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December 11, 2008

Peter Richardson
Housing Strategies, Inc.
210 College Street, Suite 202
Burlington, VT 05401

RE: Sabin's Pasture
Montpelier, Vermont

Dear Peter,

As requested, enclosed is a copy of the results of a preliminary Traffic Impact Assessment for the proposed development of Sabin's Pasture on Barre Street in Montpelier.

Please call if you have any questions or comments.

Sincerely,

Roger Dickinson

Roger Dickinson, P.E., PTOE

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Sabin's Pasture
Traffic Impact Assessment

DRAFT

Barre Street, Montpelier
December 8, 2008

INTRODUCTION

Sabin's Pasture is an undeveloped 100± acre parcel located at the easterly edge of the City's core, with dense residential areas to the west and relatively undeveloped areas to the east. Its frontage along Barre Street extending roughly 200 ft deep is zoned as high density residential, with the remainder of the parcel being zoned medium density residential. Situated on the north side of Barre Street, it is easily accessed from Montpelier's downtown area as well as from US Route 2 via the Granite Street and Pioneer Street bridges across the Winooski River. **Figure 1** shows the location of Sabin's Pasture.

Long owned by the Aja family, the property was initially offered for sale in 2002. In 2007, the Trust for Public Land (TPL) acquired an option to purchase the property, and began to develop a consensus based solution that would permit some development while conserving the majority of the property. A local group comprised on community leaders and stakeholders was convened to develop a recommended development/conservation plan. That group, known as the Sabin's Pasture Working Group, ultimately produced a plan in early 2008 that envisions a mixed use development of 175-225 residential units and some commercial space on 15-20 acres of the property, with the remaining land being conserved for potential future use as a community park.

The purpose of this traffic impact assessment (TIA) is to examine the capacity and safety of the City's streets to accommodate the additional traffic that would be generated by the future development of Sabin's Pasture. It is "preliminary" in the sense that the exact nature or size of the proposed development has yet to be determined. Thus, two trip generation scenarios representing the anticipated range in the number of potential peak hour trips are examined in the following sections.

insert figure 1

STUDY AREA

A TIA's geographic scope normally includes the project's access point(s), those intersections or highways receiving 75 or more project generated peak hour trips and those intersections or highway segments that may fail as a result of the development[1]

With the foregoing in mind, initial discussions with City Department of Public Works (DPW) staff concerning the study area identified five existing intersections for inclusion in this TIA. From east to west, they include:

- River Street / Pioneer Street
- River Street / Berlin Street / Granite Street
- Barre Street / Granite Street
- Barre Street / Sibley Avenue
- Main Street / Barre Street

A future Barre Street / Project Access intersection was also added to the above list.

In the way of functional classifications, Barre, Granite and Pioneer Streets function as collector streets. Collector streets provide for a mix of land access and movement of through traffic. Main Street and the portion of Berlin Street leading up the hill to Berlin function as minor arterials. River Street and the portion of Berlin Street adjacent to the Winooski River are part of US Route 2, and function as principal arterials. The primary function of arterial streets is to provide for the movement of through traffic, with land access being a secondary function. All roads (with the exception of I-89, Dog River Road and a portion of Memorial Drive) in the City of Montpelier are owned and maintained by the City.

