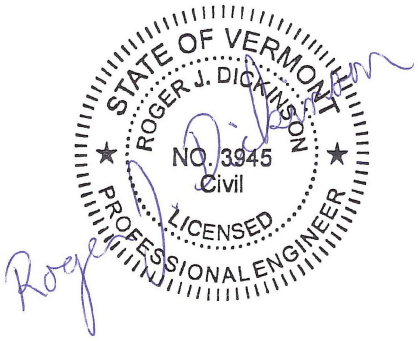
Updated
Traffic Impact Assessment

for a

Hannaford Supermarket

Lot 15 - Commerce Park
Hinesburg, Vermont



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1.0 INTRODUCTION

The purpose of this traffic impact assessment (TIA) is to determine the potential traffic congestion and safety impacts of a new Hannaford Supermarket (the Project) located on Lot 15 of Commerce Park in Hinesburg, Vermont. The proposed supermarket will have a gross floor area of 36,783 sf. More specifically, this evaluation will:

- Project present and future background design hour traffic volumes and traffic congestion conditions at major intersections in the immediate vicinity of this Project during existing and future peak hours.
- Determine the future vehicular trip generation of the Project.
- Evaluate whether this Project will create unreasonable traffic congestion conditions.
- Examine existing safety conditions, and evaluate this Project's potential impact upon those conditions.
- Determine what, if any, traffic improvements will be needed to mitigate the effects of this Project on the adjacent highway system.

Commerce Park is a commercial subdivision located in the fork between VT Route 116 and Mechanicsville Road on the north end of Hinesburg village. Commerce Street was constructed to provide access from both Route 116 and Mechanicsville Road to the lots in Commerce Park. Lot 15 is accessed from Commerce St. via a 50 ft wide by 250 ft long right-of-way (Commerce St. Ext.) situated between Lot 12 (Dark Star) and Lot 13 (National Bank of Middlebury). This right-of-way is presently used by the National Bank of Middlebury for its entering traffic.

VT Route 116 is a north-south state highway linking the easterly portions of Addison and Chittenden Counties. It's functional classification is a rural minor arterial. Mechanicsville Road is a Class 2 town highway (TH #2) and is also classified by the Vermont Agency of Transportation (VTrans) as a major collector (MC 209). Commerce Street is a Class 3 town highway (TH #43) and functions as a local street. The location of this Project relative to the adjacent road network is shown on Figure 1.

Figure 1 - Project Location

2.0 BACKGROUND TRAFFIC VOLUMES

For this TIA, automatic traffic recorder (ATR) and turning movement (TM) counts were obtained within the anticipated study area from VTrans and CCMPO. Background traffic volumes for this TIA were then calculated by expanding and adjusting those counts as more completely outlined in the following sections.

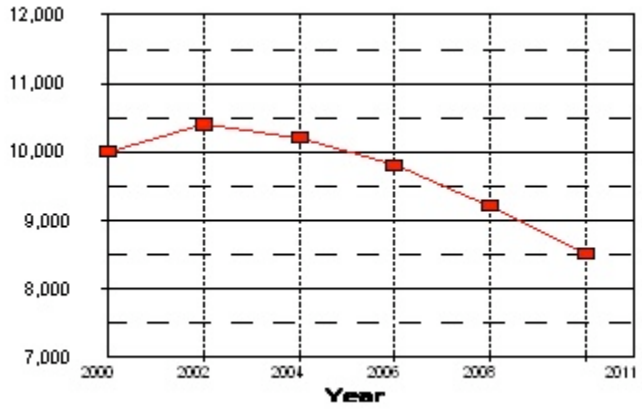
For the purposes of this TIA, Chapters 2.0 and 4.0 present the results of design hour volume (DHV) calculations and intersection capacity analyses for the weekday pm peak hour. Volume calculations and intersection capacity analyses for the weekday am peak hour are presented in Chapter 5.0.

Traffic Growth Projections

VTrans typically counts average daily traffic volumes on VT Route 116 biannually. In Hinesburg, the closest count location is Station D126, located north of the CVU/Shelburne Falls Rd. intersection. The most recent count was performed in 2010, and resulted in an annual average daily traffic volume (AADT) of 8,500 vehicles per day (vpd). The results of the 2010 AADT count have not been finalized by VTrans; therefore for the purpose of this TIA we have applied the 2008 AADT of 9,200 vpd at D126 as representing the 2010 AADT.

Since 2008, there has been little, if any, traffic growth both statewide and in Chittenden County. Data from VTrans' statewide network of continuous traffic counters indicate that daily traffic volumes declined by 2% on rural primary and secondary roads such as Route 116 from 2008 to 2009. Figure 1, showing AADT's at Station D126, illustrates this same trend on Route 116. From 2010, VTrans' most recent traffic growth projections are 1% to 2012 and 3% to 2017. For the purposes of this TIA, 2012 represents the anticipated opening year and 2017 is required 5-year projection from that initial opening. These growth rates are just for background growth. Growth resulting from other nearby approved developments and from this Project is calculated separately.

Figure 1 - D126 AADT's (vpd)



For traffic studies such as this, the DHV is used to determine the capacity and corresponding level of service on adjacent highways and intersections. The DHV represents the 30th highest traffic hour that occurs each year, and generally occurs on a weekday during the afternoon peak hour. On rural primary and secondary highways in Vermont, DHV's are typically ±11% of the AADT. For this TIA, AADT's and corresponding DHV's along Route 116 were calculated for years 2012 and 2017 by pivoting the 9,200 vpd AADT at Station D126 around key Route 116 intersections using 12-hour turning movement count totals. Peak hour volumes from recent (2009 and 2010) turning movement counts performed by the CCMPO where then adjusted to the calculated DHV's. Detailed DHV calculations are included in **Appendix A**.

New peak hour trips generated by nearby approved major residential and commercial developments were then added to background traffic volumes. These other developments include the Bissonette/ Champlain Oil convenience store project on Shelburne Falls Rd., Lot 34 of the Hinesburg Center project (Kinney Drug) on Farmall Drive, and the Thistle Hill residential development on Mechanicsville Road. Together, these three developments are estimated to generate a total of 195 pm peak hour non pass-by trips, which were then distributed onto Route 116 and adjacent streets based on existing traffic patterns.

Together, the estimated background DHV's and other development peak hour trips form the baseline "no-build" scenarios for this TIA. Figures 3-7 illustrate design hour volumes without other development, other development trips and the summation of the two, (Figures 6 and 7) "No-Build" scenarios.

