TRAFFIC EVALUATION

PROPOSED OPEN-SPACE SUBDIVISION

Exeter, New Hampshire

December 2017

Prepared for

Exeter Rose Farm, LLC

**NOT FOR SUBMITTAL
FOR REVIEW
PURPOSES ONLY**

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TRAFFIC EVALUATION
PROPOSED RESIDENTIAL DEVELOPMENT
EXETER, NEW HAMPSHIRE
DECEMBER 15, 2017

DRAFT

Introduction – This evaluation has been prepared for Exeter Rose Farm, LLC to provide the Planning Board and town staff with information regarding the traffic impacts associated with the proposed open-space subdivision, and to address the following specific items requested by town staff:

1. Collect traffic counts at the Forest Street/Wadleigh Street intersection during the Weekday AM peak period (7-9 AM), the Weekday PM peak period (4-6 PM), and the Saturday Midday peak period (11 AM-1 PM).
2. Collect daily traffic counts (on 2 Weekdays and a Saturday) along the neighborhood roads (e.g., Oak Street near Park Street, Summer Street near Water Street, and Summer Street near Park Street).
3. Determine improvements for the Forest Street/Wadleigh Street intersection (e.g., All Way Stop).
4. Describe the impact the proposed development would have on the local roadway network.
5. Qualitative analyses identifying the different travel routes site vehicles could use to reach the major roadway system.
6. Identify the classification of the neighborhood roads to help estimate their capacity (i.e., how much traffic they are designed to carry).
7. Determine whether the neighborhood roadways can absorb the additional traffic from the proposed project.
8. Conduct a field visit to identify posted traffic signs and pavement markings in the vicinity of the site and at the outlets to the major roadways from the neighborhood (e.g., Oak Street near Park Street, Summer Street near Water Street, and Summer Street near Park Street).
9. Determine the design speed for the proposed subdivision road.

To address several of these issues required a trip generation analysis to quantify the volume of traffic that will be generated by the development, and a trip distribution analysis to where subdivision traffic will likely travel to and from.

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Proposed Development – According to the plan entitled "Open Space Overall Subdivision Plan – Exeter Rose Farm," prepared by TFM for Exeter Rose Farm, LLC dated August 15, 2017 (see Appendix A), the proposed development consists of 39 single-family dwelling units. The site is located north of Forest Street and access is proposed via Oak Street Extension and Rose Farm Lane, which will intersect Forest Street directly across from Wadleigh Street. Based on our site inspection, we have prepared two sets of traffic projections: Access Configuration A (two access points) and Access Configuration B (access via Rose Farm Lane, and emergency vehicle access only via Oak Street Extension). Figure 1 shows the location of the site with respect to the area roadway system.

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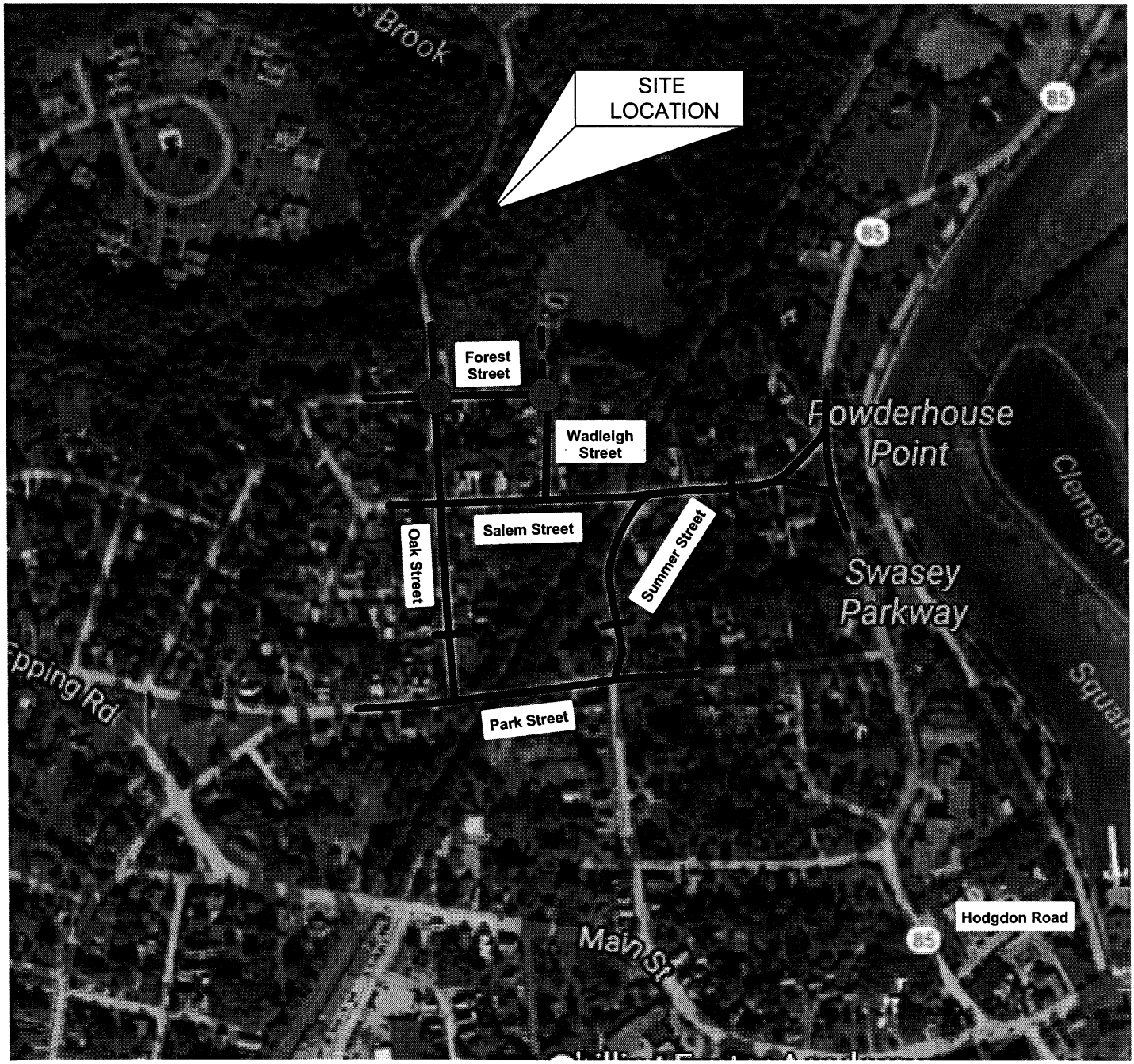

