

**MEMORANDUM**

Ref: 2000A

To: Michael J. Sievert, P.E.  
MJS Engineering, P.C.

From: Stephen G. Pernaw, P.E., PTOE

Subject: Proposed Residential Development  
Durham, New Hampshire

Date: February 21, 2020 (Updated 4/17/20)

---

As requested, Pernaw & Company, Inc. has conducted a trip generation analysis for the proposed residential development located off of Ambler Way in Durham, New Hampshire. The purpose of this updated memorandum is to summarize the results of our trip generation analyses for the revised layout as well as our trip distribution analysis. To summarize:

Proposed Development – According to the plan entitled “*Landscape Plan*,” prepared by MJS Engineering, P.C. for Michael & Martha Mulhern (see Attachment 1), the proposed residential development will consist of thirteen age-restricted (55+) dwelling units constructed along two separate cul-de-sac roadways. It is our understanding that at least 80% of the units are required to be age-restricted; meaning that up to three units could be unrestricted in terms of age.

The site is located on the east side of Ambler Way at its intersection with Gerrish Drive. Access to the proposed development will be provided via a two-way site access road that will extend easterly from the Ambler Way/Gerrish Drive intersection.

Trip Generation - To estimate the quantity of vehicle-trips that will be produced by the proposed residential development, Pernaw & Company, Inc. considered standard trip generation rates published by the Institute of Transportation Engineers<sup>1</sup> (ITE). Land Use Code 251 (Senior Adult Housing–Detached) and Land Use Code 210 (Single-Family Detached Housing) are the most applicable categories for the subject site and the number of dwelling units was utilized as the independent variable. The average “trip rate” method was utilized given the relatively small size of the development.

The following table summarizes the results of the trip generation analyses for two occupancy scenarios (100% and 80% age-restricted units). The computations pertaining to the trip generation analyses are attached (see Attachments 2 & 3).

---

<sup>1</sup> Institute of Transportation Engineers, *Trip Generation*, 10<sup>th</sup> Edition (Washington, D.C., 2017)

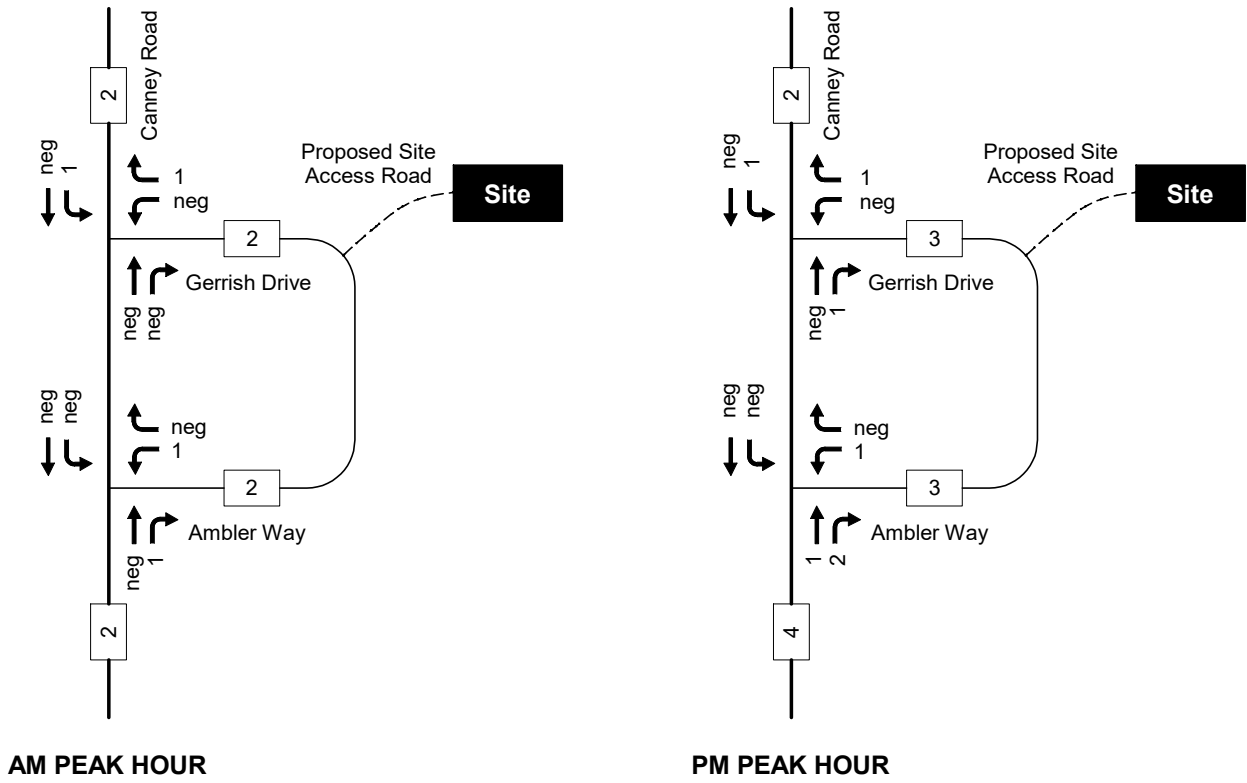
**Table 1** **Trip Generation Summary / Comparison**

