

MEMORANDUM

TOWN OF HANOVER
2018 AUG -2 AM 11: 12

TO: Mr. Mark McSharry
McSharry Brothers, Inc.
P.O. Box 206
Abington, MA 02351

FROM: Mr. Jeffrey S. Dirk, P.E., PTOE, FITE
Principal
Vanasse & Associates, Inc.
35 New England Business Center Drive
Suite 140
Andover, MA 01810-1066
(978) 269-6830
jdirk@rdva.com

JSD

DATE: May 16, 2018

RE: 7926

SUBJECT: Proposed Warehouse/Storage Facility
Winter Street
Hanover, Massachusetts

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in support of the proposed warehouse/storage facility to be located between 273 and 301 Winter Street in Hanover, Massachusetts (hereafter referred to as the "Project"). This assessment provides an existing conditions context for the Project with regard to its interface with the transportation infrastructure and includes: i) traffic volume projections for the Project; ii) an assessment of potential impacts; iii) a review of lines of sight at the proposed access roadway; and iv) recommendations with regard to the design and operation of the driveway that will serve the Project.

Based on this evaluation, we have determined that the Project represents less than a 2.0 percent increase in traffic along the Winter Street corridor on an average weekday, a level of impact that would not result in a material impact (increase) on motorist delays or vehicle queueing over current conditions. Further, lines of sight to and from the Project site driveway intersection with Winter Street exceed the recommended minimum distance for safe and efficient operation based on the measured speed of traffic approaching the driveway. Accordingly and with implementation of the recommendations provided herein, we have concluded that the transportation infrastructure affords sufficient capacity to accommodate the Project in a safe and efficient manner.

The following details our assessment of the Project.

PROJECT DESCRIPTION AND EXISTING CONDITIONS CONTEXT

Project Description

The Project will entail the construction of a warehouse/storage facility to be located between 273 and 301 Winter Street in Hanover, Massachusetts. As proposed, the Project will entail the construction of seven (7) liner buildings encompassing 48,000 ± square feet (sf) of space that will be demised to accommodate approximately 33 storage units for use by contractors or others for the storage of goods and materials. The Project site consists of approximately 6.50 ± acres of land that is bounded by commercial properties and areas of open and wooded space to the north and south; Winter Street and commercial



properties to the east; and areas of open and wooded space and low-lying wetland areas under the conservancy of the Town of Hanover Conservation Commission to the west. Access to the Project site will be provided by way of a new driveway that will intersect the west side of Winter Street approximately 280 feet north of Birch Drive. On-site parking will be provided for 102 vehicles in marked spaces.

Existing Conditions Context

Winter Street is a two-lane, urban collector roadway that is under the jurisdiction of the Town of Hanover and traverses a general north-south alignment between Liberty Street in Hanson and Circuit Street in Hanover. In the vicinity of the Project site, Winter Street is approximately 24-feet in width (paved area) and provides two 11-foot wide travel lanes separated by a double-yellow centerline with 1-foot wide marked shoulders provided. Sidewalks are not provided along Winter Street within the study area and Winter Street does not provide sufficient width (combined travel lane and shoulder) to support bicycle travel in a shared traveled-way configuration.¹

Traffic volume data measured in May 2018 indicates that Winter Street in the vicinity of the Project site accommodates approximately 3,735 vehicles per day on an average weekday (two-way, 24-hour volume). A posted speed limit is not provided along Winter Street within the study area and, as such, the regulated or “prima facie” travel speed pursuant to M.G.L. Chapter 90, Section 17 is 30 miles per hour (mph).² Prevailing travel speeds of 40 mph were measured in the vicinity of the Project site over a 72-hour period in May 2018.³

A review of the MassDOT statewide High Crash Location List did not indicate any listed locations in the immediate vicinity of the Project site or along the Winter Street corridor.

Regularly scheduled public transportation services are not currently provided along Winter Street or to the Town of Hanover. The Greater Attleborough-Taunton Regional Transit Authority (GATRA) does provide demand response (Dial-A-Ride) transit services for people with disabilities and seniors within the Town.

PROJECT-GENERATED TRAFFIC

In order to determine the traffic characteristics of the Project, trip-generation methodologies established by the Institute of Transportation Engineers (ITE)⁴ were used. The ITE provides trip-generation information for various types of land uses developed as a result of scientific studies that have been conducted over the past 50 plus years, the most recent update of which was published in September 2017. As proposed, the Project will consist of seven (7) liner buildings encompassing 48,000 = sf of space that will be demised to accommodate approximately 33 storage units for use by contractors or others for the storage of goods and materials. Based on the defined characteristics of the Project and a review of the ITE trip-generation database, ITE Land Use Code (LUC) 151, *Mini-Warehouse*, was determined to be the most appropriate land use to develop the traffic characteristics of the Project.

¹ A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared traveled-way condition.

² The “prima facie” speed is defined in M.G.L. Chapter 90, Section 17, as the speed which would be deemed reasonable and proper to operate a motor vehicle.

³ The prevailing travel speed is also known as the 85th percentile travel speed and is the speed at which 85 percent of the observed vehicles were found to travel at or below during the observation period.

⁴ *Trip Generation*, 10th Edition; Institute of Transportation Engineers; Washington, DC; 2017.

Table 1 summarizes the trip-generation calculations for the Project using the above methodology.

Table 1
TRIP GENERATION SUMMARY
PROPOSED STORAGE FACILITY

Time Period/Direction	Vehicle Trips
	Proposed Storage Facility (48,000 sf) ^a
<i>Average Weekday Daily:</i>	
Entering	36
<u>Exiting</u>	<u>36</u>
Total	72
<i>Weekday Morning Peak Hour:</i>	
Entering	3
<u>Exiting</u>	<u>2</u>
Total	5
<i>Weekday Evening Peak Hour:</i>	
Entering	4
<u>Exiting</u>	<u>4</u>
Total	8

^aBased on ITE LUC 151, *Mini-Warehouse*.

Project-Generated Traffic Summary

As can be seen in Table 1, the Project is expected to generate approximately 72 vehicle trips on an average weekday (two-way, 24-hour volume, or 36 vehicles entering and 36 exiting), with 5 vehicle trips (3 vehicles entering and 2 exiting) expected during the weekday morning peak-hour and 8 vehicle trips (4 vehicles entering and 4 exiting) expected during the weekday evening peak-hour. *When dispersed over the course of the day and the respective peak hours, the Project represents a relatively minor increase in traffic to the Winter Street corridor (less than 2.0 percent on an average weekday) and would not be expected to result in a material increase in motorist delays or vehicle queuing over existing conditions.* Traffic volumes associated with the Project on a weekend will be similar to or lower than those on a weekday.

