU-30) delivery truck and the largest Ashland fire apparatus (ladder truck). The analysis indicates that Site access/egress, circulation aisles and parking layout provide adequate maneuvering area for the design vehicles. Supporting AutoTurn® analysis and exhibits are provided to confirm this finding (refer to the **Attachments**).

CONCLUSIONS AND RECOMMENDATIONS

In summary, the projected traffic increases due to the proposed development will be nominal in the immediate study area (1 vehicle or less per minute during the peak periods) and adequate capacity is available under 2028 Build conditions along Pond Street to accommodate the proposed site use. The project is not projected to materially change any reported operating levels compared to 2028 No-Build conditions. In addition, access/egress along Pond Street will be designed to ensure that adequate sight lines are provided in accordance with recommended AASHTO criteria based on posted travel speeds.

MDM recommends the following site design elements to enhance safety and capacity while promoting alternative modes of transportation.

- *Signs and Pavement Markings.* A MUTCD compliant "STOP" sign (R1-1) and STOP line pavement markings are recommended on the proposed driveway approaches to Pond Street. The signs and pavement markings shall conform to MUTCD standards.

- *Maintain Clear Driveway Sight Lines.* Existing and/or new plantings (shrubs, bushes) and structures (walls, fences, etc.) should be maintained at a height of 2 feet or less within the sight line triangles with respect to Pond Street to provide unobstructed sight lines for vehicles entering and exiting the proposed site driveways.

- *Sidewalks.* The project incorporates sidewalks that connect the parking areas to the building entrances. The project incorporates sidewalk connections between the site and the proposed sidewalk along Pond Street.

- *Bicycle Accommodations.* A secure bike parking area shall be provided on-site near the building entrance for residents and visitors.

ATTACHMENTS

- □ Traffic Volume Data
- □ Seasonal/ Yearly Growth Data
- □ Speed Data
- □ Crash Data
- □ Sight Distance Calculations
- □ Trip Generation
- □ Trip Distribution Calculations
- □ Capacity Analysis
- □ AutoTURN®

□ Traffic Volume Data

MDM Transportation Consultants, Inc.
28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Route 126
South of Site Driveway
Ashland, MA

Site Code: 1163
Station ID:

Start Time	12-Aug-21 Thu	Southbound Morning	Southbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Northbound Morning	Northbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		10	70			3	89				
12:15		8	83			4	81				
12:30		5	87			7	84				
12:45		0	76	23	316	3	77	17	331	40	647
01:00		5	86			2	76				
01:15		2	54			4	69				
01:30		3	73			2	68				
01:45		0	63	10	276	2	74	10	287	20	563
02:00		2	74			4	71				
02:15		4	72			5	64				
02:30		4	78			5	66				
02:45		3	64	13	288	1	65	15	266	28	554
03:00		4	75			3	69				
03:15		2	78			4	76				
03:30		0	88			2	82				
03:45		4	77	10	318	9	98	18	325	28	643
04:00		5	101			7	79				
04:15		4	96			12	98				
04:30		10	106			12	110				
04:45		10	96	29	399	14	84	45	371	74	770
05:00		8	116			18	105				
05:15		14	98			35	93				
05:30		24	94			32	87				
05:45		30	101	76	409	40	96	125	381	201	790
06:00		32	86			54	75				
06:15		51	100			57	71				
06:30		70	60			65	75				
06:45		83	72	236	318	54	79	230	300	466	618
07:00		48	88			65	92				
07:15		57	68			90	81				
07:30		61	74			90	58				
07:45		60	73	226	303	91	53	336	284	562	587
08:00		40	57			74	43				
08:15		72	70			86	56				
08:30		60	38			74	38				
08:45		57	50	229	215	74	33	308	170	537	385
09:00		49	46			60	35				
09:15		67	42			56	28				
09:30		61	29			68	31				
09:45		67	42	244	159	78	23	262	117	506	276
10:00		67	25			59	28				
10:15		68	29			73	15				
10:30		64	21			70	14				
10:45		59	13	258	88	57	12	259	69	517	157
11:00		57	14			82	12				
11:15		67	12			49	13				
11:30		65	14			72	13				
11:45		73	10	262	50	75	16	278	54	540	104
Total		1616	3139			1903	2955			3519	6094
Percent		34.0%	66.0%			39.2%	60.8%			36.6%	63.4%
Total		3120	6143			3794	5727			6914	11870
Percent		33.7%	66.3%			39.8%	60.2%			36.8%	63.2%
Combined Total		9263				9521				18784	

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

E/W: Eliot Street
N/S: Pond Street
Ashland, MA

File Name : 1163_Pond_at_Eliot_865948_08-12-2021
Site Code : 1163
Start Date : 8/12/2021
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

	Pond Street From North					Eliot Street From East					Pond Street From South					Eliot Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	27	27	8	0	62	4	21	3	0	28	7	58	13	0	78	7	43	46	0	96	264
07:15 AM	17	52	5	0	74	2	17	5	0	24	8	62	11	0	81	8	35	29	0	72	251
07:30 AM	21	37	7	0	65	5	15	9	0	29	14	67	31	0	112	9	53	35	0	97	303
07:45 AM	28	54	8	0	90	2	24	5	0	31	11	59	18	0	88	15	58	37	0	110	319
Total	93	170	28	0	291	13	77	22	0	112	40	246	73	0	359	39	189	147	0	375	1137
08:00 AM	29	29	4	0	62	4	28	4	0	36	8	54	21	0	83	24	35	37	0	96	277
08:15 AM	35	42	9	0	86	6	22	5	0	33	10	68	23	0	101	18	47	35	0	100	320
08:30 AM	20	34	8	0	62	4	37	8	0	49	12	57	19	0	88	20	50	40	0	110	309
08:45 AM	40	44	12	0	96	5	32	11	0	48	8	51	30	0	89	18	36	32	0	86	319
Total	124	149	33	0	306	19	119	28	0	166	38	230	93	0	361	80	168	144	0	392	1225
04:00 PM	66	56	12	0	134	12	44	16	0	72	10	51	26	0	87	20	37	45	0	102	395
04:15 PM	68	83	4	0	155	5	44	18	0	67	12	71	28	0	111	18	38	50	0	106	439
04:30 PM	59	68	6	0	133	10	39	20	0	69	11	81	30	0	122	15	29	51	0	95	419
04:45 PM	71	68	12	0	151	10	38	24	0	72	10	63	17	0	90	16	26	52	0	94	407
Total	264	275	34	0	573	37	165	78	0	280	43	266	101	0	410	69	130	198	0	397	1660
05:00 PM	67	82	9	0	158	12	50	19	0	81	9	76	23	0	108	25	18	41	0	84	431
05:15 PM	56	57	13	0	126	15	48	7	0	70	8	69	18	0	95	21	25	65	0	111	402
05:30 PM	71	78	11	0	160	7	58	17	0	82	5	63	16	0	84	28	34	38	0	100	426
05:45 PM	65	68	9	0	142	14	43	16	0	73	13	68	10	0	91	23	27	47	0	97	403
Total	259	285	42	0	586	48	199	59	0	306	35	276	67	0	378	97	104	191	0	392	1662
Grand Total	740	879	137	0	1756	117	560	187	0	864	156	1018	334	0	1508	285	591	680	0	1556	5684
Apprch %	42.1	50.1	7.8	0		13.5	64.8	21.6	0		10.3	67.5	22.1	0		18.3	38	43.7	0		
Total %	13	15.5	2.4	0	30.9	2.1	9.9	3.3	0	15.2	2.7	17.9	5.9	0	26.5	5	10.4	12	0	27.4	
Lights	704	835	129	0	1668	111	534	185	0	830	153	966	320	0	1439	269	565	636	0	1470	5407
% Lights	95.1	95	94.2	0	95	94.9	95.4	98.9	0	96.1	98.1	94.9	95.8	0	95.4	94.4	95.6	93.5	0	94.5	95.1
Mediums	28	37	6	0	71	5	21	2	0	28	3	42	12	0	57	14	20	36	0	70	226
% Mediums	3.8	4.2	4.4	0	4	4.3	3.8	1.1	0	3.2	1.9	4.1	3.6	0	3.8	4.9	3.4	5.3	0	4.5	4
Articulated Trucks	8	7	2	0	17	1	5	0	0	6	0	10	2	0	12	2	6	8	0	16	51
% Articulated Trucks	1.1	0.8	1.5	0	1	0.9	0.9	0	0	0.7	0	1	0.6	0	0.8	0.7	1	1.2	0	1	0.9

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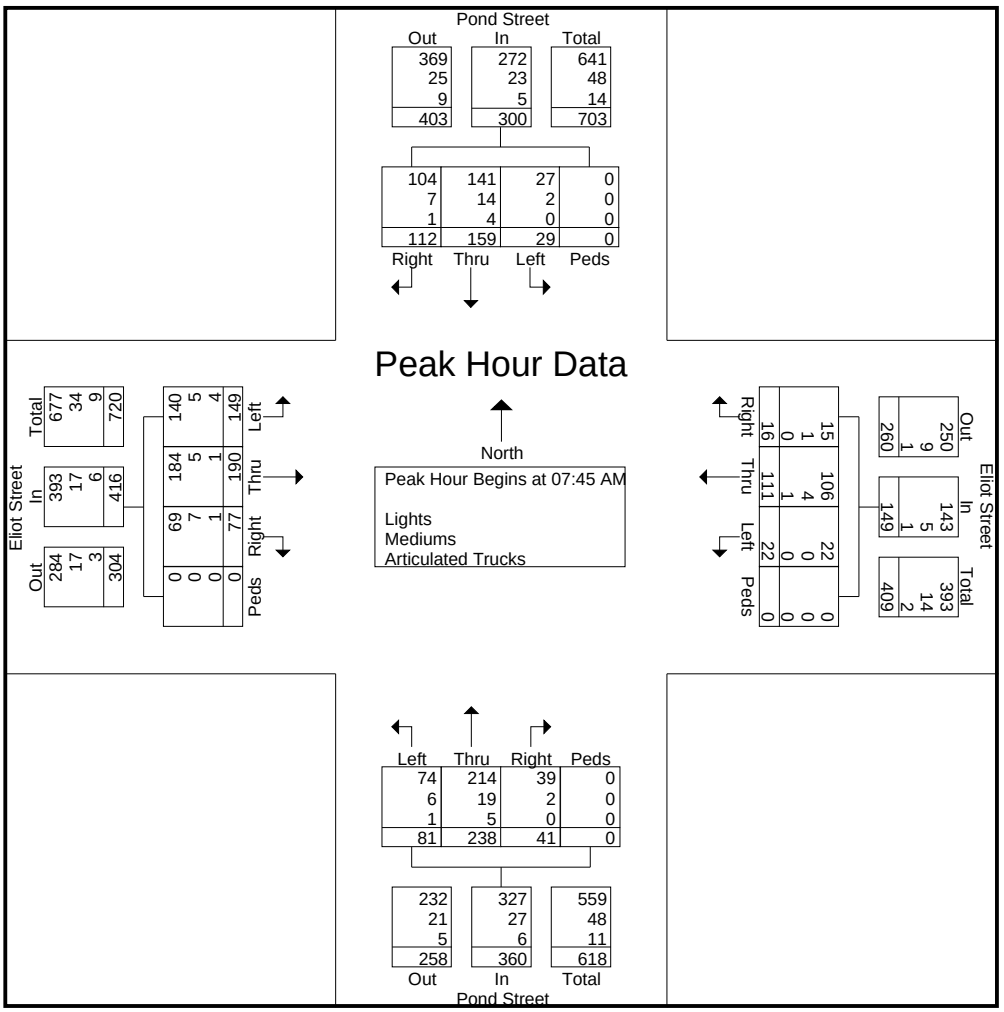
28 Lord Road, Suite 280
Marlborough, MA, 01752

E/W: Eliot Street
N/S: Pond Street
Ashland, MA

File Name : 1163_Pond_at_Eliot_865948_08-12-2021
Site Code : 1163
Start Date : 8/12/2021
Page No : 2

	Pond Street From North					Eliot Street From East					Pond Street From South					Eliot Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	28	**54**	8	0	**90**	2	24	5	0	31	11	59	18	0	88	15	**58**	37	0	**110**	319
08:00 AM	29	29	4	0	62	4	28	4	0	36	8	54	21	0	83	**24**	35	37	0	96	277
08:15 AM	**35**	42	**9**	0	86	**6**	22	5	0	33	10	**68**	**23**	0	**101**	18	47	35	0	100	**320**
08:30 AM	20	34	8	0	62	4	**37**	**8**	0	**49**	**12**	57	19	0	88	20	50	**40**	0	110	309
Total Volume	112	159	29	0	300	16	111	22	0	149	41	238	81	0	360	77	190	149	0	416	1225
% App. Total	37.3	53	9.7	0		10.7	74.5	14.8	0		11.4	66.1	22.5	0		18.5	45.7	35.8	0		
PHF	.800	.736	.806	.000	.833	.667	.750	.688	.000	.760	.854	.875	.880	.000	.891	.802	.819	.931	.000	.945	.957
Lights	104	141	27	0	272	15	106	22	0	143	39	214	74	0	327	69	184	140	0	393	1135
% Lights	92.9	88.7	93.1	0	90.7	93.8	95.5	100	0	96.0	95.1	89.9	91.4	0	90.8	89.6	96.8	94.0	0	94.5	92.7
Mediums	7	14	2	0	23	1	4	0	0	5	2	19	6	0	27	7	5	5	0	17	72
% Mediums	6.3	8.8	6.9	0	7.7	6.3	3.6	0	0	3.4	4.9	8.0	7.4	0	7.5	9.1	2.6	3.4	0	4.1	5.9
Articulated Trucks	1	4	0	0	5	0	1	0	0	1	0	5	1	0	6	1	1	4	0	6	18
% Articulated Trucks	0.9	2.5	0	0	1.7	0	0.9	0	0	0.7	0	2.1	1.2	0	1.7	1.3	0.5	2.7	0	1.4	1.5



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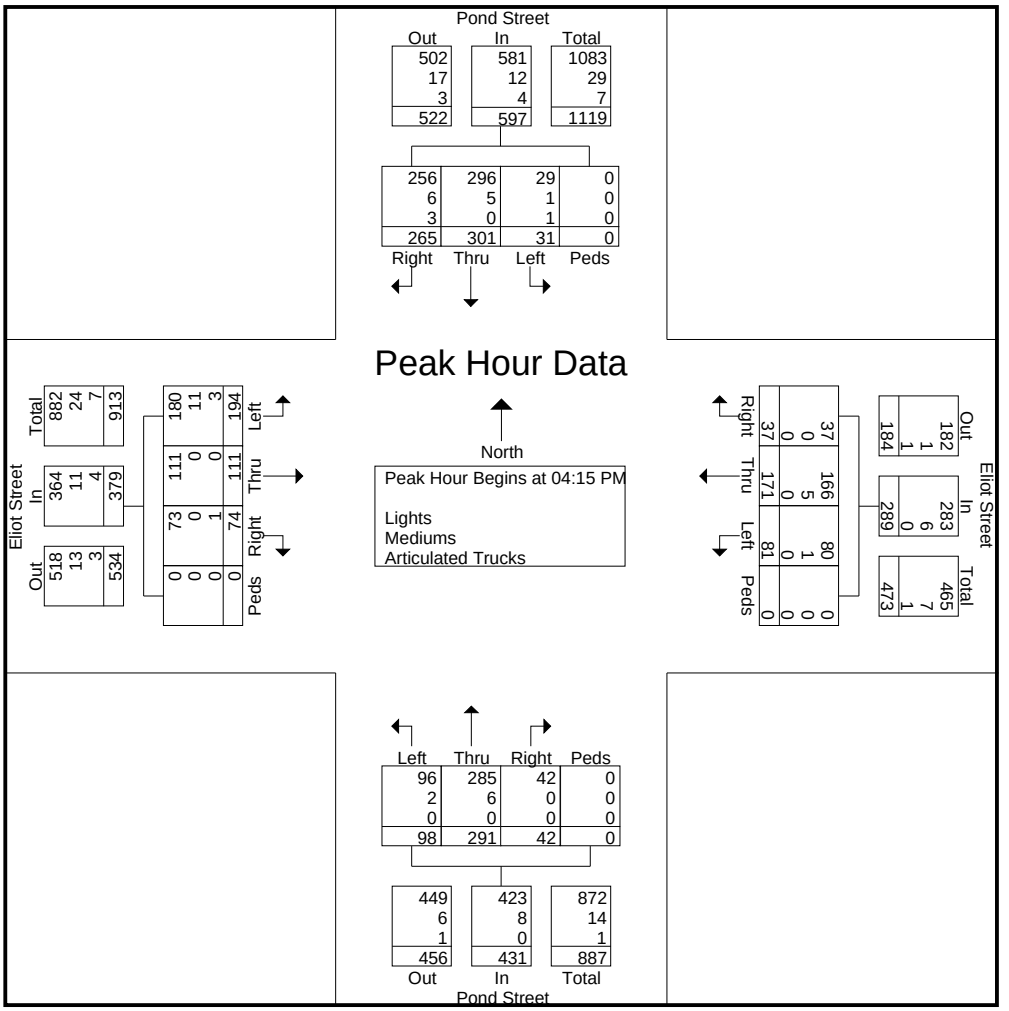
28 Lord Road, Suite 280
Marlborough, MA, 01752

E/W: Eliot Street
N/S: Pond Street
Ashland, MA

File Name : 1163_Pond_at_Eliot_865948_08-12-2021
Site Code : 1163
Start Date : 8/12/2021
Page No : 3

	Pond Street From North					Eliot Street From East					Pond Street From South					Eliot Street From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	68	**83**	4	0	155	5	44	18	0	67	**12**	71	28	0	111	18	**38**	50	0	**106**	**439**
04:30 PM	59	68	6	0	133	10	39	20	0	69	11	**81**	**30**	0	**122**	15	29	51	0	95	419
04:45 PM	**71**	68	**12**	0	151	10	38	**24**	0	72	10	63	17	0	90	16	26	**52**	0	94	407
05:00 PM	67	82	9	0	**158**	**12**	**50**	19	0	**81**	9	76	23	0	108	**25**	18	41	0	84	431
Total Volume	265	301	31	0	597	37	171	81	0	289	42	291	98	0	431	74	111	194	0	379	1696
% App. Total	44.4	50.4	5.2	0		12.8	59.2	28	0		9.7	67.5	22.7	0		19.5	29.3	51.2	0		
PHF	.933	.907	.646	.000	.945	.771	.855	.844	.000	.892	.875	.898	.817	.000	.883	.740	.730	.933	.000	.894	.966
Lights	256	296	29	0	581	37	166	80	0	283	42	285	96	0	423	73	111	180	0	364	1651
% Lights	96.6	98.3	93.5	0	97.3	100	97.1	98.8	0	97.9	100	97.9	98.0	0	98.1	98.6	100	92.8	0	96.0	97.3
Mediums	6	5	1	0	12	0	5	1	0	6	0	6	2	0	8	0	0	11	0	11	37
% Mediums	2.3	1.7	3.2	0	2.0	0	2.9	1.2	0	2.1	0	2.1	2.0	0	1.9	0	0	5.7	0	2.9	2.2
Articulated Trucks	3	0	1	0	4	0	0	0	0	0	0	0	0	0	0	1	0	3	0	4	8
% Articulated Trucks	1.1	0	3.2	0	0.7	0	0	0	0	0	0	0	0	0	0	1.4	0	1.5	0	1.1	0.5