		CASE A		CASE B <sup>2</sup>	
		100% Age-Restricted <sup>1</sup> (13 Dwelling Units)	80% Age-Restricted <sup>1</sup> (10 Dwelling Units)	Conventional <sup>2</sup> (3 Dwelling Units)	Total
<b>Weekday Total</b>					
	Entering	28 veh	22 veh	14 veh	36 veh
	Exiting	<u>28 veh</u>	<u>22 veh</u>	<u>14 veh</u>	<u>36 veh</u>
	Total	56 trips	44 trips	28 trips	72 trips
<b>Weekday AM Peak Hour</b>					
	Entering	1 veh	1 veh	1 veh	2 veh
	Exiting	<u>2 veh</u>	<u>1 veh</u>	<u>1 veh</u>	<u>2 veh</u>
	Total	3 trips	2 trips	2 trips	4 trips
<b>Weekday PM Peak Hour</b>					
	Entering	2 veh	2 veh	2 veh	4 veh
	Exiting	<u>2 veh</u>	<u>1 veh</u>	<u>1 veh</u>	<u>2 veh</u>
	Total	4 trips	3 trips	3 trips	6 trips
<b>Saturday Total</b>					
	Entering	18 veh	14 veh	15 veh	29 veh
	Exiting	<u>18 veh</u>	<u>14 veh</u>	<u>15 veh</u>	<u>29 veh</u>
	Total	36 trips	28 trips	30 trips	58 trips
<b>Saturday Peak Hour</b>					
	Entering	1 veh	1 veh	2 veh	3 veh
	Exiting	<u>2 veh</u>	<u>1 veh</u>	<u>1 veh</u>	<u>2 veh</u>
	Total	3 trips	2 trips	3 trips	5 trips

<sup>1</sup>ITE Land Use Code 251- Senior Adult Housing - Detached (Trip Rate Method due to Independent Variable Size)

<sup>2</sup>ITE Land Use Code 210 - Single-Family Detached Housing (Trip Rate Method due to Independent Variable Size)

This table shows that the proposed residences are estimated to generate approximately 4 vehicle-trips (1 arrival, 3 departures) during the weekday AM peak hour, and 6 vehicle-trips (4 arrivals, 2 departures) during the weekday PM peak hour. It should be noted that site traffic will be immediately dispersed at the site entrance as one group will utilize Gerrish Drive for access and the remainder will utilize Ambler Way, depending upon the driver's origin or destination. Figure 1 shows the anticipated travel patterns in the immediate study area for the higher of the two cases. The trip distribution analysis is summarized on Attachment 4.



AM PEAK HOUR

PM PEAK HOUR



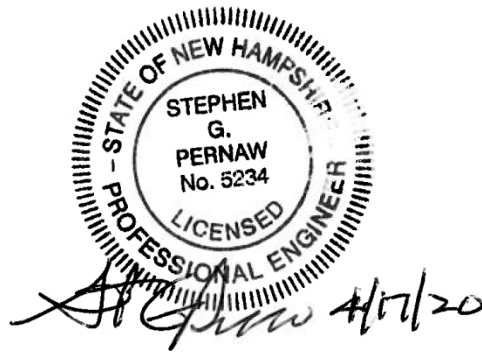
**Figure 1**

**Site Generated Traffic Volumes**  
*Traffic Evaluation, Proposed Residential Development, Durham, New Hampshire*

### Findings & Conclusions

1. Access to the proposed development is proposed via a two-way site access road that will extend from the Gerrish Drive/Ambler Way intersection.
2. The trip generation analysis indicates that the proposed development will generate approximately 4 (AM) and 6 (PM) during the worst-case peak hour periods.
3. Site traffic is expected to be split equally between Gerrish Drive and Ambler Way. This means each roadway will accommodate only +3 vehicles over a one-hour period (PM peak hour). This translates into one additional vehicle every 20 minutes, on average.
4. Traffic increases of this order of magnitude will not significantly impact traffic operations at nearby intersections.
5. Development sites that generate fewer than 500 vehicles per day are generally considered to be “low-volume” traffic generators. Clearly, the proposed development is not a major traffic generator.
6. The proposed site access road approach to Gerrish Drive/Ambler Way should operate under STOP sign control (MUTCD R1-1), and include the installation of an 18-inch white stop line. As an option, the access road could be delineated with a four-inch double-yellow centerline to separate ingress and egress vehicles.