SIGHT DISTANCE ASSESSMENT

Sight distance measurements were performed at the Project site driveway intersection with Winter Street in accordance with MassDOT and American Association of State Highway and Transportation Officials (AASHTO)⁵ requirements. Both stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. ISD or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an on-coming vehicle and safely complete a turning or crossing maneuver with on-coming traffic. In accordance with AASHTO standards, if the measured ISD is at least equal to the required SSD value for the appropriate design speed, the intersection can operate in a safe manner. Table 2 presents the measured SSD and ISD at the subject intersections.

Table 2
SIGHT DISTANCE MEASUREMENTS^a

Intersection Sight Distance Measurement	Feet		
	Required Minimum (SSD)	Desirable (ISD) ^b	Measured
<i>Winter Street at the Project Site Driveway</i>			
<i>Stopping Sight Distance:</i>			
Winter Street approaching from the north	305	--	650–
Winter Street approaching from the south	305	--	649
<i>Intersection Sight Distance:</i>			
Looking to the north from the Project Site Driveway	305	385–445	650–
Looking to the south from the Project Site Driveway	305	385–445	650–

^aRecommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2011; and based on an approach speed of 40 mph along Winter Street.

^bValues shown are the intersection sight distance for a vehicle turning right/left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed.

As can be seen in Table 2, the available sight lines at the Project site driveway intersection with Winter Street were found to exceed the recommended minimum sight distance for the intersection to function in a safe (SSD) and efficient (ISD) manner based on a 40 mph approach speed along Winter Street, which is consistent with the measured prevailing travel speed (40 mph) and is 10 mph above the regulated or “prima facie” speed limit (30 mph).

⁵*A Policy on Geometric Design of Highway and Streets*, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); Washington D.C.; 2011.

SUMMARY

VAI has prepared a TIA in support of the proposed warehouse/storage facility to be located between 273 and 301 Winter Street in Hanover, Massachusetts. This assessment has provided an existing conditions context for the Project with regard to its interface with the transportation infrastructure and included: i) traffic volume projections for the Project; ii) an assessment of potential impacts; iii) a review of lines of sight at the proposed access roadway; and iv) recommendations with regard to the design and operation of the driveway that will serve the Project, a discussion of which follows.

Based on this evaluation, we have determined that the Project represents less than a 2.0 percent increase in traffic along the Winter Street corridor on an average weekday, a level of impact that would not result in a material impact (increase) on motorist delays or vehicle queueing over current conditions. Further, lines of sight to and from the Project site driveway intersection with Winter Street exceed the recommended minimum distance for safe and efficient operation based on the measured speed of traffic approaching the driveway. Accordingly, we have concluded that the transportation infrastructure affords sufficient capacity to accommodate the Project in a safe and efficient manner. This conclusion is predicated on implementation of the following specific recommendations that should be advanced as a part of the Project:

1. The Project site driveway should be a minimum of 24-feet in width or as required to accommodate the turning and maneuvering requirements of a tractor semi-trailer combination (WB-62 minimum design vehicle), a single-unit truck (SU-30/40 design vehicle) and the largest anticipated responding emergency vehicle as defined by the Town of Hanover Fire Department.
2. Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP-line provided.
3. All signs and pavement markings to be installed within the Project site shall conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).⁶
4. Signs and landscape features to be installed within the site triangle areas of the Project site driveway shall be designed and maintained so as not to restrict lines of sight.
5. Snow windrows along the Project site frontage on Winter Street within the sight triangle areas of the Project site driveway shall be promptly removed where such accumulations would inhibit sight lines.

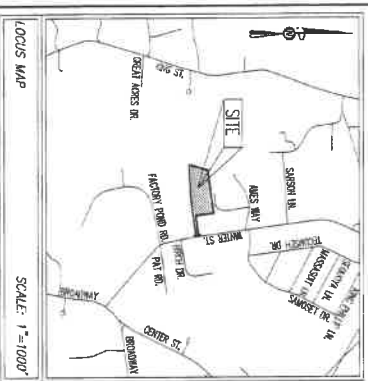
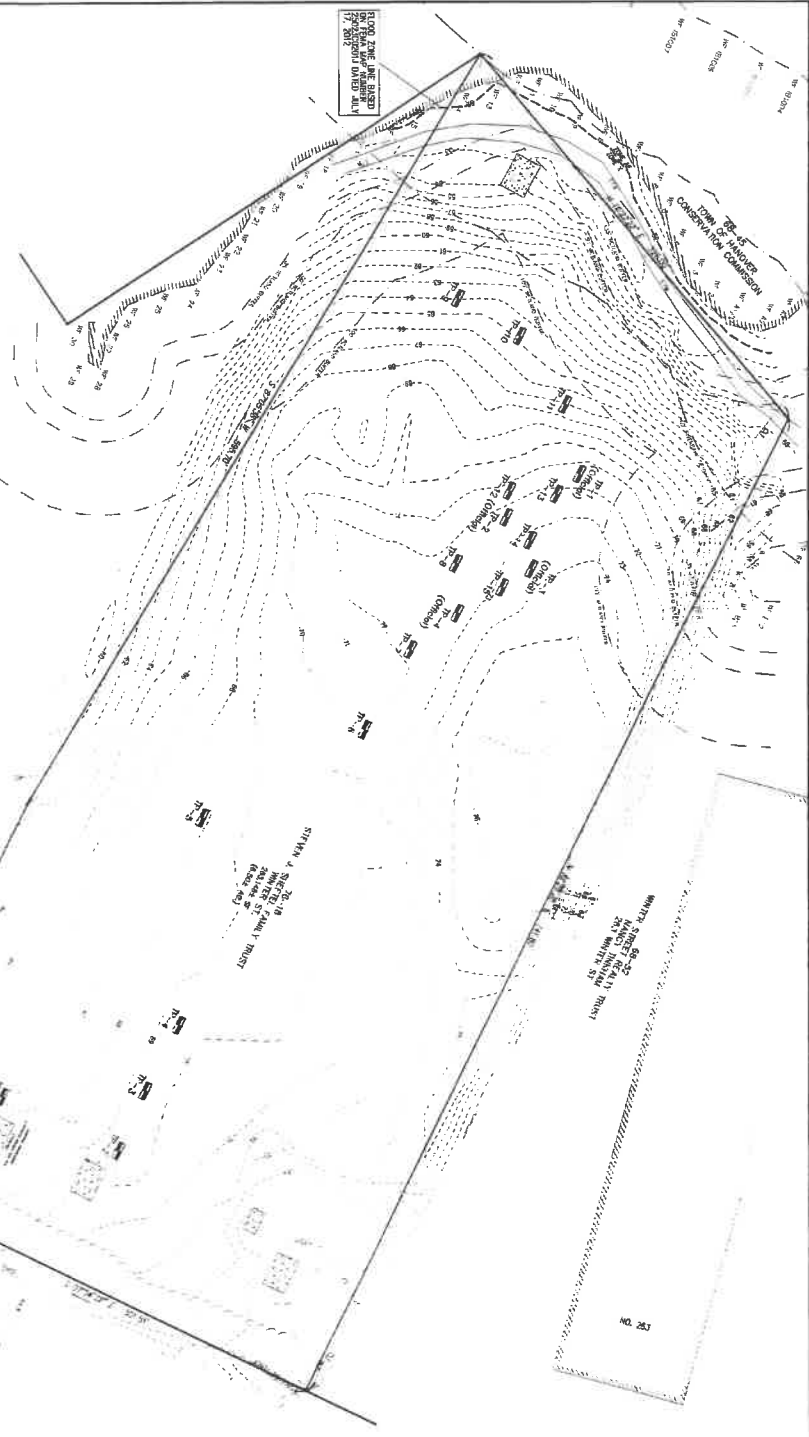
With implementation of the above recommendations, safe and efficient access can be provided to the Project site and the Project can be accommodated within the confines of the existing transportation infrastructure.