= AUTOMATIC TRAFFIC RECORDER LOCATION (SGP & CO., INC.)

= INTERSECTION TURNING MOVEMENT COUNT LOCATION

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Figure 1

Site Location

Traffic Evaluation, Proposed Residential Development, Exeter, New Hampshire

Existing Conditions – Forest, Wadleigh, Oak, Salem and Summer Streets are all two-lane bi-directional roadways. Spot pavement width measurements in the study area varied accordingly:

- Forest Street: 22 - 29 feet
- Oak Street: 22 - 30 feet
- Oak Street Extension: 15 feet
- Wadleigh Street: 25 feet
- Salem Street: 21 - 28 feet
- Summer Street: 24 - 30 feet
- Walnut Street: 21 - 26 feet

In terms of pavement markings, there is no centerline (double yellow) or edge line (single white) markings in the study area. White stop lines are present on all four approaches to the Oak Street/Forest Street intersection and the Oak Street/Salem Street intersection. A single stop line is present on the Summer Street northbound approach to the Summer Street/Salem Street intersection. Faded stop lines were found on the Summer Street approaches to NH85.

Regulatory signs in the study area include All-Way-Stop-Control (AWSC) at the Oak Street/Forest Street intersection and the Oak Street/Salem Street intersection. Stop sign control is also present on the Summer Street northbound approach to the Salem Street/Summer Street intersection. Yield sign control is present on the Summer Street approaches to NH85 and on the Summer Street westbound approach to Summer Street (confluence). One speed limit sign (25 mph) is present on Summer Street (west of NH85) and it faces westbound motorists.

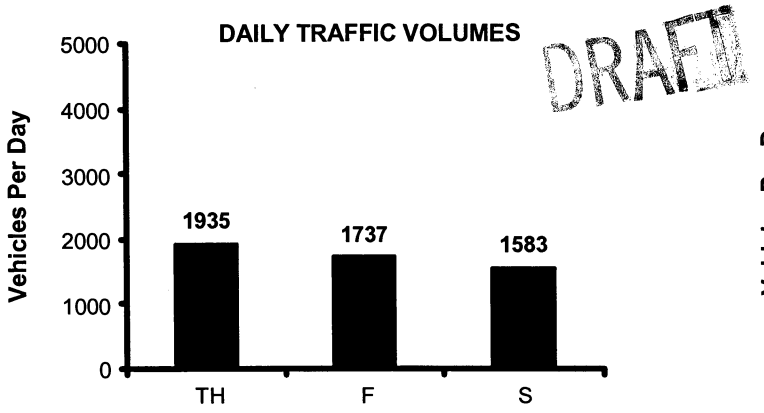
Warning signs in the study area include one railroad crossing sign on Salem Street, two railroad signs on Summer Street, deaf-person signs on Summer Street (vicinity of the Salem Street/Summer Street intersection) and on Oak Street (vicinity of the Park Street/Oak Street intersection). A "turn" sign is also present on the Forest Street approach to Wadleigh Street.