Figure 3 - 2012 Background DHV

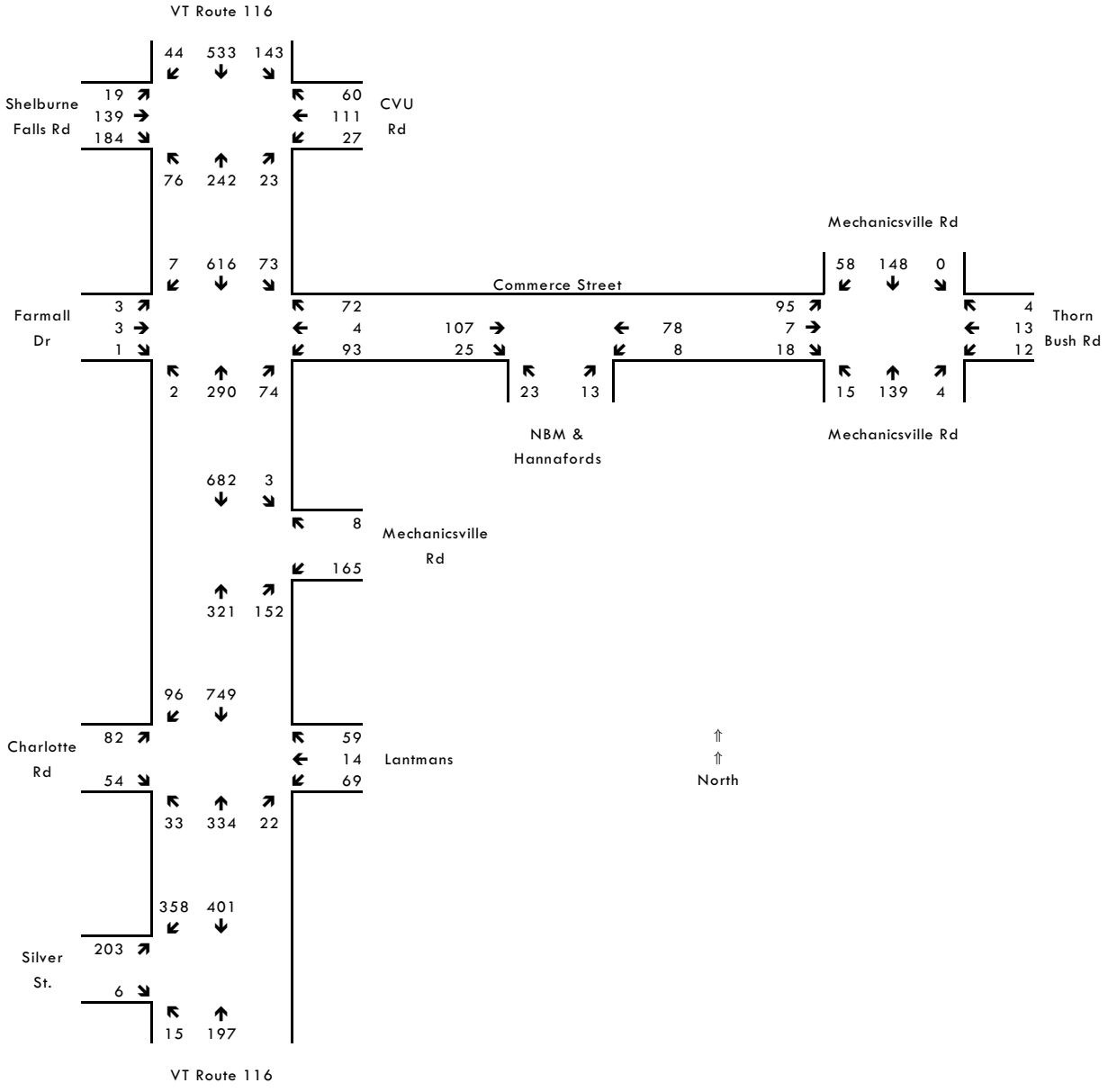


Figure 4 - 2017 Background DHV

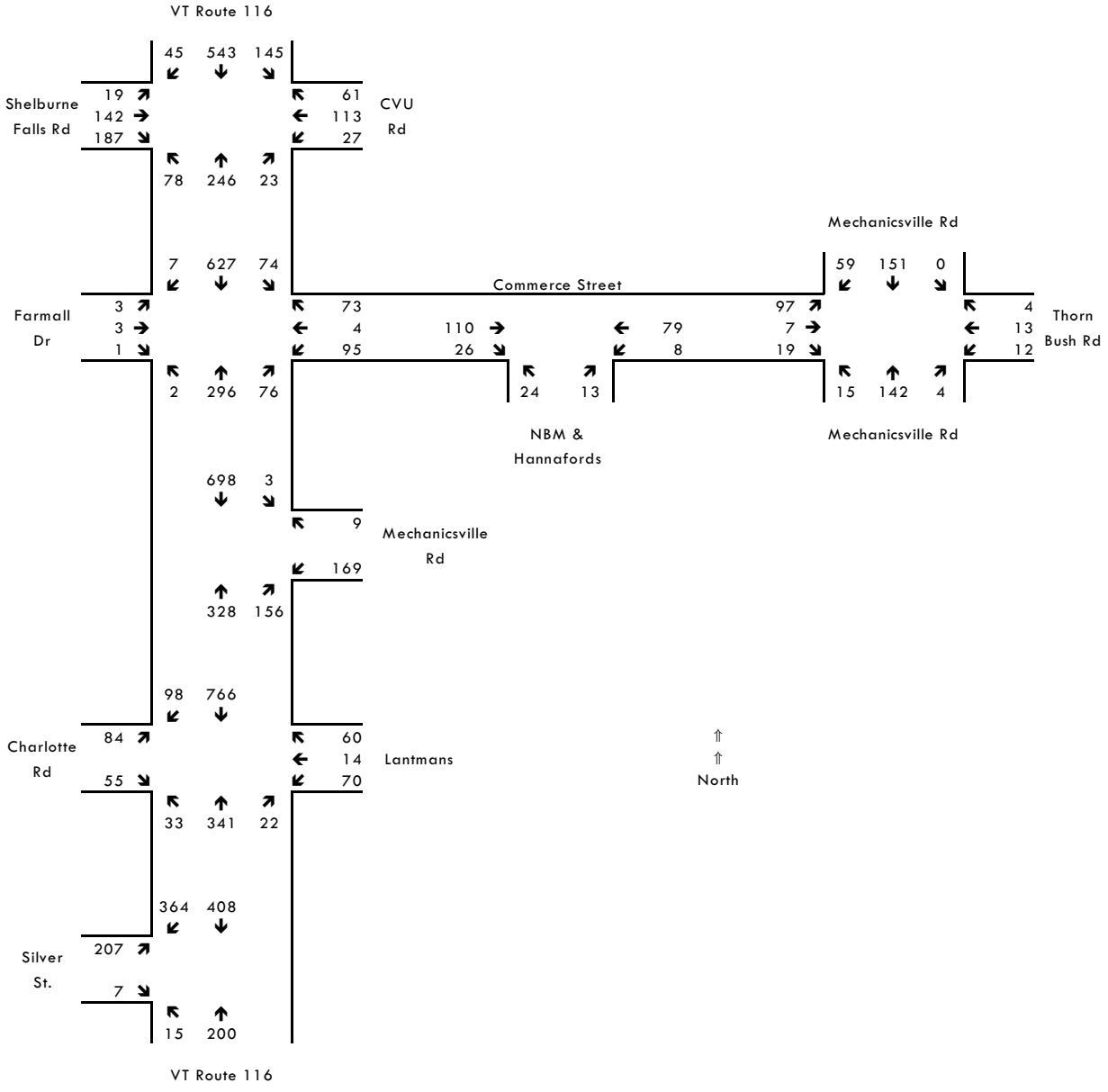


Figure 5 - Other Development PM Peak Hour Trips (ODT)

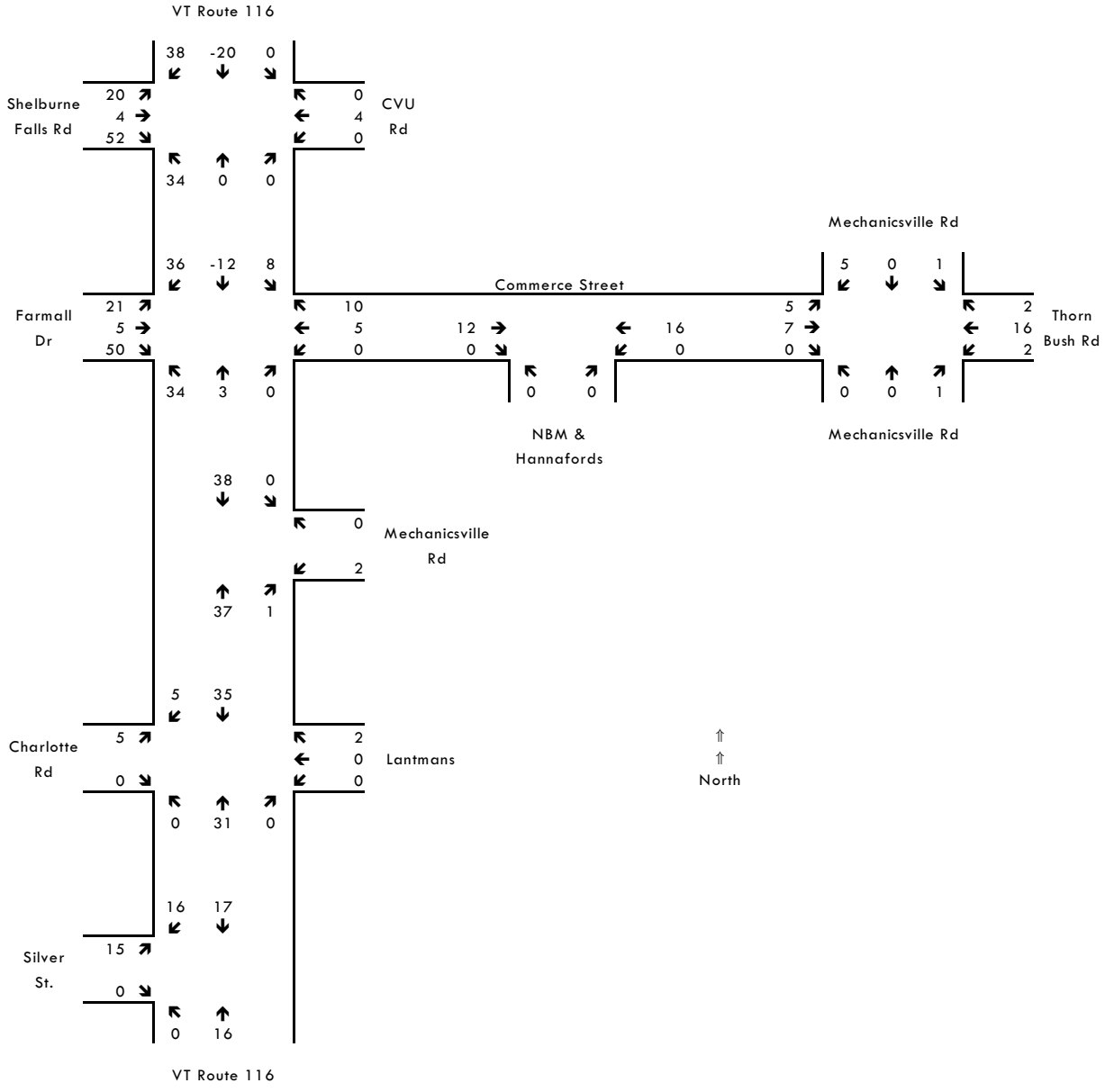


Figure 6 - 2012 Background DHV + ODT (No-Build)

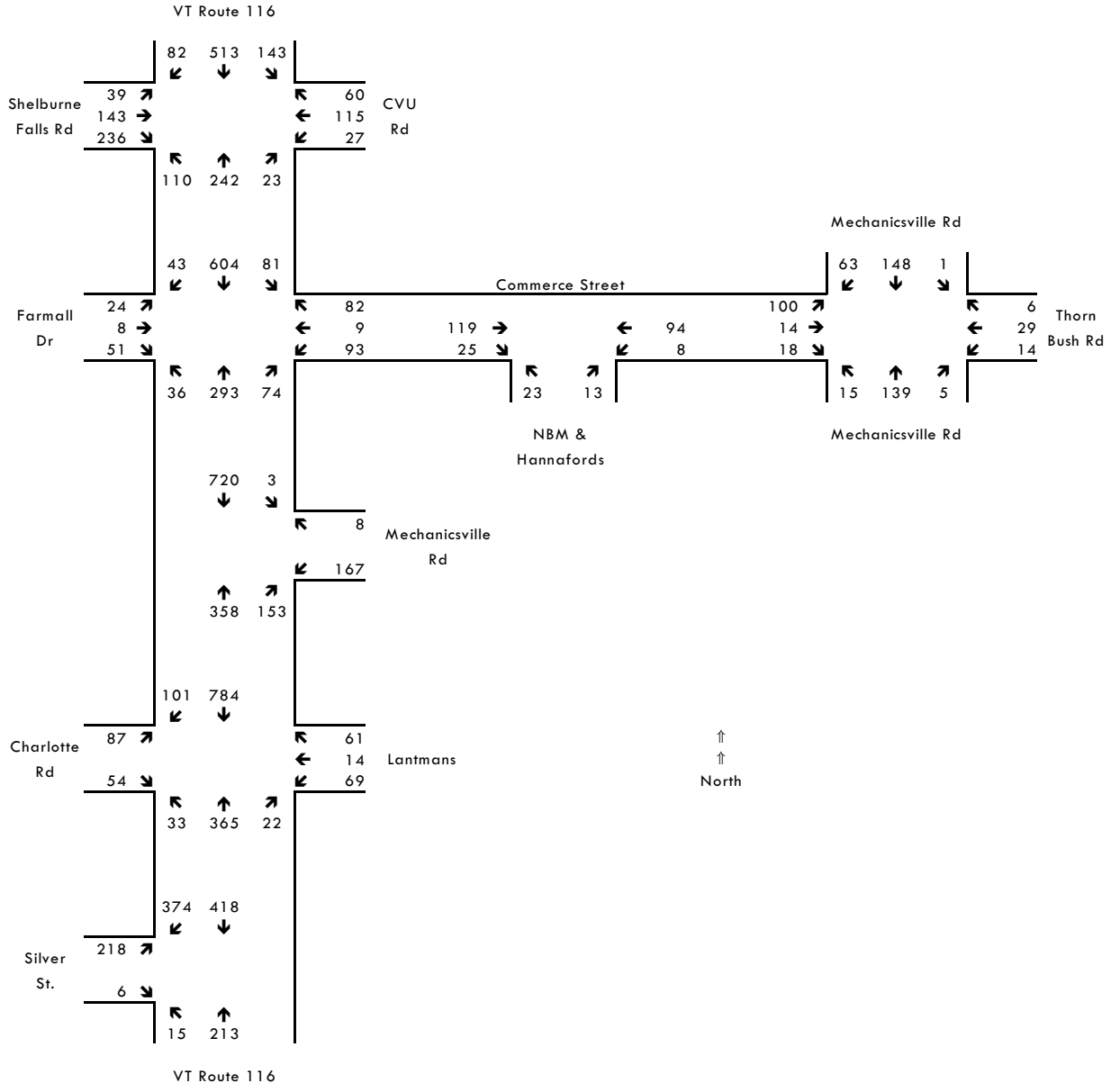
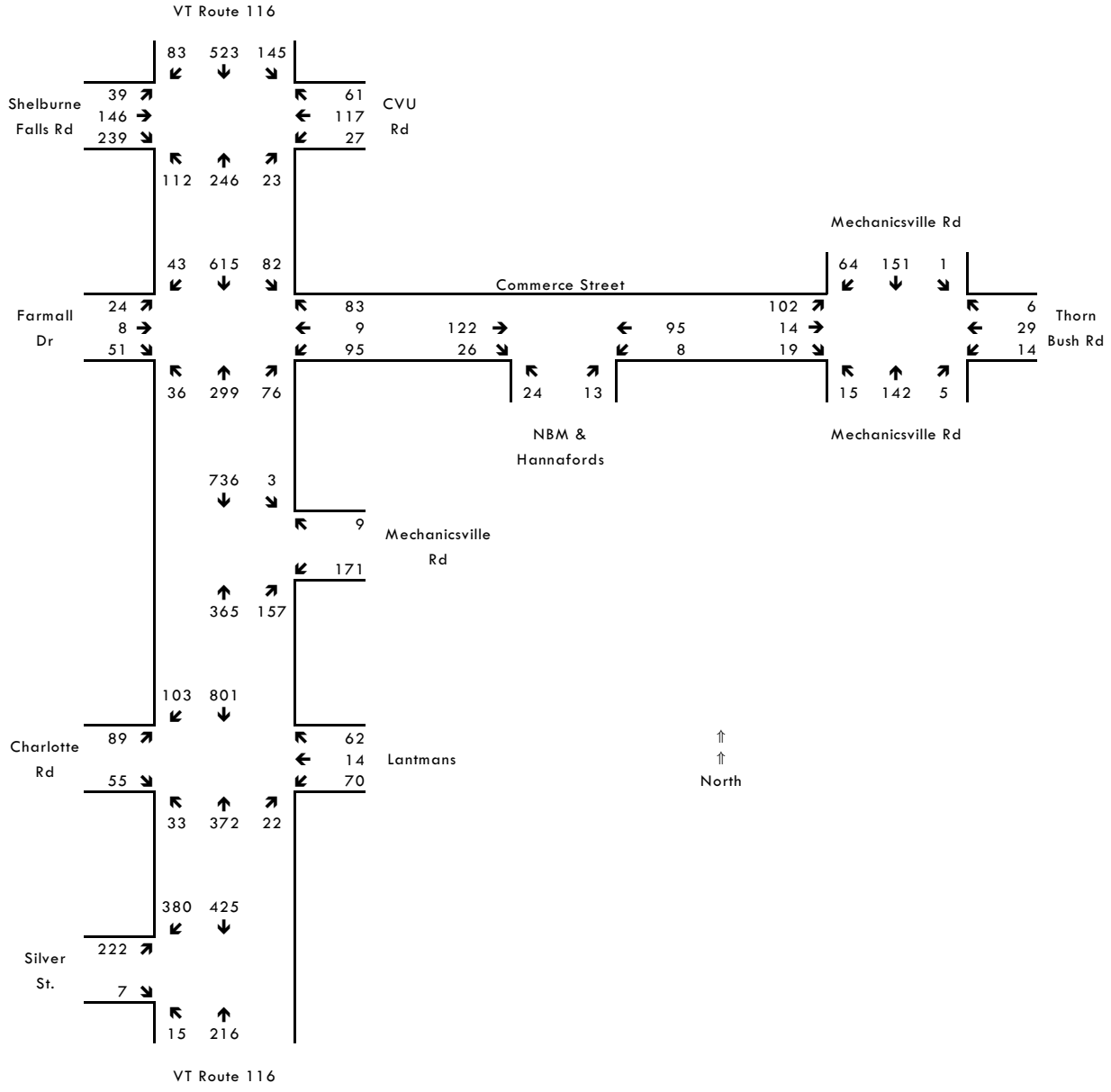