cc: File

⁶*Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009.



SITE PLAN



- SURVEY NOTES:**
1. THE SURVEY WAS MADE ON THE GROUND IN PRESENCE OF 2017 BY LOCATOR ENGINEERING GROUP, INC. IN ACCORDANCE WITH THE MASSACHUSETTS REGULATION.
 2. ELEVATIONS SHOWN ARE REFERENCED TO THE NORTH AMERICAN DATUM (NAD83).
 3. THE LAND RECORDS DEPARTMENT HAS REVIEWED THIS PLAN AND HAS NO OBJECTION TO THE SUBDIVISION.
 4. THE SUBDIVISION IS SUBJECT TO THE EXISTING EASEMENTS AND ENCUMBRANCES.
 5. THE PROPERTY SHOWN HEREON IS LOCATED IN ZONE A, ZONE Y OF THE CITY OF ROCKLAND, MASSACHUSETTS.
 6. THE PROPERTY SHOWN HEREON IS LOCATED IN ZONE A, ZONE Y OF THE CITY OF ROCKLAND, MASSACHUSETTS.
 7. THE PROPERTY SHOWN HEREON IS LOCATED IN ZONE A, ZONE Y OF THE CITY OF ROCKLAND, MASSACHUSETTS.
 8. THE PROPERTY SHOWN HEREON IS LOCATED IN ZONE A, ZONE Y OF THE CITY OF ROCKLAND, MASSACHUSETTS.
 9. THE PROPERTY SHOWN HEREON IS LOCATED IN ZONE A, ZONE Y OF THE CITY OF ROCKLAND, MASSACHUSETTS.
 10. THE PROPERTY SHOWN HEREON IS LOCATED IN ZONE A, ZONE Y OF THE CITY OF ROCKLAND, MASSACHUSETTS.



- LEGEND**
- 1. LOT
 - 2. LOT
 - 3. LOT
 - 4. LOT
 - 5. LOT
 - 6. LOT
 - 7. LOT
 - 8. LOT
 - 9. LOT
 - 10. LOT
 - 11. LOT
 - 12. LOT
 - 13. LOT
 - 14. LOT
 - 15. LOT
 - 16. LOT
 - 17. LOT
 - 18. LOT

- LEGEND**
- 1. LOT
 - 2. LOT
 - 3. LOT
 - 4. LOT
 - 5. LOT
 - 6. LOT
 - 7. LOT
 - 8. LOT
 - 9. LOT
 - 10. LOT
 - 11. LOT
 - 12. LOT
 - 13. LOT
 - 14. LOT
 - 15. LOT
 - 16. LOT
 - 17. LOT
 - 18. LOT