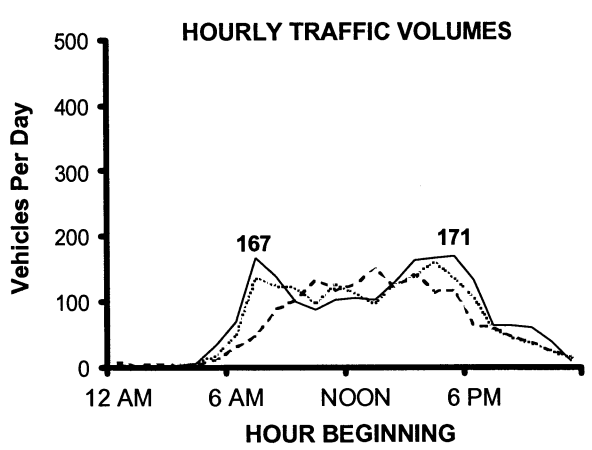
From a traffic engineering standpoint, Summer Street, and to a lesser degree Salem and Oak Streets, are local urban streets that function as "minor collectors" as they serve two functions: they provide access to abutting properties and they carry a small volume of external "through" traffic. Wadleigh Street, Forest Street, and the northerly end of Oak Street function as "local" urban streets as their primary function is to provide access to abutting properties and they exhibit very low traffic volumes.

Existing Traffic Volumes – Automatic traffic recorder counts were conducted on Oak Street and at two locations on Summer Street, at the specific locations requested on two weekdays and a Saturday. Figure 2 summarizes the results for each location and on a daily and hourly basis. The hourly traffic volumes reach peak levels during the typical weekday commuter periods and during the midday on Saturday. Appendix B contains the detail sheets from each traffic recorder.

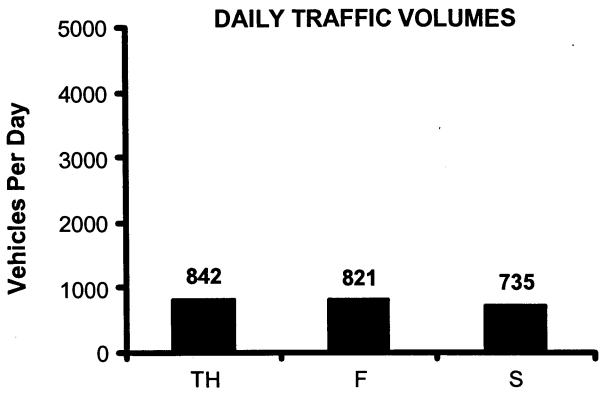
Intersection turning movement counts were conducted at the two requested intersections on Forest Street on a typical weekday (Thursday) during the typical morning and evening commuter periods and during the midday on Saturday. This data is summarized graphically on Figure 3. Appendix C contains the detail sheets for both intersections.

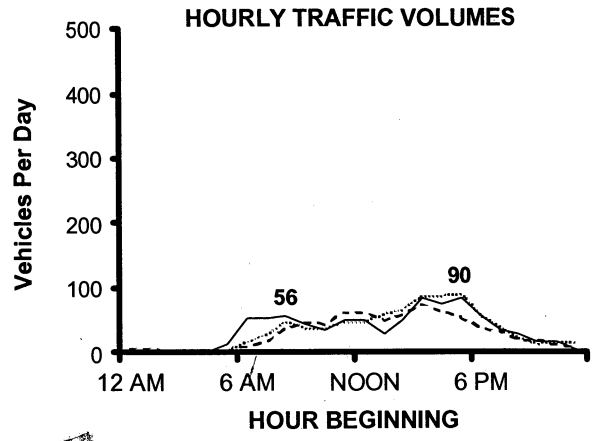
I. Oak Street (North of Park Street)