Figure 7 - 2017 Background DHV + ODT (No-Build)



3.0 PROJECT-GENERATED TRIPS

This Project's peak hour vehicular trip generation was estimated by using both national ITE[1] and Vermont[2] trip generation rates for the supermarket land-use category (#850). The Vermont trip generation rates are obtained from a recent VTrans report presenting the results of over 1,000 trip generation studies performed of various land uses exclusively in Vermont. Included are the results of 31 trip generation studies at supermarkets in Vermont; 10 in Chittenden County plus 21 outside of Chittenden County. In both categories (Chittenden County and non-Chittenden County), the pm peak hour trip generation rates were found to be considerably lower than national ITE weekday pm peak hour rates. Of the two, Chittenden County supermarkets had a higher average rate; but still lower than the national ITE rate (30% lower).

Relevant statistics related to the ITE and Vermont pm peak hour supermarket trip generation data are summarized in Table 1.

Table 1 - PM Peak Hour Supermarket Trip Generation Data Statistics

		Vermont	
	ITE	Chittenden County	non-Chittenden County
# Studies	40	10	21
Average Gross Floor Area (sf)	59,000	49,100	46,900
Average Trip Rate (vte/hr/ksf)	10.50	8.87	6.39
Standard Deviation	4.97	2.31	2.45
Std. Dev. / Avg. Trip Rate	47.3%	26.0%	38.3%
Equation?	Yes	Yes	Yes
Correlation Coefficient (R^2)	0.52	0.713	0.711

VTrans' traffic study guidelines[3] encourage the use of locally generated trip generation rates; as evidenced by the following statement:

> *"The use of local Trip Generation rates is preferable to using ITE Trip Generation rates or equations, but only where sufficient data has been collected at specific sites to insure statistical reliability."*

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1 *Trip Generation*, Institute of Transportation Engineers, 8th Edition

2 *Vermont Trip Generation Manual*, Vermont Agency of Transportation, March 2010

3 *Traffic impact Study Guidelines*, Vermont Agency of Transportation, October 2008

With regard to statistical reliability, the Vermont pm peak hour trip generation data has better statistics than the national ITE pm peak hour data. The standard deviations, as a percentage of the average rate, are lower and the correlation coefficients are higher; both positive attributes meaning that individual data points are not as widely scattered. Additionally, even though Chittenden County only has 10 studies, it is a subset of a larger database containing a total of 31 studies that, if merged, would have a lower trip generation rate than the subset.

Therefore, for the purpose of this updated TIA, we have prepared and analyzed two trip generation scenarios: a "VT" scenario using Vermont-Chittenden County supermarket trip generation data, and an "ITE" scenario using national ITE data. With the equations having correlation coefficients less than 0.75, the average rates from both the Vermont-Chittenden County and the national ITE data sets have been used to estimate the pm peak hour trip generation. Additionally, because the Vermont trip generation rates do not include the am adjacent street peak hour time period (7:00-9:00 am), the standard ITE am peak hour trip generation was reduced by 16% for the purpose of analyzing a corresponding VT am peak hour scenario.

Table 2 summarizes the resulting peak hour trips in vehicle trip ends (vte) per hour.

Table 2 - Weekday Trip Generation (vte/hour)

	AM Peak Hour		PM Peak Hour	
	VT	ITE	VT	ITE
Enter	68	81	170	197
Exit	43	51	156	189
Total	111	132	326	386

Similar to many retail land-uses, supermarkets also typically attract "pass-by" trips in addition to creating new "primary" trips. Pass-by trips are generated by motorists who are already driving by Commerce Street on Route 116 or Mechanicsville Road. Instead of simply driving by, they turn in to shop at a store, and then exit in the same direction that they were originally traveling. For example, the ITE estimates that 36% of a supermarket's trip generation during the weekday pm peak hour time period results from pass-by trips. Based on that, 117 of this Project's 326 peak hour trips (VT) or 139 of this Project's 386 peak hour trips (ITE) are estimated to be diverted from traffic already traveling by Commerce Drive.

Directional patterns of new supermarket trips entering and exiting Commerce Street were estimated using the geographic distribution of surrounding population for non pass-by trips and using existing traffic patterns for pass-by trips. The resulting Project-generated pm peak hour trip distributions are shown in Figures 8 and 9. Detailed trip generation and distribution calculations are included in **Appendix B**.

Figure 8 - Project PM Peak Hour Trip Distribution (VT)

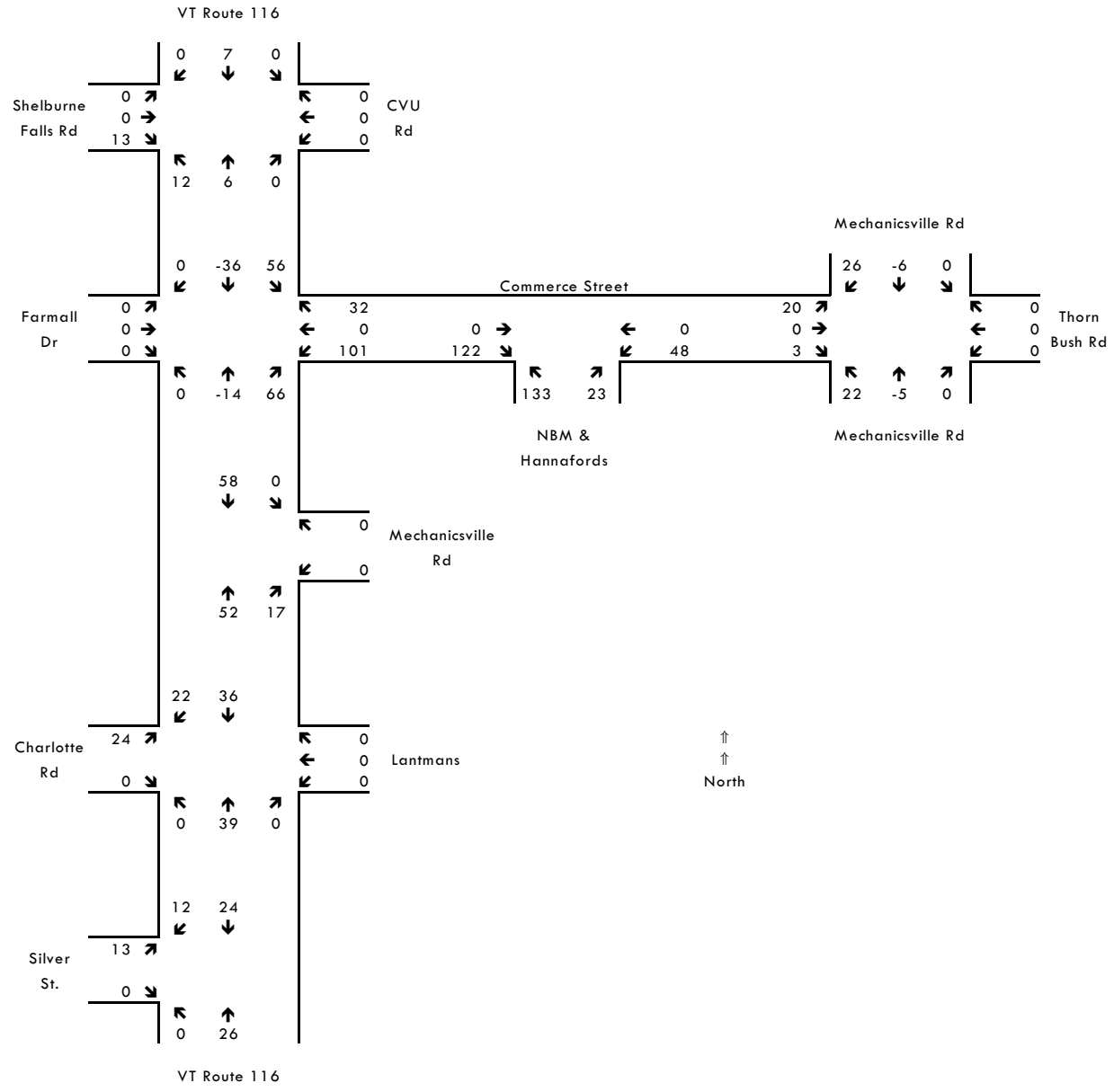
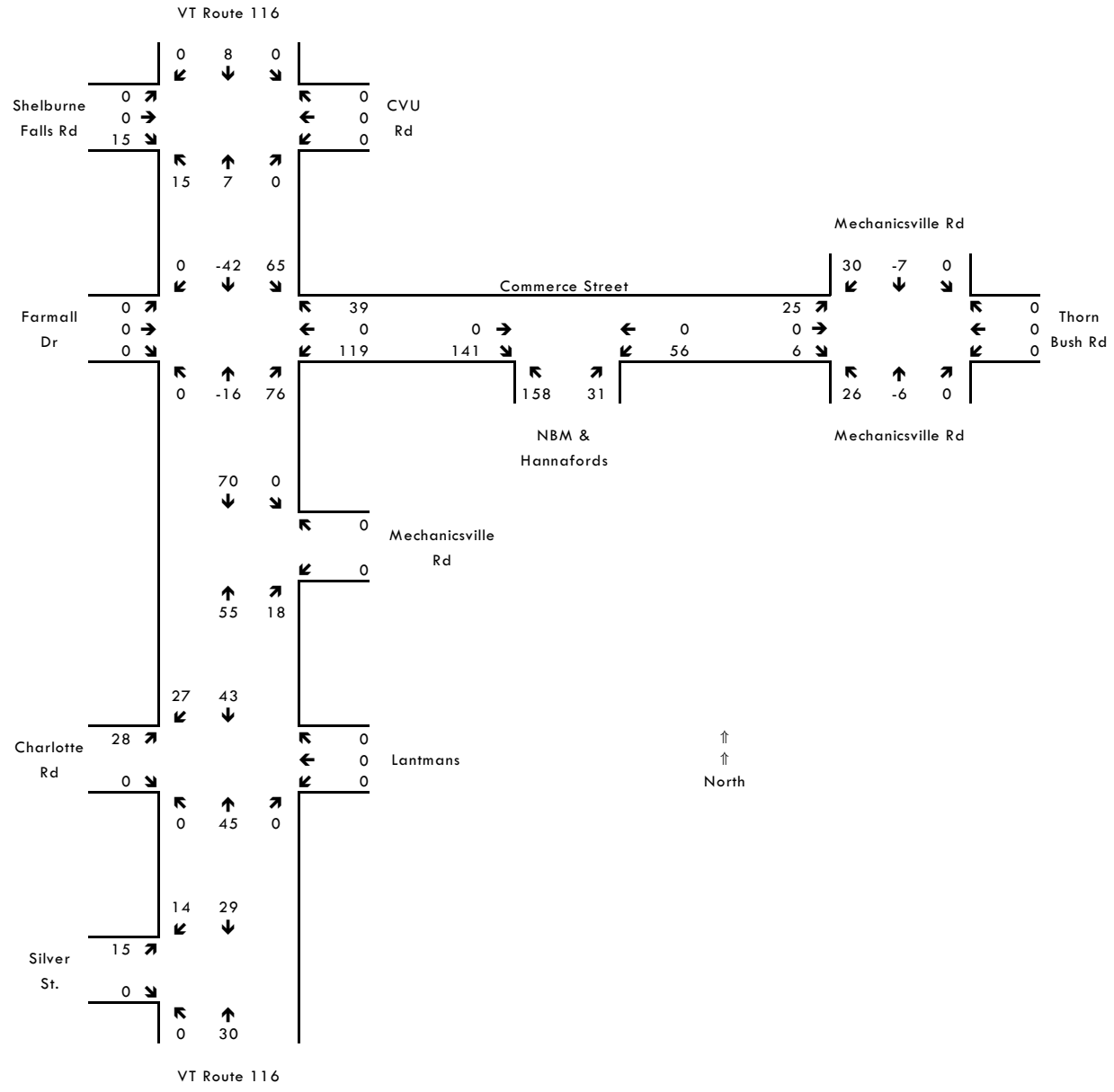