### Attachments



## **ATTACHMENTS**



### Trip Generation Summary

Alternative: Alternative 1  
 Phase:  
 Project: 2000A 041720  
 Open Date: 4/16/2020  
 Analysis Date: 4/16/2020

ITE	Land Use	Weekday Average Daily Trips			Weekday AM Peak Hour of Adjacent Street Traffic			Weekday PM Peak Hour of Adjacent Street Traffic		
		* Enter	Exit	Total	* Enter	Exit	Total	* Enter	Exit	Total
210	SFHOUSE 1	14	14	28	1	1	2	2	1	3
3	Dwelling Units									
251	SENIORDETACHED 2	22	21	43	1	1	2	2	1	3
10	Dwelling Units									
251	SENIORDETACHED 1	28	28	56	1	2	3	2	2	4
13	Dwelling Units									
Unadjusted Volume		64	63	127	3	4	7	6	4	10
Internal Capture Trips		0	0	0	0	0	0	0	0	0
Pass-By Trips		0	0	0	0	0	0	0	0	0
Volume Added to Adjacent Streets		64	63	127	3	4	7	6	4	10

Total Weekday Average Daily Trips Internal Capture = 0 Percent

Total Weekday AM Peak Hour of Adjacent Street Traffic Internal Capture = 0 Percent

Total Weekday PM Peak Hour of Adjacent Street Traffic Internal Capture = 0 Percent

\* - Custom rate used for selected time period.

## Trip Generation Summary

Alternative: Alternative 1

Phase:

Open Date: 4/16/2020

Project: 2000A 041720

Analysis Date: 4/16/2020

ITE	Land Use	Saturday Average Daily Trips			Saturday Peak Hour of Generator				
		*	Enter	Exit	Total	*	Enter	Exit	Total
210	SFHOUSE 1 3 Dwelling Units		15	<del>14</del> 15	<del>29</del> 30		2	1	3
251	SENIORDETACHED 2 10 Dwelling Units		14	<del>13</del> 14	<del>27</del> 28		1	1	2
251	SENIORDETACHED 1 13 Dwelling Units		18	<del>17</del> 18	<del>35</del> 36		1	2	3
Unadjusted Volume			47	44	91		4	4	8
Internal Capture Trips			0	0	0		0	0	0
Pass-By Trips			0	0	0		0	0	0
Volume Added to Adjacent Streets			47	44	91		4	4	8

Total Saturday Average Daily Trips Internal Capture = 0 Percent

Total Saturday Peak Hour of Generator Internal Capture = 0 Percent

\* - Custom rate used for selected time period.

Source: Institute of Transportation Engineers, Trip Generation Manual 10th Edition

TRIP GENERATION 10, TRAFFICWARE, LLC

P. 1



**TRIP DISTRIBUTION ANALYSIS**

**A. Work Destination Report - Where Workers are Employed Who Live in the Selection Area - by County Subdivisions**

To/From	Count	Jobs Counts by County Subdivisions Where Workers are Employed - All Jobs				Gateway %				Gateway Allocation	
		North		South		North		South		North	South
		Canney Rd	Canney Rd	Canney Rd	Canney Rd	Canney Rd	Canney Rd	Canney Rd	Canney Rd	Canney Rd	Canney Rd
Durham town (Strafford, NH)	628	0.40	0.60	0.40	0.60	251	377	251	377	628	
Portsmouth city (Rockingham, NH)	416	0.40	1.00	0	416	0	416	0	416	416	
Dover city (Strafford, NH)	309	0.90	0.60	124	185	124	185	124	185	309	
Manchester city (Hillsborough, NH)	191	0.90	0.10	172	19	172	19	172	19	191	
Nashua city (Hillsborough, NH)	147	0.90	0.10	132	15	132	15	132	15	147	
Exeter town (Rockingham, NH)	143	0.20	1.00	0	143	0	143	0	143	143	
Salem town (Rockingham, NH)	121	1.00	0.80	24	97	24	97	24	97	121	
Concord city (Merrimack, NH)	87	1.00	0.90	87	0	87	0	87	0	87	
Rochester city (Strafford, NH)	86	0.10	1.00	9	77	9	77	9	77	86	
Boston city (Suffolk, MA)	77			0	77	0	77	0	77	77	
	2204			799	1406	799	1406	799	1406	2205	
				36.2%	63.8%	36.2%	63.8%	36.2%	63.8%	100%	
				35		65		100			