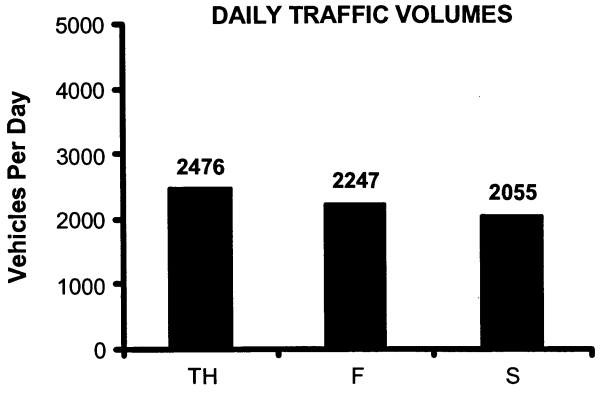


II. Summer Street (North of Park Street)





III. Summer Street (West of Water Street)



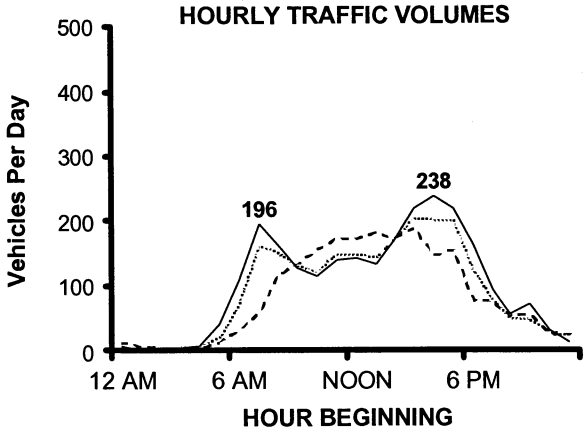


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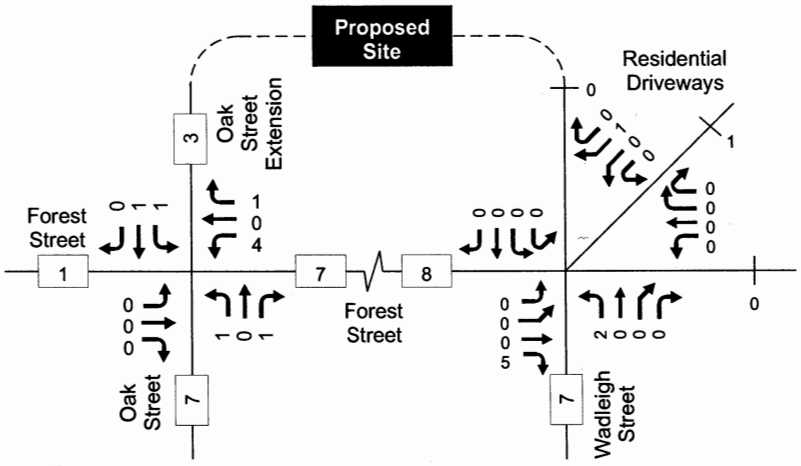
Figure 2

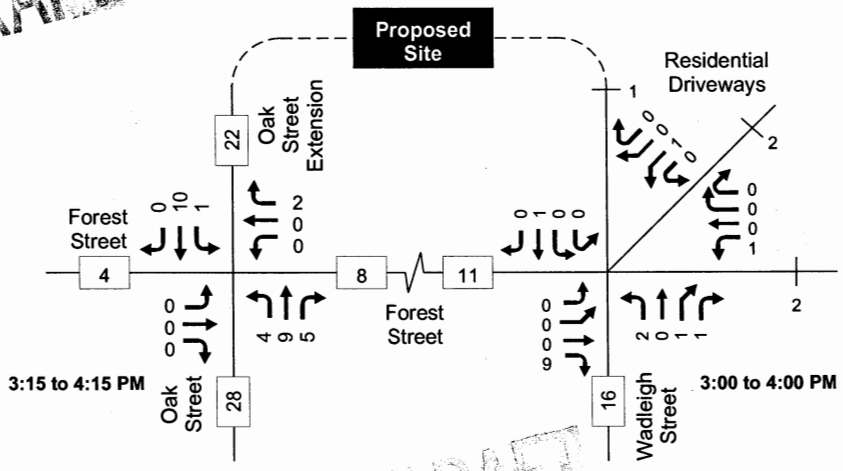
2017 Existing Traffic Volumes - Roadway Volumes

Traffic Evaluation, Proposed Residential Development, Exeter, New Hampshire

AM PEAK HOUR
Thursday, November 9, 2017
7:00 to 8:00 AM



PM PEAK HOUR
Thursday, November 9, 2017
3:00 to 4:00 PM
3:15 to 4:15 PM



SATURDAY PEAK HOUR
Saturday, November 11, 2017
1:00 to 2:00 PM

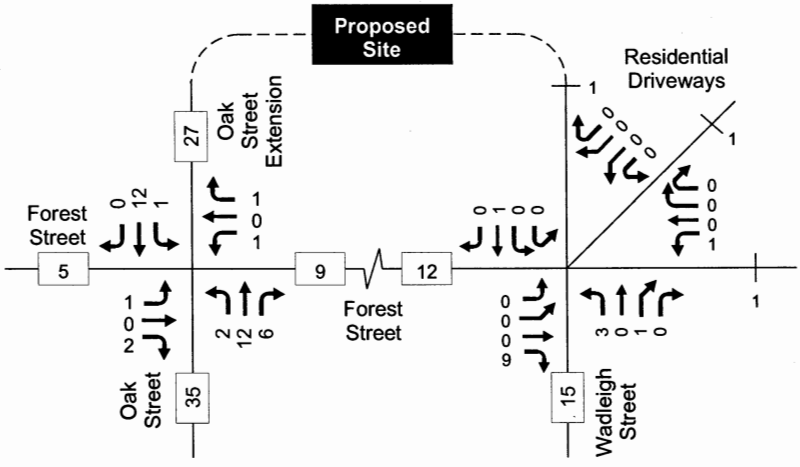


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Figure 3

2017 Existing Traffic Volumes - Intersection Volumes

Traffic Evaluation, Proposed Residential Development, Exeter, New Hampshire

Trip Generation - To estimate the quantity of vehicle-trips that will be produced by the proposed residences, Pernaw & Company, Inc. considered standard trip generation rates and equations published by the Institute of Transportation Engineers[1] (ITE). Land Use Code LUC 210: (Single-Family Detached Housing) is the most applicable category and the number of dwelling units was utilized as the independent variable. The following table summarizes the results of the trip generation analyses using the trip "equation" method. The computations pertaining to the trip generation analyses are found in Appendix D.