Figure 9 - Project PM Peak Hour Trip Distribution (ITE)



The outer limits of the study area for this TIA are established by those key intersections that are impacted by ≥75 new peak hour trips[3]. From Figures 8 and 9, this limits the geographic scope of this TIA to the following six key intersections:

- VT 116 & Commerce Street
- VT 116 & Mechanicsville Road
- VT 116 & Charlotte Road
- VT 116 & Silver Street
- Mechanicsville Road & Commerce Street
- Commerce Street & NBM/Hannaford Access

The VT 116 & CVU Road/Shelburne Falls Road intersection was not initially included in this TIA due to less than 75 new project-generated pm peak hour trips (the net increase in new trips equals 45 in the ITE scenario) traveling Route 116 north of Commerce Street. However, at a meeting with VTrans on January 24, 2011, it was requested that this intersection be added.

Additionally, overall AM peak hour background traffic volumes on Route 116 are lower than pm peak hour volumes. This Project's peak hour trip generation is also much less during the am peak hour than during the pm (66-71% lower). Combined, the two pm peaks will create a greater impact on future traffic congestion conditions during the pm peak hour. This TIA, therefore, only analyzes the pm peak hour period at all of the above seven intersections. Analyses of AM traffic conditions are also included at the two intersections of VT 116 & CVU Road/Shelburne Falls Road (requested by VTrans) and VT 116 & Commerce St (requested by VTrans and CCMPO). AM peak hour traffic volumes and intersection capacity analysis results are presented separately in Chapter 5.0.

One last note concerning this Project's new peak hour trips and their directional patterns. The traffic projections of this TIA do not account for the reduction in existing shopping trips presently being made by Hinesburg residents to more distant supermarkets, such as those in Williston and South Burlington, due to the complexity of such an analysis. Many of those trips will be intercepted by this new supermarket; resulting in reduced traffic volumes at selected off-site intersections and less than predicted increased traffic volumes at others. Overall, this Project will result in less vehicle miles traveled together with associated environmental benefits (e.g. less emissions and energy consumption).

Figures 10-13 on the following pages illustrate future 2012 and 2017 DHV's with project-generated trips added (Build DHV).

Figure 10 - 2012 Build DHV (VT)

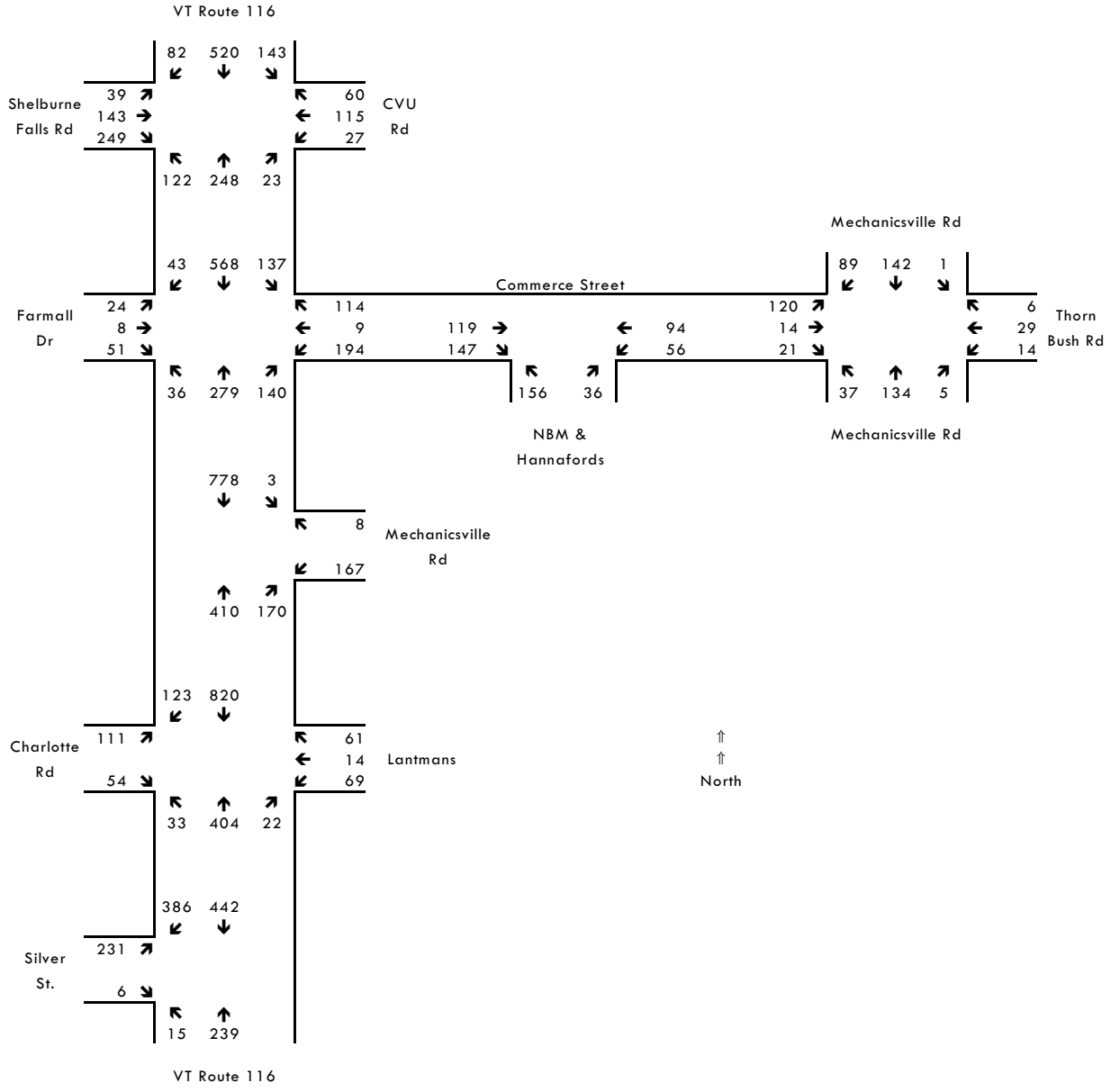


Figure 11 - 2012 Build DHV (ITE)