[1] VTrans Traffic Impact Study Guidelines, November 2007

NO-BUILD TRAFFIC VOLUMES

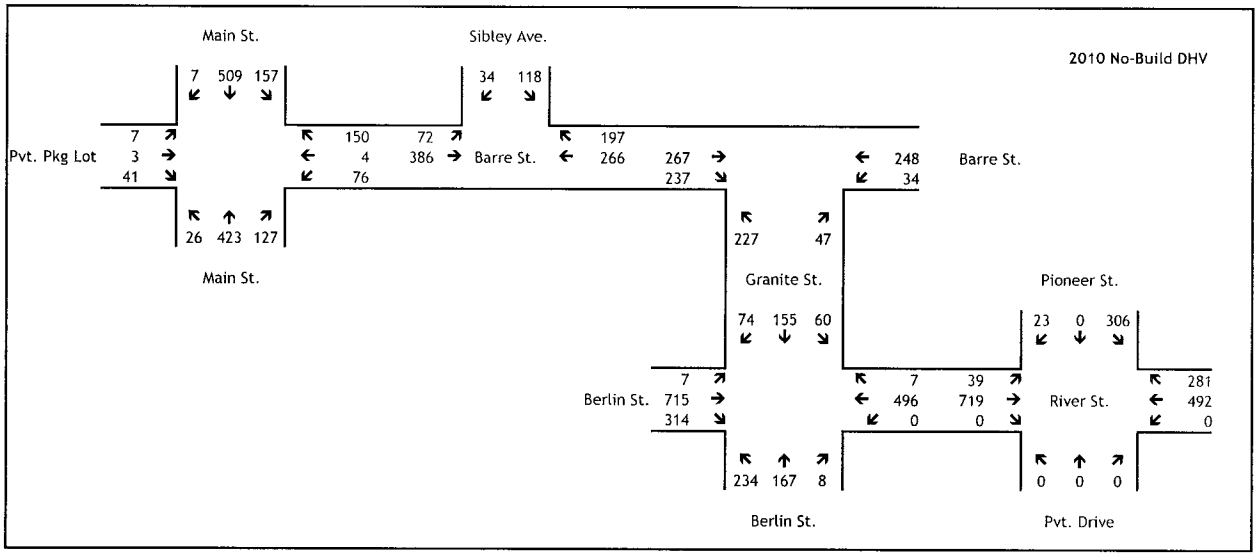
Traffic volumes were determined from recent traffic counts performed at each of the above intersections by the Vermont Agency of Transportation (VTrans). Those counts were adjusted to design hour volumes (DHV) through the use of other longer duration counts, including CTC (continuous count station) W24 located on Memorial Drive just west of Taylor Avenue, and ATR's (automatic traffic recorder counts) located on Barre, Berlin, River and Granite Streets. DHV's are the 30th highest hourly traffic volume that occur on a roadway in a given year, and are used in TIA's to evaluate traffic congestion conditions.

It is important to note that historical annual high hour listings at CTC W24 have consistently shown the DHV at this location as consistently occurring during the weekday afternoon peak hour period. This pattern is also reinforced by data from the ATR counts on each street, which show weekday morning peak hour volumes being 75-85% of the afternoon peak hour volumes.

At the request of the City DPW, we also contacted the Central Vermont Regional Planning Commission (CVRPC), who maintains the City's traffic model. The model was developed as part of the 2005 Downtown Montpelier Circulation Study and consists of a *SYNCHRO*[2] network analysis of the City's major streets and intersections. That study included growth and development projections to the year 2020. Digital files of the *SYNCHRO* network were provided by the CVRPC for use in performing the capacity analyses for this TIA.

With development at Sabin's Pasture likely occurring in phases, years 2010 and 2015 were selected as initial construction and completion of construction years, respectively. This resulted in the year 2020 representing the required five-year post construction analysis scenario. Background "no-build" DHV's were therefore estimated for the years 2010 and 2020, and are shown in **Figure 2**.