Table 1 — Trip Generation Summary (39 Dwelling Units)

Weekday AM Peak Hour	Entering	8 veh
	Exiting	24 veh
	Total	32 trips
Weekday PM Peak Hour	Entering	26 veh
	Exiting	15 veh
	Total	41 trips
Weekday Total	Entering	219 veh
	Exiting	219 veh
	Total	438 trips
Saturday Peak Hour	Entering	28 veh
	Exiting	23 veh
	Total	51 trips
Saturday Total	Entering	203 veh
	Exiting	203 veh
	Total	406 trips

[1] ITE Land Use Code 210: Single-Family Housing, Trip Generation Manual 10th Edition

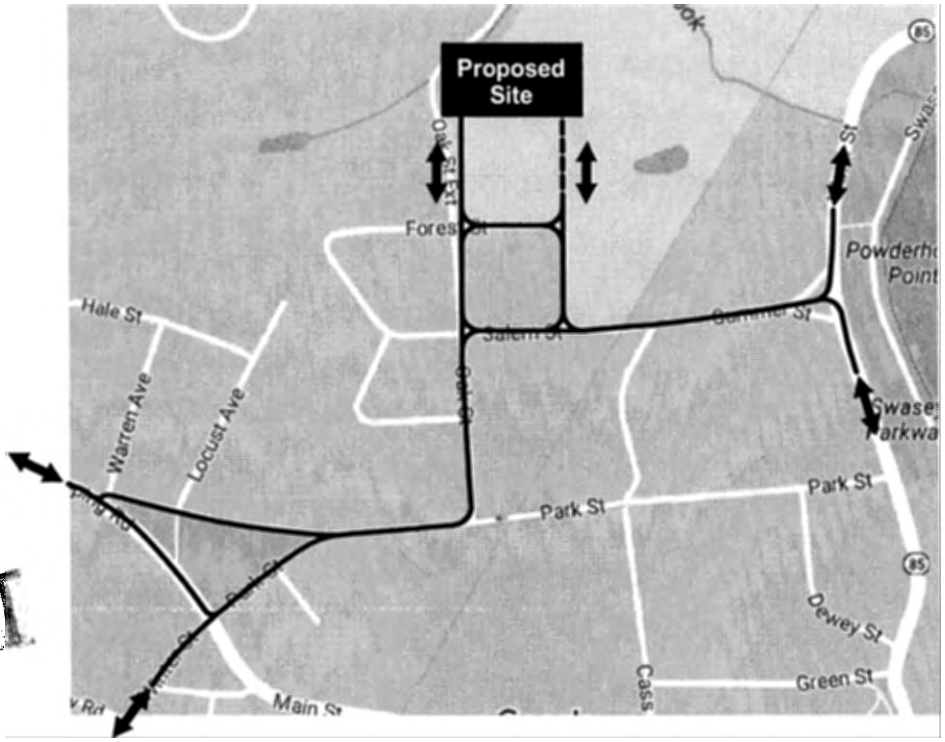
Travel Routes – During the typical commuter periods, the majority of subdivision traffic is expected to travel to and from several "gateways" to the community, including:

- NH108 (north & south)
- NH27 (east & west)
- NH111 (west)
- NH111-A (west)
- NH85 (north)

The primary travel routes between the subject site and these gateways are summarized graphically on Figure 4 for the two access configurations described previously.

[1] Institute of Transportation Engineers, *Trip Generation*, 10th Edition (Washington, D.C., 2017)

Access Configuration A
(Two Full-Access Points)



Access Configuration B
(One Full-Access Point)