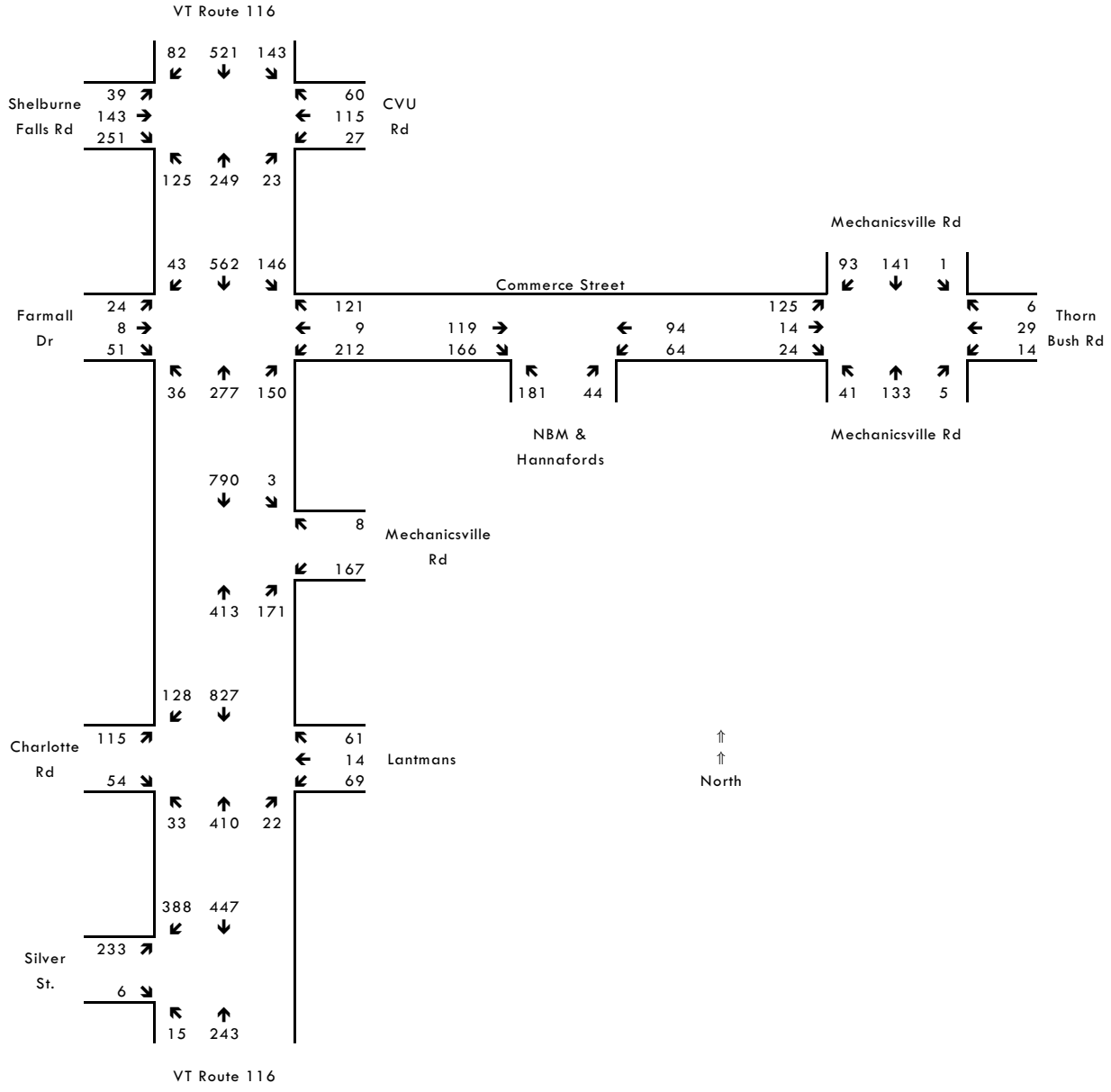


Figure 12 - 2017 Build DHV (VT)

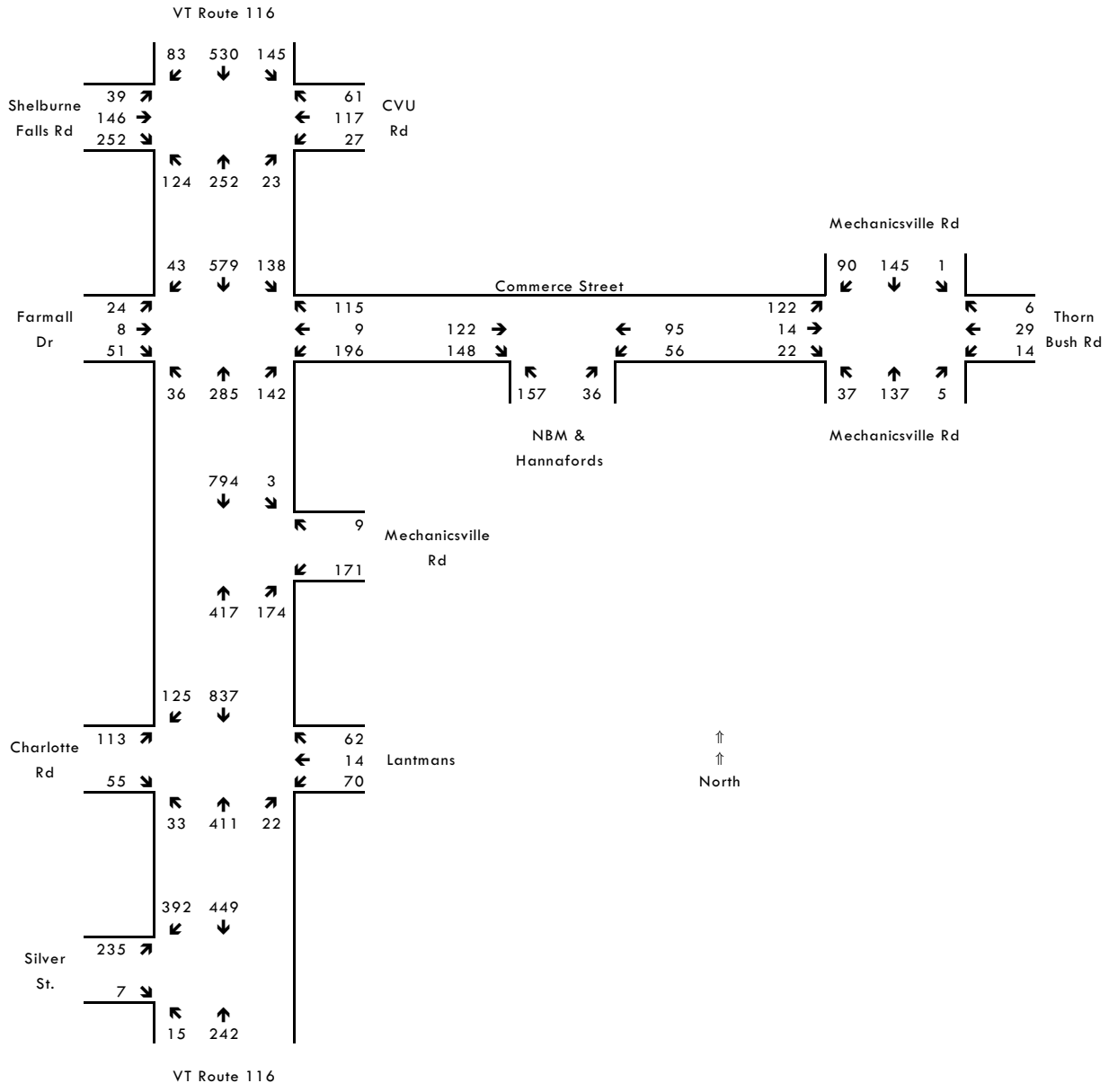
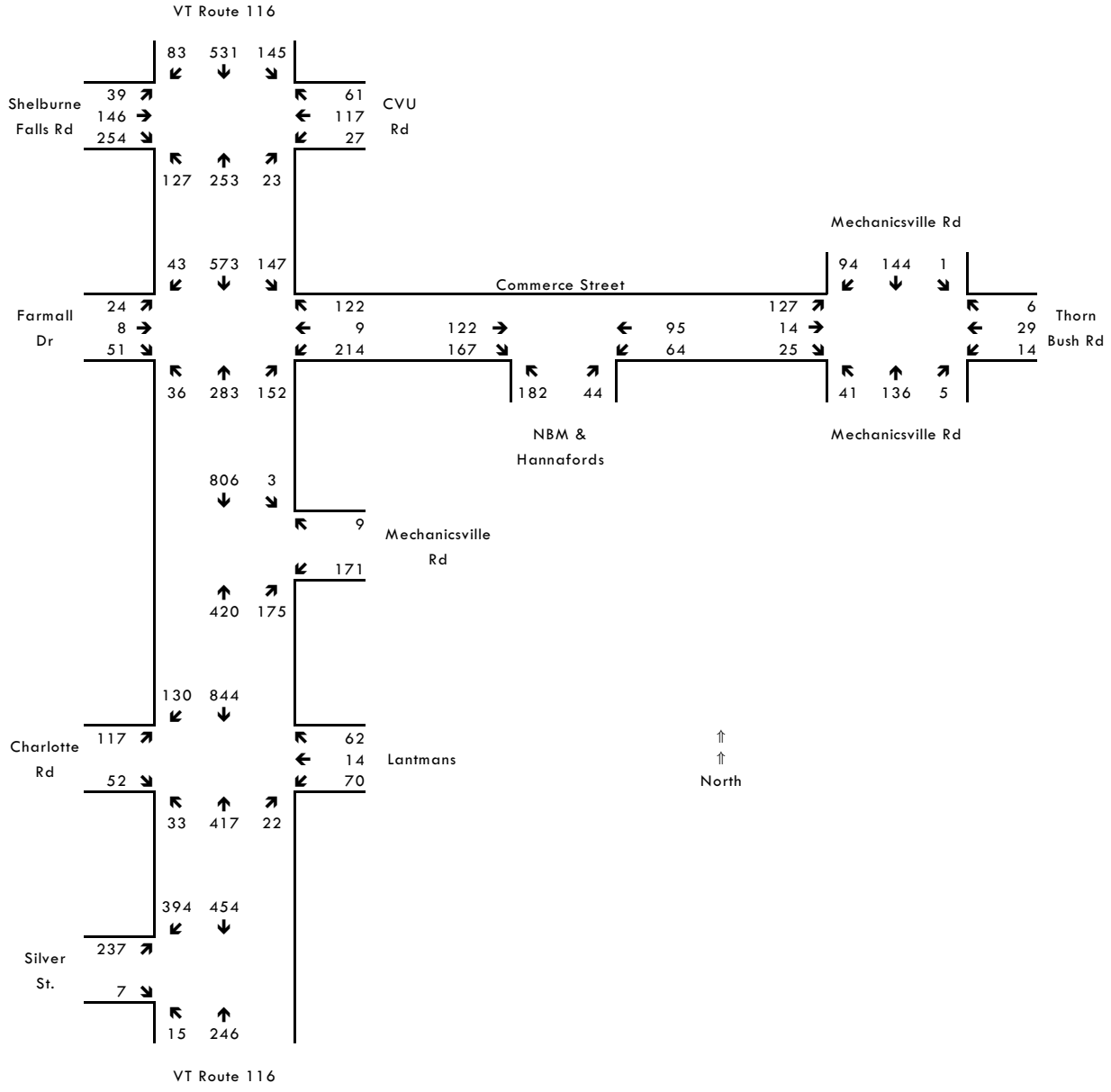


Figure 13 - 2017 Build DHV (ITE)



4.0 DHV (PM PEAK HOUR) TRAFFIC CONGESTION ANALYSES

For development projects such as this, intersection capacity analyses are typically conducted using accepted traffic engineering procedures. These analyses produce a rating known as level of service (LOS), which range from A (best) to F (poor). At intersections, the LOS is determined by the average control delay; measured in seconds per vehicle. The methodology for analyzing LOS is established by the *Highway Capacity Manual* (*HCM*)[4] and is incorporated into several computer programs designed specifically for this purpose, notably *Highway Capacity Software* (*HCS*) and *Synchro*. Table 3 summarizes the *HCM* LOS and delay criteria for intersections.

Table 3 - Level of Service & Delay Criteria

	Avg. Delay (sec/veh)			Avg. Delay (sec/veh	
LOS	Signalized	Unsignalized	LOS	Signalized	Unsignalized
A	≤10	≤10	D	≤55	≤35
B	≤20	≤15	E	≤80	≤50
C	≤35	≤25	F	>80	>50

As can be seen in Table 3, the *HCM* sets lower delays for a given LOS at unsignalized intersections vs. signalized intersections. This has been done due to the fact that motorists at unsignalized intersections tend to be less patient when faced with long delays than those at signalized intersections.