OWNERS/APPLICANT:
MC SHARRY BROS.
 7 LEAH DRIVE
 ROCKLAND, MASSACHUSETTS

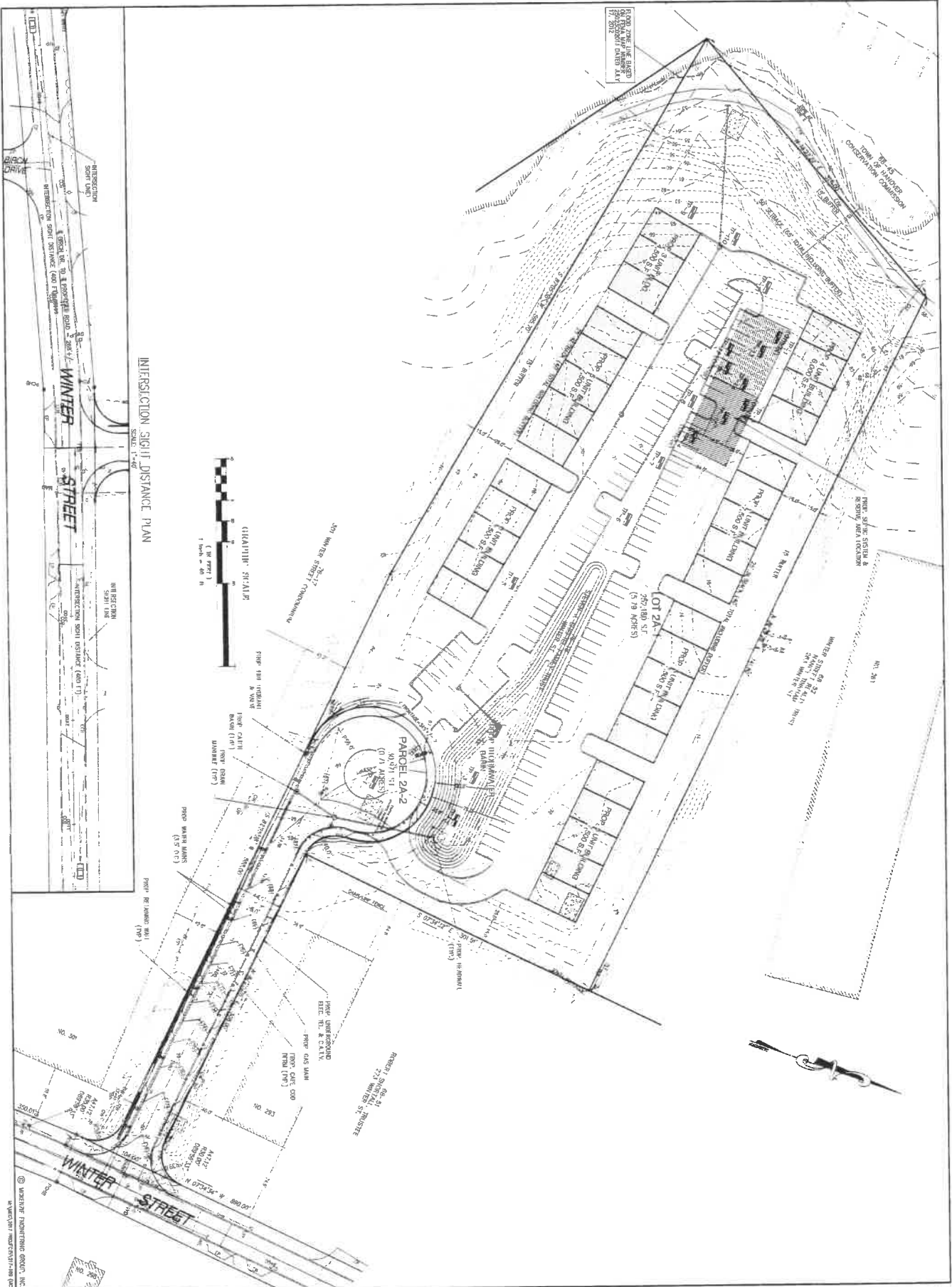
EXISTING CONDITIONS

NOT FOR CONSTRUCTION

PRELIMINARY SUBDIVISION PLAN (ASSESSOR'S MAP 76, LOT 18) WINTER STREET HANOVER, MASSACHUSETTS

McKenzie Engineering Group, Inc.
 PROFESSIONAL CIVIL ENGINEERS AND LAND SURVEYORS
 150 LONGVIEW DRIVE
 ROCKLAND, MA 01866
 PHONE: (978) 762-3333
 FAX: (978) 762-3333

REV	DATE	DESCRIPTION	BY	APP
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				



REV	DATE	DESCRIPTION	BY	APP
1	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC
2	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC
3	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC
4	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC
5	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC
6	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC
7	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC
8	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC
9	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC
10	1/1/2012	PRELIMINARY SUBDIVISION PLAN	MC	MC

REV	DATE	DESCRIPTION	BY	APPROVED BY
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TRAFFIC COUNTS

Accurate Counts

978-664-2565

Page 1

Location : Winter Street
Location : North of Birch Drive
City/State: Hanover, MA

7926VOL1

Start Time	5/2/2018 Wed	SB		Hour Totals		NB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		8	35			0	25				
12:15		2	31			2	26				
12:30		1	28			0	37				
12:45		1	18	12	112	0	37	2	125	14	237
01:00		1	32			2	23				
01:15		1	19			2	18				
01:30		0	19			0	28				
01:45		0	18	2	88	2	12	6	81	8	169
02:00		0	12			0	20				
02:15		0	25			1	15				
02:30		0	40			0	18				
02:45		0	28	0	105	0	17	1	70	1	175
03:00		0	40			1	29				
03:15		0	37			1	23				
03:30		0	55			0	27				
03:45		0	60	0	192	4	31	6	110	6	302
04:00		3	58			1	20				
04:15		4	44			3	29				
04:30		2	41			11	22				
04:45		4	55	13	198	18	27	33	98	46	296
05:00		2	60			18	30				
05:15		5	43			11	22				
05:30		10	40			25	30				
05:45		16	37	33	180	37	24	91	106	124	286
06:00		14	31			31	20				
06:15		12	26			46	15				
06:30		17	43			62	19				
06:45		26	22	69	122	60	24	199	78	268	200
07:00		26	20			63	19				
07:15		25	18			54	14				
07:30		19	16			59	15				
07:45		28	19	98	73	65	18	241	66	339	139
08:00		21	25			44	14				
08:15		27	7			55	9				
08:30		25	5			47	9				
08:45		24	13	97	50	45	6	191	38	288	88
09:00		11	14			31	4				
09:15		18	8			29	5				
09:30		20	6			26	6				
09:45		23	13	72	41	24	3	110	18	182	59
10:00		21	10			29	7				
10:15		21	9			20	11				
10:30		18	4			28	5				
10:45		24	2	84	25	20	4	97	27	181	52
11:00		20	5			25	4				
11:15		36	1			27	0				
11:30		20	4			30	4				
11:45		21	4	97	14	33	1	115	9	212	23
Total		577	1200			1092	826			1669	2026
Percent		32.5%	67.5%			56.9%	43.1%			45.2%	54.8%

Accurate Counts

978-664-2565

Location : Winter Street
Location : North of Birch Drive
City/State: Hanover, MA

7926VOL1

Start Time	5/3/2018 Thu	SB		Hour Totals		NB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		7	25			0	30				
12:15		2	14			1	27				
12:30		0	34			0	27				
12:45		0	25	9	98	0	31	1	115	10	213
01:00		0	19			0	28				
01:15		2	20			1	35				
01:30		0	20			0	30				
01:45		0	27	2	86	1	26	2	119	4	205
02:00		0	18			0	22				
02:15		2	27			1	27				
02:30		0	47			0	48				
02:45		0	35	2	127	0	34	1	131	3	258
03:00		1	43			1	30				
03:15		0	42			0	22				
03:30		0	42			0	39				
03:45		0	52	1	179	1	23	2	114	3	293
04:00		0	47			0	36				
04:15		1	30			5	30				
04:30		2	43			6	36				
04:45		2	34	5	154	20	26	31	128	36	282
05:00		3	54			12	32				
05:15		4	60			21	31				
05:30		7	41			28	26				
05:45		14	44	28	199	28	35	89	124	117	323
06:00		14	26			43	28				
06:15		14	30			43	25				
06:30		11	24			49	19				
06:45		17	18	56	98	62	21	197	93	253	191
07:00		18	27			56	23				
07:15		15	18			56	20				
07:30		23	17			60	9				
07:45		21	23	77	85	43	17	215	69	292	154
08:00		31	14			43	14				
08:15		21	21			32	19				
08:30		22	17			52	17				
08:45		26	8	100	60	44	11	171	61	271	121
09:00		22	3			44	4				
09:15		21	9			39	10				
09:30		17	9			26	7				
09:45		16	7	76	28	28	2	137	23	213	51
10:00		24	7			35	0				
10:15		22	6			31	7				
10:30		25	7			25	2				
10:45		28	5	99	25	36	2	127	11	226	36
11:00		14	4			25	3				
11:15		23	7			26	1				
11:30		21	4			20	7				
11:45		29	4	87	19	29	3	100	14	187	33
Total		542	1158			1073	1002			1615	2160
Percent		31.9%	68.1%			51.7%	48.3%			42.8%	57.2%
Grand Total		1119	2358			2165	1828			3284	4186
Percent		32.2%	67.8%			54.2%	45.8%			44.0%	56.0%