[2] Synchro is a traffic analysis computer program



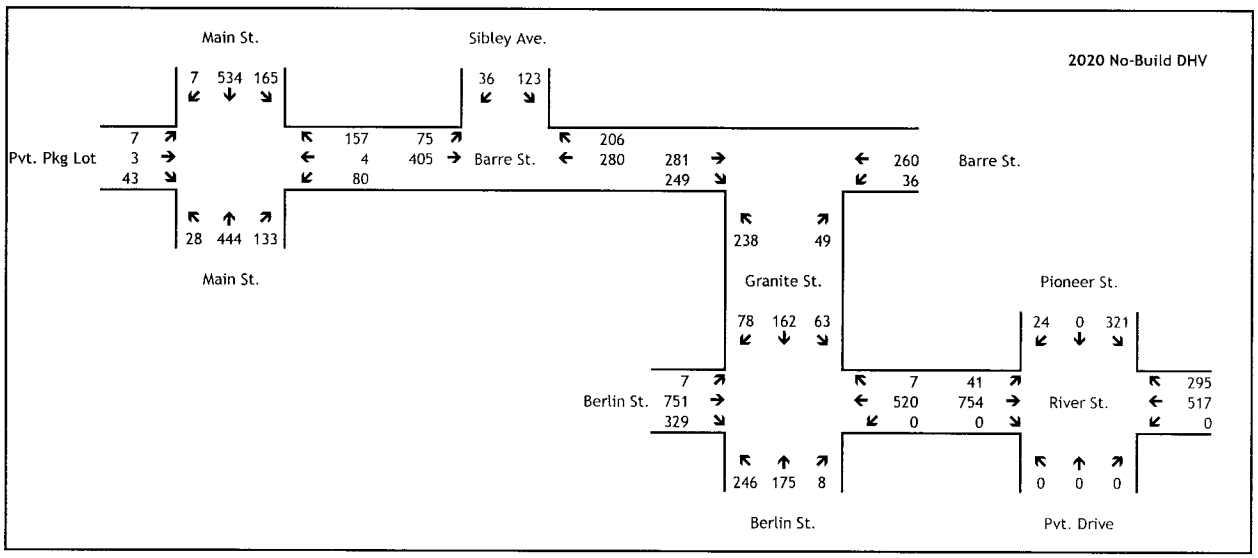


Figure 2 - No-Build DHV's

PROJECT-GENERATED TRIPS

The trip generation of this Project was estimated using trip generation data published by the Institute of Transportation Engineers (ITE). As noted earlier, because the exact nature of the proposed development is yet to be determined, two trip generation scenarios were developed, representing "high" and "low" development densities.

Trips generated by residential uses are typically estimated based on the number of units without regard to the number of bedrooms per unit. ITE does include several different residential categories, though, that can be applied to a mix of residential units. For illustrative purposes, Table 1 shows the range in the number of pm peak hour trips that would be generated by 100 units in various residential categories.

Table 1 - PM Peak Hour Trips per 100 Units

Residential Category	Peak Hour Trips (vte/hour)
#210 Single Family Dwelling	101
#220 Apartment	62
#230 Residential Condominium/Townhouse	60
#252 Senior Housing - Attached	16

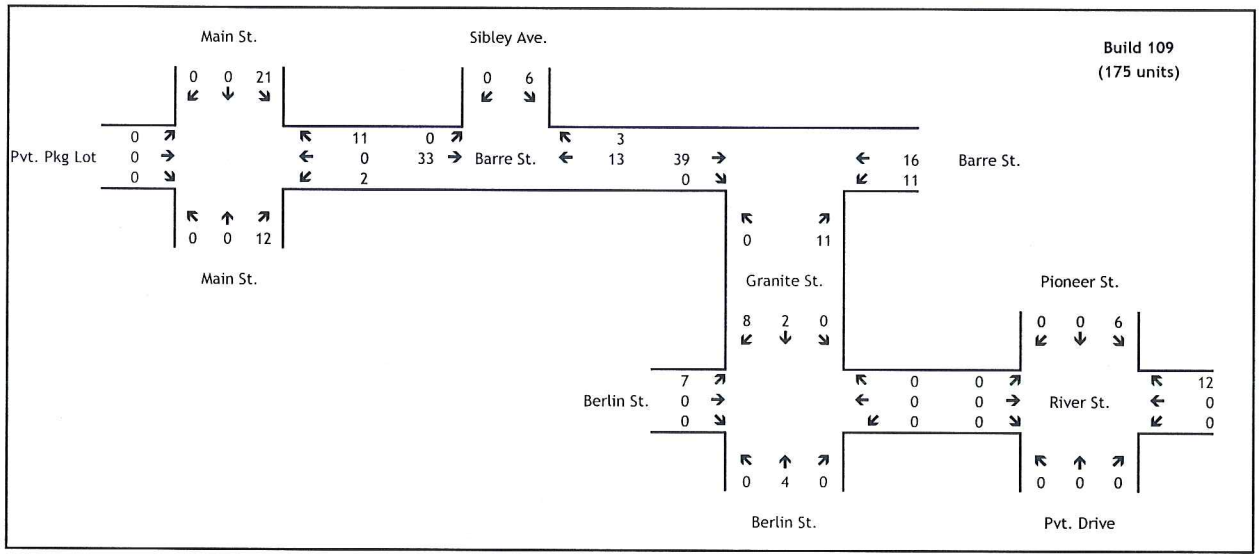
For this Project, the low density trip generation scenario consists only of 175 apartment units (ITE #220). The high density trip generation scenario was estimated to consist of 25 single family dwellings, 200 apartment units, 6,000 sf of general office and 6,000 sf of specialty retail. Table 2 presents the base trip generation of both scenarios.