VTrans' Level of Service Policy[5] effectively establishes desired LOS standards for the state highway system. For signalized intersections, an overall rating of LOS C represents the accepted design target. Reduced LOS ratings may be acceptable (as determined by VTrans) in built-up densely settled areas (such as Hinesburg village) where negative cultural and environmental impacts may result to the surrounding area from improvements necessary to achieve LOS C. The VTrans LOS Policy does not establish design targets for individual lane groups or approaches at signalized intersections, however accepted engineering practice is to provide LOS E or better and to maintain v/C (volume/capacity) ratios below 1.0 on each lane group.

At unsignalized intersections, LOS D represents the accepted design target established in the VTrans LOS Policy for side roads having approach volumes exceeding 100 vph on a single-lane approach or 150 vph on a two-lane approach. There is no LOS design target at unsignalized intersections having side road approach volumes lower than the foregoing thresholds. All unsignalized intersections but the Commerce

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[4] *Highway Capacity Manual*, Transportation Research Board, 2000

[5] *Highway Design "Level of Service" Policy*, Vermont Agency of Transportation, May 31, 2007

St & NBM/Hannaford intersection meet the volume thresholds without this Project. All meet them with this Project.

Tables 4 and 5 present the results of the intersection capacity analyses at each study area intersection. Following Table 5 is a discussion of the results at each intersection. Detailed level of service analysis worksheets for each intersection are included in **Appendices C-I**.

Table 4 - 2012 Intersection PM Peak Hour Levels of Service

	No-Build				Build (VT)				Build (ITE)			
	LOS	Avg. Delay	v/C Ratio	95% Queue	LOS	Avg. Delay	v/C Ratio	95% Queue	LOS	Avg. Delay	v/C Ratio	95% Queue
VT 116 & Shelburne Falls/CVU Rd												
Shelburne Falls Rd LT/TH/RT	C	31	0.80	289'	C	32	0.81	300'	C	33	0.82	301'
CVU Rd LT/TH/RT	B	19	0.45	116'	B	19	0.44	116'	B	19	0.44	116'
VT 116 NB LT/TH/RT	A	8	0.47	155'	A	9	0.51	173'	A	9	0.52	177'
VT 116 SB LT/TH/RT	B	16	0.79	494'	B	17	0.80	502'	B	17	0.80	503'
Overall[6]	**B**	**18**	**0.79**		**B**	**19**	**0.80**		**B**	**19**	**0.81**	
VT 116 & Commerce St												
Farmall Dr LT/TH	D	43	0.17	53'	D	38	0.12	50'	D	37	0.12	50'
Farmall Dr RT	D	42	0.03	41'	D	37	0.03	39'	D	36	0.03	39'
Commerce St LT/TH	D	48	0.58	134'	-	-	-	-	-	-	-	-
Commerce St RT	D	42	0.05	52'	-	-	-	-	-	-	-	-
Commerce St LT	-	-	-	-	E	56	0.77	258'	E	59	0.80	294'
Commerce St TH/RT	-	-	-	-	D	37	0.10	68'	D	37	0.10	70'
Route 116 NB LT	E	58	0.36	41'	E	56	0.36	34'	E	56	0.36	33'
Route 116 NB TH	B	11	0.28	243'	B	16	0.31	192'	B	17	0.31	183'
Route 116 NB RT	A	10	0.06	25'	B	15	0.11	27'	B	16	0.12	27'
Route 116 SB LT	D	48	0.50	113'	D	49	0.62	176'	D	49	0.64	185'
Route 116 SB TH/RT	B	15	0.58	728'	B	18	0.59	678'	B	18	0.60	666'
Overall	**C**	**22**	**0.58**		**C**	**28**	**0.63**		**C**	**29**	**0.64**	
VT 116 & Mechanicsville Rd												
Route 116 SB LT	A	8	0.00	25'	A	9	0.00	25'	A	9	0.00	25'
Mechanicsville Rd LT/RT	F	50	0.69	148'	F	82	0.81	223'	F	88	0.83	235'
VT 116 & Charlotte Rd												
Charlotte Rd LT	D	53	0.60	125'	D	54	0.65	176'	E	55	0.67	185'
Charlotte Rd RT	D	46	0.04	46'	D	45	0.04	46'	D	45	0.05	48'
Lantman's LT/TH/RT	E	66	0.75	230'	E	71	0.78	230'	E	71	0.78	230'
Route 116 NB LT/TH/RT	B	10	0.43	396'	B	13	0.53	579'	B	14	0.55	605'
Route 116 SB TH/RT	C	20	0.85	1,057'	C	31	0.92	1,155'	C	34	0.94	1,158'
Overall	**C**	**25**	**0.81**		**C**	**31**	**0.87**		**C**	**33**	**0.89**	
VT 116 & Silver St												
Route 116 NB LT	A	9	0.02	25'	A	10	0.02	25'	A	10	0.02	25'
Silver St LT/RT	D	30	0.61	111'	E	40	0.70	157'	E	42	0.72	166'
Mechanicsville Rd & Commerce St												
Mechanicsville Rd NB LT	A	8	0.01	25'	A	8	0.03	25'	A	8	0.03	25'
Mechanicsville Rd SB LT	A	8	0.00	0'	A	8	0.00	0'	A	8	0.00	0'
Thistle Hill LT/TH/RT	B	12	0.08	25'	B	12	0.09	25'	B	12	0.09	25'
Commerce St LT/TH/RT	B	13	0.23	25'	B	14	0.29	30'	B	15	0.31	33'
Commerce St & NBM/Hannaford												
Commerce St WB LT	A	8	0.01	25'	A	8	0.04	25'	A	8	0.05	25'
NBM/Hannaford LT/RT	A	10	0.05	25'	B	13	0.31	34'	B	15	0.38	45'

[6] *HCM* calculates overall intersection levels of service only at signalized intersections

Table 5 - 2017 Intersection PM Peak Hour Levels of Service

	No-Build				Build (VT)				Build (ITE)			
	LOS	Avg. Delay	v/C Ratio	95% Queue	LOS	Avg. Delay	v/C Ratio	95% Queue	LOS	Avg. Delay	v/C Ratio	95% Queue
VT 116 & Shelburne Falls/CVU Rd												
Shelburne Falls Rd LT/TH/RT	C	32	0.80	296'	C	33	0.82	306'	C	33	0.82	308'
CVU Rd LT/TH/RT	B	19	0.45	118'	B	19	0.45	118'	B	19	0.44	118'
VT 116 NB LT/TH/RT	A	9	0.48	160'	A	10	0.52	179'	A	10	0.53	183'
VT 116 SB LT/TH/RT	B	17	0.81	507'	C	18	0.82	515'	C	18	0.82	516'
Overall[5]	**B**	**19**	**0.81**		**B**	**20**	**0.82**		**B**	**20**	**0.82**	
VT 116 & Commerce St												
Farmall Dr LT/TH	D	43	0.17	52'	D	38	0.12	50'	D	37	0.11	50'
Farmall Dr RT	D	42	0.03	41'	D	37	0.03	39'	D	36	0.03	39'
Commerce St LT/TH	D	48	0.59	-	-	-	-	-	-	-	-	-
Commerce St RT	D	42	0.05	-	-	-	-	-	-	-	-	-
Commerce St LT	-	-	-	136'	E	57	0.78	263'	E	59	0.80	298'
Commerce St TH/RT	-	-	-	53'	D	37	0.10	68'	D	37	0.10	70'
Route 116 NB LT	E	57	0.36	40'	E	56	0.36	32'	E	56	0.36	31'
Route 116 NB TH	B	11	0.28	237'	B	16	0.31	182'	B	17	0.32	174'
Route 116 NB RT	A	10	0.06	23'	B	15	0.12	25'	B	16	0.13	24'
Route 116 SB LT	D	48	0.50	113'	D	49	0.62	178'	D	49	0.64	186'
Route 116 SB TH/RT	B	15	0.59	747'	B	18	0.60	696'	B	19	0.61	686'
Overall	**C**	**22**	**0.59**		**C**	**28**	**0.63**		**C**	**29**	**0.65**	
VT 116 & Mechanicsville Rd												
Route 116 SB LT	A	9	0.00	25'	A	9	0.00	25'	A	9	0.00	25'
Mechanicsville Rd LT/RT	F	57	0.73	172'	F	99	0.85	261'	F	110	0.87	279'
VT 116 & Charlotte Rd												
Charlotte Rd LT	D	53	0.61	127'	E	55	0.66	180'	E	56	0.68	189'
Charlotte Rd RT	D	46	0.04	47'	D	45	0.04	48'	D	45	0.05	49'
Lantman's LT/TH/RT	E	67	0.76	233'	E	73	0.78	233'	E	73	0.78	233'
Route 116 NB LT/TH/RT	B	11	0.45	473'	B	14	0.56	615'	B	14	0.58	642'
Route 116 SB TH/RT	C	22	0.87	1,094'	D	35	0.94	1,184'	D	40	0.95	1,189'
Overall	**C**	**26**	**0.83**		**C**	**34**	**0.89**		**D**	**37**	**0.90**	
VT 116 & Silver St												
Route 116 WB LT	A	9	0.02	25'	A	10	0.02	25'	A	10	0.02	25'
Silver St LT/RT	D	32	0.64	122'	E	43	0.72	172'	E	46	0.74	184'
Mechanicsville Rd & Commerce St												
Mechanicsville Rd NB LT	A	8	0.01	25'	A	8	0.03	25	A	8	0.03	25
Mechanicsville Rd SB LT	A	8	0.00	0'	A	8	0.00	0'	A	8	0.00	0'
Thistle Hill LT/TH/RT	B	12	0.08	25'	B	12	0.09	25'	B	12	0.09	25'
Commerce St LT/TH/RT	B	13	0.23	25'	B	15	0.30	31'	B	15	0.31	34'
Commerce St & NBM/Hannaford												
Commerce St WB LT	A	8	0.01	25'	A	8	0.04	25'	A	8	0.05	25'
NBM/Hannaford LT/RT	A	10	0.05	25'	B	14	0.31	34'	B	15	0.38	46'

VT 116 & Shelburne Falls Rd/CVU Rd - This intersection will continue to operate at acceptable levels of service with the addition of this Project.

VT 116 & Farmall St/Commerce St - This intersection was signalized by the National Bank of Middlebury in 2008. The proposed Hinesburg Square Lot 34 development (Kinney Drug) is currently making certain geometric and traffic signal improvements at this intersection which have been included in the capacity analyses. Those improvements include constructing a new northbound left-turn lane on Route 116, widening Farmall Drive to provide an exclusive right-turn lane on that approach, installing additional pedestrian signals and crosswalks, and upgrading to vehicle video detection. The updated capacity analyses at this intersection now also include the exclusive pedestrian signal phase.

The impact of additional turning movements at this intersection will be mitigated by increasing the existing 89 sec signal cycle length to 110 sec and implementing new signal timings. In addition, with the major turn movement exiting Commerce St changing from right-turns to left-turns, it is proposed to modify the through movement lane assignment so that there will be an exclusive left-turn lane instead of the existing exclusive right-turn lane. With these changes, this intersection will continue to operate at desired levels of service with the addition of this Project.

This Project will increase queue lengths in the southbound Route 116 left-turn lane and on the westbound Commerce Street left/through lane. The solution to the latter will be to lengthen the right-turn lane so as to allow right-turning vehicles to get around vehicles queued in the adjacent lane. The southbound left-turn and westbound right-turn lanes are presently 75 ft and 25 ft long, respectively. We recommend that they be lengthened to 175 ft and 200 ft, respectively.