ADT

ADT 3,735

AADT 3,735

7926VOL1

[illegible]

VEHICLE TRAVEL SPEED MEASUREMENTS

Accurate Counts

978-664-2565

Page 1

Location : Winter Street
Location : North of Birch Drive
City/State: Hanover, MA

7926SPD1

SB

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
05/02/18	0	2	0	1	3	3	3	0	0	0	0	0	0	0	12
01:00	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	1	0	10	0	1	0	0	1	0	0	0	0	0	13
05:00	0	0	1	3	18	9	0	2	0	0	0	0	0	0	33
06:00	0	0	2	9	20	27	9	2	0	0	0	0	0	0	69
07:00	3	2	4	15	19	40	13	2	0	0	0	0	0	0	98
08:00	1	2	2	8	38	27	16	2	1	0	0	0	0	0	97
09:00	0	2	0	9	30	23	6	2	0	0	0	0	0	0	72
10:00	1	0	0	12	39	28	3	1	0	0	0	0	0	0	84
11:00	5	2	3	19	28	31	7	1	1	0	0	0	0	0	97
12 PM	3	1	4	16	34	43	11	0	0	0	0	0	0	0	112
13:00	2	0	0	7	36	34	8	1	0	0	0	0	0	0	88
14:00	2	5	2	10	36	33	14	2	1	0	0	0	0	0	105
15:00	1	0	0	22	55	73	39	2	0	0	0	0	0	0	192
16:00	3	0	1	8	43	96	42	5	0	0	0	0	0	0	198
17:00	0	3	1	3	18	94	55	5	1	0	0	0	0	0	180
18:00	1	0	0	1	28	54	34	4	0	0	0	0	0	0	122
19:00	0	1	0	5	16	36	15	0	0	0	0	0	0	0	73
20:00	5	0	1	5	15	22	2	0	0	0	0	0	0	0	50
21:00	0	0	0	4	12	21	4	0	0	0	0	0	0	0	41
22:00	1	0	2	2	2	14	4	0	0	0	0	0	0	0	25
23:00	0	0	0	2	4	4	4	0	0	0	0	0	0	0	14
Total	28	21	23	171	494	715	289	31	5	0	0	0	0	0	1777

Daily

15th Percentile : 30 MPH
50th Percentile : 36 MPH
85th Percentile : 41 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 36 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace 1209
Percent in Pace 68.0%
Number of Vehicles > 35 MPH 1040
Percent of Vehicles > 35 MPH : 58.5%

Accurate Counts

978-664-2565

Page 2

Location : Winter Street
Location : North of Birch Drive
City/State: Hanover, MA

7926SPD1

SB

Start Time	15	16	21	26	31	36	41	46	51	56	61	66	71	76	Total
05/03/18	0	0	0	1	2	4	1	1	0	0	0	0	0	0	9
01:00	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2
02:00	0	1	0	0	0	0	1	0	0	0	0	0	0	0	2
03:00	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
04:00	0	0	0	0	2	0	1	1	1	0	0	0	0	0	5
05:00	0	0	0	2	8	10	6	2	0	0	0	0	0	0	28
06:00	0	0	1	3	18	26	7	0	1	0	0	0	0	0	56
07:00	5	1	0	8	21	34	8	0	0	0	0	0	0	0	77
08:00	2	1	2	20	25	39	9	2	0	0	0	0	0	0	100
09:00	1	1	6	14	22	22	10	0	0	0	0	0	0	0	76
10:00	1	5	5	16	32	36	4	0	0	0	0	0	0	0	99
11:00	0	2	7	21	29	22	3	3	0	0	0	0	0	0	87
12 PM	1	0	3	13	41	32	7	1	0	0	0	0	0	0	98
13:00	0	2	5	15	25	31	6	2	0	0	0	0	0	0	86
14:00	1	2	2	18	35	43	25	1	0	0	0	0	0	0	127
15:00	4	5	5	30	43	54	36	2	0	0	0	0	0	0	179
16:00	1	1	2	13	32	73	31	1	0	0	0	0	0	0	154
17:00	0	2	6	8	24	111	44	4	0	0	0	0	0	0	199
18:00	0	2	2	9	14	51	19	1	0	0	0	0	0	0	98
19:00	1	1	1	4	19	43	15	1	0	0	0	0	0	0	85
20:00	0	1	2	7	23	22	5	0	0	0	0	0	0	0	60
21:00	0	0	0	2	9	12	5	0	0	0	0	0	0	0	28
22:00	0	0	0	4	8	9	4	0	0	0	0	0	0	0	25
23:00	0	0	0	2	4	9	4	0	0	0	0	0	0	0	19
Total	17	27	49	210	436	685	251	22	3	0	0	0	0	0	1700

Daily

15th Percentile : 28 MPH
50th Percentile : 35 MPH
85th Percentile : 40 MPH
95th Percentile : 43 MPH

Mean Speed(Average) : 35 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 1121
Percent in Pace : 65.9%
Number of Vehicles > 35 MPH : 961
Percent of Vehicles > 35 MPH : 56.5%

Grand Total	45	48	72	381	930	1400	540	53	8	0	0	0	0	0	3477
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Overall

15th Percentile : 29 MPH
50th Percentile : 35 MPH
85th Percentile : 40 MPH
95th Percentile : 43 MPH

Mean Speed(Average) : 36 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 2330
Percent in Pace : 67.0%
Number of Vehicles > 35 MPH : 2001
Percent of Vehicles > 35 MPH : 57.5%