Table 2 - Average Weekday Vehicle Trip Generation
(vehicle trip ends per hour)

	Size	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Low-Density Scenario (Build 109)							
Apartments	175 units	18	71	89	71	38	109
High-Density Scenario (Build 174)							
Single Family Residential	25 units	5	14	19	16	9	25
Apartments	200 units	20	82	102	81	43	124
General Office	6,000 sf	18	2	20	2	7	9
Specialty Retail	6,000 sf	0	0	0	7	9	16
Total		43	98	141	106	68	174

The above peak hour trip generation estimates were then adjusted to account for local non-vehicular (multi-modal) travel patterns. For this, US Census journey to work data indicates that 50% of City residents work locally in the City. The same data also indicates that 16% of all City residents walk or bike to work. Effectively, for those who live and work in the City, this translates to a 32% walk or bike travel mode choice. With Sabin's Pasture being located within a reasonable walking distance of Montpelier's downtown, community facilities and major places of employment, we estimate an overall 12% modal split for non-vehicular travel during peak hour periods. This split is applied to only those vehicular trips traveling on Barre Street to and from Montpelier's downtown area; resulting in a 24% reduction of those movements.

The directional patterns of project-generated peak hour trips were estimated using the same US Census journey to work data for Montpelier City residents. **Figures 3 and 4** show the resulting pm peak hour trip distributions and total of background traffic volumes plus Project trips, respectively.



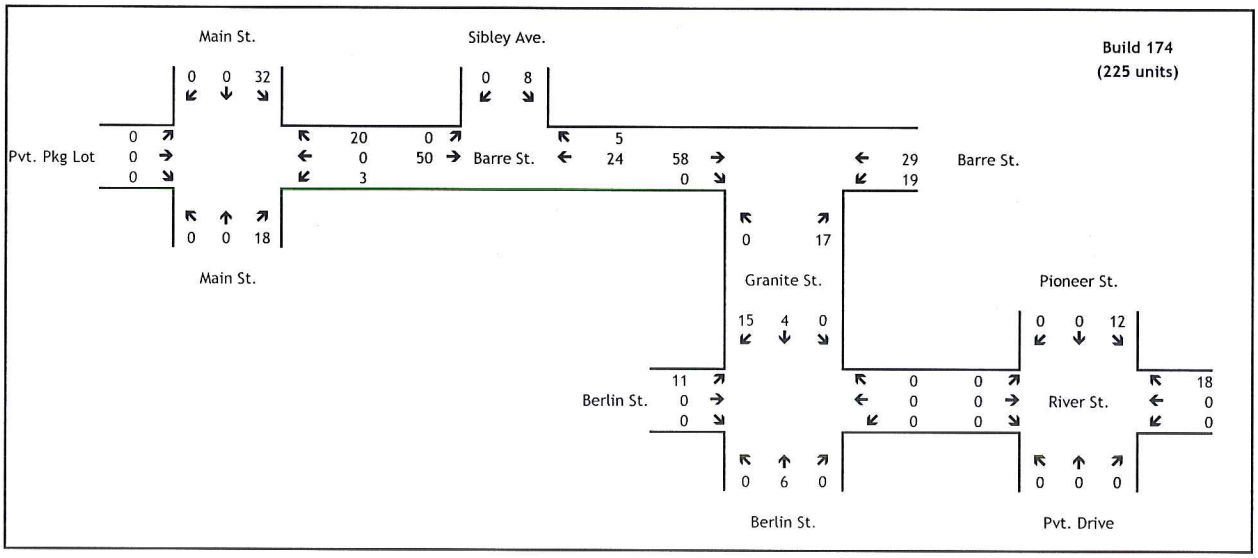
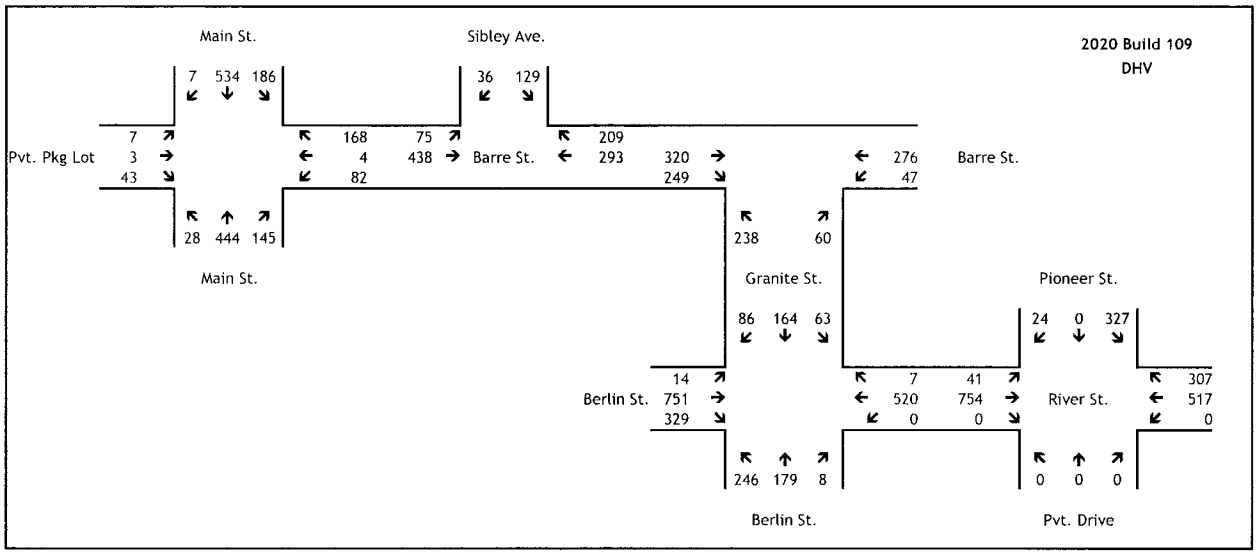