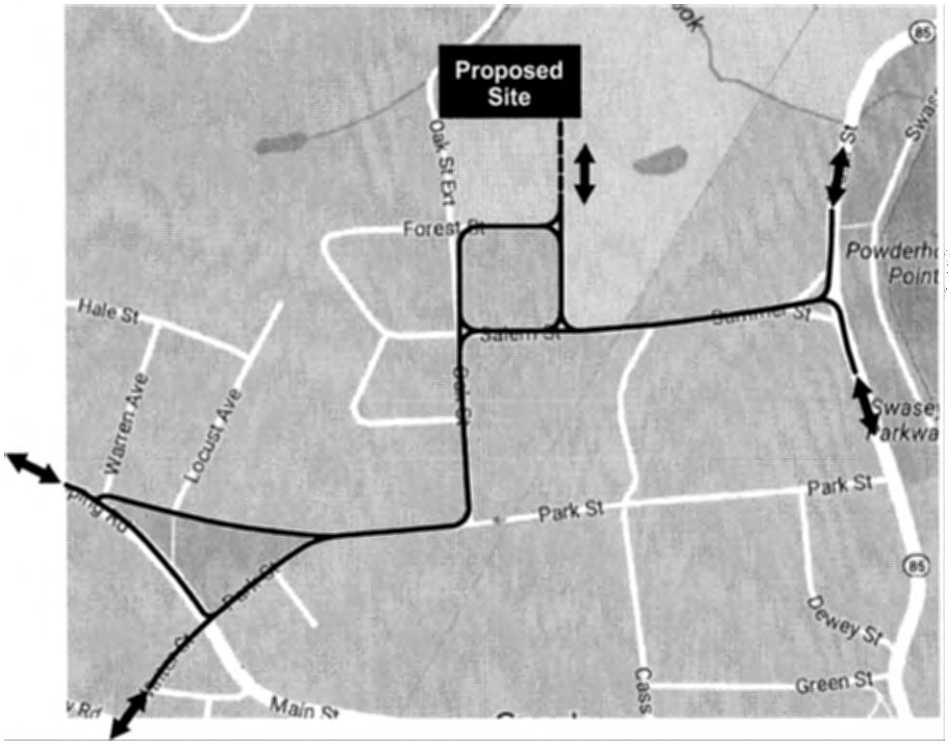


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Figure 4

Primary Travel Routes

Traffic Evaluation, Proposed Residential Development, Exeter, New Hampshire

Trip Distribution – Analysis of journey-to-work data from the US Census indicates that the majority of the subdivision traffic (60%) will travel to/from points east via Salem Street, to reach points north and south via NH85. The remainder (40%) is expected to use Park Street to reach NH27, NH111-A, NH111 and NH108. The following tabulation summarizes the trip distribution patterns for the major gateways to the study area:

• NH108 (south)	10%
• NH27 (east)	10%
• NH27 (west)	10%
• NH111 (west)	15%
• NH111-A (west)	5%
• NH85 (north)	50%
	100%

The diagrams on Figure 5 (Access Configuration A) and Figure 6 (Access Configuration B) combine the results of the trip generation and trip distribution analyses, and "assigns" the peak hour trips to the study area network. These diagrams show that during the highest traffic hour for subdivision traffic (Saturday midday peak hour), the proposed Rose Farm Lane access point is expected to accommodate approximately 38 of the 51 vehicle-trips (75%), with Oak Street Extension accommodating the remaining 25%. Under Access Configuration B, all 51 vehicle-trips will utilize the Wadleigh Street/Forest Street/Rose Farm Lane intersection for access and egress.

Intersection Operations – A capacity and Level of Service analysis of the two study area intersections confirmed that both intersections (Access Configuration A) will operate well below capacity and at Level of Service A during all hours of the day, with the proposed subdivision fully occupied. This means that traffic congestion will not occur, vehicle delays will be minimal, and vehicle queues will be short. Similar findings apply to the Wadleigh Street/Forest Street/Rose Farm Lane intersection under Access Configuration B.

With either access configuration the Forest Street eastbound approach to the intersection should operate under stop sign control, as the "through" movements between Wadleigh Street and Rose Farm Lane constitute the higher volumes. The vehicular volumes projected to enter this intersection fall well below the minimum guidelines for multi-way stop control. Therefore, multi-way stop control is not recommended at the Wadleigh Street/Forest Street/Rose Farm Lane intersection.

Roadway Capacity – A street network in a residential area is comprised of roadway segments and intersections. In the case of this study area, the capacity of the various intersections (stop sign controlled and uncontrolled) in the network is considerably lower than the capacity of the two-lane roadway segments between the intersections. With the roadway widths inventoried previously, roadway capacity is a non-issue. The capacity analyses demonstrate that there is ample intersection capacity to accommodate subdivision traffic at the study area intersections.