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28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Pond Street
EB: Mini Golf Driveway
Ashland, MA

File Name : 1163_Pond_at_Mini_Golf_865951_08-12-2021
Site Code : 1163
Start Date : 8/12/2021

Groups Printed- Lights - Mediums - Articulated Trucks

	Pond Street From North				Pond Street From South				Mini Golf Driveway From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
07:00 AM	0	40	0	40	69	0	0	69	0	0	0	0	109
07:15 AM	0	57	0	57	79	0	0	79	0	0	0	0	136
07:30 AM	0	60	0	60	98	0	0	98	0	0	0	0	158
07:45 AM	0	59	0	59	81	0	0	81	0	0	0	0	140
Total	0	216	0	216	327	0	0	327	0	0	0	0	543
08:00 AM	1	52	0	53	69	0	0	69	0	0	0	0	122
08:15 AM	0	61	0	61	87	0	0	87	0	1	0	1	149
08:30 AM	0	58	0	58	72	0	0	72	0	0	0	0	130
08:45 AM	0	63	0	63	79	0	0	79	0	0	0	0	142
Total	1	234	0	235	307	0	0	307	0	1	0	1	543
04:00 PM	0	97	0	97	82	0	0	82	1	2	0	3	182
04:15 PM	0	106	0	106	93	1	0	94	1	1	0	2	202
04:30 PM	0	101	0	101	111	0	0	111	0	0	0	0	212
04:45 PM	0	109	0	109	82	0	0	82	0	0	0	0	191
Total	0	413	0	413	368	1	0	369	2	3	0	5	787
05:00 PM	1	111	0	112	105	0	0	105	0	1	0	1	218
05:15 PM	1	90	0	91	91	0	0	91	0	0	0	0	182
05:30 PM	2	101	0	103	88	0	0	88	1	0	0	1	192
05:45 PM	1	97	0	98	83	2	0	85	1	0	0	1	184
Total	5	399	0	404	367	2	0	369	2	1	0	3	776
Grand Total	6	1262	0	1268	1369	3	0	1372	4	5	0	9	2649
Apprch %	0.5	99.5	0		99.8	0.2	0		44.4	55.6	0		
Total %	0.2	47.6	0	47.9	51.7	0.1	0	51.8	0.2	0.2	0	0.3	
Lights	6	1195	0	1201	1292	3	0	1295	4	5	0	9	2505
% Lights	100	94.7	0	94.7	94.4	100	0	94.4	100	100	0	100	94.6
Mediums	0	54	0	54	60	0	0	60	0	0	0	0	114
% Mediums	0	4.3	0	4.3	4.4	0	0	4.4	0	0	0	0	4.3
Articulated Trucks	0	13	0	13	17	0	0	17	0	0	0	0	30
% Articulated Trucks	0	1	0	1	1.2	0	0	1.2	0	0	0	0	1.1

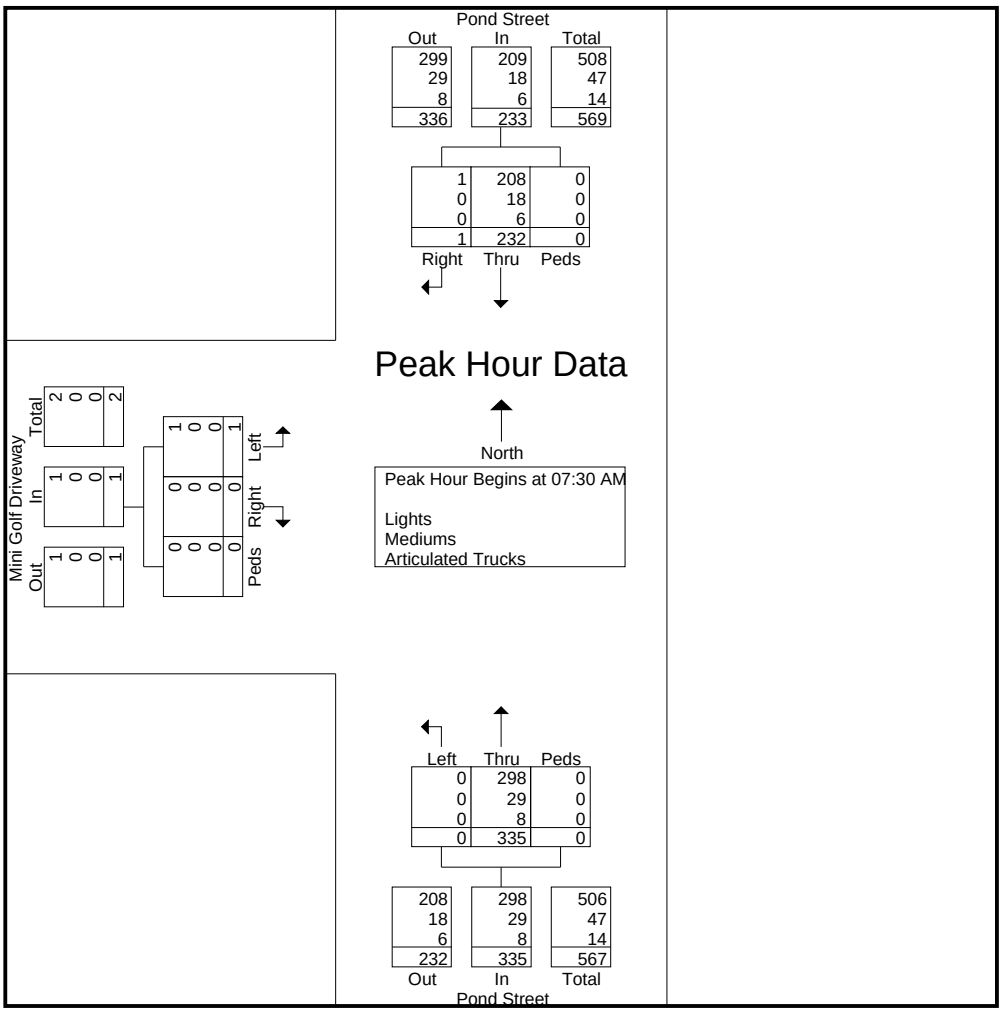
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Pond Street
EB: Mini Golf Driveway
Ashland, MA

File Name : 1163_Pond_at_Mini_Golf_865951_08-12-2021
Site Code : 1163
Start Date : 8/12/2021
Page No : 2

	Pond Street From North				Pond Street From South				Mini Golf Driveway From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	60	0	60	**98**	0	0	**98**	0	0	0	0	**158**
07:45 AM	0	59	0	59	81	0	0	81	0	0	0	0	140
08:00 AM	**1**	52	0	53	69	0	0	69	0	0	0	0	122
08:15 AM	0	**61**	0	**61**	87	0	0	87	0	**1**	0	**1**	149
Total Volume	1	232	0	233	335	0	0	335	0	1	0	1	569
% App. Total	0.4	99.6	0		100	0	0		0	100	0		
PHF	.250	.951	.000	.955	.855	.000	.000	.855	.000	.250	.000	.250	.900
Lights	1	208	0	209	298	0	0	298	0	1	0	1	508
% Lights	100	89.7	0	89.7	89.0	0	0	89.0	0	100	0	100	89.3
Mediums	0	18	0	18	29	0	0	29	0	0	0	0	47
% Mediums	0	7.8	0	7.7	8.7	0	0	8.7	0	0	0	0	8.3
Articulated Trucks	0	6	0	6	8	0	0	8	0	0	0	0	14
% Articulated Trucks	0	2.6	0	2.6	2.4	0	0	2.4	0	0	0	0	2.5



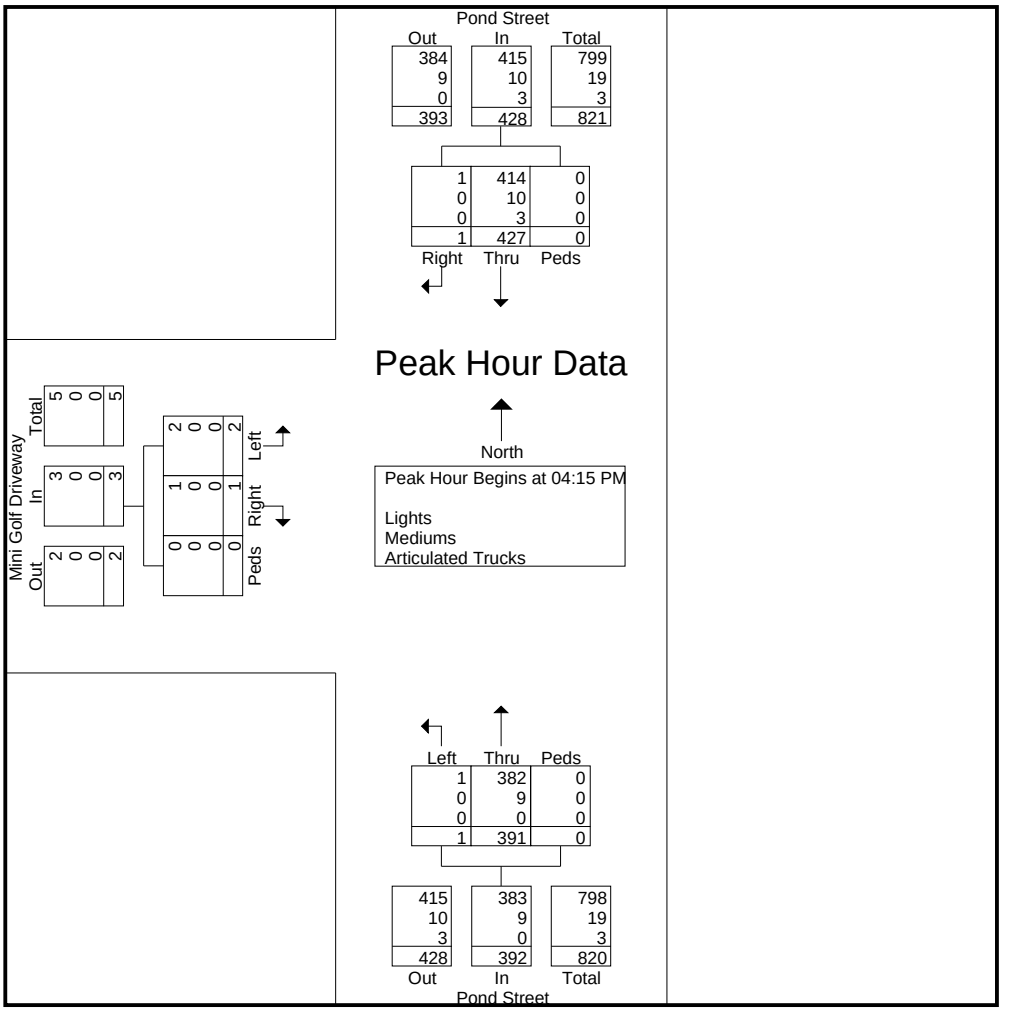
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Pond Street
EB: Mini Golf Driveway
Ashland, MA

File Name : 1163_Pond_at_Mini_Golf_865951_08-12-2021
Site Code : 1163
Start Date : 8/12/2021
Page No : 3

	Pond Street From North				Pond Street From South				Mini Golf Driveway From West				
Start Time	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:15 PM													
04:15 PM	0	106	0	106	93	**1**	0	94	**1**	**1**	0	**2**	202
04:30 PM	0	101	0	101	**111**	0	0	**111**	0	0	0	0	212
04:45 PM	0	109	0	109	82	0	0	82	0	0	0	0	191
05:00 PM	**1**	**111**	0	**112**	105	0	0	105	0	1	0	1	**218**
Total Volume	1	427	0	428	391	1	0	392	1	2	0	3	823
% App. Total	0.2	99.8	0		99.7	0.3	0		33.3	66.7	0		
PHF	.250	.962	.000	.955	.881	.250	.000	.883	.250	.500	.000	.375	.944
Lights	1	414	0	415	382	1	0	383	1	2	0	3	801
% Lights	100	97.0	0	97.0	97.7	100	0	97.7	100	100	0	100	97.3
Mediums	0	10	0	10	9	0	0	9	0	0	0	0	19
% Mediums	0	2.3	0	2.3	2.3	0	0	2.3	0	0	0	0	2.3
Articulated Trucks	0	3	0	3	0	0	0	0	0	0	0	0	3
% Articulated Trucks	0	0.7	0	0.7	0	0	0	0	0	0	0	0	0.4



MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Pond Street
WB: Spyglass Hill Drive
Ashland, MA

File Name : 1163_Pond_at_Spyglass_+_Shaws_865950_08-12-2021
Site Code : 1163
Start Date : 8/12/2021
Page No : 1

Groups Printed- Lights - Mediums - Articulated Trucks

	Pond Street From North					Spyglass Hill Drive From East					Pond Street From South					Shaws Plaza From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	0	34	1	0	35	15	2	2	0	19	1	62	2	0	65	0	0	0	0	0	119
07:15 AM	1	57	3	0	61	11	2	1	0	14	2	73	5	0	80	2	1	2	0	5	160
07:30 AM	0	49	4	0	53	16	0	2	0	18	1	92	0	0	93	3	1	1	0	5	169
07:45 AM	4	61	6	0	71	8	1	4	0	13	3	72	2	0	77	1	1	3	0	5	166
Total	5	201	14	0	220	50	5	9	0	64	7	299	9	0	315	6	3	6	0	15	614
08:00 AM	5	38	11	0	54	13	0	1	0	14	5	58	3	0	66	5	1	3	0	9	143
08:15 AM	5	51	9	0	65	17	1	4	0	22	4	73	4	0	81	9	1	3	0	13	181
08:30 AM	2	45	9	0	56	18	1	1	0	20	1	63	6	0	70	5	2	0	0	7	153
08:45 AM	2	58	4	0	64	16	5	3	0	24	3	60	7	0	70	4	1	2	0	7	165
Total	14	192	33	0	239	64	7	9	0	80	13	254	20	0	287	23	5	8	0	36	642
04:00 PM	4	66	20	0	90	7	0	3	0	10	5	64	11	0	80	13	2	2	0	17	197
04:15 PM	16	84	9	0	109	10	3	4	0	17	3	89	6	0	98	16	1	8	0	25	249
04:30 PM	9	83	14	0	106	10	4	2	0	16	0	95	12	0	107	13	2	10	0	25	254
04:45 PM	9	83	10	0	102	6	5	1	0	12	1	68	11	0	80	16	6	8	0	30	224
Total	38	316	53	0	407	33	12	10	0	55	9	316	40	0	365	58	11	28	0	97	924
05:00 PM	12	100	13	0	125	9	1	5	0	15	2	93	11	0	106	8	1	13	0	22	268
05:15 PM	4	66	13	0	83	9	0	5	0	14	7	70	5	0	82	16	2	8	0	26	205
05:30 PM	8	95	21	0	124	8	0	2	0	10	2	72	14	0	88	10	2	2	0	14	236
05:45 PM	15	75	17	0	107	11	1	3	0	15	7	67	10	0	84	14	2	11	0	27	233
Total	39	336	64	0	439	37	2	15	0	54	18	302	40	0	360	48	7	34	0	89	942
Grand Total	96	1045	164	0	1305	184	26	43	0	253	47	1171	109	0	1327	135	26	76	0	237	3122
Apprch %	7.4	80.1	12.6	0		72.7	10.3	17	0		3.5	88.2	8.2	0		57	11	32.1	0		
Total %	3.1	33.5	5.3	0	41.8	5.9	0.8	1.4	0	8.1	1.5	37.5	3.5	0	42.5	4.3	0.8	2.4	0	7.6	
Lights	93	991	158	0	1242	181	26	43	0	250	44	1112	106	0	1262	129	25	72	0	226	2980
% Lights	96.9	94.8	96.3	0	95.2	98.4	100	100	0	98.8	93.6	95	97.2	0	95.1	95.6	96.2	94.7	0	95.4	95.5
Mediums	3	45	6	0	54	3	0	0	0	3	1	46	3	0	50	5	1	4	0	10	117
% Mediums	3.1	4.3	3.7	0	4.1	1.6	0	0	0	1.2	2.1	3.9	2.8	0	3.8	3.7	3.8	5.3	0	4.2	3.7
Articulated Trucks																					
% Articulated Trucks	0	0.9	0	0	0.7	0	0	0	0	0	4.3	1.1	0	0	1.1	0.7	0	0	0	0.4	0.8

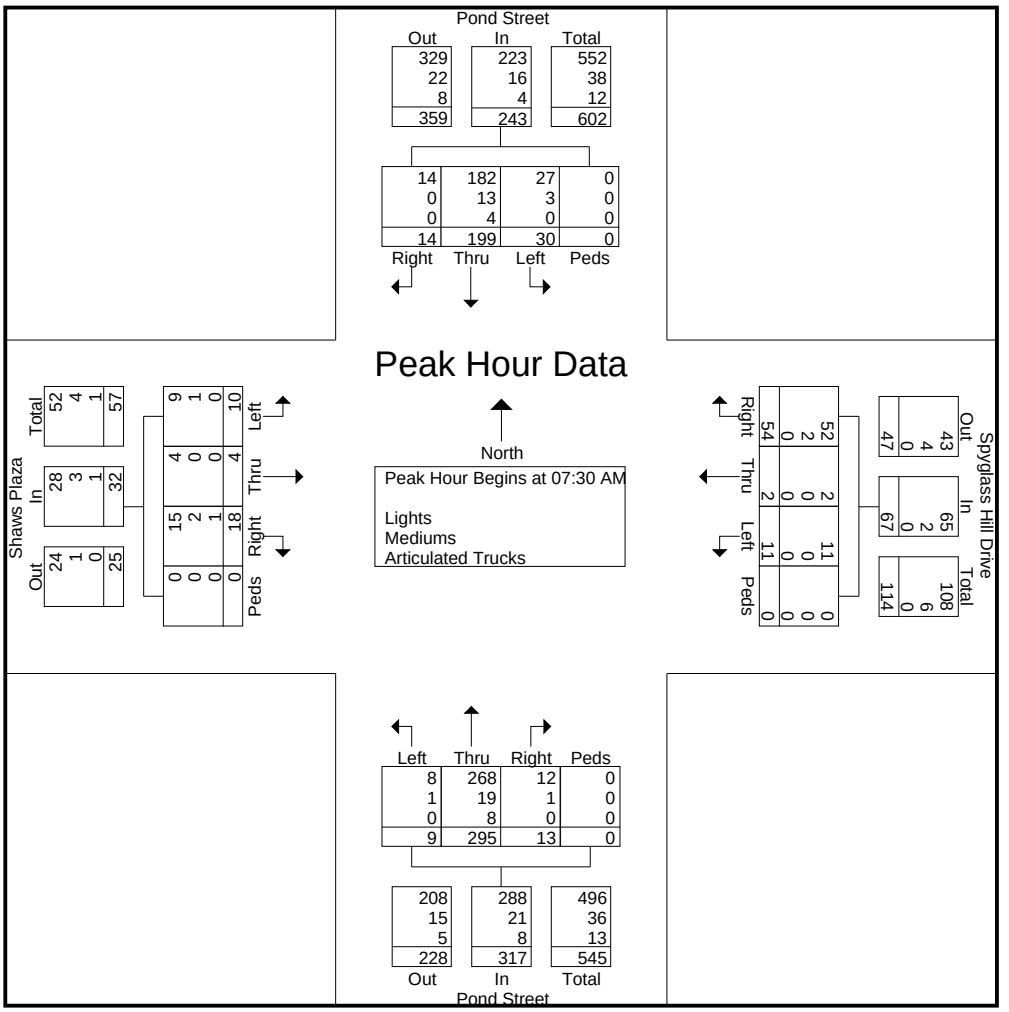
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Pond Street
WB: Spyglass Hill Drive
Ashland, MA