Figure 3 - Project-Generated PM Peak Hour Trips



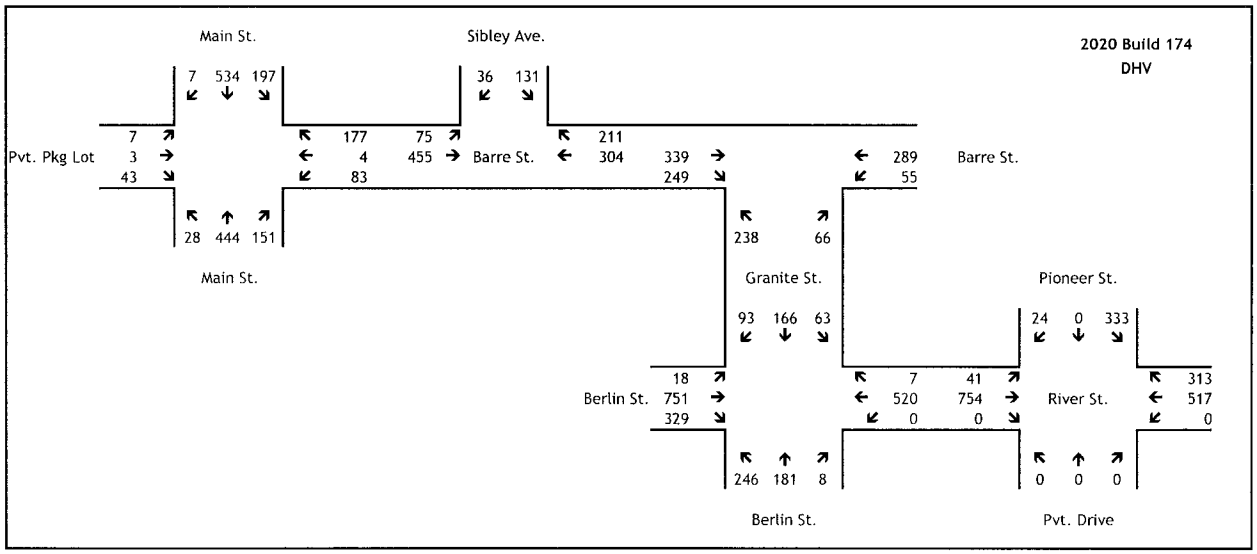


Figure 4- Build DHV's

TRAFFIC CONGESTION

Traffic congestion conditions are identified by "levels of service", commonly referred to as "LOS". The ranges are A to F; where A represents essentially free flow (no congestion), C represents average congestion, and F represents severe congestion. The level of service criteria for intersections is shown in Table 3.

Table 3 - Level of Service/Delay Criteria

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

VTrans has adopted a level of service policy for the state highway system. This policy establishes LOS C as the desired design target for the overall intersection at signalized intersections. The overall intersection level of service is determined by the weighted average of the delay experienced on all approaches. Individual approach and/or lane levels of service at signalized intersections may be lower than LOS C.