Accurate Counts

978-664-2565

Location : Winter Street
Location : North of Birch Drive
City/State: Hanover, MA

7926SPD1

NB

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
05/02/18	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
01:00	0	0	0	0	3	0	3	0	0	0	0	0	0	0	6
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
03:00	0	0	0	0	1	4	1	0	0	0	0	0	0	0	6
04:00	0	0	0	0	1	16	12	3	1	0	0	0	0	0	33
05:00	0	1	0	2	9	46	26	6	1	0	0	0	0	0	91
06:00	0	2	20	21	44	70	34	8	0	0	0	0	0	0	199
07:00	2	9	5	32	45	108	38	1	1	0	0	0	0	0	241
08:00	2	5	9	14	39	74	44	3	1	0	0	0	0	0	191
09:00	0	3	7	19	19	42	19	1	0	0	0	0	0	0	110
10:00	1	8	9	17	32	18	11	1	0	0	0	0	0	0	97
11:00	5	5	9	28	34	26	6	2	0	0	0	0	0	0	115
12 PM	1	4	7	16	40	43	13	1	0	0	0	0	0	0	125
13:00	0	1	15	19	15	19	10	2	0	0	0	0	0	0	81
14:00	4	2	7	10	22	19	5	0	1	0	0	0	0	0	70
15:00	0	1	3	11	32	49	13	1	0	0	0	0	0	0	110
16:00	1	1	3	7	29	41	15	1	0	0	0	0	0	0	98
17:00	2	1	0	4	28	45	20	4	2	0	0	0	0	0	106
18:00	0	0	1	1	12	40	21	2	0	1	0	0	0	0	78
19:00	0	1	1	6	21	25	6	6	0	0	0	0	0	0	66
20:00	0	1	3	3	7	16	8	0	0	0	0	0	0	0	38
21:00	0	0	0	2	5	9	1	0	1	0	0	0	0	0	18
22:00	0	0	0	7	4	12	1	0	2	0	1	0	0	0	27
23:00	0	0	0	0	6	1	2	0	0	0	0	0	0	0	9
Total	18	45	99	219	450	724	309	42	10	1	1	0	0	0	1918

Daily

15th Percentile : 27 MPH
50th Percentile : 35 MPH
85th Percentile : 41 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 35 MPH

10 MPH Pace Speed : 31-40 MPH

Number in Pace : 1174

Percent in Pace : 61.2%

Number of Vehicles > 35 MPH : 1087

Percent of Vehicles > 35 MPH : 56.7%

Accurate Counts

978-664-2565

Page 4

Location : Winter Street
Location : North of Birch Drive
City/State: Hanover, MA

7926SPD1

NB

Start Time	15	16	21	26	31	36	41	46	51	56	61	66	71	76	999	Total
05/03/18	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
01:00	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
04:00	0	0	0	0	3	9	18	0	0	1	0	0	0	0	0	31
05:00	0	0	0	2	15	39	24	6	3	0	0	0	0	0	0	89
06:00	2	4	13	43	42	68	23	2	0	0	0	0	0	0	0	197
07:00	2	3	5	17	37	102	42	7	0	0	0	0	0	0	0	215
08:00	1	6	5	21	50	60	23	5	0	0	0	0	0	0	0	171
09:00	1	1	10	21	33	50	20	1	0	0	0	0	0	0	0	137
10:00	1	7	9	24	40	32	11	3	0	0	0	0	0	0	0	127
11:00	0	2	5	25	27	31	9	1	0	0	0	0	0	0	0	100
12 PM	3	3	13	27	34	27	8	0	0	0	0	0	0	0	0	115
13:00	0	1	8	11	29	43	26	1	0	0	0	0	0	0	0	119
14:00	1	9	9	19	38	35	19	1	0	0	0	0	0	0	0	131
15:00	2	7	7	6	36	28	27	1	0	0	0	0	0	0	0	114
16:00	1	1	3	20	40	45	15	2	1	0	0	0	0	0	0	128
17:00	0	2	2	12	43	47	15	1	2	0	0	0	0	0	0	124
18:00	0	1	1	3	25	45	16	2	0	0	0	0	0	0	0	93
19:00	0	1	0	5	16	34	11	2	0	0	0	0	0	0	0	69
20:00	0	1	0	6	32	18	3	1	0	0	0	0	0	0	0	61
21:00	0	0	0	1	11	9	1	1	0	0	0	0	0	0	0	23
22:00	0	0	0	2	5	3	0	1	0	0	0	0	0	0	0	11
23:00	0	0	1	1	7	5	0	0	0	0	0	0	0	0	0	14
Total	14	49	92	266	563	735	311	38	6	1	0	0	0	0	0	2075

Daily

15th Percentile : 27 MPH
50th Percentile : 35 MPH
85th Percentile : 40 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 35 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 1298
Percent in Pace : 62.6%
Number of Vehicles > 35 MPH : 1091
Percent of Vehicles > 35 MPH : 52.6%

Grand Total

32	94	191	485	1013	1459	620	80	16	2	1	0	0	0	0	3993
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Overall

15th Percentile : 27 MPH
50th Percentile : 35 MPH
85th Percentile : 40 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 35 MPH
10 MPH Pace Speed : 31-40 MPH
Number in Pace : 2472
Percent in Pace : 61.9%
Number of Vehicles > 35 MPH : 2178
Percent of Vehicles > 35 MPH : 54.5%

Accurate Counts

978-664-2565

Location : Winter Street
Location : North of Birch Drive
City/State: Hanover, MA

7926SPD1

SB, NB

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
05/02/18	0	2	0	1	5	3	3	0	0	0	0	0	0	0	14
01:00	0	0	0	0	3	2	3	0	0	0	0	0	0	0	8
02:00	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
03:00	0	0	0	0	1	4	1	0	0	0	0	0	0	0	6
04:00	0	1	0	10	1	17	12	3	2	0	0	0	0	0	46
05:00	0	1	1	5	27	55	26	8	1	0	0	0	0	0	124
06:00	0	2	22	30	64	97	43	10	0	0	0	0	0	0	268
07:00	5	11	9	47	64	148	51	3	1	0	0	0	0	0	339
08:00	3	7	11	22	77	101	60	5	2	0	0	0	0	0	288
09:00	0	5	7	28	49	65	25	3	0	0	0	0	0	0	182
10:00	2	8	9	29	71	46	14	2	0	0	0	0	0	0	181
11:00	10	7	12	47	62	57	13	3	1	0	0	0	0	0	212
12 PM	4	5	11	32	74	86	24	1	0	0	0	0	0	0	237
13:00	2	1	15	26	51	53	18	3	0	0	0	0	0	0	169
14:00	6	7	9	20	58	52	19	2	2	0	0	0	0	0	175
15:00	1	1	3	33	87	122	52	3	0	0	0	0	0	0	302
16:00	4	1	4	15	72	137	57	6	0	0	0	0	0	0	296
17:00	2	4	1	7	46	139	75	9	3	0	0	0	0	0	286
18:00	1	0	1	2	40	94	55	6	0	1	0	0	0	0	200
19:00	0	2	1	11	37	61	21	6	0	0	0	0	0	0	139
20:00	5	1	4	8	22	38	10	0	0	0	0	0	0	0	88
21:00	0	0	0	6	17	30	5	0	1	0	0	0	0	0	59
22:00	1	0	2	9	6	26	5	0	2	0	1	0	0	0	52
23:00	0	0	0	2	10	5	6	0	0	0	0	0	0	0	23
Total	46	66	122	390	944	1439	598	73	15	1	1	0	0	0	3695