File Name : 1163_Pond_at_Spyglass_+_Shaws_865950_08-12-2021
Site Code : 1163
Start Date : 8/12/2021
Page No : 2

	Pond Street From North					Spyglass Hill Drive From East					Pond Street From South					Shaws Plaza From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 11:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	49	4	0	53	16	0	2	0	18	1	**92**	0	0	**93**	3	**1**	1	0	5	169
07:45 AM	4	**61**	6	0	**71**	8	**1**	**4**	0	13	3	72	2	0	77	1	1	**3**	0	5	166
08:00 AM	**5**	38	**11**	0	54	13	0	1	0	14	**5**	58	3	0	66	5	1	3	0	9	143
08:15 AM	5	51	9	0	65	**17**	1	4	0	**22**	4	73	**4**	0	81	**9**	1	3	0	**13**	**181**
Total Volume	14	199	30	0	243	54	2	11	0	67	13	295	9	0	317	18	4	10	0	32	659
% App. Total	5.8	81.9	12.3	0		80.6	3	16.4	0		4.1	93.1	2.8	0		56.2	12.5	31.2	0		
PHF	.700	.816	.682	.000	.856	.794	.500	.688	.000	.761	.650	.802	.563	.000	.852	.500	1.00	.833	.000	.615	.910
Lights	14	182	27	0	223	52	2	11	0	65	12	268	8	0	288	15	4	9	0	28	604
% Lights	100	91.5	90.0	0	91.8	96.3	100	100	0	97.0	92.3	90.8	88.9	0	90.9	83.3	100	90.0	0	87.5	91.7
Mediums	0	13	3	0	16	2	0	0	0	2	1	19	1	0	21	2	0	1	0	3	42
% Mediums	0	6.5	10.0	0	6.6	3.7	0	0	0	3.0	7.7	6.4	11.1	0	6.6	11.1	0	10.0	0	9.4	6.4
Articulated Trucks	0	4	0	0	4	0	0	0	0	0	0	8	0	0	8	1	0	0	0	1	13
% Articulated Trucks	0	2.0	0	0	1.6	0	0	0	0	0	0	2.7	0	0	2.5	5.6	0	0	0	3.1	2.0



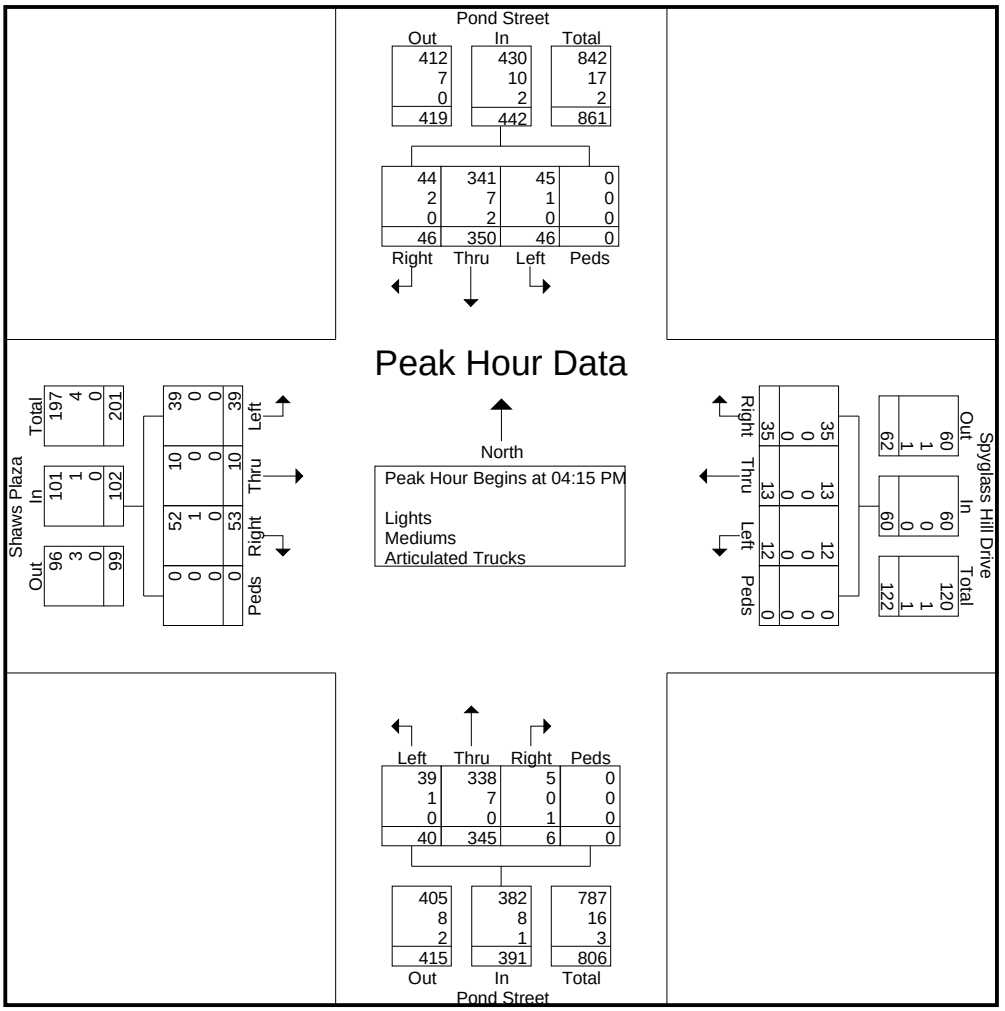
MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Pond Street
WB: Spyglass Hill Drive
Ashland, MA

File Name : 1163_Pond_at_Spyglass_+_Shaws_865950_08-12-2021
Site Code : 1163
Start Date : 8/12/2021
Page No : 3

	Pond Street From North					Spyglass Hill Drive From East					Pond Street From South					Shaws Plaza From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	**16**	84	9	0	109	**10**	3	4	0	**17**	**3**	89	6	0	98	**16**	1	8	0	25	249
04:30 PM	9	83	**14**	0	106	10	4	2	0	16	0	**95**	**12**	0	**107**	13	2	10	0	25	254
04:45 PM	9	83	10	0	102	6	**5**	1	0	12	1	68	11	0	80	16	**6**	8	0	**30**	224
05:00 PM	12	**100**	13	0	**125**	9	1	**5**	0	15	2	93	11	0	106	8	1	**13**	0	22	**268**
Total Volume	46	350	46	0	442	35	13	12	0	60	6	345	40	0	391	53	10	39	0	102	995
% App. Total	10.4	79.2	10.4	0		58.3	21.7	20	0		1.5	88.2	10.2	0		52	9.8	38.2	0		
PHF	.719	.875	.821	.000	.884	.875	.650	.600	.000	.882	.500	.908	.833	.000	.914	.828	.417	.750	.000	.850	.928
Lights	44	341	45	0	430	35	13	12	0	60	5	338	39	0	382	52	10	39	0	101	973
% Lights	95.7	97.4	97.8	0	97.3	100	100	100	0	100	83.3	98.0	97.5	0	97.7	98.1	100	100	0	99.0	97.8
Mediums	2	7	1	0	10	0	0	0	0	0	0	7	1	0	8	1	0	0	0	1	19
% Mediums	4.3	2.0	2.2	0	2.3	0	0	0	0	0	0	2.0	2.5	0	2.0	1.9	0	0	0	1.0	1.9
Articulated Trucks	0	2	0	0	2	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	3
% Articulated Trucks	0	0.6	0	0	0.5	0	0	0	0	0	16.7	0	0	0	0.3	0	0	0	0	0	0.3



□ Seasonal Data/ Yearly Growth

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

STATION 307 - WESTBOROUGH - RTE.9 - EAST OF NORTHBOROUGH T.L.

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
07	47,505	47,283	49,268	49,136	*50,000*	*52,000*	*53,000*	52,322	49,031	50,571	49,662	47,007	49,732
	-4%	-2%	-3%	1%	1%	-4%	-8%	-7%	-1%	-3%	-4%	-1%	-3.0%
08	45,614	46,112	47,829	49,816	*50,518*	*49,936*	*48,629*	48,759	48,531	49,009	47,490	46,696	48,245
	-3%	1%	-3%	-2%	-2%	0%	-2%	-3%	-2%	-1%	0%	2%	-1.3%
09	44,103	46,434	46,455	49,049	*49,474*	*49,934*	*47,638*	47,056	47,762	48,663	47,379	47,564	47,626
	-1%	0%	2%	0%	0%	1%	-1%	1%	1%	1%	2%	2%	0.6%
11	43,244	46,150	48,016	48,943	*49,781*	*50,525*	*46,812*	48,234	48,825	49,198	49,151	49,888	48,231
	7%	2%	1%	-1%	1%	-1%	3%	4%	0%	2%	2%	-5%	1.2%
12	46,381	46,883	48,608	48,662	*50,126*	*49,961*	*48,380*	49,941	48,882	50,056	50,015	47,600	48,791
	0%	-1%	-2%	1%	1%	-9%	3%	-1%	2%	0%	-1%	2%	-0.5%
13	46,393	46,220	47,421	49,359	*50,657*	*45,623*	*49,797*	49,223	49,935	50,021	49,651	48,441	48,562
	1%	1%	2%	1%	1%	6%	0%	1%	0%	1%	1%	1%	1.3%
16	47,447	47,570	50,342	50,977	*52,259*	*53,476*	*49,724*	50,789	50,057	51,035	51,749	50,442	50,489
Seasonal Adjustment Factor	1.07	1.05	1.01	0.99	0.97	0.97	0.99	0.99	1.00	0.98	0.99	1.01	
(to average month)												**Growth**	**-0.27%**

STATION AET09 - FRAMINGHAM - I-90/ EAST OF I-495

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR
17	101,451	98,919	106,101	115,894	118,225	113,384	113,033	*119,402*	116,066	118,183	114,587	105,753	111,750
	-4%	6%	-1%	1%	1%	6%	2%	1%	1%	0%	0%	3%	1%
18	97,265	104,694	104,758	116,945	119,749	120,311	114,772	*120,269*	117,743	118,539	114,293	108,839	113,181
	2%	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	-1%	0%
19	103,242	105,833	110,627	118,889	*118,583*	*120,696*	*116,694*	122,292	119,348	120,903	115,029	106,330	114,872
Seasonal Adjustment Factor	1.13	1.10	1.06	0.97	0.95	0.96	0.99	0.94	0.96	0.95	0.99	1.06	
(to average month)												**Growth**	**0.83%**
Average													
Seasonal Adjustment Factor	1.10	1.07	1.03	0.98	0.96	0.97	0.99	0.96	0.98	0.97	0.99	1.04	
(to average month)													

Average Yearly Growth Calculated 0.3%

Yearly Growth Factor Used 1.0%

ITALICS = ESTIMATED DATA

MADT

Volume Count Report

LOCATION INFO	
Location ID	AET08
Type	SPOT
Fnct'l Class	1
Located On	MASSACHUSETTS TURNPIKE
Loc On Alias	
EAST OF	CORDAVILLE
Direction	2-WAY
County	Worcester
Community	Southborough
MPO ID	
HPMS ID	
Agency	MHD

COUNT DATA INFO	
Count Status	Accepted
Start Date	Thu 8/12/2021
End Date	Fri 8/13/2021
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	AET08
Study	
Speed Limit	
Description	
Sensor Type	
Source	TCDS_COUNT_IMPORT_COMBINE
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	204	233	170	163	770
1:00-2:00	143	112	129	111	495
2:00-3:00	127	123	96	131	477
3:00-4:00	129	123	163	164	579
4:00-5:00	167	221	307	405	1,100
5:00-6:00	533	759	888	1,064	3,244
6:00-7:00	1,160	1,319	1,480	1,357	5,316
7:00-8:00	1,391	1,561	1,712	1,720	6,384
8:00-9:00	1,651	1,522	1,558	1,425	6,156
9:00-10:00	1,406	1,496	1,499	1,375	5,776
10:00-11:00	1,336	1,468	1,408	1,422	5,634
11:00-12:00	1,322	1,358	1,562	1,451	5,693
12:00-13:00	1,432	1,460	1,449	1,456	5,797
13:00-14:00	1,492	1,481	1,558	1,473	6,004
14:00-15:00	1,526	1,546	1,731	1,756	6,559
15:00-16:00	1,681	1,879	1,819	1,710	7,089
16:00-17:00	1,703	1,243	1,265	1,204	5,415
17:00-18:00	1,725	1,719	1,554	1,610	6,608
18:00-19:00	1,531	1,431	1,275	1,083	5,320
19:00-20:00	1,368	1,270	1,106	1,100	4,844
20:00-21:00	976	800	694	589	3,059
21:00-22:00	585	595	539	537	2,256
22:00-23:00	400	396	444	435	1,675
23:00-24:00	378	372	308	268	1,326
Total					97,576
AADT					85,086
AM Peak					07:15-08:15 6,644
PM Peak					14:45-15:45 7,135

Count Navigation: |<< < > >> Count Type: VOLUME

Directions: 2-WAY EB 1 2 3 WB 1 2 3

Volume Count Report

LOCATION INFO	
Location ID	AET08
Type	SPOT
Fnct'l Class	1
Located On	MASSACHUSETTS TURNPIKE
Loc On Alias	
EAST OF	CORDAVILLE
Direction	2-WAY
County	Worcester
Community	Southborough
MPO ID	
HPMS ID	
Agency	MHD

COUNT DATA INFO	
Count Status	Accepted
Start Date	Thu 8/15/2019
End Date	Fri 8/16/2019
Start Time	12:00:00 AM
End Time	12:00:00 AM
Direction	
Notes	
Station	AET08
Study	
Speed Limit	
Description	
Sensor Type	
Source	TCDS_COUNT_IMPORT_COMBINE
Latitude,Longitude	

INTERVAL:15-MIN

Time	15-min Interval 1st	2nd	3rd	4th	Hourly Count
0:00-1:00	352	328	296	222	1,198
1:00-2:00	201	169	152	137	659
2:00-3:00	160	164	136	153	613
3:00-4:00	142	147	174	199	662
4:00-5:00	214	294	391	518	1,417
5:00-6:00	711	1,063	1,275	1,503	4,552
6:00-7:00	1,481	1,476	1,550	1,503	6,010
7:00-8:00	1,581	1,724	1,866	1,920	7,091
8:00-9:00	1,883	1,926	1,938	1,860	7,607
9:00-10:00	1,790	1,786	1,732	1,743	7,051
10:00-11:00	1,624	1,636	1,614	1,583	6,457
11:00-12:00	1,616	1,455	1,759	1,575	6,405
12:00-13:00	1,632	1,618	1,567	1,613	6,430
13:00-14:00	1,514	1,643	1,625	1,681	6,463
14:00-15:00	1,743	1,887	1,914	1,933	7,477
15:00-16:00	1,951	2,109	2,010	2,021	8,091
16:00-17:00	1,802	1,971	1,866	1,875	7,514
17:00-18:00	1,859	1,922	1,880	1,862	7,523
18:00-19:00	1,807	1,672	1,551	1,484	6,514
19:00-20:00	1,413	1,505	1,553	1,403	5,874
20:00-21:00	1,182	1,171	1,087	921	4,361
21:00-22:00	866	796	710	694	3,066
22:00-23:00	703	698	579	541	2,521
23:00-24:00	523	550	475	393	1,941
Total					117,497
AADT					102,457
AM Peak					07:45-08:45 7,667
PM Peak					15:00-16:00 8,091

Count Navigation: |<< < > >> Count Type: VOLUME

Directions: 2-WAY EB 1 2 3 WB 1 2 3

Pandemic Adjustment Calculations

Based on Location AET08 Massachusetts Turnpike in Southborough (See Attached Sheet)

	2019 Volume	**2021 Volume**	
Location AET08 Thursday Weekday	8/15/2019	8/12/2021	Correction Factor
7:00 to 9:00	14,698	12,540	1.17
4:00 to 6:00	15,037	12,023	1.25
Daily	117,497	97,576	1.20

□ Speed Data

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA, 01752

N/S: Route 126
South of Site Driveway
Ashland, MA

Site Code: 1163
Station ID:

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
08/11/21	0	0	0	0	4	8	7	2	0	0	0	0	0	0	21	44
01:00	0	0	0	0	3	7	3	3	0	0	0	0	0	0	16	46
02:00	0	0	0	0	2	0	3	1	0	0	0	0	0	0	6	45
03:00	0	0	0	0	1	1	2	0	0	0	0	0	0	0	4	43
04:00	0	0	0	0	4	6	8	1	1	0	0	0	0	0	20	44
05:00	0	0	0	0	6	41	28	6	5	0	0	0	0	0	86	44
06:00	0	0	1	3	25	121	46	15	2	0	0	0	0	0	213	43
07:00	0	0	0	1	24	104	85	19	3	0	0	0	0	0	236	44
08:00	0	0	1	3	27	90	85	23	1	0	0	0	0	0	230	44
09:00	0	0	0	2	54	96	59	11	5	0	0	0	0	0	227	43
10:00	0	0	0	4	43	105	71	14	2	0	0	0	0	0	239	43
11:00	0	0	2	0	20	112	58	11	3	0	0	0	0	0	206	43
12 PM	0	0	0	1	34	138	120	23	4	0	0	0	0	0	320	44
13:00	0	0	0	1	41	105	68	21	4	0	0	0	0	0	240	44
14:00	0	0	0	1	25	124	110	21	0	1	0	0	0	0	282	44
15:00	0	0	0	2	37	124	94	17	2	0	0	0	0	0	276	43
16:00	0	0	0	1	37	125	125	37	7	0	1	0	0	0	333	44
17:00	0	0	0	6	50	179	133	28	3	0	0	0	0	0	399	43
18:00	0	0	0	5	22	144	118	33	4	0	0	0	0	0	326	44
19:00	0	0	0	2	31	119	93	14	4	0	0	0	0	0	263	43
20:00	0	0	0	7	50	115	66	18	1	0	0	0	0	0	257	43
21:00	0	0	0	1	29	81	55	8	1	0	0	0	0	0	175	43
22:00	0	0	0	3	14	37	29	6	2	0	0	0	0	0	91	44
23:00	0	0	0	1	7	15	15	4	0	0	0	0	0	0	42	44

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N/S: Route 126
South of Site Driveway
Ashland, MA

Site Code: 1163
Station ID:

Southbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
08/12/21	0	0	0	1	5	4	5	6	1	1	0	0	0	0	23	48
01:00	0	0	0	0	1	7	2	0	0	0	0	0	0	0	10	41
02:00	0	0	0	0	1	6	5	1	0	0	0	0	0	0	13	44
03:00	0	0	0	0	1	4	3	2	0	0	0	0	0	0	10	46
04:00	0	0	0	3	2	10	10	3	1	0	0	0	0	0	29	44
05:00	0	0	0	1	9	25	31	6	3	0	1	0	0	0	76	44
06:00	0	1	9	8	26	109	66	13	4	0	0	0	0	0	236	43
07:00	0	0	2	4	35	104	70	10	0	1	0	0	0	0	226	43
08:00	0	0	0	0	43	99	67	17	1	1	1	0	0	0	229	43
09:00	0	0	1	3	47	125	57	11	0	0	0	0	0	0	244	42
10:00	0	0	0	11	43	134	58	12	0	0	0	0	0	0	258	42
11:00	0	0	2	5	38	136	72	7	2	0	0	0	0	0	262	42
12 PM	0	0	0	2	42	151	104	14	3	0	0	0	0	0	316	43
13:00	0	1	1	11	44	118	80	18	3	0	0	0	0	0	276	43
14:00	0	0	0	2	26	144	91	21	4	0	0	0	0	0	288	44
15:00	0	0	0	4	53	131	101	25	4	0	0	0	0	0	318	44
16:00	2	0	0	5	48	177	139	26	1	1	0	0	0	0	399	43
17:00	0	0	1	0	47	172	156	32	1	0	0	0	0	0	409	44
18:00	0	0	0	8	32	135	111	29	3	0	0	0	0	0	318	44
19:00	0	1	0	11	48	147	82	13	1	0	0	0	0	0	303	43
20:00	0	0	0	6	48	112	39	10	0	0	0	0	0	0	215	42
21:00	0	0	0	0	32	79	40	8	0	0	0	0	0	0	159	43
22:00	0	0	0	1	21	31	29	5	0	0	1	0	0	0	88	43
23:00	0	0	0	0	7	17	20	2	4	0	0	0	0	0	50	44

	15th Percentile :	34 MPH
	50th Percentile :	38 MPH
	85th Percentile :	43 MPH
	95th Percentile :	47 MPH
Statistics	10 MPH Pace Speed :	36-45 MPH
	Number in Pace :	7093
	Percent in Pace :	76.6%
	Number of Vehicles > 45 MPH :	726
	Percent of Vehicles > 45 MPH :	7.8%
	Mean Speed(Average) :	40 MPH

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
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N/S: Route 126
South of Site Driveway
Ashland, MA

Site Code: 1163
Station ID:

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
08/11/21	0	0	1	1	8	5	10	1	0	0	0	0	0	0	26	43
01:00	0	0	0	0	2	4	0	1	0	0	0	0	0	0	7	39
02:00	0	0	0	0	2	3	3	1	1	0	0	0	0	0	10	47
03:00	0	0	0	1	0	6	6	5	1	1	0	0	0	0	20	49
04:00	0	0	0	0	1	15	16	6	3	0	0	0	0	0	41	47
05:00	0	0	0	4	19	48	40	13	1	1	0	0	0	0	126	44
06:00	0	0	0	0	26	112	87	15	3	0	0	0	0	0	243	43
07:00	0	0	0	4	17	134	128	23	2	0	0	0	0	0	308	44
08:00	0	0	3	5	33	126	94	16	1	0	0	0	0	0	278	43
09:00	1	0	4	1	34	149	70	12	3	0	0	0	0	0	274	43
10:00	0	0	0	5	42	131	79	17	0	1	0	0	0	0	275	43
11:00	1	5	5	6	37	110	102	15	2	0	0	0	0	0	283	43
12 PM	0	0	1	4	29	119	104	18	2	0	0	0	0	0	277	43
13:00	0	0	0	2	36	102	93	23	1	0	0	0	0	0	257	44
14:00	0	0	0	7	22	110	81	28	4	0	0	0	0	0	252	44
15:00	0	0	0	0	30	164	104	16	4	0	0	0	0	0	318	43
16:00	0	0	2	5	37	149	118	29	2	0	0	0	0	0	342	44
17:00	1	0	0	4	42	152	132	25	3	0	0	0	0	0	359	44
18:00	0	0	0	9	24	113	106	17	3	0	1	0	0	0	273	44
19:00	1	0	0	4	44	136	68	6	1	0	0	0	0	0	260	42
20:00	0	0	1	5	49	89	39	6	1	0	0	0	0	0	190	42
21:00	0	0	0	4	23	67	36	2	1	0	0	0	0	0	133	42
22:00	0	0	1	0	13	33	18	6	1	0	0	0	0	0	72	43
23:00	0	0	0	1	5	21	7	5	0	0	0	0	0	0	39	44

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N/S: Route 126
South of Site Driveway
Ashland, MA

Site Code: 1163
Station ID:

Northbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
08/12/21	0	0	0	1	1	7	5	3	0	0	0	0	0	0	17	45
01:00	0	0	1	0	1	3	3	2	0	0	0	0	0	0	10	46
02:00	0	0	0	1	0	6	4	1	3	0	0	0	0	0	15	51
03:00	0	0	0	0	4	5	5	3	1	0	0	0	0	0	18	47
04:00	0	0	2	0	1	11	19	10	2	0	0	0	0	0	45	47
05:00	0	0	0	1	13	47	59	4	1	0	0	0	0	0	125	43
06:00	0	0	0	7	18	94	82	24	5	0	0	0	0	0	230	44
07:00	0	0	0	11	44	153	110	18	0	0	0	0	0	0	336	43
08:00	0	0	1	6	31	147	101	21	1	0	0	0	0	0	308	43
09:00	0	0	0	3	50	108	93	7	1	0	0	0	0	0	262	43
10:00	0	0	1	11	50	122	56	17	1	0	1	0	0	0	259	43
11:00	0	0	1	3	45	117	98	14	0	0	0	0	0	0	278	43
12 PM	0	0	1	7	52	142	109	18	1	1	0	0	0	0	331	43
13:00	2	0	1	4	48	111	111	9	0	1	0	0	0	0	287	43
14:00	0	0	1	1	41	110	94	18	1	0	0	0	0	0	266	43
15:00	0	0	0	5	38	147	110	22	3	0	0	0	0	0	325	43
16:00	0	0	1	4	34	185	118	26	3	0	0	0	0	0	371	43
17:00	0	0	0	5	50	193	106	18	9	0	0	0	0	0	381	43
18:00	0	0	1	2	47	125	103	21	0	1	0	0	0	0	300	43
19:00	1	0	3	8	46	153	62	10	1	0	0	0	0	0	284	42
20:00	0	0	0	10	50	79	25	6	0	0	0	0	0	0	170	41
21:00	0	0	1	7	40	48	18	3	0	0	0	0	0	0	117	40
22:00	0	0	1	1	11	31	22	2	1	0	0	0	0	0	69	43
23:00	0	0	0	1	11	30	7	4	1	0	0	0	0	0	54	42

	15th Percentile :	34 MPH
	50th Percentile :	38 MPH
	85th Percentile :	43 MPH
	95th Percentile :	46 MPH
Statistics	10 MPH Pace Speed :	36-45 MPH
	Number in Pace :	7333
	Percent in Pace :	77.0%
	Number of Vehicles > 45 MPH :	670
	Percent of Vehicles > 45 MPH :	7.0%
	Mean Speed(Average) :	39 MPH

□ Crash Data

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Ashland, MA COUNT DATE : Aug-21

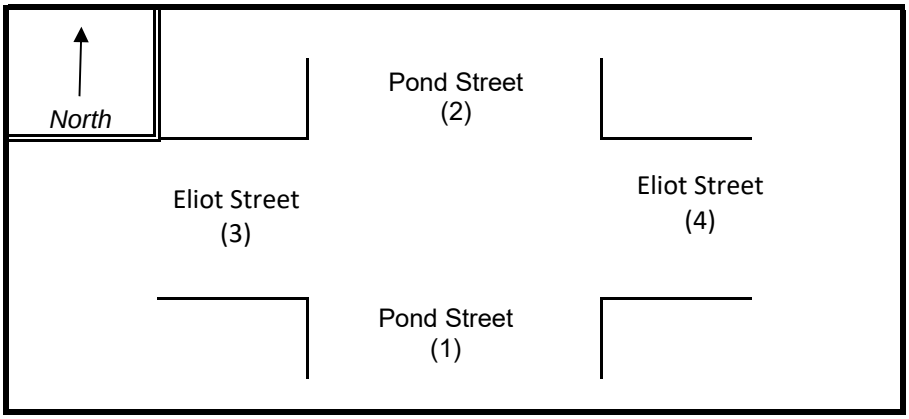
DISTRICT : 3 UNSIGNALIZED : [ ] SIGNALIZED : [X]

~ INTERSECTION DATA ~

MAJOR STREET : Pond Street (Route 126)

MINOR STREET(S) : Eliot Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (PM) :	538	747	474	362		2,121

" K " FACTOR : **0.088**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **24,102**

TOTAL # OF CRASHES : 37

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (**A**) : **7.40**

CRASH RATE CALCULATION : 0.84

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : MassDOT District 3 Avg: Signalized = 0.89; Unsignalized = 0.61

Project Title & Date: 1163 - Ashland

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Ashland, MA COUNT DATE : Aug-21

DISTRICT : 3 UNSIGNALIZED : X SIGNALIZED :

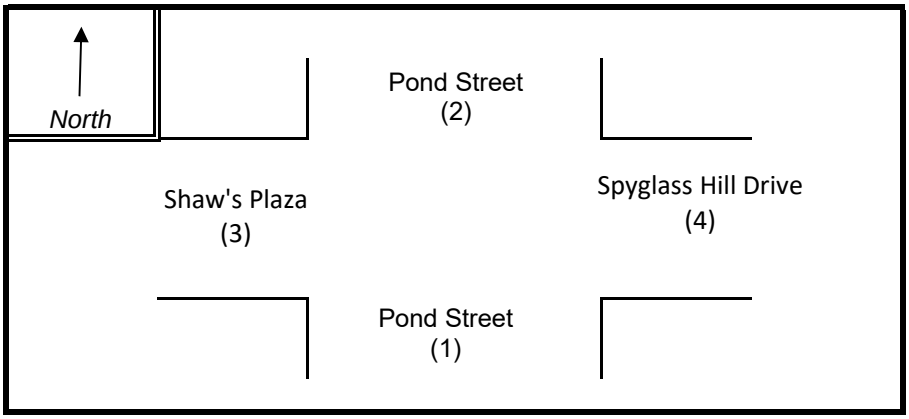
~ INTERSECTION DATA ~

MAJOR STREET : Chestnut Street

MINOR STREET(S) : Shaw's Plaza

Spyglass Hill Drive

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (PM) :	490	552	128	75		**1,245**

" K " FACTOR : **0.088**

INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **14,148**

TOTAL # OF CRASHES : 8

OF YEARS : 5

AVERAGE # OF CRASHES PER YEAR (**A**) : **1.60**

CRASH RATE CALCULATION : 0.31

RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : MassDOT District 3 Avg: Signalized = 0.89; Unsignalized = 0.61

Project Title & Date: 1163 - Ashland

Crash Number	Crash Date	Crash Severity	Crash Time	Number of Vehicles	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Most Harmful Event (All Vehicles)	X	Y	Roadway
4159337	02/24/2016	Property damage only (none injured)	6:02 PM	1	Dark - lighted roadway	Rear-end	Wet	0	0	V1: Travelling straight ahead	V1:(Passenger car)	V1: S	Rain	V1:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	POND ST / ELIOT ST
4169658	03/12/2016	Property damage only (none injured)	6:38 PM	2	Dark - lighted roadway	Rear-end	Dry	0	0	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: W	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	ELIOT ST / POND ST
4216686	06/09/2016	Non-fatal injury	5:48 AM	2	Daylight	Angle	Dry	0	2	V1: Turning left / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: S	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	POND ST / ELIOT ST
4257100	08/23/2016	Property damage only (none injured)	8:02 PM	3	Dark - lighted roadway	Rear-end	Dry	0	0	V1: Travelling straight ahead / V2: Travelling straight ahead / V3: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car) / V3:(Passenger car)	V1: W / V2: W / V3: W	Clear/Other	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic) / V3:(Collision with motor vehicle in traffic)	205652.3914	887889.805	POND ST
4288213	08/27/2016	Property damage only (none injured)	5:50 PM	2	Daylight	Rear-end	Dry	0	0	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Tractor/semi-trailer)	V1: N / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	POND STREET / ELIOT STREET
4308935	11/30/2016	Property damage only (none injured)	3:31 PM	4	Daylight	Head-on	Wet	0	0	V1: Turning left / V2: Parked / V3: Parked / V4: Parked	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility)) / V3:(Passenger car) / V4:(Passenger car)	V1: N / V2: E / V3: E / V4: E	Rain	V1:(Collision with parked motor vehicle) / V2:(Collision with motor vehicle in traffic) / V3:(Collision with motor vehicle in traffic) / V4:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	POND ST / ELIOT ST
4308959	12/24/2016	Non-fatal injury	2:14 AM	2	Dark - lighted roadway	Angle	Dry	0	1	V1: Travelling straight ahead / V2: Entering traffic lane	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	POND ST / ELIOT ST
4308962	12/25/2016	Property damage only (none injured)	10:45 AM	2	Daylight	Angle	Dry	0	0	V1: Travelling straight ahead / V2: Turning left	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: S / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	POND ST / ELIOT ST
4326839	01/31/2017	Property damage only (none injured)	6:00 PM	2	Dark - lighted roadway	Rear-end	Snow	0	0	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Snow	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205593.1222	887918.3763	ELIOT ST
4326848	02/07/2017	Property damage only (none injured)	6:49 PM	2	Dark - lighted roadway	Angle	Ice	0	0	V1: Travelling straight ahead / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: S	Sleet, hail (freezing rain or drizzle)/Snow	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205649.612	887881.1806	POND ST
4326857	02/14/2017	Property damage only (none injured)	6:18 PM	2	Dark - lighted roadway	Head-on	Wet	0	0	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: N	Cloudy	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	ELIOT ST / POND ST
4373831	05/07/2017	Property damage only (none injured)	10:55 AM	2	Daylight	Rear-end	Dry	0	0	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: W	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	ELIOT ST / POND ST
4373836	06/05/2017	Not Reported	4:37 PM	2	Daylight	Sideswipe, same direction	Dry	0	0	V1: Turning left / V2: Travelling straight ahead	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Passenger car)	V1: E / V2: W	Cloudy	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205652.3914	887889.805	POND ST
4402610	07/18/2017	Property damage only (none injured)	4:52 PM	2	Daylight	Rear-end	Wet	0	0	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Rain	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	POND ST Rte 126
4478413	11/28/2017	Property damage only (none injured)	8:14 PM	2	Dark - lighted roadway	Sideswipe, same direction	Dry	0	0	V1: Travelling straight ahead / V2: Turning right	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: W	Clear/Other	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205652.3914	887889.805	POND ST
4514339	03/05/2018	Non-fatal injury	11:42 AM	2	Daylight	Rear-end	Dry	0	1	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Clear/Other	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205652.3914	887889.805	POND ST
4542713	05/18/2018	Property damage only (none injured)	6:56 AM	2	Daylight	Sideswipe, same direction	Dry	0	0	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Passenger car)	V1: N / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205652.3914	887889.805	POND ST
4612136	07/17/2018	Unknown	4:31 PM	2	Daylight	Rear-end	Snow	0	0	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Rain	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205590.568	887917.8315	ELIOT STREET
4632244	11/20/2018	Non-fatal injury	9:12 AM	2	Daylight	Rear-end	Wet	0	1	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: E	Rain	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4529	887933.4377	POND ST / ELIOT ST
4659799	01/19/2019	Property damage only (none injured)	12:29 PM	2	Daylight	Angle	Dry	0	0	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: W	Clear/Other	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205649.5688	887881.0456	POND ST
4737359	07/12/2019	Property damage only (none injured)	7:06 AM	2	Daylight	Sideswipe, opposite direction	Dry	0	0	V1: Travelling straight ahead / V2: Entering traffic lane	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: W	Clear/Unknown	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205649.6122	887881.1805	POND ST
4768026	10/10/2019	Property damage only (none injured)	6:36 PM	2	Dark - lighted roadway	Front to Rear	Unknown	0	0	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: W	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4532	887933.438	ELIOT ST / POND ST
4771506	11/02/2019	Non-fatal injury	12:56 PM	2	Daylight	Sideswipe, opposite direction	Dry	0	0	V1: Travelling straight ahead / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205649.6122	887881.1805	POND ST
4802291	05/23/2019	Property damage only (none injured)	3:10 PM	2	Daylight	Angle	Dry	0	0	V2: Travelling straight ahead / V1: Turning right	V2:(Passenger car) / V1:(Unknown heavy truck, cannot classify)	V2: W / V1: W	Cloudy	V2:(Collision with motor vehicle in traffic) / V1:(Collision with motor vehicle in traffic)	205666.4532	887933.438	ELIOT STREET / POND STREET
4803773	11/04/2019	Non-fatal injury	5:40 PM	2	Dark - lighted roadway	Angle	Dry	0	0	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: S	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4532	887933.438	POND ST / ELIOT ST
4804204	11/10/2019	Property damage only (none injured)	8:33 PM	1	Dark - lighted roadway	Single vehicle crash	Dry	0	0	V1: Turning right	V1:(Passenger car)	V1: N	Clear	V1:(Collision with motor vehicle in traffic)	205666.4532	887933.438	POND ST / ELIOT ST
4804208	11/27/2019	Property damage only (none injured)	3:57 PM	1	Dusk	Sideswipe, same direction	Dry	0	0	V1: Slowing or stopped in traffic	V1:(Passenger car)	V1: E	Cloudy	V1:(Collision with motor vehicle in traffic)	205666.4532	887933.438	ELIOT ST / POND ST
4807052	08/20/2019	Property damage only (none injured)	1:08 PM	2	Daylight	Angle	Dry	0	0	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205649.5688	887881.0456	POND ST
4807199	12/07/2019	Property damage only (none injured)	8:25 PM	2	Dark - lighted roadway	Single vehicle crash	Dry	0	0	V1: Turning left / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: E	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4532	887933.438	ELIOT ST / POND ST
4807481	07/12/2019	Property damage only (none injured)	7:23 AM	2	Daylight	Angle	Dry	0	0	V1: Parked / V2: Other	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Passenger car)	V1: Not Reported / V2: S	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with parked motor vehicle)	205666.4532	887933.438	POND STREET / ELIOT STREET
4847433	05/15/2020	Property damage only (none injured)	12:44 PM	2	Daylight	Sideswipe, opposite direction	Dry	0	0	V2: Travelling straight ahead / V1: Travelling straight ahead	V2:(Passenger car) / V1:(Unknown heavy truck, cannot classify)	V2: S / V1: E	Clear	V2:(Collision with motor vehicle in traffic) / V1:(Collision with motor vehicle in traffic)	205649.5687	887881.0456	POND STREET
4860527	06/23/2020	Property damage only (none injured)	1:18 PM	2	Daylight	Angle	Dry	0	0	V1: Travelling straight ahead / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: S	Clear/Other	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4532	887933.438	ELIOT ST / POND ST
4892863	08/05/2020	Property damage only (none injured)	5:28 PM	2	Daylight	Rear-end	Dry	0	0	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4532	887933.438	POND ST / ELIOT ST
4893399	09/04/2020	Property damage only (none injured)	8:01 PM	2	Dark - lighted roadway	Angle	Dry	0	0	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205666.4532	887933.438	POND ST / ELIOT ST
4919829	11/18/2020	Property damage only (none injured)	5:15 PM	3	Dark - lighted roadway	Head-on	Dry	0	0	V1: Travelling straight ahead / V2: Turning left / V3: Leaving traffic lane	V1:(Passenger car) / V2:(Passenger car) / V3:(Light truck(van, mini-van, pickup, sport utility))	V1: S / V2: E / V3: S	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic) / V3:(Collision with motor vehicle in traffic)	205666.4532	887933.438	POND ST / ELIOT ST
4919916	11/12/2020	Property damage only (none injured)	7:30 AM	3	Daylight	Angle	Wet	0	0	V1: Travelling straight ahead / V2: Travelling straight ahead / V3: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car) / V3:(Passenger car)	V1: E / V2: N / V3: S	Cloudy	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic) / V3:(Collision with motor vehicle in traffic)	205666.4532	887933.438	POND ST / ELIOT ST
4919918	11/22/2020	Property damage only (none injured)	9:30 PM	1	Dark - lighted roadway	Sideswipe, opposite direction	Dry	0	0	V1: Slowing or stopped in traffic	V1:(Passenger car)	V1: N	Cloudy	V1:(Collision with motor vehicle in traffic)	205666.4532	887933.438	ELIOT ST / POND ST