At two-way stop controlled intersections having ≥100 vph approach volume on a single-lane side street approach or ≥150 vph approach volume on a two-lane side street approach, the VTrans level of service policy establishes LOS D as the desired design target on the minor street approach(s). There is no level of service standard for unsignalized intersections not meeting the above side street volume thresholds.

The level of service policy also anticipates that there will be intersections which already operate at poor levels of service; including LOS F. At such intersections, the policy provides that a reduced (less than C) LOS may be acceptable where the necessary geometric improvements are not feasible as long as an improvement over existing conditions can be demonstrated through the use of selected techniques. This is important, as it points out that the policy is to mitigate otherwise adverse traffic impacts at intersections without necessarily having to improve the overall level of service to LOS C.

Section 702.C of the City of Montpelier's Zoning and Subdivision Regulations also provides guidance concerning allowable traffic congestion conditions on existing city streets. While not establishing a

specific level of service standard, this section requires that development "...not cause congestion or unsafe conditions with respect to the use of existing streets and intersections." It also states that a reduction of more than one level of service by a major planned development would create an adverse impact on neighborhood character.

For the purpose of this study, all intersection capacity analyses were performed using the *SYNCHRO* model developed for the City. The results of the capacity analyses are shown in Table 4. Detailed output reports for each scenario are also enclosed as **Appendices A-D.**

Table 4 - Intersection Levels of Service
(Existing Geometrics & Traffic Control)

	2010	2020		
	No-Build	No-Build	Build 109	Build 174
Main St./Barre St.	F (764)	F (>999)	F (>999)	F (>999)
Barre St./Sibley Ave.	C (25)	D (28)	D (32)	E (35)
Barre St./Granite St.	D (30)	E (37)	F (57)	F (83)
Barre St./Project Access	--	--	B (11)	B (11)
Berlin St./River St./Granite St.	D (46)	E (60)	E (64)	E (78)
River St./Pioneer St.	B (13)	B (15)	B (15)	B (15)

The results of the above analyses indicate that three intersections are already experiencing significant levels of traffic congestion under existing and future "No-Build" conditions. One of those, the Main St./Barre St. intersection, already experiences unreasonable conditions (LOS F). Adding this Project causes one additional intersection, the Barre St./Granite St. intersection, to also experience LOS F.

With those results, we proceeded to identify potential geometric and/or traffic control improvements that this Project could reasonably implement that would reduce future delays and mitigate any degradation in future levels of service. They include:

- Main St./Barre St. - Adding an exclusive right-turn lane on the Barre St. approach.
- Barre St./Sibley Ave. - Converting this intersection to all-way stop control.
- Barre St./Granite St. - Converting this intersection to all-way stop control.
- Berlin St./River St./Granite St. - Adding an exclusive left-turn lane on the northbound Berlin St. approach.

The results of the capacity analyses with the above improvements are shown in Table 5. Detailed output reports for each scenario are also enclosed as **Appendices E and F.**

Table 5 - Intersection Levels of Service
(with traffic improvements)

	2020	
	Build 109	Build 174
Main St./Barre St.	F (321)	F (367)
Barre St./Sibley Ave.	C (20)	C (22)
Barre St./Granite St.	C (23)	D (28)
Berlin St./River St./Granite St.	D (39)	D (41)

The results of the additional capacity analyses with the proposed traffic improvements show that this Project's impact on future levels of service and delays can be effectively mitigated.

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 within the study area of this TIA.

Sight Distances

The existing speed limit on Barre St. between Pioneer St. and the curve located just west of Sabin's Pasture is 30 mph. West of that curve, the speed limit on Barre St. is 25 mph. At the 30 mph speed limit, intersection sight distances of 335 ft are recommended and available along Barre St. Cutting back portions of the roadside slope along the north side of Barre St. can also be employed to increase available sight distances as the future project design necessitates.

Crash History

The most recent 2001-2005 VTrans High Crash Location Report identifies the section of Barre St. extending from Main St. (mm 0.00) to just west of Putnam St. (mm 0.30) as being a high crash location. This section has an actual/critical ratio of 1.683. In addition, the section of State and Main Streets (Business Route 2) from just east of Taylor St. (mm 0.30) to Barre St. (mm 0.60) is also listed as a high crash location with an actual/critical ratio of 1.898.