Daily

15th Percentile : 29 MPH
50th Percentile : 35 MPH
85th Percentile : 41 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 36 MPH

10 MPH Pace Speed : 31-40 MPH

Number in Pace : 2383

Percent in Pace : 64.5%

Number of Vehicles > 35 MPH : 2127

Percent of Vehicles > 35 MPH : 57.6%

Accurate Counts

978-664-2565

Location : Winter Street
Location : North of Birch Drive
City/State: Hanover, MA

7926SPD1

SB, NB

Start Time	15	16	21	26	31	36	41	46	51	56	61	66	71	76	Total
	15	20	25	30	35	40	45	50	55	60	65	70	75	999	
05/03/18	0	0	0	1	2	5	1	1	0	0	0	0	0	0	10
01:00	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4
02:00	0	1	1	0	0	0	1	0	0	0	0	0	0	0	3
03:00	0	0	0	0	0	2	0	0	1	0	0	0	0	0	3
04:00	0	0	0	0	5	9	19	1	1	1	0	0	0	0	36
05:00	0	0	0	4	23	49	30	8	3	0	0	0	0	0	117
06:00	2	4	14	46	60	94	30	2	1	0	0	0	0	0	253
07:00	7	4	5	25	58	136	50	7	0	0	0	0	0	0	292
08:00	3	7	7	41	75	99	32	7	0	0	0	0	0	0	271
09:00	2	2	16	35	55	72	30	1	0	0	0	0	0	0	213
10:00	2	12	14	40	72	68	15	3	0	0	0	0	0	0	226
11:00	0	4	12	46	56	53	12	4	0	0	0	0	0	0	187
12 PM	4	3	16	40	75	59	15	1	0	0	0	0	0	0	213
13:00	0	3	13	26	54	74	32	3	0	0	0	0	0	0	205
14:00	2	11	11	37	73	78	44	2	0	0	0	0	0	0	258
15:00	6	12	12	36	79	82	63	3	0	0	0	0	0	0	293
16:00	2	2	5	33	72	118	46	3	1	0	0	0	0	0	282
17:00	0	4	8	20	67	158	59	5	2	0	0	0	0	0	323
18:00	0	3	3	12	39	96	35	3	0	0	0	0	0	0	191
19:00	1	2	1	9	35	77	26	3	0	0	0	0	0	0	154
20:00	0	2	2	13	55	40	8	1	0	0	0	0	0	0	121
21:00	0	0	0	3	20	21	6	1	0	0	0	0	0	0	51
22:00	0	0	0	6	13	12	4	1	0	0	0	0	0	0	36
23:00	0	0	1	3	11	14	4	0	0	0	0	0	0	0	33
Total	31	76	141	476	999	1420	562	60	9	1	0	0	0	0	3775

Daily

15th Percentile : 28 MPH
50th Percentile : 35 MPH
85th Percentile : 40 MPH
95th Percentile : 43 MPH

Mean Speed(Average) : 35 MPH

10 MPH Pace Speed : 31-40 MPH

Number in Pace : 2419

Percent in Pace : 64.1%

Number of Vehicles > 35 MPH : 2052

Percent of Vehicles > 35 MPH : 54.4%

Grand Total

77 142 263 866 1943 2859 1160 133 24 2 1 0 0 0 7470

Overall

15th Percentile : 28 MPH
50th Percentile : 35 MPH
85th Percentile : 40 MPH
95th Percentile : 44 MPH

Mean Speed(Average) : 35 MPH

10 MPH Pace Speed : 31-40 MPH

Number in Pace : 4802

Percent in Pace : 64.3%

Number of Vehicles > 35 MPH : 4179

Percent of Vehicles > 35 MPH : 55.9%

TRIP-GENERATION CALCULATIONS

Mini-Warehouse (151)

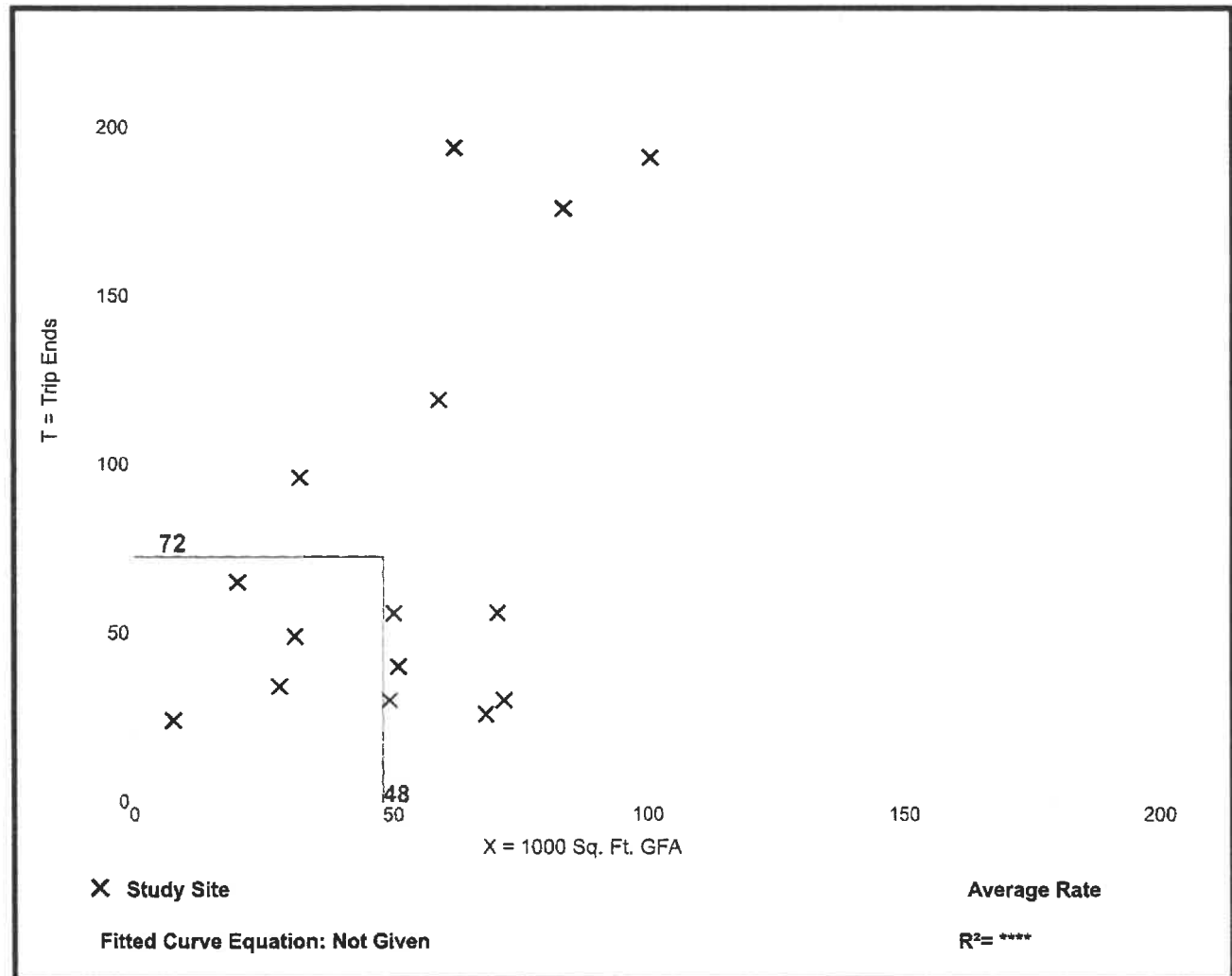
Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday

Setting/Location: General Urban/Suburban
Number of Studies: 15
Avg. 1000 Sq. Ft. GFA: 52
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
1.51	0.38 - 3.25	0.95

Data Plot and Equation



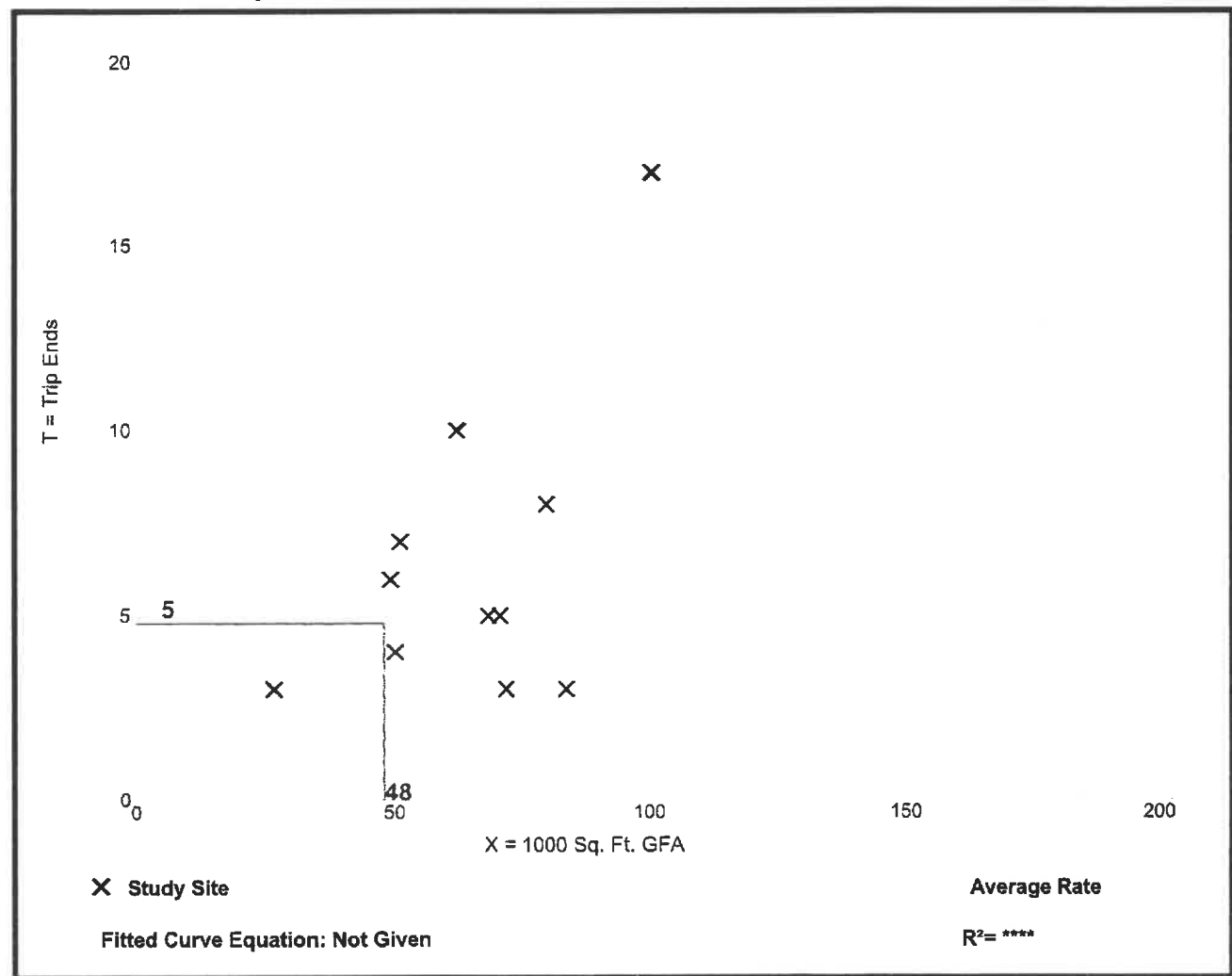
Mini-Warehouse (151)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.
Setting/Location: General Urban/Suburban
 Number of Studies: 11
 Avg. 1000 Sq. Ft. GFA: 65
 Directional Distribution: 60% entering, 40% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.10	0.04 - 0.17	0.05

Data Plot and Equation



Mini-Warehouse (151)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA

On a: Weekday,

Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Setting/Location: General Urban/Suburban

Number of Studies: 16

Avg. 1000 Sq. Ft. GFA: 54

Directional Distribution: 47% entering, 53% exiting

Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.17	0.04 - 0.64	0.14

Data Plot and Equation