VT 116 & Mechanicsville Rd - This intersection presently experiences the greatest level of traffic congestion of any in the study area of this TIA. While this Project is not projected to increase Mechanicsville Rd approach volumes during pm peak hour conditions, it will increase through traffic passing on Route 116, thus reducing the number and size of gaps for vehicles exiting Mechanicsville Rd. From the HCS ITE scenario analyses results, the future (2017 Build DHV) volume/capacity ratio on the Mechanicsville Rd approach will equal 0.87 and the 95th percentile queue length will equal 11 vehicles. These indicate that unreasonable traffic congestion conditions will not be created at this intersection despite the LOS F rating. The increased cycling of the Commerce St traffic signal immediately north of this intersection will help mitigate future peak hour traffic conditions somewhat by creating additional gaps in the heavy southbound Route 116 flow of traffic.

With ready access to the existing traffic signal at the Route 116/Commerce St intersection, it is likely that some number of southbound Mechanicsville Rd vehicles are diverting to Commerce St in order to avoid the long delays at this location. In the future, as delays increase at the Route 116/Mechanicsville Rd intersection, more drivers are likely to take advantage of the Commerce St signal for their southbound left-turns during peak times; thus offsetting the theoretical increase in delays at the Route 116/ Mechanicsville Rd intersection. Such a future diversion, however, has not been factored into the analyses at this intersection.

At a meeting with CCMPO on January 29, 2011, it was noted that future traffic volumes at this intersection were previously identified as satisfying one or more warrants for signalization by the year 2015 unless traffic exiting Mechanicsville Road was diverted to Commerce St.[7] Our examination of the hourly traffic volumes from the June 3, 2010 CCMPO turning movement count at this intersection indicates that the four hour volume warrant for signalization is already satisfied.

VT 116 & Charlotte Rd - This intersection was signalized in 2007 by VTrans. Even with signalization, southbound Route 116 traffic often experiences long delays and queues during the afternoon peak hour. Our observations of pm peak hour traffic operations at this intersection have noted the following contributing factors:

- This intersection has an exclusive pedestrian signal phase that is utilized several times during the peak hour; with resulting increased delays to vehicular traffic.
- The southbound Route 116 approach has an uphill grade of ±4%; which reduces its capacity.
- Considerable unused green time was observed during each signal cycle (successive southbound vehicles were often spaced far apart).
- During the summer months a local farmer's market at the church just north of this intersection sets up an "unofficial" mid-block pedestrian crossing in order to access parking on the opposite side of Route 116. This contributes to some of the unused green time noted above.
- The entrance to Lantman's Store is located just south of the intersection such that southbound left-turns entering Lantman's are actually through movements until just south of the intersection, where they then often have to wait until the northbound queue clears before turning. Although there is sufficient width for southbound traffic to bypass waiting left-turning vehicles, this causes considerable friction and slows southbound traffic flow.

Input variables for the capacity analyses at this intersection were modified in an effort to more accurately project existing and future levels of service and vehicular delays. One of the key modifications was to reduce the southbound movement's saturation flow rate from the standard default of 1,900 vehicles per hour of green to 1,700. This effectively reduced the number of southbound vehicles that can make it through the intersection during each signal cycle. The reduced saturation flow rate is based on field observations of pm peak hour traffic flow at this intersection. From our observations, we estimate that the unused capacity on the southbound approach equals ±5 vehicles per cycle. At 40 cycles per hour, that results in a 200 vph reduction in the saturation flow rate. The updated intersection capacity analyses at this intersection now also include the existing exclusive pedestrian signal phase.

We also note that accepted engineering practice in Vermont (as established by VTrans policy) is to analyze DHV conditions for the full hour without applying a 15-minute peaking factor. Peak hour traffic volumes typically exhibit a 15-30 minute peak within their respective one-hour periods. The resulting capacity analyses will not account for those mini-peaks.

As with the Route 116/Commerce St. intersection, the existing 89 sec cycle length at this intersection is proposed to be increased to 110 sec (these two intersections operate in the coordinated mode during

[7] Route 116 Hinesburg Village Corridor Study, DuBois & King, Inc., June 2004

peak hours and thus need to have the same cycle length) and new signal timings implemented. With those changes, the results of the capacity analyses indicate that this intersection will retain its LOS C overall rating with this Project (VT scenario). Under the ITE scenario, the overall LOS of this intersection will drop to LOS D. Given the built-up nature of Hinesburg village immediately surrounding this intersection, it is our opinion that this intersection qualifies for the reduced LOS standard as outlined in the VTrans Level of Service Policy.

VT 116 & Silver St - This intersection was recently realigned and a southbound right-turn lane added on Route 116 as part of a VTrans highway improvement project. While this Project will cause future levels of service at this intersection to drop by one range (from D to E) during the DHV peak hour, the HCS ITE scenario results indicate that the future (2017 Build) volume/capacity ratio on the Silver St approach will equal 0.74 and the 95th percentile queue length will equal 8 vehicles. These indicate that unreasonable traffic congestion conditions will not be created at this intersection despite the LOS E rating.

Mechanicsville Rd & Commerce St - This intersection will continue to operate at desired levels of service with the addition of this Project.

Commerce St & NBM/Hannaford - This intersection will continue to operate at desired levels of service with the addition of this Project. No geometric improvements other than increasing the corner radii to accommodate larger delivery vehicles are needed.

Conclusion - Traffic Congestion

Based on the above and with the recommended lengthening of the turn lanes at the Route 116/ Commerce St intersection, it is our professional opinion that this Project will not create unreasonable traffic congestion conditions within the limits of the study area of this TIA.

5.0 AM PEAK HOUR TRAFFIC CONGESTION ANALYSES

As noted previously, both VTrans and CCMPO requested additional intersection capacity analyses for two intersections; Route 116/Shelburne Falls Rd/CVU Rd and Route 116/Farmall Dr/Commerce St. Calculations of the am peak hour traffic volumes are included in the DHV calcuations (**Appendix A**). In addition, am peak hour trips resulting from other nearby development and from this Project were calculated as previously described. Figures 14-22 present the resulting am peak hour volumes used in the capacity analyses.

Figure 14 - 2012 Background AM Peak

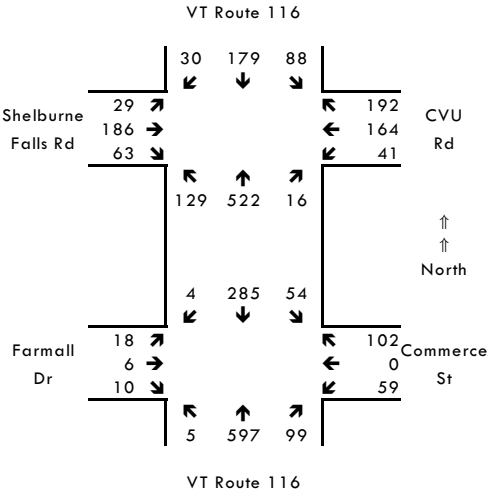


Figure 15 - 2017 Background AM Peak

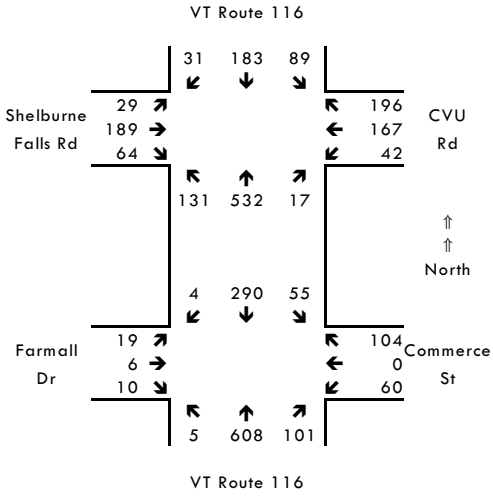


Figure 16 - Other Development AM Trips

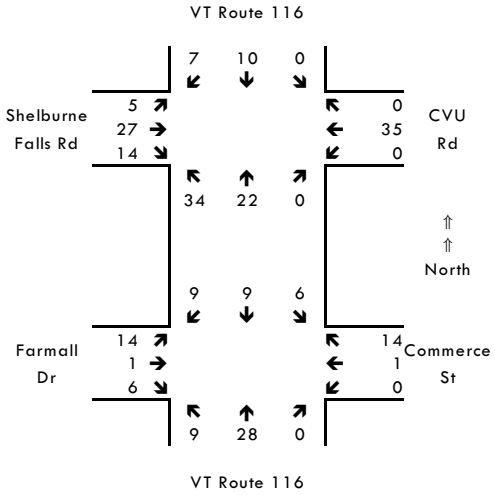


Figure 17 - 2012 No-Build AM Peak

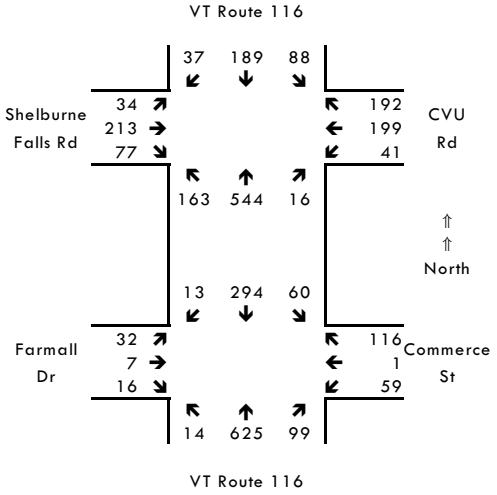


Figure 18 - 2017 No-Build AM Peak

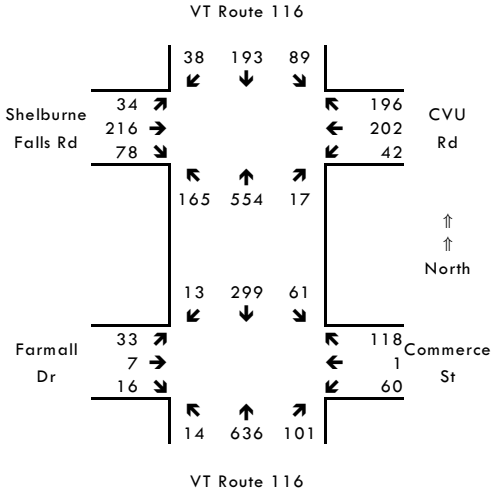


Figure 19 - Project Trips (VT)

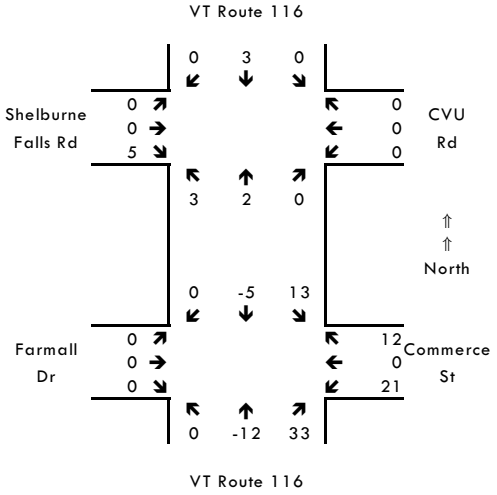


Figure 20 - Project Trips (ITE)