Barre St. from Main to Granite Streets has urban street geometrics (on-street parallel parking both sides, sidewalks both sides, 34 ft curb to curb width, straight alignment, flat grade) typical of a collector street in a predominantly residential neighborhood. The on-street parking leaves a 9-10 ft traveled way lane width in each direction. This lane width conforms with recommended design standards for urban collector streets and help provide some traffic calming effect by reducing prevailing vehicle speeds.

The types of crashes occurring on the Barre St. high crash section were examined using 2003-2007 crash listings compiled by VTrans. Over that 5-year period, a total of 26 crashes occurred on this section. The two most common crash types were same direction sideswipe (9) and rear end (6). The relatively large number of same direction sideswipe crashes most likely involves either passing vehicles scraping an adjacent parked vehicle and/or vehicles pulling into and out of parking spaces. None of the crashes involved pedestrians.

We note that the VTrans statewide crash statistics for urban collector and minor arterial roads do not differentiate between downtown areas having on-street parking and non-downtown areas. This, in our

opinion, gives reason to believe that Barre St. and Main St. in Montpelier are high crash locations due to their high number of parking, driveway related turning movements and pedestrian movements; as opposed to some flaw or shortcoming in their design that could be corrected.

Pedestrian Safety

This Project will link with the City's existing sidewalk and bike path network. Presently, Barre Street has sidewalks on both sides west of Granite Street and for a limited distance on the south side east of Granite Street. Substantial sections of those sidewalks have been recently replaced and upgraded. An existing bike path, part of the Central Vermont Regional Bike Path, also begins at Granite Street and heads west to the City's downtown and beyond (Winooski West). An extension of that bike path (Winooski East) east to US Routes 2 and 302 along the former Montpelier and Wells River Railroad alignment is in the planning and design phases by the City. That future bike path alignment extends across the Sabin's Pasture parcel's frontage on the north side of Barre Street. The recent construction of the new Pioneer Street bridge also constructed a new sidewalk on the south side of Pioneer St. in the immediate vicinity of the bridge and acquired a portion of the Sabin's Pasture parcel to use as right-of-way for the future bike path on the north side.

It is anticipated that the proposed development of Sabin's Pasture will include construction of new links to the City's existing sidewalk network along Barre and Pioneer Streets. The proposed development will also designed to coordinate with the future Winooski East extension of the Central Vermont Regional Bike Path.

Overall

While this Project will bring increased traffic volumes primarily to Barre St., it is not anticipated that future increased volumes (±5% increase) would significantly change existing traffic safety conditions. Indeed, there are measures that could undertaken by Sabin's Pasture to improve future traffic safety conditions. We recommend that consideration be given to:

- Replacing the existing yield sign at Sibley Ave. with a stop sign.
- Converting to all-way stop control at the Granite St. and Sibley Ave. intersections will improve safety to both vehicle and pedestrian traffic at those locations.
- Installing traffic calming measures (e.g. curb extensions, raised crosswalks and/or speed tables) at selected locations along Barre St. to improve overall safety conditions. For example, in our observations of existing conditions we noted vehicles parking in no-parking zones and obstructing visibility immediately adjacent to crosswalks. Installing curb extensions at crosswalk locations would prevent that.

CONCLUSION

In summary, we conclude that with appropriate mitigation, the proposed development of the Sabin's Pasture parcel in Montpelier will not create an unreasonable impact on existing or future traffic congestion conditions or create unsafe traffic safety conditions.

We recommend, that as the design and permitting of Sabin's Pasture progresses, that the following traffic improvements be incorporated into the Project:

- Constructing new sidewalk links to the existing sidewalk network on Barre St. and Pioneer St.
- Or, in the alternative, constructing a new bike path link to connect with the existing Central Vermont Regional Bike Path at Granite Street.
- The project design should include provisions to permit the construction of the planned Winooski West segment of the Central Vermont Regional Bike Path across its frontage along the north side of Barre St.
- Installing traffic calming measures at selected locations along Barre Street to improve existing and future traffic safety conditions.
- Adding an exclusive right-turn lane on Barre St. at its intersection with Main St. in order to increase the capacity and reduce future delays at that intersection.
- Converting Sibley Ave. and Granite St. intersections on Barre St. from two-way stop control to all-way stop control.
- Widening the northbound Berlin St. approach at its intersection with River and Granite Streets to provide an exclusive lane for Berlin St. through traffic plus an outer right-turn lane for Granite St. and River St. right-turn movements.