Crash Number	Crash Date	Crash Severity	Crash Time	Number of Vehicles	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Most Harmful Event (All Vehicles)	X	Y	Roadway
4203470	05/26/2016	Property damage only (none injured)	3:41 PM	2	Daylight	Angle	Dry		0	V1: Travelling straight ahead / V2: Entering traffic lane	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: W	Clear/Other	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205619.3438	887789.1873	POND ST / SPYGLASS HILL DR
4203628	05/18/2016	Property damage only (none injured)	11:45 AM	2	Daylight	Rear-end	Dry		0	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205582.6836	887690.7031	POND ST
4288240	07/23/2016	Non-fatal injury	7:40 PM	2	Daylight	Rear-end	Dry		0	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Cloudy	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205582.6836	887690.7031	POND ST
4288258	11/15/2016	Property damage only (none injured)	7:59 PM	2	Dark - lighted roadway	Rear-end	Wet		0	V1: Other / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Rain/Other	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205582.6836	887690.7031	POND ST
4432176	09/22/2017	Property damage only (none injured)	4:01 PM	1	Daylight	Rear-end	Wet		0	V1: Travelling straight ahead	V1:(Passenger car)	V1: N	Rain/Unknown	V1:(Collision with motor vehicle in traffic)	205582.6836	887690.7031	POND ST
4542721	04/13/2018	Non-fatal injury	2:59 PM	3	Daylight	Angle	Dry		0	V1: Travelling straight ahead / V2: Travelling straight ahead / V3: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility)) / V3:(Light truck(van, mini-van, pickup, sport utility))	V1: N / V2: E / V3: W	Clear	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic) / V3:(Collision with motor vehicle in traffic)	205619.3438	887789.1873	SPYGLASS HILL DR / POND ST
4615465	10/26/2018	Non-fatal injury	2:14 PM	2	Daylight	Angle	Dry		0	V1: Entering traffic lane / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: N	Clear/Other	V1:(Collision with motor vehicle in traffic) / V2:(Collision with motor vehicle in traffic)	205595.4119	887722.3657	POND ST / SPYGLASS HILL DR
4766584	09/18/2019	Property damage only (none injured)	5:36 PM	1	Daylight	Single vehicle crash	Dry		0	V1: Travelling straight ahead	V1:(Passenger car)	V1: E	Clear/Unknown	V1:(Collision with other fixed object (wall, building, tunnel, etc.))	205587.4754	887703.6078	POND ST

□ Sight Distance Calculations

Stopping Sight Distance - Posted

Pond Street at Converse Way

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	45	165.375	194.1	359.4
Direction 2	SB	45	165.375	194.1	359.4

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	45	45
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - 85th Percentile

Pond Street at Converse Way

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	NB	43	158.025	177.2	335.2
Direction 2	SB	43	158.025	177.2	335.2

INPUTS	Direction 1	Direction 2
Travel Direction	NB	SB
Speed	43	43
Grade	0	0
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Intersection Sight Distance Calculations

Source: *A Policy on Geometric Design of Highways and Street, 6th Edition;* AASHTO; 2011.

Passenger Car
ISD = 1.47 * V * t

V = speed
t = time gap

t = 7.5 s for a passenger car for Left Turn from a Stop
t = 6.5 s for a passenger car for Right Turn from a Stop

Pond Street Street Posted (Regulatory) Speed Limit

Proposed Site Driveway ISD = 1.47 * 45 * 7.5 = 496 ft **SAY 500 ft**
(left-turn from a stop)

Proposed Site Driveway ISD = 1.47 * 45 * 6.5 = 430 ft **SAY 430 ft**
(right-turn from a stop)

- Trip Generation

Institute of Transportation Engineers (ITE) 10th Edition
Land Use Code (LUC) 221 - Multifamily Housing (Mid-Rise)

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 120

AVERAGE WEEKDAY DAILY

T = 5.44 * X
T = 5.44 * 120
T = 652.80
T = 652 vehicle trips
with 50% (**326** vpd) entering and 50% (**326** vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.36 * X
T = 0.36 * 120
T = 43.20
T = 43 vehicle trips
with 26% (**11** vph) entering and 74% (**32** vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.44 * X
T = 0.44 * 120
T = 52.80
T = 53 vehicle trips
with 61% (**32** vph) entering and 39% (**21** vph) exiting.

SATURDAY DAILY

T = 4.91 * X
T = 4.91 * 120
T = 589.20
T = 590 vehicle trips
with 50% (**295** vpd) entering and 50% (**295** vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 0.44 * X
T = 0.44 * 120
T = 52.80
T = 53 vehicle trips
with 49% (**26** vph) entering and 51% (**27** vph) exiting.

Institute of Transportation Engineers (ITE) 11th Edition
Land Use Code (LUC) 712 - Small Office Building

Average Vehicle Trips Ends vs: 1000 Sq. Feet Gross Floor Area
Independent Variable (X): 6.8

AVERAGE WEEKDAY DAILY

T = 14.39 * (X)
T = 14.39 * 6.8
T = 97.85
T = 98 vehicle trips
with 50% (**49** vpd) entering and 50% (**49** vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 1.67 * (X)
T = 1.67 * 6.8
T = 11.36
T = 11 vehicle trips
with 82% (**9** vph) entering and 18% (**2** vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 2.16 * (X)
T = 2.16 * 6.8
T = 14.69
T = 15 vehicle trips
with 34% (**5** vph) entering and 66% (**10** vph) exiting.

WEEKDAY MORNING PEAK HOUR OF GENERATOR

T = 2.61 * (X)
T = 2.61 * 6.8
T = 17.75
T = 18 vehicle trips
with 60% (**10** vph) entering and 40% (**8** vph) exiting.

WEEKDAY EVENING PEAK HOUR OF GENERATOR

T = 3.15 * (X)
T = 3.15 * 6.8
T = 21.42
T = 21 vehicle trips
with 42% (**9** vph) entering and 58% (**12** vph) exiting.

□ Trip Distribution Calculations

Journey-to-Work Distribution
US Census Journey-to-Work Data

Residence Town Name	Workplace Town Name	All Workers	% of Total Rounded
Ashland town	Framingham town	1,510	16.8%
Ashland town	Ashland town	1,362	15.1%
Ashland town	Boston city	1,301	14.5%
Ashland town	Natick town	637	7.1%
Ashland town	Newton city	348	3.9%
Ashland town	Wellesley town	325	3.6%
Ashland town	Marlborough city	265	2.9%
Ashland town	Hopkinton town	186	2.1%
Ashland town	Milford town	165	1.8%
Ashland town	Worcester city	159	1.8%
Ashland town	Cambridge city	129	1.4%
Ashland town	Waltham city	128	1.4%
Ashland town	Brookline town	117	1.3%
Ashland town	Westborough town	111	1.2%
Ashland town	Holliston town	90	1.0%
Ashland town	Needham town	86	1.0%
Ashland town	Canton town	80	0.9%
Ashland town	Southborough town	78	0.9%
Ashland town	Wayland town	77	0.9%
Ashland town	Franklin Town city	74	0.8%
Ashland town	Concord town	68	0.8%
Ashland town	Plainville town	66	0.7%
Ashland town	Lowell city	65	0.7%
Ashland town	Watertown Town city	64	0.7%
Ashland town	Burlington town	60	0.7%
Ashland town	Weston town	57	0.6%
Ashland town	Malden city	56	0.6%
Ashland town	Woburn city	54	0.6%
Ashland town	Chelsea city	51	0.6%
Ashland town	Maynard town	48	0.5%
Ashland town	Tewksbury town	47	0.5%
	Sub-Total	**7,865**	**87%**
	Other	1,134	13%
	Total	**8,999**	**100%**

	To/From Routes								
	Eliot Street (To/From West)		Route 126 (To/From South)		Route 126 (To/From North)		Eliot Street (To/From East)		Total
Workplace									
Framingham town		0.0%		0.0%	75.0%	12.6%	25%	4.2%	16.8%
Ashland town	100%	15.1%		0.0%		0.0%		0.0%	15.1%
Boston city		0.0%		0.0%	100%	14.5%		0.0%	14.5%
Natick town		0.0%	50%	3.5%		0.0%	50%	3.5%	7.1%
Newton city		0.0%		0.0%	100%	3.9%		0.0%	3.9%
Wellesley town		0.0%		0.0%	25%	0.9%	75%	2.7%	3.6%
Marlborough city	100%	2.9%		0.0%		0.0%		0.0%	2.9%
Hopkinton town	75%	1.6%	25%	0.5%		0.0%		0.0%	2.1%
Milford town		0.0%	100%	1.8%		0.0%		0.0%	1.8%
Worcester city	100%	1.8%		0.0%		0.0%		0.0%	1.8%
Cambridge city	50%	0.7%		0.0%	50%	0.7%		0.0%	1.4%
Waltham city	25%	0.4%		0.0%	75%	1.1%		0.0%	1.4%
Brookline town	25%	0.3%		0.0%	75%	1.0%		0.0%	1.3%
Westborough town	100%	1.2%		0.0%		0.0%		0.0%	1.2%
Holliston town		0.0%	100%	1.0%		0.0%		0.0%	1.0%
Needham town		0.0%		0.0%		0.0%	100%	1.0%	1.0%
Canton town		0.0%	100%	0.9%		0.0%		0.0%	0.9%
Southborough town	100%	0.9%		0.0%		0.0%		0.0%	0.9%
Wayland town		0.0%		0.0%	100%	0.9%		0.0%	0.9%
Franklin Town city		0.0%	100%	0.8%		0.0%		0.0%	0.8%
Concord town		0.0%		0.0%	100%	0.8%		0.0%	0.8%
Plainville town		0.0%	100%	0.7%		0.0%		0.0%	0.7%
Lowell city	50%	0.4%		0.0%	50%	0.4%		0.0%	0.7%
Watertown Town city	50%	0.4%		0.0%	50%	0.4%		0.0%	0.7%
Burlington town		0.0%		0.0%	100%	0.7%		0.0%	0.7%
Weston town		0.0%		0.0%	100%	0.6%		0.0%	0.6%
Malden city		0.0%		0.0%	100%	0.6%		0.0%	0.6%
Woburn city		0.0%		0.0%	100%	0.6%		0.0%	0.6%
Chelsea city		0.0%		0.0%	100%	0.6%		0.0%	0.6%
Maynard town	50%	0.3%		0.0%	50%	0.3%		0.0%	0.5%
Tewksbury town	50%	0.3%		0.0%	50%	0.3%		0.0%	0.5%
Sub-Total		26.1%		9.3%		40.5%		11.4%	87.4%
Other		3.8%		1.3%		5.8%		1.6%	12.6%
Total		29.9%		10.7%		46.4%		13.0%	100.0%
	SAY	30%		10%		45%		15%	100%

Source: 2010 US Census Journey-to-Work Data

□ Capacity Analysis

Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	0	0	392	271	1
Future Vol, veh/h	1	0	0	392	271	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	11	10	0
Mvmt Flow	1	0	0	436	301	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	737	301	302	0	-	0
Stage 1	301	-	-	-	-	-
Stage 2	436	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	389	743	1270	-	-	-
Stage 1	755	-	-	-	-	-
Stage 2	656	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	389	743	1270	-	-	-
Mov Cap-2 Maneuver	389	-	-	-	-	-
Stage 1	755	-	-	-	-	-
Stage 2	656	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.3	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1270	-	389	-	-
HCM Lane V/C Ratio	-	-	0.003	-	-
HCM Control Delay (s)	0	-	14.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection												
Int Delay, s/veh	2.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	12	5	21	13	2	63	11	346	15	35	233	17
Future Vol, veh/h	12	5	21	13	2	63	11	346	15	35	233	17
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	Free	-	-	None
Storage Length	-	-	175	-	-	75	100	-	75	250	-	180
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	10	0	17	0	0	4	11	9	8	10	8	0
Mvmt Flow	13	5	23	14	2	69	12	380	16	38	256	19

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	737	736	256	760	755	380	275	0	-	380	0	0
Stage 1	332	332	-	404	404	-	-	-	-	-	-	-
Stage 2	405	404	-	356	351	-	-	-	-	-	-	-
Critical Hdwy	7.2	6.5	6.37	7.1	6.5	6.24	4.21	-	-	4.2	-	-
Critical Hdwy Stg 1	6.2	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.2	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.59	4	3.453	3.5	4	3.336	2.299	-	-	2.29	-	-
Pot Cap-1 Maneuver	324	349	747	325	340	663	1238	-	0	1136	-	-
Stage 1	665	648	-	627	603	-	-	-	0	-	-	-
Stage 2	607	603	-	666	636	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	279	334	747	301	325	663	1238	-	-	1136	-	-
Mov Cap-2 Maneuver	279	334	-	301	325	-	-	-	-	-	-	-
Stage 1	658	627	-	621	597	-	-	-	-	-	-	-
Stage 2	536	597	-	618	615	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.6	12.3	0.2	1
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1238	-	293	747	304	663	1136	-	-
HCM Lane V/C Ratio	0.01	-	0.064	0.031	0.054	0.104	0.034	-	-
HCM Control Delay (s)	7.9	-	18.1	10	17.5	11.1	8.3	-	-
HCM Lane LOS	A	-	C	B	C	B	A	-	-
HCM 95th %tile Q(veh)	0	-	0.2	0.1	0.2	0.3	0.1	-	-

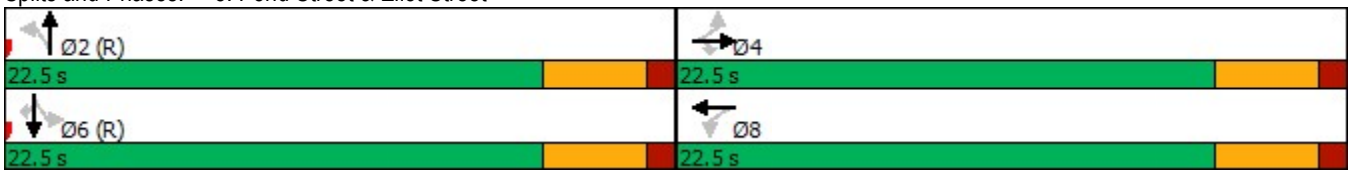
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	174	223	90	26	130	19	95	278	48	34	186	131
Future Volume (vph)	174	223	90	26	130	19	95	278	48	34	186	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	16	12	10	10	11	13	13	12	12	11
Storage Length (ft)	150		60	100		0	200		0	0		125
Storage Lanes	1		1	1		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.981			0.978				0.850
Flt Protected	0.950			0.950			0.950				0.992	
Satd. Flow (prot)	1703	1783	1664	1805	1669	0	1601	1757	0	0	1707	1459
Flt Permitted	0.659			0.614			0.616				0.917	
Satd. Flow (perm)	1181	1783	1664	1167	1669	0	1038	1757	0	0	1578	1459
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			94		20			23				136
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		250			250			600			250	
Travel Time (s)		6.8			6.8			9.1			3.8	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	6%	3%	10%	0%	4%	6%	9%	10%	5%	7%	11%	7%
Adj. Flow (vph)	181	232	94	27	135	20	99	290	50	35	194	136
Shared Lane Traffic (%)												
Lane Group Flow (vph)	181	232	94	27	155	0	99	340	0	0	229	136
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	0.85	1.00	1.09	1.09	1.04	0.96	0.96	1.00	1.00	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	50.0%
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0		18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5			4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	0
Act Effct Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0			18.0	18.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40		0.40	0.40			0.40	0.40
v/c Ratio	0.38	0.33	0.13	0.06	0.23		0.24	0.47			0.36	0.20
Control Delay	12.6	10.9	3.1	8.8	8.9		10.9	12.0			11.6	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Delay	12.6	10.9	3.1	8.8	8.9		10.9	12.0			11.6	3.2
LOS	B	B	A	A	A		B	B			B	A
Approach Delay		10.1			8.9			11.8			8.4	
Approach LOS		B			A			B			A	
Queue Length 50th (ft)	31	39	0	4	22		16	57			39	0
Queue Length 95th (ft)	70	78	19	15	50		41	111			80	23
Internal Link Dist (ft)		170			170			520			170	
Turn Bay Length (ft)	150		60	100			200					125
Base Capacity (vph)	472	713	722	466	679		415	716			631	665
Starvation Cap Reductn	0	0	0	0	0		0	0			0	0
Spillback Cap Reductn	0	0	0	0	0		0	0			0	0
Storage Cap Reductn	0	0	0	0	0		0	0			0	0
Reduced v/c Ratio	0.38	0.33	0.13	0.06	0.23		0.24	0.47			0.36	0.20

Intersection Summary

Area Type: Other
Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 10.0 Intersection LOS: B
Intersection Capacity Utilization 61.8% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 8: Pond Street & Eliot Street



Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	3	1	1	489	534	1
Future Vol, veh/h	3	1	1	489	534	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	3	1	1	520	568	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1090	568	569	0	-	0
Stage 1	568	-	-	-	-	-
Stage 2	522	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	240	526	1013	-	-	-
Stage 1	571	-	-	-	-	-
Stage 2	599	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	240	526	1013	-	-	-
Mov Cap-2 Maneuver	240	-	-	-	-	-
Stage 1	570	-	-	-	-	-
Stage 2	599	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.2	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1013	-	278	-	-
HCM Lane V/C Ratio	0.001	-	0.015	-	-
HCM Control Delay (s)	8.6	0	18.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

Intersection												
Int Delay, s/veh	5.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	49	13	66	15	16	44	50	432	8	57	438	57
Future Vol, veh/h	49	13	66	15	16	44	50	432	8	57	438	57
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	Yield	-	-	Free	-	-	None
Storage Length	-	-	175	-	-	75	100	-	75	250	-	180
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	93	93	93	93	93	93	93	93	93
Heavy Vehicles, %	0	0	2	0	0	0	2	2	17	2	3	4
Mvmt Flow	53	14	71	16	17	47	54	465	9	61	471	61