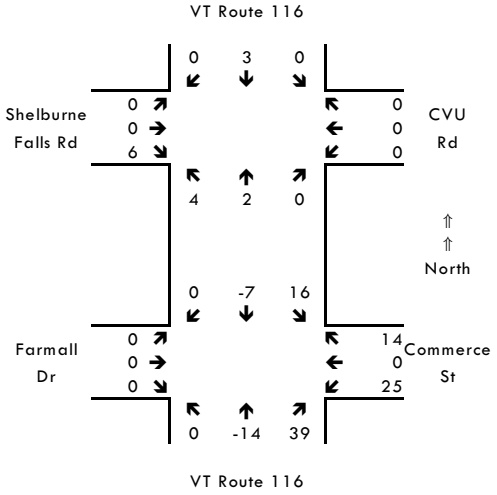


Figure 21 - 2012 Build AM Peak (VT)

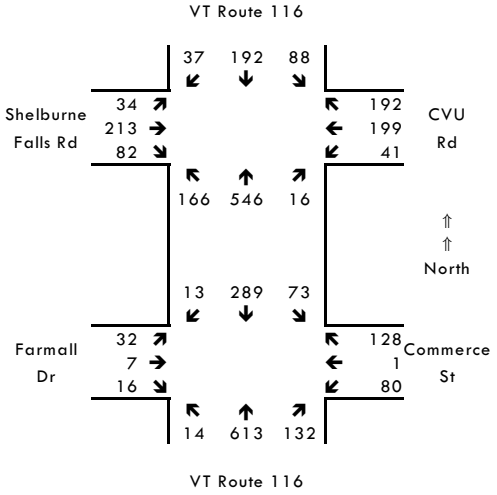


Figure 22 - 2012 Build AM Peak (ITE)

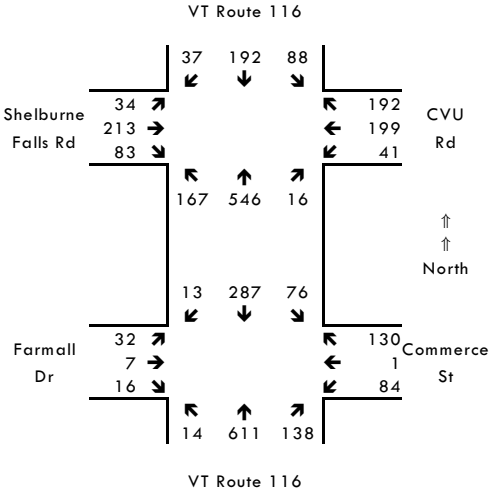


Figure 23 - 2017 Build AM Peak (VT)

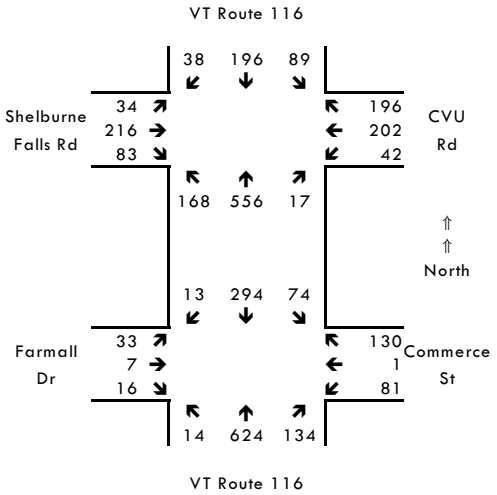
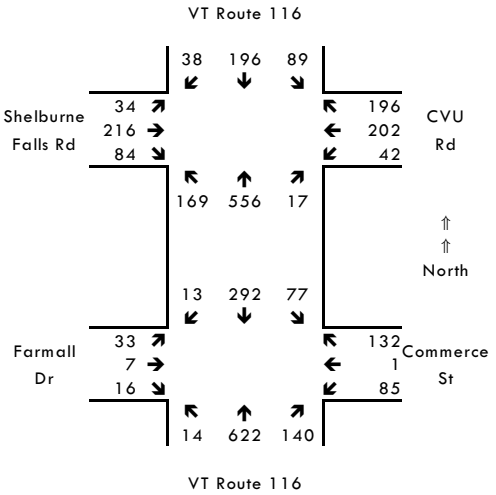


Figure 24 - 2017 Build AM Peak (ITE)



Tables 6 and 7 present the results of the am peak hour intersection capacity analyses at the above two intersections. The results indicate that desired levels of service will be maintained under future am peak hour traffic conditions with this Project at both intersections. Detailed level of service analysis worksheets for each intersection are included in **Appendices C** and **D**.

The results of the above analyses indicate that this Project will not create unreasonable traffic congestion conditions within the limits of the study area of this TIA during the am peak hour.

Table 6 - 2012 Intersection AM Peak Hour Levels of Service

	No-Build				Build (VT)				Build (ITE)			
	LOS	Avg. Delay	v/C Ratio	95% Queue	LOS	Avg. Delay	v/C Ratio	95% Queue	LOS	Avg. Delay	v/C Ratio	95% Queue
VT 116 & Shelburne Falls/CVU Rd												
Shelburne Falls Rd LT/TH/RT	C	21	0.65	263'	C	21	0.66	268'	C	20	0.65	255'
CVU Rd LT/TH/RT	C	28	0.80	362'	C	29	0.80	362'	C	27	0.78	350'
VT 116 NB LT/TH/RT	B	17	0.83	548'	B	18	0.83	555'	B	19	0.84	571'
VT 116 SB LT/TH/RT	B	17	0.63	202'	B	17	0.63	205'	B	17	0.64	212'
Overall	**C**	**20**	**0.81**		**C**	**21**	**0.82**		**C**	**21**	**0.82**	
VT 116 & Commerce St												
Farmall Dr LT/TH	C	33	0.26	50'	C	33	0.32	51'	C	32	0.28	51'
Farmall Dr RT	C	32	0.01	19'	C	31	0.01	19'	C	31	0.01	19'
Commerce St LT/TH	C	34	0.42	70'	-	-	-	-	-	-	-	-
Commerce St RT	C	32	0.07	55'	-	-	-	-	-	-	-	-
Commerce St LT	-	-	-	-	C	34	0.51	89'	C	33	0.48	92'
Commerce St TH/RT	-	-	-	-	C	32	0.09	59'	C	31	0.09	60'
Route 116 NB LT	D	38	0.20	26'	D	38	0.20	26'	D	38	0.20	26'
Route 116 NB TH	B	15	0.62	605'	B	17	0.64	589'	B	18	0.66	587'
Route 116 NB RT	A	9	0.09	57'	A	10	0.13	71'	B	11	0.14	74'
Route 116 SB LT	D	36	0.42	70'	C	34	0.41	82'	C	34	0.42	85'
Route 116 SB TH/RT	A	9	0.28	208'	A	9	0.28	204'	A	9	0.29	203'
Overall	**B**	**17**	**0.60**		**B**	**19**	**0.59**		**B**	**19**	**0.59**	

Table 7 - 2017 Intersection AM Peak Hour Levels of Service

	No-Build				Build (VT)				Build (ITE)			
	LOS	Avg. Delay	v/C Ratio	95% Queue	LOS	Avg. Delay	v/C Ratio	95% Queue	LOS	Avg. Delay	v/C Ratio	95% Queue
VT 116 & Shelburne Falls/CVU Rd												
Shelburne Falls Rd LT/TH/RT	C	21	0.66	269'	C	21	0.67	274'	C	21	0.66	261'
CVU Rd LT/TH/RT	C	29	0.81	372'	C	30	0.81	373'	C	29	0.80	360'
VT 116 NB LT/TH/RT	B	19	0.84	564'	B	19	0.85	572'	C	20	0.86	586'
VT 116 SB LT/TH/RT	B	17	0.64	209'	B	17	0.64	211'	B	18	0.65	219'
Overall	**C**	**21**	**0.83**		**C**	**22**	**0.83**		**C**	**22**	**0.83**	
VT 116 & Commerce St												
Farmall Dr LT/TH	C	33	0.27	52'	C	32	0.29	52'	C	32	0.29	52'
Farmall Dr RT	C	32	0.01	19'	C	31	0.01	19'	C	30	0.01	19'
Commerce St LT/TH	C	34	0.43	71'	-	-	-	-	-	-	-	-
Commerce St RT	C	32	0.07	56'	-	-	-	-	-	-	-	-
Commerce St LT	-	-	-	-	C	33	0.47	89'	C	33	0.49	93'
Commerce St TH/RT	-	-	-	-	C	31	0.09	60'	C	31	0.09	60'
Route 116 NB LT	D	38	0.20	26'	D	38	0.20	26'	D	38	0.20	26'
Route 116 NB TH	B	15	0.63	619'	B	18	0.67	604'	B	18	0.67	601'
Route 116 NB RT	A	9	0.10	59'	B	10	0.13	73'	B	11	0.14	75'
Route 116 SB LT	D	36	0.43	72'	C	34	0.42	83'	C	34	0.43	86'
Route 116 SB TH/RT	A	9	0.29	212'	A	9	0.29	208'	A	9	0.29	207'
Overall	**B**	**17**	**0.61**		**B**	**19**	**0.60**		**B**	**19**	**0.60**	

6.0 TRAFFIC SAFETY

Vehicular traffic safety is influenced by many factors, including road width, pavement conditions, sight distances, lighting, proper signing and pavement markings, speed limits, alignment, number and spacing of accesses, etc. The following discusses several of the more important factors with respect to conditions on the adjacent street network in the immediate vicinity of the proposed Hannaford supermarket.

Speed Limits & Sight Distances

The existing speed limit on VT Route 116 is 40 mph north of Commerce St; reducing to 30 mph at the Commerce St intersection extending south through Hinesburg village. Posted speed limits on the town highways in the immediate vicinity of this Project also equal 30 mph. Sight distances are excellent throughout the study area.

Crash History

There are not any high crash locations that have been identified within the study area (as defined by the 75 peak hour project trip threshold) of this TIA. However, a 0.3 mile long high crash segment was identified in the VTrans 2003-2007 High Crash Location Report on Route 116 bracketing the Shelburne Falls Rd/CVU Rd intersection. The intersection itself, however, is not a high crash location. On the Route 116 segment, a total of 24 crashes occurred over that five-year period. Reviewing the more recent 2005-2009 crash history of this same segment indicates a total of 26 crashes, of which four resulted in injuries. Fourteen crashes were rear-end collisions, with the remainder being mostly left-turn and thru angle collisions. Of the 24 crashes, six resulted in injuries.

Future improvements at this intersection are currently being designed as a VTrans safety improvement project. Those improvements will include new left-turn lanes on each approach and new traffic signal equipment. It is estimated that those improvements will be constructed in 2014 at the earliest. The proposed Bissonette development will also add an exclusive right-turn lane on the Shelburne Falls Rd approach of this intersection when that project is constructed.

Pedestrian Safety

This Project proposes internal sidewalks connecting to the existing Commerce St and Mechanicsville Rd sidewalks. It also includes extending the sidewalk on the southerly side of Commerce St within the town's existing easement along the Dark Star parcel's frontage, to create a continuous sidewalk from the Project site to Route 116.

Conclusion - Traffic Safety

While this Project will bring increased traffic volumes to nearby intersections (particularly along Commerce St), the roadway and intersection improvements identified in this TIA will be designed to provide safe passage for both vehicular and pedestrian traffic. All proposed roadway and intersection improvements made as part of this Project, including pavement markings, lighting and signage, will be constructed in accordance with current MUTCD and VTrans design standards.

Based on the above, it is our professional opinion that this Project will not adversely impact existing or future traffic safety conditions within the limits of the study area of this TIA.