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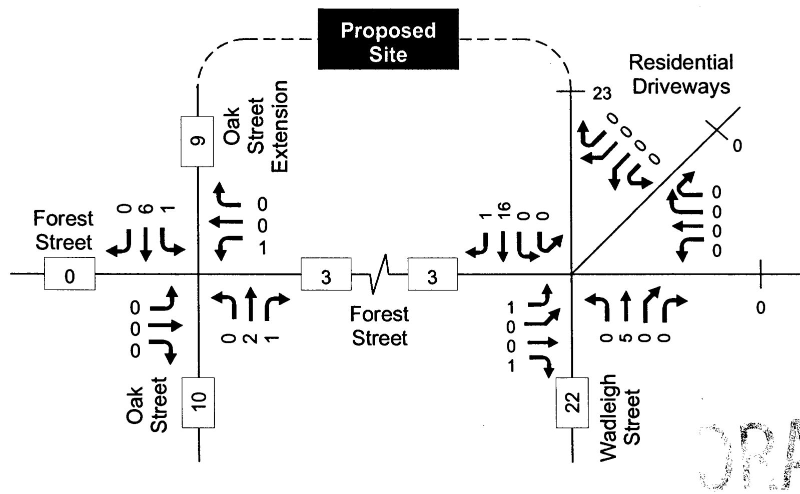
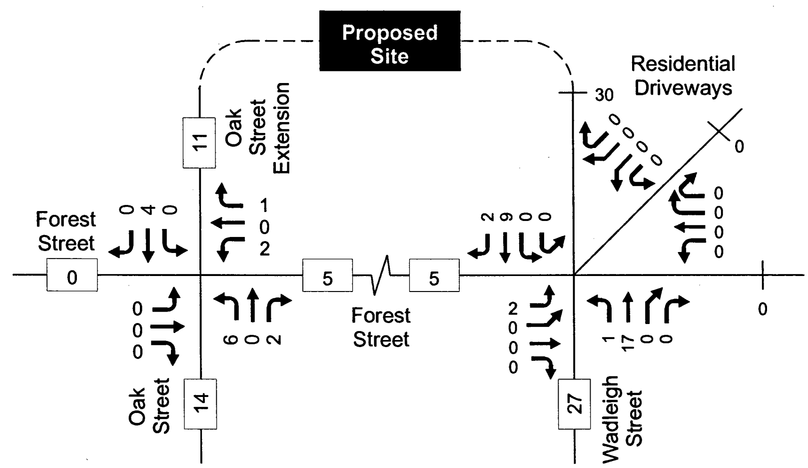
AM PEAK HOUR