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1175	1166	471	1239	1227	465	532	0	-	465	0	0
Stage 1	593	593	-	573	573	-	-	-	-	-	-	-
Stage 2	582	573	-	666	654	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.22	7.1	6.5	6.2	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.318	3.5	4	3.3	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	170	196	593	154	180	602	1036	-	0	1096	-	-
Stage 1	496	497	-	508	507	-	-	-	0	-	-	-
Stage 2	502	507	-	452	466	-	-	-	0	-	-	-
Platoon blocked, %								-			-	-
Mov Cap-1 Maneuver	132	175	593	117	161	602	1036	-	-	1096	-	-
Mov Cap-2 Maneuver	132	175	-	117	161	-	-	-	-	-	-	-
Stage 1	470	469	-	482	481	-	-	-	-	-	-	-
Stage 2	423	481	-	365	440	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	31.7	23.2	0.9	0.9
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1036	-	139	593	136	602	1096	-	-
HCM Lane V/C Ratio	0.052	-	0.48	0.12	0.245	0.079	0.056	-	-
HCM Control Delay (s)	8.7	-	52.7	11.9	39.9	11.5	8.5	-	-
HCM Lane LOS	A	-	F	B	E	B	A	-	-
HCM 95th %tile Q(veh)	0.2	-	2.2	0.4	0.9	0.3	0.2	-	-

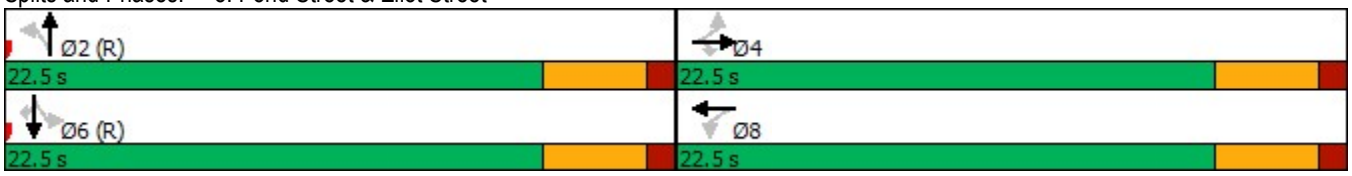
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	243	139	92	101	214	47	123	363	52	39	376	332
Future Volume (vph)	243	139	92	101	214	47	123	363	52	39	376	332
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	16	12	10	10	11	13	13	12	12	11
Storage Length (ft)	150		60	100		0	200		0	0		125
Storage Lanes	1		1	1		0	1		0	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.973			0.981				0.850
Flt Protected	0.950			0.950			0.950				0.995	
Satd. Flow (prot)	1687	1837	1812	1787	1684	0	1711	1893	0	0	1847	1516
Flt Permitted	0.586			0.666			0.401				0.935	
Satd. Flow (perm)	1041	1837	1812	1253	1684	0	722	1893	0	0	1735	1516
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			95		29			19				342
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		250			250			600			250	
Travel Time (s)		6.8			6.8			9.1			3.8	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	7%	0%	1%	1%	3%	0%	2%	2%	0%	6%	2%	3%
Adj. Flow (vph)	251	143	95	104	221	48	127	374	54	40	388	342
Shared Lane Traffic (%)												
Lane Group Flow (vph)	251	143	95	104	269	0	127	428	0	0	428	342
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	0.85	1.00	1.09	1.09	1.04	0.96	0.96	1.00	1.00	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Perm	NA	Perm	Perm	NA		Perm	NA		Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Split (s)	22.5	22.5	22.5	22.5	22.5		22.5	22.5		22.5	22.5	22.5
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	50.0%
Maximum Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0		18.0	18.0	18.0
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5			4.5	4.5
Lead/Lag												
Lead-Lag Optimize?												
Walk Time (s)	7.0	7.0	7.0	7.0	7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)	11.0	11.0	11.0	11.0	11.0		11.0	11.0		11.0	11.0	11.0
Pedestrian Calls (#/hr)	0	0	0	0	0		0	0		0	0	0
Act Effct Green (s)	18.0	18.0	18.0	18.0	18.0		18.0	18.0			18.0	18.0

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40		0.40	0.40			0.40	0.40
v/c Ratio	0.60	0.19	0.12	0.21	0.39		0.44	0.56			0.62	0.42
Control Delay	18.7	9.7	3.1	10.2	10.6		15.9	13.4			15.5	3.3
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Delay	18.7	9.7	3.1	10.2	10.6		15.9	13.4			15.5	3.3
LOS	B	A	A	B	B		B	B			B	A
Approach Delay		13.0			10.5			13.9			10.1	
Approach LOS		B			B			B			B	
Queue Length 50th (ft)	48	23	0	17	41		23	76			83	0
Queue Length 95th (ft)	#119	50	19	41	85		61	142			155	36
Internal Link Dist (ft)		170			170			520			170	
Turn Bay Length (ft)	150		60	100			200					125
Base Capacity (vph)	416	734	781	501	691		288	768			694	811
Starvation Cap Reductn	0	0	0	0	0		0	0			0	0
Spillback Cap Reductn	0	0	0	0	0		0	0			0	0
Storage Cap Reductn	0	0	0	0	0		0	0			0	0
Reduced v/c Ratio	0.60	0.19	0.12	0.21	0.39		0.44	0.56			0.62	0.42

Intersection Summary

Area Type: Other
Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed
Maximum v/c Ratio: 0.62
Intersection Signal Delay: 11.8 Intersection LOS: B
Intersection Capacity Utilization 86.8% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Pond Street & Eliot Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	187	239	96	28	139	20	102	298	51	36	199	140
Future Volume (vph)	187	239	96	28	139	20	102	298	51	36	199	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	16	12	10	10	11	13	13	12	12	11
Storage Length (ft)	150		60	100		0	200		0	150		200
Storage Lanes	1		1	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.981			0.978				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1783	1664	1805	1669	0	1601	1757	0	1687	1712	1459
Flt Permitted	0.437			0.605			0.427			0.465		
Satd. Flow (perm)	783	1783	1664	1150	1669	0	720	1757	0	826	1712	1459
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			113		5			9				146
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		250			250			600			250	
Travel Time (s)		6.8			6.8			9.1			3.8	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	6%	3%	10%	0%	4%	6%	9%	10%	5%	7%	11%	7%
Adj. Flow (vph)	195	249	100	29	145	21	106	310	53	38	207	146
Shared Lane Traffic (%)												
Lane Group Flow (vph)	195	249	100	29	166	0	106	363	0	38	207	146
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	0.85	1.00	1.09	1.09	1.04	0.96	0.96	1.00	1.00	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pt+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	pt+ov

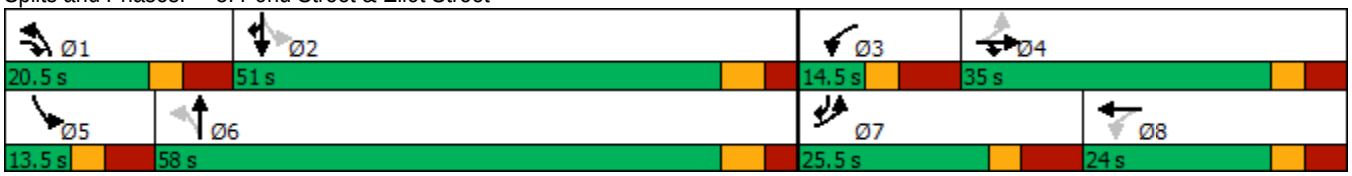
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4	4 1	3	8		1	6		5	2	2 7
Permitted Phases	4			8			6			2		
Detector Phase	7	4	4 1	3	8		1	6		5	2	2 7
Switch Phase												
Minimum Initial (s)	6.0	8.0		6.0	8.0		8.0	10.0		6.0	10.0	
Minimum Split (s)	14.5	15.0		14.5	15.0		15.5	17.0		13.5	17.0	
Total Split (s)	25.5	35.0		14.5	24.0		20.5	58.0		13.5	51.0	
Total Split (%)	21.1%	28.9%		12.0%	19.8%		16.9%	47.9%		11.2%	42.1%	
Maximum Green (s)	17.0	28.0		6.0	17.0		13.0	51.0		6.0	44.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	5.5	4.0		5.5	4.0		4.5	3.0		4.5	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	8.5	7.0		8.5	7.0		7.5	7.0		7.5	7.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)	34.0	30.6	47.9	17.8	13.2		33.0	27.8		23.3	17.7	40.0
Actuated g/C Ratio	0.40	0.36	0.56	0.21	0.16		0.39	0.33		0.27	0.21	0.47
v/c Ratio	0.42	0.39	0.10	0.10	0.63		0.28	0.63		0.13	0.58	0.19
Control Delay	21.6	26.4	2.8	20.1	46.3		18.8	31.9		18.1	38.3	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	21.6	26.4	2.8	20.1	46.3		18.8	31.9		18.1	38.3	3.0
LOS	C	C	A	C	D		B	C		B	D	A
Approach Delay		20.3			42.4			29.0			23.1	
Approach LOS		C			D			C			C	
90th %ile Green (s)	17.0	28.0		6.0	17.0		12.6	33.4		6.0	26.8	
90th %ile Term Code	Max	Hold		Max	Max		Gap	Gap		Max	Hold	
70th %ile Green (s)	15.4	26.1		6.0	16.7		10.5	26.8		6.0	22.3	
70th %ile Term Code	Gap	Hold		Max	Gap		Gap	Gap		Max	Hold	
50th %ile Green (s)	15.0	37.3		0.0	13.8		9.2	22.7		6.0	19.5	
50th %ile Term Code	Gap	Hold		Skip	Gap		Gap	Gap		Max	Hold	
30th %ile Green (s)	12.1	31.6		0.0	11.0		8.0	28.0		0.0	12.5	
30th %ile Term Code	Gap	Hold		Skip	Gap		Min	Hold		Skip	Gap	
10th %ile Green (s)	9.0	25.9		0.0	8.4		8.0	25.5		0.0	10.0	
10th %ile Term Code	Gap	Hold		Skip	Gap		Min	Hold		Skip	Min	
Queue Length 50th (ft)	70	89	0	9	84		36	182		12	101	0
Queue Length 95th (ft)	141	219	23	30	170		74	299		33	187	30
Internal Link Dist (ft)		170			170			520			170	
Turn Bay Length (ft)	150		60	100			200			150		200
Base Capacity (vph)	502	659	1015	288	347		428	1088		289	911	879
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.39	0.38	0.10	0.10	0.48		0.25	0.33		0.13	0.23	0.17

Intersection Summary

Area Type: Other
Cycle Length: 121

Actuated Cycle Length: 85
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.63
Intersection Signal Delay: 26.2
Intersection LOS: C
Intersection Capacity Utilization 67.7%
ICU Level of Service C
Analysis Period (min) 15
90th %ile Actuated Cycle: 103.4
70th %ile Actuated Cycle: 94.9
50th %ile Actuated Cycle: 87.5
30th %ile Actuated Cycle: 73.6
10th %ile Actuated Cycle: 65.4

Splits and Phases: 8: Pond Street & Eliot Street



Intersection	
Int Delay, s/veh	0

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	1	0	0	420	291	1
Future Vol, veh/h	1	0	0	420	291	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	11	10	0
Mvmt Flow	1	0	0	467	323	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	790	323	324	0	-	0
Stage 1	323	-	-	-	-	-
Stage 2	467	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	362	723	1247	-	-	-
Stage 1	738	-	-	-	-	-
Stage 2	635	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	362	723	1247	-	-	-
Mov Cap-2 Maneuver	362	-	-	-	-	-
Stage 1	738	-	-	-	-	-
Stage 2	635	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1247	-	362	-	-
HCM Lane V/C Ratio	-	-	0.003	-	-
HCM Control Delay (s)	0	-	15	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	0	-	-

LANE SUMMARY

Site: Pond Street at Spyglass Hill Drive No-Build AM

Pond Street at Spyglass Hill Drive
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Pond Street													
Lane 1[d]	434	9.0	970	0.447	100	8.9	LOS A	2.2	59.9	Full	1600	0.0	0.0
Approach	434	9.0		0.447		8.9	LOS A	2.2	59.9				
East: Spyglass Hill Drive													
Lane 1[d]	91	3.2	684	0.133	100	6.7	LOS A	0.5	11.7	Full	1600	0.0	0.0
Approach	91	3.2		0.133		6.7	LOS A	0.5	11.7				
North: Pond Street													
Lane 1[d]	333	8.0	1014	0.328	100	6.9	LOS A	1.4	38.5	Full	1600	0.0	0.0
Approach	333	8.0		0.328		6.9	LOS A	1.4	38.5				
West: Shaw's Plaza													
Lane 1[d]	45	12.7	704	0.063	100	5.8	LOS A	0.2	5.3	Full	1600	0.0	0.0
Approach	45	12.7		0.063		5.8	LOS A	0.2	5.3				
Intersection	902	8.2		0.447		7.8	LOS A	2.2	59.9				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	261	149	99	108	229	50	132	389	56	42	403	356
Future Volume (vph)	261	149	99	108	229	50	132	389	56	42	403	356
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	16	12	10	10	11	13	13	12	12	11
Storage Length (ft)	150		60	100		0	200		0	150		200
Storage Lanes	1		1	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.973			0.981				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1687	1837	1812	1787	1684	0	1711	1893	0	1703	1863	1516
Flt Permitted	0.293			0.659			0.227			0.366		
Satd. Flow (perm)	520	1837	1812	1240	1684	0	409	1893	0	656	1863	1516
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			114		8			7				289
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		250			250			600			250	
Travel Time (s)		6.8			6.8			9.1			3.8	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	7%	0%	1%	1%	3%	0%	2%	2%	0%	6%	2%	3%
Adj. Flow (vph)	269	154	102	111	236	52	136	401	58	43	415	367
Shared Lane Traffic (%)												
Lane Group Flow (vph)	269	154	102	111	288	0	136	459	0	43	415	367
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	0.85	1.00	1.09	1.09	1.04	0.96	0.96	1.00	1.00	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pt+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	pt+ov

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4	4 1	3	8		1	6		5	2	2 7
Permitted Phases	4			8			6			2		
Detector Phase	7	4	4 1	3	8		1	6		5	2	2 7
Switch Phase												
Minimum Initial (s)	6.0	8.0		6.0	8.0		8.0	10.0		6.0	10.0	
Minimum Split (s)	14.5	15.0		14.5	15.0		15.5	17.0		13.5	17.0	
Total Split (s)	20.5	32.0		20.5	32.0		20.5	54.0		13.5	47.0	
Total Split (%)	17.1%	26.7%		17.1%	26.7%		17.1%	45.0%		11.3%	39.2%	
Maximum Green (s)	12.0	25.0		12.0	25.0		13.0	47.0		6.0	40.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	5.5	4.0		5.5	4.0		4.5	3.0		4.5	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	8.5	7.0		8.5	7.0		7.5	7.0		7.5	7.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)	34.7	24.0	42.2	29.2	21.2		45.7	39.7		34.5	28.9	49.8
Actuated g/C Ratio	0.34	0.23	0.41	0.28	0.20		0.44	0.38		0.33	0.28	0.48
v/c Ratio	0.86	0.36	0.13	0.28	0.82		0.44	0.63		0.15	0.80	0.42
Control Delay	54.4	38.9	4.0	25.1	59.1		21.5	31.7		18.1	47.1	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	54.4	38.9	4.0	25.1	59.1		21.5	31.7		18.1	47.1	5.6
LOS	D	D	A	C	E		C	C		B	D	A
Approach Delay		40.1			49.6			29.4			27.1	
Approach LOS		D			D			C			C	
90th %ile Green (s)	12.0	25.0		12.0	25.0		13.0	47.0		6.0	40.0	
90th %ile Term Code	Max	Hold		Max	Max		Max	Hold		Max	Max	
70th %ile Green (s)	12.0	25.5		11.5	25.0		12.1	41.4		6.0	35.3	
70th %ile Term Code	Max	Hold		Gap	Max		Gap	Hold		Max	Gap	
50th %ile Green (s)	12.0	26.1		9.7	23.8		10.6	35.0		6.0	30.4	
50th %ile Term Code	Max	Hold		Gap	Gap		Gap	Hold		Max	Gap	
30th %ile Green (s)	12.0	23.1		8.1	19.2		9.1	41.0		0.0	24.4	
30th %ile Term Code	Max	Hold		Gap	Gap		Gap	Hold		Skip	Gap	
10th %ile Green (s)	12.0	19.6		6.5	14.1		8.0	32.8		0.0	17.3	
10th %ile Term Code	Max	Hold		Gap	Gap		Min	Hold		Skip	Gap	
Queue Length 50th (ft)	129	87	0	48	180		54	272		16	261	29
Queue Length 95th (ft)	#301	170	30	100	#348		93	391		37	390	90
Internal Link Dist (ft)		170			170			520			170	
Turn Bay Length (ft)	150		60	100			200			150		200
Base Capacity (vph)	312	457	826	447	421		349	880		280	734	881
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.86	0.34	0.12	0.25	0.68		0.39	0.52		0.15	0.57	0.42

Intersection Summary

Area Type: Other
Cycle Length: 120

Actuated Cycle Length: 103.5
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 34.4 Intersection LOS: C
Intersection Capacity Utilization 82.2% ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 120
70th %ile Actuated Cycle: 114.4
50th %ile Actuated Cycle: 106.8
30th %ile Actuated Cycle: 94.7
10th %ile Actuated Cycle: 81.4
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Pond Street & Eliot Street

Intersection	
Int Delay, s/veh	0.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	3	1	1	524	573	1
Future Vol, veh/h	3	1	1	524	573	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	150
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	3	1	1	557	610	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1169	610	611	0	-	0
Stage 1	610	-	-	-	-	-
Stage 2	559	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	215	498	978	-	-	-
Stage 1	546	-	-	-	-	-
Stage 2	576	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	215	498	978	-	-	-
Mov Cap-2 Maneuver	215	-	-	-	-	-
Stage 1	545	-	-	-	-	-
Stage 2	576	-	-	-	-	-

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

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	978	-	251	-	-
HCM Lane V/C Ratio	0.001	-	0.017	-	-
HCM Control Delay (s)	8.7	0	19.6	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

LANE SUMMARY

Site: Pond Street at Spyglass Hill Drive No-Build PM

Pond Street at Spyglass Hill Drive
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Pond Street													
Lane 1[d]	572	2.3	960	0.595	100	12.1	LOS B	3.9	100.2	Full	1600	0.0	0.0
Approach	572	2.3		0.595		12.1	LOS B	3.9	100.2				
East: Spyglass Hill Drive													
Lane 1[d]	87	0.0	601	0.145	100	7.7	LOS A	0.5	12.5	Full	1600	0.0	0.0
Approach	87	0.0		0.145		7.7	LOS A	0.5	12.5				
North: Pond Street													
Lane 1[d]	643	3.0	997	0.645	100	13.2	LOS B	4.9	124.8	Full	1600	0.0	0.0
Approach	643	3.0		0.645		13.2	LOS B	4.9	124.8				
West: Shaw's Plaza													
Lane 1[d]	150	1.0	607	0.247	100	9.1	LOS A	0.9	22.8	Full	1600	0.0	0.0
Approach	150	1.0		0.247		9.1	LOS A	0.9	22.8				
Intersection	1452	2.3		0.645		12.0	LOS B	4.9	124.8				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	187	239	102	31	139	20	113	313	56	36	207	140
Future Volume (vph)	187	239	102	31	139	20	113	313	56	36	207	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	16	12	12	10	11	13	13	12	12	11
Storage Length (ft)	150		60	100		0	200		0	150		200
Storage Lanes	1		1	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.981			0.977				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1703	1783	1664	1805	1788	0	1601	1756	0	1687	1712	1459
Flt Permitted	0.416			0.605			0.423			0.450		
Satd. Flow (perm)	746	1783	1664	1150	1788	0	713	1756	0	799	1712	1459
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			113		5			9				146
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		250			250			600			250	
Travel Time (s)		6.8			6.8			9.1			3.8	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Heavy Vehicles (%)	6%	3%	10%	0%	4%	6%	9%	10%	5%	7%	11%	7%
Adj. Flow (vph)	195	249	106	32	145	21	118	326	58	38	216	146
Shared Lane Traffic (%)												
Lane Group Flow (vph)	195	249	106	32	166	0	118	384	0	38	216	146
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	0.85	1.00	1.00	1.09	1.04	0.96	0.96	1.00	1.00	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pt+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	pt+ov

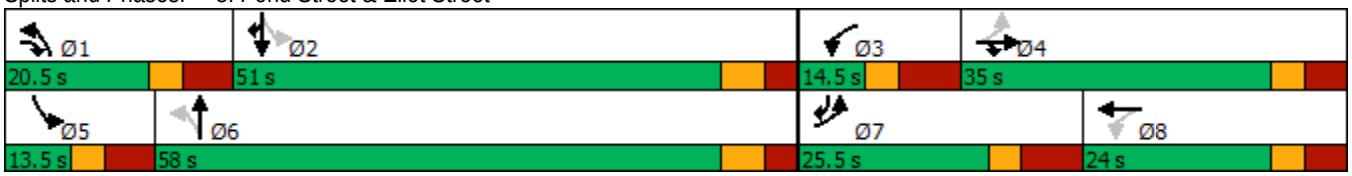
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4	4 1	3	8		1	6		5	2	2 7
Permitted Phases	4			8			6			2		
Detector Phase	7	4	4 1	3	8		1	6		5	2	2 7
Switch Phase												
Minimum Initial (s)	6.0	8.0		6.0	8.0		8.0	10.0		6.0	10.0	
Minimum Split (s)	14.5	15.0		14.5	15.0		15.5	17.0		13.5	17.0	
Total Split (s)	25.5	35.0		14.5	24.0		20.5	58.0		13.5	51.0	
Total Split (%)	21.1%	28.9%		12.0%	19.8%		16.9%	47.9%		11.2%	42.1%	
Maximum Green (s)	17.0	28.0		6.0	17.0		13.0	51.0		6.0	44.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	5.5	4.0		5.5	4.0		4.5	3.0		4.5	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	8.5	7.0		8.5	7.0		7.5	7.0		7.5	7.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)	32.9	26.9	44.6	17.3	12.6		34.2	28.8		24.0	18.4	40.5
Actuated g/C Ratio	0.39	0.32	0.52	0.20	0.15		0.40	0.34		0.28	0.22	0.48
v/c Ratio	0.45	0.44	0.11	0.11	0.62		0.30	0.64		0.13	0.59	0.19
Control Delay	22.9	30.4	3.2	21.0	46.0		18.5	31.6		17.5	37.7	3.0
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	22.9	30.4	3.2	21.0	46.0		18.5	31.6		17.5	37.7	3.0
LOS	C	C	A	C	D		B	C		B	D	A
Approach Delay		22.5			41.9			28.5			23.1	
Approach LOS		C			D			C			C	
90th %ile Green (s)	17.0	28.0		6.0	17.0		13.0	35.5		6.0	28.5	
90th %ile Term Code	Max	Hold		Max	Max		Max	Gap		Max	Hold	
70th %ile Green (s)	15.7	25.5		6.0	15.8		11.1	28.5		6.0	23.4	
70th %ile Term Code	Gap	Hold		Max	Gap		Gap	Gap		Max	Hold	
50th %ile Green (s)	13.2	20.2		6.0	13.0		9.5	23.8		6.0	20.3	
50th %ile Term Code	Gap	Hold		Max	Gap		Gap	Gap		Max	Hold	
30th %ile Green (s)	12.1	31.0		0.0	10.4		8.1	28.4		0.0	12.8	
30th %ile Term Code	Gap	Hold		Skip	Gap		Gap	Hold		Skip	Gap	
10th %ile Green (s)	9.0	25.5		0.0	8.0		8.0	25.5		0.0	10.0	
10th %ile Term Code	Gap	Hold		Skip	Min		Min	Hold		Skip	Min	
Queue Length 50th (ft)	72	120	0	11	82		38	187		12	103	0
Queue Length 95th (ft)	146	225	27	33	172		81	318		32	195	30
Internal Link Dist (ft)		170			170			520			170	
Turn Bay Length (ft)	150		60	100			200			150		200
Base Capacity (vph)	487	619	952	280	371		434	1087		290	911	889
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.40	0.40	0.11	0.11	0.45		0.27	0.35		0.13	0.24	0.16

Intersection Summary

Area Type: Other
Cycle Length: 121

Actuated Cycle Length: 85.2
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.64
Intersection Signal Delay: 26.8
Intersection LOS: C
Intersection Capacity Utilization 68.8%
ICU Level of Service C
Analysis Period (min) 15
90th %ile Actuated Cycle: 105.5
70th %ile Actuated Cycle: 96
50th %ile Actuated Cycle: 86
30th %ile Actuated Cycle: 73.4
10th %ile Actuated Cycle: 65

Splits and Phases: 8: Pond Street & Eliot Street



Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	9	2	2	421	292	5
Future Vol, veh/h	9	2	2	421	292	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	0	0	11	10	0
Mvmt Flow	10	2	2	468	324	6

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	799	327	330	0	-	0
Stage 1	327	-	-	-	-	-
Stage 2	472	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	357	719	1241	-	-	-
Stage 1	735	-	-	-	-	-
Stage 2	632	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	356	719	1241	-	-	-
Mov Cap-2 Maneuver	356	-	-	-	-	-
Stage 1	734	-	-	-	-	-
Stage 2	632	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	14.5	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1241	-	392	-	-
HCM Lane V/C Ratio	0.002	-	0.031	-	-
HCM Control Delay (s)	7.9	0	14.5	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	23	1	1	429	296	13
Future Vol, veh/h	23	1	1	429	296	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	25	1	1	466	322	14

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	797	329	336	0	-	0
Stage 1	329	-	-	-	-	-
Stage 2	468	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	356	712	1223	-	-	-
Stage 1	729	-	-	-	-	-
Stage 2	630	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	356	712	1223	-	-	-
Mov Cap-2 Maneuver	356	-	-	-	-	-
Stage 1	728	-	-	-	-	-
Stage 2	630	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	15.7	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1223	-	364	-	-
HCM Lane V/C Ratio	0.001	-	0.072	-	-
HCM Control Delay (s)	7.9	0	15.7	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

LANE SUMMARY

Site: Pond Street at Spyglass Hill Drive Build AM

Pond Street at Spyglass Hill Drive
Roundabout

Lane Use and Performance

	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Pond Street													
Lane 1[d]	467	9.0	970	0.482	100	9.5	LOS A	2.5	67.8	Full	1600	0.0	0.0
Approach	467	9.0		0.482		9.5	LOS A	2.5	67.8				
East: Spyglass Hill Drive													
Lane 1[d]	91	3.2	660	0.138	100	7.0	LOS A	0.5	12.1	Full	1600	0.0	0.0
Approach	91	3.2		0.138		7.0	LOS A	0.5	12.1				
North: Pond Street													
Lane 1[d]	351	8.0	1014	0.346	100	7.2	LOS A	1.6	41.6	Full	1600	0.0	0.0
Approach	351	8.0		0.346		7.2	LOS A	1.6	41.6				
West: Shaw's Plaza													
Lane 1[d]	45	12.7	690	0.065	100	5.9	LOS A	0.2	5.4	Full	1600	0.0	0.0
Approach	45	12.7		0.065		5.9	LOS A	0.2	5.4				
Intersection	954	8.2		0.482		8.2	LOS A	2.5	67.8				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	261	149	111	114	229	50	142	402	60	42	418	356
Future Volume (vph)	261	149	111	114	229	50	142	402	60	42	418	356
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	16	12	10	10	11	13	13	12	12	11
Storage Length (ft)	150		60	100		0	200		0	150		200
Storage Lanes	1		1	1		0	1		0	1		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.973			0.980				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1687	1837	1812	1787	1684	0	1711	1891	0	1703	1863	1516
Flt Permitted	0.292			0.659			0.213			0.349		
Satd. Flow (perm)	519	1837	1812	1240	1684	0	384	1891	0	626	1863	1516
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			114		8			7				281
Link Speed (mph)		25			25			45			45	
Link Distance (ft)		250			250			600			250	
Travel Time (s)		6.8			6.8			9.1			3.8	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	7%	0%	1%	1%	3%	0%	2%	2%	0%	6%	2%	3%
Adj. Flow (vph)	269	154	114	118	236	52	146	414	62	43	431	367
Shared Lane Traffic (%)												
Lane Group Flow (vph)	269	154	114	118	288	0	146	476	0	43	431	367
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	0.85	1.00	1.09	1.09	1.04	0.96	0.96	1.00	1.00	1.04
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2	1	1	2		1	2		1	2	1
Detector Template	Left	Thru	Right	Left	Thru		Left	Thru		Left	Thru	Right
Leading Detector (ft)	20	100	20	20	100		20	100		20	100	20
Trailing Detector (ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Position(ft)	0	0	0	0	0		0	0		0	0	0
Detector 1 Size(ft)	20	6	20	20	6		20	6		20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA	pt+ov	pm+pt	NA		pm+pt	NA		pm+pt	NA	pt+ov

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Protected Phases	7	4	4 1	3	8		1	6		5	2	2 7
Permitted Phases	4			8			6			2		
Detector Phase	7	4	4 1	3	8		1	6		5	2	2 7
Switch Phase												
Minimum Initial (s)	6.0	8.0		6.0	8.0		8.0	10.0		6.0	10.0	
Minimum Split (s)	14.5	15.0		14.5	15.0		15.5	17.0		13.5	17.0	
Total Split (s)	20.5	32.0		20.5	32.0		20.5	54.0		13.5	47.0	
Total Split (%)	17.1%	26.7%		17.1%	26.7%		17.1%	45.0%		11.3%	39.2%	
Maximum Green (s)	12.0	25.0		12.0	25.0		13.0	47.0		6.0	40.0	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	4.0		3.0	4.0	
All-Red Time (s)	5.5	4.0		5.5	4.0		4.5	3.0		4.5	3.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	8.5	7.0		8.5	7.0		7.5	7.0		7.5	7.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	None		None	None		None	Min		None	Min	
Act Effct Green (s)	34.6	23.9	42.2	29.5	21.4		46.9	40.8		35.4	29.8	50.7
Actuated g/C Ratio	0.33	0.23	0.40	0.28	0.20		0.45	0.39		0.34	0.28	0.48
v/c Ratio	0.88	0.37	0.14	0.29	0.82		0.47	0.64		0.16	0.81	0.42
Control Delay	57.3	39.8	4.9	25.7	60.1		22.3	32.0		18.1	48.2	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	0.0
Total Delay	57.3	39.8	4.9	25.7	60.1		22.3	32.0		18.1	48.2	5.9
LOS	E	D	A	C	E		C	C		B	D	A
Approach Delay		41.1			50.1			29.7			28.2	
Approach LOS		D			D			C			C	
90th %ile Green (s)	12.0	25.0		12.0	25.0		13.0	47.0		6.0	40.0	
90th %ile Term Code	Max	Hold		Max	Max		Max	Hold		Max	Max	
70th %ile Green (s)	12.0	25.0		12.0	25.0		12.5	43.3		6.0	36.8	
70th %ile Term Code	Max	Hold		Max	Max		Gap	Hold		Max	Gap	
50th %ile Green (s)	12.0	26.0		10.1	24.1		11.0	36.7		6.0	31.7	
50th %ile Term Code	Max	Hold		Gap	Gap		Gap	Hold		Max	Gap	
30th %ile Green (s)	12.0	23.1		8.4	19.5		9.4	42.3		0.0	25.4	
30th %ile Term Code	Max	Hold		Gap	Gap		Gap	Hold		Skip	Gap	
10th %ile Green (s)	12.0	19.6		6.6	14.2		8.0	33.5		0.0	18.0	
10th %ile Term Code	Max	Hold		Gap	Gap		Min	Hold		Skip	Gap	
Queue Length 50th (ft)	133	90	0	52	184		59	287		16	277	32
Queue Length 95th (ft)	#301	170	37	106	#348		100	410		37	408	95
Internal Link Dist (ft)		170			170			520			170	
Turn Bay Length (ft)	150		60	100			200			150		200
Base Capacity (vph)	307	450	815	443	416		341	868		274	725	875
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	0
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	0
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	0
Reduced v/c Ratio	0.88	0.34	0.14	0.27	0.69		0.43	0.55		0.16	0.59	0.42

Intersection Summary

Area Type: Other
Cycle Length: 120

Actuated Cycle Length: 104.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 35.2 Intersection LOS: D
Intersection Capacity Utilization 83.2% ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 120
70th %ile Actuated Cycle: 116.3
50th %ile Actuated Cycle: 108.8
30th %ile Actuated Cycle: 96.3
10th %ile Actuated Cycle: 82.2
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Pond Street & Eliot Street

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	4	4	525	574	9
Future Vol, veh/h	10	4	4	525	574	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	11	4	4	559	611	10

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1183	616	621	0	-	0
Stage 1	616	-	-	-	-	-
Stage 2	567	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	211	494	969	-	-	-
Stage 1	543	-	-	-	-	-
Stage 2	572	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	210	494	969	-	-	-
Mov Cap-2 Maneuver	210	-	-	-	-	-
Stage 1	540	-	-	-	-	-
Stage 2	572	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	20.2	0.1	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	969	-	251	-	-
HCM Lane V/C Ratio	0.004	-	0.059	-	-
HCM Control Delay (s)	8.7	0	20.2	-	-
HCM Lane LOS	A	A	C	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	1	1	534	582	25
Future Vol, veh/h	20	1	1	534	582	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	1	1	580	633	27

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	1229	647	660	0	-	0
Stage 1	647	-	-	-	-	-
Stage 2	582	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	196	471	928	-	-	-
Stage 1	521	-	-	-	-	-
Stage 2	559	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	196	471	928	-	-	-
Mov Cap-2 Maneuver	196	-	-	-	-	-
Stage 1	520	-	-	-	-	-
Stage 2	559	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	25.1	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	928	-	202	-	-
HCM Lane V/C Ratio	0.001	-	0.113	-	-
HCM Control Delay (s)	8.9	0	25.1	-	-
HCM Lane LOS	A	A	D	-	-
HCM 95th %tile Q(veh)	0	-	0.4	-	-

LANE SUMMARY

Site: Pond Street at Spyglass Hill Drive Build PM

Pond Street at Spyglass Hill Drive
Roundabout

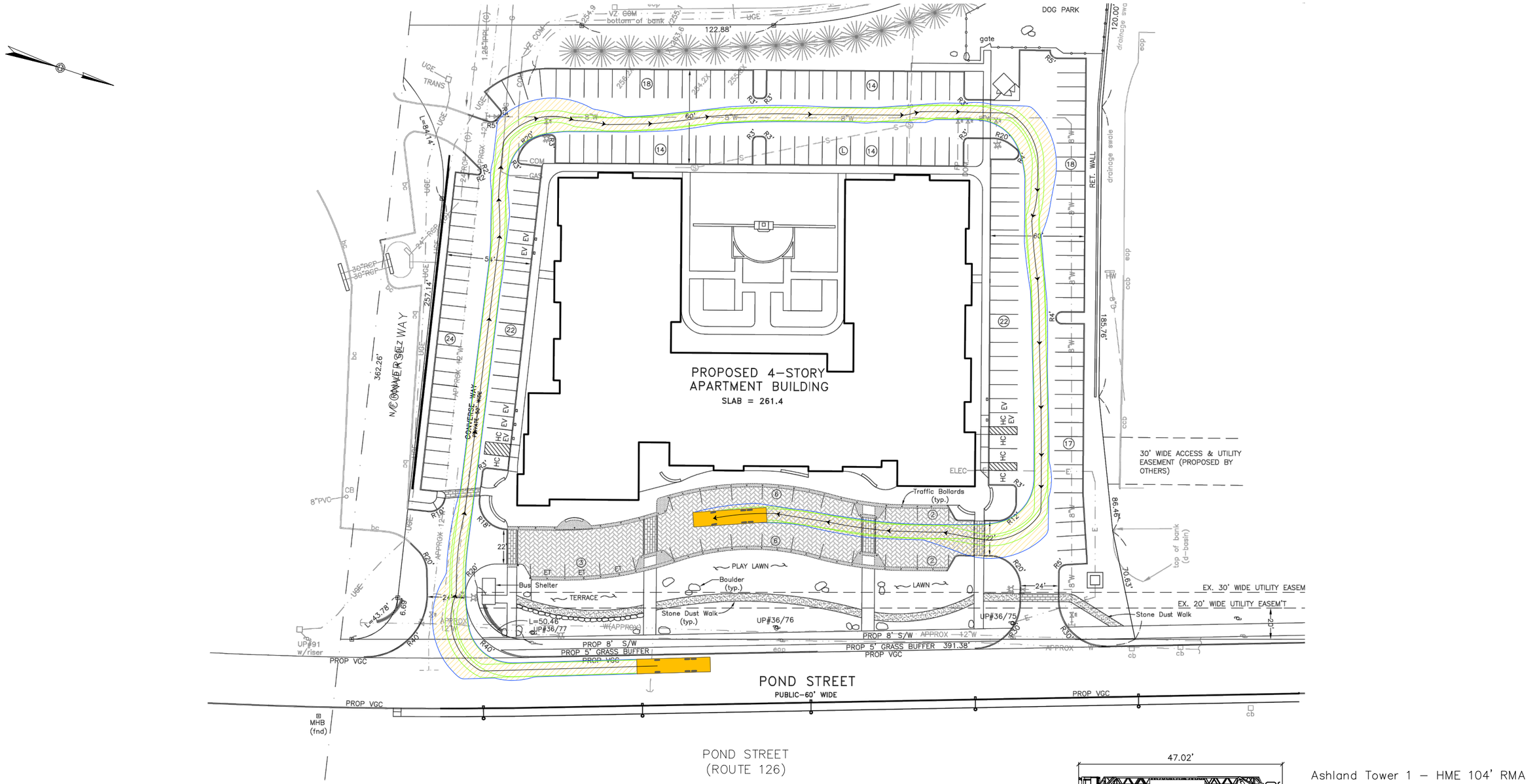
Lane Use and Performance

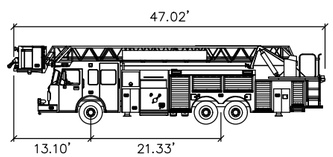
	Demand Flows Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Veh	Dist ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: Pond Street													
Lane 1[d]	601	2.2	960	0.626	100	12.9	LOS B	4.4	111.1	Full	1600	0.0	0.0
Approach	601	2.2		0.626		12.9	LOS B	4.4	111.1				
East: Spyglass Hill Drive													
Lane 1[d]	87	0.0	584	0.149	100	8.0	LOS A	0.5	12.9	Full	1600	0.0	0.0
Approach	87	0.0		0.149		8.0	LOS A	0.5	12.9				
North: Pond Street													
Lane 1[d]	679	3.0	997	0.681	100	14.4	LOS B	5.6	142.3	Full	1600	0.0	0.0
Approach	679	3.0		0.681		14.4	LOS B	5.6	142.3				
West: Shaw's Plaza													
Lane 1[d]	150	1.0	585	0.256	100	9.5	LOS A	0.9	23.5	Full	1600	0.0	0.0
Approach	150	1.0		0.256		9.5	LOS A	0.9	23.5				
Intersection	1517	2.3		0.681		13.0	LOS B	5.6	142.3				