PM PEAK HOUR



SATURDAY PEAK HOUR

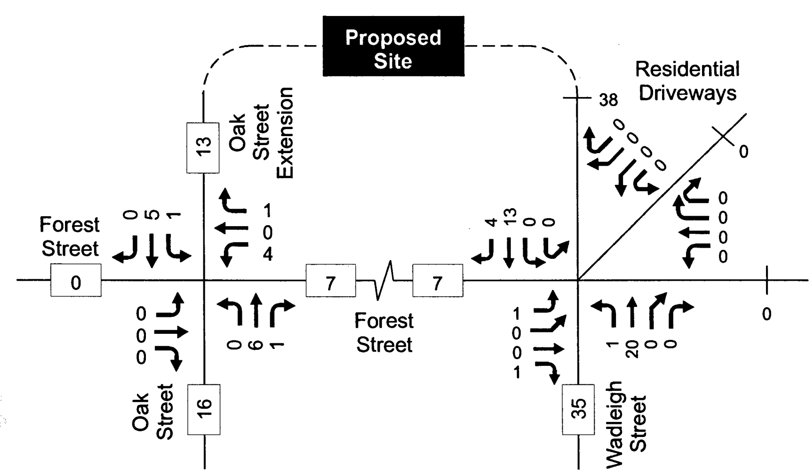


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Figure 5

Site Generated Traffic Volumes - Access Configuration A

Traffic Evaluation, Proposed Residential Development, Exeter, New Hampshire

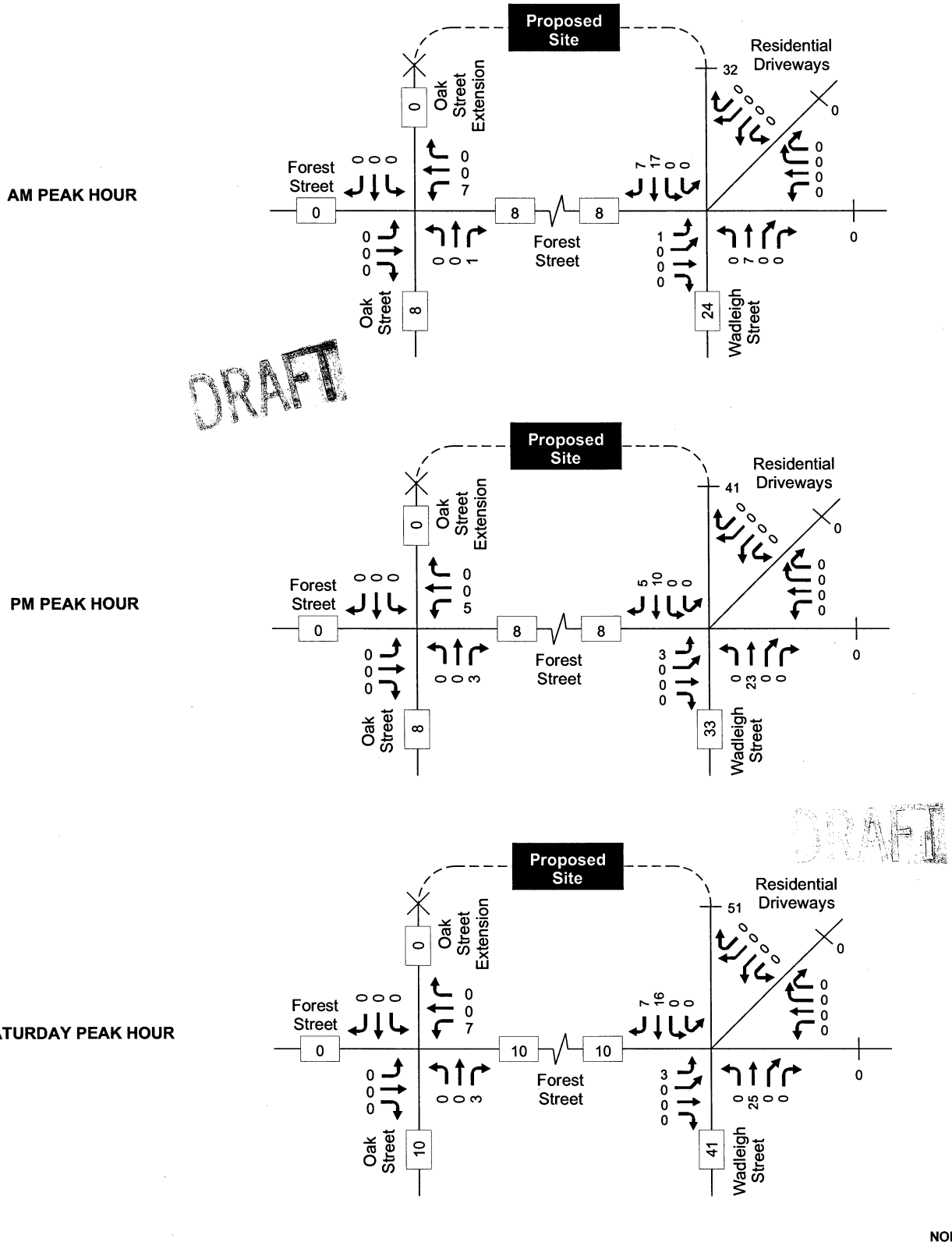

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Figure 6

Site Generated Traffic Volumes - Access Configuration B

Traffic Evaluation, Proposed Residential Development, Exeter, New Hampshire

Findings & Conclusions

1. The trip generation analysis indicates that the proposed residences will generate approximately 32 trips during the AM peak hour, 41 trips during the PM peak hour, and 51 trips during the Saturday midday peak hour when fully occupied. This translates into less than one additional vehicle per minute, on average, during the worst-case peak hour periods.

2. The Wadleigh Street/Forest Street intersection currently carries a very low volume of traffic: approximately 15 vehicles during the weekday and Saturday peak hour periods. Under Access Configuration A (with two points of access to the proposed subdivision) this intersection is expected to carry an additional +30 (PM) and +38 (SAT) vehicles during the peak hour periods. Under Access Configuration B (one point of access) this intersection will accommodate all 41 (PM) and 51 (SAT) vehicles during the peak hour periods. Although the percentage increase is high (due to the low existing volumes), post-development traffic volumes remain relatively low.

3. The impacts to the roadway network are summarized on Figure 5 & 6. The impacts on Oak Street (south of Forest Street) range from 8 to 16 additional vehicles per hour, depending upon the peak hour and Access Configuration. Similarly, the impacts on Wadleigh Street (south of Forest Street) range from 27 to 41 additional vehicles.

4. The capacity and Level of Service analysis confirms that the two study area intersections exhibit ample capacity to absorb the additional subdivision traffic without creating congestion. Vehicle delays and queuing will be minimal at these locations regardless of the access configuration that is implemented. The greatest impact will occur on Wadleigh Street during the Saturday midday peak hour (+41 vehicles) under Access Configuration B. This impact will be dispersed at the Salem Street/Wadleigh Street intersection as subdivision traffic splits between points east and west on Salem Street. Traffic volume increases of this order of magnitude will not significantly alter the prevailing traffic operations at nearby intersections in the study area and on the surrounding roadway network. The impacts of subdivision traffic will diminish further as drivers disperse at nearby intersections.

5. The proposed Wadleigh Street/Forest Street/Rose Farm Lane intersection will operate adequately with one general-purpose lane on each approach. The Forest Street eastbound approach should operate under stop sign control (MUTCD R1-1). The existing "turn" sign on the Forest Street approach should be removed.

6. Since the function of local streets is to provide access to abutting properties, the design elements should encourage speeds of 30 mph or less. Aside from any town ordinances, it is recommended that a 30-40 mph design speed be utilized for the subdivision's internal roadway system, and that these roads be posted at 30 mph.

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APPENDIX

Appendix A	**Open Space Overall Subdivision Plan**
Appendix B	**Automatic Traffic Recorder Counts**
Appendix C	**Intersection Turning Movement Counts**
Appendix D	**Trip Generation Analysis**
Appendix E	**Trip Distribution Analysis**
Appendix F	**Capacity and Level of Service Calculations – Unsignalized**