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

□ AutoTURN®





Ashland Tower 1 – HME 104' RMA

Width	: 9.33 FT.
Track	: 8.50 FT.
Lock to Lock Time	: 6.0 SEC.
Steering Angle	: 33.2°

28 Lord Road, Suite 280
Marlborough, MA 01752

Proposed Housing Development

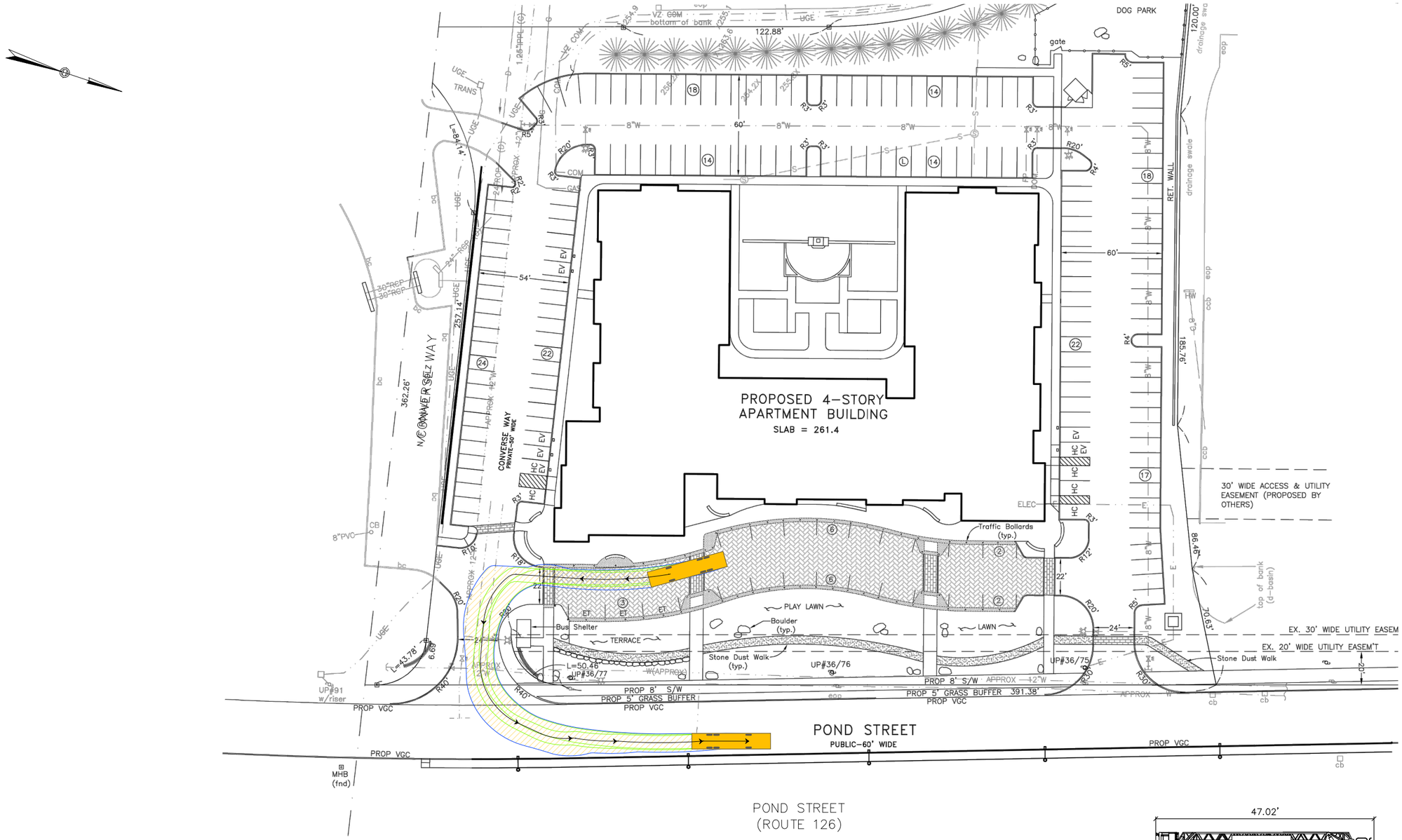
Ashland, Massachusetts

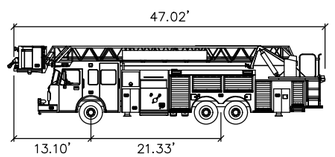
SCALE
0 15 30 60 90 FEET

Exhibit 1
Autoturn Analysis
Ashland Fire Truck

Scale: As Noted
DWG No. 1163 Fig 2-Autoturn (2022-05-05).dwg

Date: May 2022
Project No. 1163





Ashland Tower 1 – HME 104' RMA

Width	: 9.33 FT.
Track	: 8.50 FT.
Lock to Lock Time	: 6.0 SEC.
Steering Angle	: 33.2°

28 Lord Road, Suite 280
Marlborough, MA 01752

Proposed Housing Development

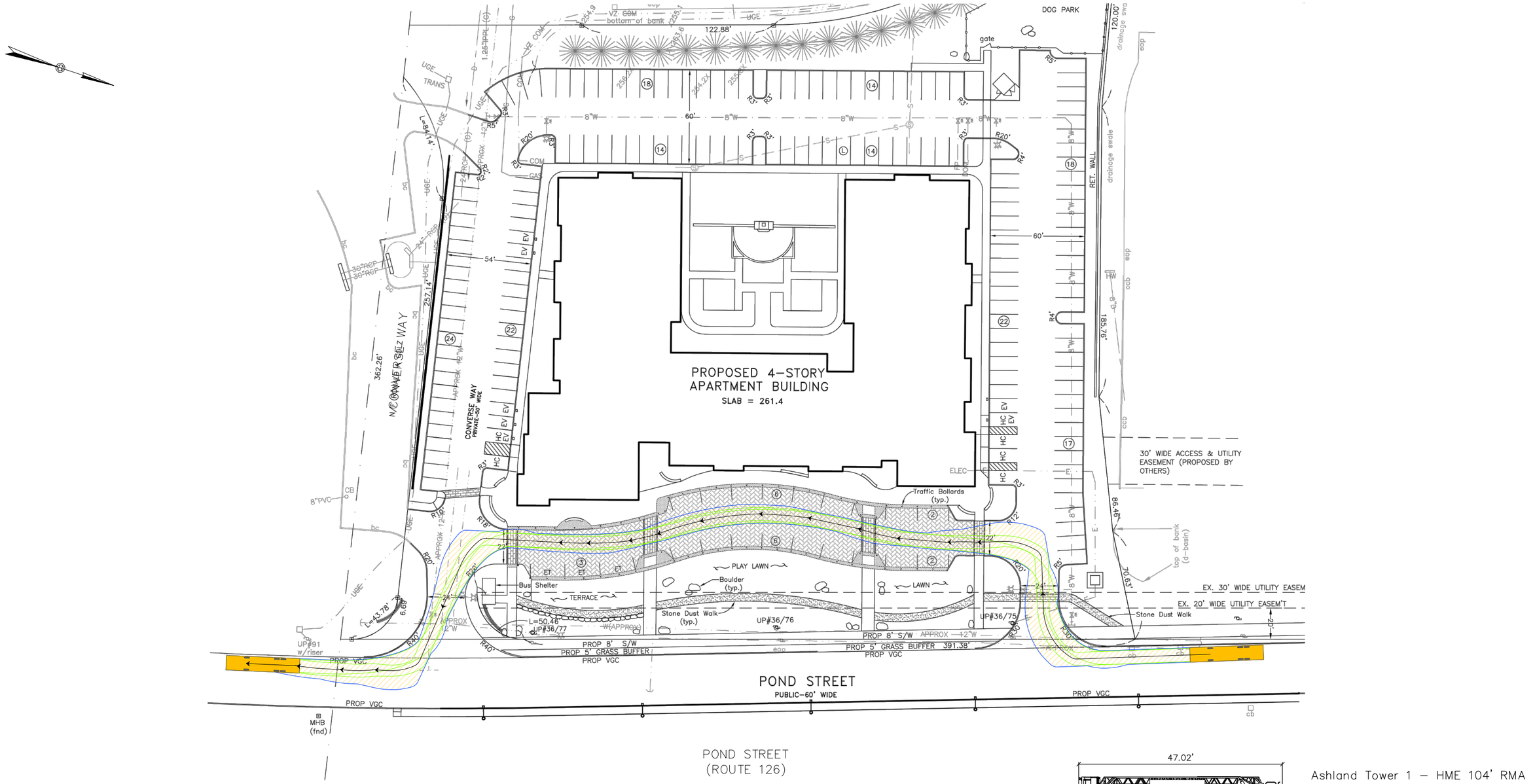
Ashland, Massachusetts

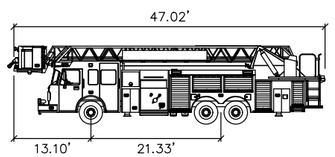
SCALE
0 15 30 60 90 FEET

Exhibit 2
Autoturn Analysis
Ashland Fire Truck

Scale: As Noted
DWG No. 1163 Fig 2-Autoturn (2022-05-05).dwg

Date: May 2022
Project No. 1163





Ashland Tower 1 – HME 104' RMA

Width	: 9.33 FT.
Track	: 8.50 FT.
Lock to Lock Time	: 6.0 SEC.
Steering Angle	: 33.2°

28 Lord Road, Suite 280
Marlborough, MA 01752

Proposed Housing Development

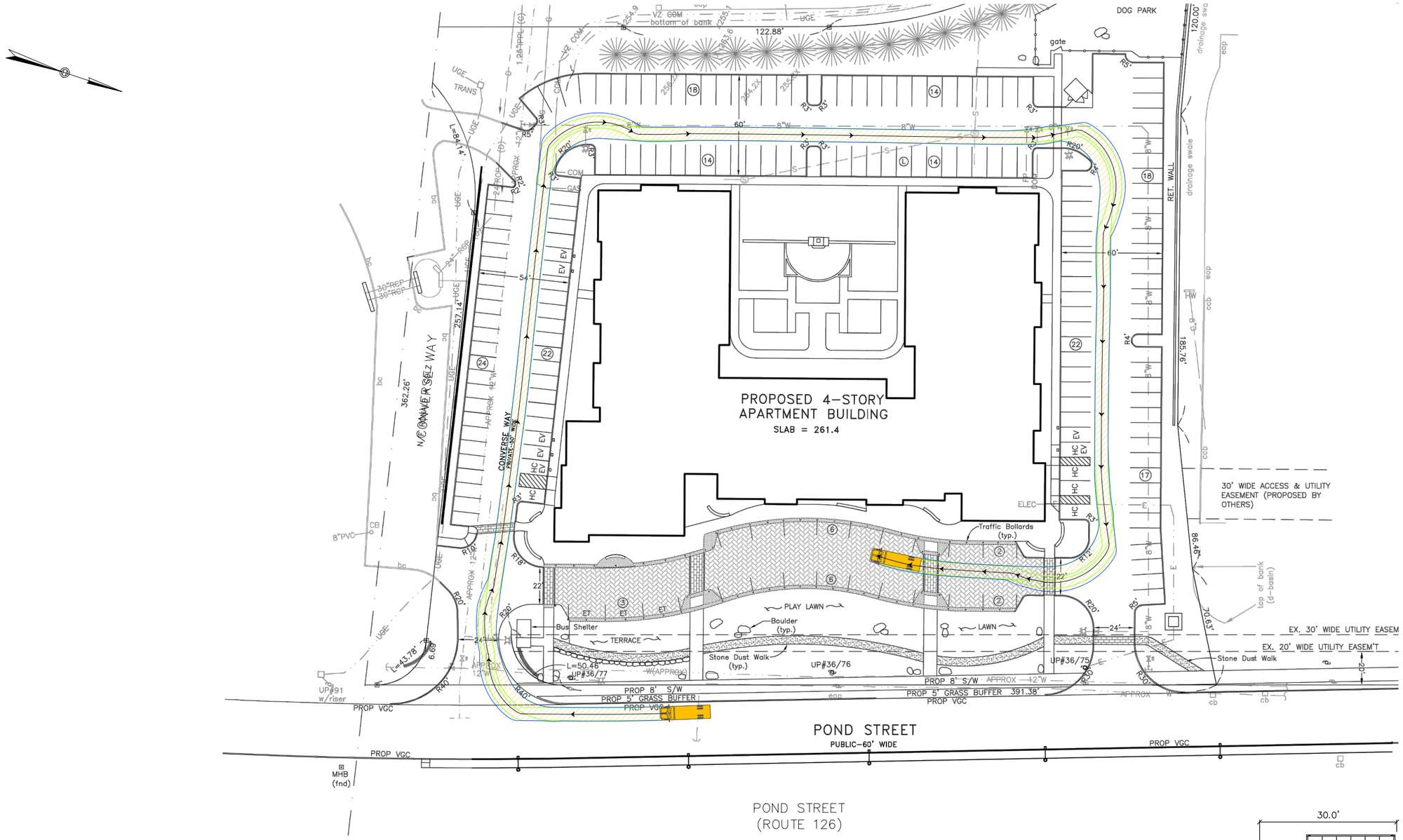
Ashland, Massachusetts

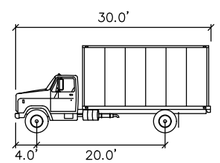
SCALE
0 15 30 60 90 FEET

Exhibit 3
Autoturn Analysis
Ashland Fire Truck

Scale: As Noted
DWG No. 1163 Fig 2-Autoturn (2022-05-05).dwg

Date: May 2022
Project No. 1163





SU-30

Width	: 8.0 FT.
Track	: 8.0 FT.
Lock to Lock Time	: 6.0 SEC.
Steering Angle	: 31.8°

28 Lord Road, Suite 280
Marlborough, MA 01752

Proposed Housing Development

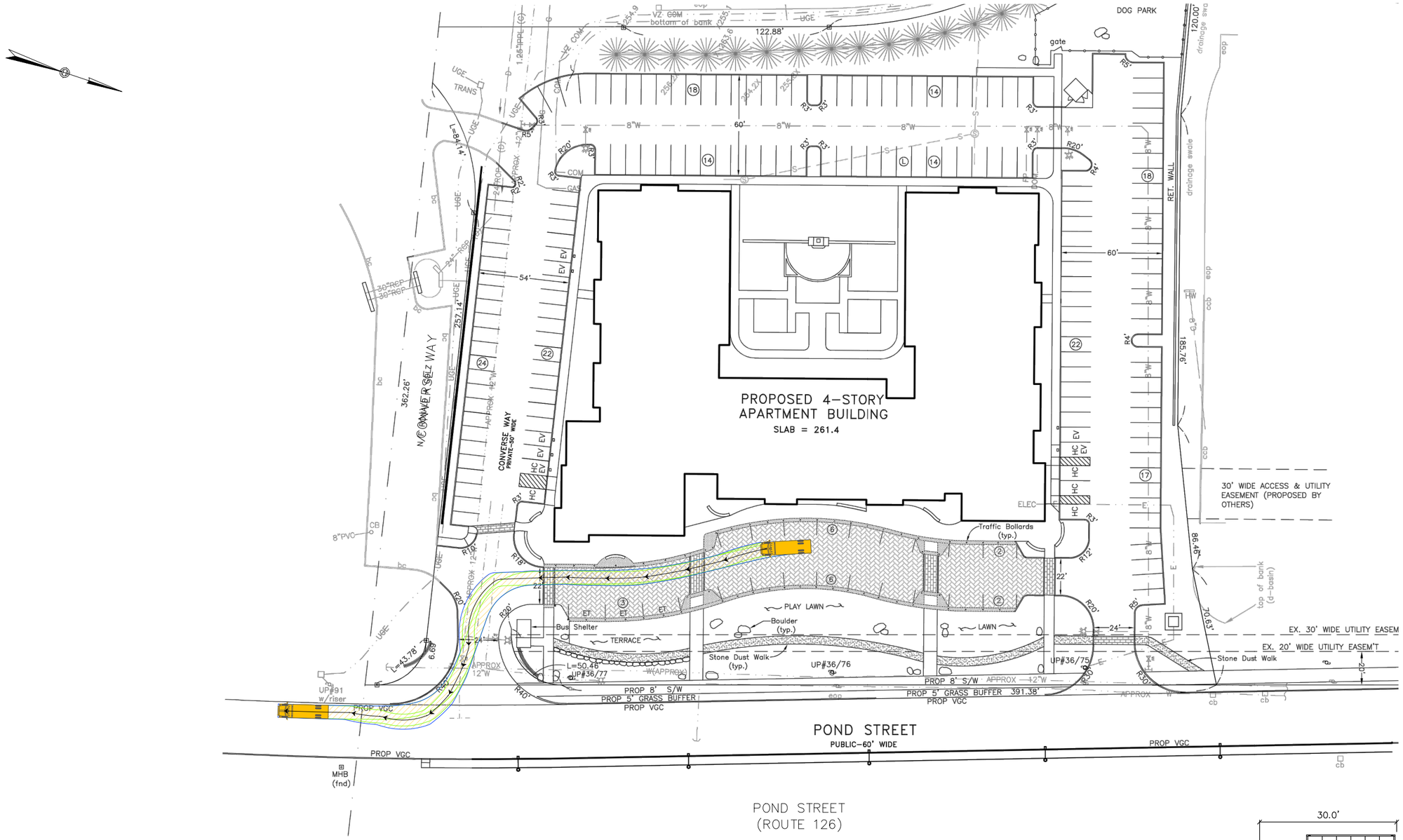
Ashland, Massachusetts

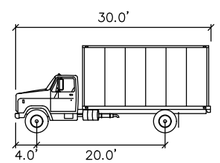
SCALE
0 15 30 60 90 FEET

Exhibit 4
Autoturn Analysis
Single-Unit Truck

Scale: As Noted
DWG No. 1163 Fig 2-Autoturn (2022-05-05).dwg

Date: May 2022
Project No. 1163





SU-30

Width	: 8.0 FT.
Track	: 8.0 FT.
Lock to Lock Time	: 6.0 SEC.
Steering Angle	: 31.8°

28 Lord Road, Suite 280
Marlborough, MA 01752

Proposed Housing Development

Ashland, Massachusetts

SCALE
0 15 30 60 90 FEET

Exhibit 5
Autoturn Analysis
Single-Unit Truck

Scale: As Noted
DWG No. 1163 Fig 2-Autoturn (2022-05-05).dwg

Date: May 2022
Project No. 1163